CKD



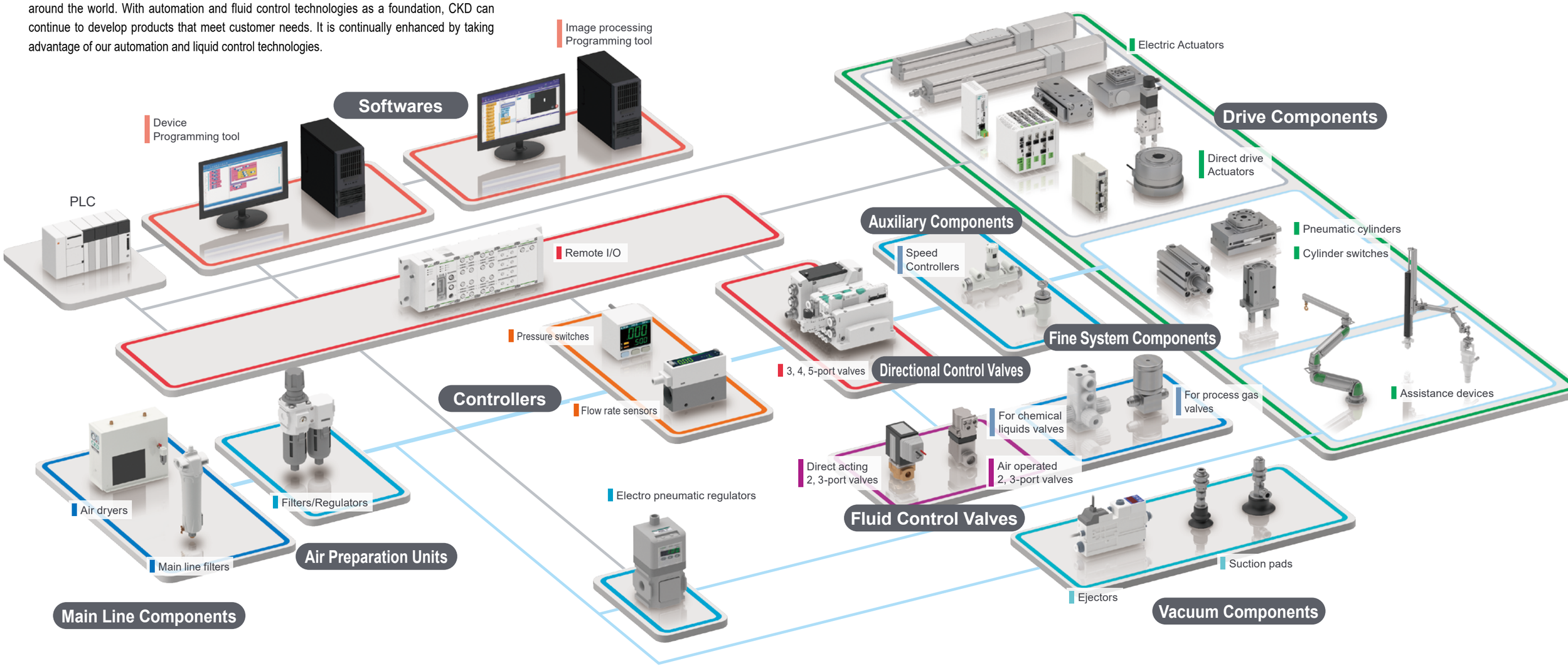
Sensor Controllers

- Pressure switches
- Flow rate sensors
- Flow rate controllers
- Air sensors

CKD products seen from their configuration images

Both Air and Electric. From software to I/O unit

CKD's product lineup has been expanding steadily, contributing to the creation of products around the world. With automation and fluid control technologies as a foundation, CKD can continue to develop products that meet customer needs. It is continually enhanced by taking advantage of our automation and liquid control technologies.



CKD products by application

High Durability Components
HP Series

Long service life
Environmental resistance

HP HIGH PRODUCTIVITY


CC-1421A

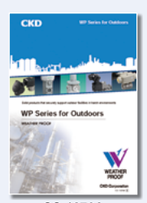
For food manufacturing processes
FP Series

FP Food Process™


CC-1271A

For outdoor use
WP Series

WEATHER PROOF


CC-1276A

Rechargeable Battery
Manufacturing Process **P4 Series**

Material
restrictions
1/5 or less dust
generation rate


CC-1226AA

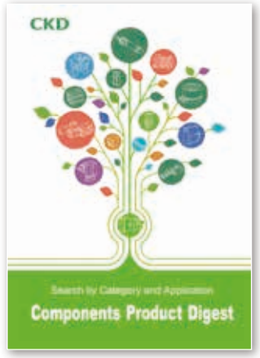
For Clean Components
P5/P7 Series

Low dust
generation
Exhaust port


CB-033SA

Guide to the CKD catalog

Learn more about each product category in the booklet catalog



RJ-001AA

The Digest Catalog allows you to search for components you are looking for by overview

Detailed specifications are available in the respective Booklet and WEB catalogs.

Main Line Component Products
Gas Generators

Air Dryers | Main Line Filters | Condensate Drains | Nitrogen gas extraction units

RJ-009AA



Refining and pressure adjusting components
Auxiliary Components

Filters | Regulators | Pressure gauges | Speed controllers | Silencers | Fittings | Tubes

RJ-007



Sensors/Controllers

Pressure switches | Flow rate sensors | Flow rate controllers | Air sensors

RJ-008AA



Precision / Vacuum Components

Air bearings | Ejector systems | Vacuum pump systems | Suction Pads

RJ-010AA



Fluid Control Valves

Solenoid valves | Air operated valves | Ball valves

RJ-013



Wet Fine System/High Purity Chemical Liquid System

CB-031A

Dry Fine System/High Purity Gas Control System Components

CB-035A



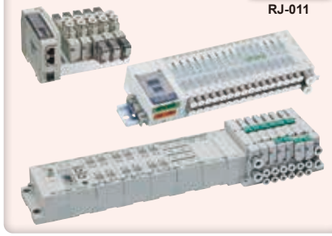
Learn more on the WEB

https://www.ckd.co.jp/kiki/en/

Directional Control Valves (1)

Plug-in Block Manifolds | 3, 4, 5-port valves | Remote I/O

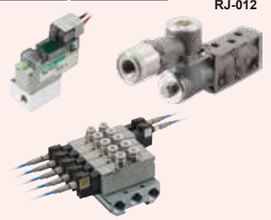
RJ-011



Directional Control Valves (2)

2, 3, 5-port valve | Explosion-proof | Air operated valve | Manual selector valve

RJ-012



Pneumatic Cylinders (1)

Standard

RJ-002AA



Pneumatic Cylinders (2)

Space saving structures

RJ-003AA



Pneumatic Cylinders (3)

With linear guide | With guide

RJ-004AA



Pneumatic Cylinders (4)

Rodless | With brake | Clamps | Oscillation / Rotation

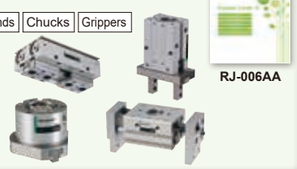
RJ-005



Pneumatic Cylinders (5)

Hands | Chucks | Grippers

RJ-006AA



Visual Programming Tool for Image Processing

Facilea
CC-1548AA

Facilea AI
CC-1623A

Device Visual Programming Tool

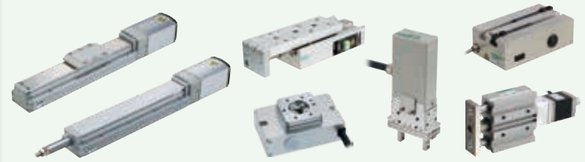
ExiaStudio
CC-1579AA



Electric Actuators

ROBODEX Pulse

RJ-014AA



Electric Actuators

ROBODEX Std.

CB-055A



Electric Actuators

ROBODEX Servo

CC-1275AA CC-1436AA



ABSODEX

ABSODEX

CC-1614AA



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Guide to the model selection system Intro 10

⚠ Safety Precautions Intro 17
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Published on the CKD website.
https://www.ckd.co.jp/kiki/en/

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Flow rate controllers
>>> Page **517**

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	Electronic pressure switch with digital display (Pressure switch) PPD3-S	**40**
	Electronic pressure switch with digital display PPG-D	**60**
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	Compact electronic pressure switch PPE-□A	**80**
	Compact electronic pressure switch PPEV-□A	**86**
	Modular design F.R.L. Digital pressure sensor dedicated for regulator mounting PPR	**92**
 Air contact/close contact/ cutting tool breakage detection switches >>> Page **97**	Digital gap switch GPS3	**100**
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Search by product series

Select from appearance and product overview of each series.

Pressure switches >>> Page 1

Air pressure switches



Listed Page From Page 3

Pneumatic pressure sensor

Electronic pressure switch

■Pressure switch

Series	Pressure range	Features	Page
PPX	-100 kPa to 1000 kPa	Standard and high-function types are available. Twin display of current pressure and set pressure values. 3-digit digital display	10
PPD3-S	-100 kPa to 980 kPa	Stainless steel diaphragm sensor	42
PPG-D	-101.3 kPa to 100.0 kPa	Size/31 mm Digital pressure sensor	62
PPE	-100 kPa to 1000 kPa	Sensor-amplifier integrated without display. Easy-to-install miniature body	72
PPEV	-100 kPa to 1.0 MPa	Small form factor of 10 mm width, high accuracy and high reliability	86
PPR	-100 kPa to 1.0 MPa	Modular F.R.L. dedicated for regulator mounting	92

Air pressure switches



Listed Page From Page 97

Pneumatic pressure sensor

Contact/close contact/cutting tool breakage detection switch

■Contact confirmation switches (digital gap switch)

Series	Detection range	Features	Page
GPS3	0.03 to 0.4mm	Single unit	104
MGPS3		Manifold (2 to 6 stations)	108
UGPS3	0.02 to 0.15mm	Solenoid valve with needle, regulator integrated general purpose unit	110

■Contact confirmation switch (gap switch)

Series	Orifice size	Features	Page
GPS2	ø0.5, ø0.7	Single unit	126
MGPS2	ø0.5, ø0.7	Manifold (2 to 5 stations)	132
UGPS2	ø0.5, ø0.7	Solenoid valve with needle, regulator integrated general purpose unit	136

■Close contact confirmation switch

Series	Orifice size	Features	Page
HPS	ø0.5, ø0.7, ø1.0	Single unit	154
MHPS	ø0.5, ø0.7, ø1.0	Manifold (2 to 5 stations)	160
UHPS	ø0.5, ø0.7, ø1.0	Solenoid valve with needle, regulator integrated general purpose unit	164

■Cutting tool breakage detection switch

Series	Orifice size	Features	Page
TLPS	ø0.3	Single unit	182
MTLPS	ø0.3	Manifold (2 to 5 stations)	188
UTLPS	ø0.3	Solenoid valve with needle, regulator integrated general purpose unit	192

Pressure switches for coolants



Pressure switches for coolants

■Mechanical pressure switch for coolants

Series	Port size	Features	Page
CPE	Rc1/4	Enables a wide pressure setting range of 0.05 to 0.8 MPa for coolant liquid through air	210

■Electronic pressure switch for coolants

Series	Pressure range	Features	Page
CPD	0 to 7 MPa	With sensor amplifier integrated display for coolants and other liquids	214

Flow rate sensor >>> Page 219

Flow rate sensor for air



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Flow rate sensor for air

Compact flow rate sensor (RAPIFLOW)®

■High-precision/high-speed response, integrated display/separated display FSM3

Series	Flow range uni-direction/bi-direction	Features	Page
FSM3-□005	0 to 500/-500 to 500 mL/min	High precision High-speed response. Needle valve integrated. Separated display is available. Can be rotated and displayed LCD. Panel mounting is supported. Unrestricted mounting orientation. Variety of fitting variations.	229
FSM3-□010	0 to 1000/-1000 to 1000 mL/min		
FSM3-□020	0 to 2.00/-2.00 to 2.00 L/min		
FSM3-□050	0 to 5.00/-5.00 to 5.00 L/min		
FSM3-□100	0 to 10.00/-10.00 to 10.00 L/min		
FSM3-□200	0 to 20.0/-20.0 to 20.0 L/min		
FSM3-□500	0 to 50.0/-50.0 to 50.0 L/min		
FSM3-□101	0 to 100.0/-100.0 to 100.0 L/min		
FSM3-□201	0 to 200/-200 to 200 L/min		
FSM3-□501	0 to 500/-500 to 500 L/min		
FSM3-□102	0 to 1000/-1000 to 1000 L/min		



■Environment-resistant specifications Integrated display/separated display FSM3

Series	Flow range uni-direction/bi-direction	Features	Page
FSM3-□005	0 to 500/-500 to 500 mL/min	Compact flow rate sensor with protection structure equivalent to IP65 while maintaining the features of the FSM3 Series. Optionally, ATEX directive compliant.	323
FSM3-□010	0 to 1000/-1000 to 1000 mL/min		
FSM3-□020	0 to 2.00/-2.00 to 2.00 L/min		
FSM3-□050	0 to 5.00/-5.00 to 5.00 L/min		
FSM3-□100	0 to 10.00/-10.00 to 10.00 L/min		
FSM3-□200	0 to 20.0/-20.0 to 20.0 L/min		
FSM3-□500	0 to 50.0/-50.0 to 50.0 L/min		
FSM3-□101	0 to 100.0/-100.0 to 100.0 L/min		
FSM3-□201	0 to 200/-200 to 200 L/min		
FSM3-□501	0 to 500/-500 to 500 L/min		
FSM3-□102	0 to 1000/-1000 to 1000 L/min		

■Separated display FSM2-D

Series	Settable flow rate range	Features	Page
FSM2-D	5, 10, 50, 100, 500, 1000 [mL]	Separated display dedicated for FSM3 Series. When connecting the FSM3 integrated display/separated display, the flow rate range, etc., is automatically recognized.	355
	2, 4, 5, 10, 12, 20, 25, 32, 50, 100, 200, 500, 1000, 1500 [L]		



■Miniature/ultra-high-speed response Analog output FSM-X

Series	Flow rate range L/min uni-direction (bi-direction)	Features	Page
FSM-X-A□005	0 to 0.5 (-0.5 to 0.5)	Compact body enabled by separating the sensor head.	372
FSM-X-A□010	0 to 1 (-1 to 1)		
FSM-X-A□050	0 to 5 (-5 to 5)		
FSM-X-A□100	0 to 10 (-10 to 10)		

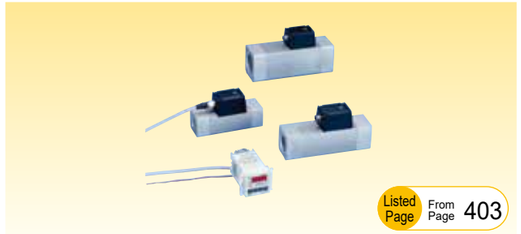
■Miniature analog output/switch output FSM-V

Series	Flow rate range L/min	Features	Page
FSM-V-□-R0005	−0.05 to +0.05	Easy measurement of forward and reverse flow. Ideal for detection control of vacuum suction and vacuum burst.	378
FSM-V-□-R0010	−0.1 to 0.1		
FSM-V-□-R0050	−0.5 to 0.5		
FSM-V-□-R0100	−1 to 1		
FSM-V-□-R0500	−5 to 5		
FSM-V-□-R1000	−10 to 10		

■Miniature inline filter FSM-VFM

Series	Port size	Features	Page
FSM-VFM	ø1.8, ø4, M5	Inline filter dedicated for miniature and space saving FSM Series	394

Flow rate sensors for air



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Flow rate sensor for air

Pneumatic flow rate sensors FLUEREX®

■Separated display PFD

Series	Flow rate range L/min (normal)	Features	Page
PFD-501	25 to 500	Covers a wide range of flow rates. Compressed air flow rate detection.	406
PFD-102	5 to 50		
PFD-202	100to 2000		
PFD-402	100 to 200		
PFD-802	400 to 8000		
PFD-163	800 to 16000		

Search by product series

Select from appearance and product overview of each series.

Flow rate sensor >>> Page 219

Flow rate sensor for liquid



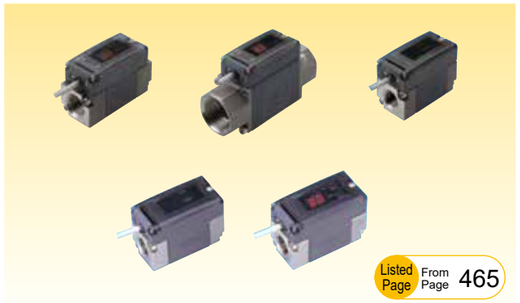
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Flow rate sensors for liquids

Flow sensors for liquids FLUEREX®

■Karman's vortex

Series	Measured flow rate range	Features	Page
WFK2-005	0.4 to 5 L/min	Wide flow rate measured range IO-Link configuration Equipped with multiple functions enabling various settings	426
WFK2-020	1.6 to 20 L/min		
WFK2-050	4.0 to 50 L/min		
WFK2-100	8.0 to 100 L/min		
WFK2-250	20 to 250 L/min		



Listed Page From Page 465

Flow rate sensors for liquids

Flow rate sensors for water

■Karman's vortex

Series	Measured flow rate range	Features	Page
WFK3000	0.5 to 40, 1.5 to 12 L/min	Compact/device built-in	468



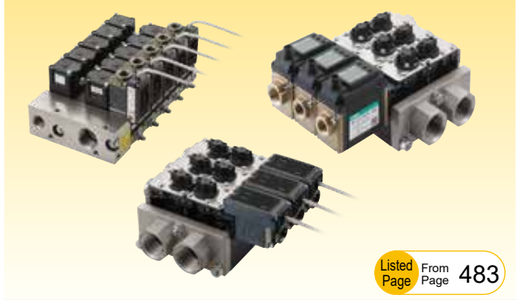
Listed Page From Page 447

Flow rate sensors for liquid

Capacitance electromagnetic flow sensors

■Capacitance

Series	Measured flow rate range	Features	Page
WFC-150	0.5 to 15 L/min	The Flo-Thru structure is resistant to foreign matter	450
WFC-600	2.0 to 60 L/min		



Listed Page From Page 483

Integrated units for water control

Series	Features	Page
WXU-H	1 Fluid control	486
WXU-HC	1 Fluid control	486
WXU-J	1 Fluid control	492
WXU-P	2 Fluid control	496

Flow rate controllers >>> Page 517

Flow rate controllers for air



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Flow rate controllers for air

Compact flow rate controllers RAPIFLOW®

■Standard models

Series	Flow rate range	Features	Page
FCM-9500	0 to 0.5 L/min	Compact, high-speed and multifunctional flow rate controller. Compatible fluids are air, nitrogen, argon, oxygen, city gas, methane, propane, hydrogen, helium	524
FCM-0001	0 to 1 L/min		
FCM-0002	0 to 2 L/min		
FCM-0005	0 to 5 L/min		
FCM-0010	0 to 10 L/min		
FCM-0020	0 to 20 L/min		
FCM-0050	0 to 50 L/min		
FCM-0100	0 to 100 L/min		

■Low differential pressure models

Series	Flow rate range	Features	Page
FCM-L9500	0 to 0.5 L/min	Suitable for controlling burner flame or other combustion gases with low supply pressure.	524
FCM-L0001	0 to 1 L/min		
FCM-L0002	0 to 2 L/min		
FCM-L0005	0 to 5 L/min		
FCM-L0010	0 to 10 L/min		

Multi-monitors >>> Page 577



Listed Page From Page 577

Multi-monitor

■Multi-monitors

Series	Flow rate/pressure range	Features	Page
MD	-100 to 980	For remote monitoring of flow rate and pressure.	580

CKD How to use CAD data

Free download!

This is what makes CKD's CAD great!

Comprehensive list of CKD's leading products



Japanese, English, Chinese (Simplified and Traditional), and Korean are supported.

Simultaneous with new product launch

NEW Model No. AX1R

ABSODEX



Supports various data formats



More than 25 types of 2D and more than 35 types of 3D

Supports PDF and JPEG formats!

✱To use 3D CAD, you must register as a CKD plus member.

CKD plus How to register as a member

STEP 1

From the CKD components product top page, click "New member registration"



STEP 2.

Enter your name, company name, contact information, and email address

Easy registration in 2 STEPS

Registration complete!



How to download CAD

STEP 1

Click on "3D CAD" from the product detail page



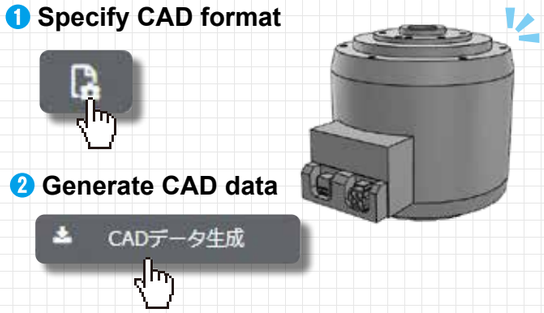
STEP 2.

Select model No.

STEP 3

❶ Specify CAD format

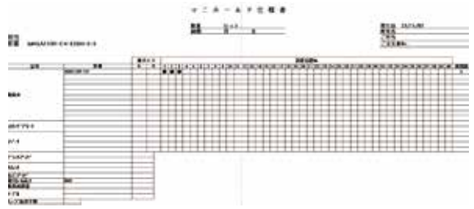
❷ Generate CAD data



Download complete!

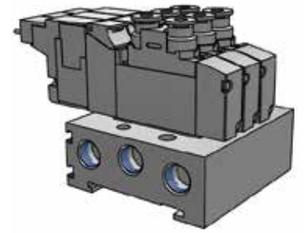
Pneumatic valve manifold specifications and CAD data are easily available on the Web.

Specifications are available



Manifold specifications for pneumatic valves can be prepared and shipped assembled to the customer.

Get CAD data



2D and 3D CAD data available for pneumatic valve manifold assemblies

Specifications and download method of CAD data

STEP 1

CKD components product TOP page > Product details page >Click "Manifold specifications sheet"



STEP 2.

Select model No.



STEP 3

Create specifications sheet



STEP 4

Download complete!



Significantly reduces work time

●For specifications output, click 仕様出力.

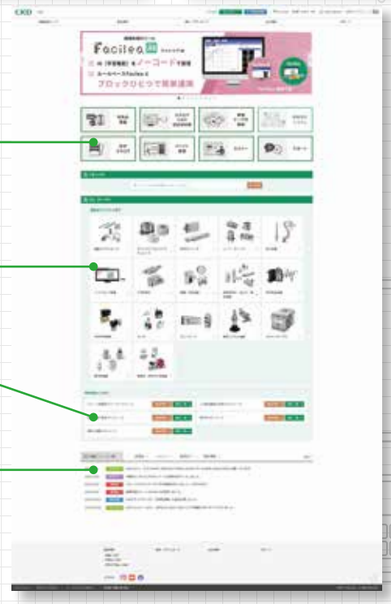
●If downloading CAD data, click 2D/3D CAD.

For details, please contact our nearest sales office. © 2023. CKD Corporation All Rights Reserved.

Website Information

We provide various information on our website.
Please take advantage of it

Catalog	CAD	Instruction manual
Maintenance parts	Software	Model selection
FAQ	Technical information	Product Information
Column	Event information	Seminar



You'll find the information you need here

You can find the product you want

Find the right product for each application

Stay up-to-date with the latest news



Various information is provided on each product page



Various information is available according to the products and applications

Guide to the Model Selection System

How to use the Model Selection System

The CKD system supports selection of the following items.
Please use this information when selecting and designing models.

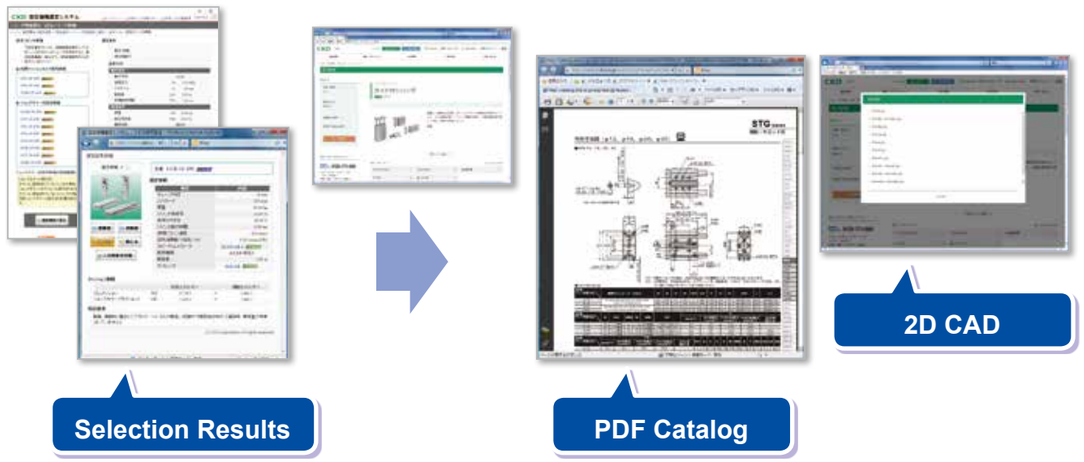
Available on our website

This is a system for selecting products according to the customer's application and working conditions.



∗Software may not be downloadable due to your security policy. If that is the case, contact CKD.

Linked to PDF catalogs and CAD data from selection results!



No registration required, available anytime!

A variety of services such as CKD product catalogs, PDF, CAD data and model selection are available. Feel free to try it.

https://www.ckd.co.jp/en/

How Flow Characteristics are Indicated

1. Flow Characteristics Indication

The catalog specifications indicate the flow rate as follows.

Applicable Components	Indicator	Unit	Standards
Pneumatic Components	JIS compliant indication	C, b	ISO 6358:1989 "Pneumatic fluid power - components using compressible fluids - Determination of flow-rate characteristics" JIS B 8390:2000 (ISO 6358 translation)
	Conventional Display	S	JIS B 8379:1995 "Pneumatic noise reduction device"
		Cv	ANSI (NFPA)T3. 21. 3 R1-2008
Fluid Control Components	JIS compliant indication	Cv Kv	IEC 60534-2-3: 2015 "Industrial Process Control Valves - Part 2: Flow rate - Part 3: Test Procedure" JIS B 2005-2-3: 2004 (IEC 60534-2-3 translation) JIS B 8471: 2004 "Solenoids for water" JIS B 8472: 2008 "Solenoids for steam" JIS B 8473: 2007 "Solenoids for fuel"
	Conventional Display		

2. Pneumatic components descriptions

The flow characteristics of the pneumatic components were conventionally indicated with the effective cross-sectional area S and flow coefficient Cv.However, following JIS revisions (JIS B 8390:2000), these characteristics are now indicated with the sonic conductance C and critical pressure ratio b.

●Sonic conductance C: Value obtained by dividing the passage mass flow of the choked flow component by the product of the upper limit absolute pressure and standard condition density. (sonic conductance) S≈5. 0C (C enables sizing as before.)

●Critical pressure ratio b: Pressure at which choked flow results if smaller than this value (downstream pressure/upstream pressure (critical pressure ratio)

●Effective cross-sectional area S (m㎡): The value of the ideal restricted cross-sectional area without friction or compressed flow, calculated from the pressure changes inside the air tank when the choked flow is released from the components mounted on the air tank.

✱Choked flow: Flow at which upstream pressure is higher than downstream pressure, and speeds at components sections reach acoustic velocity. The mass flow rate of the gas is proportional to the upstream pressure and independent of the downstream pressure. (Choked flow)

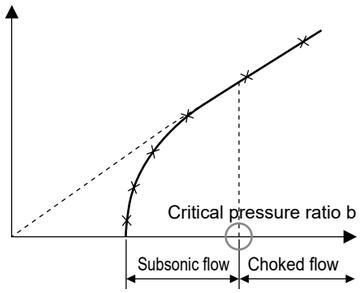


Fig. 1 Mass flow characteristics for upstream pressure

Flow Rate Formula

Depending on the actual unit, they are shown as follows.

- $\frac{P_2}{P_1}$ Choked flow when ≤ b

$$Q=600\times C\times P_1\times \sqrt{\frac{293}{273+T}} \quad \text{..... (1)}$$

- $\frac{P_2}{P_1}$ Subsonic flow when >b

$$Q=600\times C\times P_1\times \sqrt{1-\left[\frac{\frac{P_2}{P_1}-b}{1-b}\right]^2}\ \sqrt{\frac{293}{273+T}} \quad \text{..... (2)}$$

Q: Flow rate L/min (ANR) in standard condition
C: Sonic conductance [dm³/(s·bar)]
b: Critical pressure ratio
S: Effective cross-sectional area m㎡
P_1: Primary side absolute pressure MPa (abs)
P_2: Primary side absolute pressure MPa (abs)
T: Air temperature °C

When calculating with effective cross-sectional area S, substitute value C obtained with C=S/5 in the above formula. For subsonic flow, substitute b = 0.5 in formula (2).

3. Fluid control components

The flow characteristics of the fluid control components indicated flow coefficients Cv and Av. However, the Av value was eliminated from the control valve flow coefficient with "JIS B 2005-2-3:2004" revisions, so that only Kv and Cv are used. Cv and Kv values are listed for the flow characteristics of the fluid control components.

●Flow coefficient Cv: This is a non-SI control valve flow coefficient, but is used commonly throughout the world. US gal value which indicates 40 to 100°F city water flow rate per minute passing through the valve (device under test) at pressure differential of 1 psi.

$$Cv=Q\sqrt{\frac{\rho}{\rho w}\cdot\frac{1}{\triangle P}} \quad \text{..... (3)}$$

Cv: Flow coefficient
Q: Flow rate [U.S.gal/min] (1 U.S.gal/min=6,309×10)$^{-5}$m³/s)
ρ: Fluid density [1b/ft³](1b/ft³=16,018 kg/m³)
ρw: Water density of 40°F to 100°F (4°C to 38°C) [1b/ft³]
△P: Pressure difference [psi] (1 psi = 6.8948 kPa)

●Flow coefficient Kv: Numerical value expressing the flow rate of drinking water at temperatures from 5 to 40°C flowing through the valve in m³/h when the pressure difference is 1 bar.

$$Kv=Q\sqrt{\frac{1\times 10^5}{\triangle P}\cdot\frac{\rho}{1000}} \quad \text{.....(4)}$$

Kv: Flow coefficient
Q: Flow rate [m³/h]
△P: Pressure difference [Pa]
ρ: Fluid density [kg/m³]

Flow Rate Formula

Depending on the actual unit, they are shown as follows.

●Flow coefficient Cv

For liquids:

$$Q=45.58\ Cv\sqrt{\frac{\triangle P}{G}} \quad \text{.....(5)}$$

Cv: Flow coefficient
Q: Flow rate [L/min]
△P: Pressure difference [MPa]
G: Specific gravity [water G = 1]

For steam:

When $P_2 \le \frac{P_1}{2}$ $\quad W=\frac{99\ Cv\ P_1}{K}$ .....(6)

When $P_2 > \frac{P_1}{2}$ $\quad W=\frac{198\ Cv\sqrt{(P_1-P_2)\ P_2}}{K}$ .....(7)

Cv: Flow coefficient
W: Flow rate [kg/h]
P1: Primary side absolute pressure [MPa]
P2: Secondary side absolute pressure [MPa]
K: (1+0.0013 ts) ts: Superheat
(Saturation steam K = 1)

How Flow Characteristics are Indicated

Flow Rate Formula

Depending on the actual unit, they are shown as follows.

●Flow coefficient Kv

For liquids:

$$Q=52.63\,Kv\sqrt{\frac{\triangle P}{G}} \quad \text{.....(8)}$$

Kv: Flow coefficient
Q: Flow rate [L/min]
△P: Pressure difference [MPa]
G: Specific gravity [water G = 1]

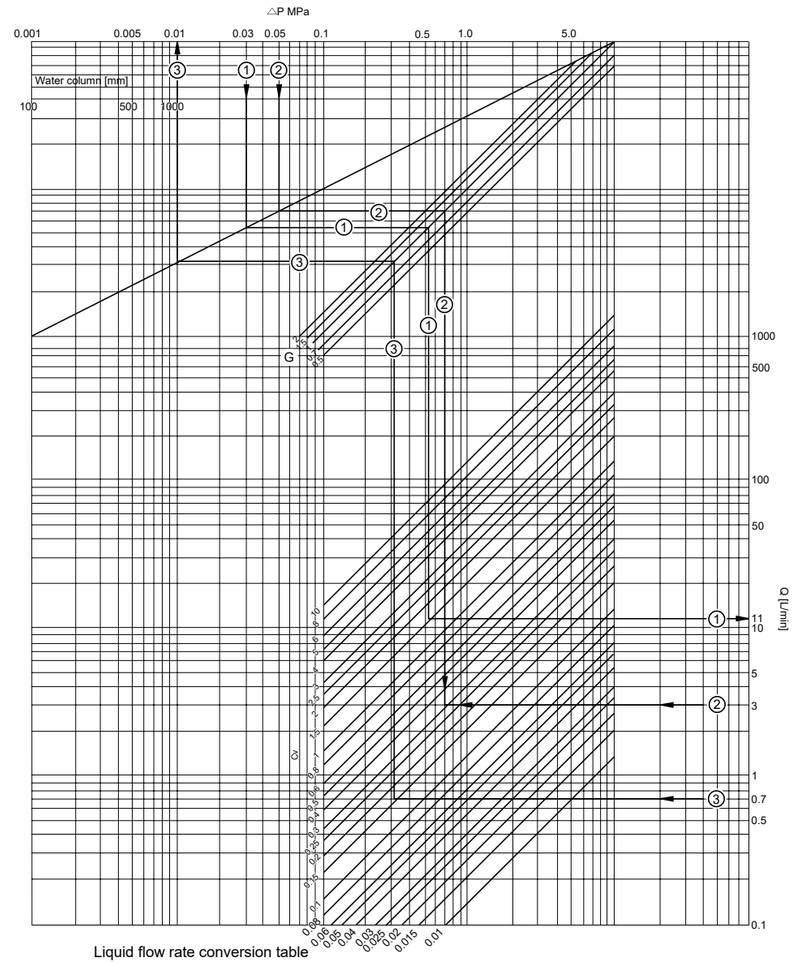
Flow coefficient conversion

Kv≈0.87 Cv

Kv: Numerical value expressing the flow rate of drinking water at a temperature of 5 to 40°C through the valve in m^3/h when the pressure difference is 1 bar.
Cv: Numerical value expressing the flow rate in US gal/min of 60 °F drinking water temperature flowing through the valve when the pressure difference is 1 lbf/in^2 (psi)
The values do not match those of Kv and Cv for air because the test methods are different.

Flow rate conversion table

Water



Liquid flow rate conversion table

●Example 1:
What is the flow rate when water (specific gravity=1) flows through a valve with Cv 1.5 at △P=0.03 MPa
(P1-P2)
Q=11.8 L/min

●Example 2:
Cv value required to flow water (specific gravity=1) at 3 L/min at △P=0.05 MPa
Cv=0.29

●Example 3:
Pressure loss when water (specific gravity = 1) is passed through a Cv=0.15 valve at 0.7 L/min
△P=0.01 MPa

*1: The table shows Cv up to 10. If this value is exceeded, multiply the Cv and flow rate Q proportionally.
Example: For a Cv value of 15, this would mean using the 1.5 place and multiplying the flow rate by 10.

Flow rate calculation method

Flow coefficient Kv

$$Q=52.63\,Kv\sqrt{\frac{\triangle P}{G}}$$

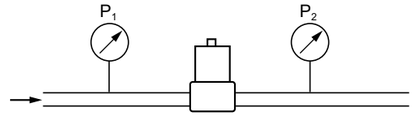
Kv: Flow coefficient
Q: Flow rate [L/min]
△P: Pressure difference [MPa]
G: Specific gravity [water G = 1]

Flow coefficient conversion
Kv≈0.87 Cv

Flow coefficient Cv

$$Q=45.58\,Cv\sqrt{\frac{\triangle P}{G}}$$

Cv: Flow coefficient
Q: Flow rate [L/min]
△P: Pressure difference [MPa]
G: Specific gravity [water G = 1]

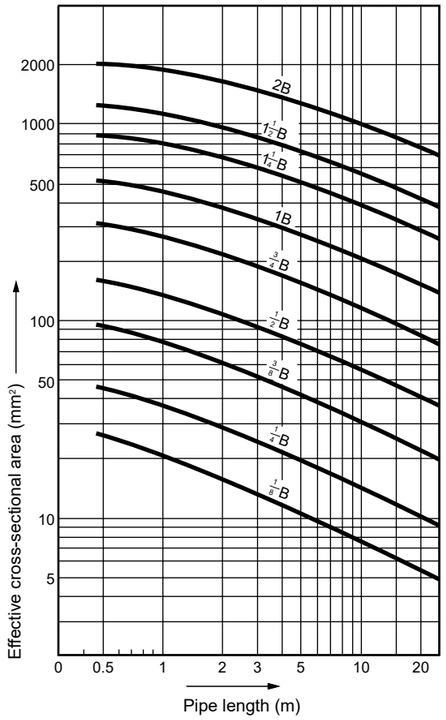


Pressure loss
△P
$\triangle P=P_1-P_2$

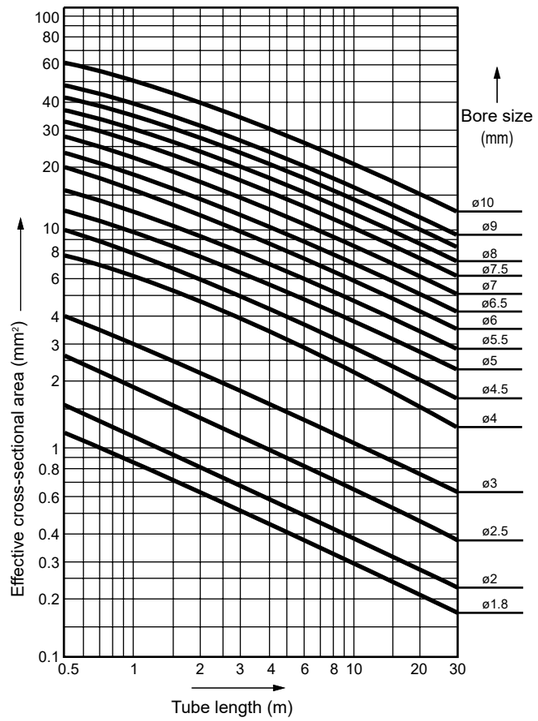
P_1: Upstream pressure [MPa]
P_2: Downstream pressure [MPa]

Effective cross-sectional area for steel pipes and nylon tubes, and recommended max. flow rate for gas pipes

Effective cross-sectional area of steel pipes



Effective cross-sectional area of nylon tubes



Recommended max. flow rate table of gas tube

Nominal size	1/8B	1/4B	3/8B	1/2B	3/4B	1B	1 1/4B	1 1/2B
Pressure drop MPa (*1)	0.124	0.0707	0.0576	0.0425	0.0276	0.0209	0.0133	0.0105
Inlet pressure MPa	Recommended max. flow rate (L/min)							
0.05	127	244	518	838	1,465	2,460	3,870	5,150
0.1	146	282	598	965	1,690	2,828	4,460	5,950
0.15	163	314	668	1,076	1,885	3,150	4,960	6,630
0.2	179	344	730	1,180	2,060	3,450	5,430	7,280
0.3	206	395	840	1,360	2,375	3,900	6,300	8,400
0.4	230	442	940	1,520	2,660	4,450	7,000	9,360
0.5	252	485	1,030	1,660	2,920	4,875	7,700	10,250
0.6	272	523	1,110	1,800	3,140	5,250	8,300	11,050
0.7	292	558	1,185	1,920	3,350	5,620	8,870	11,800
0.8	308	592	1,260	2,035	3,560	5,970	9,430	12,570
0.9	324	623	1,325	2,140	3,745	6,290	9,900	13,220
1.0	340	654	1,395	2,250	3,930	6,600	10,400	13,880
1.2	370	717	1,510	2,450	4,280	7,150	11,250	15,040
1.4	398	763	1,625	2,624	4,590	7,700	12,100	16,200
1.5	410	790	1,680	2,710	4,740	7,930	12,550	16,780

(*1: Inlet pressure = 0.5 MPa
Gas tube length: 10 m)

(Remarks)

In mainlines with long piping distances, it is necessary to consider the degree of pressure drop that occurs at the end of the mainline when air flows through it. The maximum recommended flow rate means the maximum flow rate that can be recommended within an acceptable pressure drop relative to the pipe length from a practical standpoint. This does not mean that a higher flow is not possible, but rather that the pressure will further decrease if the flow exceeds this value.

Degree of protection

- Degree of Protection
- IEC (International Electrotechnical Commission) Standards (IEC60529)
- JIS C 0920 : 2003

IP- □ □

Protection Characteristic Codes (International Protection)

1st Characteristic No. (degree of protection for foreign solid matter)

1st Characteristic No.	Degree of protection	
0	No protection	
1	ø50 mm	Protection against inflow of solids 50 mm and over in diameter
2	ø12.5 mm	Protection against inflow of solids 12.5 mm and over in diameter
3	2.5 mm	Protection against inflow of solids 2.5 mm and over in diameter
4	1 mm	Protection against inflow of solids 1.0 mm and over in diameter
5	Dust-proof	No inflow of dust at levels adversely affecting normal device operation or safety
6	Dust resistant	No inflow of dust

2nd Characteristic No. (degree of protection for water entry)

2nd Characteristic No.	Degree of protection	
0	No protection	
1	Protection against water dripping	No harmful effects from water dripping vertically.
2	Protection against dripping water tilted at an angle of up to 15° (15°)	Water dripping vertically has no adverse effect when the product is tilted at an angle of up to 15° from its normal position.
3	Protection for watering	Water falling as a spray at any angle up to 60° from the vertical has no adverse effect.
4	Protection against splashing water	Water splashing against the product from any direction has no adverse effect.
5	Protection against water jets	No harmful effects occur even when water is sprayed with nozzles from all directions.
6	Protection against powerful water jets	Water projected in powerful jets against the product from any direction has no adverse effect.
7	Protection against immersion	Water will not enter the product even when it is immersed in water under defined conditions.
8	Protection against immersion	The product can be used for continuous immersion in water.

Safety Precautions

Be sure to read this section before use.

When designing and manufacturing equipment using CKD products, the manufacturer is obligated to ensure that the safety of the mechanism, pneumatic control circuit and/or water control circuit and the system that runs the electrical controls are secured.
It is important to select, use, handle and maintain CKD products appropriately to ensure their safe usage.
Observe warnings and precautions to ensure device safety.
Check that device safety is ensured, and manufacture a safe device.

WARNING

1 This product is designed and manufactured as a general industrial machine part. It must be handled by an operator having sufficient knowledge and experience.

2 Use this product in accordance with specifications.

This product must be used within its stated specifications. In addition, never modify or additionally machine this product.
This product is intended for use in general industrial machinery equipment or parts. It is not intended for use outdoors (except for products with outdoor specifications) or for use under the following conditions or environments. (Note that this product can be used when CKD is consulted prior to its usage and the customer consents to CKD product specifications. The customer should provide safety measures to avoid danger in the event of problems.)

❶ Use for applications requiring safety, including nuclear energy, railways, aircraft, marine vessels, vehicles, medical devices, devices or applications in contact with beverages or foodstuffs, amusement devices, emergency cutoff circuits, press machines, brake circuits, or safety devices or applications.
❷ Use for applications where life or assets could be significantly affected, and special safety measures are required.

3 Observe organization standards and regulations, etc., related to the safety of the device design and control, etc.

ISO4414,JIS B 8370(Pneumatic fluid power - General rules and safety requirements for systems and their components)
JFPS2008(Principles for pneumatic cylinder selection and use)
Including the High Pressure Gas Safety Act, Industrial Safety and Health Act, other safety rules, organization standards and regulations, etc.

4 Do not handle, pipe, or remove devices before confirming safety.

❶ Inspect and service the machine and devices after confirming safety of the entire system related to this product.
❷ Note that there may be hot or charged sections even after operation is stopped.
❸ When inspecting or servicing the device, turn OFF the energy source (air supply or water supply), and turn OFF power to the facility. Discharge any compressed air from the system, and pay enough attention to possible water leakage and leakage of electricity.
❹ When starting or restarting a machine or device that incorporates pneumatic components, make sure to secure system safety, such as pop-out prevention measures.

5 Observe the warnings and cautions on the following pages to prevent accidents.

■ Precautions are ranked as “DANGER”, “WARNING”, and “CAUTION” in this section.

DANGER:	In the case where the product operation is mishandled and/or when the urgency of a dangerous situation is high, it may lead to fatalities or serious injuries.
WARNING:	A dangerous situation may occur if handling is mistaken, leading to fatal or serious injuries.
CAUTION:	A dangerous situation may occur if handling is mistaken, leading to minor injuries or property damage.

Note that some items indicated with “CAUTION” may lead to serious results depending on the conditions.
All items contain important information and must be observed.

Warranty

1 Warranty period

The product specified herein is warranted for one (1) year from the date of delivery to the location specified by the customer.

2 Warranty coverage

If the product specified herein fails for reasons attributable to CKD within the warranty period specified above, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty product at one of CKD’s facilities free of charge.
However, following failures are excluded from this warranty:

1) Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or the Instruction Manual.
2) Failure caused by use of the product exceeding its durability (cycles, distance, time, etc.) or caused by consumable parts.
3) Failure not caused by the product.
4) Failure caused by use not intended for the product.
5) Failure caused by modifications/alterations or repairs not carried out by CKD.
6) Failure caused by reasons unforeseen at the level of technology available at the time of delivery.
7) Failure caused by acts of nature and disasters beyond control of CKD.

The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.
Note: For details on the durability and consumable parts, contact your nearest CKD sales office.

3 Compatibility check

The customer is responsible for confirming the compatibility of CKD products with the customer’s systems, machines and equipment.

Precautions for export

1 Security Trade Control

The products in this catalog and their related technologies may require approval before export or provision.
For the sake of maintaining world peace and safety, there may be cases in which approval under the Foreign Exchange and Foreign Trade Control Law is required in advance, depending on the country to where the product or related technology is being exported or provided.
The scope of products and related technologies requiring approval are listed in the Export Trade Control Order Appendix Table 1 or Foreign Exchange Order Appendix Table.
The Export Trade Control Order Appendix Table 1 and Foreign Exchange Order Appendix Table contain the following two types of information.

- “List controls” specified for items 1 to 15
- “Catch-all controls” that do not indicate specifications by item, but restriction by application (Section 16)

Products that require authorization or the range of relevant technology

- List control, which is specified in item 1 to 15
  Listed in the “Export Trade Control Order Appendix Table 1” or “Foreign Exchange Order Appendix Table”
- Catch-all control restricted by application (item 16)
  Listed in the “Export Trade Control Order Appendix Table 1” or “Foreign Exchange Order Appendix Table”

An application for approval is received by the Security Export Licensing Division of the Ministry of Economy, Trade and Industry or local bureaus of the Ministry of Economy, Trade and Industry.

2 Products and related technologies in this catalog

The products and related technologies in this catalog are subject to the catch-all control of the Foreign Exchange and Foreign Trade Control Law.
When exporting or providing the products or related technologies in this catalog, ensure that they are not used for arms or weapons.

3 Contact

Contact your local CKD Sales Office for information on the Security Trade Control of products and related technologies in this catalog.

Design / Selection

1. Checking the specifications

⚠WARNING

■Use the product in the range of conditions specified for the product. The product in this catalog is designed for use only in a compressed air system. Use with pressures or temperatures outside the specifications range may result in damage or operation failure. (Refer to specifications)
Contact CKD when using fluids other than those specified in the specifications for each component.

2.Safety Design

⚠WARNING

■Take measures to prevent physical harm or property damage in the event of breakdown.

⚠CAUTION

■Understand compressed air features before designing a pneumatic circuit.
- ●The same functions as mechanical, hydraulic and electrical methods cannot be anticipated if instantaneous service interruption and holding are required during an emergency stop.
- ●Pop-out, air discharge, or leakage due to air compression and expansion may occur.
- ●Design the circuit so that compressed air in the system is exhausted.

■Decide on a method of lubricating the pneumatic components, and provide correct maintenance.
- ●Is it a lubrication type?

Is it a no-lubrication type?
Specify either of the above for control of lubricant.

■Check for leakage current to avoid malfunction caused by the leakage current.
- ●When using a programmable controller, leakage current may cause malfunction.

3. Design by Application

⚠CAUTION

■Exerts no influence on performance as it uses compressed air and a small amount of leakage is tolerable. Contact CKD if no-leakage is required.

4. Working Environment

⚠WARNING

■Install the product where it will not be exposed to rain, water or direct sunlight.

■Do not use this product in a corrosive environment. Use in such an environment could lead to damage or operation failure.

■Avoid using this product in environments where ozone is generated. Consult with CKD if ozone is generated in the air supply, as an ozone-resistant series is available.

■If ambient temperature is less than 5°C, moisture in the circuit could freeze and lead to misoperations, etc. Remove moisture to prevent freezing.

⚠CAUTION

■Confirm before use that the product will withstand the working environment.
- ●This product cannot be used in environments where functional obstacles could occur. Such environments include high temperatures, chemical atmospheres, or those where chemical liquids, vibration, moisture, dripping water, coolant or gas are present. Contact CKD if no-leakage is required.

5. Securing of space

⚠CAUTION

■Secure sufficient space around the pneumatic components for installation, removal, wiring, and piping work.

6. Clearly state in the instruction manual

⚠CAUTION

■Indicate the maintenance conditions in the device's instruction manual.
- ●The product's performance may drop too low to maintain an appropriate safety level depending on usage conditions, working environment and maintenance status. With correct maintenance, the product functions can be used to the fullest.

Mounting, Installation and Adjustment

⚠CAUTION

1. Mounting

■Do not remove the pneumatic components packaging and the piping port seat cap until just before starting to pipe.
- ●If the piping port cap is removed from the piping port before piping work is started, foreign matter could enter the pneumatic component from the piping port and result in faults or faulty operation.

■When mounting a pneumatic components, do not use a mounting method that relies on support from the piping.

■Remove the dust-proof seal of piping port just before starting to pipe.
- ●Removing it before starting piping work may cause foreign matter to enter the inside from the piping port, resulting in breakdown malfunction.

2. Pre-operation confirmation

■After connecting the pipes, check pipe connections for air leaks before supplying compressed air.
- ●Apply a leakage detection agent on pipe connections with a brush and check for air leaks. Make sure that the leak detection agent does not adhere to the plastic bowl. The plastic bowl could break, which is dangerous.

3. Piping

■When connecting pipes, wrap sealing tape in the opposite direction from the threading, from the inside position to within 2 mm from the pipe end.
- ●If sealing tape protrudes from the pipe threads, it could be cut when screwing the bolts in. This could cause the tape to enter the solenoid valve, causing breakdowns.



When using a liquid sealant, make sure that it does not adhere to the plastic bowl. The plastic bowl could break, which is dangerous.

■Check that the piping connected to the pneumatic components is not dislocated due to vibration, looseness, or tension.
- ●Piping dislocation is dangerous.

■Observe the following precautions when using nylon or urethane tubes as the piping material.
- ●Use flame-resistant tubes or metal steel pipes in an environment where spattering may occur.
- ●Use a hydraulic hose for common piping for hydraulic and pneumatic specifications.
- ●When using the standard push-in fitting on the spiral tube, fix the base of the tube with a hose clamp. Rotation may occur, causing a reduction in holding force.
- ●When using for hot liquids, use a spigot fitting. The push-in fitting cannot be used.

■Connect the piping so that connections are not dislocated by equipment movement, vibration, tension, etc.

■Always flush just before piping pneumatic component.
- ●Any foreign matter that has entered the pneumatic components during piping must not enter the valve.

■Tighten pipes with the appropriate torque.
- ●The purpose is to prevent air leakage and damage to bolts.
- ●First tighten the bolts by hand to ensure that the threads are not damaged, then use a tool.

[Recommended values]

Port thread	Tightening torque N·m
M3	0.3 to 0.6
M5	1 to 1.5
Rc1/8	3 to 5
Rc1/4	6 to 8
Rc3/8	13 to 15
Rc1/2	16 to 18
Rc3/4	19 to 40
Rc1	41 to 70

Note: If a specific tightening torque is recommended for the model, use the torque.



4. Pneumatic source

■Install a pneumatic filter just before the pneumatic component in the circuit.

■When supplying compressed air after connecting pipes, do not suddenly apply high pressure.
- ●The pipe connection could dislocate causing the pipe to fly off and result in accidents.
- ●CAUTION: If compressed air is supplied too slowly, sealing pressure may not be generated depending on the internal sealing mechanism of the solenoid valve and may cause air leaks.

■Air Quality
- ●Use CKD clean air system components appropriate for your application.
- ●Use compressed air that does not contain oil oxides, tar, carbon, etc., from the air compressor.
- ●Use compressed air that does not contain solid foreign matter.

Use / Maintenance

⚠CAUTION

1. Disassembly / Assembly

■Pneumatic components products must be disassembled and assembled by qualified personnel.

●Personnel involved in this step must have passed the Pneumatic Pressure Skill Test Class 2 or higher.

■Read the relevant product's instruction manual thoroughly and fully familiarize yourself with the work before disassembling or assembling the pneumatic components.

●Personnel must be fully familiar with pneumatic component structure and operational principles and safety requirements.

2. Maintenance / Inspection

■Be sure to turn power OFF, stop the compressed air supplied, and check that there is no residual pressure before starting maintenance.

●This is required to ensure safety.

MEMO

Pressure switches

Listed page

For air	Electronic pressure switches	3
	Contact/close contact/cutting tool breakage detection switches	97
For coolants	Mechanical pressure switches	209
	Electronic pressure switches	214

Electronic pressure switches for air

■ Pressure switch

Overview

Air pressure is electrically detected, displayed and outputted.

Overview

Diverse variety
Wide variations are available from compact sensors to displays.



CONTENTS

Series variation	4
Applications	6
● PPX with digital display (sensor/amplifier integrated)	8
● PPD3-S with display (sensor/amplifier integrated/separated)	40
● PPG-D with digital display (sensor/amplifier integrated)	60
● PPE without display (sensor/amplifier integrated)	72
● PPE-□A without display/analog output (sensor/amplifier integrated)	80
● PPE-□A without display/analog output (sensor/amplifier integrated)	86
● PPR with digital display (sensor/amplifier integrated)	92

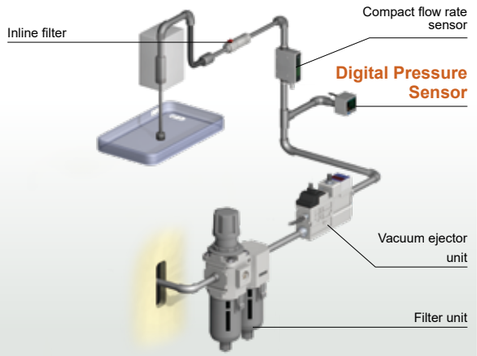
●= Available in lineup
- = Not available in lineup

*1: Select by model No.

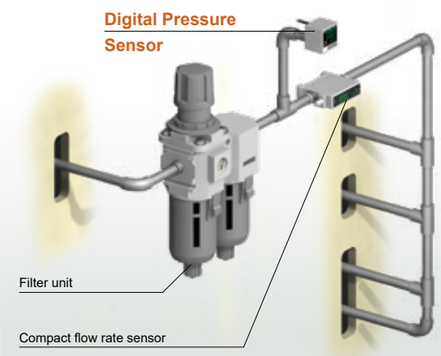
Model		Type: Sensor/amplifier integrated	Type: Sensor/amplifier separated	Pressure range (kPa): 0 to 980 (1000)	Pressure range (kPa): 0to 98 (100)	Pressure range (kPa): 0 to −100 (-101.3)	Pressure range (kPa): −100 to 980 (1000)	Pressure range (kPa): −100 to 300	Pressure range (kPa): −100 to 100	Degree of Protection		Switch output (number of points) *1: NPN	Switch output (number of points) *1: PNP	Analog voltage/ current	IO-Link	Applicable fluid	Mounting Method: FR Mounting	Mounting Method: Panel mount	Mounting Method: Others (mounting brackets, etc.)	Mounting Method: Piping connection: Rc1/8	Mounting Method: Piping connection: R1/8	Mounting Method: Piping connection: Push-in	Mounting Method: Piping connection: Plug	Mounting Method: Piping connection: M5 Female thread	Mounting Method: Piping connection: NPT1/8	Mounting Method: Piping connection: G1/8	Indicator: Digital display	Indicator: Output lamp only	Listed on Page
PPX 	Digital pressure sensor with a twin display that allows the user to simultaneously check the current pressure value and the set pressure value, a 3-color display, a setting copy function, three mode settings, and other unprecedented ease-of-use and high functionality.	●	-	-	-	-	● (1000)	-	●	IP40		●(2)	●(2)	-	●	Air Non-corrosive gas	● Included	●	●	-	●	-	-	●	●	●	●	—	8
												●(1)	●(1)	● (1)															
PPD3-S 	Pressure switch with digital display stainless steel diaphragm is used for sensor section.	●	-	-	-	-	●	●	●	IP65		● (2)	● (2)	-	-	Air Non-corrosive gas (Including drainage and oil) Compressed air	-	●	●	●	-	●	-	-	-	-	●	-	40
												● (1)	● (1)	● (1)															
		-	●							IP65 (IP 40 for display section)		● (2)	● (2)	● (1)			-	●	●	●	-	-	-	-	-	-	●	-	
PPD3 	Digital display pressure switch ideal for pneumatic lines Abundant port structures allow flexible use, such as adsorption and seating checks.	-	●	-	-	-	●	●	●	IP65 (IP 40 for display section)		● (2)	● (2)	● (1)	-	Air Non-corrosive gas	-	●	●	-	●	●	●	-	-	-	•	-	40
PPG-D 	Basic digital pressure sensor suitable for pneumatic/vacuum pressure. A variety of selectable ports to enable support to be provided globally	●	-	● (1000)	-	● (−101.3)	-	-	●	IP65		●(2)	●(2)	●	-	Air Non-corrosive gas	-	●	●	●	●	-	-	●	●	●	●	-	60
PPE 	Trimmer setting semiconductor pressure switch developed for pneumatic/ vacuum circuits Usage is flexible due to compact shape and three types of piping connections	●	-	● (1000)	● (100)	● (−101.3)	-	-	-	IP65		● (2-wire) (1)	-	-	-	Air Non-corrosive gas	-	-	-	-	●	●	●	-	-	-	-	●	72
PPE-□A 	Semiconductor pressure sensor developed for pneumatic/ vacuum circuits 1 to 5 V output (analog output) is proportional to applied pressure	●	-	● (1000)	● (100)	●	-	-	-	IP65		-	-	● (1)	-	Air Non-corrosive gas	-	-	-	-	●	●	●	-	-	-	-	● (displays energized state only)	80
PPEV-□A 	Semiconductor pressure sensor for pneumatic/vacuum circuits 1 to 5 V output (analog output) is proportional to applied pressure Can be connected to a compact components such as a pneumatic valve for use in output confirmation, etc.	●	-	● (1000)		●	-	-	-	Dust-proof		-	-	● (1)	-	Compressed air	-	-	-	-	-	-	●	●	-	-	-	●	86
PPR 	Digital pressure sensor for regulators with twin display that allows simultaneous confirmation of [current value] and [set value] of pressure, 3-color display, lock function, and energy-saving mode function.	●	-	● (1000)	-	-	-	-	-	IP40		●(1)	●(1)	-	-	Compressed air	●	-	-	-	-	-	-	-	-	-	●	-	92

Digital pressure sensors Case study

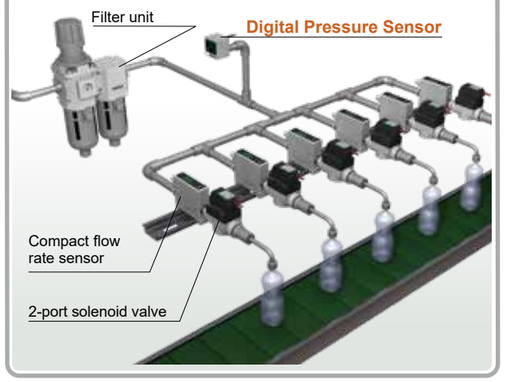
Workpiece suction confirmation



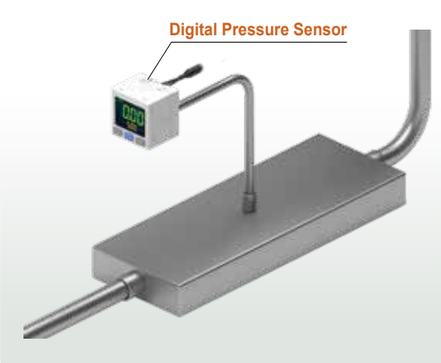
Checking equipment source pressure



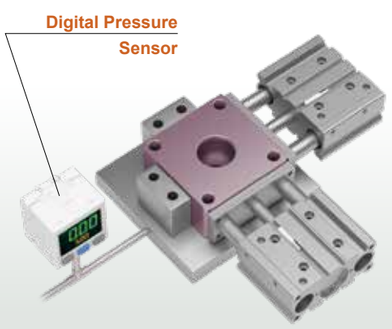
Container leakage inspection



Vacuum pressure monitor



Contact confirmation



Glossary

- **Pressure switch:** A component that outputs an ON/OFF signal in response to a set pressure value (threshold value).
- **Pressure sensor:** A component that outputs an analog signal (voltage or current) proportional to pressure.

MEMO

Pressure switch
Electronic pressure Switch
Contact Confirm Switch
For Coolant Pressure Switch
Ending

Digital pressure sensor **PPX Series**

Set values can be changed while viewing present values!

Comparison output 1
Operation indicator lamp
Communication operation indicator lamp for IO-Link-type

Comparison output 2
Operation indicator lamp
High-function-type has analog voltage output operation indicator lamp



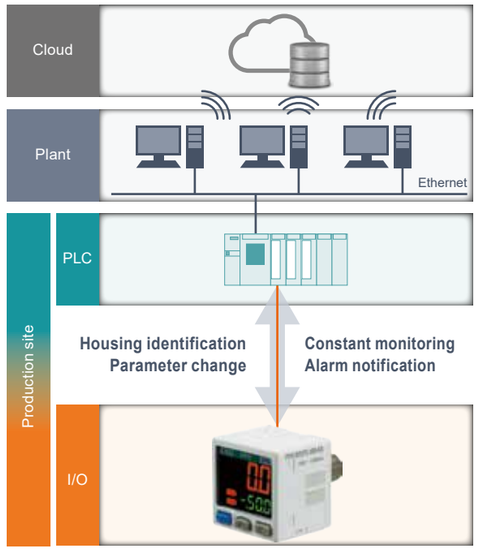
Mode switching key
UP key
DOWN key

Present value [Main display]
3-color display (red/green/orange)
Main display section changes between green and red in conjunction with output ON/OFF and shows orange during setting.

Set value [Sub-display]
Sub-display section can be customized
Arbitrary alphanumeric characters other than set values can be displayed.

IO-Link model available

IO-Link is a digital communication standard for sensors/actuators at factory sites. (IEC 61131-9)
Unlike analog communication, it enables the transmission of parameters and event data.



Features of IO-Link



Constant monitoring via digital data is possible.



Parameters can be set and changed via the network, enabling remote equipment operation.



Models, serial numbers, etc., can be confirmed on the network.



The settings can be copied from the master, making parameter reconfiguration after maintenance obsolete.



Device failure and disconnection can be confirmed.



It can also be converted to Ethernet networks and connected, enabling devices to be IoT-ready.

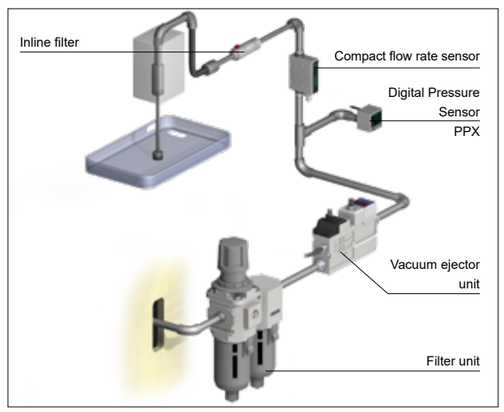
Selectable output

Select from comparison output, analog output and IO-Link. 3 output types in the lineup to match applications.

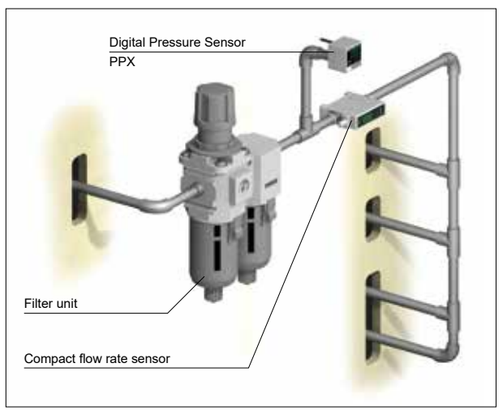
	Standard	High-function	IO-Link
Output 1	Comparison output (NPN/PNP)	Analog Output (Voltage/current)	IO-Link
Output 2	Comparison output (NPN/PNP)	Comparison output (NPN/PNP)	Control output (PNP)

Examples of applications

Workpiece suction confirmation



Checking equipment source pressure



Oil-free gas-contact section

PPX-P12 Series

- **Gas-contact section is Oil-free**
- **Ideal for applications susceptible to grease, including semiconductors and medical use.**

Handy functions for ease of use

- **Easy-to-read alphanumeric display**



- **Peak/bottom hold function**
  The max. and min. values of pressure fluctuation are displayed using 2 screens.
- **10 increments of response time can be set. (2.5 ms to 5000 ms)**
- **The setting descriptions can be displayed by code number**

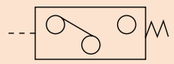


Space saving contact mounting is possible.



Digital pressure sensor standard

PPX Series

Circuit diagram Symbol 

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

[Model No. Notation Method in Japan]

PPX - R01 N - 6M - ( )

- PPX: Model No.
- R01: ❶ Pressure range
- N: ❷ Output
- 6M: Piping shape: R1/8, M5 female thread
- ( ): ❸ Connector cable

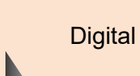
❶Pressure range

Code	Description
R01	−100.0 to 100.0 kPa
R10	−0.100 to 1.000 MPa

❷Output

Code	Description
N	NPN transistor output 2 point (Standard)
P	PNP transistor output 2 point (standard)
NH	NPN transistor output 1 point + analog voltage output or external input (high-function)
PH	PNP transistor output 1 point + analog voltage output or external input (high-function)

❸Connector cable

	Code	Description	
	Blank	2 m connector cable attached	
Note	J	Without connector cable	

Note: ❷ Selectable only when "N" or "P" is selected for output.

[Model No. Notation Method for overseas markets]

PPX - R01 N - 6M - ( ) - KA

- PPX: Model No.
- R01: ❶ Pressure range
- N: ❷ Output format
- 6M: ❸ Piping shape
- ( ): ❹ Connector cable
- KA: With unit change function

In compliance with the new Measurement Law, export models with unit select function cannot be used in Japan.

❶Pressure range

Code	Description
R01	−100.0 to 100.0 kPa
R10	−0.100 to 1.000 MPa

❷Output

Code	Description
N	NPN transistor output 2 point (Standard)
P	PNP transistor output 2 point (standard)
NH	NPN transistor output 1 point + analog voltage output or external input (high-function)
PH	PNP transistor output 1 point + analog voltage output or external input (high-function)

❸Piping shape

	Code	Description
*1	6M	R1/8, M5
	6N	NPT1/8, M5
*2	6G	G1/8, M5

*1: ❷ Selectable only when "N" or "NH" is selected for output.
*2: ❷ Selectable only when "P" or "PH" is selected for output.

❹Connector cable

	Code	Description	
	Blank	2 m connector cable attached	
*	J	Without connector cable	

*: ❷ Selectable only when "N" or "P" is selected for output.

Destination	Switch Output NPN	Switch Output PNP	Unit	Unit Change Function	Unit seal label included Note	Piping port
Domestic	○	○	kPa/MPa	−	−	R1/8(M5)
Asia	○	−	kPa/MPa	○	○	R1/8(M5)
Europe	−	○	kPa/MPa	○	○	G1/8(M5)
North America	○	○	kPa/MPa	○	○	NPT1/8(M5)

Note: For the included unit sealant, Page 39.

Type	Model No.	Port size	Output	Remarks
Standard	PPX-R01N-6M-(J)-KA	M5 female thread + R (PT) 1/8 male thread	NPN transistor/open collector	For Asia
	PPX-R10N-6M-(J)-KA			
High-function	PPX-R01NH-6M-KA			
	PPX-R10NH-6M-KA			
Standard	PPX-R01P-6G-(J)-KA	M5 female thread + G1/8 male thread	PNP transistor/open collector	For Europe
	PPX-R10P-6G-(J)-KA			
High-function	PPX-R01PH-6G-KA			
	PPX-R10PH-6G-KA			
Standard	PPX-R01N-6N-(J)-KA	M5 female thread + NPT1/8 male thread	NPN transistor/open collector	For North America
	PPX-R01P-6N-(J)-KA		PNP transistor/open collector	
	PPX-R10N-6N-(J)-KA		NPN transistor/open collector	
	PPX-R10P-6N-(J)-KA		PNP transistor/open collector	
High-function	PPX-R01NH-6N-KA		NPN transistor/open collector	
	PPX-R01PH-6N-KA		PNP transistor/open collector	
	PPX-R10NH-6N-KA		NPN transistor/open collector	
	PPX-R10PH-6N-KA		PNP transistor/open collector	

Specifications for rechargeable battery (Catalog No.CC-1226AA)

Conforms to CKD P4 Series equivalent specifications as standard.

Discrete option model No.

PPX - C1

- C1: ❶ Option

❶Option

Code	Description		
C1	Cable with connector	1 m	
C2		2 m	
C3		3 m	
C5		5 m	
CN	Connector set (×10 set)		
KL	Mounting bracket (mounting screw attached)		
KHS	Panel bracket		
KCB	Front protective cover (when using panel bracket)		

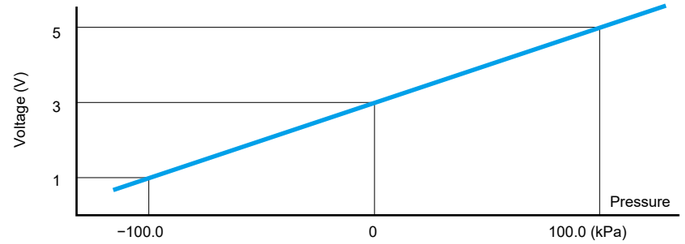
Specifications

Item		Standard		High-function	
		For low pressure PPX-R01□	For high pressure PPX-R10□	For low pressure PPX-R01□H	For high pressure PPX-R10□H
Type of pressure		Gauge pressure			
Rated pressure		−100.0 to +100.0 kPa	−0.100 to +1.000 MPa	−100.0 to +100.0 kPa	−0.100 to +1.000 MPa
Pressure setting		−101.0 to +101.0 kPa	−0.101 to +1.010 MPa	−101.0 to +101.0 kPa	−0.101 to +1.010 MPa
Proof pressure		500 kPa	1.5 MPa	500 kPa	1.5 MPa
Applicable fluid		Air/non-corrosive gas			
Power supply voltage		12 to 24 VDC ±10%, Ripple P-P 10% or less			
Power consumption		Normal: 720 mW or less (current consumption 30 mA or less at 24 V power supply voltage) ECO mode: 480 mW of less at STD (current consumption 20 mA or less at power supply voltage 24 V), 360 mW or less at FULL (current consumption 15 mA or less at power supply voltage 24 V)			
Comparison output (Comparison output 1, Comparison output 2)		[NPN output] NPN transistor/open collector • Max. inrush current: 100 mA • Applied voltage: 30 VDC or less (comparison output - 0 V interval) • Residual voltage: 2 V or less (at inrush current 100 mA)		[PNP output] PNP transistor/open collector • Max. outflow current: 100 mA • Applied voltage: 30 VDC or less (comparison output - +V interval) • Residual voltage: 2 V or less (at outflow current 100 mA)	
	Output operation	Select NO/NC with key operation			
	Output mode	EASY mode/hysteresis mode/window comparator mode			
	Hysteresis	Min. 1 digit (variable)			
	Repeatability	±0.1% F.S. (within ±2 digits)	±0.2% F.S. (within ±2 digits)	±0.1% F.S. (within ±2 digits)	±0.2% F.S. (within ±2 digits)
	Response time	2.5 ms, 5 ms, 10 ms, 25 ms, 50 ms, 100 ms, 250 ms, 500 ms, 1000 ms, 5000 ms select by key operation			
	Short-circuit protection	Equipped			
External input (auto reference/remote zero adjusting)		———		[NPN output] ON voltage: 0.4 VDC or less OFF voltage: 5 to 30 VDC or release Input impedance: 10 kΩ Input time: 1 ms and over	[PNP output] ON voltage: 5 V to+VDC OFF voltage: 0.6 VDC or less or release Input impedance: 10 kΩ Input time: 1 ms and over
Analog voltage output		———		Output voltage: 1 to 5 V Zero point: Within 3 V±5%F.S. Span: Within 4 V±5%F.S. Linearity: Within ±1%F.S. Output impedance: 1 kΩ	Output voltage: 0.6 to 5 V Zero point: Within 1 V±5%F.S. Span: Within 4.4 V±5%F.S. Linearity: Within ±1%F.S. Output impedance: 1 kΩ
Analog current output		———		Output current: 4 to 20 mA Zero point: Within 12 mA ±5% F.S. Span: Within 16 mA ±5% F.S. Linearity: Within ±1%F.S. Load resistance: 250 Ω (max.)	Output current: 2.4 to 20 mA Zero point: Within 4mA±5%F.S. Span: Within 17.6 mA±5%F.S. Linearity: Within ±1%F.S. Load resistance: 250 Ω (max.)
Indicator		4-digit + 4-digit 3-color LCD display (display updating cycle: 250 ms, 500 ms, 1000 ms select by key operation)			
	Indicator pressure range	-101.0 to +101.0 kPa	-0.101 to +1.010 MPa	-101.0 to +101.0 kPa	-0.101 to +1.010 MPa
Indicator lamp		Orange LED (comparison output 1 operation indicator lamp, comparison output 2 operation indicator lamp: Lit when comparison output is ON)		Orange LED (comparison output 1 operation indicator lamp: Lit when comparison output is ON, analog voltage output operation indicator lamp: Lit at setup)	
Environment conditions	Degree of Protection	IP40 (IEC)			
	Ambient temperature	-10 to +50°C, at the time of storage: -10 to +60°C			
	Ambient humidity	35 to 85%RH (no condensation or freezing), when stored: 35 to 85%RH			
	Withstand voltage	1000 VAC for 1 minute applied to all charged sections/between cases			
	Insulation resistance	50 MΩ and over with 500 VDC megger overall charging section/between cases			
	Vibration resistance	Durability of 10 to 500Hz double amplitude 3 mm XYZ 2 hours in each direction (Panel mounting: Endurance 10 to 150 Hz double amplitude 0.75 mm XYZ 2 hours in each direction)			
	Shock resistance	Durability of 100 m/s^2 (approx. 10 G) 3 times in each direction of XYZ			
Temperature characteristics (characteristics at +20°C are taken as standard)		Within ±0.5% F.S.	Within ±1% F.S.	Within ±0.5% F.S.	Within ±1% F.S.
Port size *1		M5 female thread + R (PT) 1/8 male thread			
Material		Case: PBT (glass fiber included), LCD display part: acrylic resin, pressure port: SUS303, mounting screw part: brass (nickeling), switch part: silicone rubber			
Connection		Connector connection			
Wire length		Up to 100 m (less than 30 m when CE marked) with 0.3 mm^2 or larger cable			
Unit change function		For overseas (-Only compatible with KA (MPa, kPa.kgf/c)m^2, bar, psi, mmHg, inchHg)			
Weight		Body weight: approx. 40 g, weight including package: 130 g			
Accessory *2		PPX-C2 (2 m cable with connector): 1 pc. Unit seal label (-KA with unit change function): MPa, kPa.kgf/cm^2, bar, psi, mmHg, inchHg			

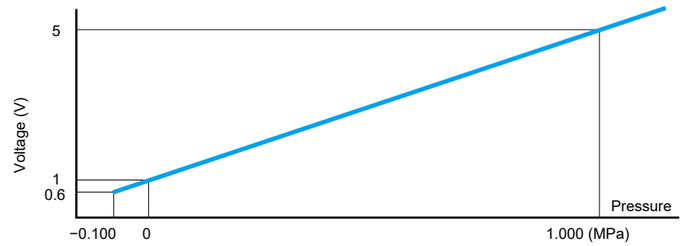
*1: Refer to page 11 for export use.
*2: For "-J", connector cable is not attached.

Analog output voltage - pressure characteristics

●PPX-R01NH
R01PH

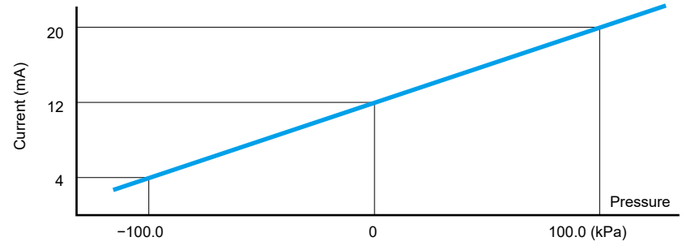


●PPX-R10NH
R10PH

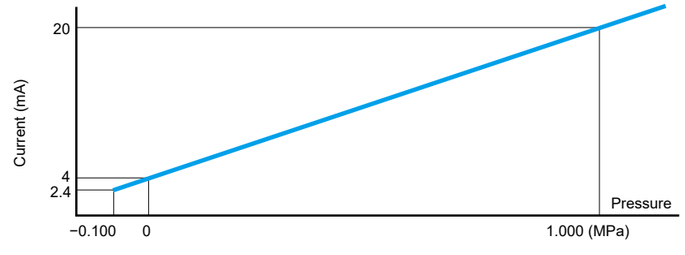


Analog output current - pressure characteristics

●PPX-R01NH
R01PH

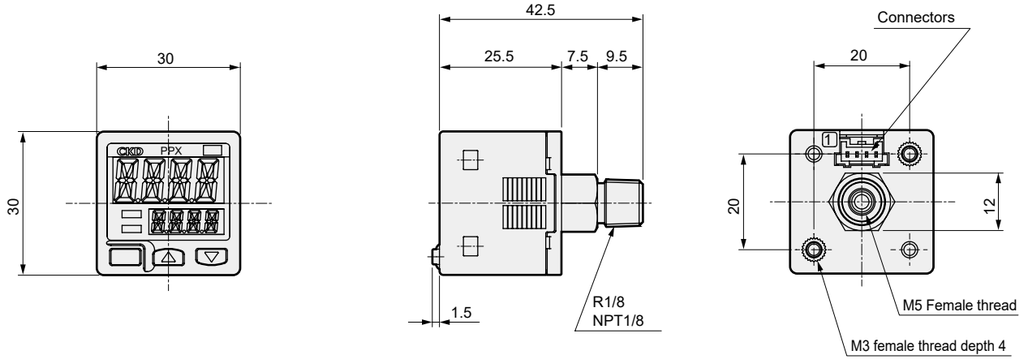


●PPX-R10NH
R10PH

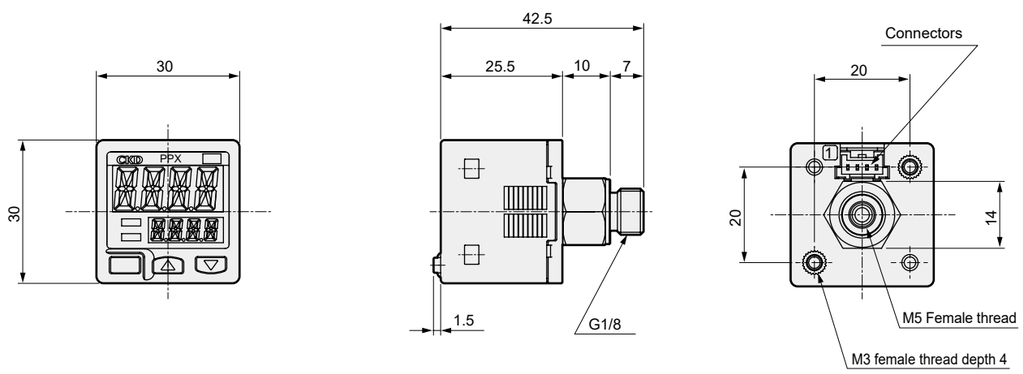


Dimensions

●PPX-R□□-6M/6N (R thread/NPT thread)

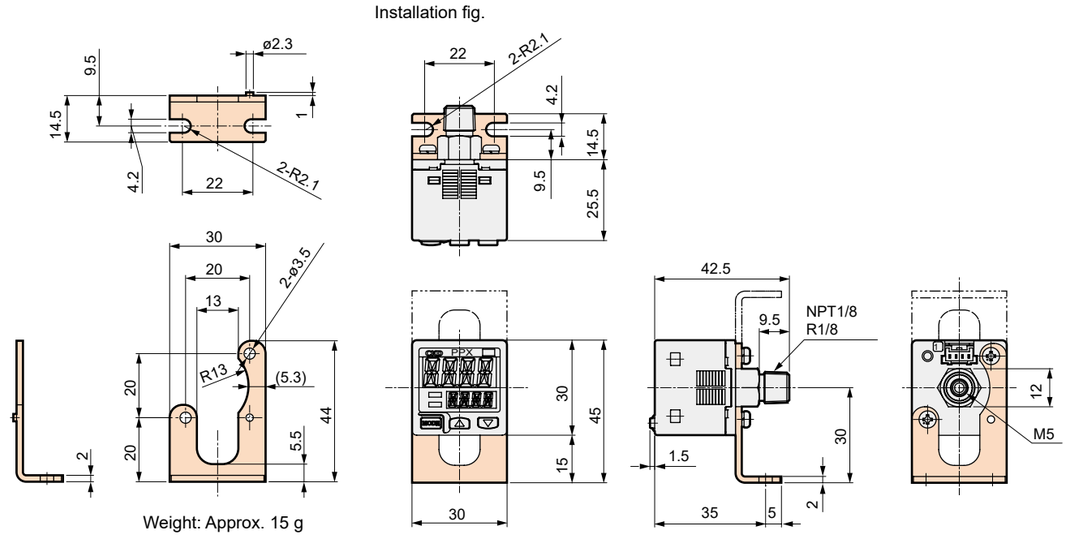


●PPX-R□□-6G (G thread)



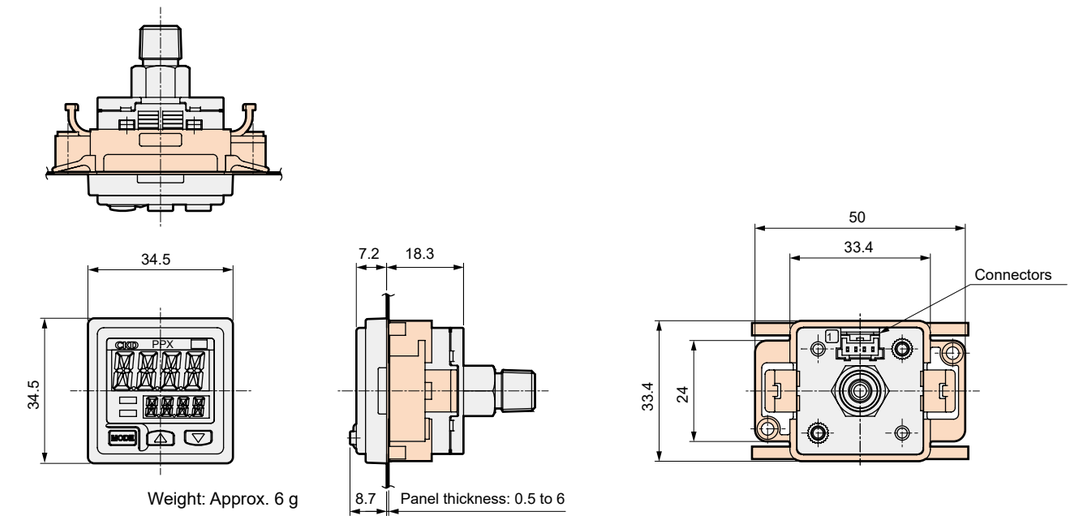
Optional dimensions

●Mounting bracket (PPX-KL)



Weight: Approx. 15 g

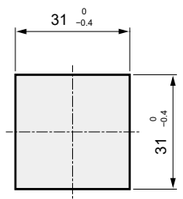
●Panel bracket (PPX-KHS) installation fig.



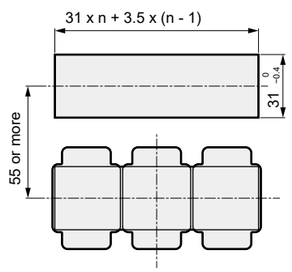
Weight: Approx. 6 g

Panel cut dimension

When installing 1 pc.

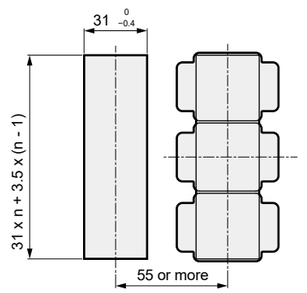


When installing consecutive n pcs. horizontally



Note: Panel thickness must be 0.5 to 6 mm.

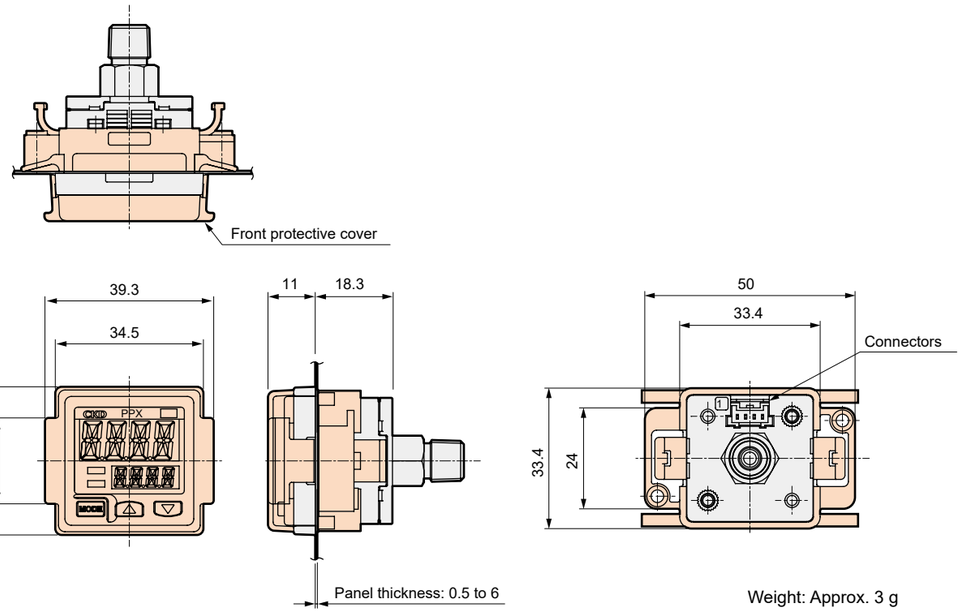
When installing consecutive n pcs. vertically



Note: Panel thickness must be 0.5 to 6 mm.

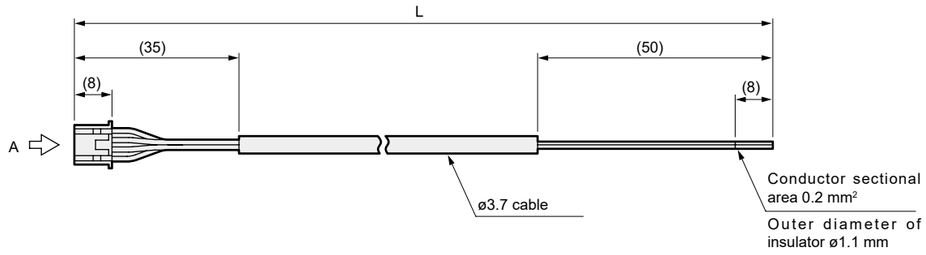
Optional dimensions

●Front protective cover (PPX-KCB) installation fig.



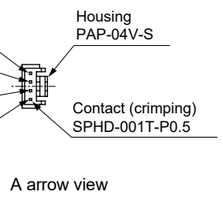
Weight: Approx. 3 g

●Cable with connector (PPX-C□)



(J.S.T.)

0 V	Blue	4
Standard: Comparison output 2 High-function: Analog voltage output or external input	White	3
Comparison output 1	Black	2
+V	Brown	1
Terminal name	Insulator color	Terminal No.



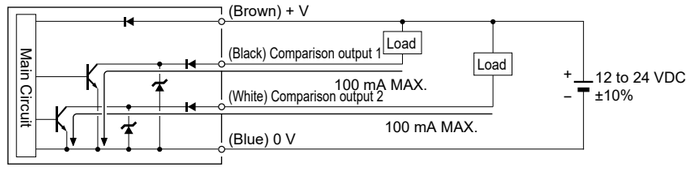
Model No.	Cable length	Weight g
PPX-C1	1 m	Approx. 20
PPX-C2	2 m	Approx. 40
PPX-C3	3 m	Approx. 60
PPX-C5	5 m	Approx. 100

●Connector set (PPX-CN)
- Housing: JST MFG CO. LTD. PAP-04V-S
- Contact: J.S.T. Mfg. Co., Ltd. SPHD-001T-P0.5

Circuit and connection method

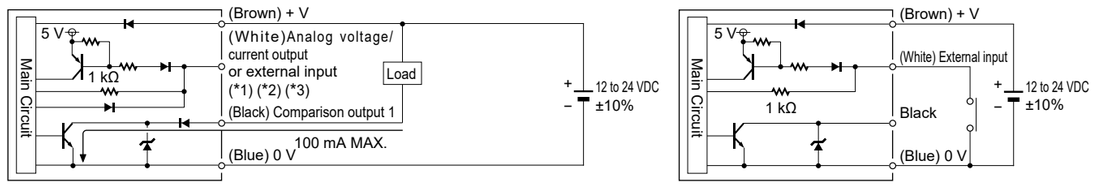
NPN output

●Standard



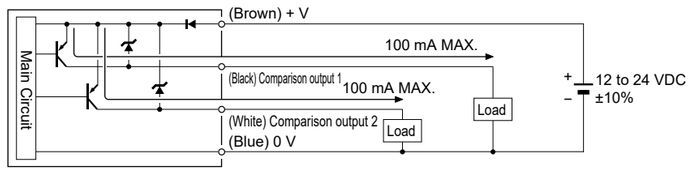
●High-function

[Example of external input connection]



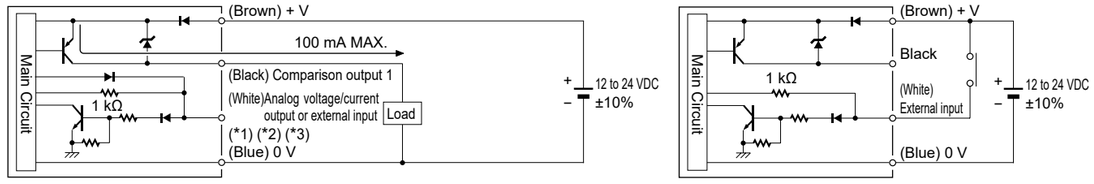
PNP output

●Standard



●High-function

[Example of external input connection]



*1: Use 250 Ω (max.) for output load resistance at the time of analog current output.
*2: Note that voltage of 5 V and over is generated at the time of analog current output.
*3: Be careful of input impedance of the connection device when using analog current output. In addition, note that the voltage is reduced by the resistance of cable at cable extension.



Digital pressure sensor oil-free type

PPX-P12 Series

Circuit diagram symbol



Refer to the CKD website for detailed compatible model Nos.

Overview

- Oil-free treatment (degreasing) at gas contact areas (piping ports, etc.)
- Silicone grease-free at gas contact areas (Grease is not used on the gas contact areas)

Features

- Ideal for applications susceptible to grease, including liquid crystal, semiconductors, foodstuffs, medical use, and electronic parts.
- Because grease is not used, this type is suitable for pressure detection of paint lines.

Model No. Notation Method

PPX - R01 N - 6M - P12

- PPX: Model No.
- R01: ❶Pressure range
- N: ❷Output
- 6M: Piping shape: R1/8, M5 female thread
- P12: Oil-free

Note: 2 m connector cable included.

❶Pressure range

Code	Description
R01	−100.0 to 100.0 kPa
R10	−0.100 to 1.000 MPa

❷Output

Code	Description
N	NPN transistor output 2 point (Standard)
NH	NPN transistor output 1 point + analog voltage output or external input (high-function)

Discrete option model No.

PPX - C1

❶Option

❶Option

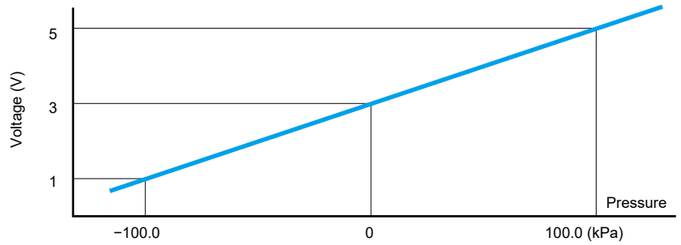
Code	Description		
C1	Cable with connector	1 m	
C2		2 m	
C3		3 m	
C5		5 m	
CN	Connector set (×10 set)		
KL	Mounting bracket (mounting screw attached)		
KHS	Panel bracket		
KCB	Front protective cover (when using panel bracket)		

Specifications

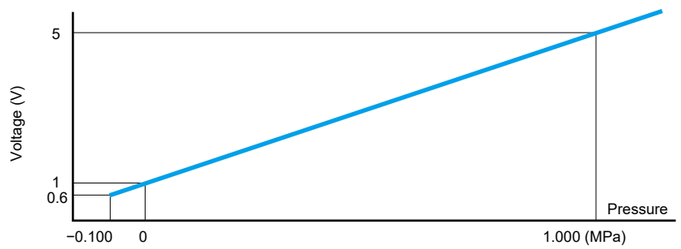
Item		Standard		High-function	
		For low pressure PPX-R01N	For high pressure PPX-R10N	For low pressure PPX-R01NH	For high pressure PPX-R10NH
Type of pressure		Gauge pressure			
Rated pressure		−100.0 to +100.0 kPa	−0.100 to +1.000 MPa	−100.0 to +100.0 kPa	−0.100 to +1.000 MPa
Pressure setting		−101.0 to +101.0 kPa	−0.101 to +1.010 MPa	−101.0 to +101.0 kPa	−0.101 to +1.010 MPa
Proof pressure		500 kPa	1.5 MPa	500 kPa	1.5 MPa
Applicable fluid		Air/non-corrosive gas			
Power supply voltage		12 to 24 VDC ±10%, Ripple P-P 10% or less			
Power consumption		Normal: 720 mW or less (current consumption 30 mA or less at 24 V power supply voltage) ECO mode: 480 mW of less at STD (current consumption 20 mA or less at power supply voltage 24 V), 360 mW or less at FULL (current consumption 15 mA or less at power supply voltage 24 V)			
Comparison output (Comparison output 1, Comparison output 2)		[NPN output] NPN transistor/open collector • Max. inrush current: 100 mA • Applied voltage: 30 VDC or less (comparison output - 0 V interval) • Residual voltage: 2 V or less (at inrush current 100 mA)			
	Output operation	Select NO/NC with key operation			
	Output mode	EASY mode/hysteresis mode/window comparator mode			
	Hysteresis	Min. 1 digit (variable)			
	Repeatability	±0.1% F.S. (within ±2 digits)	±0.2% F.S. (within ±2 digits)	±0.1% F.S. (within ±2 digits)	±0.2% F.S. (within ±2 digits)
	Response time	2.5 ms, 5 ms, 10 ms, 25 ms, 50 ms, 100 ms, 250 ms, 500 ms, 1000 ms, 5000 ms select by key operation			
	Short-circuit protection	Equipped			
External input (auto reference/remote zero adjusting)		———		[NPN output] ON voltage: 0.4 VDC or less OFF voltage: 5 to 30 VDC or release Input impedance: 10 kΩ Input time: 1 ms and over	
Analog voltage output		———		Output voltage: 1 to 5 V Zero point: Within 3 V±5%F.S. Span: Within 4 V±5%F.S. Linearity: Within ±1%F.S. Output impedance: 1 kΩ	Output voltage: 0.6 to 5 V Zero point: Within 1 V±5%F.S. Span: Within 4.4 V±5%F.S. Linearity: Within ±1%F.S. Output impedance: 1 kΩ
Analog current output		———		Output current: 4 to 20 mA Zero point: Within 12 mA ±5% F.S. Span: Within 16 mA ±5% F.S. Linearity: Within ±1%F.S. Load resistance: 250 Ω (max.)	Output current: 2.4 to 20 mA Zero point: Within 4mA±5%F.S. Span: Within 17.6 mA±5%F.S. Linearity: Within ±1%F.S. Load resistance: 250 Ω (max.)
Indicator		4-digit + 4-digit 3-color LCD display (display updating cycle: 250 ms, 500 ms, 1000 ms select by key operation)			
	Indicator pressure range	-101.0 to +101.0 kPa	-0.101 to +1.010 MPa	-101.0 to +101.0 kPa	-0.101 to +1.010 MPa
Indicator lamp		Orange LED (comparison output 1 operation indicator lamp, comparison output 2 operation indicator lamp: Lit when comparison output is ON)		Orange LED (comparison output 1 operation indicator lamp: Lit when comparison output is ON, analog voltage output operation indicator lamp: Lit at setup)	
Environment conditions	Degree of Protection	IP40 (IEC)			
	Ambient temperature	-10 to +50°C, at the time of storage: -10 to +60°C			
	Ambient humidity	35 to 85%RH (no condensation or freezing), when stored: 35 to 85%RH			
	Withstand voltage	1000 VAC for 1 minute applied to all charged sections/between cases			
	Insulation resistance	50 MΩ and over with 500 VDC megger overall charging section/between cases			
	Vibration resistance	Durability of 10 to 500Hz double amplitude 3 mm XYZ 2 hours in each direction (Panel mounting: Endurance 10 to 150 Hz double amplitude 0.75 mm XYZ 2 hours in each direction)			
	Shock resistance	Durability of 100 m/s^2 (approx. 10 G) 3 times in each direction of XYZ			
Temperature characteristics (characteristics at +20°C are taken as standard)		Within ±0.5% F.S.	Within ±1% F.S.	Within ±0.5% F.S.	Within ±1% F.S.
Port size		M5 female thread + R (PT) 1/8 male thread			
Material		Case: PBT (glass fiber included), LCD display part: acrylic resin, pressure port: SUS303, mounting screw part: brass (nickeling), switch part: silicone rubber			
Connection		Connector connection			
Wire length		Up to 100 m (less than 30 m when CE marked) with 0.3 mm^2 or larger cable			
Weight		Body weight: approx. 40 g, weight including package: 130 g			
Accessory		PPX-C2 (2 m cable with connector): 1 pc.			

Analog output voltage - pressure characteristics

●PPX-R01NH

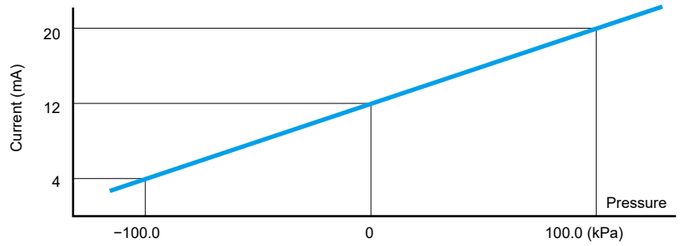


●PPX-R10NH

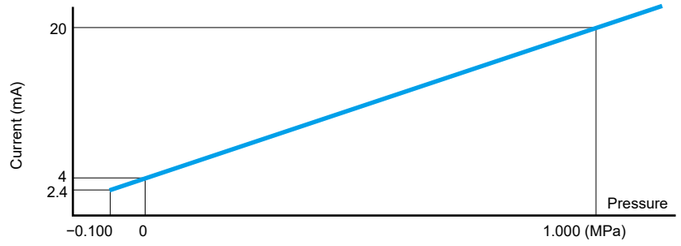


Analog output current - pressure characteristics

●PPX-R01NH

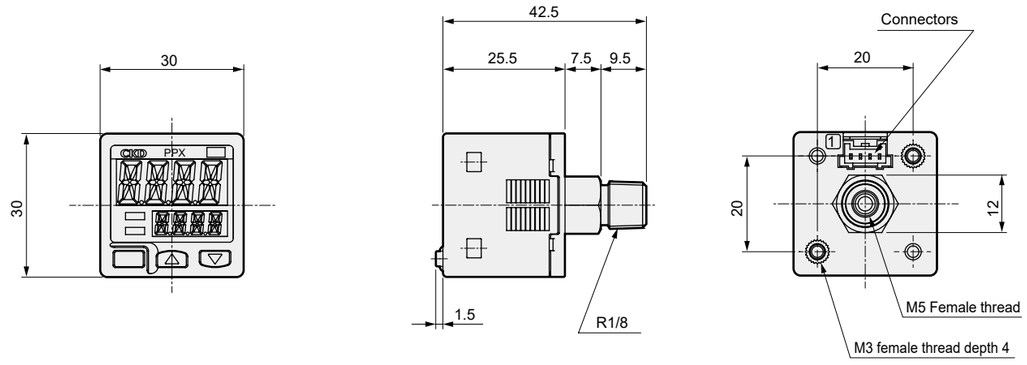


●PPX-R10NH



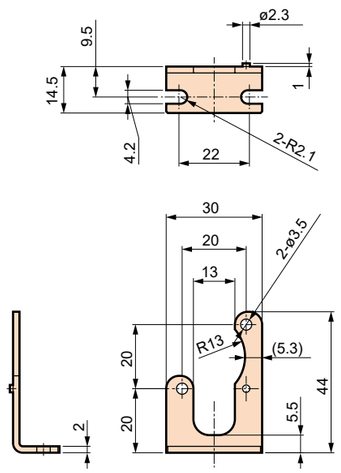
Dimensions

●PPX-R□□-6M (R thread)

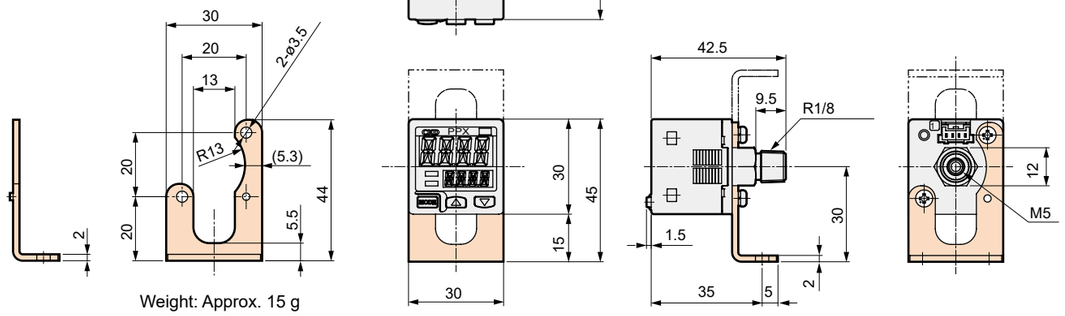


Optional dimensions

●Mounting bracket (PPX-KL)

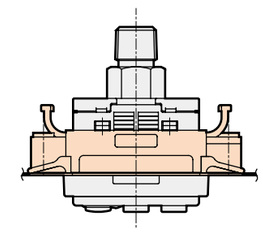


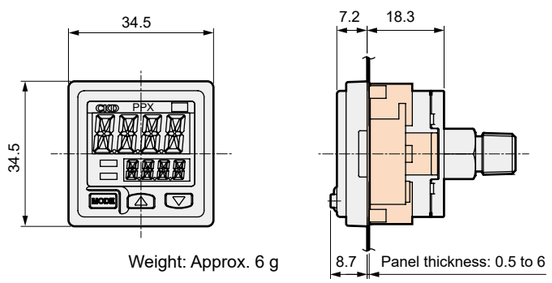
Installation fig.



Weight: Approx. 15 g

●Panel bracket (PPX-KHS) installation fig.

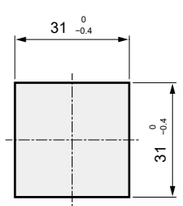




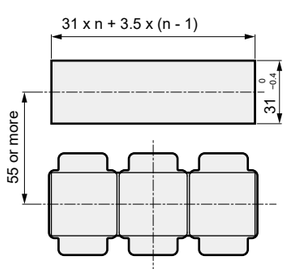
Weight: Approx. 6 g

Panel cut dimension

When installing 1 pc.

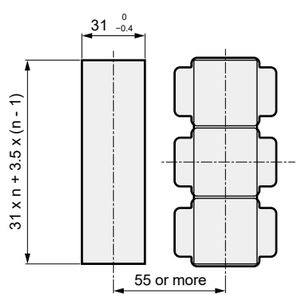


When installing consecutive n pcs. horizontally



Note: Panel thickness must be 0.5 to 6 mm.

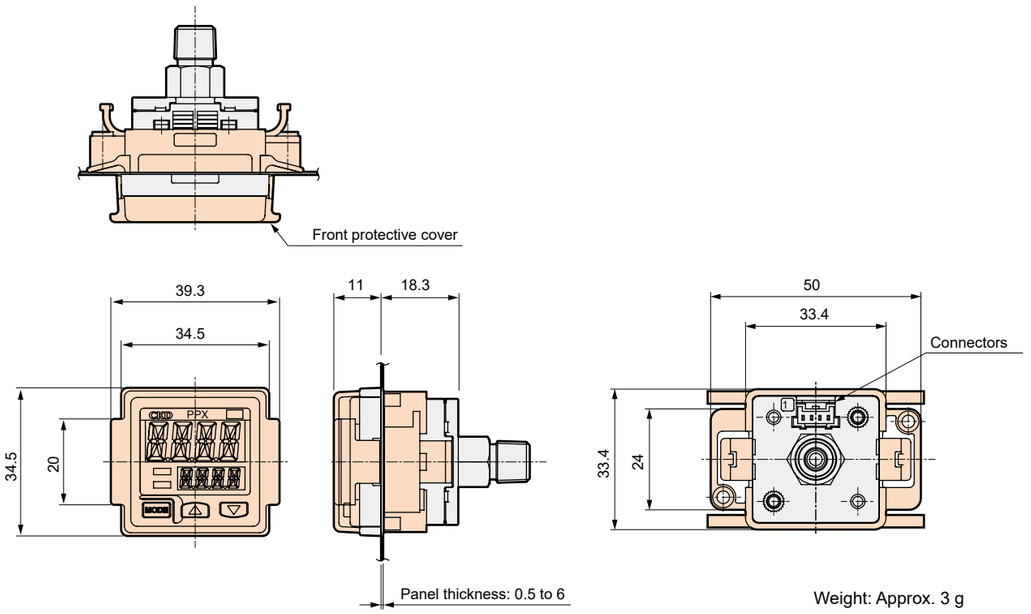
When installing consecutive n pcs. vertically



Note: Panel thickness must be 0.5 to 6 mm.

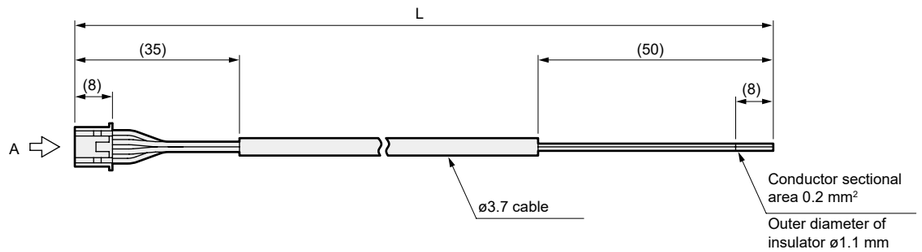
Optional dimensions

●Front protective cover (PPX-KCB) installation fig.



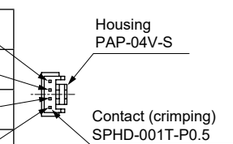
Weight: Approx. 3 g

●Cable with connector (PPX-C□)



(J.S.T.)

0 V	Blue	4
Standard: Comparison output 2 High-function: Analog voltage output or external input	White	3
Comparison output 1	Black	2
+V	Brown	1
Terminal name	Insulator color	Terminal No.

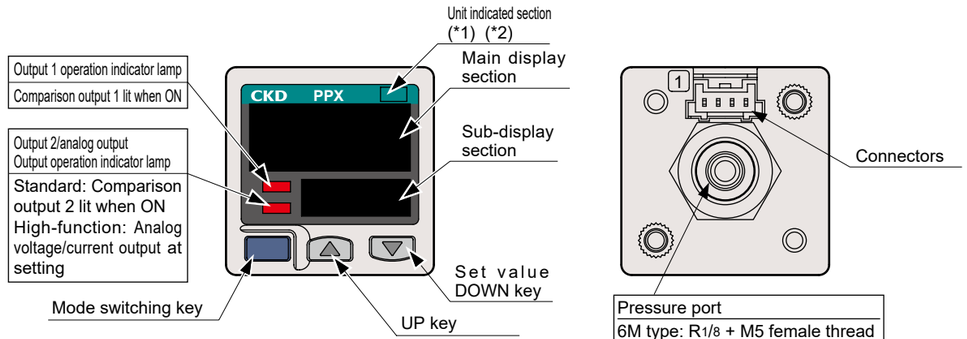


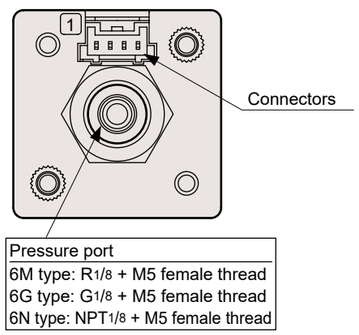
A arrow view

Model No.	Cable length	Weight (g)
PPX-C1	1 m	Approx. 20
PPX-C2	2 m	Approx. 40
PPX-C3	3 m	Approx. 60
PPX-C5	5 m	Approx. 100

●Connector set (PPX-CN)
- Housing: JST MFG CO. LTD. PAP-04V-S
- Contact: J.S.T. Mfg. Co., Ltd. SPHD-001T-P0.5

Names of display/operation section





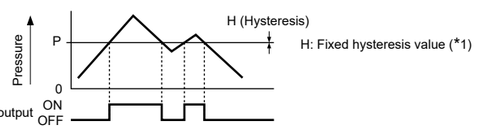
*1: For outside Japan, attach the accompanying unit switching plate corresponding to the set pressure unit.
*2: For outside Japan, the pressure unit can only be set to "MPa" or "kPa".

Operation mode and output operation

The selectable output modes include EASY mode, hysteresis mode, or window comparator mode for comparison output 1 and comparison output 2.

EASY mode

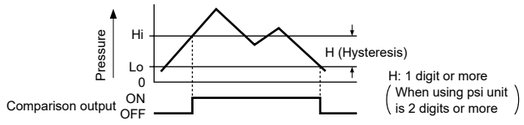
Mode in which comparison output ON/OFF is controlled.



*1: Hysteresis can be set to eight stages.
*2: In case of comparison output 1, "P-1", and in case of comparison output 2, "P-2" are indicated on the sub-display.

Hysteresis mode

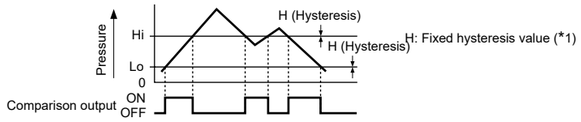
In this mode, the comparison output hysteresis is randomly set to control ON/OFF.



*1: In case of comparison output 1, "Hi-1", "Lo-1", and in case of comparison output 2, "Hi-2", "Lo-2" are indicated on the sub-display.

Window comparator mode

This mode is used to turn comparison output ON or OFF within the setting range.



*1: Hysteresis can be set to eight stages.
*2: For comparison output 1, "Hi-1", "Lo-1", and for comparison output 2, "Hi-2", "Lo-2" are indicated on the sub-display.
*3: The setting interval between the Lo and Hi sides should be at least the fixed hysteresis value or greater.

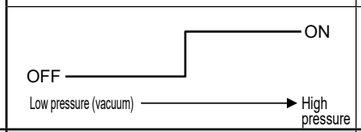
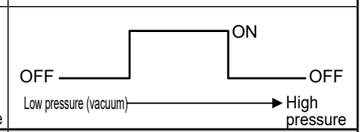
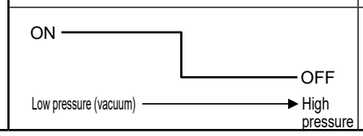
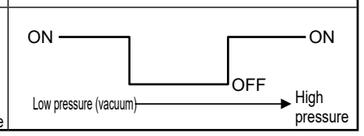
About RUN Mode

Item	Description	Initial state	
Threshold setting	Threshold setting is performed on the sub-display. The main display is not switched.	Standard (low pressure) OUT1: EASY OUT2: OFF NO/NC: NC OUT1 Threshold: -50.0 Standard (high pressure) OUT1: EASY OUT2: OFF NO/NC: NO OUT1 Threshold: .500	High-function (low pressure) OUT1: EASY Analog voltage output NO/NC: NC OUT1 Threshold: -50.0 High-function (high pressure) OUT1: EASY Analog voltage output NO/NC: NO OUT1 Threshold: .500
Zero adjustment	The zero adjustment function forcibly sets the pressure display to "zero" when the pressure port is released to atmospheric pressure.	—	
Key lock function	The key lock function disables key operations so that conditions set for setting modes cannot be mistakenly changed.	—	
Peak/bottom hold function	The peak and bottom hold function is to display the peak and bottom values of varying pressure.	—	

Menu setting mode

Setting items	Initial state	Description	
Comparison output 1 output Mode setting	EASY	Set comparison output 1 output mode.	OFF EASY HYS WCMP
Setting comparison output 2 output mode (Only standard)	OFF	Set comparison output 2 output mode.	OFF EASY HYS WCMP
Switching analog voltage output/ external input (Only high-function)	Vout	The item can be selected from analog voltage output, automatic reference input, or remote zero adjustment input.	Vout AREF ZERO tout
Switching NO/NC	Low pressure: Nc High pressure: No	Set normally open (NO) or normally closed (NC).	—
Setting response time	25	Set the response time. Response time can be selected from 2.5 ms, 5 ms, 10 ms, 25 ms, 50 ms, 100 ms, 250 ms, 500 ms, 1,000 ms, or 5,000 ms.	—
Switching main display color	R-ON	Colors on the main display can be changed.	R-ON G-ON RED GREN
Unit switching	Low pressure: kPA High pressure: MPA	The pressure unit can be changed. (MPa, kPa, kgf, bar, psi, mmHg, inHg)	MPA kPA kgF bAr PSI MMHG inHG

*NO ./N.C. Behavior

NO (normally open)	EASY mode & HYS mode	WCMP MODE
	Switch is turned ON when the pressure reaches or exceeds the set value.	Switch is turned ON when the pressure is within the set value.
		
NC (normally closed)	EASY mode & HYS mode	WCMP MODE
	Switch is turned ON when the pressure reaches or falls below the set value.	Switch is turned OFF when the pressure is within the set value.
		

PRO mode

Setting items	Initial state	Description
Switching sub-display	Std	Set the sub-display for the RUN mode [OFF]: Nothing is displayed. [Unit]: Displays the current pressure unit. [No**]: Displays a random number. [Cust]: Displays a random number, alphabetic character (some characters cannot be displayed), and code.
Switching display speed	250	Set the speed of the pressure displayed on the main display. (250 ms, 500 ms, 1000 ms)
Switching fixed hysteresis value	111	Set hysteresis for the EASY mode and window comparator mode. (8 stages)
Switching linked with display color (Only standard)	Out1	Interlinking the settings made with the main display color switching in the menu setting mode can be done with either comparison output 1 or comparison output 2.
Setting ECO mode	OFF	Power consumption can be reduced. [OFF]: Normal (ECO mode OFF) [Std]: Display is dimmed if no key is pressed for 5 seconds in RUN mode. [FULL]: Display is turned OFF if no key is pressed for 5 seconds in RUN mode. The normal display appears temporarily if any key is pressed.
Setting confirmation code	0000	Currently set details can be confirmed. Check codes in the List of Codes.
Setting copy mode	OFF	Details set for the master sensor can be copied to the device unit sensor. Refer to "Setting copy function" for details. [ON]: Set details are copied. [ON-L]: Set details are copied and device side sensor keys are locked.
Setting reset	OFF	Settings are returned to defaults. Pressing the mode changeover key when "ON" is pressed will return to the initial state (factory default).

Code list

Code	1st digit		2nd digit			3rd digit	4th digit	
			Standard		High-function			Standard only
	Comparison output 1 output mode	Switching NO/NC	Comparison output 2 output mode	Switching NO/NC	Analog voltage output/external input	Threshold display	Main display section display color	Display color interlock
0	EASY	NO	OFF	OFF	Analog voltage output	P-1, Lo-1	Red when turned ON	Comparison output 1
1		N.C.	EASY	NO	Auto-reference	Hi-1		Comparison output 2
2	Hysteresis	NO		N.C.	Remote zero adjustment	P-2, Lo-2	Green when turned ON	Comparison output 1
3		N.C.	Hysteresis	NO	Analog current output	Hi-2		Comparison output 2
4	Window comparator	NO		N.C.	—	ADJ.	Normally red	Comparison output 1
5		N.C.	Window comparator	NO	—	—		Comparison output 2
6	—	—		N.C.	—	—	Normally green	Comparison output 1
7	—	—	—	—	—	—		Comparison output 2

Code	5th digit	6th digit	7th digit	8th digit
	Response time	Unit switching	Indicator speed	Eco mode
0	2.5 ms	MPa	250 ms	OFF
1	5 ms	kPa	500 ms	Std
2	10 ms	kgf/cm²	1,000 ms	Full
3	25 ms	bar	—	—
4	50 ms	psi	—	—
5	100 ms	mmHg	—	—
6	250 ms	inchHg	—	—
7	500 ms	—	—	—
8	1,000 ms	—	—	—
9	5,000 ms	—	—	—

Limited to export models with unit select functions

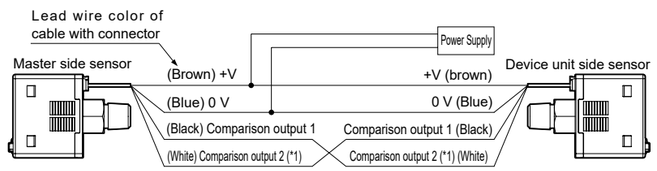
Setting copy function

This function copies settings from the master sensor to the device unit sensor.

●Settings can be copied only between the same models. Data cannot be copied between different models.
●The setting copy function can copy settings for one master sensor to one device unit sensor.

[Installation procedure]

①Set the master sensor setting copy mode to Copy ON or ON-L, and press the mode select key to prepare for copying.
②Turn master sensor power OFF.
③Connect the master sensor to the device unit sensor as shown below.



*1: Analog voltage output and external input are connected for the high-function type.

④ Turn ON the power for the master sensor and device unit sensor simultaneously. (*2) (*3)
⑤ Setting details are encoded in 16-bit code and displayed in orange on the main sensor display, after which copying begins.
⑥ The same code as in the procedure ⑤ is displayed in green on the device unit sensor's main display, and "OK" is displayed on the sub-display when copying finishes.
⑦ Turn master sensor and device unit sensor power OFF, and disconnect wires.
*To repeatedly copy settings to another sensor, follow steps ③ to ⑥ .

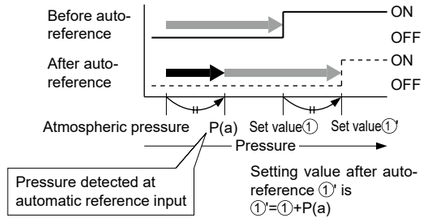
*2: Set details may not be copied if sensor power is not turned ON simultaneously.
*3: Pulse output is output to comparison output 1 when power is turned ON.

[Canceling master sensor setting copy mode]

①Turn the master sensor power ON (with device unit sensor wiring disconnected).
②Press the mode select key for 2 seconds.

Automatic reference function (high-function only)

The automatic reference function compensates for the setting using the pressure detected at automatic reference input as the reference pressure. Setting value ①' is automatically compensated for as "Setting value ①+ P (a)" using pressure value P (a) detected during automatic reference input as the reference.



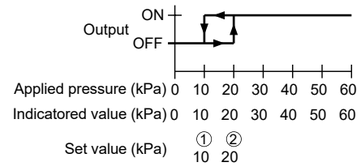
Valid setting range and set pressure range after compensation

The set pressure range is wider than the rated pressure range to comply with the automatic reference function.

When using automatic reference input, if the compensated setting value exceeds the set pressure, the setting is automatically compensated to within the set pressure range. Check that the set pressure is not exceeded.

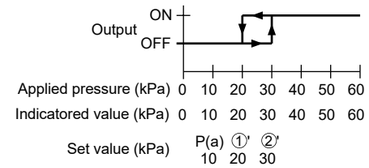
Operation chart

[Normal (NO setting for each comparison output)]



〈Auto-reference input (NO setting for each comparison output)〉

Detection pressure when auto-reference input: 10 kPa
• Output mode: hysteresis mode



*1: For EASY mode and window comparator mode, the setting values are corrected in the same way.

●The pressure detected at automatic reference input is set to zero when the setting for the analog voltage output/external input select function is set or power is turned ON again.
●The automatic reference input can be confirmed when the RUN mode threshold is set.

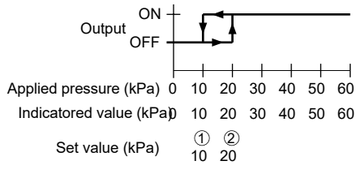
Remote zero adjusting (high-function only)

●The remote zero adjustment function forcibly sets the pressure to zero when the external signal is input.

The setting is not compensated for when remote zero adjustment is input. Check that pressure and setting for the remote zero adjustment function do not exceed the set pressure.

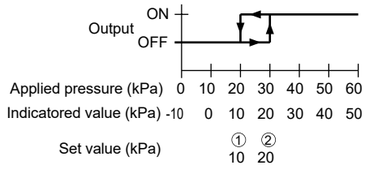
Operation chart

[Normal (NO setting for each comparison output)]



〈Remote zero adjusting input (NO setting for each comparison output)〉

Pressure for remote zero adjusting input: 10 kPa
• Output mode: hysteresis mode



*1: The same setting values are not corrected for EASY mode and window comparator mode.

●The remote zero adjustment function is cleared to zero when the setting for the analog voltage output/external input select function is set or power is turned ON again, and operation returns to normal using atmospheric pressure as a reference. The remote zero adjustment can be confirmed when the RUN mode threshold is set.

For details on operation and setting method, refer to CKD Components Product website (https://www.ckd.co.jp/kiki/en/) → "Model No."→Instruction manual



Digital pressure sensor IO-Link

PPX Series

Circuit diagram symbol



Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

[Model No. Notation Method in Japan]

PPX - R01 PC - 6M

- PPX: Model No.
- R01: ❶Pressure range
- PC: Output: PNP output + IO-Link
- 6M: Piping shape: R1/8, M5

❶Pressure range

Code	Description
R01	−100.0 to 100.0 kPa
R10	−0.100 to 1.000 MPa

Note: A one-sided loose wire 2 m connector cable (model No.: PPX-C2) is attached. M12 cable with connector is a separately-sold optional item.



[Model No. Notation Method for overseas markets]

In compliance with the new Measurement Law, export models with unit select function cannot be used in Japan.

PPX - R01 PC - 6M - KA

- PPX: Model No.
- R01: ❶Pressure range
- PC: Output: PNP output + IO-Link
- 6M: ❷Piping shape
- KA: With unit change function

Note: A one-sided loose wire 2 m connector cable (model No.: PPX-C2) is attached. M12 cable with connector is a separately-sold optional item.



❶Pressure range

Code	Description
R01	−100.0 to 100.0 kPa
R10	−0.100 to 1.000 MPa

❷Piping shape

Code	Description
6M	R1/8, M5
6N	NPT1/8, M5
6G	G1/8, M5

❶Option

Code	Description		
CN1	With M12 connector Cable	1 m	
CN2		2 m	
CN3		3 m	
KL	Mounting bracket (mounting screw attached)		
KHS	Panel bracket		
KCB	Front protective cover (when using panel bracket)		

Discrete option model No.

PPX - CN1

- PPX: Model No.
- CN1: ❶Option

Specifications for rechargeable battery

(Catalog No.CC-1226AA)

Conforms to CKD P4 Series equivalent specifications as standard.

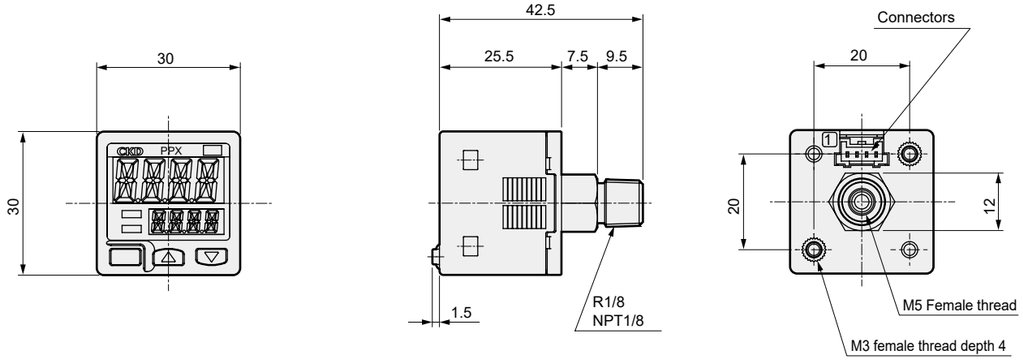
Specifications

Item		IO-Link	
		For low pressure PPX-R01PC	For high pressure PPX-R10PC
Type of pressure		Gauge pressure	
Rated pressure		−100.0 to +100.0 kPa	−0.100 to +1.000 MPa
Pressure setting		−101.0 to +101.0 kPa	−0.101 to +1.010 MPa
Proof pressure		500 kPa	1.5 MPa
Applicable fluid		Air/non-corrosive gas	
Power supply voltage		12 to 24 VDC ±10%, Ripple P-P 10% or less	
Power consumption		Normal: 720 mW or less (current consumption 30 mA or less at 24 V power supply voltage) ECO mode: 480 mW of less at STD (current consumption 20 mA or less at power supply voltage 24 V), 360 mW or less at FULL (current consumption 15 mA or less at power supply voltage 24 V)	
Communication output (C/Q) *1	IO-Link communication	IO-Link Specification V1.1	
	Transmission bit rate	COM3 (230.4kbps)	
	Process data	4 byte	
	Minimum cycle	1.0 ms	
Control output (DO)		[PNP output] PNP transistor/open collector • Max. outflow current: 50 mA • Applied voltage: 30 VDC or less (control output -/+V interval) • Residual voltage: 2 V or less (at outflow current 50 mA)	
	Output operation	Select from NO and NC	
	Output mode	EASY mode/hysteresis mode/window comparator mode	
	Hysteresis	Min. 1 digit (variable)	
	Repeatability	±0.1% F.S. (within ±2 digits)	±0.2% F.S. (within ±2 digits)
	Response time	2.5 ms, 5 ms, 10 ms, 25 ms, 50 ms, 100 ms, 250 ms, 500 ms, 1000 ms, 5000 ms	
	Short-circuit protection	Equipped	
Indicator		4 digit + 4 digit 3-color LCD display (display updating cycle: 250 ms, 500 ms, 1000 ms)	
	Indicator pressure range	-101.0 to +101.0 kPa	-0.101 to +1.010 MPa
Indicator lamp		Orange LED	
		Output operation indicator lamp blinks during 1: IO-Link communication, turns ON during control output in non-IO-Link communication (synchronized with output operation indicator lamp 2)	
		Output operation indicator lamp 2: Turns ON when control output is ON	
Environment conditions	Degree of Protection	IP40 (IEC)	
	Ambient temperature	-10 to +50°C, at the time of storage: -10 to +60°C	
	Ambient humidity	35 to 85%RH (no condensation or freezing), when stored: 35 to 85%RH	
	Withstand voltage	1000 VAC for 1 minute applied to all charged sections/between cases	
	Insulation resistance	50 MΩ and over with 500 VDC megger overall charging section/between cases	
	Vibration resistance	Durability of 10 to 500Hz double amplitude 3 mm XYZ 2 hours in each direction (Panel mounting: Endurance 10 to 150 Hz double amplitude 0.75 mm XYZ 2 hours in each direction)	
	Shock resistance	Durability of 100 m/s^2 (approx. 10 G) 3 times in each direction of XYZ	
Temperature characteristics (characteristics at +20°C are taken as standard)		Within ±0.5% F.S.	Within ±1% F.S.
Port size *2		M5 female thread + R (PT) 1/8 male thread M5 female thread + G1/8 male thread M5 female thread + NPT1/8 male thread	
Material		Case: PBT (glass fiber included), LCD display part: acrylic resin, pressure port: SUS303, mounting screw part: brass (nickeling), switch part: silicone rubber	
Connection		Connector connection	
Wire length		Total length up to 20 m (less than 20 m for CE mark conformance) with 0.3 mm^2 or larger cable	
Unit change function		Only supported for overseas (-KA) (MPa, kPa.kgf/c) m^2, bar, psi, mmHg, inchHg)	
Weight		Body weight: approx. 40 g, weight including package: 130 g	
Accessory		PPX-C2 (2 m cable with connector): 1 pc. Unit seal label (with unit change function for -KA): MPa, kPa.kgf/cm^2, bar, psi, mmHg, inchHg	

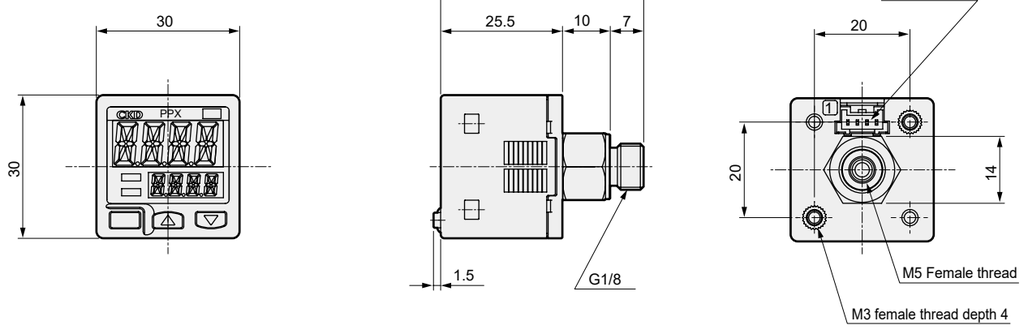
*1: When used as a standard sensor, communication output (C/Q) will be the same output operation as control output (DO).
*2: Only "M5 female thread + R (PT) 1/8 male thread" is available for Japan. All-types are available for overseas.

Dimensions

●PPX-R□□PC-6M/6N (R thread/NPT thread)

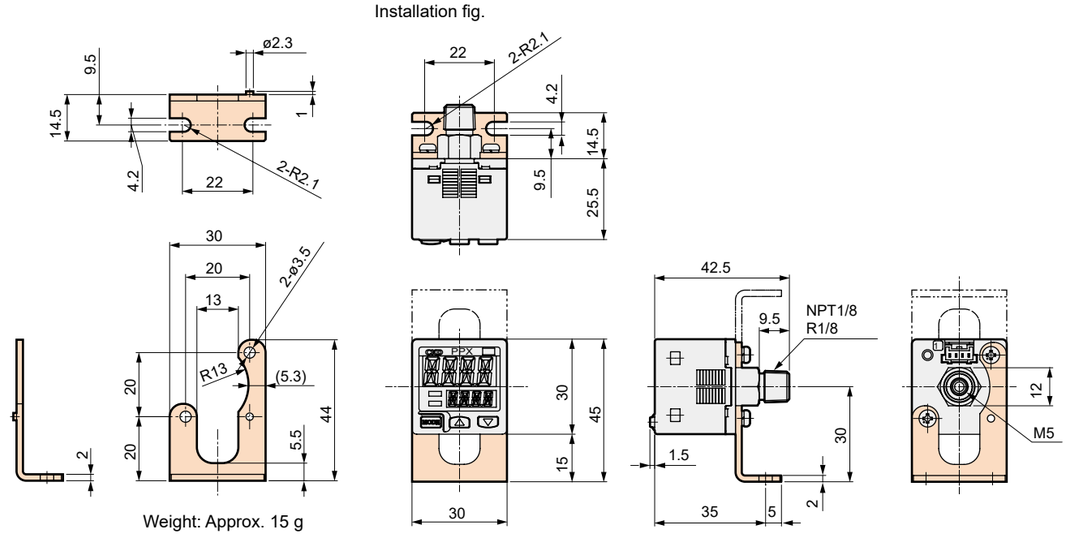


●PPX-R□□PC-6G (G thread)



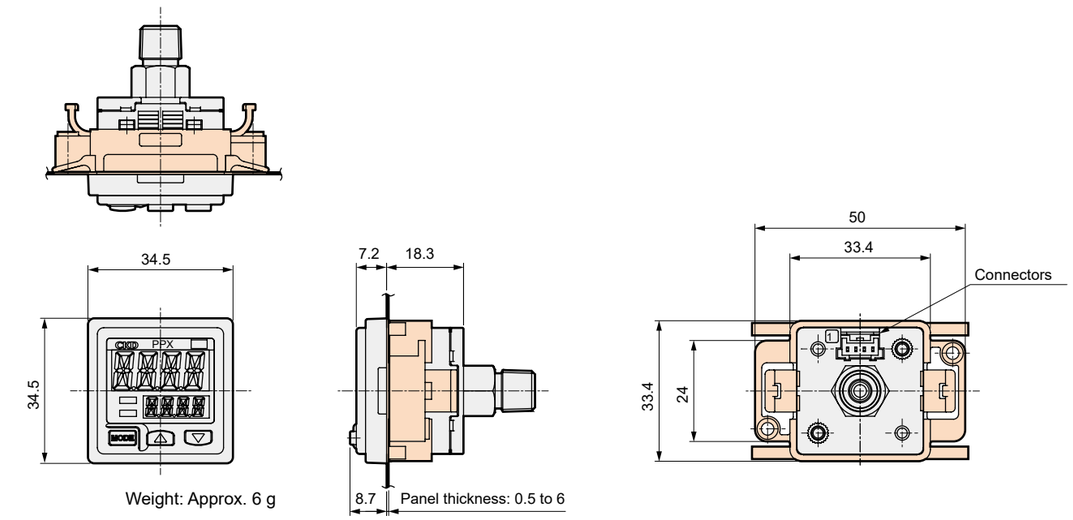
Optional dimensions

●Mounting bracket (PPX-KL)



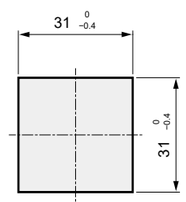
Weight: Approx. 15 g

●Panel bracket (PPX-KHS) installation fig.

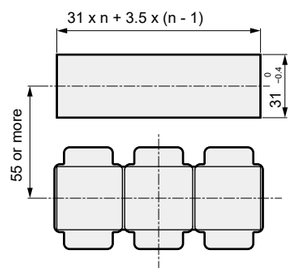


Panel cut dimension

When installing 1 pc.

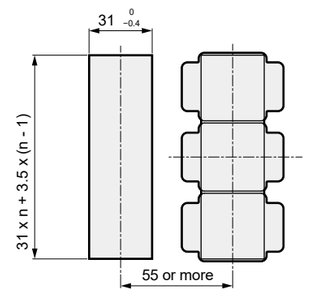


When installing consecutive n pcs. horizontally



Note: Panel thickness must be 0.5 to 6 mm.

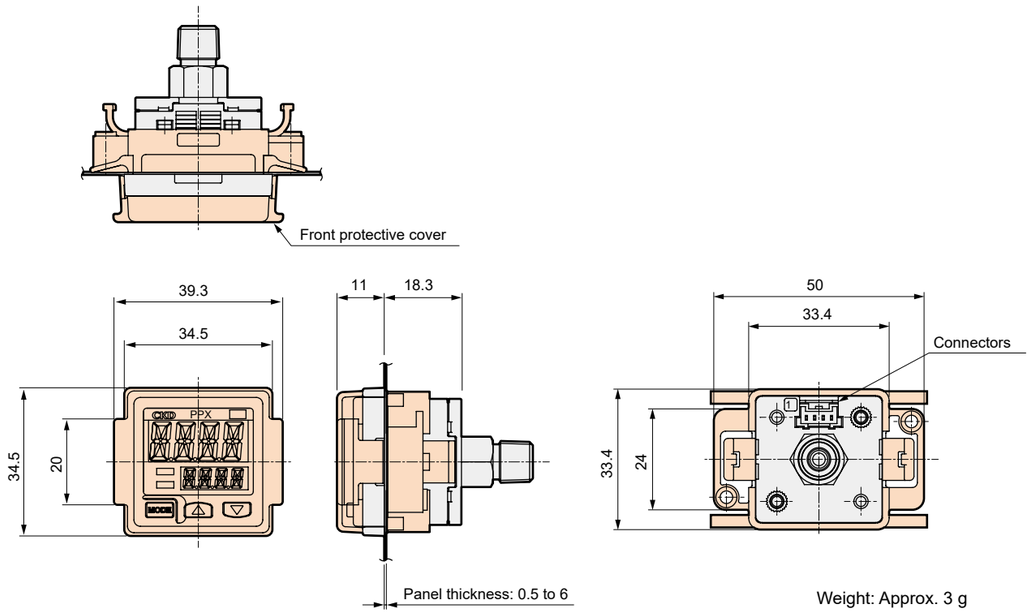
When installing consecutive n pcs. vertically



Note: Panel thickness must be 0.5 to 6 mm.

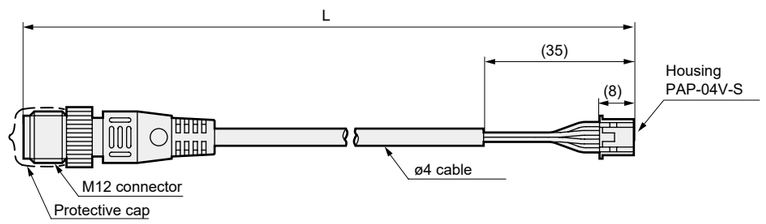
Optional dimensions

●Front protective cover (PPX-KCB) installation fig.



Weight: Approx. 3 g

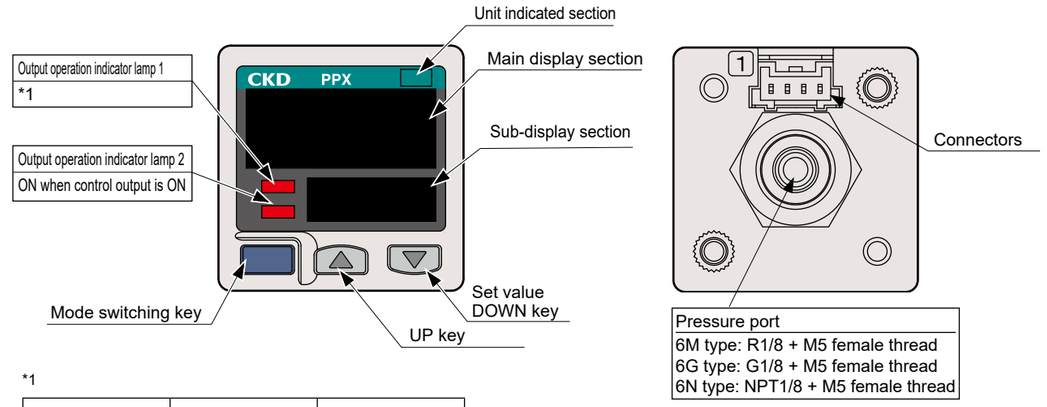
●Cable with connector (PPX-CN*)



M12 connector pin No.	Lead wire color	Housing terminal No.	Applications
1	Brown	1	+V
2	White	3	DO
3	Blue	4	0 V
4	Black	2	C/Q

Model No.	Cable length	Weight (g)
PPX-CN1	1m	Approx. 40
PPX-CN2	2m	Approx. 70
PPX-CN3	3m	Approx. 100

Names and functions of display/operation section (IO-Link)



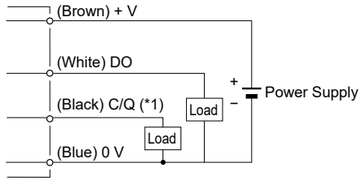
*1

	During non-IO-Link communication	During IO-Link communication
Indicator lamp operation	Control output lit when ON *2	Blinking operation

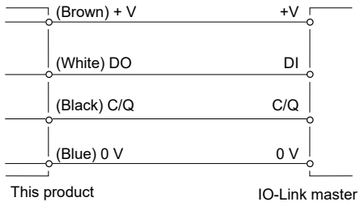
*2: Synchronized with operation output display lamp 2

Connection

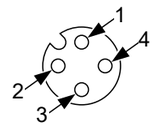
●When used as a standard sensor



●When used connected to IO-Link master



[M12 connector cable terminal array]



Terminal No.	Terminal name
1	+V
2	Control output (DO)
3	0 V
4	IO-Link communication (C/Q) (*1)

*1: When used with general sensors, IO-Link communication (C/Q) has the same output operation as control output (DO).

M12 connector mounting

The connector will detach if the fixing ring loosens, resulting in a communication error from this product. Be sure to confirm before use that the fixing ring is not loose.

Communication specifications

• Common to all models

Item	Details
Communication protocol	IO-Link
Communication protocol version	V1.1
Transmission bit rate	COM3(230.4kbps)
Port	Class A
Process data length (input)	4 byte
Process data length (output)	0 byte
Minimum cycle time	1 ms
Data storage	15 byte
SIO mode support	Yes
Vendor ID	855

• Device ID for each model

	Device ID
PPX-R01PC-6M	2179072
PPX-R10PC-6M	2179073
PPX-R01PC-6M-KA	2179074
PPX-R01PC-6N-KA	2179075
PPX-R01PC-6G-KA	2179076
PPX-R10PC-6M-KA	2179077
PPX-R10PC-6N-KA	2179078
PPX-R10PC-6G-KA	2179079

Process data (PD)

	bit							
	7	6	5	4	3	2	1	0
PD0	Upper byte of pressure value							
PD1	Lower byte of pressure value							

PD2 bit	Allocation	Remarks
7 6 5 4 3 2 1 0	Control output (DO)	0: OFF 1: ON
	Fixed	0
	Fixed	0
	Fixed	0
	Fixed	0
	Notifications	0: No notification 1: Notification
	Error level	0: Normal 1: Caution 2: Error

PD3	Scale Low pressure sensor: -1 High pressure sensor: -3 (with MPa selected) 0

	PD0 (31-24bit)	PD1 (23-16bit)
Low pressure	Pressure value [Pa] (-1010 to 1010)	
High pressure	Pressure value [Pa] (-100 to 1010)	

Function list

Function	Body side setting	IO-Link communication setting
Control output mode setting	Select from EASY mode/hysteresis mode/window comparator mode	Index61_2
Threshold setting	EASY mode: Threshold setting, Hysteresis mode/window comparator mode: Low side threshold setting	Index60_1
	Hysteresis mode/window comparator mode: Hi side threshold setting	Index60_2
Zero adjustment	Run/Cancel	Index2
Key lock function	Set/Cancel	Index12
Peak/bottom hold function	Setting	Index82_4
Control output operation setting	NO./N.C.	Index61_1
Setting response time	Select from 10 levels	Index66
Main display section color setting	Select from 4 modes	Index82_1
Pressure unit setting	Select from MPa/kPa/kgf/bar/psi/mmHg/inchHg [List of units that can be set] • For Japan/low pressure: kPa • For Japan/high pressure: MPa, kPa • For overseas/low pressure: kPa, kgf, bar, psi, mmHg, inchHg • For overseas/high pressure: MPa, kPa, kgf, bar, psi	Index83
Sub-display section display setting	Select from 5 modes	Index82_2
	No. display setting	Index84_1
	Customized display setting	Index84_2
Indicator speed setting	Select from 3 levels	Index82_3
Hysteresis setting	Select from 8 levels	Index61_3
Setting ECO mode	Select from 3 modes	Index80
Setting confirmation code	8-digit display	—
Setting reset	Run	Index2
Remote zero adjustment setting	—	Index2
Zero adjustment notification	—	Index85
Auto-reference setting	—	Index2
Operation time	—	Index163
No. of memory write cycles	—	Index164
Notification flag setting	—	Index168
Notification event code reading	—	Index169

Note: IO-LinkDownload the setting file (IODD) from the CKD website (https://www.ckd.co.jp/en/).

MEMO

Pressure switch
Electronic pressure Switch
Contact Confirm Switch
For Coolant Pressure Switch
Ending

Pneumatic components (electronic pressure switch and sensor)

Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

Product-specific cautions: Digital pressure sensor PPX Series

During Design and Selection

⚠WARNING

■Use this product in accordance with specifications.
Use for applications, or at load currents, voltages, temperatures, impacts or sites excluded from the specifications could result in damage or malfunctions.

■Do not use oxygen, corrosive or combustible gas, or toxic fluid for this product.

■Never use this product in an explosive gas atmosphere.
The pressure switch does not have an explosive-proof structure. Never use in an explosive gas atmosphere as explosions or fires could result.

■Avoid installing this product in a sealed control box or indoors.
If the fluid should leak due to any trouble, the pressure in the sealed chamber could change and recreate a hazardous state. Use this product in the control box having safety device to control internal pressure, or indoors with no pressure differential from the outsidePlease.

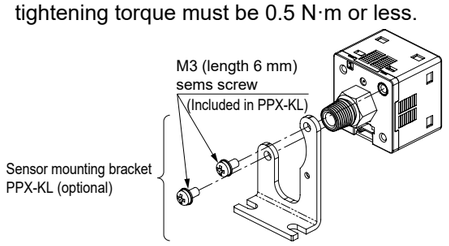
■Power supply voltage
Do not use this product at levels exceeding the power supply voltage. If voltage exceeding this range or AC power supply (100 VAC) is applied, the controller could rupture or burn.

■DC power not insulated from the AC primary side may damage the product and power, possibly leading to electric shock. Do not use the product in this case.

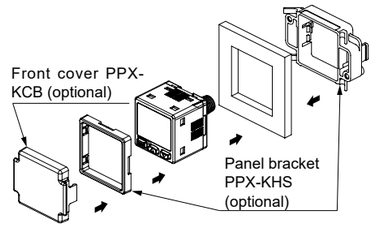
■Load short-circuit
Do not short-circuit the load. Failure to observe this could result in rupture or burning.

■Incorrect wiring
Avoid incorrect wiring such as mistaken power source polarities, etc. Failure to observe this could result in rupture or burning.

■Sensor mounting bracket PPX-KL is available. If a sensor is installed with a mounting bracket, etc., tightening torque must be 0.5 N·m or less.



■Panel bracket PPX-KHS (optional) and front cover PPX-KCB (optional) are also available.



⚠CAUTION

■Applicable fluid
When using applicable fluid other than air; nitrogen gas, etc., oxygen deficiency could be caused. Observe the following instructions.
- Use in well ventilated locations.
- Ventilate the work area when nitrogen gas is being used.
- Inspect nitrogen gas piping regularly to avoid leaks.
- Non-corrosive gas means substances such as nitrogen or carbon dioxide contained in air and inert gases such as argon or neon.
- When using this product for compressed air containing water or oil, use the PPD3-S (stainless steel diaphragm sensor specifications) with increased corrosion resistance.

■If this product is used for vacuum suction confirmation, care must be taken for following matters.
When applying positive pressure for vacuum burst onto the product, check that it does not exceed the specified proof pressure.

■Working environment
- Avoid use in locations subject to vibration or shock of 100 m/s^2 or more.
- Check the temperature of fluid being measured and the environmental temperature in piping.
- When using a type that does not have the corresponding degree of protection, do not use for applications in which water or oil could be applied.

■Determine the setting, taking error caused by accuracy limitations and temperature characteristics into consideration.

■Take care when using this product for an interlock circuit.
When using the pressure switch for an interlock signal requiring high reliability, provide a double interlock by installing a mechanical protection function or a switch (sensor) other than a pressure switch as a safeguard against breakdown. Regularly inspect and confirm that the interlock activates correctly.

■Response time is affected by working pressure and load volume. If reproducibility with stable response time is required, install a regulator in the proceeding stage.

■Take the following countermeasures to prevent malfunction caused by noise.
- Insert a line filter in the AC power supply line.
- Do not share power with an inverter or components causing motor noise, etc.
- Use a surge suppressor such as a CR or diode on the inductive load (solenoid valve, relay, etc.) and remove noise from the source.
- When using a components (switching regulator, inverter motor, etc.) that could generate noise near the sensor, be sure to ground the components frame ground (F.G.) terminal.
- Separate wiring to the sensors from strong magnetic fields.
- Components Connect wiring to the sensors with a shield wire.
- Ground the shield wire on the power supply side.

■Care must be taken for protection of body and lead wire.
- Do not bump or drop the body, or apply excessive bending or tensile strength to the lead wire. This may lead to disconnection.
- Connect and wire bending-resistant material, such as robot wire material, for the movable sections.

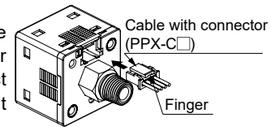
■Avoid connecting the output for a relay contact, operation switch, or other components output in parallel with the PLC to the product's output, or short-circuiting the input terminal of the PLC to which this product is connected with the power supply cable's negative side to test the input device. This product's output circuit could be damaged.

■When releasing the secondary control pressure, such as air blowing, into the atmosphere, the pressure could fluctuate depending on the piping and flow conditions. Test with actual working conditions, or contact CKD.

■Components When selecting dryer, air filter, oil mist filter or regulator, select a device with a flow rate higher than that used by proportional pressure controls.

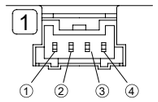
■CE-compliance working conditions
The standard for the immunity for industrial environments applied to CE conforming product is EN61000-6-2, but the following requirements must be satisfied in order to conform to this standard.
Conditions
- The evaluation of this product is performed by using a cable that has a power supply line and a signal line paired to assess the product's performance.
- This product is not equipped with surge protection. Implement surge protection measures on the system side.

■Connector wiring
- Connect by inserting the cable with connector PPX-C□ into the product connector as shown at right.
- To remove, press down on the pawl of the cable with a connector and pull out the connector.
- Do not pull on the cable without pressing down on jaws. The cable could break or the connector could be damaged.



[Connector]
Contact: SPHD-001T-P0.5
Housing: PAP-04V-S
[Manufactured by J.S.T. Mfg. Co., Ltd.]

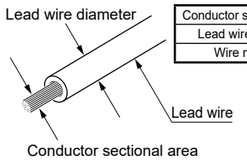
[Connector pin array drawing]



Connector pin No.	Terminal name
①	+V
②	Comparison output 1
③	Standard: Comparison output 2 High-function: Analog voltage output or external input
④	0 V

- When wiring with a connector set (PPX-CN), be sure to use a compatible cable and crimp tool specialized for housing and contacts.

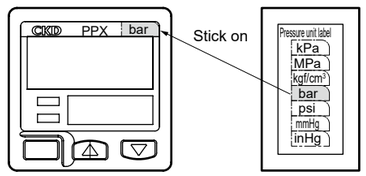
[Conforming cable]



Conductor sectional area	0.12 to 0.32 mm² (AWG26 to 22)
Lead wire diameter	ø1.0 to ø1.5 mm
Wire material	Annealed copper twisted wire

Housing	J.S.T. Mfg. Co., Ltd. PAP-04V-S
Contact	J.S.T. Mfg. Co., Ltd. SPHD-001T-P0.5
Recommended crimping tools	J.S.T. Mfg. Co., Ltd. YC-610R (AWG26 to 24)
	J.S.T. Mfg. Co., Ltd. YC-611R (AWG22)

■When using the unit change function
If using export models (for outside Japan), when changing the units other than MPa or kPa, make sure to attach the unit seal attached and attached to the product to the unit indication section on the operation section.



[Unit seal label]

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual

With digital display
Electronic pressure switch

PPD3 Series

Easy use with wide variations!

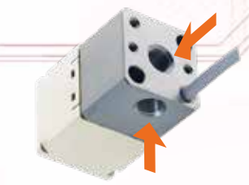
- Common operations are used for both the sensor integrated and separated - User-friendly.
- Degree of protection IP65 or equivalent - Excellent reliability even in adverse environment.
- Full-range coupling pressure – Measuring from vacuum to positive pressure is possible.

Sensor integrated

PPD3-S Stainless steel diaphragm



A wide range of port shapes

Rc1/8 2-direction port (Rear side/down direction)	Rc1/8 through port (Lateral direction)	ø6 push-in fitting (Downward direction)	ø6 Push-in fitting through port (Lateral direction)
			
(Port) (-6B)	(-6T)	(-6HD)	(-6HT)

Sensor separated

PPD3-□D Semiconductor sensor
PPD3-S-□D Stainless steel diaphragm

Indicator



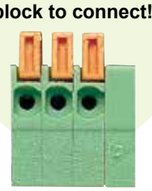
*PPD3-KHS-D mounting state

Sensor body

Any combination of indicators and sensors can be used!

●R1/8	●ø6 push-in fitting	●ø6 plug	●Rc1/8
			
(Port) (−6)	(-H6)	(-H6-B)	(-6B)
Semiconductor sensor			Stainless steel diaphragm sensor

Just insert into the terminal block to connect!



Select by application

Both sensor integrated and sensor separateds are available.

- Pressure can be easily adjusted and checked. (Sensor integrated)
- Remote processing is possible. (Sensor separated)

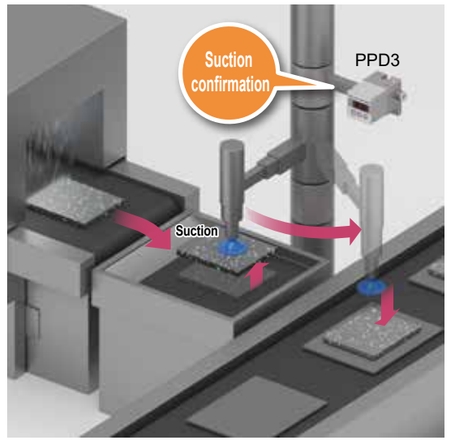
Use general air with stainless steel diaphragm sensor.

Stainless steel diaphragm and semiconductor sensors are available.

- Sensors can be used based on air-line quality.
- All sensors have degree of protection IP65 or equivalent

IP65

Suction confirmation for wet



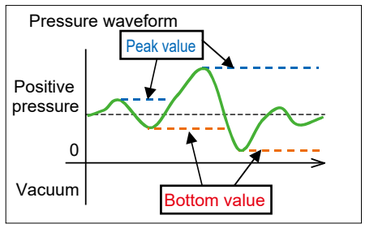
Easy-to-use pressure port lineup

- **Resin ports with push-in fittings (6HD, 6HT, H6) are available. Measurement and space saving are possible.**
- **Through-port types (6T, 6HT, H6) are available. Ideal for suction and seating confirmation. Can be installed using minimal piping space.**

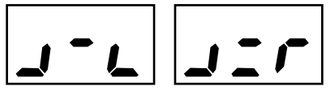
Ample functions

- **Convenient functions such as a peak hold function, switch waveform display, forcible switch function, and pressure gage reading function make startup more efficient.**

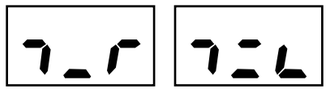
Peak hold



Switch waveform display



Window mode Hysteresis mode

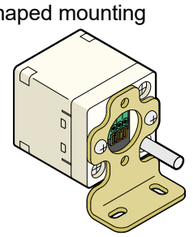


Window mode Hysteresis mode

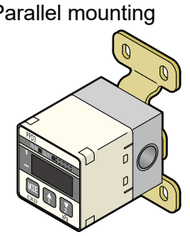
Different mounting bracket options sold separately

Can be installed anywhere.

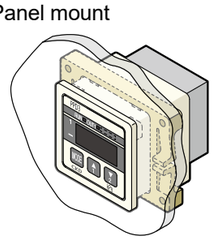
L shaped mounting



Parallel mounting



Panel mount



Operation protective cover

Use this cover to protect the display panel and prevent incorrect input.



Electronic pressure switch with digital display (pressure switch)
Sensor integrated

PPD3-S Series

Circuit diagram symbol 

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

●Sensor integrated body

PPD3-S – R03 NA – 6T

- PPD3-S: Stainless steel diaphragm sensor
- ❶ R03: Pressure range
- ❷ NA: Output
- ❸ 6T: Port

Note: Mounting brackets and kits are not included with the body. They are available separately.

❶Pressure range

Code	Description
R10	For -100 to 980 kPa
R03	For -100 to 300 kPa
R01	For -100 to 100 kPa

❷Output

Code	Description
N	NPN transistor output 2 point
P	PNP transistor output 2 points
NA	NPN transistor output 1 point + Analog output 1 point
PA	PNP transistor output 1 points + Analog output 1 point

❸Port

Code	Description	
6B	Rc1/8, 2-direction port Rear side/bottom outlet	
6T	Rc1/8, Through port Lateral both sides outlet	
6HD	6 mm push-in Lightweight port with fitting (Downward direction)	
6HT	6 mm push-in Lightweight through port with two fittings (Horizontal both directions)	

●Mounting bracket and kit

PPD3- KL

- ❶ KL: Option

❶Option

Code	Description	
KL	One-side mounting foot (L-shaped mounting) (mounting screw attached)	
KD	Both sides mounting foot (parallel mounting) (mounting screw attached)	
KHS	Panel mounting bracket set, with cover (ø6 push-in fitting attached)	
KC	Operation protective cover	

*1: The mounting of this panel ❸ applies to port type "6B". It cannot be used with other ports.
*2: Refer to Page 51 for dimensions.

Sensor integrated specifications

Item	PPD3-S		
	R10	R03	R01
Pressure sensitive element	Single stainless steel diaphragm pressure sensor		
Applicable fluid	Air/non-corrosive gas/compressed air (including water and drain)		
Rated pressure	-100 to 980 kPa	-100 to 300 kPa	-100 to 100 kPa
Unit indicated	kPa	kPa	kPa
Min. unit indicated *1	1 kPa		
Proof pressure	2 MPa	0.6 MPa	0.6 MPa
Indicator accuracy (25°C)	±1% F.S.		±1% F.S.
Temperature characteristics (0 to 50°C)	±1% F.S.		±1% F.S.
Leak rate	1 cm³/min (ANR) or less		
Indicator	3-digit LED display character height 8 mm		
Power supply voltage	12 to 24 VDC ± 10% (ripple rate 1% or less)		
Current consumption	50 mA or less (60 mA or less for sensor separated)		
Switch output	Sensor integrated	N: NPN transistor open collector output 2 points P: PNP transistor open collector output 2 points NA: NPN transistor open collector output 1 point + analog output 1 point PA: PNP transistor open collector output 1 point + analog output 1 point	
Switch output current	50 mA or less		
Switch Output Voltage drop value	2.4 V or less		
Switch output response time	Approximately 5 msec		
Analog Output	1 to 5 V±0.1 V load impedance: 10 kΩ or more		
Set value hold	EEPROM		
Lead wire	Body: Oil resistant vinyl cable 4-conductor (0.3 mm² Insulator outer diameter ø1.1) 1 m		
Ambient temperature	0 to 50°C		
Ambient humidity	0 to 85% RH (no condensation)		
Vibration resistance	10 to 55 Hz compound amplitude 1.5 mm 2 hours per X, Y, Z direction		
Degree of Protection	IP65 equiv. *2 (IP40 equivalent only for display section of sensor separated)		
Protection circuit *3	Power reverse connection protection, switch output reverse connection protection, switch output load short-circuit protection		
Weight	PPD3-S-R□-6B: approx. 105 g		

*1: This indicates min. display unit, and does not guarantee display accuracy.
***2: When an atmosphere inlet port is processed (see Page 58).**
*3: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.

Clean-room specifications

(Catalog No. CB-033SA)

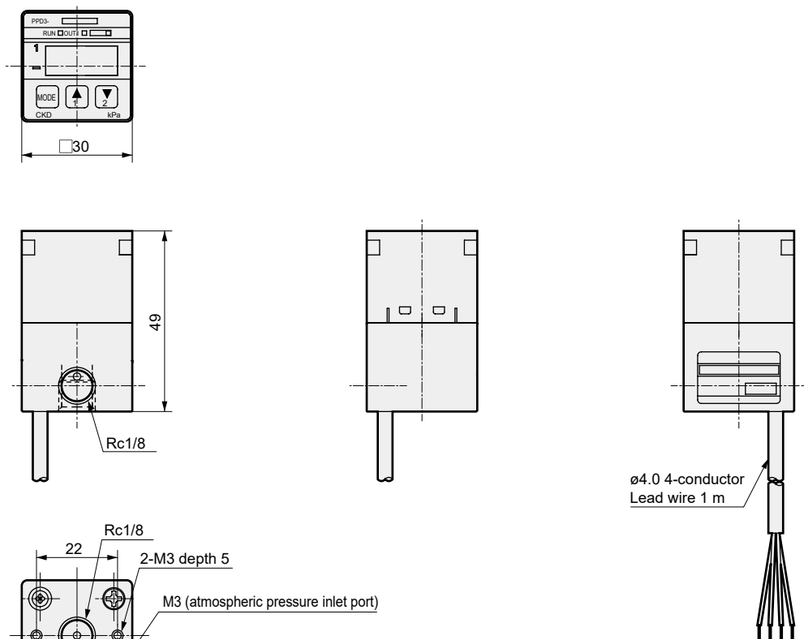
●Anti-dust generation structure for use in cleanrooms

PPD3-S- · · · · -P7□
PPD3-S- · · · · -P8□
PPD3-S- · · · · -P9□

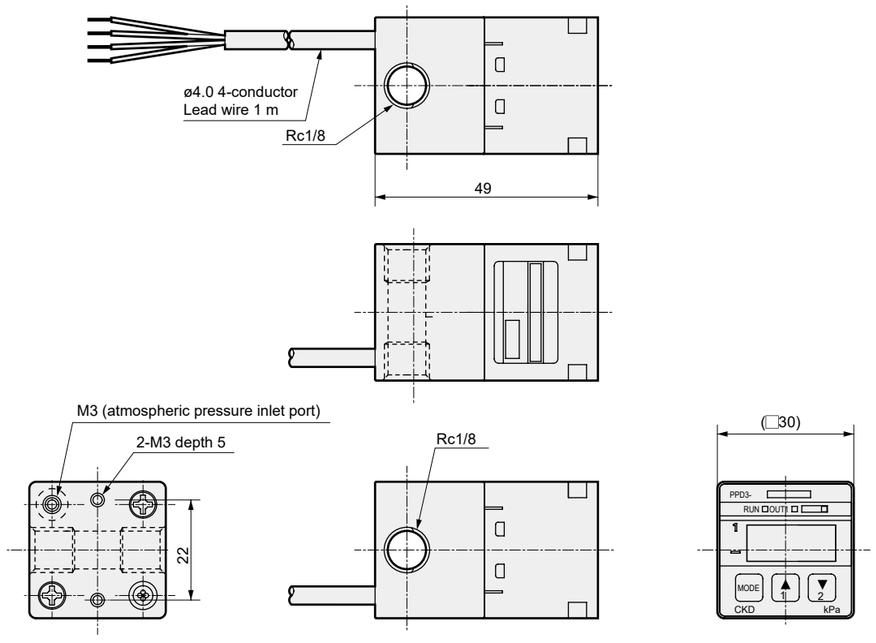
Dimensions diagram (sensor integrated)

Sensor integrated (stainless steel diaphragm sensor)

●PPD3-S-□□□□□-6B



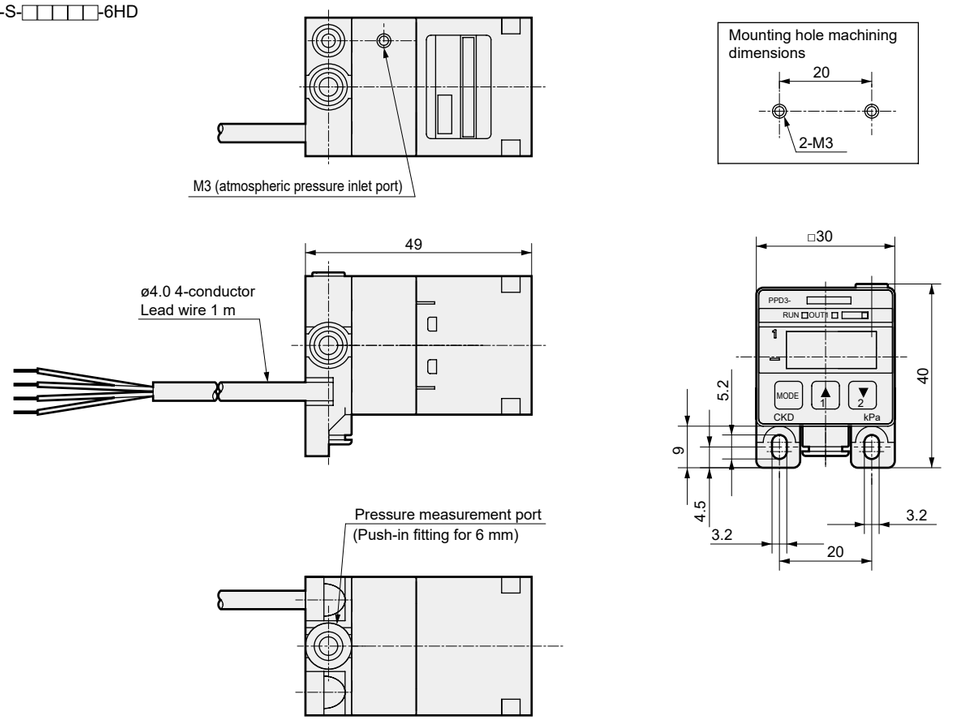
●PPD3-S-□□□□□-6T



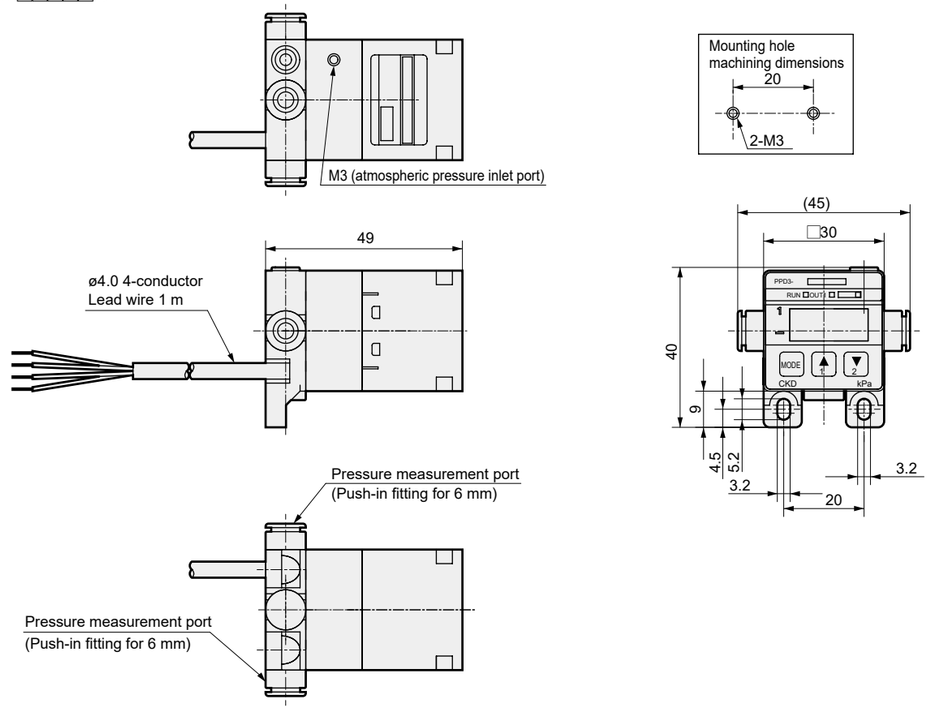
Dimensions diagram (sensor integrated)

Sensor integrated (stainless steel diaphragm sensor)

●PPD3-S-□□□□□-6HD



●PPD3-S-□□□□□-6HT





Electronic pressure switch with digital display (pressure switch)
Sensor separated

PPD3, PPD3-S Series

Circuit diagram symbol 

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

●Sensor separated body

PPD3 - R03 NA D - H6

❶Sensor ❷Pressure range ❸Output ❹Port

Note: Mounting brackets and kits are not included with the body. They are available separately.

❶Sensor

Code	Description
PPD3	Semiconductor sensor
PPD3-S	Stainless steel diaphragm sensor

❷Pressure range

Code	Description
R10	For -100 to 980 kPa
R03	For -100 to 300 kPa
R01	For -100 to 100 kPa

❸Output

Code	Description
NA	NPN transistor output 2 points + analog output 1 point
PA	PNP transistor output 2 points + analog output 1 point

❹Port

Code	Description	
6	R1/8	For PPD3 (semiconductor sensor) 
H6	6 mm push-in fitting	
H6-B	6 mm plug	
6B	Rc1/8	For PPD3-S (Stainless steel diaphragm sensor) 

Clean-room specifications (Catalog No. CB-033SA)

●Anti-dust generation structure for use in cleanrooms

PPD3-S- · · · · -P7□

PPD3-S- · · · · -P8□

PPD3-S- · · · · -P9□

●Model No. of single display

Example) PPD3 - R10 NA D

❸Output ❷Pressure range

Note: ❷, ❸Select from the table above for model No. of Item .

●Discrete sensor model No.

Example) PPD3 - R03 A - H6

❶Sensor ❷Pressure range ❹Port

Note: ❶, ❷, ❹ Select from the table above for model No. of Item .

Sensor separated specifications

Item	PPD3			PPD3-S		
	R10	R03	R01	R10	R03	R01
Pressure sensitive element	Diffused semiconductor pressure sensor			Single stainless steel diaphragm pressure sensor		
Applicable fluid	Air/non-corrosive gas			Air/non-corrosive gas/compressed air (including water and drain)		
Rated pressure	-100 to 980 kPa	-100 to 300 kPa	-100 to 100 kPa	-100 to 980 kPa	-100 to 300 kPa	-100 to 100 kPa
Unit indicated	kPa	kPa	kPa	kPa	kPa	kPa
Min. unit indicated *1	1 kPa					
Proof pressure	1.5 MPa	0.6 MPa	0.2 MPa *2	2 MPa	0.6 MPa	0.6 MPa
Indicator accuracy (25°C)	±1% F.S.					±1% F.S.
Temperature characteristics (0 to 50°C)	±1% F.S.					±1% F.S.
Leak rate	1 cm³/min (ANR) or less					
Indicator	3-digit LED display character height 8 mm					
Power supply voltage	12 to 24 VDC ± 10% (ripple rate 1% or less)					
Current consumption	60 mA or less					
Switch output	NA:NPN transistor open collector output 2 points + analog output 1 point PA:PNP transistor open collector output 2 points + analog output 1 point					
Switch output current	50 mA or less					
Switch Output Voltage drop value	2.4 V or less					
Switch output response time	Approximately 5 msec					
Analog Output	1 to 5 V±0.1 V load impedance: 10 kΩ or more					
Set value hold	EEPROM					
Lead wire	Body: Oil resistant vinyl cable (5-conductor 0.2 mm² Insulator outer diameter ø1.0) Sensor section of sensor separated: Oil resistant vinyl cable 3-conductor (0.15 mm² Insulator outer diameter ø1.0) 3 m					
Ambient temperature	0 to 50°C					
Ambient humidity	0 to 85% RH (no condensation)					
Vibration resistance	10 to 55 Hz compound amplitude 1.5 mm 2 hours per X, Y, Z direction					
Degree of Protection	IP 65 or equiv. (IP40 equivalent only for display section of sensor separated)					
Protection circuit *3	Power reverse connection protection, switch output reverse connection protection, switch output load short-circuit protection					
Weight	PPD3-R□D-6: Approx. 100 g			PPD3-S-R□D-6B: Approx. 115 g		

*1: This indicates min. display unit, and does not guarantee display accuracy.
*2: Sensor separated is 0.3 MPa.
*3: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.

●Mounting bracket and kit

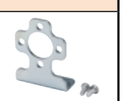
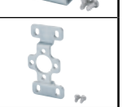
PPD3-KL-D

❶Option

●Operation protective cover

PPD3-KC 

❶Option

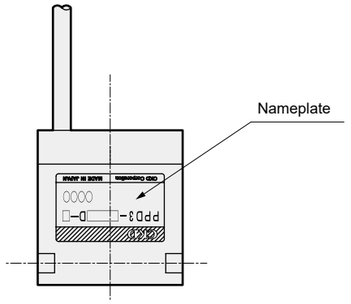
Code	Description	
KL	One side mounting foot (L shaped mounting) (mounting screw attached)	
KD	Both sides mounting foot (parallel mounting) (mounting screw attached)	
KHS	Panel mounting bracket set, with cover	

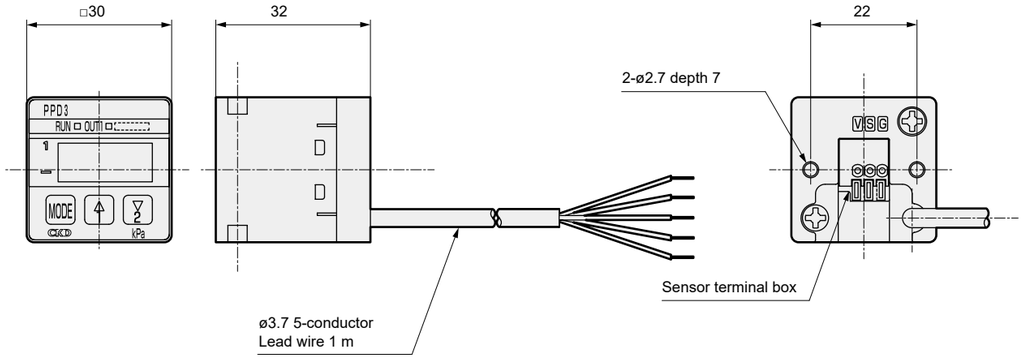
*1: Refer to Page 51 for dimensions.

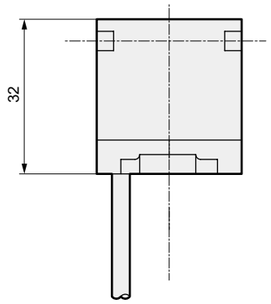
Dimensions diagram (sensor separated/display)

Sensor separated (display)

●PPD3-□□□□□-D (display)







[Sensor terminal box connection]

Code	Sensor lead wire color
V	Brown
S	Black
G	Blue

Internal structure/material (semiconductor sensor)

Sensor separated (semiconductor sensor)

●PPD3-R□□D-6

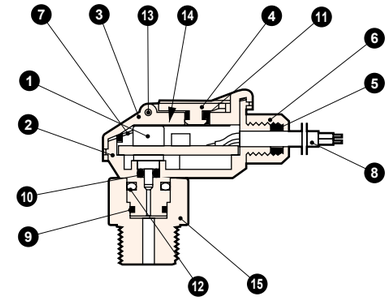
●PPD3-R□□A-6 (discrete sensor model No.)

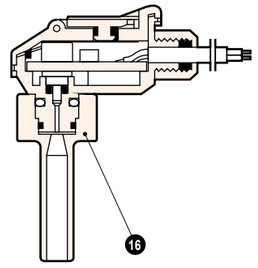
●PPD3-R□□D-H6-B

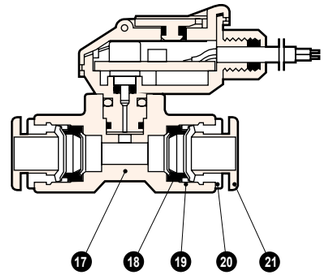
●PPD3-R□□A-H6-B (discrete sensor model No.)

●PPD3-R□□D-H6

●PPD3-R□□A-H6 (discrete sensor model No.)







Cannot be disassembled

Part No.	Part name	Material	Part No.	Part name	Material
1	Pressure sensor	Diffusion semiconductor strain gauge	12	Stopper	Stainless steel
2	Body	Polybutylene terephthalate (glass fiber 30%)	13	Spring pin	Stainless steel
3	Cover	Polycarbonate	14	Shield sheet	Aluminum
4	Trimmer guard	Polycarbonate	15	R1/8	Polybutylene terephthalate
5	Bush	Nitrile Rubber	16	Plug	Polybutylene terephthalate
6	Bush holder	Aluminum	17	Push-in fitting	Polybutylene terephthalate
7	Cover gasket	Silicone rubber	18	Packing	Nitrile Rubber
8	Lead wire (3 m)	Polyvinyl chloride	19	Chuck	Brass (electroless nickeling)
9	O-ring	Nitrile Rubber	20	Outer ring	Brass (electroless nickeling)
10	O-ring	Nitrile Rubber	21	Push ring	Polyacetal
11	O-ring	Nitrile Rubber			

Dimensions diagram (semiconductor sensor)

Sensor separated (semiconductor sensor)

●PPD3-R□□D-6

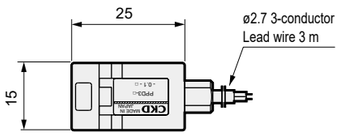
●PPD3-R□□A-6 (discrete sensor model No.)

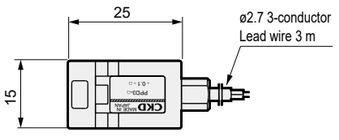
●PPD3-R□□D-H6-B

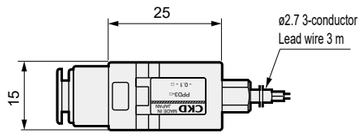
●PPD3-R□□A-H6-B (discrete sensor model No.)

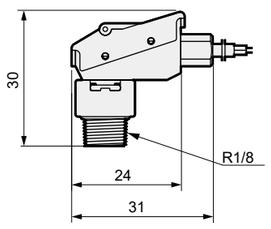
●PPD3-R□□D-H6

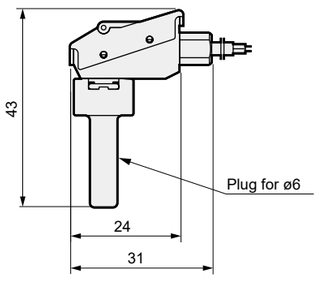
●PPD3-R□□A-H6 (discrete sensor model No.)

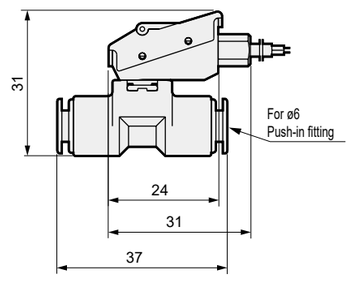










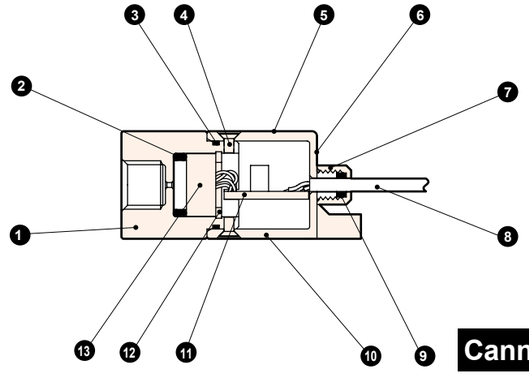


Internal structure/material (stainless steel diaphragm sensor)

Sensor separated (stainless steel diaphragm sensor)

●PPD3-S-R□□D-6B

●PPD3-S-R□□A-6B (discrete sensor model No.)



Cannot be disassembled

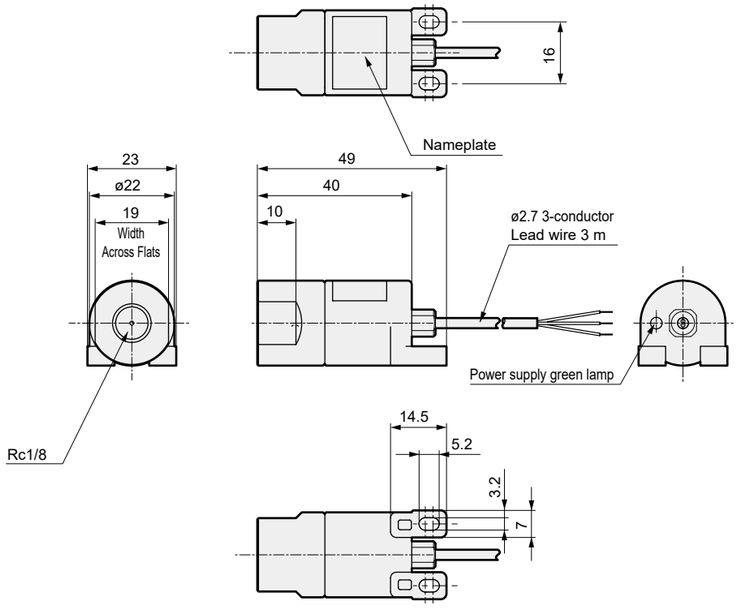
Part No.	Part name	Material	Part No.	Part name	Material
1	Pressure port	Aluminum	8	Lead wire (3 m)	Polyvinyl chloride
2	O-ring	Fluoro rubber	9	Bush	Nitrile Rubber
3	O-ring	Nitrile Rubber	10	Sensor body	Polybutylene terephthalate (glass fiber 30%)
4	Flat head screw	SUSXM7	11	Amplifier board	Glass epoxy resin
5	Nameplate	Polyester film	12	C-ring for hole	Stainless steel
6	Lamp seat	Polyester film	13	Pressure sensor	Stainless steel diaphragm strain gauge
7	Bush holder	Aluminum			

Dimensions diagram (stainless steel diaphragm sensor)

Sensor separated (stainless steel diaphragm sensor)

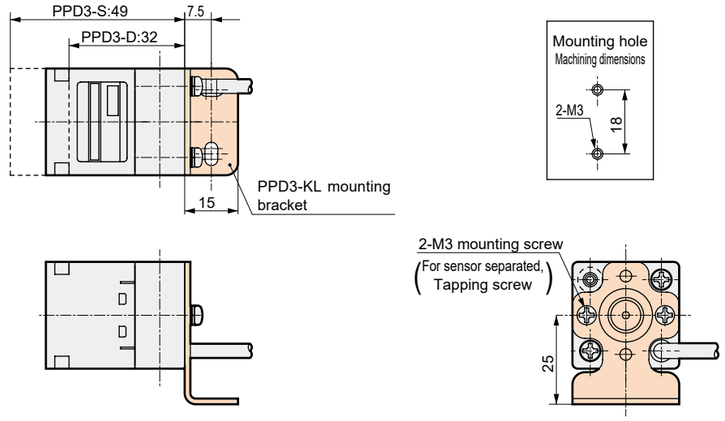
●PPD3-S-R□□D-6B

●PPD3-S-R□□A-6B (discrete sensor model No.)

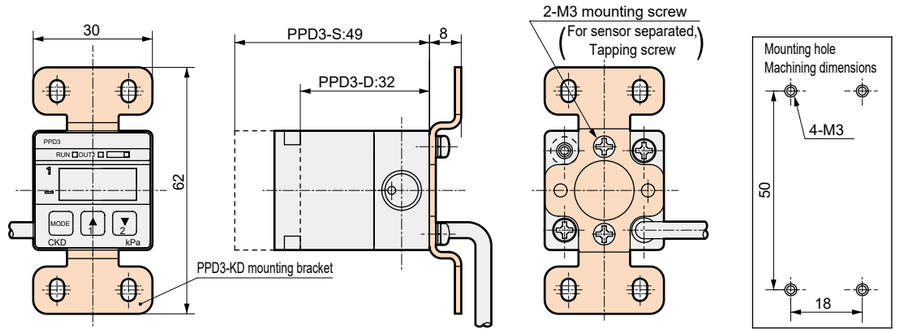


Optional dimensions diagram: Mounting bracket

●PPD3-KL (-D) assembly drawing

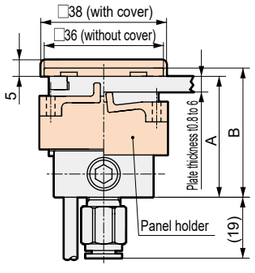


●PPD3-KD (-D) assembly drawing Note: For this installation, use CKD miniature fitting FTL4-M3 for atmospheric release port. (Sensor integrated only)



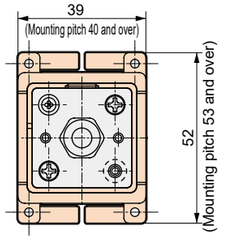
●PPD3-KHS (-D) assembly drawing Note: Push-in fitting is not included with PPD3-KHS-D.

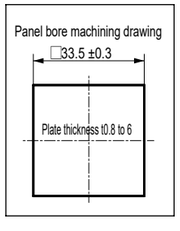
Combinations with PPD3-R□□□□-6B



Mounting dimensions for each model

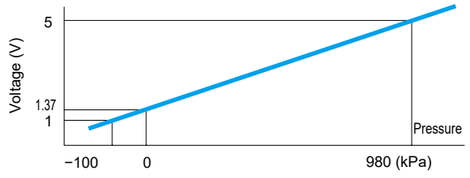
Model	A	B
PPD3-S	46.5	49
PPD3-D	29.5	32



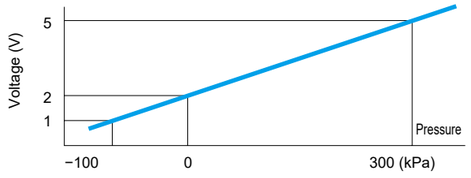


Analog output voltage - pressure characteristics

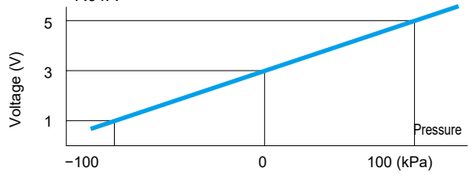
●PPD3-S-R10NA
R10PA
R10A



●PPD3-S-R03NA
R03PA
R03A



●PPD3-S-R01NA
R01PA
R01A



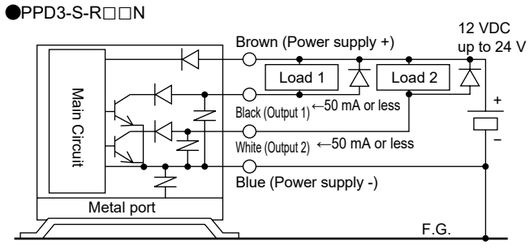
[Precautions]

●Analog output accuracy is affected by temperature characteristics and heat generated when energized. Provide a standby time (5 minutes or more after energizing) before use.

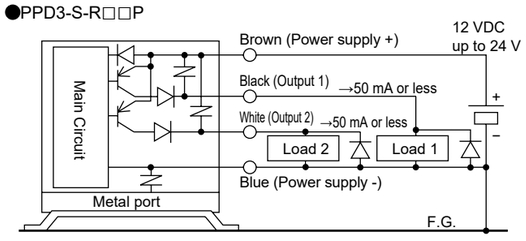
Internal circuit / connection method

PPD3-S Series (sensor integrated)

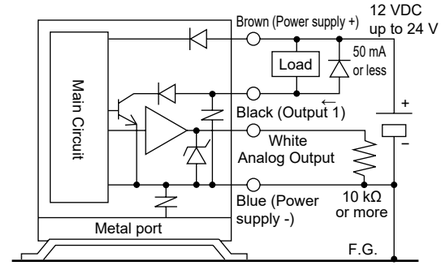
●PPD3-S-R□□N



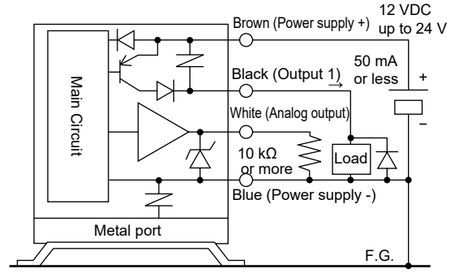
●PPD3-S-R□□P



●PPD3-S-R□□NA

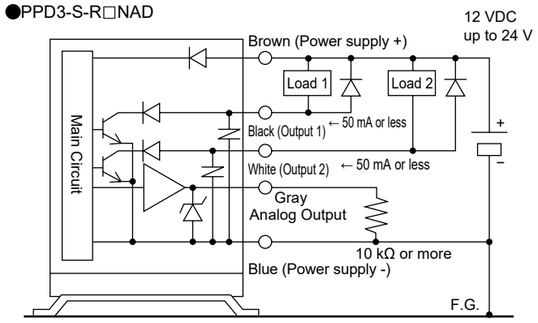


●PPD3-S-R□□PA

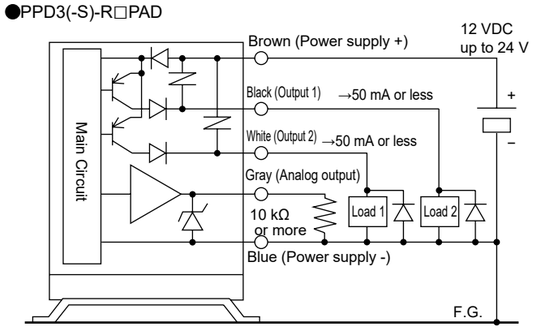


PPD3 (-S)-D Series (sensor separated)

●PPD3-S-R□NAD

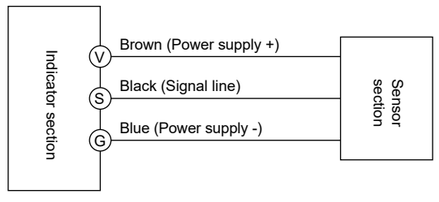


●PPD3(-S)-R□PAD

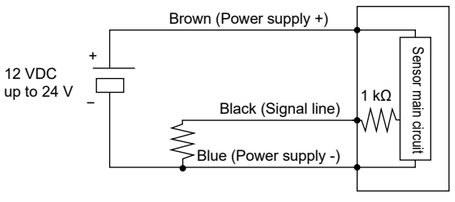


Sensor section connection method

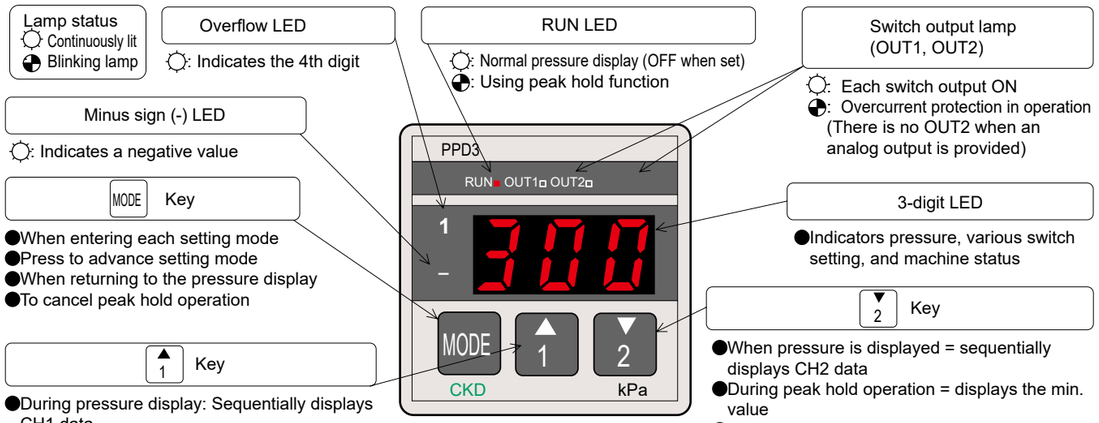
●PPD3(-S)-R□D



●PPD3(-S)-R□A connection method when single sensor is used



Indicator and function



LED display

Numbers and letters are displayed with a combination of LED displays.

Numerals	0	1	2	3	4	5	6	7	8	9
Indicator	0	1	2	3	4	5	6	7	8	9

Characters	A	B (b)	C	D (d)	H	I (i)	J	L	N (n)	O (o)	P
Indicator	A	b	C	d	H	I	J	L	n	o	P

Rated pressure	980 kPa	300 kPa	100 kPa
Model No.	R10	R03	R01
Pressure code	JO JO	Lo LO	HO HO

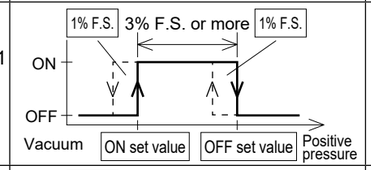
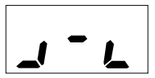
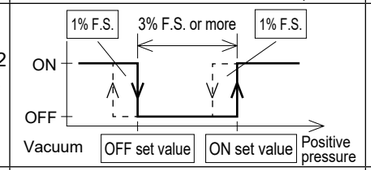
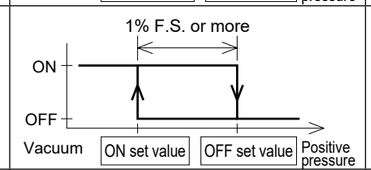
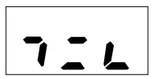
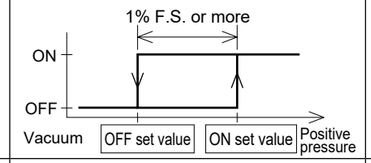
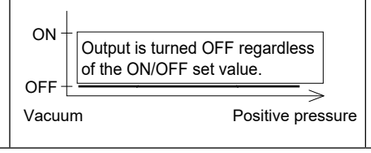
Model No. display



Output	NPN output	PNP output
Model No.	N, NA	P, PA
Output code	N n	P p

Function list

Item	Description	Initial state
Set value confirmation	The switch operation mode, switch ON set value, and switch OFF set value can be confirmed.	—
Peak hold function	The max. and min. values within the mode setting period can be confirmed.	—
Switch output setting	Set the switch operation mode, ON value setting value, and OFF setting value. [Operation mode]	Stop operation
Forced output function Switch output test function	Forces the switch output to turn ON and is used to check the initial operation of wiring connections and input devices.	—
Zero point adjustment function	Deviation of the display from the zero point is compensated in the atmospheric pressure pressurized state.	—

Operation mode name	Operation waveform	LED operation waveform display
1 Window operation 1 (ON when inside the range)		
2 Window operation 2 (ON when outside the range)		
3 Hysteresis operation 1 (ON at low pressure)		
4 Hysteresis operation 2 (ON at high pressure)		
5 Stop operation		

For details on operation and setting method, refer to CKD Components Product website (https://www.ckd.co.jp/kiki/en/) → "Model No."→ Instruction manual

Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

Electronic pressure switch with digital display (pressure switch) PPD3 Series

During Design and Selection

⚠WARNING

■Use this product in accordance with specifications.
Use for applications, or at load currents, voltages, temperatures, impacts or sites excluded from the specifications could result in damage or malfunctions.

■Do not use oxygen, corrosive or combustible gas, or toxic fluid for this product.

■Never use this product in an explosive gas atmosphere.
The pressure switch does not have an explosive-proof structure. Never use in an explosive gas atmosphere as explosions or fires could result.

■Avoid installing this product in a sealed control box or indoors.
If the fluid should leak due to any trouble, the pressure in the sealed chamber could change and recreate a hazardous state. Use this product in the control box having safety device to control internal pressure, or indoors with no pressure differential from the outsidePlease.

■Power supply voltage
Do not use this product at levels exceeding the power supply voltage. If voltage exceeding this range or AC power supply (100 VAC) is applied, the controller could rupture or burn.

■DC power not insulated from the AC primary side may damage the product and power, possibly leading to electric shock. Do not use the product in this case.

■Load short-circuit
Do not short-circuit the load. Failure to observe this could result in rupture or burning.

■Incorrect wiring
Avoid incorrect wiring such as mistaken power source polarities, etc. Failure to observe this could result in rupture or burning.

⚠CAUTION

■Applicable fluid
When using applicable fluid other than air; nitrogen gas, etc., oxygen deficiency could be caused. Observe the following instructions.
- Use in well ventilated locations.
- Ventilate the work area when nitrogen gas is being used.
- Inspect nitrogen gas piping regularly to avoid leaks.
- Non-corrosive gas means substances such as nitrogen or carbon dioxide contained in air and inert gases such as argon or neon.
- When using this product for compressed air containing water or oil, use the PPD3-S (stainless steel diaphragm sensor specifications) with increased corrosion resistance.

■If this product is used for vacuum suction confirmation, care must be taken for following matters.
When applying positive pressure for vacuum burst onto the product, check that it does not exceed the specified proof pressure.

■Working environment
- Avoid use in locations subject to vibration or shock of 100m/s^2 or more.
- Check the temperature of fluid being measured and the environmental temperature in piping.
- When using a type that does not have the corresponding degree of protection, do not use for applications in which water or oil could be applied.

■Determine the setting, taking error caused by accuracy limitations and temperature characteristics into consideration.

■Take care when using this product for an interlock circuit.
When using the pressure switch for an interlock signal requiring high reliability, provide a double interlock by installing a mechanical protection function or a switch (sensor) other than a pressure switch as a safeguard against breakdown. Regularly inspect and confirm that the interlock activates correctly.

■Response time is affected by working pressure and load volume. If reproducibility with stable response time is required, install a regulator in the proceeding stage.

■Take the following countermeasures to prevent malfunction caused by noise.
- Insert a line filter in the AC power supply line.
- Do not share power with an inverter or components causing motor noise, etc.
- Use a surge suppressor such as a CR or diode on the inductive load (solenoid valve, relay, etc.) and remove noise from the source.
- When using a components (switching regulator, inverter motor, etc.) that could generate noise near the components, be sure to ground the sensor frame ground (F.G.) terminal.
- Separate wiring to the sensors from strong magnetic fields.
- Connect wiring to sensors with a shield wire.
- Ground the shield wire on the power supply side.

■Care must be taken for protection of body and lead wire.
- Do not bump or drop the body, or apply excessive bending or tensile strength to the lead wire. This may lead to disconnection.
- Connect and wire bend-resistant material, such as robot wire material, for movable sections.

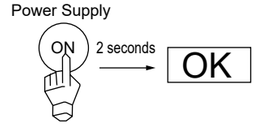
■Avoid connecting the output for a relay contact, operation switch, or other components output in parallel with the PLC to the product's output, or short-circuiting the input terminal of the PLC to which this product is connected with the power supply cable's negative side to test the input device. This product's output circuit could be damaged.

■When releasing the secondary control pressure, such as air blowing, into the atmosphere, the pressure could fluctuate depending on the piping and flow conditions. Test with actual working conditions, or contact CKD.

■Components When selecting dryer, air filter, oil mist filter or regulator, select a device with a flow rate higher than that used by proportional pressure controls.

■CE-compliance working conditions
The standard for the immunity for industrial environments applied to CE conforming product is EN61000-6-2, but the following requirements must be satisfied in order to conform to this standard.
Conditions
- The evaluation of this product is performed by using a cable that has a power supply line and a signal line paired to assess the product's performance.
- This product is not equipped with surge protection. Implement surge protection measures on the system side.

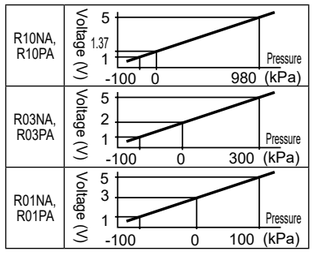
■The internal circuit is self-diagnosed immediately after power is turned ON, so pressure is not detected immediately. Set the control circuit so that signals are ignored for about 2 seconds after power is turned ON.



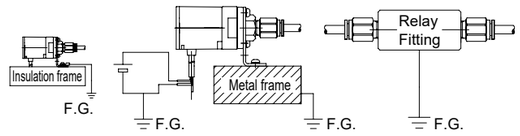
■Overcurrent protection turns the output OFF when overcurrent is detected. However, the output is repeatedly turned ON for a short time at a set cycle. This causes power supply voltage to fluctuate and may adversely affect peripheral devices.

■When using this product for compressed air containing water or oil, use the PPD3-S (stainless steel diaphragm sensor specifications) with increased corrosion resistance.

[Analog output voltage waveform]

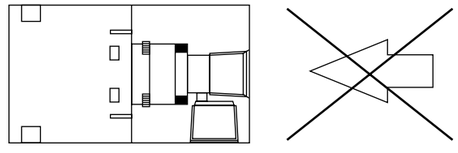


■Install the PPD3-S on a frame or panel connected to the frame ground (F.G.) and, if necessary, directly connect from the PPD3-S port to the F.G. When leading fluids in from an external device, connect via a relay fitting connected to the F.G. (To provide safety when using conductive fluids)



■PPD3-S power supply is a DC stabilized power supply completely isolated from the AC primary side. Connect either the + side or - side of the power to the FG. A varistor (limit voltage approx. 40 V) is connected between the internal power circuit and port/mounting section of this PPD3-S to prevent dielectric breakdown of the sensor. Avoid withstand voltage and insulation resistance tests between the PPD3-S internal power supply circuit and port/installation section. Disconnect PPD3-S wiring first if this testing is required. An excessive potential difference between the PPD3-S power supply and port/installation section could burn internal parts. After installing, connecting and wiring the PPD3-S, electrical welding of the device/frame, short-circuit accidents, etc., could cause welding current, excessively high voltage caused by welding, or surge voltage, etc., to run through the wiring, ground wire, or fluid path connected between the above devices, damaging wires or devices. Conduct any work such as electrical welding after removing this device and disconnecting all electric wires connected to the FG.

■Care must be taken for entry of water and drainage.
PPD3-S uses a stainless steel diaphragm pressure sensor that is not damaged by water. However, when water and condensate in the air collide with the pressure sensor during vacuum breakage after vacuum adsorption confirmation, the inrush inertia of the water may damage the pressure sensor and prevent normal pressure indication. If water or drainage can enter, connect a thin pipe to the PPD3, or install an orifice midway. Take special care when using the back ports on the PPD3-S 6B port. In addition, this type has a ø1 built-in orifice inside the pressure port.



Take special care when using the back ports of the 6B type in case of possible entry of water or drainage.

■Degree of protection, atmospheric introduction port processing precautions

- The product may be prone to damage when in a state of being unpacked or being installed. The protective functions are effective when the product is correctly installed, wired and piped. Provide protection so that water and other substances do not come in contact until installation is completed.
- Wire and pipe the product after fixing it at the installation site. Check surrounding safety and that water and other substances do not come in contact before starting wiring. Continue to provide protection after the product is connected. (The current could leak at the connection section, and water could run along the cable and enter the case.)
- The atmospheric introduction port for atmospheric pressure is treated as a key point in ensuring this product's protective performance. Use the following tube, and release the end into the atmosphere in a dry environment with no barometric pressure differences.

Recommended tube: Soft nylon tube model No. FH-3224
Urethane tube model No. U-9532, U-9504

[IMPORTANT] Never apply pressure to the atmosphere inlet port!

■If the inlet port for the atmosphere introduction port pressure is pressurized, protective performance could be lost, and the case could rupture or pop off. Set as atmospheric pressure. Leave this port set at atmospheric pressure. Separate piping for atmospheric release port from other pressurized air piping by using different tube diameters or colors. Take sufficient countermeasures to prevent pressurized air from being applied.

- Even when the protective performance is not required, if this product is installed in a humid environment with large temperature variations, condensation in the case is prevented by taking these measures. (Condensation is fatal to the electric circuits.)
- If this product is in a control panel, pressurized to a positive pressure or negative pressure within a dry environment, the pressure difference could affect indicator accuracy. Please be careful.
- This product is intended to protect city water. Protection performance cannot be guaranteed for hot water, oil, coolant (non-water soluble/water soluble), solvents, acids, alkalines, or chemicals, etc. These substances could cause solvent cracks to form on in the case's resin parts, the gasket to swell, the adhesive to melt and separate, and other problems. Note that if water that gets on the product freezes, the case could be damaged and protective performance could be lost. Please be careful.

MEMO

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→Instruction Manual

Pressure switch
Electronic pressure Switch
Contact Confirm Switch
For Coolant Pressure Switch
Ending

Electronic Pressure Switch with Digital Display

PPG-D Series

Easy to read with 2-color display, and for environments exposed to dust or water



- Switch output 2 points, analog output 1 point (1 to 5 V or 4 to 20 mA)
- Hysteresis setting possible
- Pressure display accuracy: ±2%F.S.±1digit

CE UKCA cULus RoHS

Pressure range

Model No.		Rated pressure range (MPa) −0.100.1… 1.0
PPG-D-P	Positive pressure	0 to 1.0 MPa
PPG-D-V	Vacuum pressure	-101.3 kPa to 0 MPa
PPG-D-R	Compound pressure	-100 kPa to 100 kPa

2-color LED (Green/Red)

The display color can be set to green or red, allowing the pressure state to be confirmed at a glance.



	SoG	Sor	Grn	rEd
ON	Green	Red	Green	Red
OFF	Red	Green	Green	Red

Dust-proof/waterproof function

Degree of protection: IP65



Note: Environmental surveys are only available for “RoHS Certificate” and “REACH Certificate”. Parts level detailed data is not supported.

Easy Installation / Construction

Wiring The cables are connectors, making pressure switch mounting possible after electric wiring.





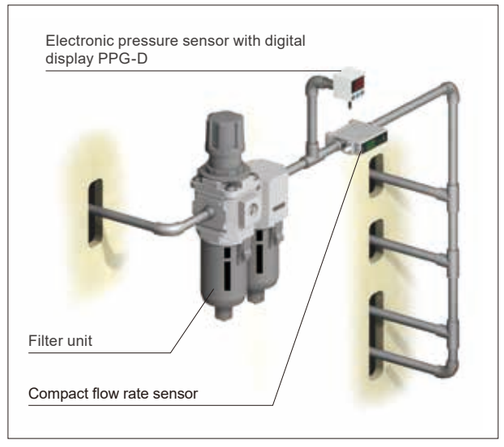
Piping Select from female thread and male thread.





Examples of applications

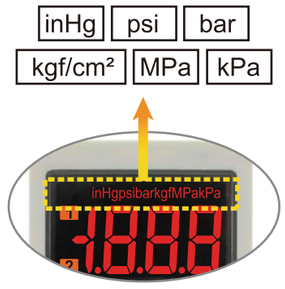
Checking equipment source pressure



Overseas support*1

The pressure unit can be changed.

*1: Supported when the model No. ends in "2".



Copy function

Ideal for reducing work processes and preventing misoperation.



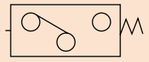
Setting master device

Setting copy device



Electronic pressure sensor with digital display

PPG-D Series

Circuit diagram symbol 

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

PPG - D - R NA - 6BM

- PPG: Model No.
- R: ❶Pressure range
- NA: ❷Output
- 6BM: ❸Piping shape
- (blank): ❹Unit change

❶Pressure range

Code	Description
R	Compound pressure (-100 to 100 kPa)
V	Vacuum pressure (0 to -101.3 kPa)
P	Positive pressure (0.000 to 1.000 MPa)

❷Output

Code	Description
NV	NPN transistor open collector 2 points + analog (voltage) output (1 to 5 V)
NA	NPN transistor open collector 2 points + analog (current) output (4 to 20 mA)
NC	NPN transistor, open collector 2 points + copy function
PV	PNP transistor open collector 2 points + analog (voltage) output (1 to 5 V)
PA	PNP transistor open collector 2 points + analog (current) output (4 to 20 mA)
PC	PNP transistor, open collector 2 points + copy function

❸Piping shape

Code	Description	
6BM	R1/8" (male thread), M5	
6NM	NPT1/8", #10-32UNF	
6GM	G1/8" (male thread), M5	
6B	Rc1/8 (female thread)	
6N	NPT 1/8 (female thread)	
6G	G1/8 (female thread)	

❹Unit change

Code	Description
Blank	SI unit fixed (kPa/MPa) User's Manual: Japanese, English
2	User's Manual with unit change function: Traditional Chinese, English

Note: In compliance with the new Measurement Act, it cannot be used in Japan.

Model No. Notation Method discrete option

PPG - D - KD

- KD: ❶Option

❶Option

❸Piping shape code	Description			Code
6BM, 6NM, 6GM	For male thread	Parallel mounting bracket (mounting screws included)		KD
		L-shaped mounting bracket (mounting screws attached)		KL
6B, 6N, 6G	For female thread	Parallel mounting bracket (mounting screws included)		KDA
		L-shaped mounting bracket (mounting screws attached)		KLA
6BM, 6NM, 6GM 6B, 6N, 6G	For both female/male threads	Panel adapter		KHS
		Panel adapter + Front protective cover		KHSCB

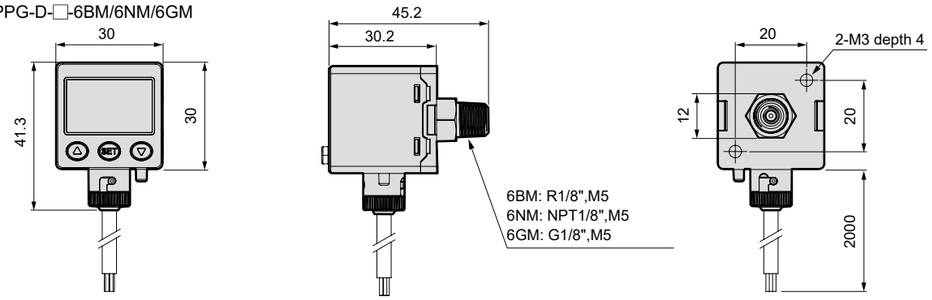
Specifications

Item			PPG-D-P-□-□ (Positive pressure)	PPG-D-V-□-□ (Vacuum pressure)	PPG-D-R-□-□ (Compound pressure)
Rated pressure			0.000 to 1.000 MPa	0.0 to -101.3 kPa	-100.0 to 100.0 kPa
Pressure setting			-0.100 to 1.000 MPa	10.0 to -101.3 kPa	-101.0 to 101.0 kPa
Proof pressure			1.5 MPa	300kPa	
Applicable fluid			Clean air, non-corrosive/non-combustible gas		
Unit indicated		kPa	-	0.1	
		MPa	0.001	-	
		kgf/cm²	0.01	0.001	
		bar	0.01	0.001	
		psi	0.1	0.01	
		inHg	-	0.1	
Power supply voltage			12 VDC to 24VDC ±10%, ripple (P-P) 10% or less or class 2		
Current consumption			40 mA or less (no load)		
Switch output	Output		NPN or PNP transistor, open collector 2 points		
	Max. load current		125 mA		
	Max. power supply voltage		NPN output: 24 VDC, PNP output: 24 VDC		
	Internal voltage drop		1.5 V or less		
	Response time		2.5 ms or less (Chattering prevention function: 25 ms, 100 ms, 250 ms, 500 ms, 1000 ms, and 1500 ms are selectable)		
	Switch output load short-circuit protection		Yes		
Analog output *2,*3	Voltage output	Voltage	1 to 5V (±2.5%)		
		Impedance	Approx. 1 kΩ		
	Current output	Current	4 to 20mA (±2.5%)		
		Impedance	Max. load impedance: 250 Ω (12 VDC) 600 Ω (24VDC) Min. load impedance: 50 Ω		
	Linearity		±1% F.S.		
Indicator	LCD display		3 1/2-digit, 7 segment (Red/Green)		
	Switch ON indicator lamp		Orange (1, 2 indicator lamps) OUT1 OUT2		
	Update time		Approx. 0.2 seconds		
	Indicator accuracy		±2% F.S. ±1 digit (Reference temperature: 25±3°C)		
Repeatability (switch output)			±0.2% F.S. ±1 digit		
Environment conditions	Degree of protection		IP65		
	Operating ambient temperature		0 to 50 °C		
	Storage ambient temperature		-10 to 60 °C (no condensation or freezing)		
	Ambient humidity		35 to 85% RH (no condensation)		
	Withstand voltage		1000 VAC, 1 minute (between the case and lead wire)		
	Insulation resistance		50 MΩ (500 VDC, between the case and lead wire)		
	Vibration resistance		Compound amplitude 1.5mm, 10 G, 10Hz-55Hz-10Hz per minute, 2 hours each in X, Y, Z directions		
	Shock resistance		100m/s² (10 G), 3 times each in X, Y, Z directions		
Temperature characteristics			±2% F.S. (25 °C Reference) temperature range 0 to 50 °C		
Port size			6BM:R1/8", M5 6NM:NPT1/8", #10-32UNF 6GM:G1/8", M5 6B:Rc1/8 (female thread), 6N:NPN1/8 (female thread), 6G:G1/8 (female thread)		
Lead wire			PVC cable ø4, 5-conductor (0.15mm². Outer diameter of insulator ø0.95 mm) 2m		
Weight			Male thread: approx. 86 g (including lead wire 2 m)/Female thread: approx. 115 g (including lead wire 2 m)		

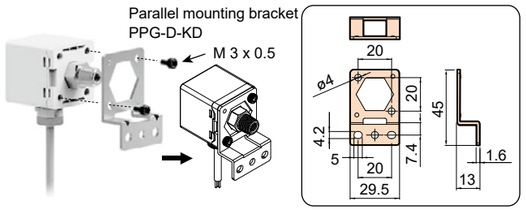
*1: The hysteresis value of one-point set mode and window comparator mode can be adjusted to between 1 and 8 digits.
*2: Analog current output cannot be selected together with analog voltage output.
*3: Analog voltage output cannot be selected together with analog current output.

Dimensions diagram (piping shape male thread)

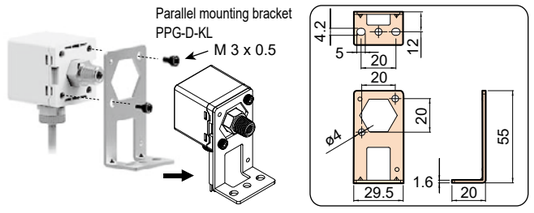
●Body PPG-D-□-6BM/6NM/6GM



●Parallel mounting bracket (mounting screws included)

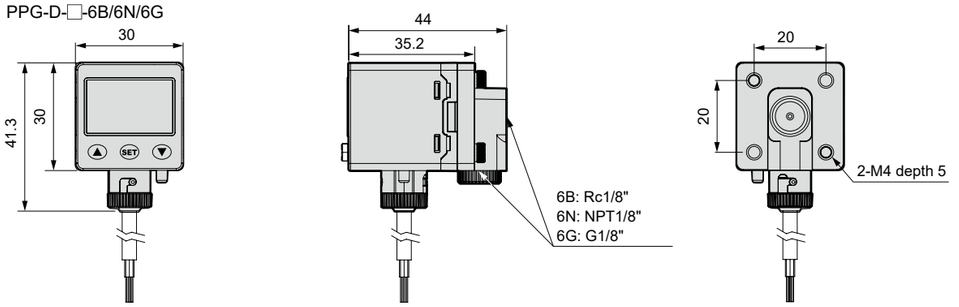


●L-shaped mounting bracket (mounting screws attached)

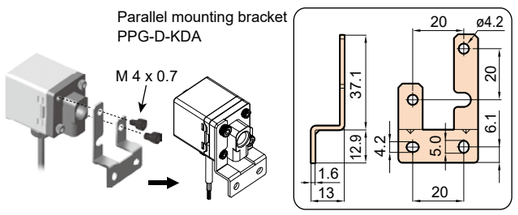


Dimensions diagram (piping shape female thread)

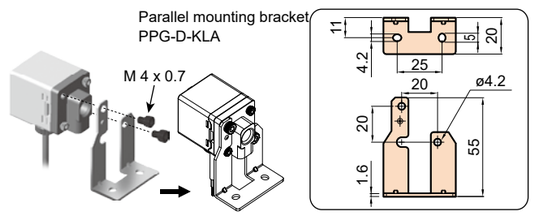
●Body PPG-D-□-6B/6N/6G



●Parallel mounting bracket (mounting screws included)

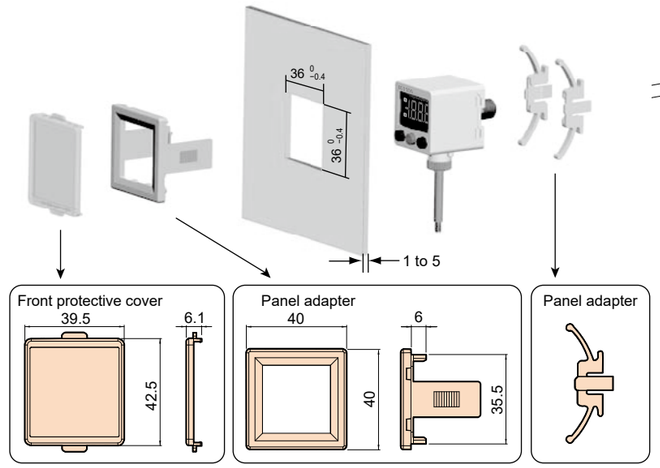


●L-shaped mounting bracket (mounting screws attached)

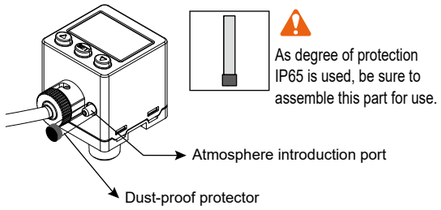


Common option dimensions diagram

●Panel adapter + Front protective cover
PPG-D-KHS, PPG-D-KHSCB

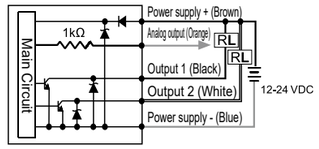


●Protector (IP65)

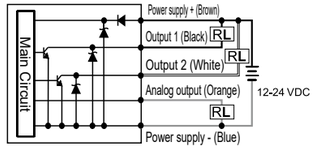


Internal circuit / connection method

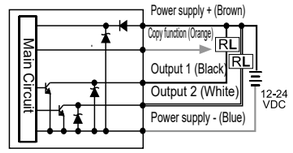
●PPG-D-□NV
2NPN + Analog output (1 to 5 V)



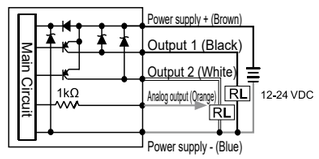
●PPG-D-□NA
2NPN + Analog output (4 to 20 mA)



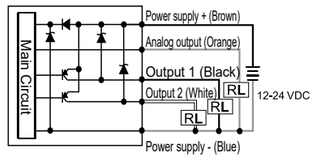
●PPG-D-□NC
2NPN + Copy function



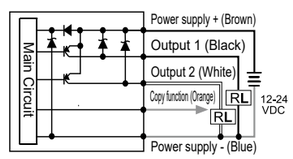
●PPG-D-□PV
2PNP + Analog output (1 to 5 V)



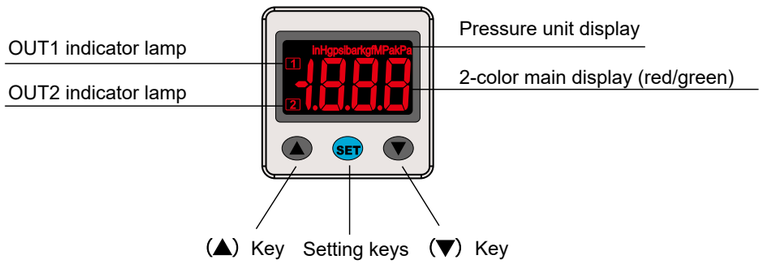
●PPG-D-□PA
2PNP + Analog output (4 to 20 mA)



●PPG-D-□PC
2PNP + Copy function



Names of display/operation sections



Function list

Measurement mode

Item	Description	Initial state
Switch output setting	Pressure value of OUT1 and OUT2 can be set.	P type: OPT mode .500 R type: OPT mode 50.0 V type: OPT mode -50.0
Zero value setting	The pressure display in the atmospheric pressure state can be forced to zero.	—
Maximum/minimum value display mode	The max. and min. values within the mode setting period can be confirmed.	—
Key lock/unlock	Locks key operations.	—

Initial setting mode

Item	Description	Initial state
OUT1 operation mode setting	Set the OUT1 mode. OPS, HYS, WIN	oPS
OUT1 output style setting	Set the output style of OUT1. NO, NC	no
OUT2 operation mode setting	Set the OUT2 mode. OFF, OPS, HYS, WIN	oFF
OUT2 output style setting	Set the output style of OUT2. NO, NC	—
Setting response time	Set the switch output response time. 2.5, 25, 100, 250, 500, 1000, 1500	2.5
Indicator color setting	Set the display color. SoG, Sor, Grn, rEd	SoG
Unit indicated	Pa (MPa/kPa) With unit change function (kPa, MPa, kgf, bar, psi, inHg)	PA Pa (MPa/kPa)

Function list

Applied setting mode

Item	Description	Initial state
Hysteresis value setting	Set the hysteresis (H) of one-point (OPT) mode and window comparator (WIN) mode. (8 stages)	3
LCD display color setting	Set the switch output to link display color changes. (OUT1, OUT2)	ot1
Power saving mode	Set the power saving mode. (OFF, ON)	oFF
Copy function setting	Set the copy function. (OFF, ON, ONL)	oFF
Initialization setting	Make the initialization settings. (OFF, ON)	oFF
Fine adjustment mode	Set the fine adjustment mode. (OFF, ON)	oFF

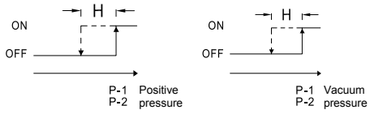
For details on operation and setting method, refer to CKD Components Product website (https://www.ckd.co.jp/kiki/en/) → "Model No."→ Instruction manual

Output

One-point mode

Normally open mode

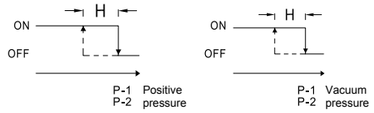
Positive pressure/compound pressure (PPG-D-P, PPG-D-R)



Vacuum pressure (PPG-D-V)

Normally closed mode

Positive pressure/compound pressure (PPG-D-P, PPG-D-R)

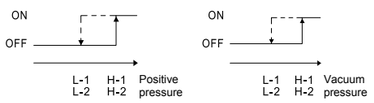


Vacuum pressure (PPG-D-V)

Hysteresis mode

Normally open mode

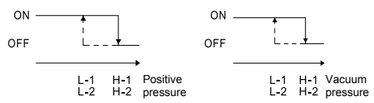
Positive pressure/compound pressure (PPG-D-P, PPG-D-R)



Vacuum pressure (PPG-D-V)

Normally closed mode

Positive pressure/compound pressure (PPG-D-P, PPG-D-R)

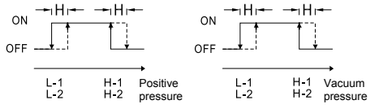


Vacuum pressure (PPG-D-V)

Window comparator mode

Normally open mode

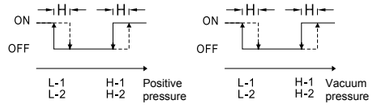
Positive pressure/compound pressure (PPG-D-P, PPG-D-R)



Vacuum pressure (PPG-D-V)

Normally closed mode

Positive pressure/compound pressure (PPG-D-P, PPG-D-R)



Vacuum pressure (PPG-D-V)

*1: When the hysteresis is set to 2 digits or less, if the input pressure is very close to the set pressure, malfunction may occur in the switch output.

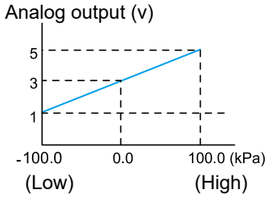
*2: In window comparator mode, if the difference between the two set points is smaller than the fixed hysteresis set value, the switch output may malfunction.

Analog output

The applicable pressure range for analog output ranges of 1 to 5 V or 4 to 20 mA is shown in the graph l

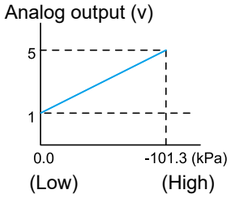
(Compound pressure)

Analog output (v)



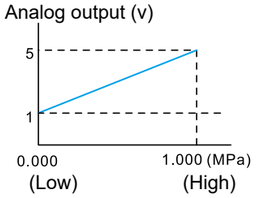
(Vacuum pressure)

Analog output (v)



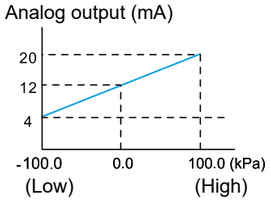
(Positive pressure)

Analog output (v)



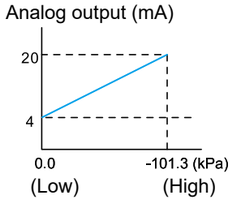
(Compound pressure)

Analog output (mA)



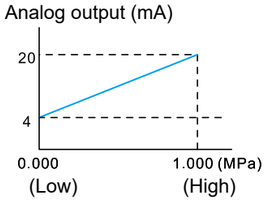
(Vacuum pressure)

Analog output (mA)



(Positive pressure)

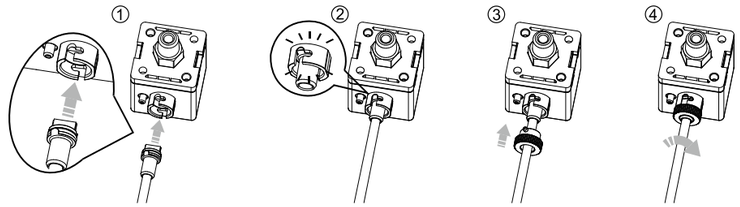
Analog output (mA)



Lead wire mounting procedure

Mount the lead wires as below.

- Set the terminal protrusion facing upward. (Refer to Fig. (1))
- Insert the terminal protrusion into the pressure sensor groove. (Refer to Fig. (2))
- Mount the terminal cover on the product. (Refer to Fig. (3))
- Rotate the terminal cover to lock. (Refer to Fig. (4))



Note: Do not insert and remove 20 times or more.

Copy function setting

◎ The copy function enables copying pressure values from the master sensor to the device sensor.

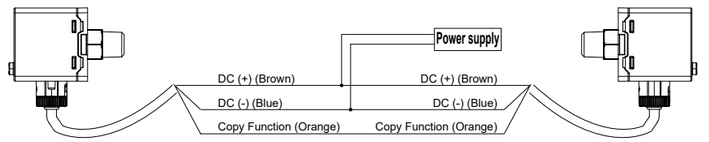
◎ Before copying, confirm the pressure sensor model number.
This function cannot be used between different model numbers.

◎ This function copies from the master side sensor to one slave side sensor at a time.

[Setting procedure]

1. Set the on or onL copy function so that the master sensor is in copy status.
   Refer to the copy setting in "H. Applied setting modes."
2. Turn the master sensor and device sensor power supply OFF.
3. Wire the master sensor to the device sensor as shown in the figure below.

Master sensor **Device sensor**



4. Turn ON the power for the master sensor and device sensor simultaneously.
5. Wait 5 seconds for data transfer. When complete, the master sensor will display [CPY] and [Gd] alternate
   The device sensor will display [SLv] and [Gd] alternately.
6. When data transfer fails
   The master sensor will display [CPY] and [Gd] alternately.
   The device sensor displays [Er8].
7. Turn the power OFF and remove the wiring.
   Failure to remove the wires could cause sensor failure.

To copy again to different device sensors, repeat steps (3) through (5).
This function is available only with PPG-D-□NC-□and PPG-D-□PC-□.

*1: If the power is not turned ON simultaneously, the data may not be copied.
*2: If the data transfer fails, check that the wiring is correct.
Then repeat steps (3) through (5).

Changing the master sensor display to measurement mode

◎When the master sensor displays [CPY] and [Gd] alternately, press ▼ to display measurement mode.

Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

Product-specific cautions: Electronic pressure sensor with digital display PPG-D Series

During Design and Selection

⚠WARNING

■Use this product in accordance with specifications.
Use for applications, or at load currents, voltages, temperatures, impacts or sites excluded from the specifications could result in damage or malfunctions.

■Do not use oxygen, corrosive or combustible gas, or toxic fluid for this product.

■Never use this product in an explosive gas atmosphere.
The pressure switch does not have an explosive-proof structure. Never use in an explosive gas atmosphere as explosions or fires could result.

■Avoid installing this product in a sealed control box or indoors.
If the fluid should leak due to any trouble, the pressure in the sealed chamber could change and recreate a hazardous state. Use this product in the control box having safety device to control internal pressure, or indoors with no pressure differential from the outsidePlease.

■Power supply voltage
Do not use this product at levels exceeding the power supply voltage. If voltage exceeding this range or AC power supply (100 VAC) is applied, the controller could rupture or burn.

■DC power not insulated from the AC primary side may damage the product and power, possibly leading to electric shock. Do not use the product in this case.

■Load short-circuit
Do not short-circuit the load. Failure to observe this could result in rupture or burning.

■Incorrect wiring
Avoid incorrect wiring such as mistaken power source polarities, etc. Failure to observe this could result in rupture or burning.

⚠CAUTION

■Applicable fluid
When using applicable fluid other than air; nitrogen gas, etc., oxygen deficiency could be caused. Observe the following instructions.
- Use in well ventilated locations.
- Ventilate the work area when nitrogen gas is being used.
- Inspect nitrogen gas piping regularly to avoid leaks.
- Non-corrosive gas means substances such as nitrogen or carbon dioxide contained in air and inert gases such as argon or neon.
- When using this product for compressed air containing water or oil, use the PPD3-S (stainless steel diaphragm sensor specifications) with increased corrosion resistance.

■If this product is used for vacuum suction confirmation, care must be taken for following matters.
When applying positive pressure for vacuum burst onto the product, check that it does not exceed the specified proof pressure.

■Working environment
- Avoid use in locations subject to vibration or shock of 100 m/s^2 or more.
- Check the temperature of fluid being measured and the environmental temperature in piping.
- When using a type that does not have the corresponding degree of protection, do not use for applications in which water or oil could be applied.

■Determine the setting, taking error caused by accuracy limitations and temperature characteristics into consideration.

■Take care when using this product for an interlock circuit.
When using the pressure switch for an interlock signal requiring high reliability, provide a double interlock by installing a mechanical protection function or a switch (sensor) other than a pressure switch as a safeguard against breakdown. Regularly inspect and confirm that the interlock activates correctly.

■Response time is affected by working pressure and load volume. If reproducibility with stable response time is required, install a regulator in the proceeding stage.

■Take the following countermeasures to prevent malfunction caused by noise.
- Insert a line filter in the AC power supply line.
- Do not share power with an inverter or components causing motor noise, etc.
- Use a surge suppressor such as a CR or diode on the inductive load (solenoid valve, relay, etc.) and remove noise from the source.
- When using a components (switching regulator, inverter motor, etc.) that could generate noise near the components, be sure to ground the sensor frame ground (F.G.) terminal.
- Separate wiring to the sensors from strong magnetic fields.
- Connect wiring to sensors with a shield wire.
- Ground the shield wire on the power supply side.

■Care must be taken for protection of body and lead wire.
- Do not bump or drop the body, or apply excessive bending or tensile strength to the lead wire. This may lead to disconnection.
- Connect and wire bend-resistant material, such as robot wire material, for movable sections.

■Avoid connecting the output for a relay contact, operation switch, or other components output in parallel with the PLC to the product's output, or short-circuiting the input terminal of the PLC to which this product is connected with the power supply cable's negative side to test the input device. This product's output circuit could be damaged.

■When releasing the secondary control pressure, such as air blowing, into the atmosphere, the pressure could fluctuate depending on the piping and flow conditions. Test with actual working conditions, or contact CKD.

■Components When selecting dryer, air filter, oil mist filter or regulator, select a device with a flow rate higher than that used by proportional pressure controls.

■CE-compliance working conditions
The standard for the immunity for industrial environments applied to CE conforming product is EN61000-6-2, but the following requirements must be satisfied in order to conform to this standard.
Conditions
- The evaluation of this product is performed by using a cable that has a power supply line and a signal line paired to assess the product's performance.
- This product is not equipped with surge protection. Implement surge protection measures on the system side.

■Environmental surveys are only available for “RoHS Certificate” and “REACH Certificate”. Detailed data at the parts level is not supported.

■As degree of protection IP65 is used, be sure to assemble the protector (parts) attached with the product for use. When constantly exposed to water, introduce normal atmosphere with a long tube.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual



Compact electronic pressure switch

PPE Series

Circuit diagram symbol 

Refer to the CKD website for detailed compatible model Nos.

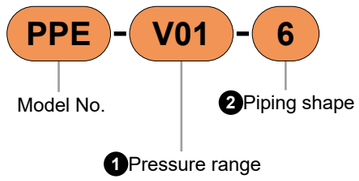
Overview

Pressure switch PPE Series is trimmer setting semiconductor pressure switch developed for pneumatic/ vacuum systems. Usage is flexible due to compact shape and three types of piping connection (R1/8, ø6 plug, ø6 push-in fitting).

Features

- Semiconductor pressure sensor
  Used semiconductor sensor pressure detection, high precision and high reliability are achieved.
- 2-wire
  Wiring man-hours are reduced and both PLC input formats (source and sink) can be used.
- High proof pressure
  Proof pressure of negative pressure type (V01) is as high as 0.6 MPa, so the product can withstand vacuum burst by pressurization.
- Reverse connection / overcurrent protection circuit integrated
  A protection circuit for improper wire connection (reverse connection, load short-circuit) is integrated.
- Wide port size
  R1/8
  ø6 plug
  ø6 push-in fitting

Model No. Notation Method



1 Pressure range

Code	Description
V01	−101.3 to 0 kPa
P01	0 to 101 kPa
P10	0 to 1 MPa

2 Piping shape

Code	Description	
6	R1/8	
H6-B	ø6 mm plug	
H6	In-line of push-in fitting for ø6 (2 pcs.)	

Clean-room specifications (Catalog No. CB-033SAA)

●Anti-dust generation structure for use in cleanrooms

PPE -··· P70

PPE -··· P80

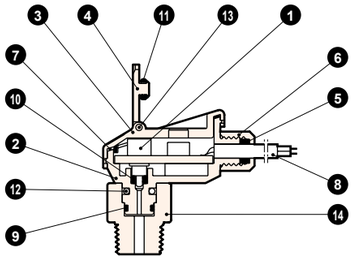
Specifications

Model No. / Item	Vacuum	For positive pressure	
	PPE-V01-□ *1	PPE-P01-□ *1	PPE-P10-□ *1
Rated pressure	−101.3 to 0 kPa	0 to 100 kPa	0 to 1 MPa
Plate color *2	Red	Green	Blue
Pressure sensitive element	Diffusion semiconductor pressure sensor		
Applicable fluid	Air/non-corrosive gas		
Proof pressure	0.6 MPa	0.3MPa	1.5 MPa
Repeatability	±1% F.S.		
Hysteresis	3% F.S. or less		
Temperature characteristics	±3% F.S.		
Load voltage	10 to 30 VDC		
Load current	5 to 50 mA		
Internal voltage drop	4 V or less		
Leakage current	1 mA or less		
Indicator lamp	Yellow LED lit when ON		
Lead wire length	Standard 3 m (oil resistant vinyl cabtyre cable 2-conductor 0.15 mm² Insulator outer diameter ø1.0)		
Operating ambient temperature range	0 to 50°C (no freezing)		
Vibration resistance	10 to 55 Hz compound amplitude 1.5 mm 4 hours per X, Y, Z direction		
Degree of Protection	IEC standards IP65 or equivalent		
Piping method	R1/8, ø6 plug, ø6 push-in fitting		
Weight	PPE-□-6/-H6-B: Approx. 37 g, PPE-□-H6: Approx. 42 g		

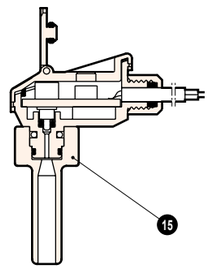
*1: □ section is matched to piping section. (Refer to Model No. Notation Method)
*2: Name plate color is changed by pressure range. (To prevent improper use when intermixed)

Internal Structure Diagram / Material

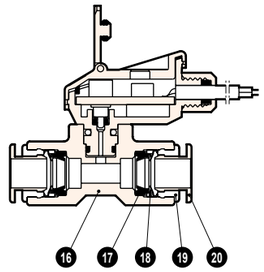
●PPE-□-6



●PPE-□-H6-B



●PPE-□-H6

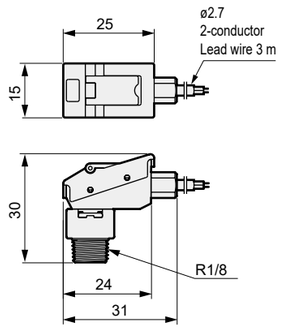


Cannot be disassembled

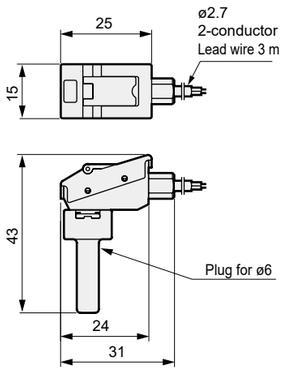
Part No.	Part name	Material	Part No.	Part name	Material
1	Pressure sensor	Diffusion semiconductor strain gauge	11	O-ring	Nitrile Rubber
2	Body	Polybutylene terephthalate	12	Stopper	Stainless steel
3	Cover	Polycarbonate	13	Spring pin	Stainless steel
4	Trimmer guard	Polycarbonate	14	R1/8	Polybutylene terephthalate
5	Bush	Nitrile Rubber	15	Plug	Polybutylene terephthalate
6	Bush holder	Aluminum	16	Push-in fitting	Polybutylene terephthalate
7	Cover gasket	Silicone rubber	17	Packing	Nitrile Rubber
8	Lead wire (3 m)	Polyvinyl chloride	18	Chuck	Brass (electroless nickeling)
9	O-ring	Nitrile Rubber	19	Outer ring	Brass (electroless nickeling)
10	O-ring	Nitrile Rubber	20	Push ring	Polyacetal

Dimensions

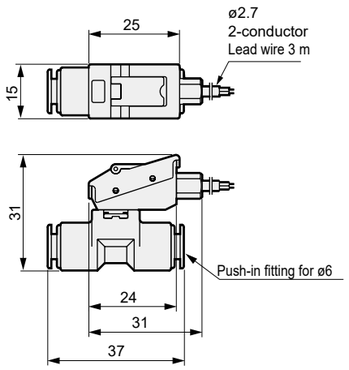
●PPE-□-6



●PPE-□-H6-B

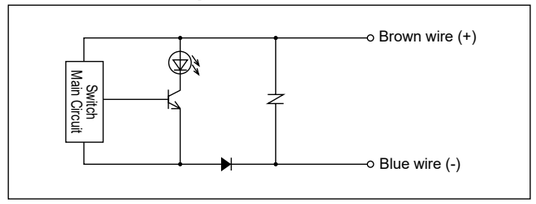


●PPE-□-H6

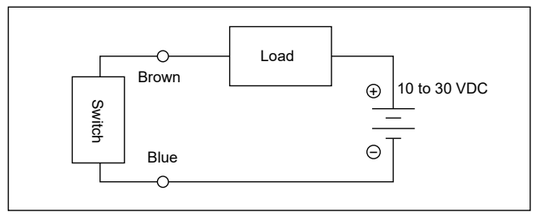


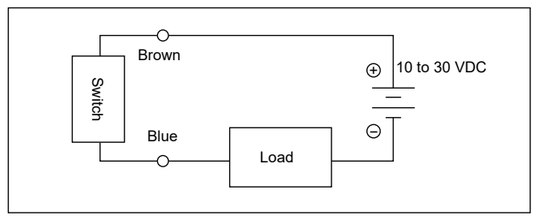
Internal circuit / connection method

●Internal circuit diagram



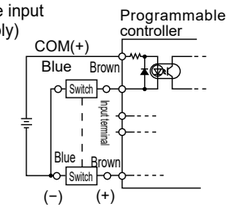
●Connecting the lead wire



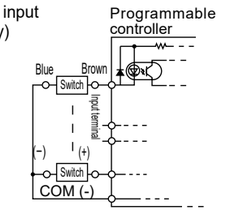


●Connection to programmable controller (PLC)

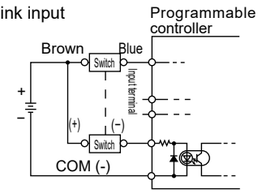
●Connection to source input (external power supply)



●Connection to source input (internal power supply)



●Connection to sink input



Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

Compact electronic pressure switch (pressure switch) PPE Series

Design / Selection

⚠WARNING

■Use this product in accordance with specifications.
Use for applications, or at load currents, voltages, temperatures, impacts or sites excluded from the specifications could result in damage or malfunctions.

■Do not use oxygen, corrosive or combustible gas, or toxic fluid for this product.

■Never use this product in an explosive gas atmosphere.
The pressure switch does not have an explosive-proof structure. Never use in an explosive gas atmosphere as explosions or fires could result.

■Avoid installing this product in a sealed control box or indoors.
If the fluid should leak due to any trouble, the pressure in the sealed chamber could change and recreate a hazardous state. Use this product in the control box having safety device to control internal pressure, or indoors with no pressure differential from the outside.

■Power supply voltage
Do not use this product at levels exceeding the power supply voltage. If voltage exceeding this range or AC power supply (100 VAC) is applied, the controller could rupture or burn.

■DC power not insulated from the AC primary side may damage the product and power, possibly leading to electric shock. Do not use the product in this case.

■Be careful of internal voltage drop.
When using with a voltage less than the specified voltage, the pressure switch may be activated correctly, but the load may not function correctly. Check the load working voltage to see that the following formula is satisfied: Power supply voltage - internal voltage drop > load working voltage

■Pay attention to the leakage current.
Even when the 2-wire pressure switch is OFF, the current (leakage current) flows to operate the internal circuit. (1 mA or less)
Load working current > leakage current
If the above expression is not satisfied, the switch may be interpreted as ON even when it is OFF, and operation fail. Use the 3-wire PPD if specifications are not met. If n units are connected in parallel, the current that flows to the load increases n-fold.

■Load short-circuit
Do not short-circuit the load. Failure to observe this could result in rupture or burning.

■Incorrect wiring
Avoid incorrect wiring such as mistaken power source polarities, etc. Failure to observe this could result in rupture or burning.

⚠CAUTION

■Applicable fluid
When using applicable fluid other than air; nitrogen gas, etc., oxygen deficiency could be caused. Observe the following instructions.
- Use in well ventilated locations.
- Ventilate the work area when nitrogen gas is being used.
- Inspect nitrogen gas piping regularly to avoid leaks.
- Non-corrosive gas means substances such as nitrogen or carbon dioxide contained in air and inert gases such as argon or neon.
- When using this product for compressed air containing water or oil, use the PPD3-S (stainless steel diaphragm sensor specifications) with increased corrosion resistance.

■If this product is used for vacuum suction confirmation, care must be taken for following matters.
When applying positive pressure for vacuum burst onto the product, check that it does not exceed the specified proof pressure.

■Working environment
- Avoid use in locations subject to vibration or shock of 100m/s^2 or more.
- Check the temperature of fluid being measured and the environmental temperature in piping.
- When using a type that does not have the corresponding degree of protection, do not use for applications in which water or oil could be applied.

■Determine the setting, taking error caused by accuracy limitations and temperature characteristics into consideration.

■Take care when using this product for an interlock circuit.
When using the pressure switch for an interlock signal requiring high reliability, provide a double interlock by installing a mechanical protection function or a switch (sensor) other than a pressure switch as a safeguard against breakdown. Regularly inspect and confirm that the interlock activates correctly.

■Response time is affected by working pressure and load volume. If reproducibility with stable response time is required, install a regulator in the proceeding stage.

■Take the following countermeasures to prevent malfunction caused by noise.
- Insert a line filter in the AC power supply line.
- Do not share power with an inverter or components causing motor noise, etc.
- Use a surge suppressor such as a CR or diode on the inductive load (solenoid valve, relay, etc.) and remove noise from the source.
- When using a components (switching regulator, inverter motor, etc.) that could generate noise near the sensor, be sure to ground the components frame ground (F.G.) terminal.
- Separate wiring to the sensors from strong magnetic fields.
- Connect wiring to sensors with a shield wire.
- Ground the shield wire on the power supply side.

■Care must be taken for protection of body and lead wire.
- Do not bump or drop the body, or apply excessive bending or tensile strength to the lead wire. This may lead to disconnection.
- Connect and wire bend-resistant material, such as robot wire material, for movable sections.

■Avoid connecting the output for a relay contact, operation switch, or other components output in parallel with the PLC to the product's output, or short-circuiting the input terminal of the PLC to which this product is connected with the power supply cable's negative side to test the input device. This product's output circuit could be damaged.

■When releasing the secondary control pressure, such as air blowing, into the atmosphere, the pressure could fluctuate depending on the piping and flow conditions. Test with actual working conditions, or contact CKD.

■Components When selecting dryer, air filter, oil mist filter or regulator, select a device with a flow rate higher than that used by proportional pressure controls.

■CE-compliance working conditions
The standard for the immunity for industrial environments applied to CE conforming product is EN61000-6-2, but the following requirements must be satisfied in order to conform to this standard.
Conditions
- The evaluation of this product is performed by using a cable that has a power supply line and a signal line paired to assess the product's performance.
- This product is not equipped with surge protection. Implement surge protection measures on the system side.

■Handling the product
- When installing the product, hold the body section so that impact is not applied to the body and excessive stress is not applied to the lead wire.
- Do not disassemble or dismantle the product. If disassembled, parts could pop off when pressure is applied. CKD does not guarantee performance after disassembly.

■Load short-circuit protection circuit
If the load is inadvertently short-circuited, the internal load short-circuit protection circuit is activated and the switch remains OFF. Fix wiring, then turn power OFF, or short-circuit the PPE's brown and blue wires to recover normal switch operations.

■The main body and fitting connection rotate, but this section should not repeatedly rotate during use.

■The degree of protection is equivalent to IP65, but this product must not be used in an environment where it could come in contact with water. Check that cutting oil and coolant do not come in contact.

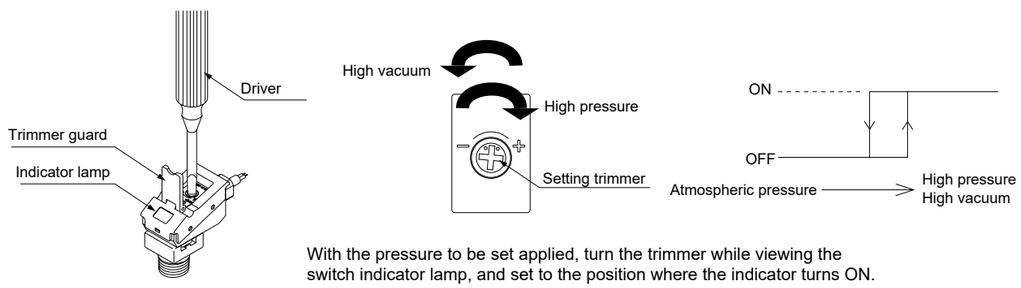
[Precautions for installation]

■Driver
When setting, use a flathead screwdriver or a 1-bit Phillips screwdriver that matches the trimmer grooves (0.5 W × 2.3 L × 0.5 D).

■Trimmer
The rotation range of the trimmer is 240 degrees. The trimmer could be damaged if turned any further or if turned forcibly.

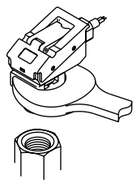
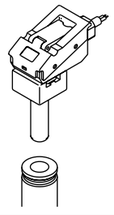
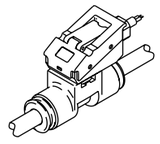
■Opening and closing the trimmer guard
Use a flathead screwdriver to open the trimmer guard and set the trimmer. After setting, press the trimmer guard with a finger and completely close it. The degree of protection (IP65) is not satisfied if the cover is not completely closed.

Setting pressure and switch operations



With the pressure to be set applied, turn the trimmer while viewing the switch indicator lamp, and set to the position where the indicator turns ON.

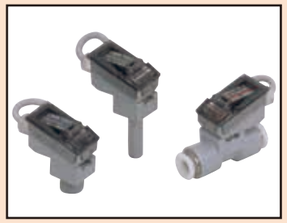
Piping method

PPE-□-6	PPE-□-H6-B	PPE-□-H6
		
Use sealing tape or sealant, and catch a wrench against the width across flats (13 mm) of the R1/8 fitting to install. (Precautions) The tightening torque is 1.0 to 1.5 N·m or less. Resin parts may be damaged if tightened too far.	Insert the CKD 6 mm tube push-in fitting and use. (Precautions) • Securely insert the plug section, and check that the plug is not dislocated. If the plug is not fully inserted, it could be dislocated or air could leak. • Use the applicable push-in fitting. GW Series GWJ Series	Insert the 6 mm tube into the two push-in fittings and use. (Precautions) • Use the designated tube and plastic plug. Tube outer diameter accuracy Nylon, soft nylon tube: Within ±0.1 mm Polyurethane tube: +0.1 mm or less New urethane tube: −0.2 mm or more and with hardness of 93° and over. • Securely insert the tube completely to the end, and make sure that the tube cannot be pulled out. If the tube is not fully inserted, it could be dislocated or air could leak. • Cut the tube with a dedicated cutter and always at a right angle.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual

MEMO

Pressure switch
Electronic pressure Switch
Contact Confirm Switch
For Coolant Pressure Switch
Ending



Compact Electronic Pressure Switch
Analog output

PPE-□A Series

Circuit diagram symbol 

Refer to the CKD website for detailed compatible model Nos.

Overview

Pressure sensor PPE-A Series is semiconductor pressure sensor developed for pneumatic/vacuum systems. Output proportional to applied voltage: 1 to 5 V (analog output). Usage is flexible due to compact shape and three types of piping connection (R1/8, ø6 plug, ø6 push-in fitting).

Features

- Semiconductor pressure sensor: Used semiconductor sensor pressure detection, high precision and high reliability are realized.
- Analog output: Analog output proportional to impressed voltage (1 to 5 V).
- Power supply indicator lamp: When power is energized, green LED lights to show operational status at load short circuit.
- Integrated protection circuit to prevent power reverse connection/load short-circuit
  A protection circuit for improper wire connection (power reverse connection, load short-circuit) is integrated.
- Selectable pipe connection method: R1/8, ø6 plug, ø6 push-in fitting

Model No. Notation Method

PPE - V01 A - 6

Model No. ❶Pressure range ❷Piping shape

❶Pressure range

Code	Description
V01	0 to −100 kPa
P01	0 to 100 kPa
P10	0 to 1 MPa

❷Piping shape

Code	Description	
6	R1/8	
H6-B	ø6 mm plug	
H6	Push-in fitting for ø6 (2 pcs.) inline	

Clean-room specifications (Catalog No. CB-033SA)

- Anti-dust generation structure for use in cleanrooms

PPE-□A-····-P70

PPE-□A-····-P80

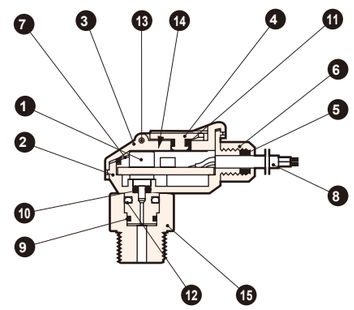
Specifications

Model No. / Item	Vacuum	For positive pressure	
	PPE-V01A-□ *1	PPE-P01A-□ *1	PPE-P10A-□ *1
Rated pressure	0 to −100 kPa	0 to 100 kPa	0 to 1 MPa
Plate line color *2	Red	Green	Blue
Pressure sensitive element	Diffusion semiconductor pressure sensor		
Applicable fluid	Air/non-corrosive gas		
Proof pressure	0.3 MPa	0.3 MPa	1.5 MPa
Accuracy	±1% F.S. or less		
Linearity	±0.3% F.S. or less		
Analog Output	1 to 5 V (output impedance 1 kΩ)		
Power supply voltage	12 to 24 VDC±10% (ripple rate 1% or less)		
Current consumption	10 mA or less		
Indicator lamp	Green LED lighting when power supply is energized		
Lead wire length	Standard 3 m (oil resistant vinyl cabtyre cable 3-conductor 0.15 mm² Insulator outer diameter ø1.0)		
Protection circuit	Power reverse connection protection, load short-circuit protection		
Ambient temperature	0 to 50°C (no freezing)		
Temperature characteristics	±0.12% F.S./°C or less		
Insulation resistance	20 MΩ and over at 500 VDC		
Withstand voltage	1000 VAC for 1 minute		
Vibration resistance	10 to 55 Hz compound amplitude 1.5 mm 4 hours per X, Y, Z direction		
Degree of Protection	IEC standards IP65 or equivalent		
Piping method	R1/8, ø6 plug, ø6 push-in fitting		
Weight	PPE-□-6/-H6-B: Approx. 37 g, PPE-□-H6: Approx. 42 g		

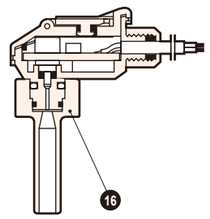
*1: □ section is matched to piping section. (Refer to Model No. Notation Method)
*2: Name plate line is changed by pressure range. (To prevent improper use when intermixed)

Internal Structure Diagram / Material

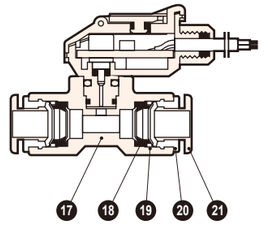
●PPE-□A-6



●PPE-□A-H6-B



●PPE-□A-H6

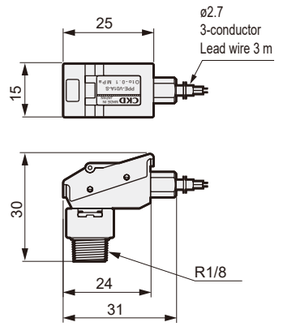


Cannot be disassembled

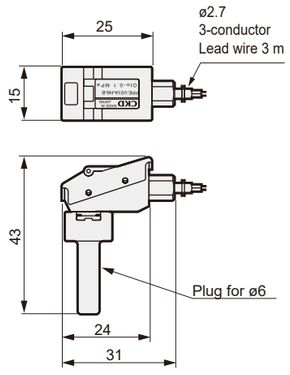
Part No.	Part name	Material	Part No.	Part name	Material
1	Pressure sensor	Diffusion semiconductor strain gauge	12	Stopper	Stainless steel
2	Body	Polybutylene terephthalate	13	Spring pin	Stainless steel
3	Cover	Polycarbonate	14	Shield sheet	Aluminum
4	Trimmer guard	Polycarbonate	15	R1/8	Polybutylene terephthalate
5	Bush	Nitrile Rubber	16	Plug	Polybutylene terephthalate
6	Bush holder	Aluminum	17	Push-in fitting	Polybutylene terephthalate
7	Cover gasket	Silicone rubber	18	Packing	Nitrile Rubber
8	Lead wire (3 m)	Polyvinyl chloride	19	Chuck	Brass (electroless nickeling)
9	O-ring	Nitrile Rubber	20	Outer ring	Brass (electroless nickeling)
10	O-ring	Nitrile Rubber	21	Push ring	Polyacetal
11	O-ring	Nitrile Rubber			

Dimensions

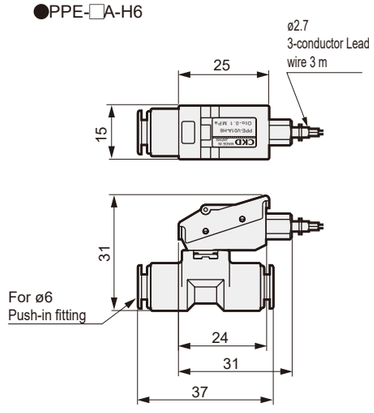
●PPE-□A-6



●PPE-□A-H6-B

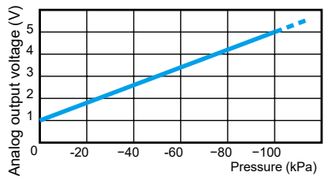


●PPE-□A-H6

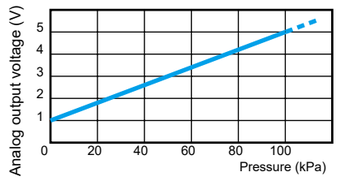


Analog output voltage - pressure characteristics

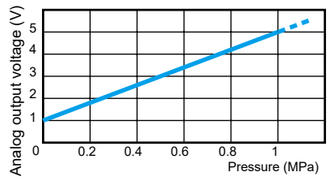
●PPE-V01A-□



●PPE-P01A-□

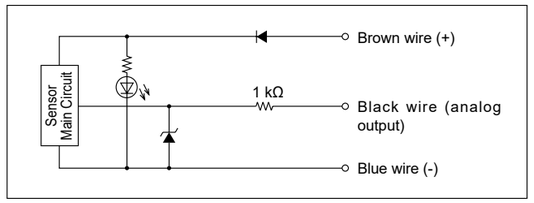


●PPE-P10A-□



Internal circuit / connection method

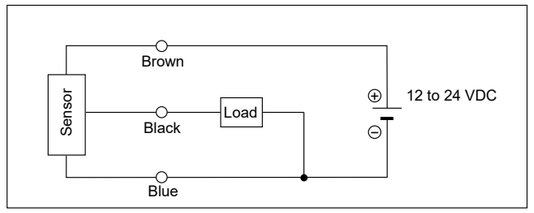
●Internal circuit diagram



●Lead wire color and content

Line color	Description
Brown	Power supply 12 to 24 VDC
Black	Analog output (1 to 5 V)
Blue	0 V (GND)

●Connecting the lead wire



Pneumatic components (electronic pressure switch and sensor)

Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

Product-specific cautions: Compact electronic pressure sensor Analog output PPE-/A Series

Design / Selection

⚠WARNING

■Use this product in accordance with specifications.
Use for applications, or at load currents, voltages, temperatures, impacts or sites excluded from the specifications could result in damage or malfunctions.

■Do not use oxygen, corrosive or combustible gas, or toxic fluid for this product.

■Never use this product in an explosive gas atmosphere.
The pressure switch does not have an explosive-proof structure. Never use in an explosive gas atmosphere as explosions or fires could result.

■Avoid installing this product in a sealed control box or indoors.
If the fluid should leak due to any trouble, the pressure in the sealed chamber could change and recreate a hazardous state. Use this product in the control box having safety device to control internal pressure, or indoors with no pressure differential from the outside Please.

■Power supply voltage
Do not use this product at levels exceeding the power supply voltage. If voltage exceeding this range or AC power supply (100 VAC) is applied, the controller could rupture or burn.

■DC power not insulated from the AC primary side may damage the product and power, possibly leading to electric shock. Do not use the product in this case.

■How to wire
Turn power OFF before wiring this product. Discharge static electricity charged in the human body, tool or equipment before and during operation. Connect and wire bending-resistant material, such as robot wire material, for the movable sections.

■Installation
This product and its wiring should be installed as far away from noise sources such as strong power lines as possible. Take separate countermeasures against surge that enter the power wire.

■Connecting load
When connecting an inductive load such as relay or solenoid valve, a surge voltage is generated when the switch is turned OFF. Directly connect a flywheel diode onto all inductive loads in the same power circuit.

■Analog output accuracy
Analog output accuracy is affected by temperature characteristics and heat generated when energized. Provide a standby time (5 minutes or more after energizing) before use.

■Connecting load
The output impedance of the analog output section is 1 kΩ . If the impedance of the connecting load is small, output error increases. Check error with the impedance of the connecting load before using.

Example of calculation

(PPE-□A output impedance: Ro = 1 KΩ
Load internal impedance: Rx = 1 MΩ

$$\text{Output value} = \left(1 - \frac{Ro}{Ro + Rx}\right) \times 100\%$$

$$= \left(1 - \frac{1\ k\Omega}{1\ k\Omega + 1\ M\Omega}\right) \times 100\%$$

Output value error ⇨approx. 0.1%

■Load short-circuit
Do not short-circuit the load. Failure to observe this could result in rupture or burning.

■Incorrect wiring
Avoid incorrect wiring such as mistaken power source polarities, etc. Failure to observe this could result in rupture or burning.

⚠CAUTION

■Applicable fluid
When using applicable fluid other than air; nitrogen gas, etc., oxygen deficiency could be caused. Observe the following instructions.
- ●Use in well ventilated locations.
- ●Ventilate the work area when nitrogen gas is being used.
- ●Inspect nitrogen gas piping regularly to avoid leaks.
- ●Non-corrosive gas means substances such as nitrogen or carbon dioxide contained in air and inert gases such as argon or neon.
- ●When using this product for compressed air containing water or oil, use the PPD3-S (stainless steel diaphragm sensor specifications) with increased corrosion resistance.

■If this product is used for vacuum suction confirmation, care must be taken for following matters.
When applying positive pressure for vacuum burst onto the product, check that it does not exceed the specified proof pressure.

■Working environment
- ●Avoid use in locations subject to vibration or shock of 100 m/s^2 or more.
- ●Check the temperature of fluid being measured and the environmental temperature in piping.
- ●When using a type that does not have the corresponding degree of protection, do not use for applications in which water or oil could be applied.

■Determine the setting, taking error caused by accuracy limitations and temperature characteristics into consideration.

■Take care when using this product for an interlock circuit.
When using the pressure switch for an interlock signal requiring high reliability, provide a double interlock by installing a mechanical protection function or a switch (sensor) other than a pressure switch as a safeguard against breakdown. Regularly inspect and confirm that the interlock activates correctly.

■Response time is affected by working pressure and load volume. If reproducibility with stable response time is required, install a regulator in the proceeding stage.

■Take the following countermeasures to prevent malfunction caused by noise.
- Insert a line filter in the AC power supply line.
- Do not share power with an inverter or components causing motor noise, etc.
- Use a surge suppressor such as a CR or diode on the inductive load (solenoid valve, relay, etc.) and remove noise from the source.
- When using a components (switching regulator, inverter motor, etc.) that could generate noise near the sensor, be sure to ground the components frame ground (F.G.) terminal.
- Separate wiring to the sensors from strong magnetic fields.
- Connect wiring to sensors with a shield wire.
- Ground the shield wire on the power supply side.

■Care must be taken for protection of body and lead wire.
- Do not bump or drop the body, or apply excessive bending or tensile strength to the lead wire. This may lead to disconnection.
- Connect and wire bend-resistant material, such as robot wire material, for movable sections.

■Avoid connecting the output for a relay contact, operation switch, or other components output in parallel with the PLC to the product's output, or short-circuiting the input terminal of the PLC to which this product is connected with the power supply cable's negative side to test the input device. This product's output circuit could be damaged.

■When releasing the secondary control pressure, such as air blowing, into the atmosphere, the pressure could fluctuate depending on the piping and flow conditions. Test with actual working conditions, or contact CKD.

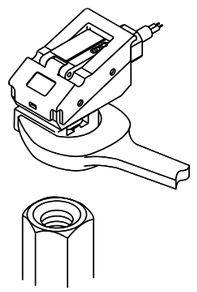
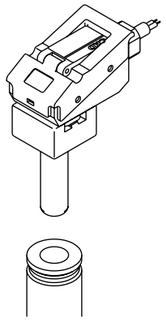
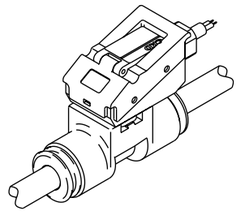
■Components When selecting dryer, air filter, oil mist filter or regulator, select a device with a flow rate higher than that used by proportional pressure controls.

■CE-compliance working conditions
The standard for the immunity for industrial environments applied to CE conforming product is EN61000-6-2, but the following requirements must be satisfied in order to conform to this standard.
Conditions
- The evaluation of this product is performed by using a cable that has a power supply line and a signal line paired to assess the product's performance.
- This product is not equipped with surge protection. Implement surge protection measures on the system side.

■The main body and fitting connection rotate, but this section should not repeatedly rotate during use.

■The degree of protection is equivalent to IP65, but this product must not be used in an environment where it could come in contact with water. Check that cutting oil and coolant do not come in contact.

[Piping method]

PPE-□A-6	PPE-□A-H6-B	PPE-□A-H6
		
Use sealing tape or sealant, and catch a wrench against the width across flats (13 mm) of the R1/8 fitting to install. (Precautions) The tightening torque is 1.0 to 1.5 N·m or less. Resin parts may be damaged if tightened too far.	Insert the CKD 6 mm tube push-in fitting and use. (Precautions) ・Securely insert the plug section, and check that the plug is not dislocated. If the plug is not fully inserted, it could be dislocated or air could leak. ・Use the applicable push-in fitting. GW Series GWJ Series	Insert the 6 mm tube into the two push-in fittings and use. (Precautions) ・Use the designated tube and plastic plug. Tube outer diameter accuracy Nylon, soft nylon tube: Within ±0.1 mm Polyurethane tube: +0.1 mm or less New urethane tube: −0.2 mm or more and with hardness of 93˚ and over. ・Securely insert the tube completely to the end, and make sure that the tube cannot be pulled out. If the tube is not fully inserted, it could be dislocated or air could leak. ・Cut the tube with a dedicated cutter and always at a right angle.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual



Compact Electronic Pressure Switch

PPEV-□A Series

Refer to the CKD website for detailed compatible model Nos.

Overview

The electronic compact pressure sensor PPEV-A Series is a semiconductor pressure sensor for pneumatic and vacuum systems. Output proportional to applied voltage: 1 to 5 V (analog output). Compact at just 10 mm wide, it can be connected to small components such as pneumatic valves for use in output confirmation, etc.

Features

- Semiconductor pressure sensor: Uses a semiconductor sensor for pressure detection to achieve high accuracy and high reliability.
- Compact and Lightweight: Just 10 mm wide and 11 g light.
- Connector wiring: Uses a connector in the sensor connection part, enabling easy pressure sensor replacement.
- Confirmation of pneumatic valve output: Use in combination with the 4GR and 3QR Series for confirmation of output and vacuum suction.

Model No. Notation Method

PPEV - P10A - H4-B

- PPEV: Model No.
- P10A: ❶Pressure range
- H4-B: ❷Port size

❶Pressure range

Code	Description
P10A	0 to 1 MPa
V01A	-100 to 0 kPa

❷Port size

Code	Description	
H4-B	ø4 mm plug	
H6-B	ø6 mm plug	
M5	M5	

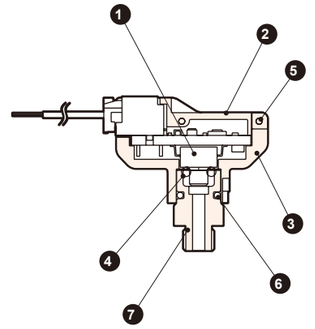
Specifications

Item		Positive pressure	Negative pressure
		PPEV-P10A-□	PPEV-V01A-□
Working pressure		0 to 1.0 MPa	-100 to 0 kPa
Service voltage		10.8 to 30.0 VDC	
Current consumption		5 mA (no 24 VDC load)	
Pressure detection method		Diffused semiconductor pressure switch	
Applicable fluid		Compressed air	
Proof pressure		1.5 MPa	0.5 MPa
Ambient temperature		0 to 55 °C	
Analog Output	Output voltage	1 to 5 V	
	Zero point voltage	1±0.1 V	
	Linearity	±0.5% F.S. max	
	Temperature characteristics	±2% F.S. max	
	Output current	0.5 mA max. (load resistance 10 kΩ)	
Indicator		None	
Wiring method		Connector connection	
Wire length		1000 mm	
Insulation resistance		20 MΩ and over at 500 VDC	
Withstand voltage		1000 VAC for 1 minute	
Shock resistance		300 m/s^2 or less	
Vibration resistance		50 m/s^2 or less	
Degree of Protection		Dust-proof	
Piping method		M5, ø4 plug, ø6 plug	
Weight	Note	PPEV-□-M5: 11.2 g, PPEV-□-H-4B: 10.7 g, PPEV-□-H-6B: 11.1 g	

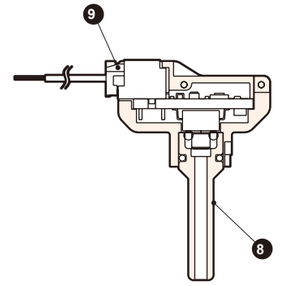
Note: Weight includes connector wiring.

Internal Structure Diagram / Material

●PPEV-□A-M5



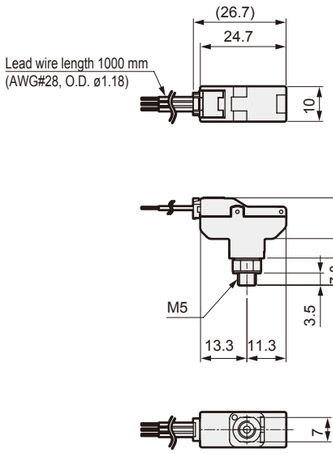
●PPEV-□A-H4(H6)



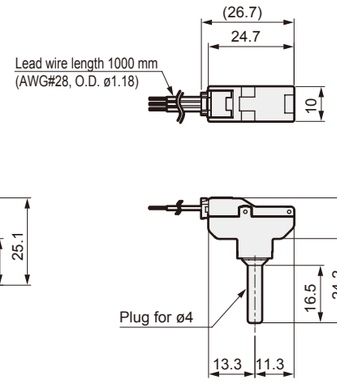
Part No.	Part name	Material	Part No.	Part name	Material
1	Pressure sensor	Diffusion semiconductor strain gauge	6	Fixing clip	Stainless steel
2	Cover	Resin	7	M5 Pipe adaptor	Aluminum
3	Case	Resin	8	ø4 pipe adaptor	Resin
4	O-ring	Nitrile Rubber	9	Connector	-
5	Spring pin	Stainless steel			

Dimensions

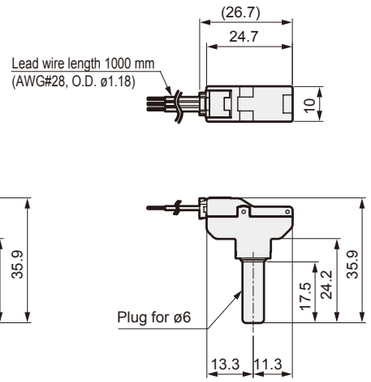
●PPEV-□A-M5



●PPEV-□A-H4



●PPEV-□A-H6

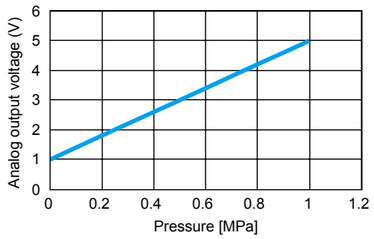


Caution

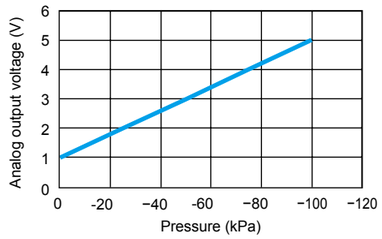
- Analog output accuracy is affected by temperature characteristics and heat generated when energized. Provide a standby time (5 minutes or more after energizing) before use.

Analog output voltage - pressure characteristics

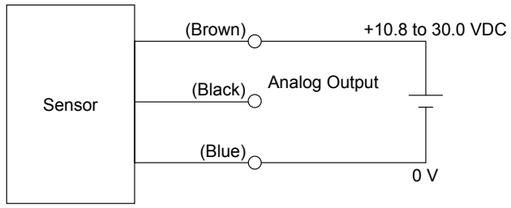
●PPEV-P10A



●PPEV-V01A



Circuit diagram and wiring method



Lead wire color and content

Line color	Description
Brown	Power supply (10.8 to 30.0 VDC)
Black	Analog output (1 to 5 V)
Blue	GND (0V)

Note: The impedance of the analog output is 10 Ω. When connecting a load resistor, use 10 kΩ and over.

$$\text{Output value} = \left(1 - \frac{R_0}{R_0 + R_X}\right) \times 100\%$$

$$\text{Output value} = \left(1 - \frac{10}{10+10000}\right) \times 100\% = 99.9\%$$

Output value error
Approx. 0.1%

Pressure sensor impedance: R_0= 10 Ω
Load internal impedance: R_X=10 kΩ

Pneumatic components (electronic pressure switch and sensor)

Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

Product-specific cautions: Compact electronic pressure sensor PPEV-/A Series

During Design and Selection

⚠ WARNING

■Use this product in accordance with specifications.
Use for applications, or at load currents, voltages, temperatures, impacts or sites excluded from the specifications could result in damage or malfunctions.

■Do not use oxygen, corrosive or combustible gas, or toxic fluid for this product.

■Never use this product in an explosive gas atmosphere.
The pressure switch does not have an explosive-proof structure. Never use in an explosive gas atmosphere as explosions or fires could result.

■Avoid installing this product in a sealed control box or indoors.
If the fluid should leak due to any trouble, the pressure in the sealed chamber could change and recreate a hazardous state. Use this product in the control box having safety device to control internal pressure, or indoors with no pressure differential from the outsidePlease.

■Power supply voltage
Do not use this product at levels exceeding the power supply voltage. If voltage exceeding this range or AC power supply (100 VAC) is applied, the controller could rupture or burn.

■DC power not insulated from the AC primary side may damage the product and power, possibly leading to electric shock. Do not use the product in this case.

■Load short-circuit
Do not short-circuit the load. Failure to observe this could result in rupture or burning.

■Incorrect wiring
Avoid incorrect wiring such as mistaken power source polarities, etc. Failure to observe this could result in rupture or burning.

⚠ CAUTION

■Applicable fluid
When using applicable fluid other than air; nitrogen gas, etc., oxygen deficiency could be caused. Observe the following instructions.
- Use in well ventilated locations.
- Ventilate the work area when nitrogen gas is being used.
- Inspect nitrogen gas piping regularly to avoid leaks.
- Non-corrosive gas means substances such as nitrogen or carbon dioxide contained in air and inert gases such as argon or neon.
- When using this product for compressed air containing water or oil, use the PPD3-S (stainless steel diaphragm sensor specifications) with increased corrosion resistance.

■If this product is used for vacuum suction confirmation, care must be taken for following matters.
When applying positive pressure for vacuum burst onto the product, check that it does not exceed the specified proof pressure.

■Working environment
- Avoid use in locations subject to vibration or shock of 100 m/s^2 or more.
- Check the temperature of fluid being measured and the environmental temperature in piping.
- When using a type that does not have the corresponding degree of protection, do not use for applications in which water or oil could be applied.

■Determine the setting, taking error caused by accuracy limitations and temperature characteristics into consideration.

■Take care when using this product for an interlock circuit.
When using the pressure switch for an interlock signal requiring high reliability, provide a double interlock by installing a mechanical protection function or a switch (sensor) other than a pressure switch as a safeguard against breakdown. Regularly inspect and confirm that the interlock activates correctly.

■Response time is affected by working pressure and load volume. If reproducibility with stable response time is required, install a regulator in the proceeding stage.

■Take the following countermeasures to prevent malfunction caused by noise.
- Insert a line filter in the AC power supply line.
- Do not share power with an inverter or components causing motor noise, etc.
- Use a surge suppressor such as a CR or diode on the inductive load (solenoid valve, relay, etc.) and remove noise from the source.
- When using a components (switching regulator, inverter motor, etc.) that could generate noise near the sensor, be sure to ground the components frame ground (F.G.) terminal.
- Separate wiring to the sensors from strong magnetic fields.
- Connect wiring to sensors with a shield wire.
- Ground the shield wire on the power supply side.

■Care must be taken for protection of body and lead wire.
- Do not bump or drop the body, or apply excessive bending or tensile strength to the lead wire. This may lead to disconnection.
- Connect and wire bend-resistant material, such as robot wire material, for movable sections.

■Avoid connecting the output for a relay contact, operation switch, or other components output in parallel with the PLC to the product's output, or short-circuiting the input terminal of the PLC to which this product is connected with the power supply cable's negative side to test the input device. This product's output circuit could be damaged.

■When releasing the secondary control pressure, such as air blowing, into the atmosphere, the pressure could fluctuate depending on the piping and flow conditions. Test with actual working conditions, or contact CKD.

■Components When selecting dryer, air filter, oil mist filter or regulator, select a device with a flow rate higher than that used by proportional pressure controls.

■CE-compliance working conditions

The standard for the immunity for industrial environments applied to CE conforming product is EN61000-6-2, but the following requirements must be satisfied in order to conform to this standard.

Conditions

- The evaluation of this product is performed by using a cable that has a power supply line and a signal line paired to assess the product's performance.
- This product is not equipped with surge protection. Implement surge protection measures on the system side.

MEMO

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual

Pressure switch
Electronic pressure Switch
Contact Confirm Switch
For Coolant Pressure Switch
Ending



Modular F.R.L. dedicated for regulator mounting
Digital Pressure Sensor

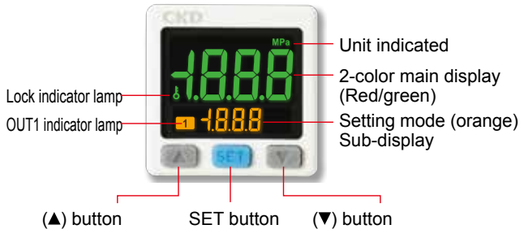
PPR Series

Refer to the CKD website for detailed compatible model Nos.

Features

■Twin display improves visibility

2-screen display enables confirmation of both the display value and the set value. Check the display value (current value) on the main display and the set value on the sub-display.



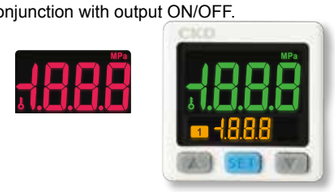
■Dedicated adaptor keeps it compact

Mounting the pressure switch with a dedicated adaptor keeps it compact and sleek.

■Easy-to-read display

3-color display

The display value and set value are displayed in three colors (red, green, orange). The main display changes between green and red in conjunction with output ON/OFF.



■Prevents misoperation

Lock function

Prevents misoperation such as touching the wrong key.

■Saves power with display OFF when not setting

Energy saving mode function

In energy saving mode, the display will turn OFF after 30 seconds unless a button is pressed.

Note: An adaptor, fixing pin, 2 mounting screws and 2 O-rings are attached.

Model No. Notation Method

PPR - N - 1

- PPR: Model No.
- N: ❶ Output
- 1: ❷ Series

❶ Output

Code	Description
N	NPN transistor output 1 point
P	PNP transistor output 1 points

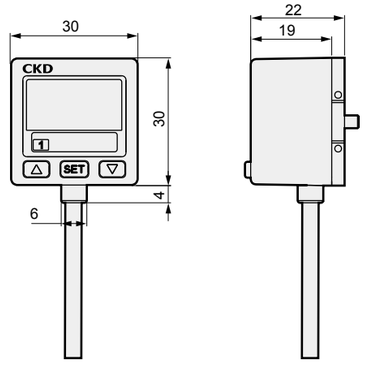
❷ Series

Code	Description
1	For 1000 Series
2	For 2000 Series
3	3000, 4000, 6000, 8000 Series, for CXU30-D4
4	For CXU10-D4

Specifications

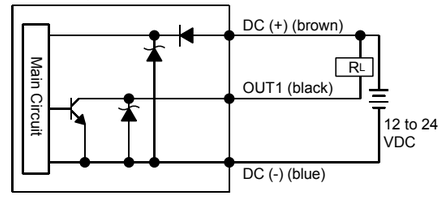
Item		PPR-□	
Rated pressure		0.000 to 1.000 MPa	
Pressure setting		-0.100 to 1.000 MPa	
Proof pressure		1.5 MPa	
Applicable fluid		Compressed air	
Unit indicated	MPa	0.001	
Power supply voltage		12 to 24 VDC ±10% ripple (P-P) 10% or less	
Current consumption		40 mA or less (no load)	
Switch Output		NPN: Transistor, open collector Max. load current: 125 mA Max. power supply voltage: 30 VDC Internal voltage drop: 1.5 V or less	PNP: Transistor, open collector Max. load current: 125 mA Max. power supply voltage: 24 VDC Internal voltage drop: 1.5 V or less
Repeatability (switch output)		±0.2% F.S. ±1 digit or less	
Hysteresis	One-point setting mode	Adjustment is possible	
	Hysteresis mode		
	Window comparator mode		
Output response time		Chattering prevention: Selectable from 0.05 s, 0.25 s, 0.5 s, 1 s, 2 s and 3 s	
Switch output load short-circuit protection		Yes	
7-segment LCD		Main/unit sub-display: 2 colors (red, green) Sub-display: Orange (sampling rate: 5 times/sec)	
Indicator accuracy		±2% F.S. ±1 digit or less (standard temperature: 25 ±3°C)	
Indicator lamp		Orange (OUT1)	
Environmental resistance	Degree of Protection	IP40	
	Ambient temperature	Usage: 0 to 50°C, Storage: -10 to 60°C (no condensation or freezing)	
	Ambient humidity	Usage/Storage: 35 to 85% RH (no condensation)	
	Withstand voltage	1000 VAC, 1 minute (between the case and lead wire)	
	Insulation resistance	50 MΩ or less (500 VDC, between the case and lead wire)	
	Vibration resistance	Compound amplitude 1.5 mm or 100 m/s^2, 10 Hz to 150 Hz to 10 Hz per minute, 2 hours each in X, Y, Z directions	
	Shock resistance	100 m/s^2 (10 G), 3 times each in X, Y, Z directions	
Temperature characteristics		±2% F.S. or less (25°C reference) temperature range 0 to 50°C	
Lead wire		Oil resistant cable (0.15 m㎡)	
Weight		Approx. 65 g (Lead wire 2 m)	

Dimensions

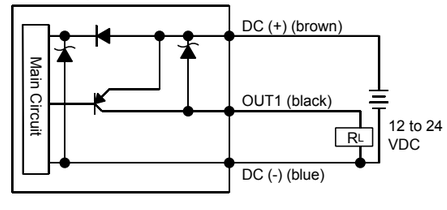


Internal circuit / connection method

NPN output



PNP output



Pneumatic components (electronic pressure switch and sensor)

Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

Product-specific cautions: Modular design F.R.L. Digital pressure sensor dedicated for regulator mounting PPR Series

During Design and Selection

⚠WARNING

■Use this product in accordance with specifications.
Use for applications, or at load currents, voltages, temperatures, impacts or sites excluded from the specifications could result in damage or malfunctions.

■Do not use oxygen, corrosive or combustible gas, or toxic fluid for this product.

■Never use this product in an explosive gas atmosphere.
The pressure switch does not have an explosive-proof structure. Never use in an explosive gas atmosphere as explosions or fires could result.

■Avoid installing this product in a sealed control box or indoors.
If the fluid should leak due to any trouble, the pressure in the sealed chamber could change and recreate a hazardous state. Use this product in the control box having safety device to control internal pressure, or indoors with no pressure differential from the outside.

■Power supply voltage
Do not use this product at levels exceeding the power supply voltage. If voltage exceeding this range or AC power supply (100 VAC) is applied, the controller could rupture or burn.

■DC power not insulated from the AC primary side may damage the product and power, possibly leading to electric shock. Do not use the product in this case.

■Load short-circuit
Do not short-circuit the load. Failure to observe this could result in rupture or burning.

■Incorrect wiring
Avoid incorrect wiring such as mistaken power source polarities, etc. Failure to observe this could result in rupture or burning.

⚠CAUTION

■Working environment
- Avoid use in locations subject to vibration or shock of 100m/s^2 or more.
- Check the temperature of fluid being measured and the environmental temperature in piping.
- When using a type that does not have the corresponding degree of protection, do not use for applications in which water or oil could be applied.

■Determine the setting, taking error caused by accuracy limitations and temperature characteristics into consideration.

■Take care when using this product for an interlock circuit.
When using the pressure switch for an interlock signal requiring high reliability, provide a double interlock by installing a mechanical protection function or a switch (sensor) other than a pressure switch as a safeguard against breakdown. Regularly inspect and confirm that the interlock activates correctly.

■Response time is affected by working pressure and load volume. If reproducibility with stable response time is required, install a regulator in the proceeding stage.

■Take the following countermeasures to prevent malfunction caused by noise.
- Insert a line filter in the AC power supply line.
- Do not share power with an inverter or components causing motor noise, etc.
- Use a surge suppressor such as a CR or diode on the inductive load (solenoid valve, relay, etc.) and remove noise from the source.
- When using a components (switching regulator, inverter motor, etc.) that could generate noise near the sensor, be sure to ground the components frame ground (F.G.) terminal.
- Separate wiring to the sensors from strong magnetic fields.
- Connect wiring to sensors with a shield wire.
- Ground the shield wire on the power supply side.

■Care must be taken for protection of body and lead wire.
- Do not bump or drop the body, or apply excessive bending or tensile strength to the lead wire. This may lead to disconnection.
- Connect and wire bend-resistant material, such as robot wire material, for movable sections.

■Avoid connecting the output for a relay contact, operation switch, or other components output in parallel with the PLC to the product's output, or short-circuiting the input terminal of the PLC to which this product is connected with the power supply cable's negative side to test the input device. This product's output circuit could be damaged.

■CE-compliance working conditions
The standard for the immunity for industrial environments applied to CE conforming product is EN61000-6-2, but the following requirements must be satisfied in order to conform to this standard.
Conditions
- The evaluation of this product is performed by using a cable that has a power supply line and a signal line paired to assess the product's performance.
- This product is not equipped with surge protection. Implement surge protection measures on the system side.

■For safety, be sure to turn the power OFF before connecting the sensor.

■Regarding the sensor to be connected, follow the instructions in the sensor's instruction manual.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual

Contact/close contact confirmation switch/ cutting tool breakage detection switch

GPS3/GPS2/HPS/TLPS

■ Pressure switch

Overview

The air sensor consists of a sensor nozzle and an air-electricity (air-air) converter. In principle, the detection air is blown onto the workpiece and the generated back pressure is converted to an electrical signal by the air-electricity converter. The sensor nozzle can be located anywhere, enabling compact system design.



Features

(1) Compact/Sensitive
All models are compact size. Space saving, high precision and quick response.

(2) For all objects
Non-contact detection does not damage the detection target and enables almost any solid object to be detected.

(3) A great variety of applications
For presence confirmation, position/dimension confirmation, counting, level check, pressure control, etc.

(4) Air sensor with stable detection

CONTENTS

Air sensor category and usage 98

Contact confirmation switches (digital gap switch)

Product Introduction 100
● Discrete (GPS3) 104
● Manifold (MGPS3) 108
● Unit (UGPS3) 110

Contact confirmation switch (gap switch®)

Product Introduction 125
● Discrete (GPS2) 126
● Manifold (MGPS2) 132
● Unit (UGPS2) 136

Close contact confirmation switch

Product Introduction 152
● Discrete (HPS) 154
● Manifold (MHPS) 160
● Unit (UHPS) 164

Cutting tool breakage detection switch

Product Introduction 180
● Discrete (TLPS) 182
● Manifold (MTLPS) 188
● Unit (UTLPS) 192

Air sensor category and usage

The air sensor consists of a detection nozzle and an air-electricity converter (air-air converter). In principle, the detection air is blown onto the workpiece and the generated back pressure is converted to an electrical signal by the air-electricity converter. Since the detection nozzle is an air blowout hole, the nozzle can be formed by hole drilling, allowing for compactness. Various air sensors are available to match your application.

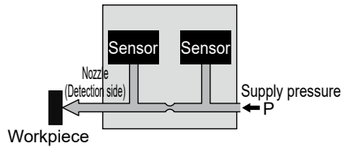
Air sensor category

Series	Detection	Detection mechanism output method	Nozzle	Major Applications	Page
Contact confirmation switches (digital gap switch) GPS3 Series	Pressure detection	Pressure sensor	ø1.5 Standard	Contact confirmation of 0.02 to 0.4 mm	100
Contact confirmation switch (gap switch) GPS2 Series	Bridge detection	Diaphragm + proximity switch Proximity (NPN, PNP)	ø1.5 Standard	Contact confirmation of 0.03 to 0.4 mm	125
Close contact confirmation switch HPS Series	Bridge detection	Diaphragm + proximity switch Proximity (NPN, PNP)	ø1.5 Standard (ø1 to ø2) Back pressure nozzle	0.01 to 0.7mm seating confirmation tool changer close contact confirmation detection distance expansion (3mm)	152
Cutting tool breakage detection switch TLPS Series	Bridge detection	Diaphragm + proximity switch Proximity (NPN, PNP)	Detecting nozzle	Drill tip breakage detection (ø0.3 to ø30)	180

●Detection

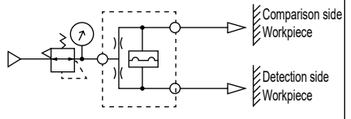
Pressure detection

Pressure sensors around orifices are used to convert to gap values (reference values) for output.



Bridge detection

Supply air is branched into two circuits, each with a sensor nozzle, and the back pressure difference between the two is compared, so that even if supply pressure fluctuates, the relationship between the two back pressures does not change. This is extremely stable detection.



Using the contact confirmation switch GPS3/GPS2 Series and close contact confirmation switch HPS Series

Model	Model No.	Detection distance (mm)	Features
		0.01 0.02 0.03 0.05 0.20 0.25 0.30 0.40 0.70 3.0	
Contact confirmation switch (Digital gap switch)	GPS3-E	0.02 to 0.15	• Digital display • High precision 2-point output • High maintainability • IO-Link communication compatible (option)
	GPS3	0.03 to 0.40	
Contact confirmation switch (Gap switch)	GPS2-05	0.03 to 0.25	• Push-in adjustment by dial (Stepped setting) (Master gauge not required)
	GPS2-07	0.03 to 0.40	
Close contact confirmation switch	HPS-05	0.01 to 0.20	• Variable adjustment with high-precision needle • Extended detection distance in combination with with back-pressure nozzles
	HPS-07	0.02 to 0.30	
	HPS-10	0.05 to 0.70	
	HPS-05+ Back pressure nozzle	0.10 to 3.0	

Digital gap switch **GPS3 Series**

Wide-range gap switch with digital display for even easier use!



Blockage indicator lamp

Output display 1

Output display 2

Output display color can be selected.
at OFF: Green at ON: Orange *2
or
at OFF: Orange at ON: Green
*2: Default setting.

Key lock function
PIN number function also built in.

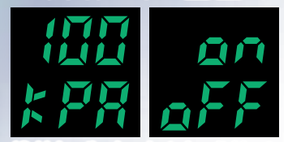
Operation button
Focus on creating a simpler layout which makes operation easier to picture.

Ref. value *1
*1: The distance from the detection side nozzle to the workpiece is a numerical conversion value, and units do not apply.

Threshold 1

Threshold 2

Pressure display
The threshold display can be switched to the detector side pressure display by pressing the ▲▼ keys.



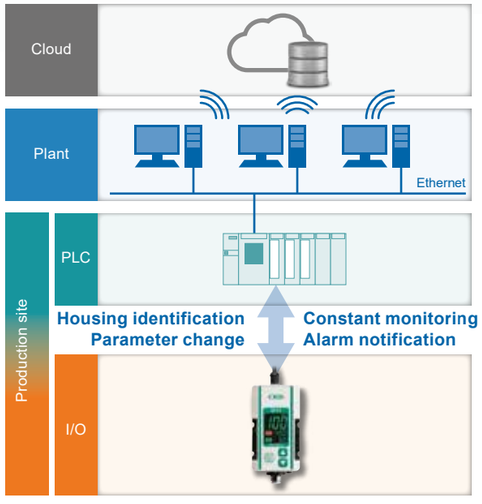
When IO-Link option is selected, switching to seating ON/OFF display is also possible.

Screen non-display settings selection possible *3
The reference value and threshold can be set to OFF at shipping.
*3: When screen non-display option is selected.

IO-Link model available

IO-Link

IO-Link is a digital communication standard for sensors/actuators at factory sites. (IEC 61131-9)
Unlike analog communication, it enables the transmission of parameters and event data.



Features of IO-Link



Constant monitoring via digital data is possible.



Installation anywhere is possible, as parameters can be configured and changed remotely via the network.



Models, serial numbers, etc., can be confirmed on the network.



The settings can be copied from the master, making parameter reconfiguration after maintenance obsolete.



Device failure and disconnection can be confirmed.

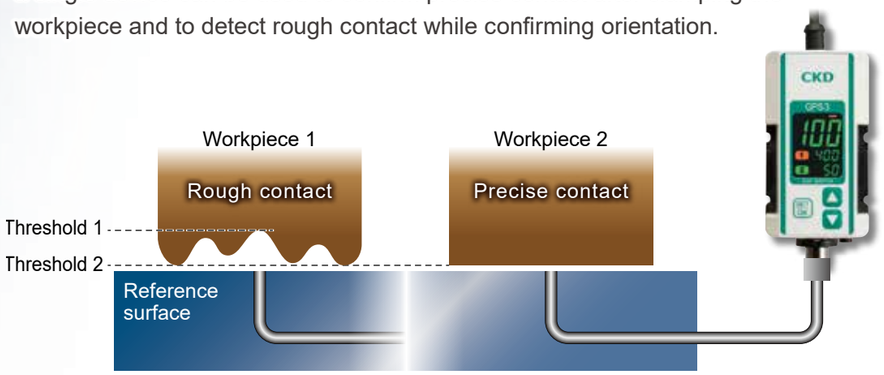


It can also be converted to Ethernet networks and connected, enabling devices to be IoT-ready.

High precision 2-point output

Industry First PAT.P
February 2016 CKD research

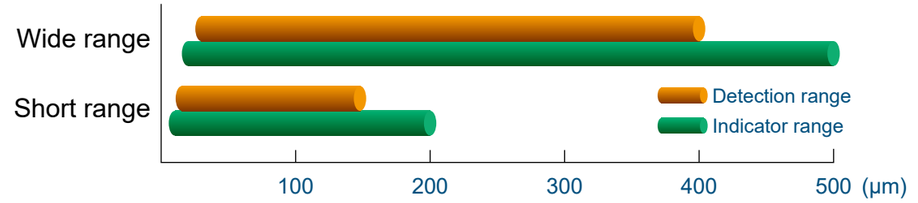
Threshold can be set to 2 points within the detection distance range. For example, a single device can be used to confirm precise contact after clamping the workpiece and to detect rough contact while confirming orientation.



Detection over a wide range from raw material surfaces through precision machined surfaces

Industry No.1!! Wide range
Wide range
February 2016 CKD research

A single unit with a detection distance range of 0.03 mm to 0.4 mm allows settings for both finished and raw material surface roughness. A new short-range type has also been added to detect shorter distances.
(Detection range scale: 0.02 mm to 0.15 mm)



High maintainability (preventative maintenance)

[Blockage indicator function]

A lamp blinks/signal outputs a blockage in the detector air flow path*4 to informed of this. The blinking period indicates which locations are likely to be blocked, enabling rapid recovery.
(Default setting is OFF)



Fast blinking: Internal orifice may be clogged Slow blinking*5: Detection nozzle may be clogged

[Orifice easy disassembly]

Orifice blockages can be cleaned without having to disassemble the assembled product.



Reset the threshold after disassembly or cleaning.

[Direct blow]

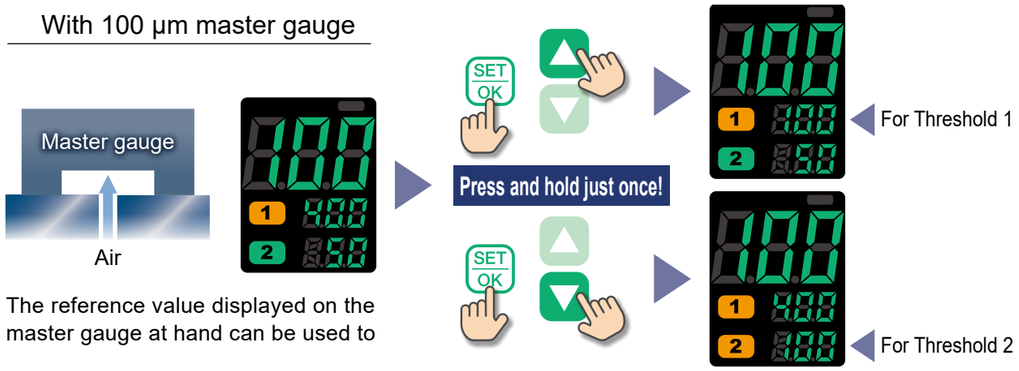
Capable of direct blow of max. 0.6 MPa.

*4: When IO-Link option is selected.
*5: When the light is blinking without a workpiece present. (Blinking also occurs during regular contact, due to the detection structure)

Easy operation

The master gauge you have at hand can be used to set the threshold easily.

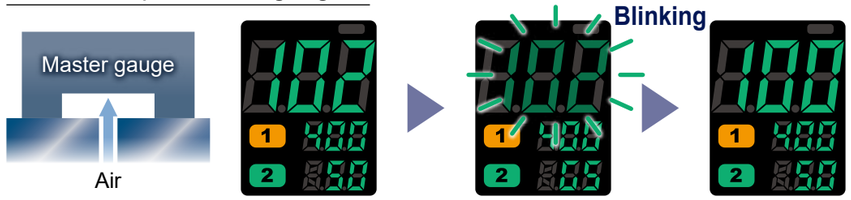
With 100 µm master gauge



The reference value displayed on the master gauge at hand can be used to

Indicatored values can be calibrated (actual measurement calibration function).

With 100 µm master gauge



Now with a function allowing calibration of discrepancies in the reference value displayed on the master gauge at hand.

(Refer to Operation mode for details)

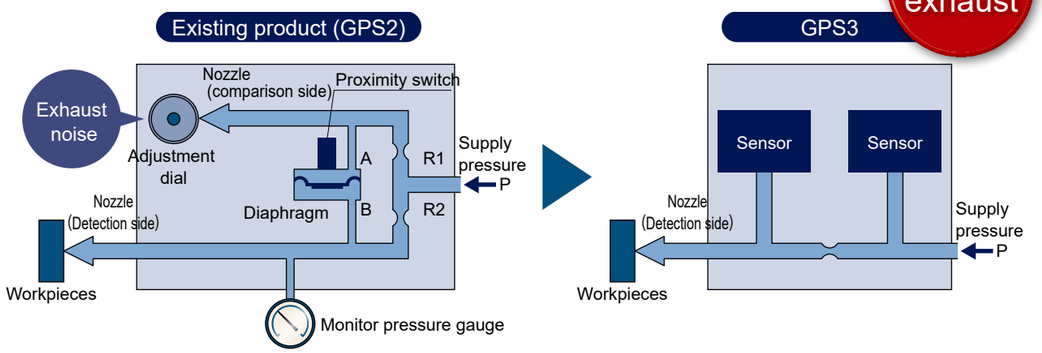
Low noise/energy-saving

Energy saving

Zero air exhaust

Rethinking the detection circuit has eliminated exhaust air on the comparison side. Exhaust noise, previously constant, is no longer a concern. Air consumption when the nozzle is open can also be reduced. Air consumption Less than 9 L/min*.

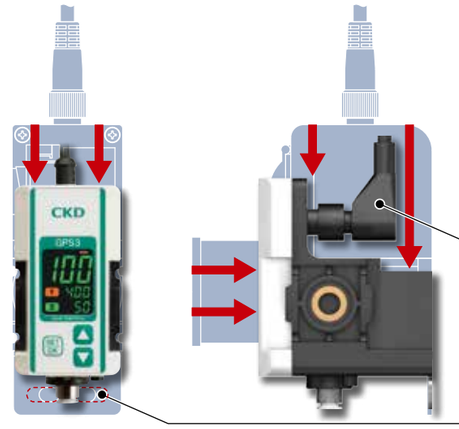
*: Short range



Excellent workability

Compact design

The appearance lives up to high-design equipment. While the assembled dimensions are compatible with the conventional GPS2 product, the design is more compact, the weight reduced, and replacement is easy.

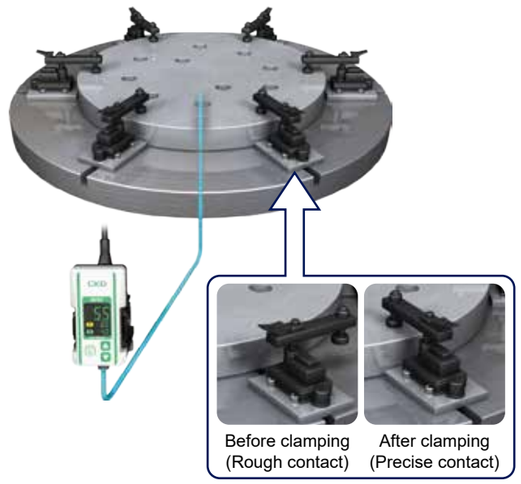


Manifold / Unit supported. Easily expandable.

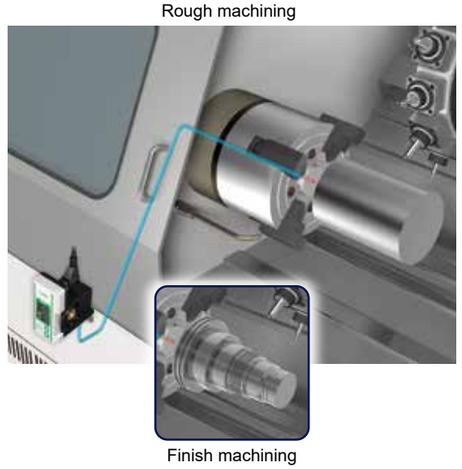


Applications

Two-point detection for rough and precise contact.



Two-point detection for rough and finish machining.



*Can be used with any detection nozzle environment



Contact confirmation switch (digital gap switch) Discrete

GPS3 Series

●Port size: Rc1/8

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

GPS3 - E N - T J B -

1 Detection range
2 Output / Communication supported
3 Screen display
4 Connector cable
5 Bracket
6 Pressure display unit

Note: Refer to P. 116 to 117 for discrete model No. of option peripheral devices.

1 Detection range

Code	Description
Blank	0.03 to 0.4
E	0.02 to 0.15

2 Output/communication supported

Code	Description
N	NPN open collector (2-point)
P	PNP open collector (2-point)
L	IO-Link communication

3 Screen display

Code	Description
Blank	Indicator (default)
T	Non-display (default)

Note: OS mode allows configuration of screen display and non-display settings.

4 Connector cable

Code	Description
Blank	5 m connector cable attached (one side elbow)
D	5 m connector cable attached (both sides elbows/straight)
J	Without connector cable

5 Bracket

Code	Description	
Blank	Without bracket	
B	With bracket	

6 Pressure display unit

Code	Description
Blank	SI units only (domestic model)
KA	With unit switching function (export model)

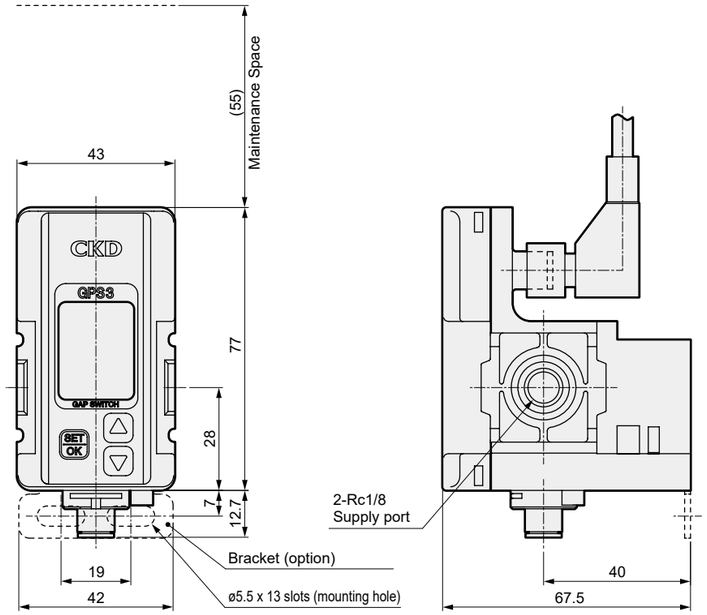
Note: In compliance with the new Measurement Act, export models (with unit select function "KA") cannot be used in Japan.

Specifications

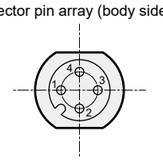
Item	Short range GPS3-E	Wide range GPS3
Working fluid	Compressed clean air (after 5 µm filter, lubrication not possible)	
Working pressure kPa	1 to 200	
Proof pressure kPa	600	
Detection range mm	0.02 to 0.15	0.03 to 0.4
Reference value display range	10 to 200 (Unit indicated 1)	20 to 500 (Unit indicated 1)
Repeatability mm	±0.01	±0.01 (detection range min to 0.1)
Hysteresis	Variable (reference value variable from 1 in increments of 1. Default 10)	
Temperature characteristics (standard 25°C)	0.015	0.030 mm or less (detection distance min to 0.3 mm) 0.1 mm or less (detection distance 0.3 to 0.4 mm)
Detection nozzle	Single hole nozzle ø1.5	
Power supply voltage V	24 DC±10% (18 to 30 DC) *1, ripple P-P10% or less (with reverse connection protection)	
Current consumption mA	25 or less (35 or less) *1	
Output/communication supported	2-point output (NPN, PNP open collector) *2	
Output rating	30 VDC, 100 mA or less	
Internal voltage drop V	2 or less (using 100 mA)	
Short-circuit protection circuit *3	Equipped	
Indicator	Reference value, thresholds (2-point), output status indicators (2-point), detection side pressure, blockage indication	
Insulation resistance	No failure after application of 1,000 VAC for 1 minute	
Withstand voltage	10 MΩ and over at 500 VDC megger	
Ambient temperature °C	0 to 50 (no freezing or condensation)	
Degree of Protection	IP 67 or equiv.	
Port size	Supply port: Rc1/8,detection port: push-in fitting ø6	
Wiring *4	M12 connector, 4-pin	
Weight (g)	128 (excluding cable)	
Air consumption L/min	Less than 9	Less than 22

*1: Values in ( ) are when communication support option L is selected
*2: For the communication specifications, refer to P. 120.
*3: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.
*4: M12 connector tightening torque is 0.5 N·m or less.

Dimensions

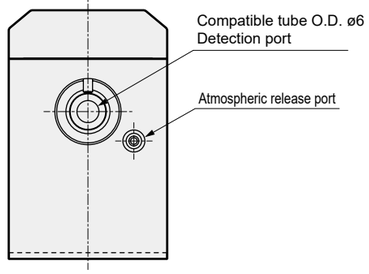


Connector pin array (body side)



Pin No.	Lead wire color	Applications
1	Brown	Power supply +
2	White	Output 2
3	Blue	Power supply -
4	Black	Output 1 (C/Q *1)

*1: IO-Link communication compatible option



(Atmospheric release port)
If this port may be blocked by coolant or oil during use, connect a ø(O.D. ø4, I.D. tube 2.5) and install the port so that the tubing end is not blocked.

MEMO

Pressure switch
Electronic pressure Switch
Contact Confirm Switch
For Coolant Pressure Switch
Ending



Gap switch Manifold

MGPS3 Series

●Station No.: 2 to 6 stations
Port size: Rc1/8

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

MGPS3 - 2 E N - T J B -

Note: Refer to P. 116 to 117 for discrete model No. of option peripheral devices.

- Model No.
- ❷Detection range
- ❹Screen display
- ❻Bracket
- ❶Station No.
- ❸Output / Communication supported
- ❺Connector cable
- ❼Pressure display unit

❶Station No.

Code	Description
2	2 stations
3	3 stations
4	4 stations
5	5 stations
6	6 stations

❷Detection range

Code	Description
Blank	0.03 to 0.4
E	0.02 to 0.15

❸Output/communication supported

Code	Description
N	NPN open collector (2-point)
P	PNP open collector (2-point)
L	IO-Link communication

❹Screen display

Code	Description
Blank	Indicator (default)
T	Non-display (default)

Note: OS mode allows configuration of screen display and non-display settings.

❺Connector cable

Code	Description
Blank	5 m connector cable attached (one side elbow)
D	5 m connector cable attached (both sides elbows/straight)
J	Without connector cable

❻Bracket

Code	Description	
Blank	Without bracket	
B	With bracket	

❼Pressure display unit

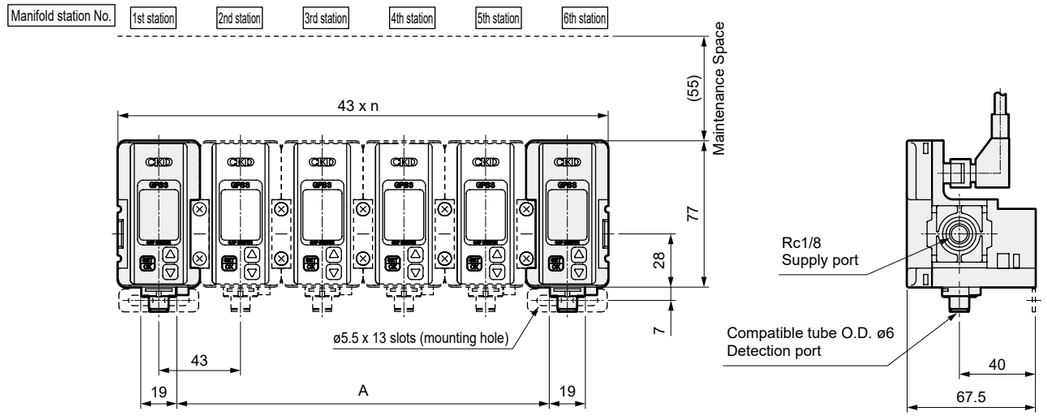
Code	Description
Blank	SI units only (domestic model)
KA	With unit switching function (export model)

Note: In compliance with the new Measurement Act, export models (with unit select function "KA") cannot be used in Japan.

Specifications

Basic specifications are the same as the Discrete on page 105.

Dimensions



	Station No. n				
	2	3	4	5	6
Dimension A	24	67	110	153	196



Gap switch unit

UGPS3 Series

●Solenoid valve with needle, regulator integrated general purpose unit
Port size: Rc1/4 *1

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

UGPS3 - 2 E N R - T J -

1 Station No. | 2 Detection range | 3 Output / Communication supported | 4 Regulator / Solenoid valve assembly position | 5 Screen display | 6 Connector cable | 7 Pressure display unit

*1: Port size for regulator and solenoid valve with needle. (The port size for single GPS3 units is Rc1/8)
*2: Refer to P. 116 to 117 for discrete model No. of option peripheral devices.

1 Station No.

Code	Description
2	2 stations
3	3 stations
4	4 stations
5	5 stations
6	6 stations

2 Detection range

Code	Description
Blank	0.03 to 0.4
E	0.02 to 0.15

3 Output/communication supported

Code	Description
N	NPN open collector (2-point)
P	PNP open collector (2-point)
L	IO-Link communication

4 Regulator/solenoid valve assembly position

Code	Description
R	Right-side assembly (supply port on right)
L	Left-side assembly (supply port on left)

Note: The assembly uses regulator for R1000 low-pressure and solenoid valve with needle for GPS2-AB3X-2H-FL-DC24V. Left or right assembly position depends on whether the GPS3 display is on the left or right.

5 Screen display

Code	Description
Blank	Indicator (default)
T	Non-display (default)

Note: OS mode allows configuration of screen display and non-display settings.

6 Connector cable

Code	Description
Blank	5 m connector cable attached (one side elbow)
D	5 m connector cable attached (both sides elbows/straight)
J	Without connector cable

7 Pressure display unit

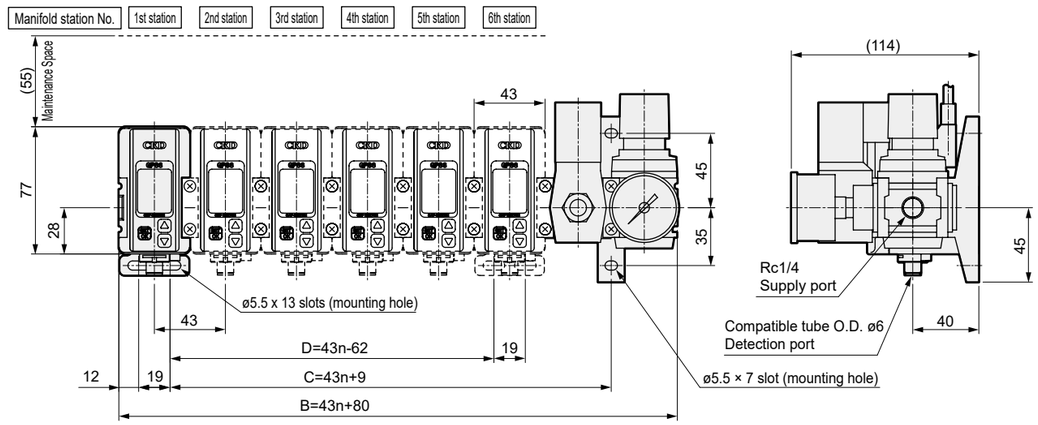
Code	Description
Blank	SI units only (domestic model)
KA	With unit switching function (export model)

Note: In compliance with the new Measurement Act, export models (with unit select function "KA") cannot be used in Japan.

Specifications

Basic specifications are the same as the discrete on P. 105 .

Dimensions

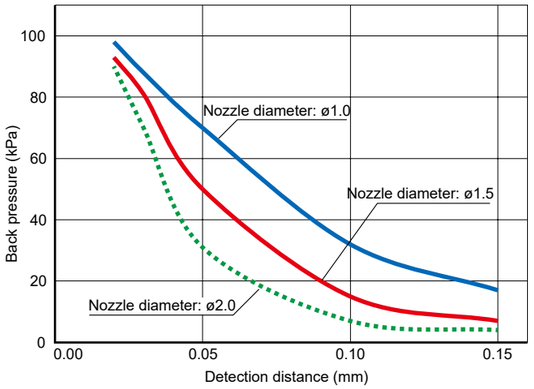


		Station No. n					
		1	2	3	4	5	6
Dimensions (mm)	B	123	166	209	252	295	338
	C	52	95	138	181	224	267
	D	–	–	67	110	153	196
Bracket set		1	1	2	2	2	2

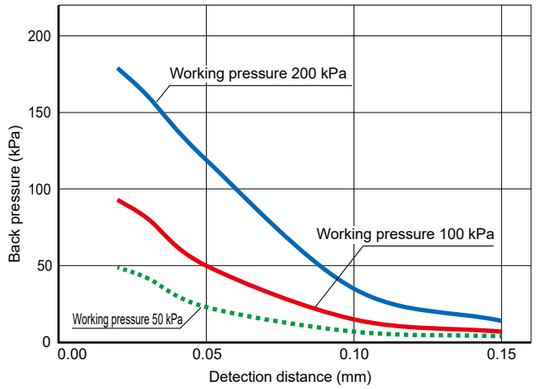
Characteristics data (short range)

GPS3 single unit data

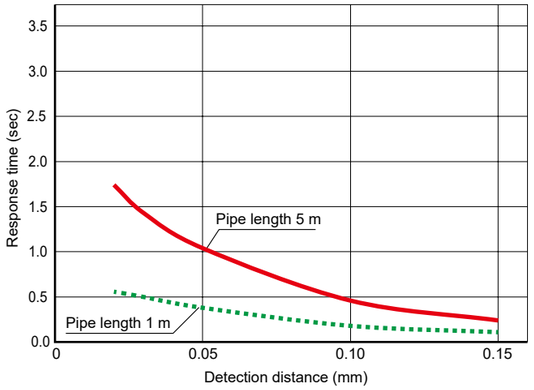
● Back pressure characteristic 1 - Differences in back pressure change due to detection nozzle diameter
- Model No.: GPS3-E, Bore size: ø6 × ø4, Pipe length: 5 m
- Supply pressure: 100 kPa



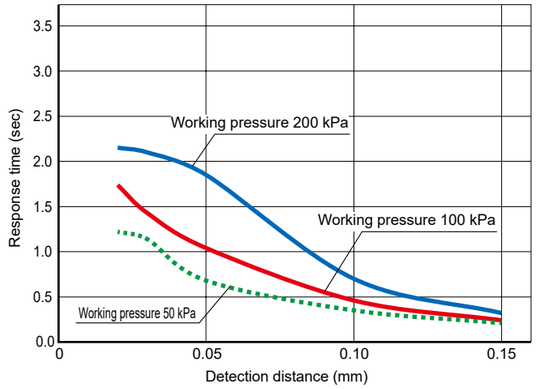
Back pressure characteristic 2 - Differences in back pressure change due to working pressure
- Model No.: GPS3-E, Bore size: ø6 × ø4, Pipe length: 5 m
- Nozzle diameter: ø1.5 (flat tip)



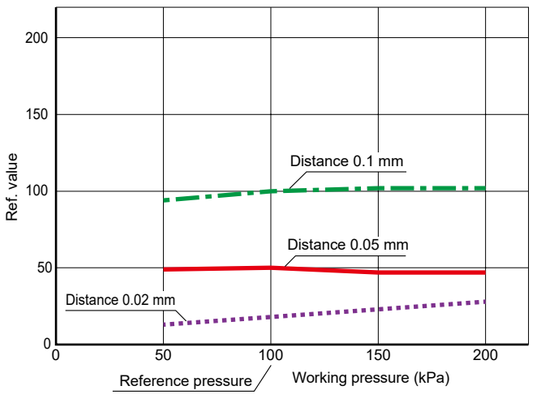
● Effect of pipe length on response time (OFF → ON)
- Model No.: GPS3-E, Port size: ø6 × ø4
- Supply pressure: 100 kPa
- Nozzle diameter: ø1.5 (flat end)



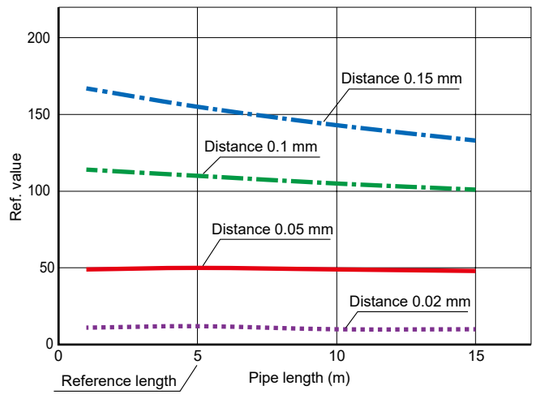
● Effect of working pressure on response time (OFF → ON)
- Model No.: GPS3-E, Bore size: ø6 × ø4, Pipe length: 5 m
- Nozzle diameter: ø1.5 (flat tip)



● Effect of working pressure change on reference value
- Model No.: GPS3-E, Bore size: ø6 × ø4, Pipe length: 5 m
- Nozzle diameter: ø1.5 (flat tip)



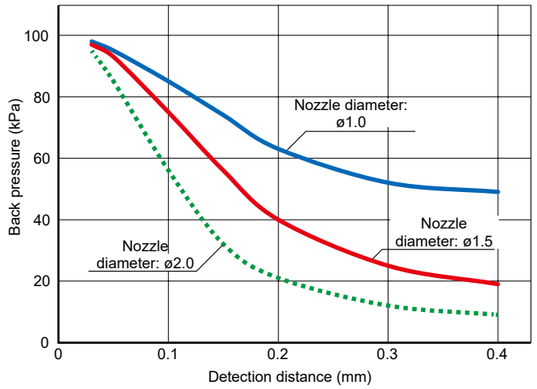
● Effect of pipe length change on reference value
- Model No.: GPS3-E, Bore size: ø6 × ø4, Reference pipe length: 5 m
- Supply pressure: 100 kPa
- Nozzle diameter: ø1.5 (flat end)



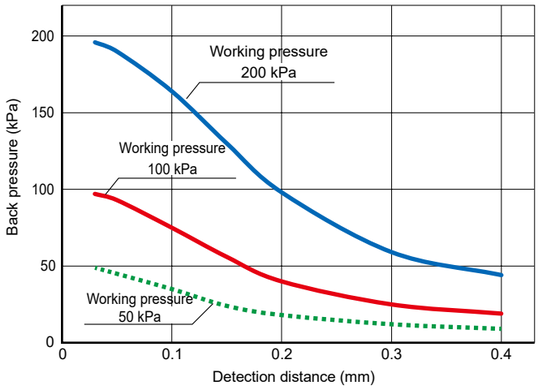
Characteristics data (wide range)

GPS3 single unit data

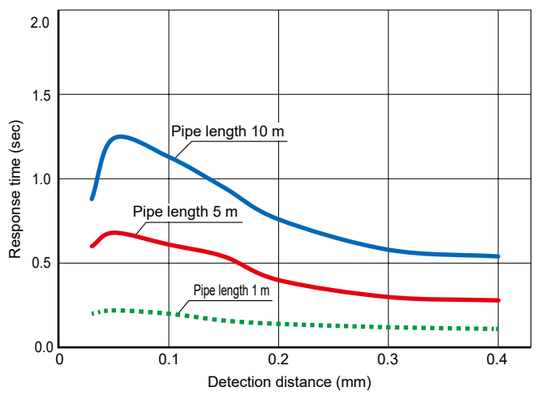
● Back pressure characteristic 1 - Differences in back pressure change due to detection nozzle diameter
- Model No.: GPS3 / Bore size: ø6 × ø4 / Pipe length: 5 m
- Supply pressure: 100 kPa



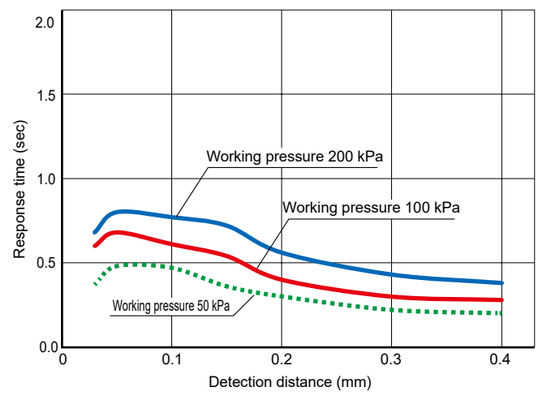
Back pressure characteristic 2 - Differences in back pressure change due to working pressure
- Model No.: GPS3 / Bore size: ø6 × ø4 / Pipe length: 5 m
- Nozzle diameter: ø1.5 (flat tip)



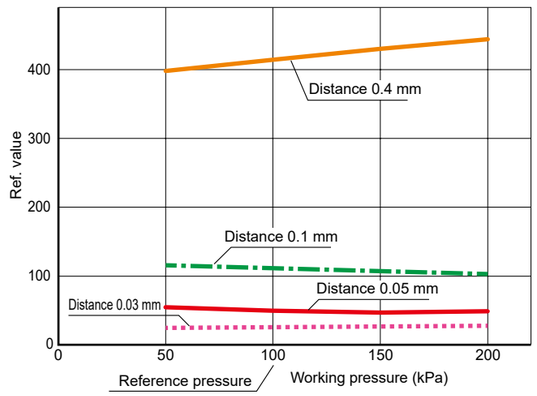
● Effect of pipe length on response time (OFF → ON)
- Model No.: GPS3 Bore size: ø6 × ø4 / Supply pressure: 100 kPa
- Nozzle diameter: ø1.5 (flat tip)
(response time is measured at 80% distance of threshold)



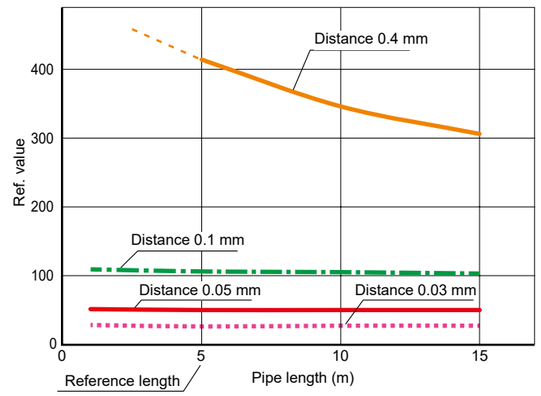
● Effect of working pressure on response time (OFF → ON)
- Model No.: GPS3 / Bore size: ø6 × ø4 / Pipe length: 5 m
- Nozzle diameter: ø1.5 (flat tip)
(response time is measured at 80% distance of threshold)



● Effect of working pressure change on reference value
- Model No.: GPS3 / Bore size: ø6 × ø4 / Pipe length: 5 m
- Nozzle diameter: ø1.5 (flat tip)



● Effect of pipe length change on reference value
- Model No.: GPS3 / Bore size: ø6 × ø4 / Reference pipe length: 5 m
- Supply pressure: 100 kPa
- Nozzle diameter: ø1.5 (flat end)



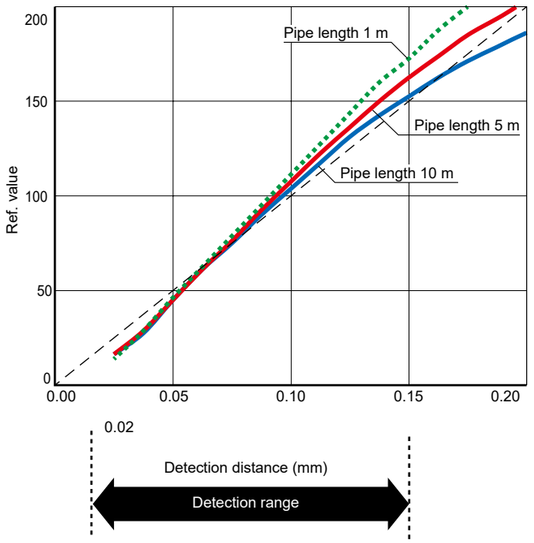
Characteristics data

GPS3 single unit data

●Short range

● Relationship between detection distance and reference value

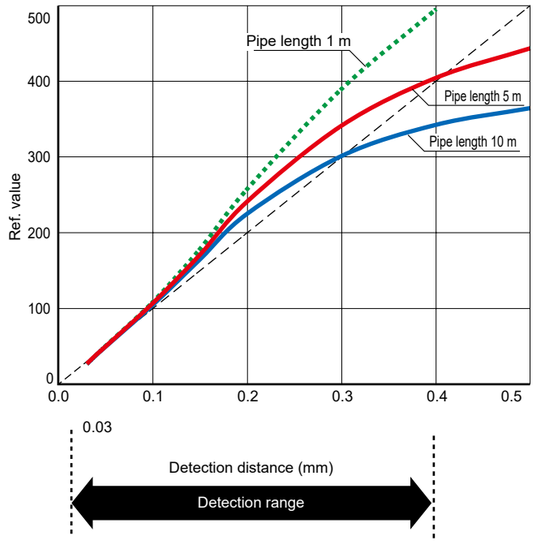
- Model No.: GPS3-E / Port size: ø6 × ø4
- Supply pressure: 100 kPa • Nozzle diameter: ø1.5 (flat end)



●Wide range

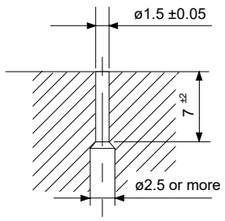
● Relationship between detection distance and reference value

- Model No.: GPS3 / Port size: ø6 × ø4
- Supply pressure: 100 kPa • Nozzle diameter: ø1.5 (flat end)
- Data from setting at shipment (reference pipe length 5 m).

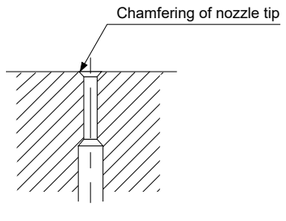


Design of detection nozzle

●Single hole nozzle



Correct nozzle shape



Incorrect nozzle shape

Design the detection nozzle with a point size of ø1.5 mm and depth of 7 ±2 mm. The blow-off section of the nozzle cannot be chamfered. If chamfered, the nozzle retracts from the seating surface and the reference value on the display will no longer match the actual dimensions.

MEMO

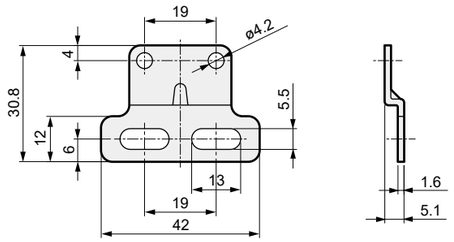
Pressure switch
Electronic pressure Switch
Contact Confirm Switch
For Coolant Pressure Switch
Ending

Options/Model No. Notation Method peripheral components/Dimensions diagram

●Example of bracket model No.

GPS3-B

Weight: 10 g



Body mounting dimensions Page 106.

●Model No. Notation Method cable with connector

GPS3-C

Cable specifications

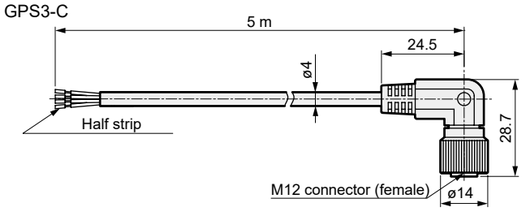
❶Cable specifications

Code	Description
C	Cable with 5 m connector (one side elbow)
D	Cable with 5 m connector (both sides elbows/straight)

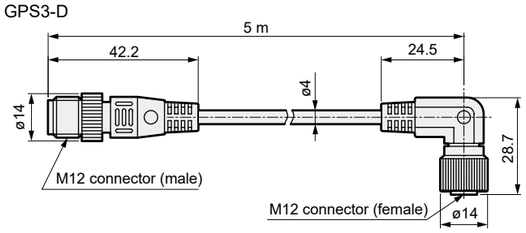
Weight: GPS3-C: 148 g
GPS3-D: 156 g

Lead wire color	Applications
Brown	Power supply +
White	Output 2
Blue	Power supply -
Black	Output 1

• GPS3-C



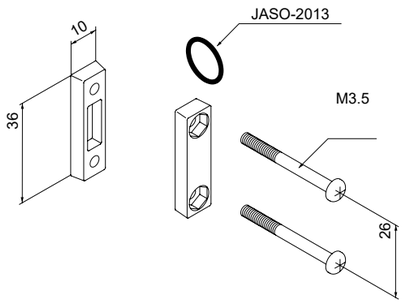
• GPS3-D



●Model No. Notation Method joiner set

C1000-J100-W

Weight: 11 g



●Gasket

C1000-GASKET

The sales unit is 5 pieces/set.
Use with a joiner when connecting GPS3 units together.

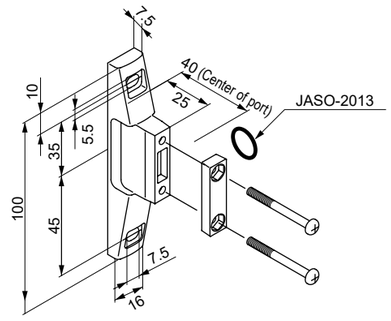


Material: NBR

●Model No. Notation Method T-bracket set

B110-W

Weight: 24 g



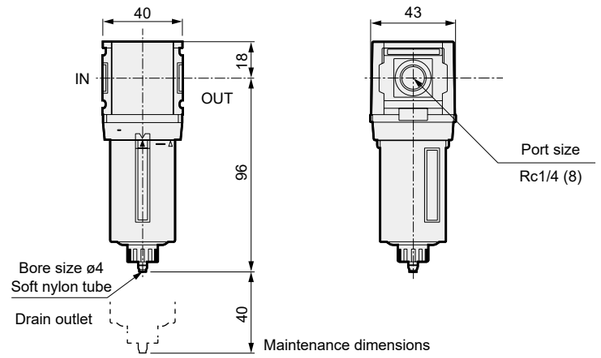
Options/Model No. Notation Method peripheral components/Dimensions diagram

Options/Model No. Notation Method peripheral components/Dimensions diagram

●Model No. Notation Method air filter

F1000-8-W

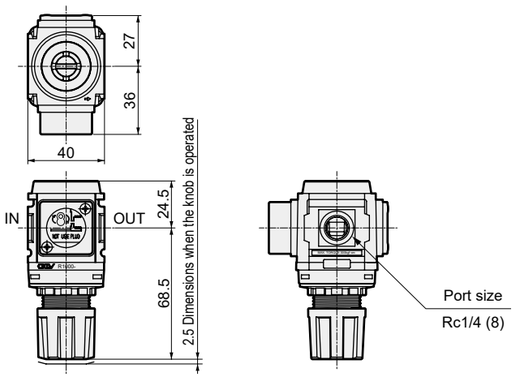
Weight: 87 g



●Model No. Notation Method regulator

R1000-8-W-LT

Weight: 150 g



●Model No. Notation Method pressure gauge with safety marker

GPS2-G40D-8-P02-S501

Pressure gauge with safety marker

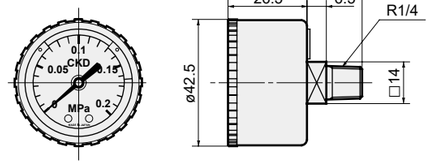
❶Pressure display

Port size Rc1/4

❶Pressure display

Code	Description
P02	0 to 0.2 MPa
P04	0 to 0.4 MPa
P10	0 to 1.0 MPa

Weight: 85 g



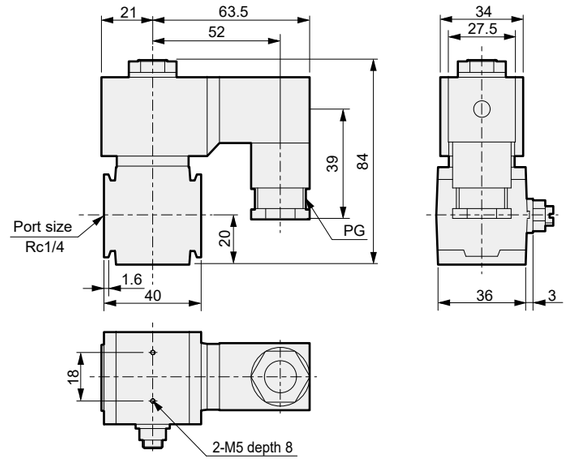
*1: Safety zone setting range: 0.03 to 0.2 MPa
*2: Safety zone setting max. width: 0.09 MPa
*3: Gage accuracy: JIS B 7505, Former 3.0 grade
*4: Cover material: Transparent nylon

●Model No. Notation Method solenoid valve with needle

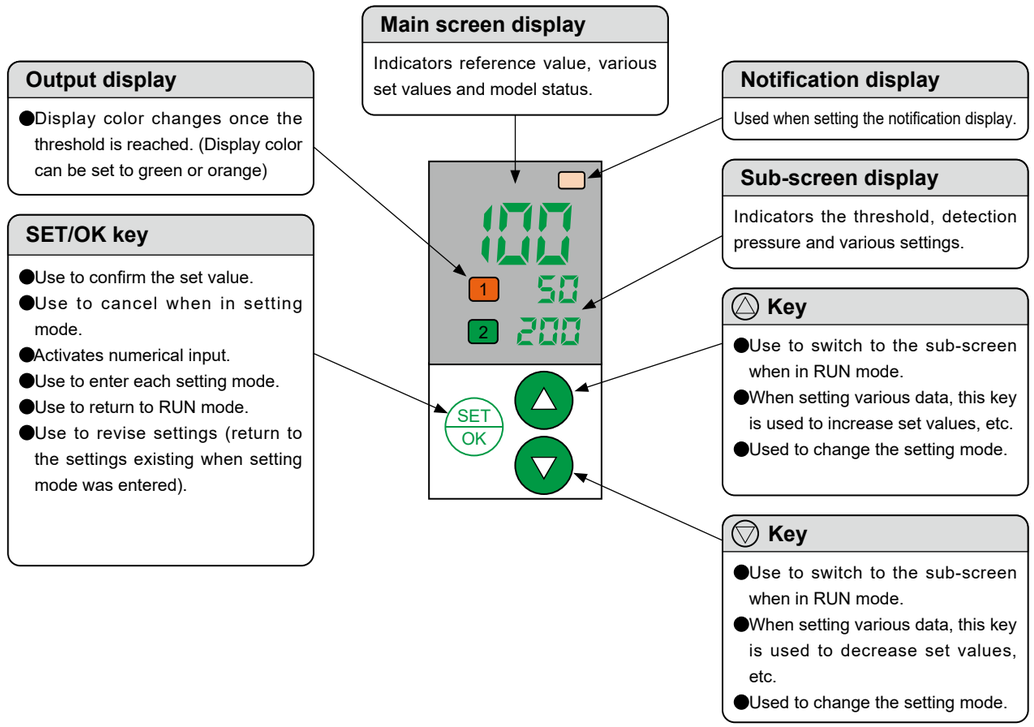
GPS2-AB3X-2H-FL-DC24V

Terminal box: DIN terminal box with lamp

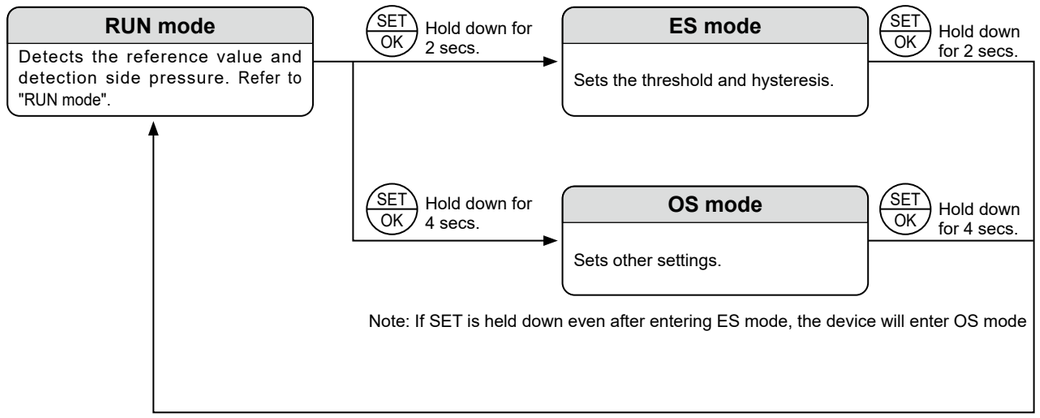
Weight: 280 g



Names and functions of display / operation section



Setting

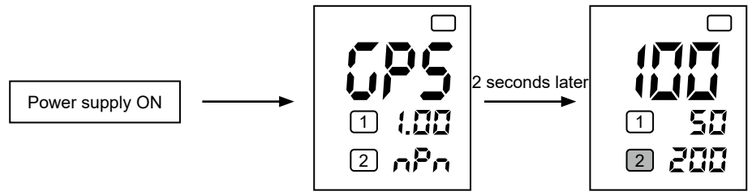


RUN mode (normal operation)

●RUN mode is the regular display and output operation mode which succeeds the startup display when the power is turned on.

Startup display

The following startup display appears when the power is turned on.

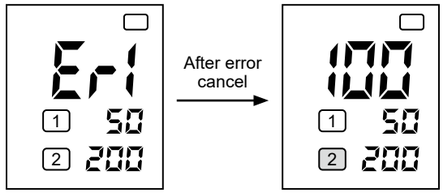


Normal screen

Screen	Indicator		Indicator color
	GPS3-E (short range)	GPS3 (wide range)	
Main screen	1 to 200 FF (beyond display range upper limit) -FF (below display range lower limit)	20 to 500 FF (beyond display range upper limit) -FF (below display range lower limit)	Green display
Sub screen	Threshold (CH1/2): 10 to 200, no display Detection output kPa: 0 to 220 bar: 0 to 2.20 (overseas option only) psi: 0 to 31.9 (export option only) Output display: ON/OFF (IO-Link compatible option only)	Threshold (CH1/2): 20 to 500, no display Detection output kPa: 0 to 220 bar: 0 to 2.20 (overseas option only) psi: 0 to 31.9 (export option only) Output display: ON/OFF (IO-Link compatible option only)	Green display
CH1/2 output display	ON		2-color display (green/orange) Note: Arbitrary setting possible
Notification display	Blinking or OFF Note: Arbitrary setting (default: OFF)		Orange display

Detecting abnormalities

At error detection, the main screen displays an error code indicating the content of the abnormality.
(Error code display remains until the error is canceled.)



Error display	Description	Countermeasures
Er1	Sensor signal error *1 (Damage / Disconnection / Excessive pressure (250 kPa or more) / P2≥P1×1.1)	Indicatored when there is a disconnection or the sensor signal exceeds the full scale. Return supply pressure to within the rated pressure range.
Er2	Outside setting range (0-point calibration)	Turn the supply pressure OFF and conduct 0-point calibration at atmospheric pressure.
Er3	Outside setting range (various settings)	Configure within each setting range.
Er4	PIN entry error	Enter the set PIN.
Er7	Temperature sensor error *1	Use within the operating temperature range (0 to 50°C).
Er8	Overcurrent (contact output) *1	Ensure the output current is 100 mA or less.
Er9	Memory error (ROM, RAM, EEPROM)	Contact CKD for details.
-H- (blinking)	Supply pressure is above 220 kPa *1	Lower the supply pressure to within the rated pressure range.
-L- (blinking)	Supply pressure is below 45 kPa *1	Raise the supply pressure to within the rated pressure range.
FF	Above display range upper limit	GPS3-E: over 200, GPS3: over 500 Detect distance within the reference value display range.
-FF	Below display range lower limit	GPS3-E: up to 10, GPS3: up to 20 Detect distance within the reference value display range.

*1: Output is OFF. Automatic recovery when back within specification range.

Initializing

With the power supply OFF, press SET + △ + ▽ buttons simultaneously and turn the power ON.
*1: When initializing, make a note in advance of any of the current settings you wish to preserve.
*2: Display OFF at shipping (option code: T) products will switch to display ON when initialized.

IO-Link Parameter Specifications

●Communication specifications

Item	Details
Communication protocol	IO-Link
Communication protocol version	V1.1
Transmission bit rate	COM2 (38.4 kbps)
Port	Class A
Process data length (input)	4 byte
Process data length (output)	0 byte
Min. cycle time	5 ms
Data storage	1 kbyte
SIO mode support	Yes (PNP only)

Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
Data name	MSB															LSB
Data range	Ref. value 20 to 500 (for GPS3-L-*) 10 to 200 (for GPS3-EL-*)															
Format	UInteger16															

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Data name	Error	WARNING	Alert display output (interior orifice may be clogged)	Alert display output (nozzle may be clogged)	Below display range lower limit	Beyond display range upper limit	Control output CH2	Control output CH1	Detection side pressure value *1							
Data range	True/False								−5 to 250 *2							
Format	Boolean								Integer8							

*1: "V2.0" is stamped on the upper right side of the product nameplate for products whose detection side pressure value can be confirmed. (As products without the above printing do not use from 0 to 7 bit, the detection side pressure value cannot be checked.)

*2: Display value on IODD in kPa. Refer to the instruction manual for details about the relation of process data and detection side pressure value.

*3: IODD files can be downloaded from the CKD website. The IODD file to be applied differs depending on whether *1 is printed above. Please apply the correct version. IODD file to take advantage of the product's features.

For details on operation and setting method, refer to CKD components product website (https://www.ckd.co.jp/kiki/en/) → "Model No."→ Instruction manual

Sensor components (sensor components)

Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

Product-specific cautions: Digital gap switch GPS3 Series

Design / Selection

DANGER

■Use with power supply voltage and output in the specified range.
Applying a voltage that is outside of the specified range may cause malfunction, damage to the sensor, electrical shock, and/or fire. Do not use any load that exceeds the rated output. Using such a load may result in damage to the output part or fire.

WARNING

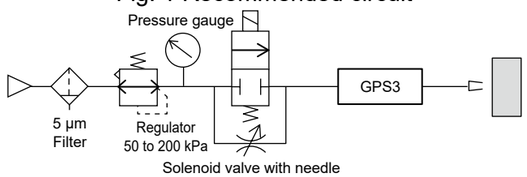
■Use the product in the range of conditions specified for the product. Contact CKD when using the product outside specifications or for special applications.
Use of the product outside the specifications range may result in insufficient performance, and its safety cannot be guaranteed.

■Confirm before use that the product will withstand the working environment.
- This product cannot be used in environments where functional obstacles could occur.
- The main material of this product is resin. Do not use in atmospheres where corrosive gases are generated. Such environments include high temperatures, chemical atmospheres, where chemical liquids, vibration, moisture, water dripping, coolant, or gas is present; where ozone is generated; chemical plants, semiconductor pre-processing, outdoors, etc.
- Compressed air quality must satisfy JIS1.4.1, "oilless clean dry air."

■This product cannot be used to display the absolute distance from the reference surface to the workpiece. It is a pressure sensor for calculating the detection output and displaying a reference value (dimensionless number). Refer to the characteristics data in the technical data for information about the relationship between reference value and distance.

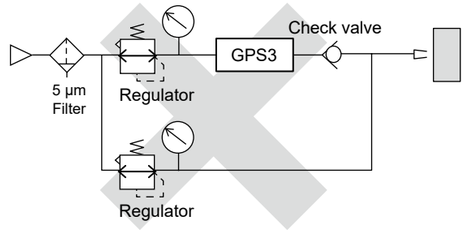
■Working fluid must be clean air from which solids, water and oil have been sufficiently removed using a dryer, filter and oil mist filter. Never supply lubricated air.
This product has a small orifice, so to prevent the entry of foreign matter, use an air filter for clean air (5 μm or less) with the recommended circuit shown below (Fig. 1).

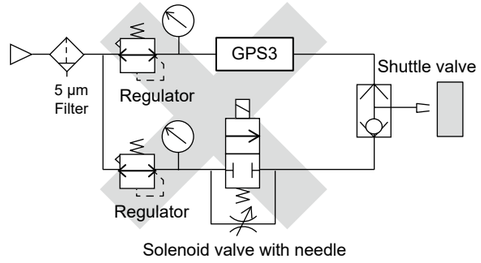
Fig. 1 Recommended circuit



■Do not use the following air circuit when blowing air from the detection nozzle.
- Circuit with check valve
  The check valve acts as exhaust resistance, and limits the adjustable range.
- Circuit with shuttle valve and 2-way valve
  Residual pressure in the OUT side of the 2-way valve prevents a correct detection. Even if a 3-way valve is used, the shuttle valve may vibrate excessively.

Fig. 2





■Check wiring insulation. Check that wires do not come into contact with other circuits, that no ground faults occur, and that the insulator between terminals is not defective. Otherwise, eddy current may flow into the sensor, causing damage.

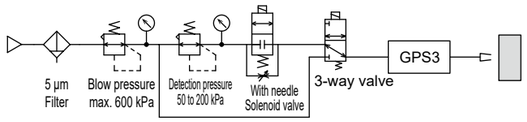
⚠CAUTION

■The entry of compressor oil and tarry substances may obstruct the flow of air and result in problems. Regularly inspect the compressor and discharge drainage.

■Keep the air flow constant so coolant and oil do not flow back from the detection nozzle, or use a solenoid valve with needle and let in a small amount of air from the bypass as shown in the recommended circuit (Fig. 1).

■Swarf and grinder chips, etc., could clog the nozzle. Switch the supply pressure (max. 600 kPa) when transporting the workpiece during machining processes to prevent the detection nozzle from becoming clogged. (Fig. 3)

Fig. 3 Circuit for detection and air blow



(When using high pressure, GPS3 will display "Er1" or "-H-" and the outputs will turn OFF)

■Select an output format (NPN, PNP) matching the input unit of the programmable controller being used.

■Operation may be disabled if a capacitance load such as an AC/DC buzzer is connected to the load. A protection circuit is provided to prevent damage from incorrect wiring or overcurrent. A relay must be used when connecting a capacitance load.

■Caution

- Reference for detection side piping (tube) is O.D. ø6, I.D. ø4 and length 5 m. If piping conditions (tube length) differ, use the actual measurement calibration function as needed to bring the reference values closer to the actual values.
- Contact confirmation detection using this product is effective across a 50 to 200 kPa supply pressure range. Outside the effective range the display will show "Er1", "-H-" or "-L-" and the outputs will turn OFF. In the case of a circuit like Fig. 3,"Er1" is displayed when the detection nozzle blows at high pressure. Furthermore, residual pressure may cause the output to instantaneously turn OFF→ON→OFF when normal supply pressure returns. For this circuit, disable the signal immediately after switching to a blower valve.
- When using a solenoid valve with needle on the supply side, "-L-" will be displayed when the solenoid is in the OFF state, indicating lower than normal supply pressure. However, a value will be displayed if there is a small amount of air flow through the needle, so the reference value and output should be disabled.

■Observe the following items when installing:

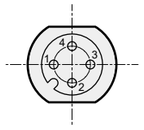
- Install this product so the detection port faces downward.
- Install this product at a position higher than the seating surface to prevent coolant from entering.
- Provide enough space for adjustment, monitoring, and maintenance.
- Use rust-resistant material such as nylon tubes or stainless steel pipes for piping material.
- When installing this product on a device, check that no load is applied to the device.
- When using steel pipes, securely fix the pipe to prevent excessive bending force from being applied to the connection.
- When welding near this product, cover it to prevent spatter from coming in contact.
- When housing this product in a box, provide an exhaust port so atmospheric pressure is maintained in the box.

■Observe the following items when wiring:

- When using a switching regulator for the power supply, ground the F.G. (frame ground).
- Avoid using in a transient state, continuing 1s after power is turned ON.
- Take special care to prevent load short-circuits or incorrect wiring. The protective circuit is activated.
- M12 connector pins are arranged as shown in Fig. 4. Take special care to prevent incorrect wiring.
- When using a load with a large rush current, such as a motor, the protection circuit will activate. In this case, use a relay.
- If there is a device (motor, welder) that generates a large surge near this product, insert a surge absorber, such as a varistor, at the source of the surge.
- If this product's lead wire is wired with the drive cable or power cable, it is affected by surge and noise deteriorating or damaging the sensor element in the switch. Use separate wiring.

■Keep unused wires from coming into contact with other wires.

Fig. 4 Connector pin array (body side)



Pin No.	Lead wire color	Applications
1	Brown	Power supply +
2	White	Output 2
3	Blue	Power supply -
4	Black	Output 1 (C/Q *1)

*1: IO-Link compatible option

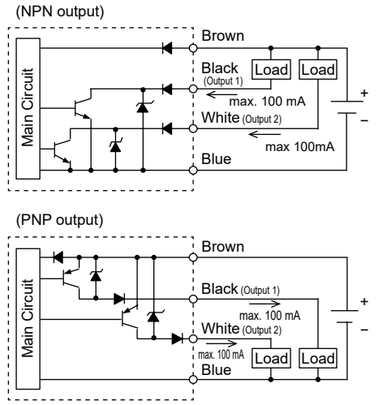
■M12 connector is integrated into the GPS3 body. Pulling on the cable is strictly forbidden. Use cable ties to fix the cable in place.

■Do not bind the sensor cable together with AC power wiring.

■The M12 connector pin array is compatible with the GPS2 Series (wiring option C□). (Excluding pin No.2)

NPN output and PNP output contact confirmation switches are available. Wire the switch based on the output as shown in Fig. 5.

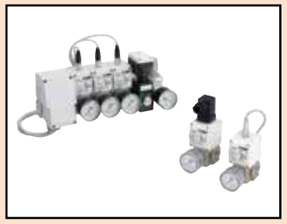
Fig. 5 Output circuit



■One detection nozzle can be used for one of these product units.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual

MEMO



Contact confirmation switch (gap switch)

GPS2, MGPS2, UGPS2 Series

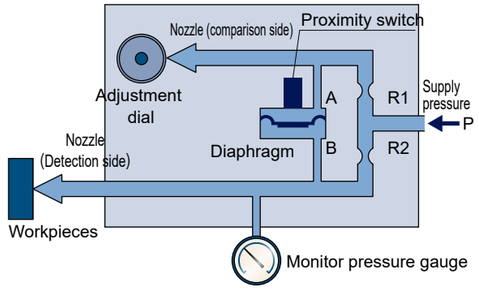
Overview

The GPS2 Series gap switch is an air sensor used to confirm the workpiece seating and clamping contacts. While retaining the features of the conventional GPS Series, a modular unit has been realized by incorporating a joiner connection structure, and the body strength has been increased by using aluminum die-cast.

Features

- **High stability**
  Air bridge circuit prevents the effect of fluctuations in the supply pressure.
- **Easy adjustment**
  The sensitivity can be easily adjusted with the scale on the sensitivity adjustment dial.
- **Non-contact detection**
  A non-contact measurement is taken, and so the product is not directly touched. Detection is possible without damaging valuable products.
- **Energy saving**
  The air consumption rate can be suppressed since this can be used with a working pressure of 0.03 MPa.
- **High precision**
- **Modularization**
  By incorporating a joiner connection, GPS2 units can be connected together, and can also be connected easily to the CKD regulator or filter.
- **Robustness**
  The body strength has been increased by using aluminum die-cast.
- **Environment conditions**
  The product can be used in environments where water, etc., may splash, as it has degree of protection IP67 (connector) equivalent.

●Gap switch principle drawing



Operational explanation

The air pressurized into port P passes through orifice R1 and R2 of the air bridge circuit, and flows to the nozzles on the comparison side and on the detection side. When the detection side nozzle clearance becomes smaller than the clearance set with the adjustment dial in the comparison side nozzle, a back pressure reverses and presses up the diaphragm. This activates the proximity switch and generates an electric signal.



Contact confirmation switch (gap switch) single unit

GPS2 Series

●Port size: Rc1/4 ●nozzle size: ø1.5
Rc1/8

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

GPS2 - 07 - 15 - N G TL - B - G2

- GPS2: Model No.
- 07: ❶Orifice size
- 15: Setting type: Dial type detection nozzle diameter
- N: ❷Output style
- G: ❸Lamp color
- TL: ❹Electrical connection option
- B: ❺Attachments and others
- G2: ❻Pressure gauge

Note: Refer to P. 140 to 145 for discrete model No. of option peripheral devices.

❶Orifice size

Code	Description
05	ø0.5
07	ø0.7

❷Output style

Code	Description
N	NPN open collector
P	PNP open collector

❸Lamp color

Code	Description
G	Green
Y	Yellow

❹Electrical connection option

Code	Description	
F	DIN terminal box (Pg11)	
C0	Connector	Without cable
C1		Cable 1 m attached
C3		Cable 3 m attached
C5		Cable 5 m attached
CTL	Connector common terminal box	Left side assembly
CTR		Right side assembly
TL	Lead wire common terminal box	Left side assembly
TR		Right side assembly
Lead wire common terminal box expanding manifold		
R	Lead wire outlet direction right (left end for mounting)	
L	Lead wire outlet direction left (right end for mounting)	
W	Lead wire outlet direction both sides (intermediate for mounting)	

❺Attachments and others

Code	Description	
Blank	Without bracket	
B	With bracket	
L	Dial cover with lock	

Note: Select "L" for automobile- and processing machine-related applications.

❻Pressure gauge

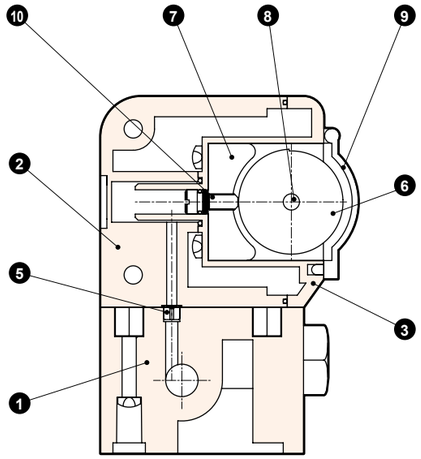
Code	Description
Blank	No pressure gauge
G2	Pressure gauge with safety marker attached (G40D-8-P02-S501)
GW2	Pressure gauge assembly with safety marker (G40D-8-P02-S501)

Specifications

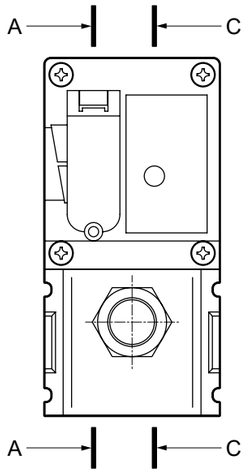
Item		GPS2-05-15	GPS2-07-15
Working fluid		Compressed clean air (lubrication not possible)	
Working pressure	*1 kPa	30 to 200	50 to 200
Detection range	mm	0.03 to 0.25	0.03 to 0.4
Repeatability	mm	±0.01 (detection range 0.03 to 0.1 mm)	
Hysteresis	mm	0.01 or less (detection range 0.03 to 0.1 mm)	
Detection nozzle type	*2	Single hole nozzle ø1.5 standard (ø1, ø2)	
Power supply voltage	V	10.2 to 26.4 DC	
Current consumption	mA	15 or less (when using 24 VDC)	
Output style		NPN, PNP open collector	
Output rating		30 VDC, 100 mA or less	
Internal voltage drop	V	2.0 or less (using 100 mA)	
Indicator lamp		LED green or yellow	
Insulation resistance		10 MΩ and over at 500 VDC megger	
Withstand voltage		No failure after application of 1,000 VAC for 1 minute	
Vibration resistance	m/s^2	98	
Ambient temperature	°C	5 to 60	
Degree of protection	*3	IP67 equivalent (connector), IP64 equivalent (DIN terminal box)	
Tube	mm	Inner diameter 4	
Port size		Supply port Rc1/4, detection port Rc1/8, pressure gauge port Rc1/4	
Weigh	g	290 (electrical connection option C0)	
Air consumption L/min (ANR)	Working pressure 50 kPa	6 or less	11 or less
	Working pressure 100 kPa	9 or less	15 or less
	Working pressure 200 kPa	14 or less	24 or less

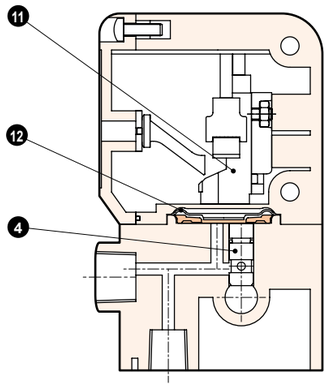
*1: If the nozzle clogs, working pressure should be set between 100 and 200 kPa.
*2: The above specifications apply to the detection nozzle with a ø1.5 single-hole nozzle.
*3: This product must be used under the following conditions:
(1) Piping and wiring must be completed and pressure applied.
(2) A waterproof bushing must be used on the wires to the terminal box.
(3) A dial cover with lock must be provided and the cover screw must be tightened.

Internal Structure Diagram / Material



A-A sectional view





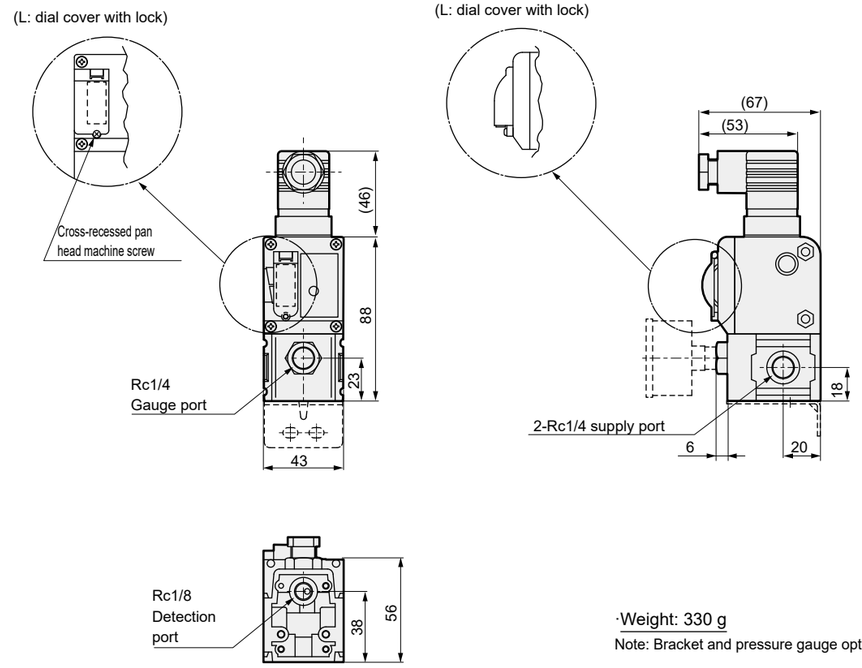
C-C sectional view

Part No.	Part name	Material	Part No.	Part name	Material
1	Base	Aluminum	7	Dial / Bracket	Aluminum
2	Body	Polybutylene terephthalate	8	Press fit pin	Stainless steel
3	Front cover	Polybutylene terephthalate	9	Dial cover	Polypropylene
4	Orifice nozzle A	Brass	10	Dial nozzle	Brass
5	Orifice nozzle B	Brass	11	Proximity switch	-
6	Dial	Stainless steel	12	Diaphragm	HNBR

Dimensions

●DIN terminal

●GPS2-□-15-□□F

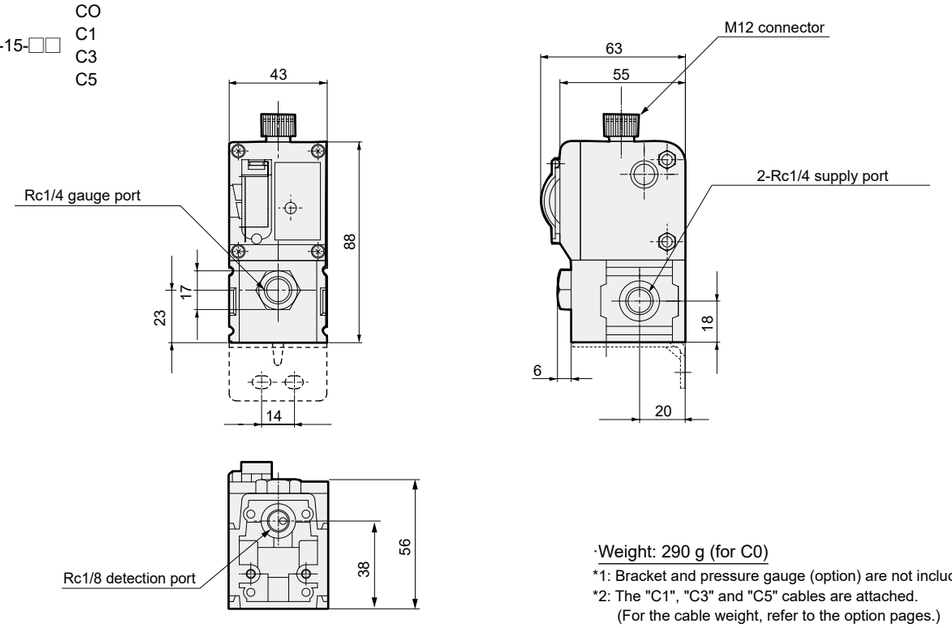


·Weight: 330 g

Note: Bracket and pressure gauge options are not included.

●Connector

●GPS2-□-15-□□ CO C1 C3 C5



·Weight: 290 g (for C0)

*1: Bracket and pressure gauge (option) are not included.

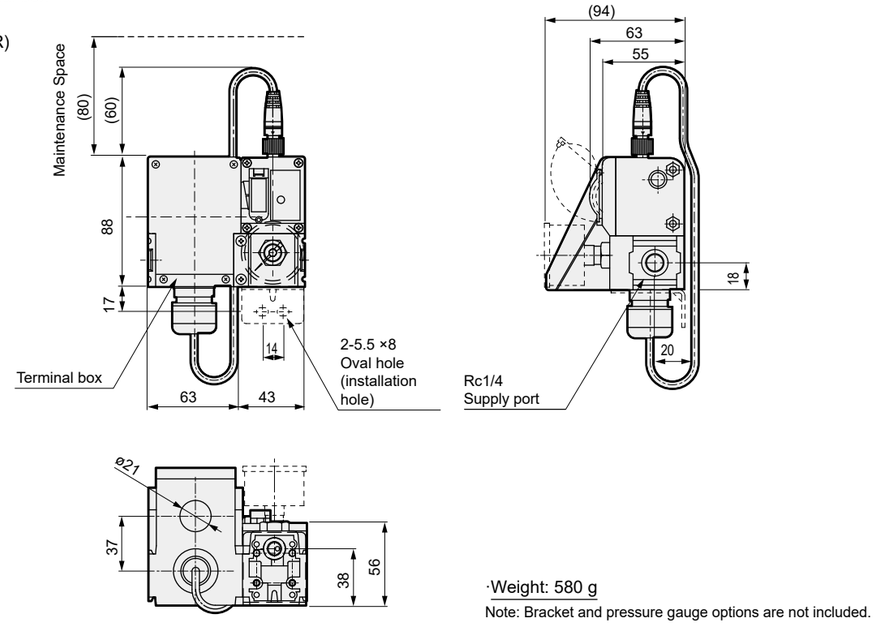
*2: The "C1", "C3" and "C5" cables are attached.
(For the cable weight, refer to the option pages.)

Note: The dial cover shape differs for the dial cover with lock. Refer to above DIN terminal type.

Dimensions

●Connector common terminal box

●GPS2-□-15-□□ CTL (CTR)



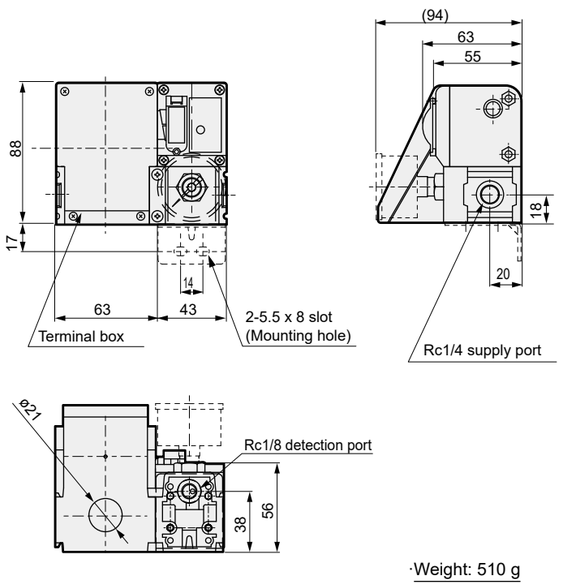
·Weight: 580 g

Note: Bracket and pressure gauge options are not included.

Note: The dial cover shape differs for the dial cover with lock. For the shape, refer to P. 129 for the DIN terminal box.

●Lead wire common terminal box

●GPS2-□-15-□□ TL (TR)



·Weight: 510 g

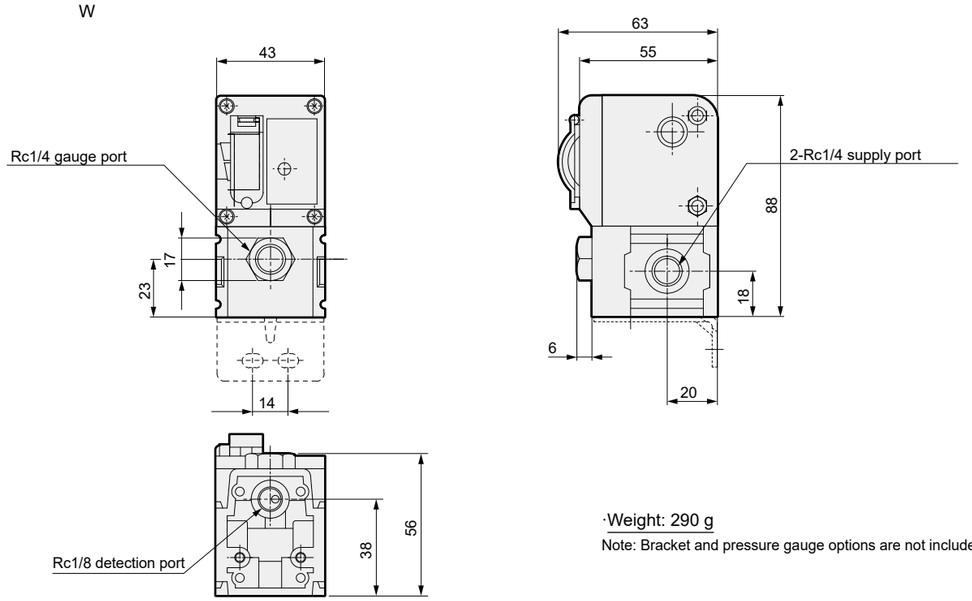
Note: Bracket and pressure gauge options are not included.

Note: The dial cover shape differs for the dial cover with lock. For the shape, refer to P. 129 for the DIN terminal box.

Dimensions

●Discrete for lead wire common terminal box expanding manifold

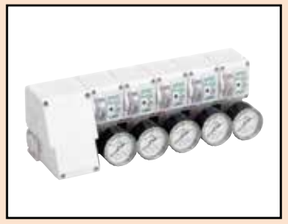
●GPS2-□-15-□□ R L W



·Weight: 290 g

Note: Bracket and pressure gauge options are not included.

Note: The dial cover shape differs for the dial cover with lock. For the shape, refer to P. 129 for the DIN terminal box.



Gap switch Manifold

MGPS2 Series

●Station No.: 2 to 5 stations

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

MGPS2 - 07 - 15 - 2 N Y TL - B - G2

- MGPS2: Model No.
- 07: ❶Orifice size
- 15: Setting type: Dial type detection nozzle diameter
- 2: ❷Station No.
- N: ❸Output style
- Y: ❹Lamp color
- TL: ❺Electrical connection option
- B: ❻Attachments and others
- G2: ❼Pressure gauge

Note: Refer to P. 140 to 145 for discrete model No. of option peripheral devices.

❶Orifice size

Code	Description
05	ø0.5
07	ø0.7

❷Station No.

Code	Description
2	2 stations
3	3 stations
4	4 stations
5	5 stations

❸Output style

Code	Description
N	NPN open collector
P	PNP open collector

❹Lamp color

Code	Description
G	Green
Y	Yellow

❺Electrical connection option

Code	Description		Degree of Protection
TL	Lead wire common terminal box	Left side assembly	IP 66 or equiv.
TR		Right side assembly	
T1		Left 1st	
T2		Left 2nd	
T3		Left 3rd	
T4		Left 4th	
CTL	Connector common terminal box	Left side assembly	IP 67 or equiv.
CTR		Right side assembly	
F	DIN terminal box (Pg11)		IP 64 or equiv.
C0	Connector	Without cable	IP 67 or equiv.
C1		Cable 1 m attached	
C3		Cable 3 m attached	
C5		Cable 5 m attached	

Note: The degree of protection should be used under the following conditions:
(1) Piping and wiring must be completed and pressure applied.
(2) A waterproof bushing must be used on the wires to the terminal box.
(3) A dial cover with lock must be provided and the cover screw must be tightened.

❻Attachments and others

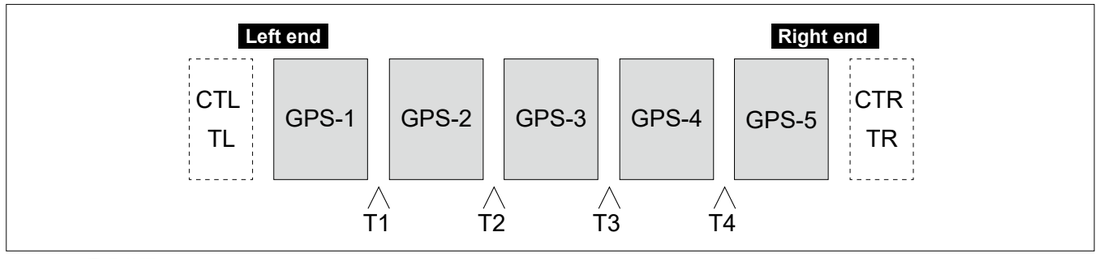
Code	Description	
Blank	Without bracket	
B	With bracket	
L	Dial cover with lock	

Note: Select "L" for automobile- and processing machine-related applications.

❼Pressure gauge

Code	Description
Blank	No pressure gauge
G2	Pressure gauge with safety marker attached (G40D-8-P02-S501)
GW2	Pressure gauge assembly with safety marker (G40D-8-P02-S501)

Terminal box installation position relation diagram



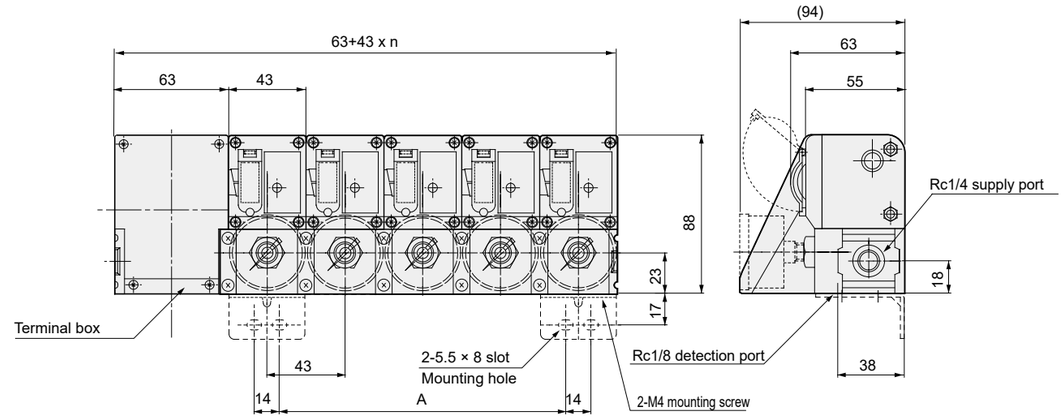
Specifications

Basic specifications are the same as the Discrete on page 127.

Dimensions

●Manifold (lead wire common terminal box: TL/TR)

●MGPS2-□-15-□□□ TL (TR)



Station No.	n	A	Weight (g)
2 stations	2	29	820
3 stations	3	72	1130
4 stations	4	115	1440
5 stations	5	158	1750

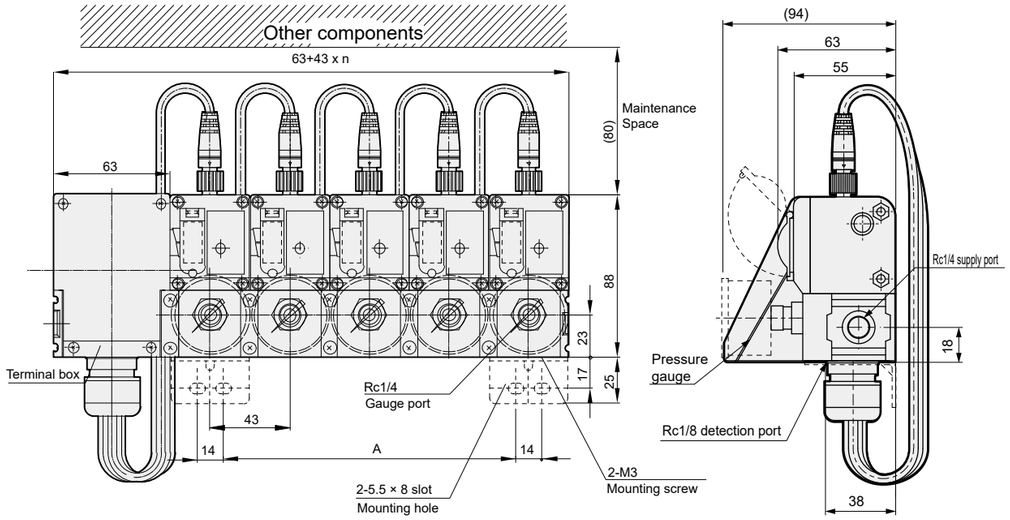
Note: Bracket and pressure gauge options are not included.

Note: The dial cover shape differs for the dial cover with lock. For the shape, refer to P. 129 for the DIN terminal box.

Dimensions

●Manifold (connector common terminal box: CTL/CTR)

●MGPS2-□-15-□□□ CTL (CTR)



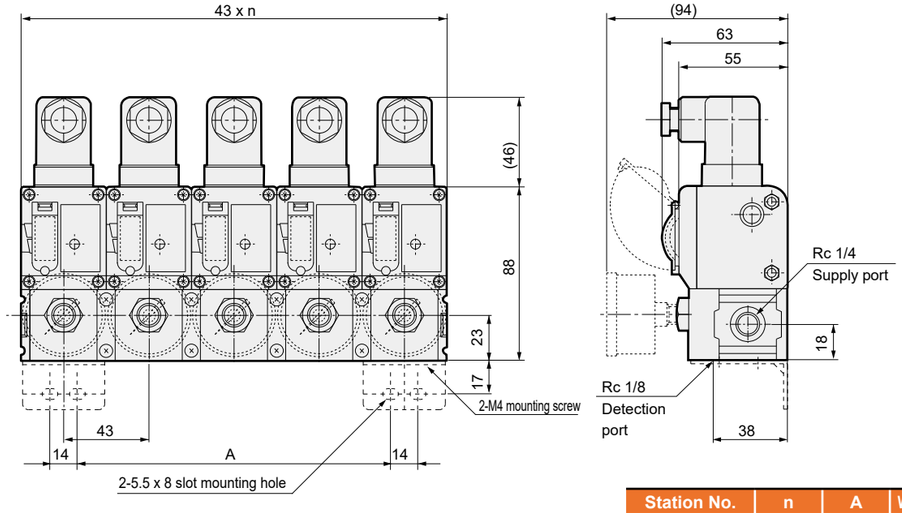
Station No.	n	A	Weight (g)
2 stations	2	29	930
3 stations	3	72	1270
4 stations	4	115	1610
5 stations	5	158	1960

Note: Bracket and pressure gauge options are not included.

Note: The dial cover shape differs for the dial cover with lock. For the shape, refer to P. 129 for the DIN terminal box.

●Manifold (DIN terminal box: F)

●MGPS2-□-15-□□□ F



Station No.	n	A	Weight (g)
2 stations	2	29	680
3 stations	3	72	1020
4 stations	4	115	1360
5 stations	5	158	1700

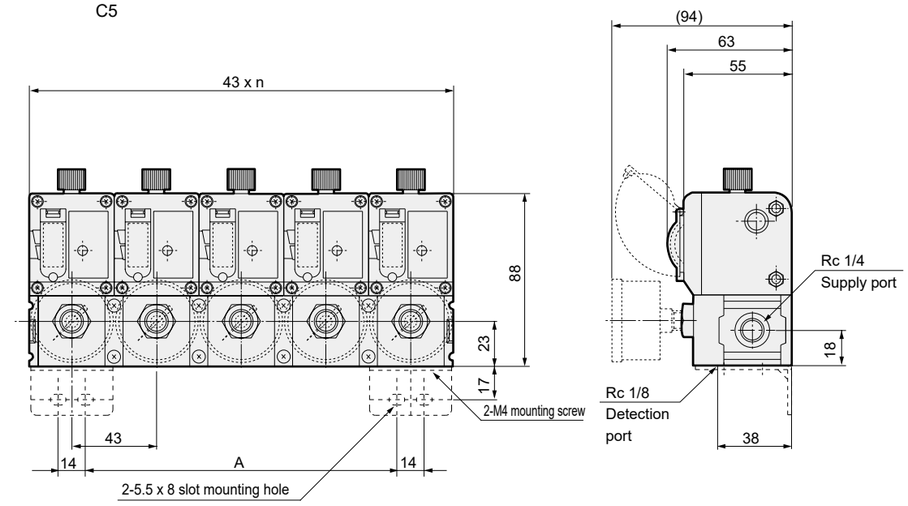
Note: Bracket and pressure gauge options are not included.

Note: The dial cover shape differs for the dial cover with lock. For the shape, refer to P. 129 for the DIN terminal box.

Dimensions

●Manifold (connector: □C)

●MGPS2-□-15-□□□ C0 C1 C3 C5



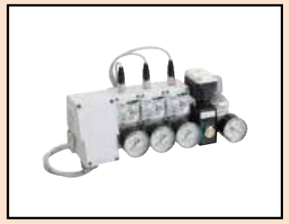
Note: The dial cover shape differs for the dial cover with lock. For the shape, refer to P. 129 for the DIN terminal box.

(For C0)

Station No.	n	A	Weight (g)
2 stations	2	29	590
3 stations	3	72	880
4 stations	4	115	1180
5 stations	5	158	1480

*1: Bracket and pressure gauge options are not included.
*2: The "C1", "C3" and "C5" cables are attached.
(For the cable weight, refer to the option pages.)

●For information on options and peripheral dimensions diagrams, refer to P. 140 to 145.



Gap switch unit

UGPS2 Series

●Solenoid valve with needle, regulator integrated general purpose unit

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

UGPS2 - 07 - 15 - 2 N Y TL - L - GW2 - 2H - 1

- UGPS2: Model No.
- 07: ❶Orifice size
- 15: Setting type: Dial type detection nozzle diameter
- 2: ❷Station No.
- N: ❸Output style
- Y: ❹Lamp color
- TL: ❺Electrical connection option
- L: ❻Attachments and others
- GW2: ❼Pressure gauge
- 2H: ❽Solenoid valve electrical connection
- 1: ❾Solenoid valve voltage

Note: Refer to P. 140 to 145 for discrete model No. of option peripheral devices.

❶Orifice size

Code	Description
05	ø0.5
07	ø0.7

❷Station No.

Code	Description
1	1 station
2	2 stations
3	3 stations
4	4 stations
5	5 stations

❸Output style

Code	Description
N	NPN open collector
P	PNP open collector

❹Lamp color

Code	Description
G	Green
Y	Yellow

❺Electrical connection option

Code	Description	
TL	Lead wire common Terminal box	Left side assembly
TR		Right side assembly
CTL	Connector common Terminal box	Left side assembly
CTR		Right side assembly
F	DIN terminal box (Pg11)	
C0	Connector	Without cable
C1		Cable 1 m attached
C3		Cable 3 m attached
C5		Cable 5 m attached

❻Attachments and others

Code	Description
Blank	None
L	Dial cover with lock

Note: Select "L" for automobile- and processing machine-related applications.

❼Pressure gauge

Code	Description
Blank	Without (*1)
GW2	Pressure gauge assembly with safety marker (G40D-8-P02-S501)

*1: Regulator pressure gauge is also provided.

❽Solenoid valve electrical connection

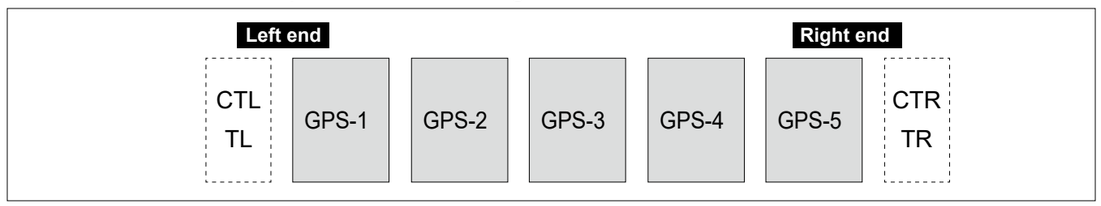
Code	Description
2E	DIN terminal box
2H	DIN terminal box with lamp
3N	HP terminal box with lamp

Note: For CE marking/UKCA-compatible parts, select from "2E" and "2H".

❾Solenoid valve voltage

Code	Description
1	100 VAC
2	200 VAC
3	24 VDC

Terminal box installation position relation diagram



Note: The solenoid valve with needle and regulator are mounted on the opposite side of the terminal box (right side when terminal box is on left side). The terminal box does not have a supply port.

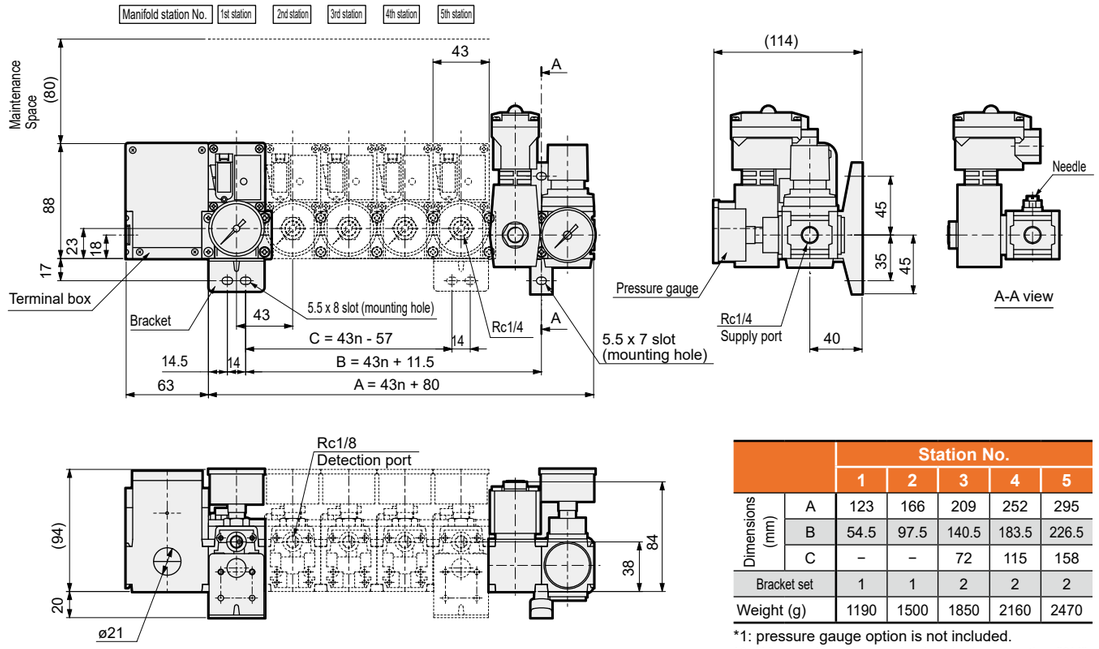
Specifications

Basic specifications are the same as the Discrete on page 127.

Dimensions

●Gap switch unit (lead wire common terminal box: TL/TR)

●UGPS2-□-15-□□□TL



Note: The dial cover shape differs for the dial cover with lock. For the shape, refer to P. 129 for the DIN terminal box.

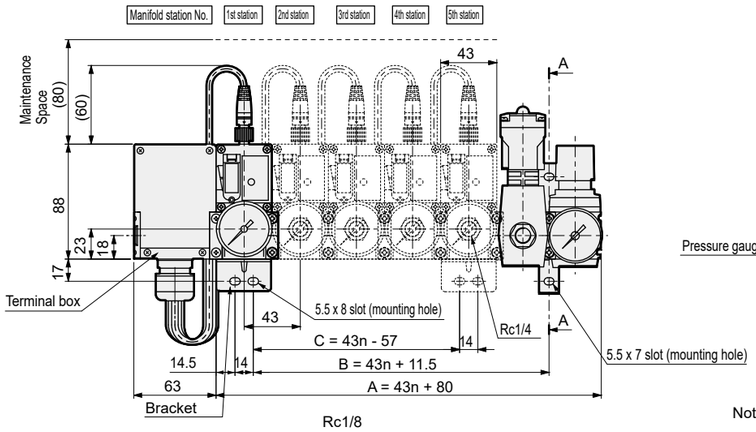
		Station No.				
		1	2	3	4	5
Dimensions (mm)	A	123	166	209	252	295
	B	54.5	97.5	140.5	183.5	226.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2
Weight (g)		1190	1500	1850	2160	2470

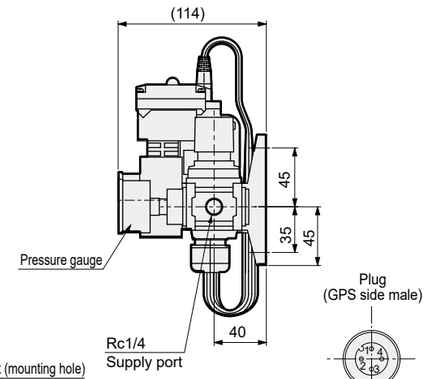
*1: pressure gauge option is not included.
*2: When solenoid valve is electrical connection "3N".

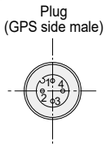
Dimensions

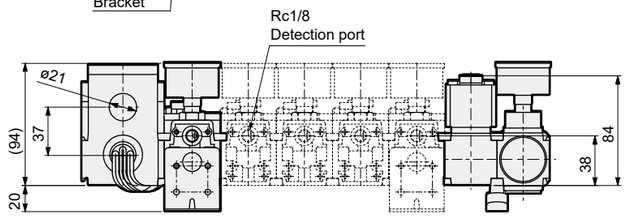
●Gap switch unit (connector common terminal box: CTL/CTR)

●UGPS2-□-15-□□□CTL









Note: Refer to the "A-A view" on P. 137 for needle position.

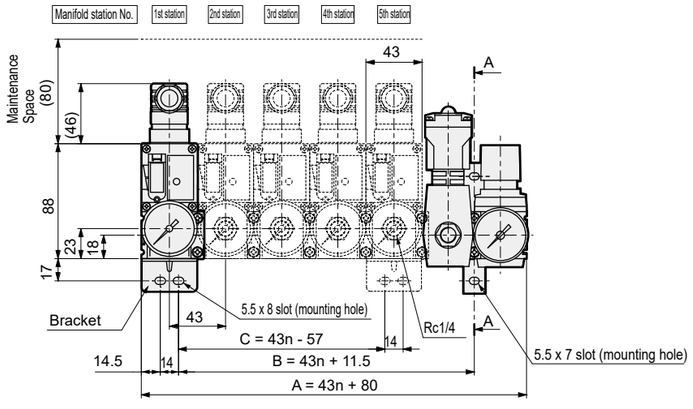
		Station No.				
		1	2	3	4	5
Dimensions (mm)	A	123	166	209	252	295
	B	54.5	97.5	140.5	183.5	226.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2
Weight	g	1260	1600	1990	2330	2680

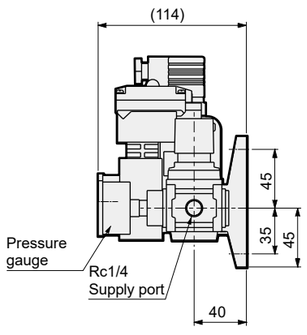
*1: pressure gauge option is not included.
*2: When solenoid valve is electrical connection "3N".

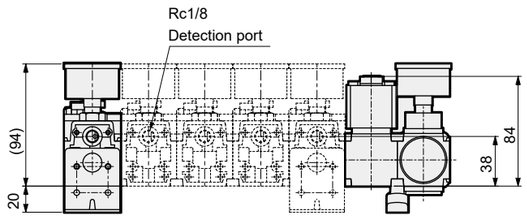
Note: The dial cover shape differs for the dial cover with lock. For the shape, refer to P. 129 for the DIN terminal box.

●Gap switch unit (DIN terminal box: F)

●UGPS2-□-15-□□□F







Note: Refer to the "A-A view" on P. 137 for needle position.

		Station No.				
		1	2	3	4	5
Dimensions (mm)	A	123	166	209	252	295
	B	54.5	97.5	140.5	183.5	226.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2
Weight (g)		1010	1360	1740	2080	2420

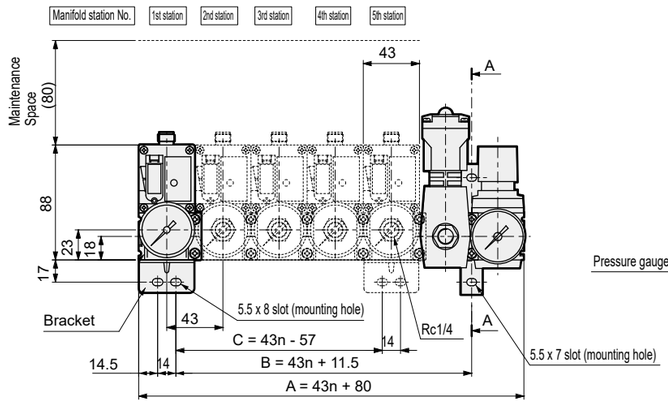
*1: pressure gauge option is not included.
*2: When solenoid valve is electrical connection "3N".

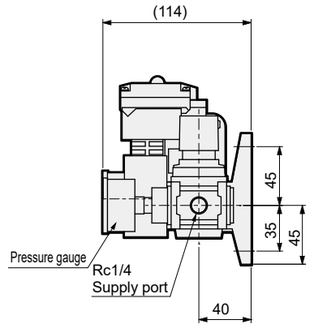
Note: The dial cover shape differs for the dial cover with lock. For the shape, refer to P. 129 for the DIN terminal box.

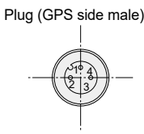
Dimensions

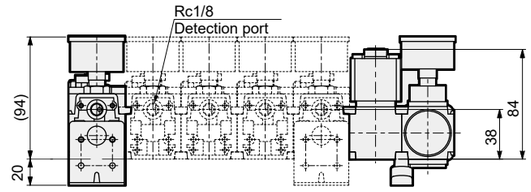
●Gap switch unit (connector: C□)

●UGPS2-□-15-□□□ C0 C1 C3 C5









Note: The dial cover shape differs for the dial cover with lock. For the shape, refer to P. 129 for the DIN terminal box.

Note: Refer to the "A-A view" on P. 137 for needle position.

		Station No.				
		1	2	3	4	5
Dimensions (mm)	A	123	166	209	252	295
	B	54.5	97.5	140.5	183.5	226.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2
Weight (For C0) g		970	1270	1610	1900	2200

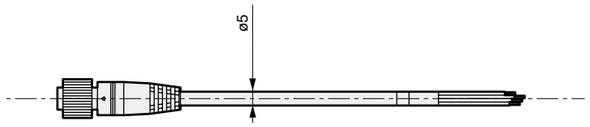
*1: pressure gauge option is not included.
*2: When solenoid valve is electrical connection "3N".
*3: The "C1", "C3" and "C5" cables are attached.
(For the cable weight, refer to the option pages.)

●For information on options and peripheral dimensions diagrams, refer to P. 140 to 145.

Model No. Notation Method options/Dimensions diagrams

●Model No. Notation Method connector cable

GPS2-C1
1 Cable length



1 Cable length

Code	Description	Weight (g)
C1	1 m	45
C3	3 m	123
C5	5 m	195

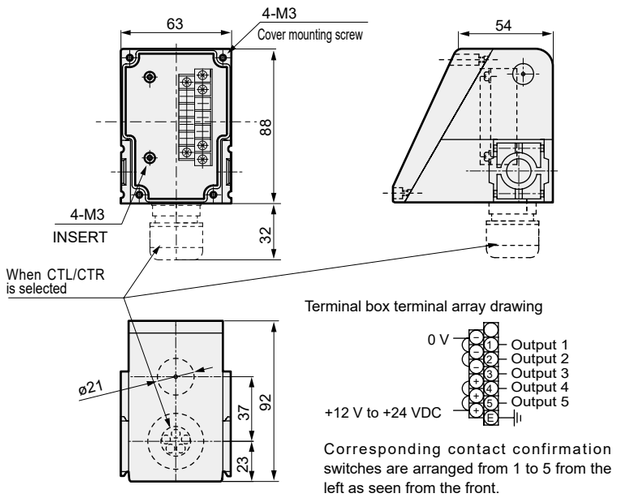
Lead wire color	Applications
Brown	Power supply +
White	NC
Blue	Power supply -
Black	Output

●Model No. Notation Method terminal box

GPS2-CTL
1 Terminal box

1 Terminal box

Code	Description	Weightg
CTL	For connector common terminal box left assembly	234 (for up to 4 stations)
CTR	For connector common terminal box right assembly	245 (for 5 stations)
TL	For lead wire common terminal box left assembly	207
TR	For lead wire common terminal box right assembly	
TW	For lead wire common terminal box intermediate assembly	



Corresponding contact confirmation switches are arranged from 1 to 5 from the left as seen from the front.

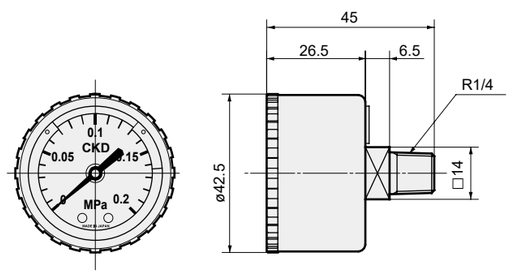
●Model No. Notation Method pressure gauge with safety marker

GPS2-G40D-8-P02-S501
Port size R1/4
Pressure gauge with safety marker
1 Pressure display

1 Pressure display

Code	Description
P02	0 to 0.2 MPa
P04	0 to 0.4 MPa
P10	0 to 1.0 MPa

Weight: 85 g

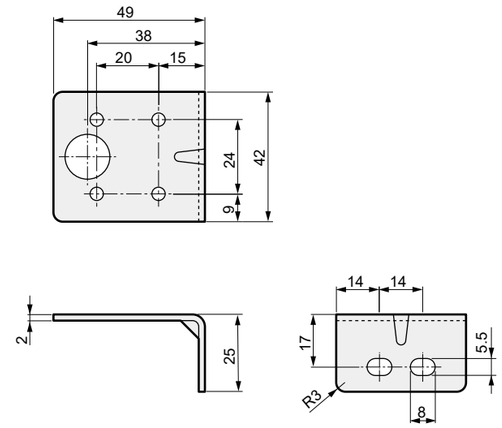


*1: Safety zone setting range: 0.03 to 0.2 MPa
*2: Safety zone setting max. width: 0.09 MPa
*3: Gage accuracy: JIS B 7505, Former 3.0 grade
*4: Cover material: Transparent nylon

Model No. Notation Method options/Dimensions diagrams

●Model No. Notation Method L-bracket

GPS2-B

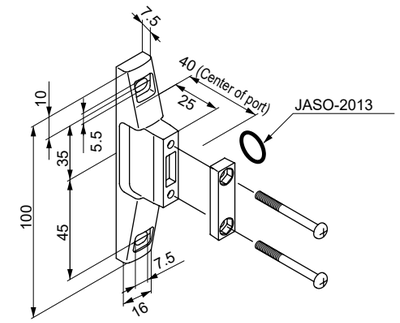


·Weight: 41 g
· Material: Iron
Trivalent chromate treatment

Body mounting dimensions Page 129.

●Model No. Notation Method T-bracket set

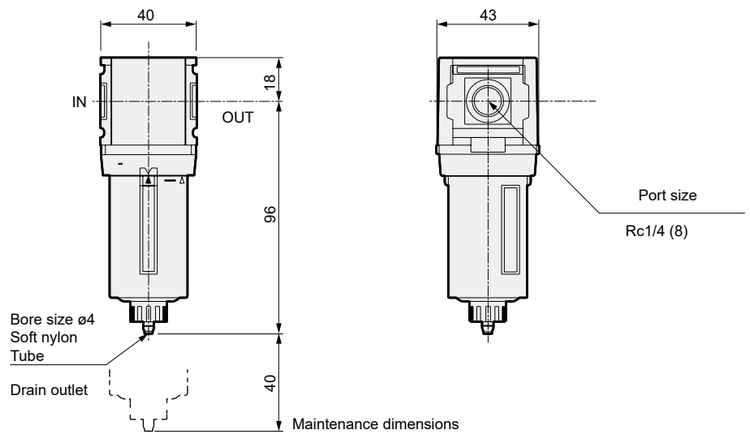
B110-W



·Weight: 24 g
· Material: Polyamide resin

●Model No. Notation Method air filter

F1000-8-W

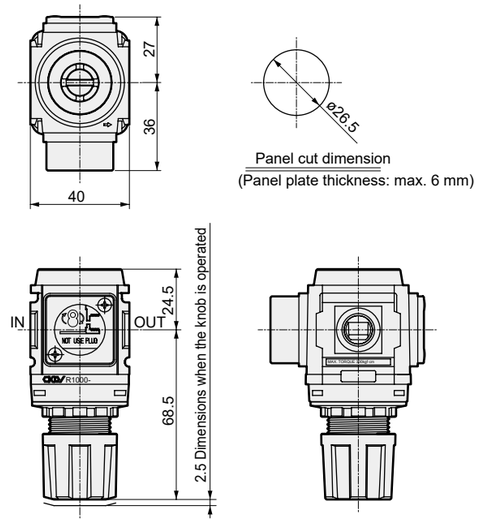


Weight: 87 g

Model No. Notation Method Peripheral components / Dimensions diagram

●Model No. Notation Method regulator

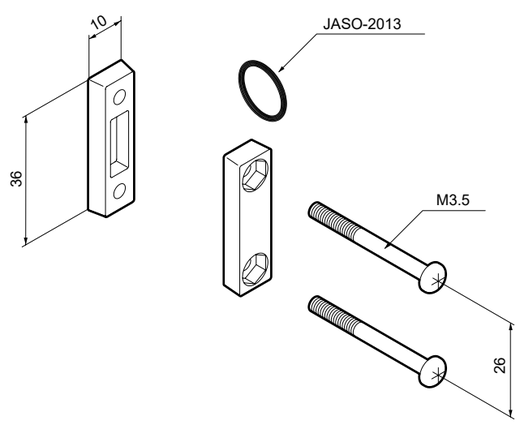
R1000-8-W-LT



Weight: 150 g

●Model No. Notation Method joiner set

C1000-J100-W

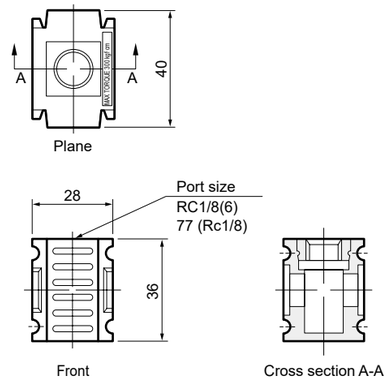


·Weight: 11 g
· Material: Polyamide resin

●Model No. Notation Method distributor

D101-00-8-W

Note: A joiner set and one gasket are attached.



·Weight: 45 g
· Material: Polyamide resin

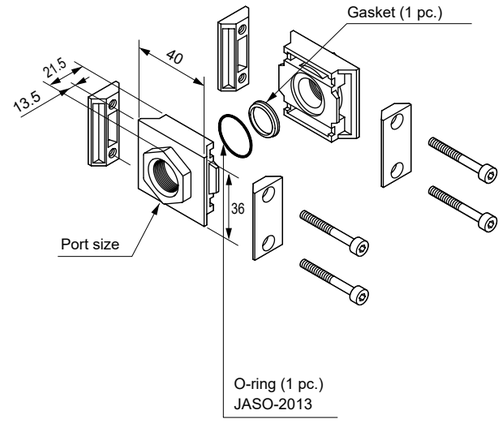
Model No. Notation Method Peripheral components / Dimensions diagram

●Pipe adaptor set
(with joiner set)

A100-8-W
❶Port size

❶Port size

Code	Description
8	Rc1/4
10	Rc3/8



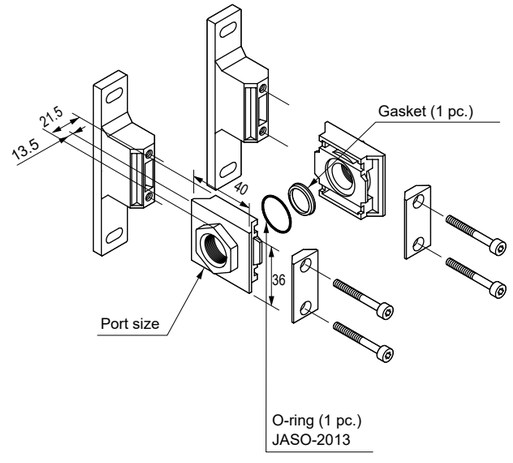
·Weight: 90 g
·Material: Aluminum alloy die-casting
Painted

●Pipe adaptor set
(with T-bracket set)

A100-8-W-B11W
❶Port size

❶Port size

Code	Description
8	Rc1/4
10	Rc3/8



·Weight: 90 g
·Material: Aluminum alloy die-casting
Painted

Model No. Notation Method Peripheral components / Dimensions diagram

Solenoid valve with needle

GPS2-AB3X-**2E**-FL-**AC100V**

❶Terminal box ❷Voltage

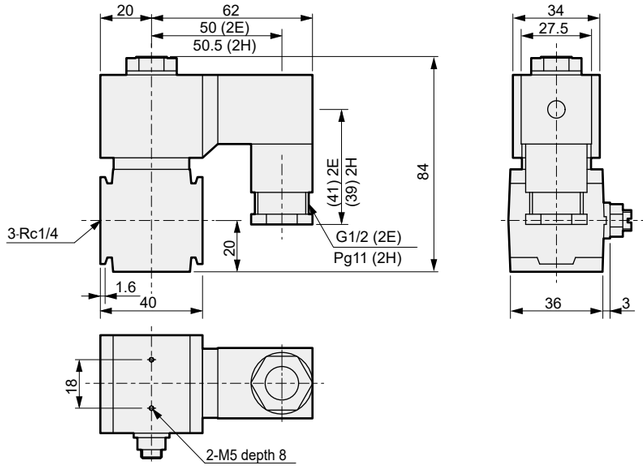
❶Terminal box

Code	Description
2E	DIN terminal box
2H	DIN terminal box with lamp
3N	HP terminal box with lamp

❷Voltage

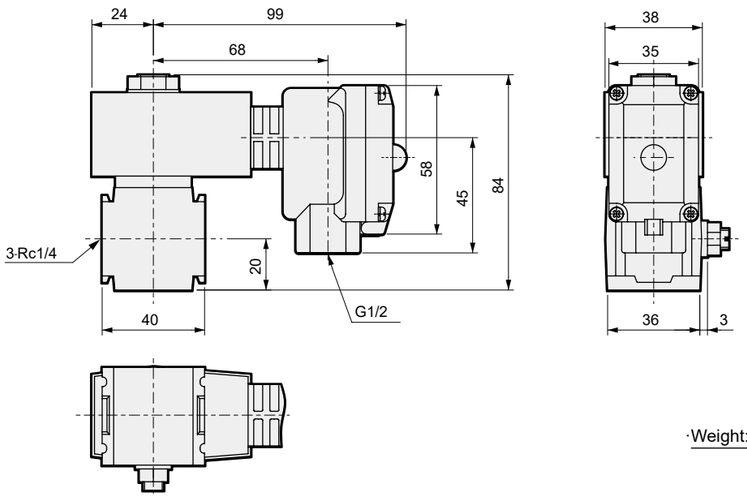
Code	Description
AC100V	100 VAC
AC200V	200 VAC
AC24V	24 VDC

●GPS2-AB3X-2E/2H-FL-AC100V/AC200V



·Weight: 280 g

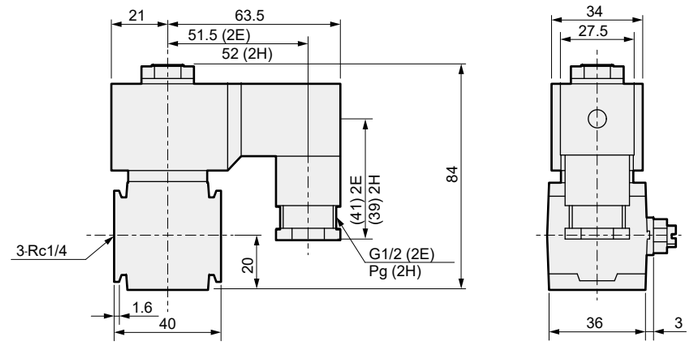
●GPS2-AB3X-3N-FL-AC100V/AC200V

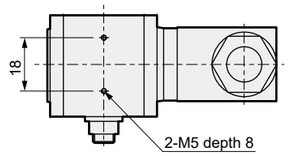


·Weight: 445 g

Model No. Notation Method Peripheral components / Dimensions diagram

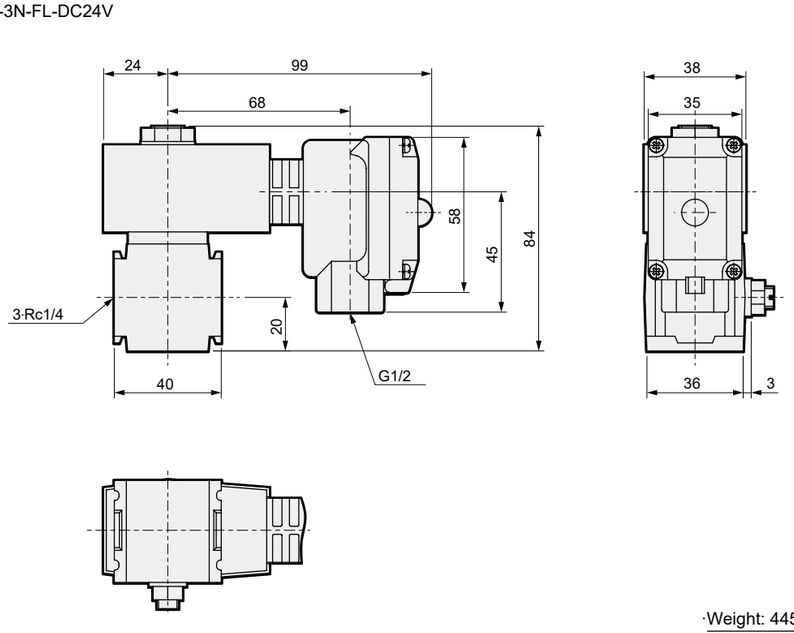
●GPS2-AB3X-2E/2H-FL-DC24V





·Weight: 280 g

●GPS2-AB3X-3N-FL-DC24V



·Weight: 445 g

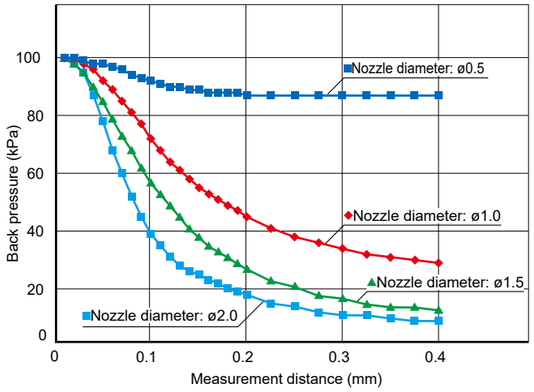
Characteristics data

Each property data is data of GPS2 single unit

●Back pressure characteristics 1 - change of nozzle diameter

Measuring conditions

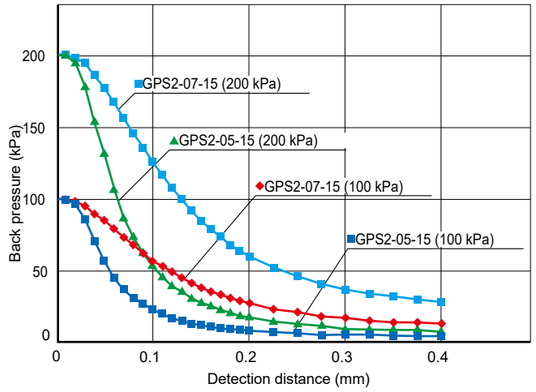
- Model No.: GPS2-07-15, Bore size: ø6 × ø4, Pipe length: 5 m
- Setting distance: 0.1 mm, Average supply pressure: 100 kPa



●Back pressure characteristics 2 - GPS2 difference in model

Measuring conditions

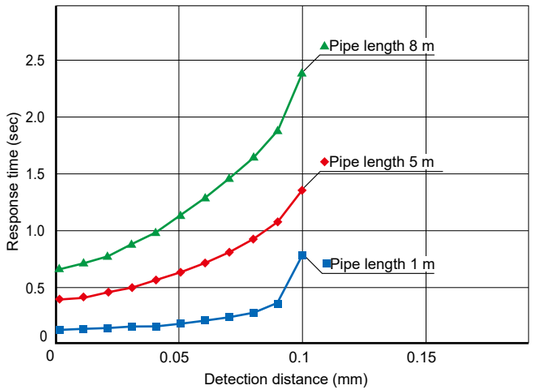
- Bore size: ø6 × ø4
- Pipe length: 5 m
- Nozzle diameter: ø1.5, Setting distance: 0.1 mm



●Response time 2 - influence by pipe length (OFF → ON)

Measuring conditions

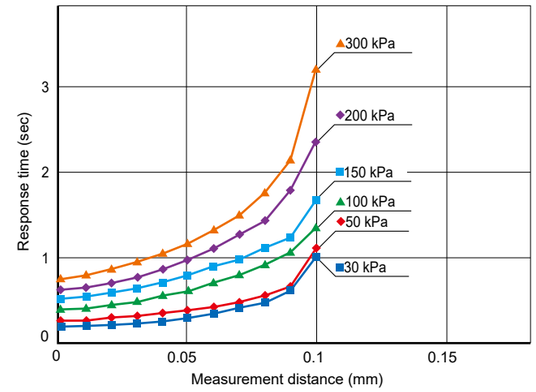
- Model No.: GPS2-07-15, Port size: ø6 × ø4
- Nozzle diameter: ø1.5
- Supply pressure: 100 kPa



●Response time 2 - influence by supply pressure (OFF → ON)

Measuring conditions

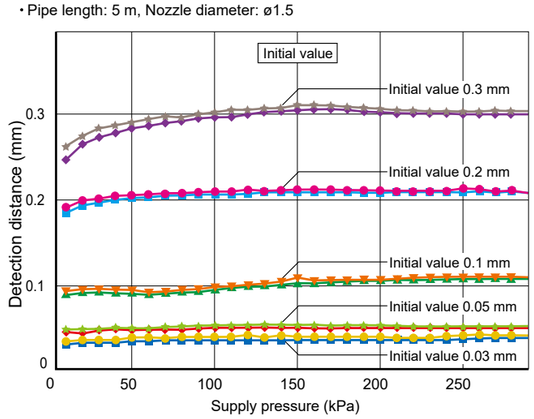
- Model No.: GPS2-07-15, Port size: ø6 × ø4
- Nozzle diameter: ø1.5, Pipe length: 5.0 m, Setting distance: 0.1 mm



●Supply pressure change - recommended range 50 to 200 kPa

Measuring conditions

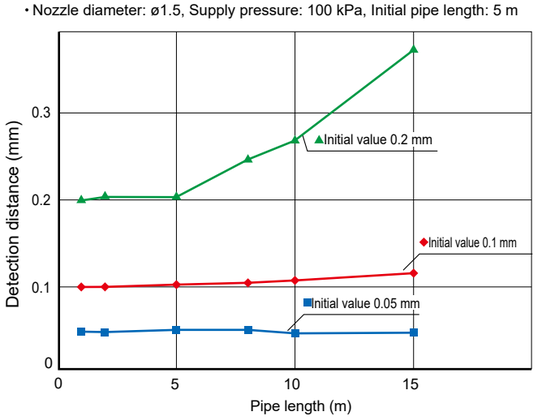
- Model No.: GPS2-07-15, Port size: ø6 × ø4
- Pipe length: 5 m, Nozzle diameter: ø1.5



●Influence to initial setting distance by pipe length

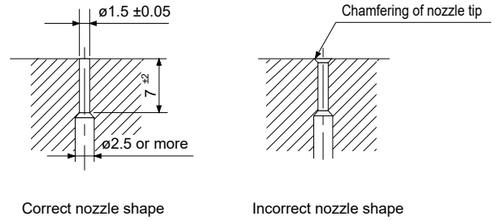
Measuring conditions

- Model No.: GPS2-07-15, Port size: ø6 × ø4
- Nozzle diameter: ø1.5, Supply pressure: 100 kPa, Initial pipe length: 5 m



Design of detection nozzle

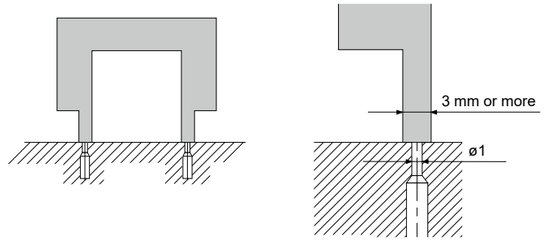
●Single hole nozzle



Design the detection nozzle with a point size of ø1.5 mm and depth of 7 ±2 mm. The blow-off section of the nozzle cannot be chamfered. If chamfered, the nozzle retracts from the seating place, and the scale on the adjustment dial and actual dimensions do not match.

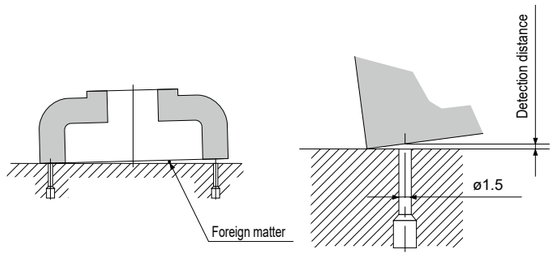
Selection of detection nozzle diameter

●When the workpiece detection surface is narrow - nozzle diameter ø1 and width is less than 3 mm, please contact us.



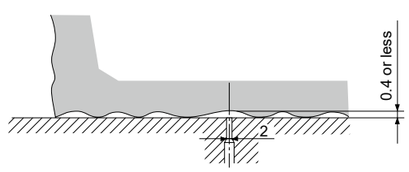
- Use with a detection distance of 0.1 mm or less.
- Use with a workpiece surface roughness of Rz=5 or less
- Check that nozzle does not separate from the detection surface.

●When the workpiece detection surface is sufficiently wide: Use ø1.5 mm nozzle.



- Use with a detection distance of 0.2 mm or less.
- Use with a workpiece surface roughness of Rz=5 or less

●When detecting the presence of a workpiece with a rough detection surface: Use ø1.5 mm or ø2.0 mm nozzle.



- The max. detection distance of the GPS2 is 0.4 mm. The workpiece cannot be detected if non-uniformity exceeds 0.4 mm. In that case, use the HPS-10.

Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

Contact confirmation switch (gap switch) GPS2 Series

During Design and Selection

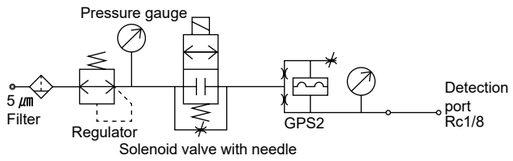
⚠WARNING

■Use the product in the range of conditions specified for the product. Contact CKD when using the product outside specifications or for special applications.
Use of the product outside the specifications range may result in insufficient performance, and its safety cannot be guaranteed.

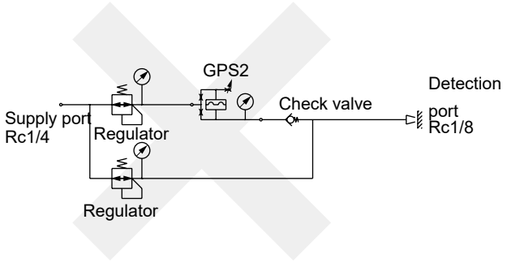
■Confirm before use that the product will withstand the working environment.
- This product cannot be used in environments where functional obstacles could occur.
- The main materials of this product are aluminum and resin. Do not use in atmospheres where corrosive gases are generated. Such environments include high temperatures, chemical atmospheres, where chemical liquids, vibration, moisture, water dripping, coolant, or gas is present; where ozone is generated; chemical plants, semiconductor pre-processing, outdoors, etc.
- Compressed air quality must satisfy JIS1.4.1, "oilless clean dry air."

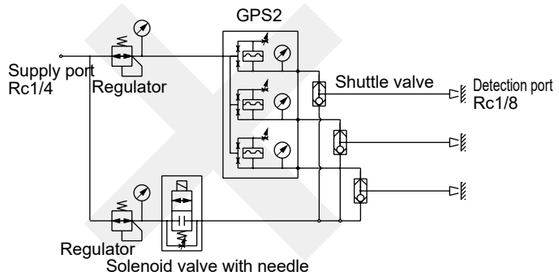
■Understand compressed air features before designing a pneumatic circuit.
This product has a small orifice, so to prevent the entry of foreign matter, use clean air with the recommended circuit shown below (Fig. 1).

Fig. 1 Recommended circuit



■Do not use the following air circuit when blowing air from the detection nozzle.
- Circuit with check valve
  The check valve acts as exhaust resistance, and limits the adjustable range.
- Circuit with shuttle valve and 2-way valve
  Residual pressure in the OUT side of the 2-way valve prevents a correct detection. Even if a 3-way valve is used, the shuttle valve may vibrate excessively.





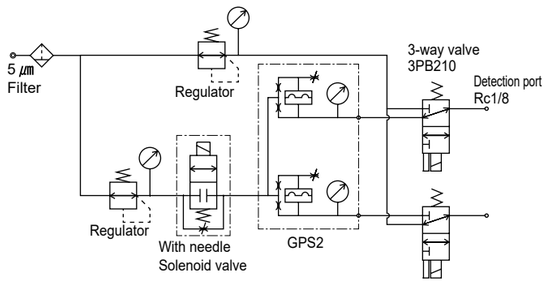
⚠CAUTION

■The entry of compressor oil and tarry substances may obstruct the flow of air and result in problems. Regularly inspect the compressor and discharge drainage.

■Keep the air flow constant so coolant and oil do not flow back from the detection nozzle, or use a solenoid valve with needle and let in a small amount of air from the bypass as shown in the recommended circuit (Fig. 1).

■Swarf and grinder chips, etc., could clog the nozzle. Increasing the supply pressure to blow these out will have no effect. Provide a 3-way valve on the pressurized nozzle as shown below (Fig. 2). The orifice for the 3-way valve should be ø2.5 mm or larger.

Fig. 2 Circuit for detection and air blow



■Select an output format (NPN, PNP) matching the input unit of the programmable controller being used.

■Operation may be disabled if a capacitance load such as an AC/DC buzzer is connected to the load. Turn power OFF and restart in this case. A protection circuit is provided to prevent damage from incorrect wiring or overcurrent. A relay must be used when connecting a capacitance load.

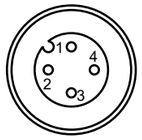
■GPS2 Precautions
- Detection side — Use inner diameter ø4 and outer diameter ø6 for piping.
- An air bridge circuit is used for this product. Even if the fine air solenoid valve is turned OFF, Even if the fine air solenoid valve is turned OFF, the output is not turned OFF, which is the same for the conventional pressure switch. Output is ON—OFF according to the pressure of a workpiece. Care must be taken when creating the program. If the program has already been created and cannot be changed, stop the fine air. Note that a delay of one second occurs when output is ON—OFF.
- Pressure switch and solenoid valve with fine air
  When the fine air solenoid valve is ON → Workpiece absent: OFF Workpiece present: ON
  When the fine air solenoid valve is OFF → Workpiece absent: OFF Workpiece present: OFF
- GPS2 and solenoid valve with fine air
  When the fine air solenoid valve is ON → Workpiece absent: OFF Workpiece present: ON
  When the fine air solenoid valve is OFF → Workpiece absent: OFF Workpiece present: ON

■Observe the following items when installing:
- Install this product so the detection port faces downward.
- Install this product at a position higher than the seating surface to prevent coolant from entering.
- Provide enough space for adjustment, monitoring, and maintenance.
- Use rust-resistant material such as nylon tubes or stainless steel pipes for piping material.
- When installing this product on a device, check that no load is applied to the device.
- When using steel pipes, securely fix the pipe to prevent excessive bending force from being applied to the connection.
- When welding near this product, cover it to prevent spatter from coming in contact.
- When housing this product in a box, provide an exhaust port so atmospheric pressure is maintained in the box.

■Observe the following items when wiring:
- When using a switching regulator for the power supply, ground the F.G. (frame ground).
- Avoid using in a transient state, continuing 1s after power is turned ON.
- Take special care to prevent load short-circuits or incorrect wiring. The protective circuit is activated. Turn power OFF to restart the product.
- Connector pins are arranged as shown in Fig. 3. Take special care to prevent incorrect wiring.

Brown → 24 VDC
Blue → 0 VDC
Black → signal, open collector

Fig. 3 Connector pin array (body side)

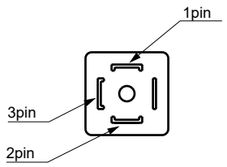


PIN array/lead wire color list

PIN No.	Electrical connection option (-C1, -C3, -C5) lead wire color	Applications
1pin	Brown	Power supply +
2pin	White	NC
3pin	Blue	Power supply -
4pin	Black	Output

The assignment of the DIN terminal box terminal numbers is shown in Fig. 4.

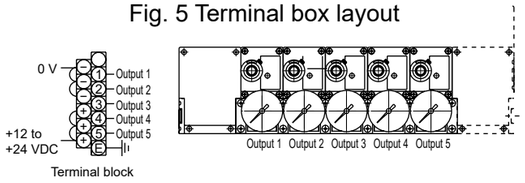
Fig. 4 DIN terminal box pin array (body side)



PIN No.	Applications
1pin	Power supply +
2pin	Power supply -
3pin	Output

When using the common terminal box, power supply terminals are on the lower side of the gland. Signal wire terminals are on the upper row. This product is wired as shown in Fig. 5.

Fig. 5 Terminal box layout



When using a load with a large rush current, such as a motor, the protection circuit will activate. In this case, use a relay.

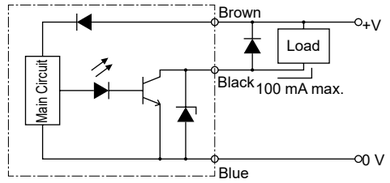
If there is a device (motor, welder) that generates a large surge near this product, insert a surge absorber, such as a varistor, at the source of the surge.

If this product's lead wire is wired with the drive cable or power cable, it is affected by surge and noise deteriorating or damaging the sensor element in the switch. Use separate wiring.

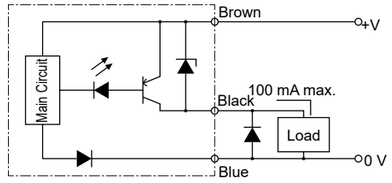
NPN output and PNP output contact confirmation switches are available. The lamp turns ON even if program controller compliance is incorrect, but signals are not retrieved. Wire the switch based on the output as shown in Fig. 6.

Fig. 6 Output circuit

(NPN output)



(PNP output)



■Handling the gap adjustment dial

The detection distance is stamped on the adjustment dial. Red indicates 0.05 mm, blue 0.1 mm, and yellow 0.2 mm. Shipment inspection is done with a 1.5 mm detection nozzle diameter, and a 5 m long 4 mm bore nylon tube. Use the following table when not using the standard nozzle of ø1.5.

◎ Relation between dial scale and detection distance

The following table is a guide for when the following conditions are applied.

(Conditions) Supply pressure: 100 kPa

Piping: ø6 × ø4 tube, length 5 m

[GPS2-05-15]

		Detection distance (mm)			Change in detecting distance per notch (mm)
Detection nozzle diameter		ø1.0	ø1.5	ø2.0	ø1.0 to ø2.0
Scale line	1 (Red wire)	0.07	0.05	0.03	0.005
	2 (Blue wire)	0.14	0.09	0.06	0.005 to 0.007
	3 (Yellow)	−	0.20	0.14	0.008 to 0.010

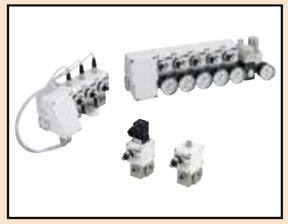
[GPS2-07-15]

		Detection distance (mm)			Change in detecting distance per notch (mm)
Detection nozzle diameter		ø1.0	ø1.5	ø2.0	ø1.0 to ø2.0
Scale line	1 (Red wire)	0.07	0.05	0.03	0.005
	2 (Blue wire)	0.15	0.10	0.06	0.005 to 0.007
	3 (Yellow)	−	0.20	0.13	0.008 to 0.010

■One detection nozzle can be used for one of these product units.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual

MEMO



Close contact confirmation switch

HPS, MHPS, UHPS Series

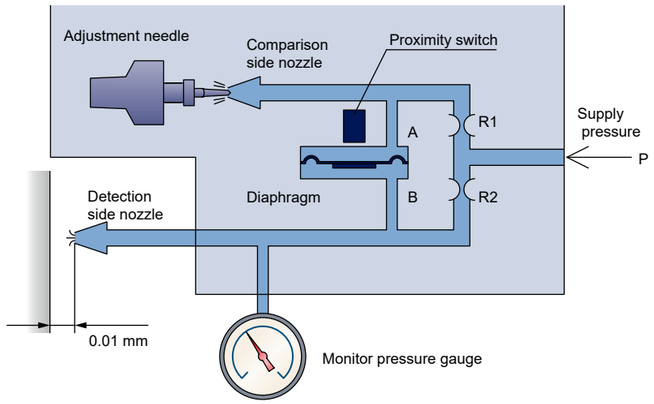
Overview

- The close contact confirmation switch HPS Series incorporates a highly accurate needle mechanism to enable highly accurate detection for contact confirmation, etc.
- With various special nozzles, this switch is used for a variety of position detections.

Features

- High precision
  Highly accurate variable-adjustment is possible with the precise linear needle.
  Min. detection distance 0.01 mm
  Resolution ±0.005 mm
- Low air consumption
  This switch is used with low pressure so air consumption is reduced.
- Lock mechanism with dial scale
  The position is adjusted easily with no need to worry about deviation.
- Modularization
  Modularization makes it easy to connect to the CKD module connection component.
- High stability
  Stable detection, unaffected by fluctuations in supply pressure, is possible with the air bridge circuit.
- Environment conditions
  IP67 degree of protection is resistant to spattering coolant and other substances.
- Special nozzle usable
  The detection distance is 3 mm with the back pressure nozzle.

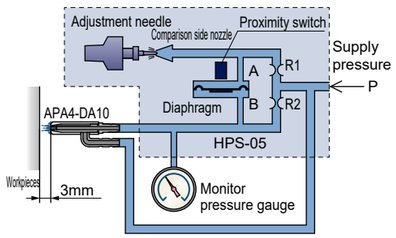
Close contact confirmation switch principle drawing



Operational explanation

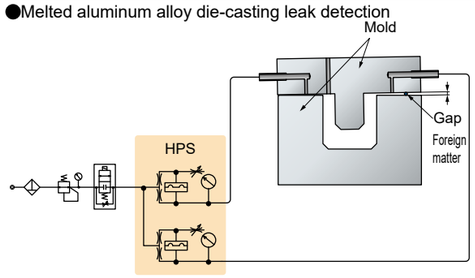
- HPS body
  The compressed air pressurized in supply port P passes through orifice R1 and R2 of the air bridge circuit, and flows to nozzles on the comparison and detection sides. When the detection side nozzle clearance becomes smaller than the clearance set with the adjustment needle within the comparison side nozzle, back pressure reverses and pushes up the diaphragm. This activates the proximity switch and generates an electrical signal.

- Back pressure nozzle
  The detection air is diffused as the clearance widens, and returns to atmospheric pressure at 0.7 mm when using the single-hole nozzle. However, if the outside circumference of the detection nozzle is shielded with air from another system, the detection air is not diffused as easily, making it possible to detect up to 3 mm.

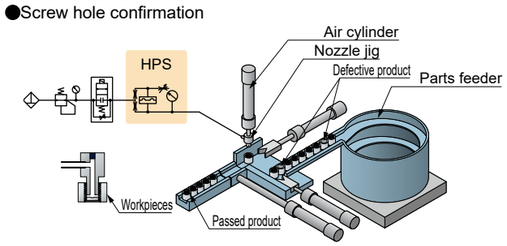


Applications

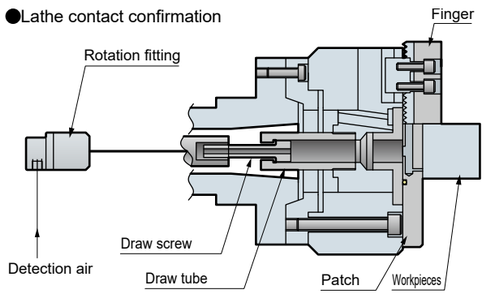
●Melted aluminum alloy die-casting leak detection



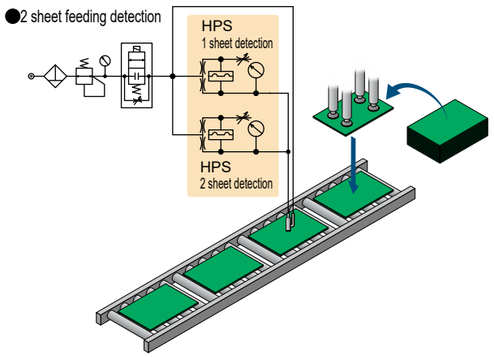
●Screw hole confirmation



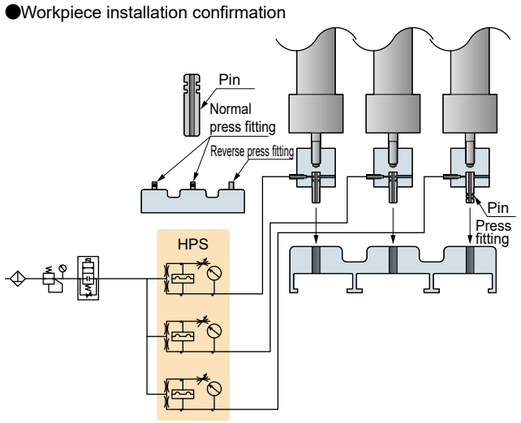
●Lathe contact confirmation



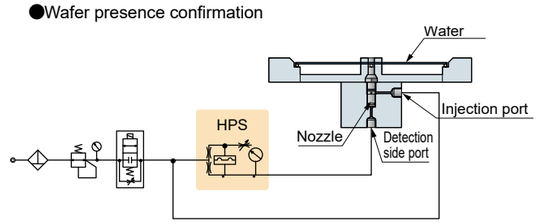
●2 sheet feeding detection



●Workpiece installation confirmation



●Wafer presence confirmation





Close contact confirmation switch, single unit

HPS Series

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

HPS - 05 - N G TL - B - G2

- HPS: Model No.
- 05: ❶Orifice size
- N: ❷Output style
- G: ❸Lamp color
- TL: ❹Electrical connection option
- B: ❺Bracket
- G2: ❻Pressure gauge

*1: For model No. of back pressure nozzles, refer to P. 174.
*2: For option and model numbers of related components, refer to P. 168 to 173.

❶Orifice size

Code	Description
05	ø0.5
07	ø0.7
10	ø1.0

❷Output style

Code	Description
N	NPN open collector
P	PNP open collector

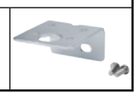
❸Lamp color

Code	Description
G	Green
Y	Yellow

❹Electrical connection option

Code	Description	
F	DIN terminal box (Pg11)	
C0	Connector	Without cable
C1		Cable 1 m attached
C3		Cable 3 m attached
C5		Cable 5 m attached
CTL	Connector common terminal box	Left side assembly
CTR		Right side assembly
TL	Lead wire common terminal box	Left side assembly
TR		Right side assembly
R	Lead wire direction right (left end for mounting)	
L	Lead wire direction left (right end for mounting)	
W	Lead wire direction both sides (intermediate for mounting)	

❺Bracket

Code	Description	
Blank	Without bracket	
B	With bracket	

❻Pressure gauge

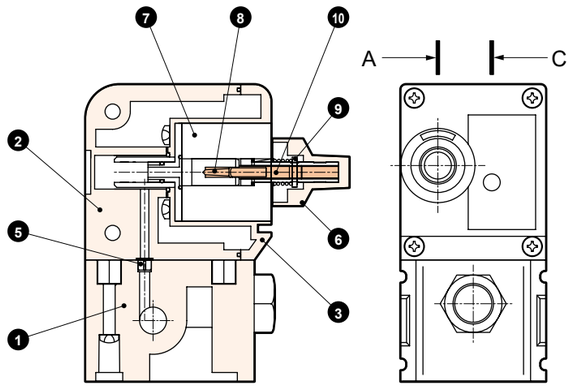
Code	Description
Blank	No pressure gauge
G2	Pressure gauge with safety marker included (G40D-8-P02-S501)
GW2	Pressure gauge assembly with safety marker (G40D-8-P02-S501)

Specifications

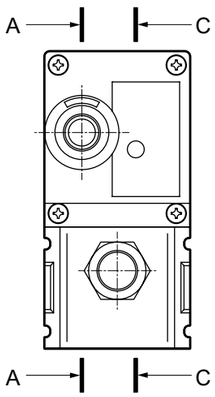
Item		HPS-05	HPS-07	HPS-10
Orifice size	mm	ø0.5	ø0.7	ø1.0
Working pressure	*1 kPa	50 to 200	50 to 200	100 to 200
Detection range	mm	0.01 to 0.2	0.02 to 0.3	0.05 to 0.7
Repeatability	mm	±0.005 (detection range 0.01 to 0.1)	±0.005 (detection range 0.02 to 0.1)	±0.02 (detection range 0.05 to 0.3)
Hysteresis	mm	0.005 or less (detection range 0.01 to 0.1)	0.005 or less (detection range 0.02 to 0.1)	0.01 or less (detection range 0.05 to 0.3)
Detection nozzle	*2	Single hole nozzle ø1.5		
Power supply voltage	V	10.2 to 26.4 DC		
Current consumption	mA	15 or less (when using 24 VDC)		
Output style		NPN, PNP open collector		
Output rating		30 VDC, 100 mA or less		
Internal voltage drop	V	2.0 or less (using 100 mA)		
Indicator lamp		LED green or yellow		
Insulation resistance		10 MΩ and over at 500 VDC megger		
Withstand voltage		No failure after 1 minute at 1000 VAC		
Vibration resistance	m/sec^2	98		
Ambient temperature	°C	5 to 60		
Degree of protection	*3	IP67 equivalent (connector), IP64 equivalent (DIN terminal box)		
Tube mm		Inner diameter 4		
Port size		Detection port Rc1/8, Supply port Rc1/4,pressure gauge port Rc1/4		
Weight	g	300 (electrical connection option C0)		
Air consumption L/min (ANR)	50 kPa	6	11	-
	100 kPa	9	15	24
	200 kPa	14	24	38

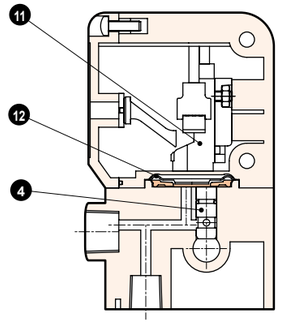
*1: If the nozzle clogs, working pressure should be set between 100 and 200 kPa.
*2: The above specifications apply to the detection nozzle with a ø1.5 single-hole nozzle.
*3: This product must be used under the following conditions:
(1) Piping and wiring must be completed and pressure applied.
(2) A waterproof bushing must be used on the wires to the terminal box.

Internal Structure Diagram / Material



A-A sectional view





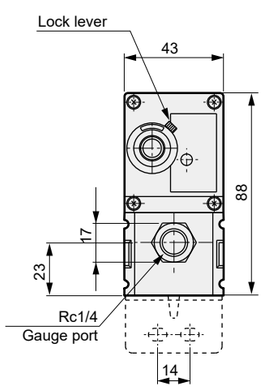
C-C sectional view

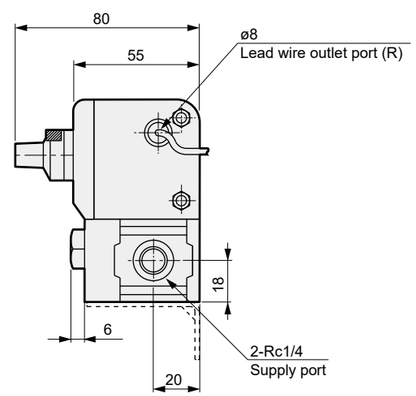
Part No.	Part name	Material	Part No.	Part name	Material
1	Base	Aluminum	7	Needle holder	Aluminum
2	Body	Polybutylene terephthalate	8	Needle	Stainless steel
3	Front cover	Polybutylene terephthalate	9	Pin	Piano wire
4	Orifice nozzle A	Brass	10	Needle shaft	Brass
5	Orifice nozzle B	Brass	11	Proximity switch	-
6	Dial	Aluminum alloy, polyamide, etc.	12	Diaphragm	HNBR

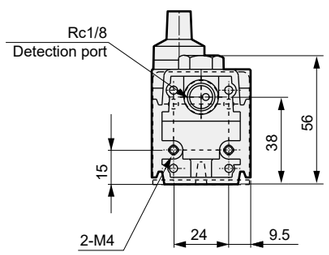
Dimensions

●Basic

●HPS-□-□□□ R / L / W





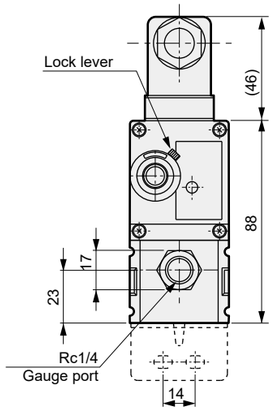


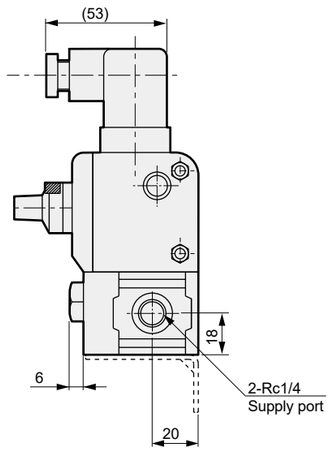
·Weight: 300 g

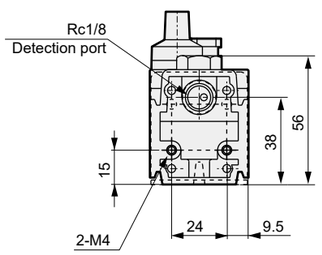
Note: Bracket and pressure gauge options are not included.

●DIN terminal box

● HPS-□-□□□F





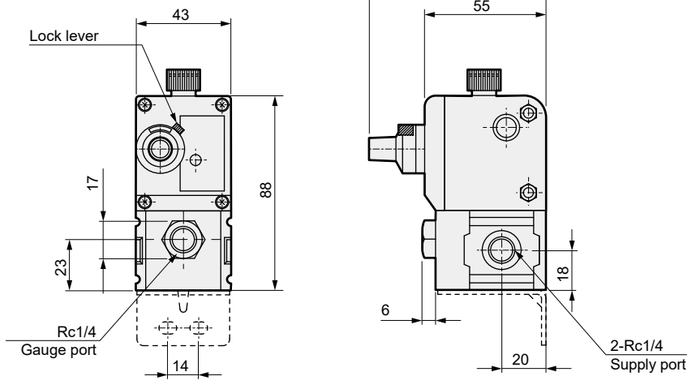


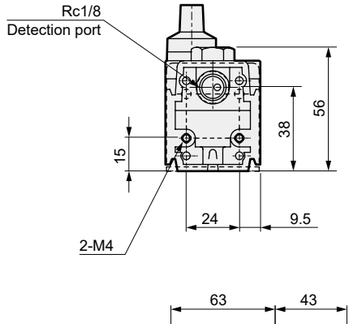
·Weight: 340 g

Note: Bracket and pressure gauge options are not included.

Dimensions

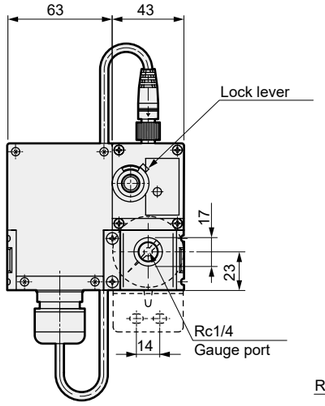
●Connector
● HPS-□-□□□ C0 C1 C3 C5

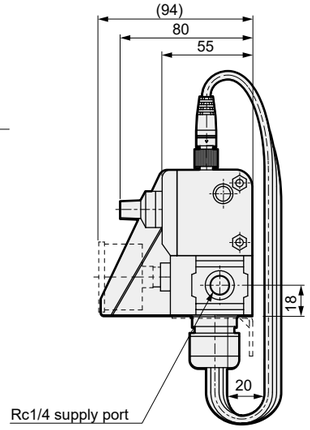




·Weight: 300 g (for C0)
*1: Bracket and pressure gauge options are not included.
*2: The "C1", "C3", and "C5" cables are attached.
(For the cable weight, refer to the option pages.)

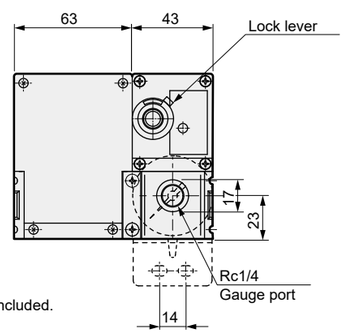
●Connector common terminal box
● HPS-□-□□□ CTL (CTR)

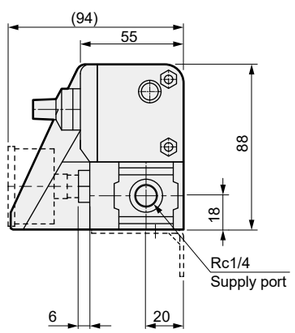




·Weight: 583 g
Note: Bracket and pressure gauge options are not included.

●Lead wire common terminal box
● HPS-□-□□□ TL (TR)





·Weight: 513 g
Note: Bracket and pressure gauge options are not included.

●For information on Options and Peripheral Dimensions diagrams, refer to P. 168 to 173.

MEMO

Pressure switch
Electronic pressure Switch
Contact Confirm Switch
For Coolant Pressure Switch
Ending



Close contact confirmation switch manifold

MHPS Series

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

MHPS - 05 - 2 N Y TL - B - G2

- MHPS: Model No.
- 05: ❶Orifice size
- 2: ❷Station No.
- N: ❸Output style
- Y: ❹Lamp color
- TL: ❺Electrical connection option
- B: ❻Bracket
- G2: ❼Pressure gauge

*1: For model No. of back pressure nozzles, refer to P. 174.
*2: For option and model numbers of related components, refer to P. 168 to 173.

❶Orifice size

Code	Description
05	ø0.5
07	ø0.7
10	ø1.0

❷Station No.

Code	Description
2	2 stations
3	3 stations
4	4 stations
5	5 stations

❸Output style

Code	Description
N	NPN open collector
P	PNP open collector

❹Lamp color

Code	Description
G	Green
Y	Yellow

❺Electrical connection option

Code	Description		Degree of Protection (*1)
F	DIN terminal box (Pg11)		IP 64 or equiv.
C0	Connector	Without cable	IP 67 or equiv.
C1		Cable 1 m attached	
C3		Cable 3 m attached	
C5		Cable 5 m attached	
CTL	Connector common terminal box	Left side assembly	IP 67 or equiv.
CTR		Right side assembly	
TL	Lead wire common terminal box	Left side assembly	IP 66 or equiv.
TR		Right side assembly	
T1		Left 1st	
T2		2nd from left	
T3		Left 3rd	
T4		Left 4th	

*1: The degree of protection should be used under the following conditions:
(1) Piping and wiring must be completed and pressure applied.
(2) A waterproof bushing must be used on the wires to the terminal box.

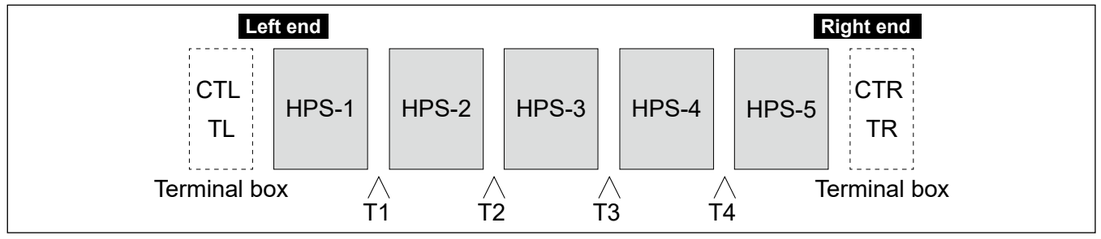
❻Bracket

Code	Description	
Blank	Without bracket	
B	With bracket	

❼Pressure gauge

Code	Description
Blank	No pressure gauge
G2	Pressure gauge with safety marker attached (G40D-8-P02-S501)
GW2	Pressure gauge assembly with safety marker (G40D-8-P02-S501)

Terminal box installation position relation diagram

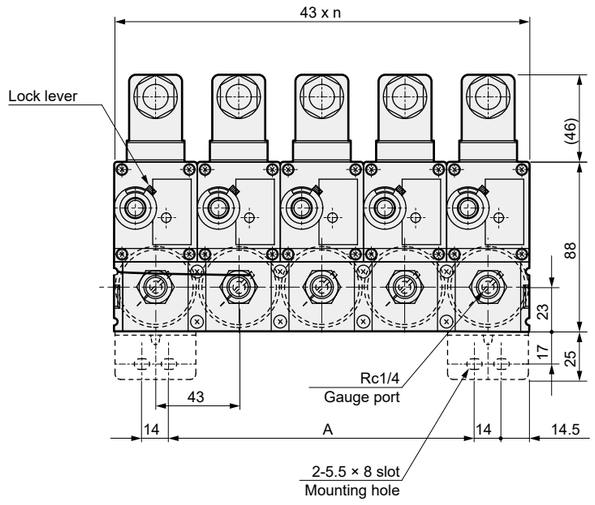


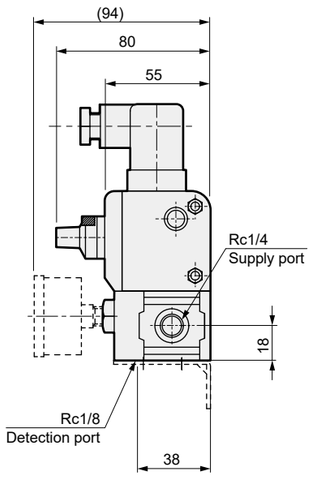
Specifications

Basic specifications are the same as the Discrete on page 155.

Dimensions

●Manifold (DIN terminal box: F)
●MHPS-□-□□□F





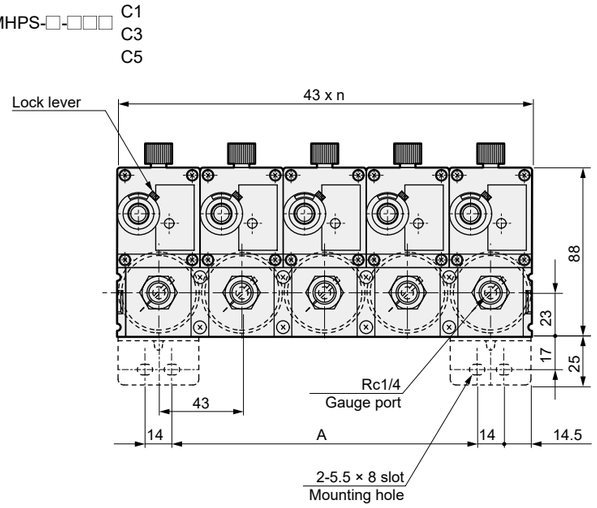
Station No.	n	A	Weight g
2 stations	2	29	680
3 stations	3	72	1030
4 stations	4	115	1370
5 stations	5	158	1710

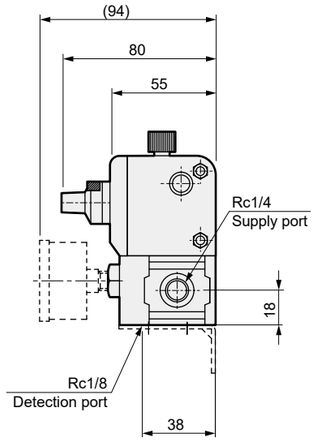
Note: Bracket and pressure gauge (option) are not included.

Dimensions

●Manifold (connector: C□)

●MHPS-□-□□□ C0 C1 C3 C5





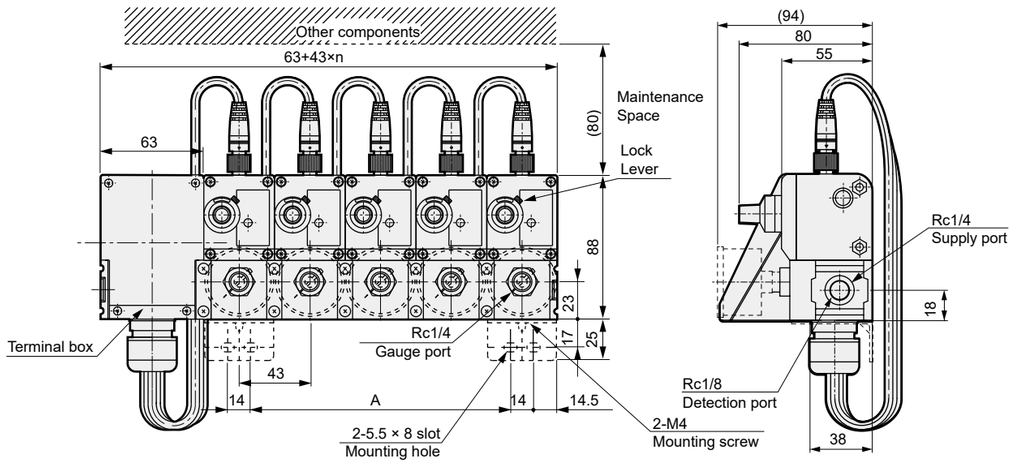
(For C0)

Station No.	n	A	Weight (g)
2 stations	2	29	590
3 stations	3	72	890
4 stations	4	115	1190
5 stations	5	158	1490

*1: Bracket and pressure gauge (option) are not included.
*2: The "C1", "C3", and "C5" cables are attached.
(For the cable weight, refer to the option pages.)

●Manifold (connector common terminal box: CTL/CTR)

●MHPS-□-□□□ CTL (CTR)



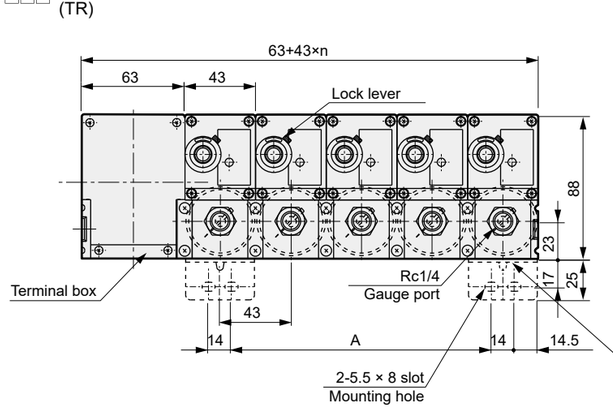
Station No.	n	A	Weight (g)
2 stations	2	29	930
3 stations	3	72	1270
4 stations	4	115	1620
5 stations	5	158	1980

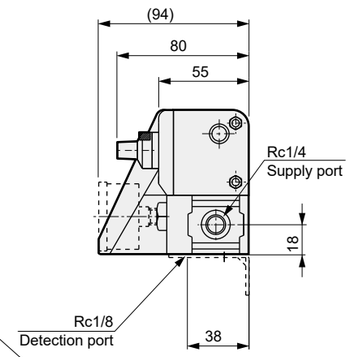
Note: Bracket and pressure gauge (option) are not included.

Dimensions

●Manifold (lead wire common terminal box: TL/TR)

●MHPS-□-□□□ TL (TR)





Station No.	n	A	Weight (g)
2 stations	2	29	830
3 stations	3	72	1140
4 stations	4	115	1460
5 stations	5	158	1770

Note: Bracket and pressure gauge (option) are not included.

●For Options and Peripheral dimensions diagram, refer to P. 168 to 173.



Close contact confirmation switch unit

UHPS Series

●Solenoid valve with needle, regulator integrated general purpose unit

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

UHPS - 05 - 2 N G TL - B - GW2 - 2H - 1

- Model No.
- ❶Orifice size
- ❷Station No.
- ❸Output style
- ❹Lamp color
- ❺Electrical connection option
- ❻Bracket
- ❼Pressure gauge
- ❽Solenoid valve electrical connection
- ❾Solenoid valve voltage

*1: For model No. of back pressure nozzles, refer to P. 174.
*2: For option and model numbers of related components, refer to P. 168 to 173.

❶Orifice size

Code	Description
05	ø0.5
07	ø0.7
10	ø1.0

❷Station No.

Code	Description
1	1 station
2	2 stations
3	3 stations
4	4 stations
5	5 stations

❸Output style

Code	Description
N	NPN open collector
P	PNP open collector

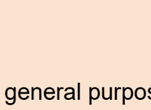
❹Lamp color

Code	Description
G	Green
Y	Yellow

❺Electrical connection option

Code	Description	
F	DIN terminal box (Pg11)	
C0	Connector	Without cable
C1		Cable 1 m attached
C3		Cable 3 m attached
C5		Cable 5 m attached
CTL	Connector common terminal box	Left side assembly
CTR		Right side assembly
TL	Lead wire common terminal box	Left side assembly
TR		Right side assembly

❻Bracket

Code	Description	
Blank	Without bracket	
B	With bracket	

❼Pressure gauge

Code	Description
Blank	Without (*1)
GW2	Pressure gauge assembly with safety marker (G40D-8-P02-S501)

*1: Regulator pressure gauge is also provided.

❽Solenoid valve electrical connection

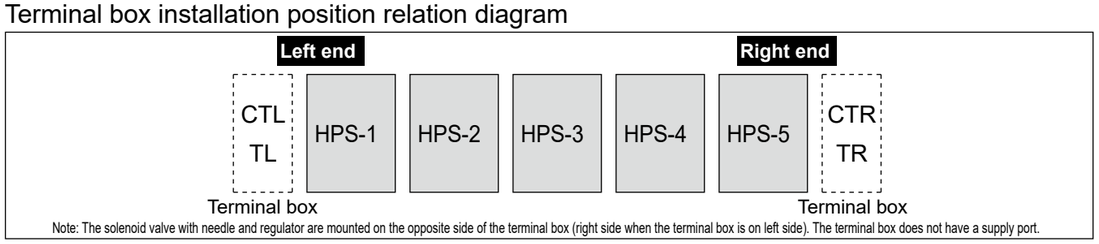
Code	Description
2E	DIN terminal box
2H	DIN terminal box with lamp
3N	HP terminal box with lamp

Note: When CE-Marking/UKCA-compatible, select from "2E" and "2H".

❾Solenoid valve voltage

Code	Description
1	100 VAC
2	200 VAC
3	24 VDC

Terminal box installation position relation diagram



Note: The solenoid valve with needle and regulator are mounted on the opposite side of the terminal box (right side when the terminal box is on left side). The terminal box does not have a supply port.

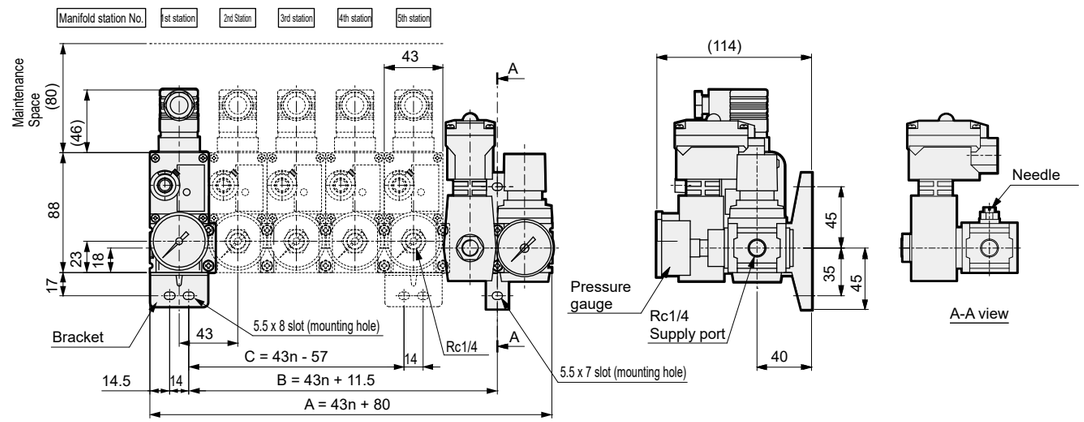
Specifications

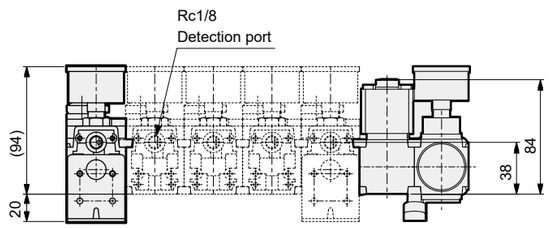
Basic specifications are the same as the Discrete on page 155.

Dimensions

●Unit (DIN terminal box: F)

●UHPS-□-□□□F





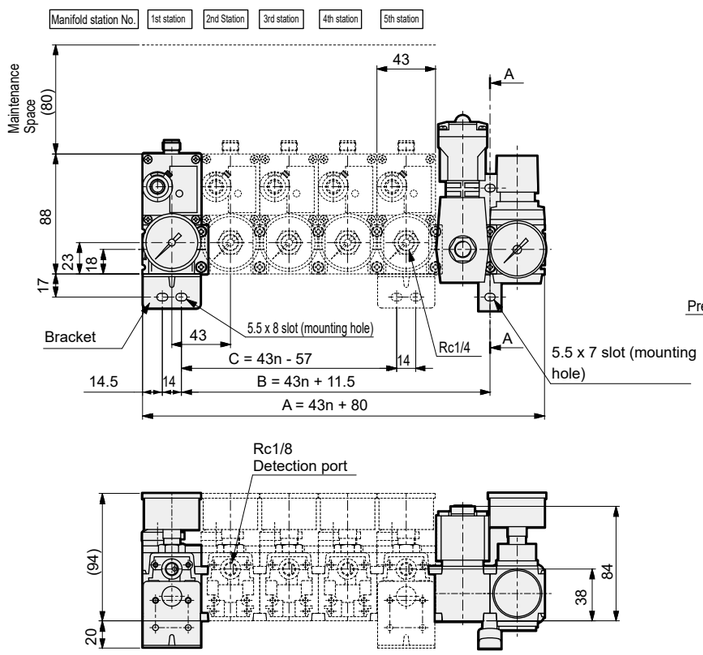
		Station No.				
		1	2	3	4	5
Dimensions (mm)	A	123	166	209	252	295
	B	54.5	97.5	140.5	183.5	226.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2
Weight (g)		1020	1360	1750	2090	2440

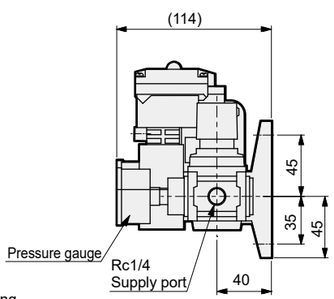
*1: pressure gauge option is not included.
*2: When solenoid valve is electrical connection "3N".

Dimensions

●Unit (connector: C□)

●UHPS-□-□□□ C0 C1 C3 C5





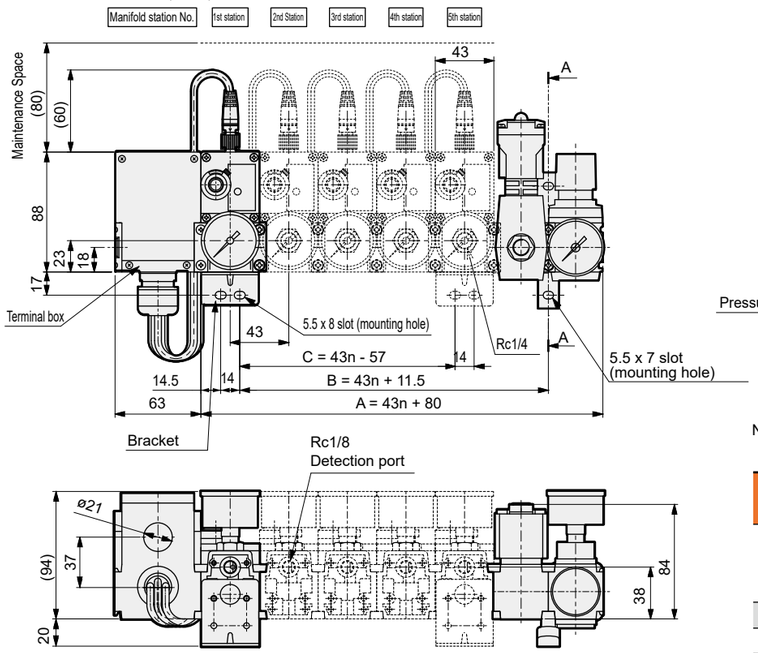
Note: Refer to the "A-A view" on page 165 for needle position.

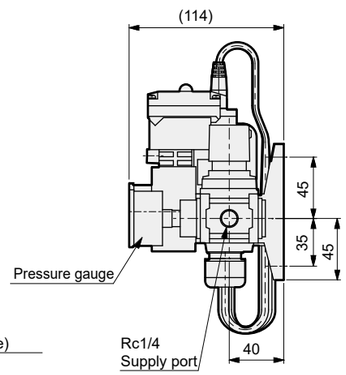
		Station No.				
		1	2	3	4	5
Dimensions (mm)	A	123	166	209	252	295
	B	54.5	97.5	140.5	183.5	226.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2
Weight (For C0) g		970	1270	1620	1920	2220

*1: pressure gauge option is not included.
*2: When solenoid valve is electrical connection "3N".
*3: The "C1", "C3", and "C5" cables are attached.
(For the cable weight, refer to the option pages.)

●Unit (connector common terminal box: CTL/CTR)

●UHPS-□-□□□ CTL (CTR)





Note: Refer to the "A-A view" on page 165 for needle position.

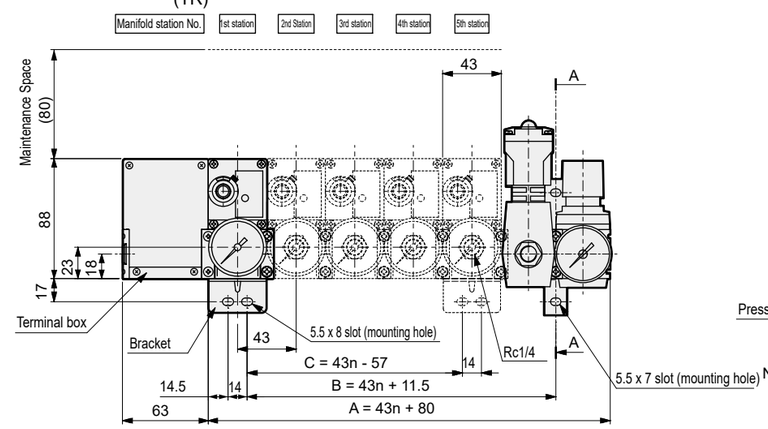
		Station No.				
		1	2	3	4	5
Dimensions (mm)	A	123	166	209	252	295
	B	54.5	97.5	140.5	183.5	226.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2
Weight (g)		1260	1610	1990	2340	2700

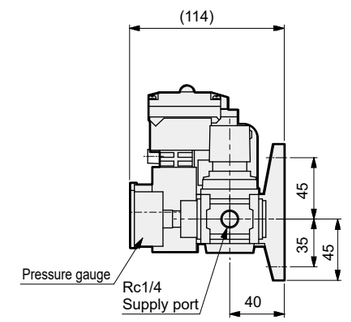
*1: pressure gauge option is not included.
*2: When solenoid valve is electrical connection "3N".

Dimensions

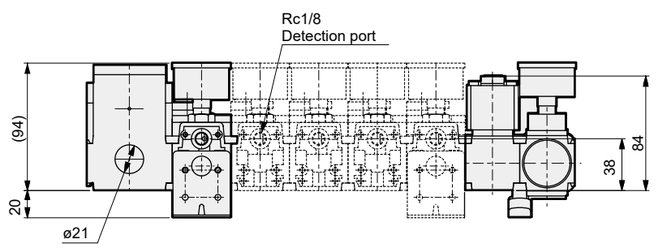
●Unit (lead wire common terminal box: TL/TR)

●UHPS-□-□□□ TL (TR)





Note: Refer to the "A-A view" on page 165 for needle position.



		Station No.				
		1	2	3	4	5
Dimensions (mm)	A	123	166	209	252	295
	B	54.5	97.5	140.5	183.5	226.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2
Weight (g)		1190	1500	1860	2170	2490

*1: pressure gauge option is not included.
*2: When solenoid valve is electrical connection "3N".

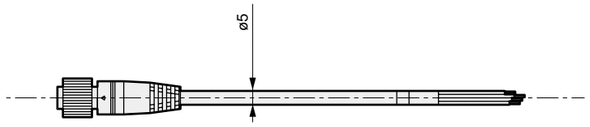
●For Options and Peripheral dimensions diagram, refer to P. 168 to 173.

Model No. Notation Method options/Dimensions diagrams

●Model No. Notation Method connector cable

GPS2-C1

Cable length



❶Cable length

Code	Description	Weight (g)
C1	1 m	45
C3	3 m	123
C5	5 m	195

Lead wire color	Applications
Brown	Power supply +
White	NC
Blue	Power supply -
Black	Output

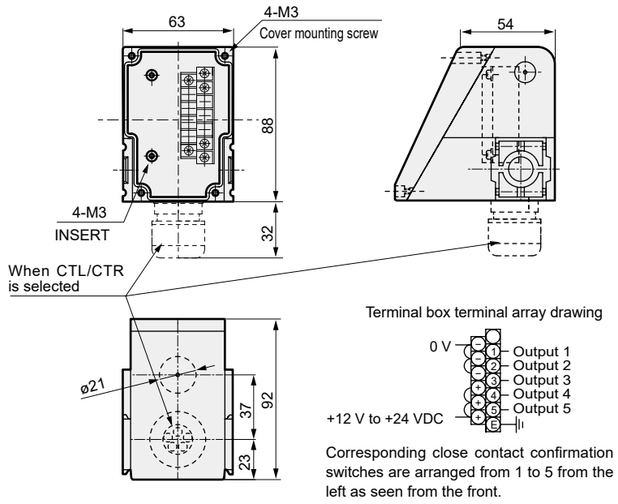
●Model No. Notation Method terminal box

GPS2-CTL

❶Terminal box

❶Terminal box

Code	Description	Weight (g)
CTL	For connector common terminal box left assembly	234 (for up to 4 stations) 245 (for 5 stations)
CTR	For connector common terminal box right assembly	
TL	For lead wire common terminal box left assembly	207
TR	For lead wire common terminal box right assembly	
TW	For lead wire common terminal box intermediate assembly	



Terminal box terminal array drawing

Corresponding close contact confirmation switches are arranged from 1 to 5 from the left as seen from the front.

●Model No. Notation Method pressure gauge with safety marker

GPS2-G40D-8-P02-S501

Port size R1/4

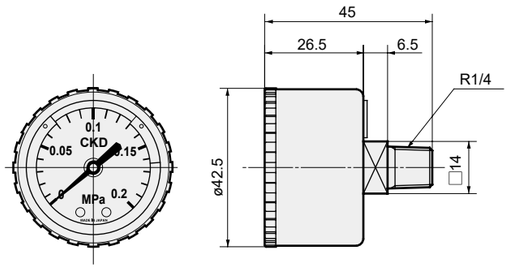
Pressure gauge with safety marker

❶Pressure display

❶Pressure display

Code	Description
P02	0 to 0.2 MPa
P04	0 to 0.4 MPa
P10	0 to 1.0 MPa

Weight: 85 g

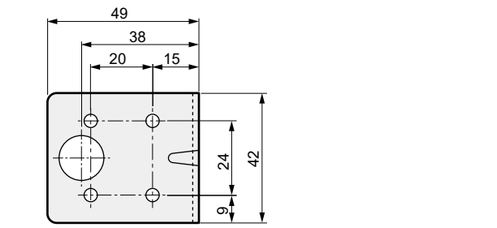


*1: Safety zone setting range: 0.03 to 0.2 MPa
*2: Safety zone setting max. width: 0.09 MPa
*3: Gage accuracy: JIS B 7505, Former 3.0 grade
*4: Cover material: Transparent nylon

Model No. Notation Method options/Dimensions diagrams

●Model No. Notation Method L-bracket

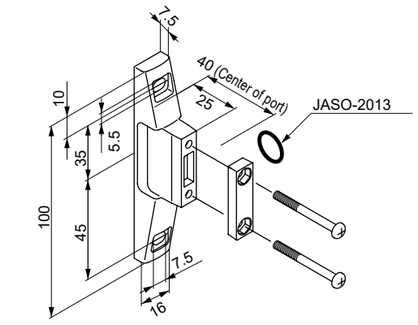
GPS2-B



·Weight: 41 g
· Material: Iron
Trivalent chromate treatment

●Model No. Notation Method T-bracket set

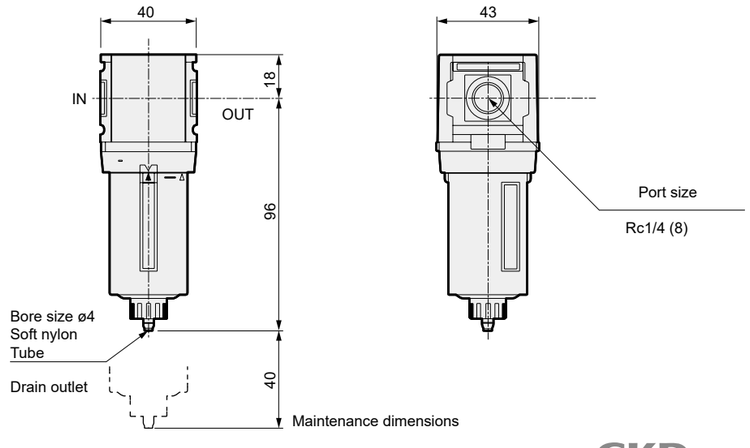
B110-W



·Weight: 24 g
· Material: Polyamide resin

●Model No. Notation Method air filter

F1000-8-W

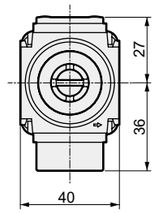


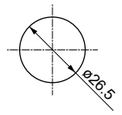
Weight: 87 g

Model No. Notation Method Peripheral components / Dimensions diagram

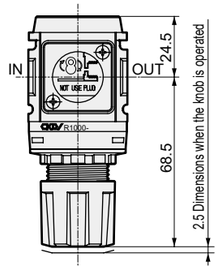
●Model No. Notation Method regulator

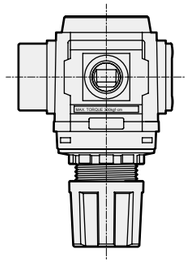
R1000-8-W-LT





Panel cut dimension
(Panel plate thickness: max. 6 mm)

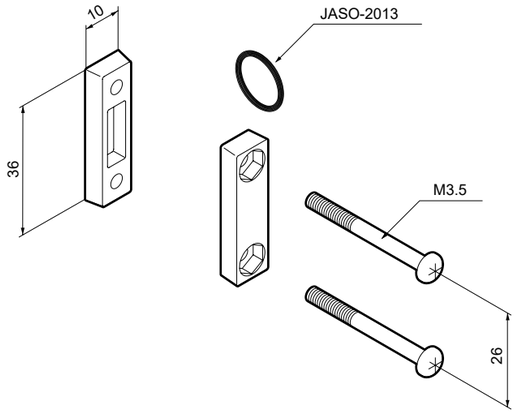




Weight: 150 g

●Model No. Notation Method joiner set

C1000-J100-W

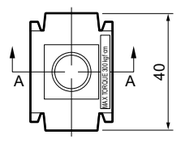


·Weight: 11 g
· Material: Polyamide resin

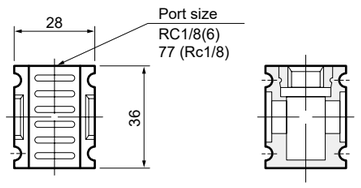
●Model No. Notation Method distributor

D101-00-8-W

Note: A joiner set and one gasket are attached.



Plane



Front

Cross section A-A

·Weight: 45 g
· Material: Polyamide resin

Model No. Notation Method Peripheral components / Dimensions diagram

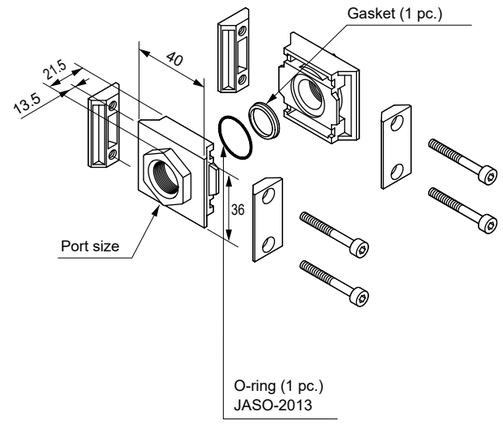
Model No. Notation Method Peripheral components / Dimensions diagram

●Pipe adaptor set
(with joiner set)

A100-8-W
❶
Port size

❶Port size

Code	Description
8	Rc1/4
10	Rc3/8



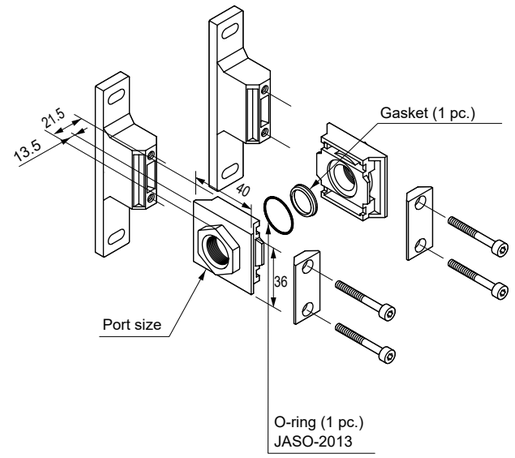
·Weight: 90 g
·Material: Aluminum alloy die-casting
Painted

●Pipe adaptor set
(with T-bracket set)

A100-8-W-B11W
❶
Port size

❶Port size

Code	Description
8	Rc1/4
10	Rc3/8



·Weight: 90 g
·Material: Aluminum alloy die-casting
Painted

Model No. Notation Method Peripheral components / Dimensions diagram

Solenoid valve with needle

GPS2-AB3X-2E-FL-AC100V

❶Terminal box ❷Voltage

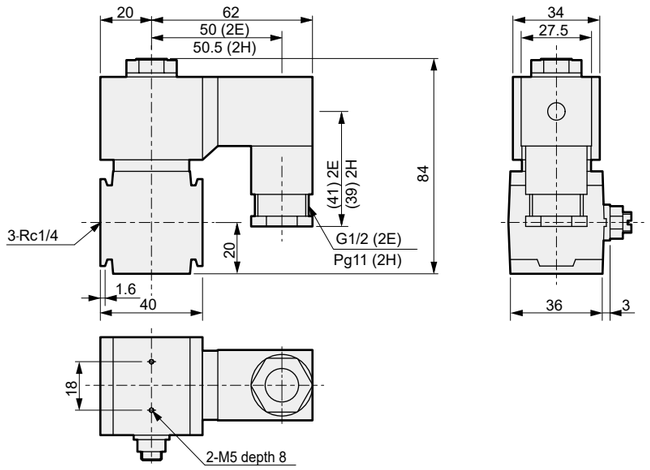
❶Terminal box

Code	Description
2E	DIN terminal box
2H	DIN terminal box with lamp
3N	HP terminal box with lamp

❷Voltage

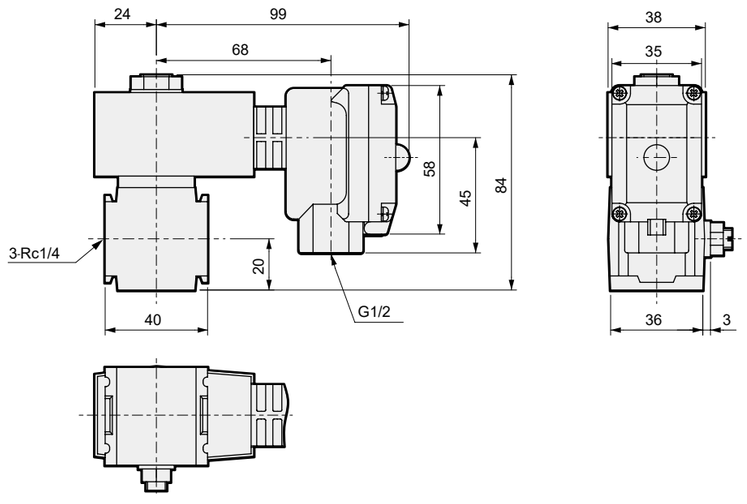
Code	Description
AC100V	100 VAC
AC200V	200 VAC
DC24V	24 VDC

●GPS2-AB3X-$\begin{matrix}2E\\2H\end{matrix}$-FL-$\begin{matrix}AC100V\\AC200V\end{matrix}$



·Weight: 280 g

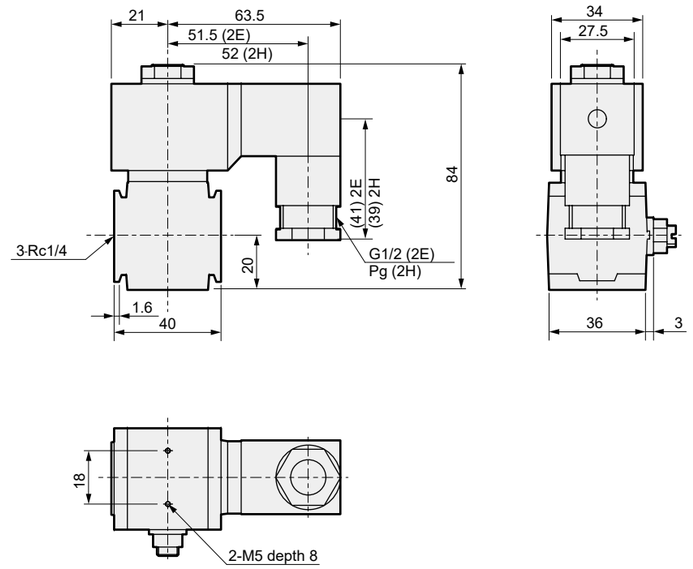
●GPS2-AB3X-3N-FL-$\begin{matrix}AC100V\\AC200V\end{matrix}$



·Weight: 445 g

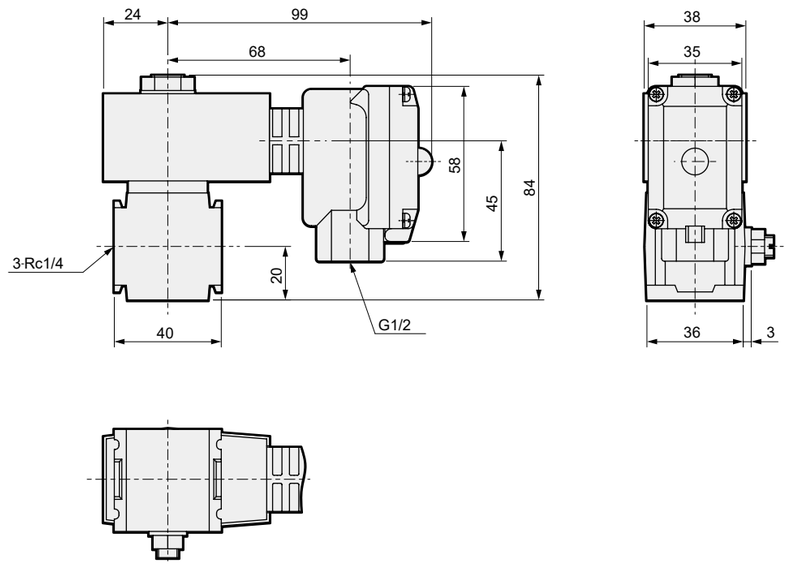
Model No. Notation Method Peripheral components / Dimensions diagram

●GPS2-AB3X-$\begin{matrix}2E\\2H\end{matrix}$-FL-DC24V



·Weight: 280 g

●GPS2-AB3X-3N-FL-DC24V



·Weight: 445 g

Optional nozzle

Model No. Notation Method

APA4-DA10

❶Nozzle specifications

❶Nozzle specifications

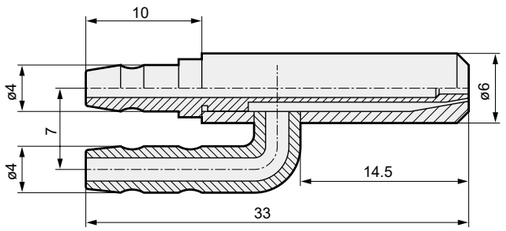
Code	Description
DA10	Outer diameter ø6, back pressure nozzle
DA20	Outer diameter M6 x P0.5, back pressure nozzle
DH10	Back pressure nozzle embedded

*1: Combine optional nozzle with HPS-05.
***2: For the characteristics, refer to P. 175 for the characteristics data.**
***3: When using HPS with standard specifications, use the same single-hole nozzle as for the GPS2. (Refer to P. 176)**

Dimensions

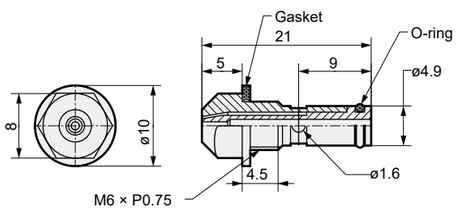
●Back pressure nozzle

· APA4-DA10



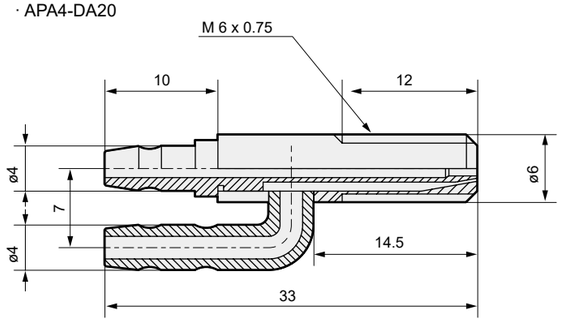
·Weight: 7 g

APA4-DH10



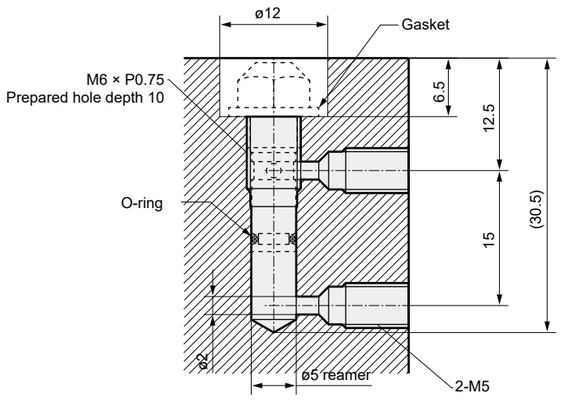
·Weight: 4 g

· APA4-DA20



·Weight: 7 g

●Example of embedding type jig design

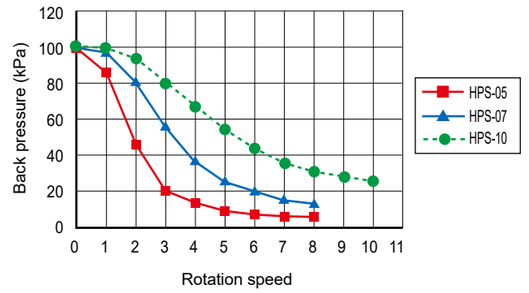


Characteristics data (HPS Series)

Characteristics data is for HPS single unit

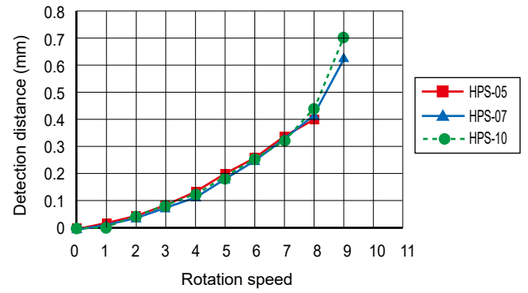
●Back pressure characteristics 1 (ø1.5 nozzle)
Measuring conditions
Port size: ø6 × ø4
Pipe length: 5 m
Supply pressure: 100 kPa
Nozzle diameter: ø1.5

Back pressure characteristics (ø1.5 nozzle)



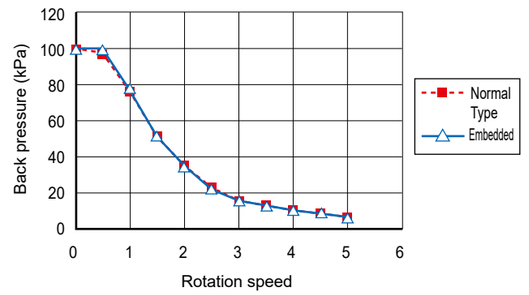
●Detection distance characteristics 1 (ø1.5 nozzle)
Measuring conditions
Port size: ø6 × ø4
Pipe length: 5 m
Supply pressure: 100 kPa
Nozzle diameter: ø1.5

Detection distance characteristics (ø1.5 nozzle)



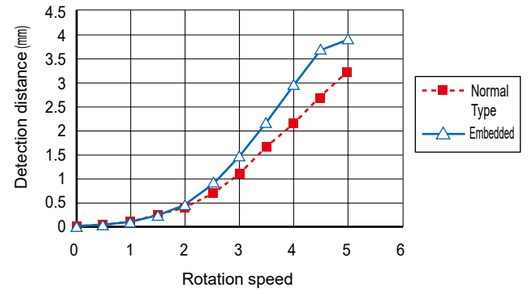
●Back pressure characteristics 2 (back pressure nozzle)
Measuring conditions
Port size: ø6 × ø4
Pipe length: 5 m
Supply pressure: 100 kPa

Back pressure characteristics (back pressure nozzle)



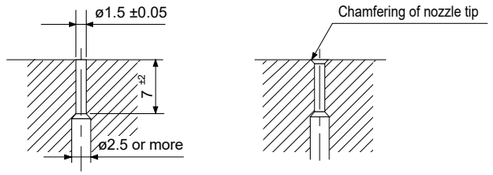
●Detection distance characteristics 2 (back pressure nozzle)
Measuring conditions
Port size: ø6 × ø4
Pipe length: 5 m
Supply pressure: 100 kPa

Detection distance characteristics (back pressure nozzle)



Design of detection nozzle

●Single hole nozzle

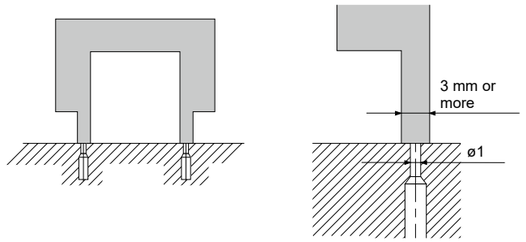


Correct nozzle shape　　Incorrect nozzle shape

Design the detection nozzle with a point size of ø1.5 mm and depth of 7 ±2 mm. The blow-off section of the nozzle cannot be chamfered. If chamfered, the nozzle retracts from the seating place, and the scale on the adjustment dial and actual dimensions do not match.

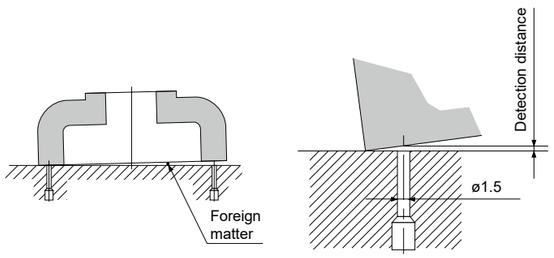
Selection of detection nozzle diameter

●When the workpiece detection surface is narrow - nozzle diameter ø1 and width is less than 3 mm, please contact us.



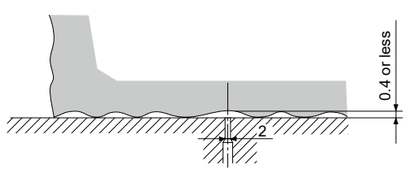
· Use with a detection distance of 0.1 mm or less.
· Use with a workpiece surface roughness of Rz=5 or less
· Check that nozzle does not separate from the detection surface.

●When the workpiece detection surface is sufficiently wide: Use ø1.5 mm nozzle.



· Use with a detection distance of 0.2 mm or less.
· Use with a workpiece surface roughness of Rz=5 or less

●When detecting the presence of a workpiece with a rough detection surface: Use ø1.5 mm or ø2.0 mm nozzle.



· The max. detection distance of the GPS2 is 0.4 mm. The workpiece cannot be detected if non-uniformity exceeds 0.4 mm. In that case, use the HPS-10.

Pneumatic components (sensors)

Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

Product-specific cautions: Close contact confirmation switch HPS Series

During Design and Selection

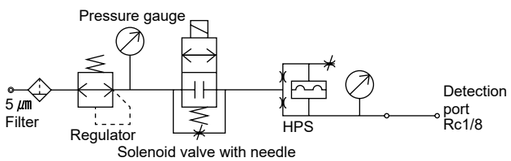
⚠WARNING

■Use the product in the range of conditions specified for the product. Contact CKD when using the product outside specifications or for special applications.
Use of the product outside the specifications range may result in insufficient performance, and its safety cannot be guaranteed.

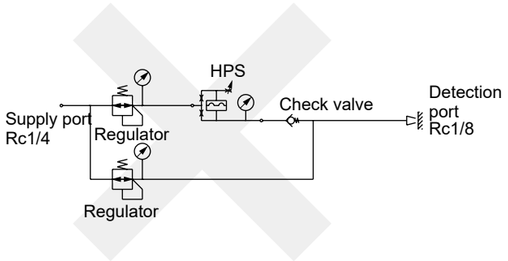
■Confirm before use that the product will withstand the working environment.
- This product cannot be used in environments where functional obstacles could occur.
- The main materials of this product are aluminum and resin. Do not use in atmospheres where corrosive gases are generated. Such environments include high temperatures, chemical atmospheres, where chemical liquids, vibration, moisture, water dripping, coolant, or gas is present; where ozone is generated; chemical plants, semiconductor pre-processing, outdoors, etc.
- Compressed air quality must satisfy JIS1.4.1, "oilless clean dry air."

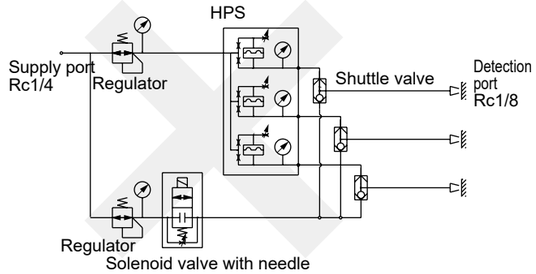
■Understand compressed air features before designing a pneumatic circuit.
This product has a small orifice, so to prevent the entry of foreign matter, use clean air with the recommended circuit shown below (Fig. 1).

Fig. 1 Recommended circuit



■Do not use the following air circuit when blowing air from the detection nozzle.
- Circuit with check valve
  The check valve acts as exhaust resistance, and limits the adjustable range.
- Circuit with shuttle valve and 2-way valve
  Residual pressure in the OUT side of the 2-way valve prevents a correct detection. Even if a 3-way valve is used, the shuttle valve may vibrate excessively.





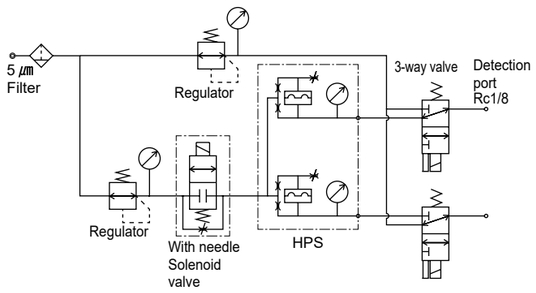
⚠CAUTION

■The entry of compressor oil and tarry substances may obstruct the flow of air and result in problems. Regularly inspect the compressor and discharge drainage.

■Keep the air flow constant so coolant and oil do not flow back from the detection nozzle, or use a solenoid valve with needle and let in a small amount of air from the bypass as shown in the recommended circuit (Fig. 1).

■Swarf and grinder chips, etc., could clog the nozzle. Increasing the supply pressure to blow these out will have no effect. Provide a 3-way valve on the pressurized nozzle as shown below (Fig. 2). The orifice for the 3-way valve should be ø2.5 mm or larger.

Fig. 2 Circuit for detection and air blow



■Select an output format (NPN, PNP) matching the input unit of the programmable controller being used.

■Operation may be disabled if a capacitance load such as an AC/DC buzzer is connected to the load. Turn power OFF and restart in this case. A protection circuit is provided to prevent damage from incorrect wiring or overcurrent. A relay must be used when connecting a capacitance load.

■Precautions for HPS

- Detection side — Use inner diameter ø4 and outer diameter ø6 for piping.
- An air bridge circuit is used for this product. Even if the fine air solenoid valve is turned OFF, Even if the fine air solenoid valve is turned OFF, the output is not turned OFF, which is the same for the conventional pressure switch. Output is ON—OFF according to the pressure of a workpiece. Care must be taken when creating the program. If the program has already been created and cannot be changed, stop the fine air. Note that a delay of one second occurs when output is ON—OFF.
- Pressure switch and solenoid valve with fine air
  When the fine air solenoid valve is ON → Workpiece absent: OFF Workpiece present: ON
  When the fine air solenoid valve is OFF → Workpiece absent: OFF Workpiece present: OFF
- HPS and fine air solenoid valve
  When the fine air solenoid valve is ON → Workpiece absent: OFF Workpiece present: ON
  When the fine air solenoid valve is OFF → Workpiece absent: OFF Workpiece present: ON

■Observe the following items when installing:

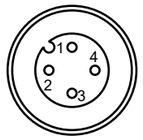
- Install this product so the detection port faces downward.
- Install this product at a position higher than the seating surface to prevent coolant from entering.
- Provide enough space for adjustment, monitoring, and maintenance.
- Use rust-resistant material such as nylon tubes or stainless steel pipes for piping material.
- When installing this product on a device, check that no load is applied to the device.
- When using steel pipes, securely fix the pipe to prevent excessive bending force from being applied to the connection.
- When welding near this product, cover it to prevent spatter from coming in contact.
- When housing this product in a box, provide an exhaust port so atmospheric pressure is maintained in the box.

■Observe the following items when wiring:

- When using a switching regulator for the power supply, ground the F.G. (frame ground).
- Avoid using in a transient state, continuing 1s after power is turned ON.
- Take special care to prevent load short-circuits or incorrect wiring. The protective circuit is activated. Turn power OFF to restart the product.
- Connector pins are arranged as shown in Fig. 3. Take special care to prevent incorrect wiring.

Brown → 24 VDC
Blue → 0 VDC
Black → signal, open collector

Fig. 3 Connector pin array (body side)

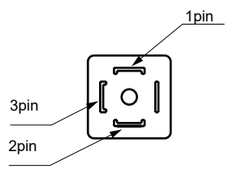


PIN array/lead wire color list

PIN No.	Electrical connection option (-C1, -C3, -C5) lead wire color	Applications
1pin	Brown	Power supply +
2pin	White	NC
3pin	Blue	Power supply -
4pin	Black	Output

- The assignment of the DIN terminal box terminal numbers is shown in Fig. 4.

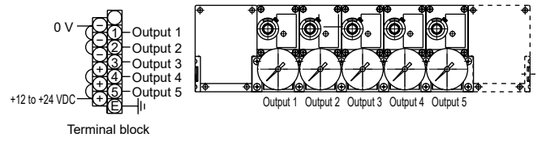
Fig. 4 DIN terminal box pin array (body side)



PIN No.	Applications
1pin	Power supply +
2pin	Power supply -
3pin	Output

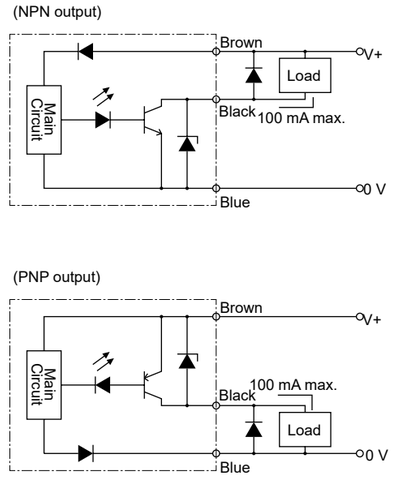
- When using the common terminal box, power supply terminals are on the lower side of the gland. Signal wire terminals are on the upper row. This product is wired as shown in Fig. 5.

Fig. 5 Terminal box layout



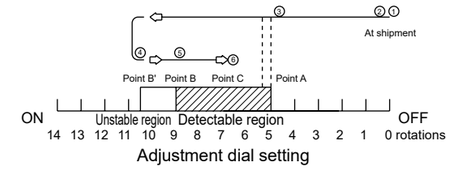
- When using a load with a large rush current, such as a motor, the protection circuit will activate. In this case, use a relay.
- If there is a device (motor, welder) that generates a large surge near this product, insert a surge absorber, such as a varistor, at the source of the surge.
- If this product's lead wire is wired with the drive cable or power cable, it is affected by surge and noise deteriorating or damaging the sensor element in the switch. Use separate wiring.
- NPN output and PNP output contact confirmation switches are available. The lamp turns ON even if program controller compliance is incorrect, but signals are not retrieved. Wire the switch based on the output as shown in Fig. 6.

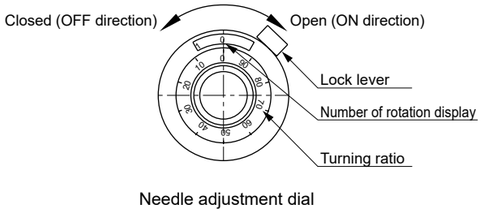
Fig. 6 Output circuit



■Adjustment sequence

1. When this product is shipped from CKD, the adjustment dial is set to display 0 rotations as the number of rotations, and rotation angle 0.
2. Supply air. The indicator lamp turns OFF.
3. With the master gage OK, turn the knob rotation of the adjustment needle in the direction in which the value rises (open) and determine the OFF→ON switching point A.
4. Turn the master gage NG side (OFF state) in the direction in which the value rises (open) again to obtain the OFF→ON switching point B'.
5. Turn the motor in the direction in which the rotation speed decreases (closed), and obtain switch point B for ON→OFF. The adjusting range is found by counting the number of rotations from point A to point B.
6. Rotate the adjustment needle in the closed direction, and set to the middle point between point A and point B. This position is point C. If point C is near point B, the signal turns ON easily and response time is short. However, it will take time to return. Stable detection is possible by setting adjustment point C between point A and point B.
7. Lock the dial after adjusting.





Do not turn the dial with force at extremities of the rotation.
The dial can be rotated up to 14 times.

■One detection nozzle can be used for one of these product units.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual



Cutting tool breakage detection switch

TLPS, MTLPS, UTLPS Series

Overview

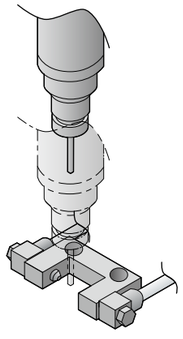
- The cutting tool breakage detection switch TLPS Series is an air sensor used to detect broken or chipped drills and taps used in the metal machining line.
- A dedicated nozzle unit is used for the detection nozzle to match the cutting tool. This switch is also usable in adverse environments, which is one of the features of the air sensor.

Features

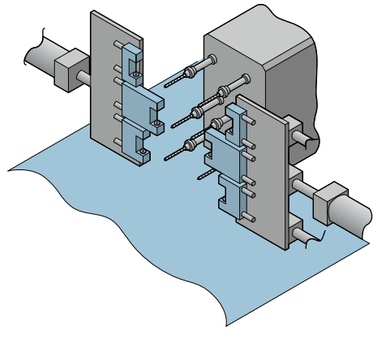
- Shorter machining tact
  Since non-contact detection makes it possible to detect the state while the tool is rotating, tact time is shortened compared to conventional methods.
- Compatible with adverse environments
  Self-cleaning by the air nozzle enables use even in environments where coolant or swarf scatter.
- Small-diameter drill and cutting edge chipping detection
  Chips are detected on a ø0.3 small drill or 1 mm drill tip.
- Low air consumption
  This switch is used with low pressure so air consumption is reduced.
  (3 L/min (ANR) at 50 kPa)
- High stability
  Stable cutting tool breakage, unaffected by fluctuations in supply pressure, is detectable with the air bridge.
- Easy adjustment
  The highly accurate needle with lock mechanism and dial scale makes it possible to adjust the detecting position easily with no worry about deviation.
- Modularization
  Modularization makes it easy to connect to the CKD module connection component.

Example of cutting tool breakage detection applications

●Nozzle unit fixed

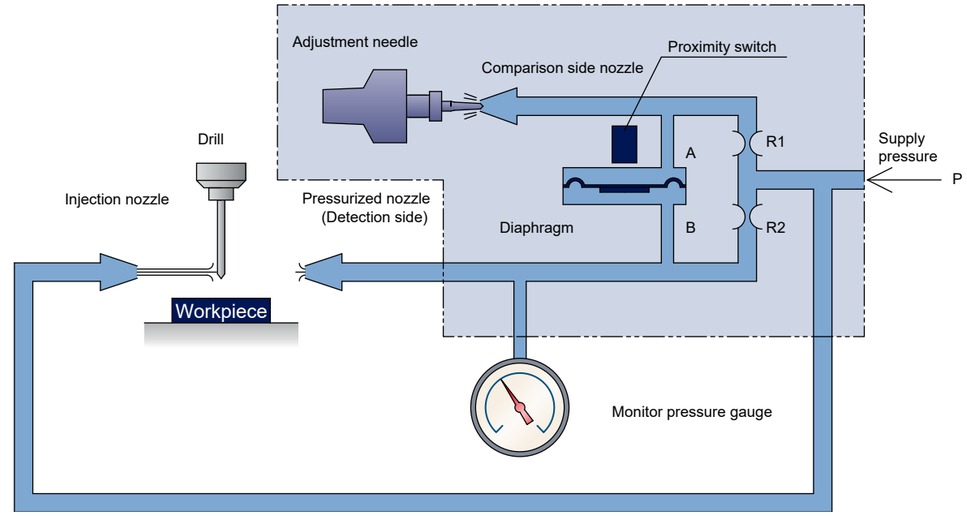


●Detecting nozzle moving type



Operational explanation

●Diagram of TLPS (facing) principle



●Detecting nozzle

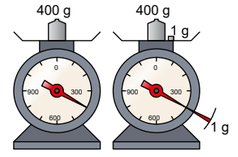
Two nozzles are used facing each other. A small amount of detection air is passed from the nozzle pressurized through the TLPS switch, and exhausted from nozzles. Conversely, air injected from the injection nozzle collides with detection air. When air collides, the back pressure of the nozzle pressurized rises, and the proximity switch in the TLPS switch is activated, generating an electrical signal. If there is a drill or other object between detecting nozzles, injection air is diffused and does not reach the nozzle pressurized, so the proximity switch in the TLPS is not activated.

●Cutting tool breakage detection switch

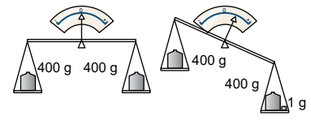
The difference of pressure when a drill is present and absent is amplified by the air bridge circuit. When expressed as a scale, the balance is the bridge type. The air bridge circuit is a system which detects micro-fluctuations in pressure highly accurately. If the detection pressure with drill is P1, and the detection pressure without drill is P2,

Adjusted pressure = (P1 + P2) / 2

If the drill is present, then P1 is smaller than the adjusted pressure and the diaphragm lowers. If the drill is absent, then P2 is greater than the adjusted pressure, so the diaphragm rises, the proximity switch is activated, and an electrical signal is generated.



Spring scale



Balance



Cutting tool breakage detection switch, single unit

TLPS Series

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

TLPS - 03 - N Y TL - B - GW2

- TLPS: Model No.
- 03: Orifice size: ø0.3 For detecting nozzle
- N: ❶Output style
- Y: Lamp color: Yellow
- TL: ❷Electrical connection option
- B: ❸Bracket
- GW2: ❹Pressure gauge

*1: Refer to page 202 for the model No. of the detecting nozzle.
*2: Refer to pages 196 to 201 for option and model No. of related components.

❶Output style

Code	Description
N	NPN open collector
P	PNP open collector

❷Electrical connection option

Code	Description	
F	DIN terminal box (Pg11)	
C0	Connector	Without cable
C1		Cable 1 m attached
C3		Cable 3 m attached
C5		Cable 5 m attached
CTL	Connector common terminal box	Left side assembly
CTR		Right side assembly
TL	Lead wire common terminal box	Left side assembly
TR		Right side assembly
R	Lead wire direction right (left end for mounting)	
L	Lead wire direction left (right end for mounting)	
W	Lead wire direction both sides (intermediate for mounting)	

❸Bracket

Code	Description	
Blank	Without bracket	
B	With bracket	

❹Pressure gauge

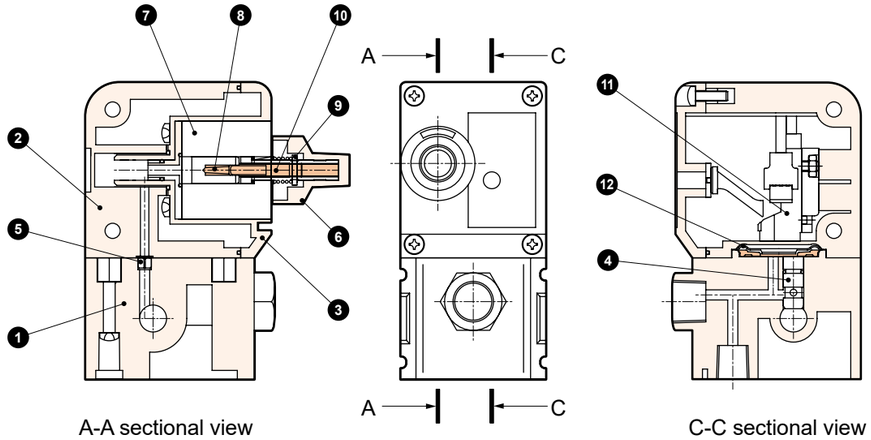
Code	Description
Blank	No pressure gauge
G2	Pressure gauge with safety marker attached (G40D-8-P02-S501)
GW2	Pressure gauge assembly with safety marker (G40D-8-P02-S501)

Specifications

Item		TLPS-03		
Orifice size (mm)		ø0.3		
Working pressure *1 kPa		50 to 200 (100 recommended)		
Detection cutting tool diameter mm		ø0.3 to 30		
Power supply voltage V		10.2 to 26.4 DC		
Current consumption mA		15 or less (when using 24 VDC)		
Output style		NPN, PNP open collector		
Output rating		30 VDC, 100 mA or less		
Internal voltage drop V		2.0 or less (using 100 mA)		
Indicator lamp and signal	When drill is broken	Yellow lamp ON, output ON		
	When drill is normal	Yellow lamp OFF, output OFF		
Cutting edge detecting position		1 mm and over from end of the edge		
Insulation resistance		10 MΩ and over at 500 VDC megger		
Withstand voltage		No failure after 1 minute at 1000 VAC		
Vibration resistance m/sec^2		98		
Ambient temperature °C		5 to 60		
Degree of protection *2		IP67 equivalent (connector), IP64 equivalent (DIN terminal box)		
Tube mm		Inner diameter 4		
Port size		Detection port Rc1/8, Supply port Rc1/4, pressure gauge port Rc1/4		
Weight g		300 (electrical connection option C0)		
Air consumption L/min (ANR) * Air consumption Value when CKD's standard nozzle is selected	Nozzle	TLPS-J0310	TLPS-J0510	TLPS-J0715
	50 kPa	2.8	4.8	6.6
	100 kPa	4.2	7.2	9.7
	200 kPa	6.6	11.1	15.1

*1: If the nozzle clogs, working pressure should be set between 100 and 200 kPa.
*2: This product must be used under the following conditions:
(1) Piping and wiring must be completed and pressure applied.
(2) A waterproof bushing must be used on the wires to the terminal box.

Internal Structure Diagram / Material



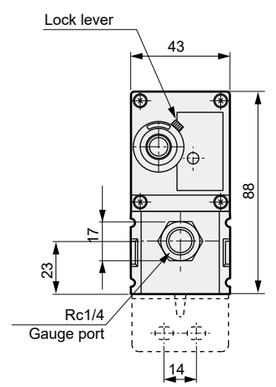
A-A sectional view

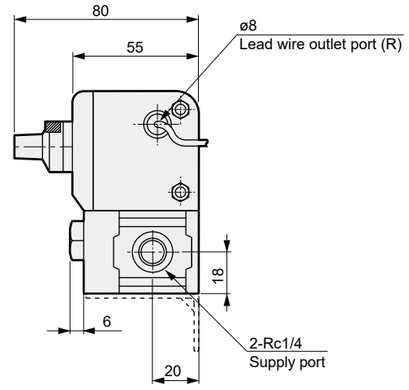
C-C sectional view

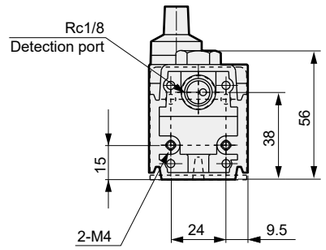
Part No.	Part name	Material	Part No.	Part name	Material
1	Base	Aluminum	7	Needle holder	Aluminum
2	Body	Polybutylene terephthalate	8	Needle	Stainless steel
3	Front cover	Polybutylene terephthalate	9	Pin	Piano wire
4	Orifice nozzle A	Brass	10	Needle shaft	Brass
5	Orifice nozzle B	Brass	11	Proximity switch	-
6	Dial	Aluminum alloy, polyamide, etc.	12	Diaphragm	HNBR

Dimensions

●Basic
TLPS-03-□□ R
L
W



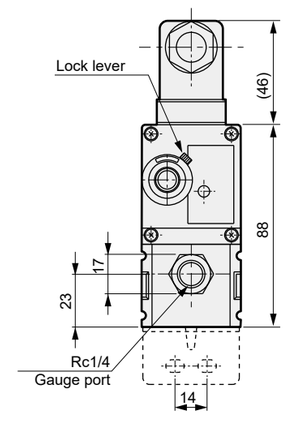


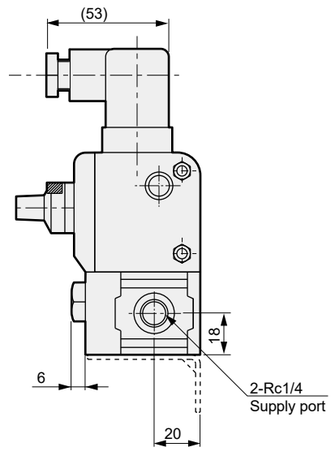


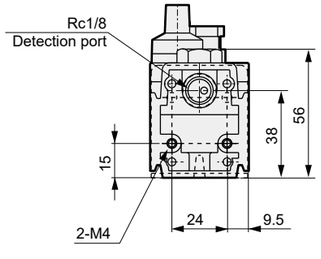
·Weight: 300 g

Note: Bracket and pressure gauge options are not included.

●DIN terminal box
TLPS-03-□□F







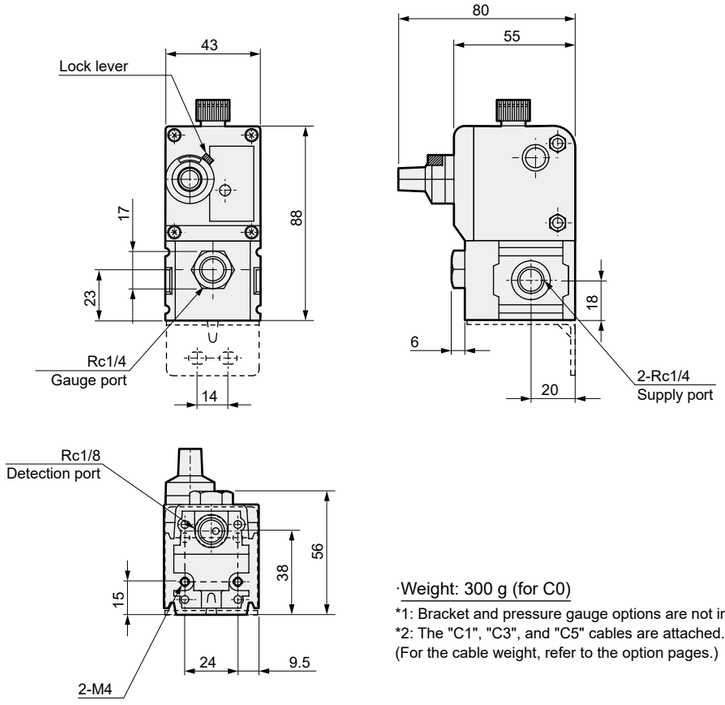
·Weight: 340 g

Note: Bracket and pressure gauge options are not included.

Dimensions

●Connector

● TLPS-03-□□ C0 C1 C3 C5

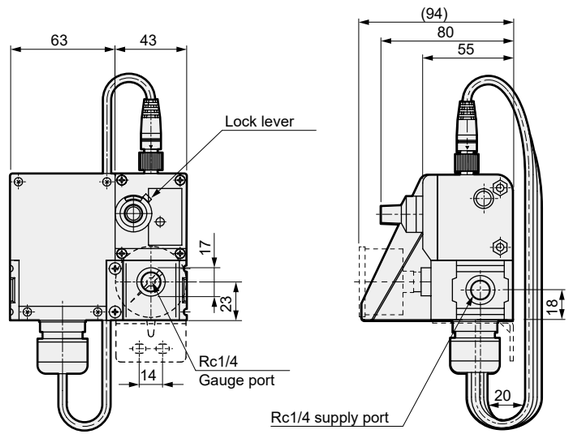


·Weight: 300 g (for C0)

*1: Bracket and pressure gauge options are not included.
*2: The "C1", "C3", and "C5" cables are attached.
(For the cable weight, refer to the option pages.)

●Connector common terminal box

●TLPS-03-□□ CTL (CTR)

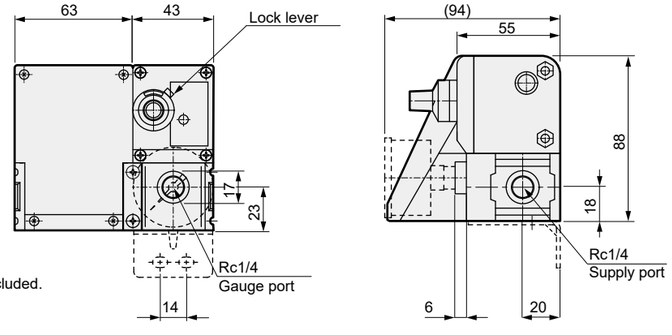


·Weight: 583 g

Note: Bracket and pressure gauge options are not included.

●Lead wire common terminal box

● TLPS-03-□□ TL (TR)



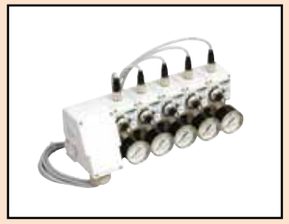
·Weight: 513 g

Note: Bracket and pressure gauge options are not included.

●For information on Options and Peripheral Dimensions diagrams, refer to pages 196 to 201.

MEMO

Pressure switch
Electronic pressure Switch
Contact Confirm Switch
For Coolant Pressure Switch
Ending



Cutting tool breakage detection switch/manifold

MTLPS Series

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

MTLPS - 03 - 2 N Y TL - B - GW2

*1: Refer to P. 202 for the model No. of the detecting nozzle.
*2: Refer to P. 196 to 201 for option and model No. of related components.

- MTLPS: Model No.
- 03: Orifice size: ø0.3 For detecting nozzle
- 2: ❶Station No.
- N: ❷Output style
- Y: Lamp color: Yellow
- TL: ❸Electrical connection option
- B: ❹Bracket
- GW2: ❺Pressure gauge

❶Station No.

Code	Description
2	2 stations
3	3 stations
4	4 stations
5	5 stations

❷Output style

Code	Description
N	NPN open collector
P	PNP open collector

❸Electrical connection option

Code	Description		Degree of Protection (*2)
F	DIN terminal box (Pg11)		IP 64 or equiv.
C0	Connector	Without cable	IP 67 or equiv.
C1		Cable 1 m attached	
C3		Cable 3 m attached	
C5		Cable 5 m attached	
CTL	Connector common terminal box	Left side assembly	IP 67 or equiv.
CTR		Right side assembly	
TL	Lead wire common terminal box	Left side assembly	IP 66 or equiv.
TR		Right side assembly	
T1		Intermediate assembly (1st from left)	
T2		Intermediate assembly (2nd from left)	
T3		Intermediate assembly (3rd from left)	
T4		Intermediate assembly (4th from left)	

*1: The degree of protection should be used under the following conditions:
(1) Piping and wiring must be completed and pressure applied.
(2) A waterproof bushing must be used on the wires to the terminal box.

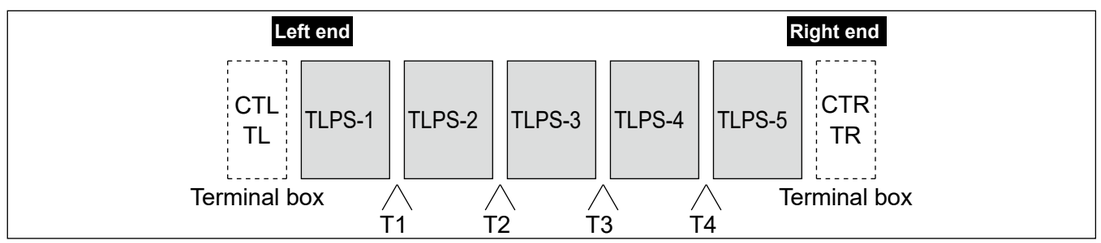
❹Bracket

Code	Description	
Blank	Without bracket	
B	With bracket	

❺Pressure gauge

Code	Description
Blank	No pressure gauge
G2	Pressure gauge with safety marker included (G40D-8-P02-S501)
GW2	Pressure gauge assembly with safety marker (G40D-8-P02-S501)

Terminal box installation position relation diagram



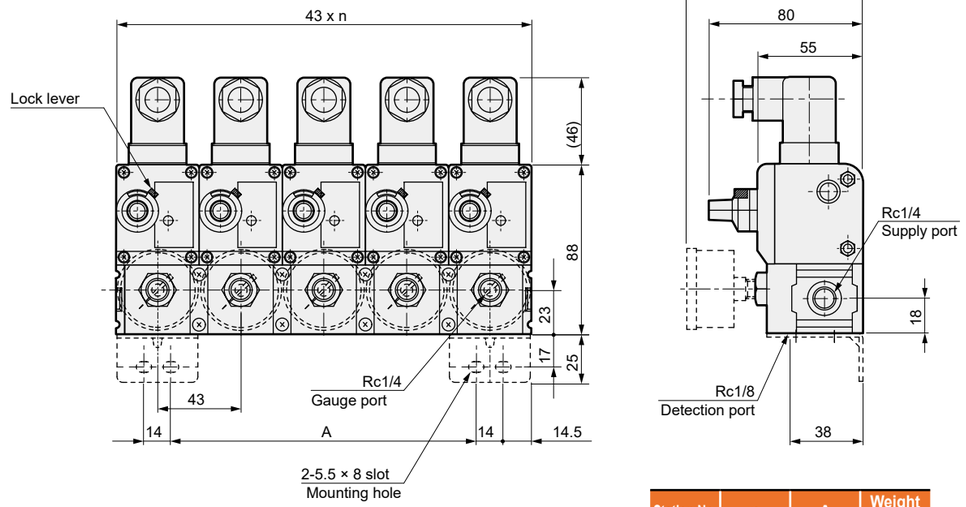
Specifications

Basic specifications are the same as the Discrete on page 183 .

Dimensions

●Manifold (DIN terminal box: F)

●MTLPS-03-□□□ F



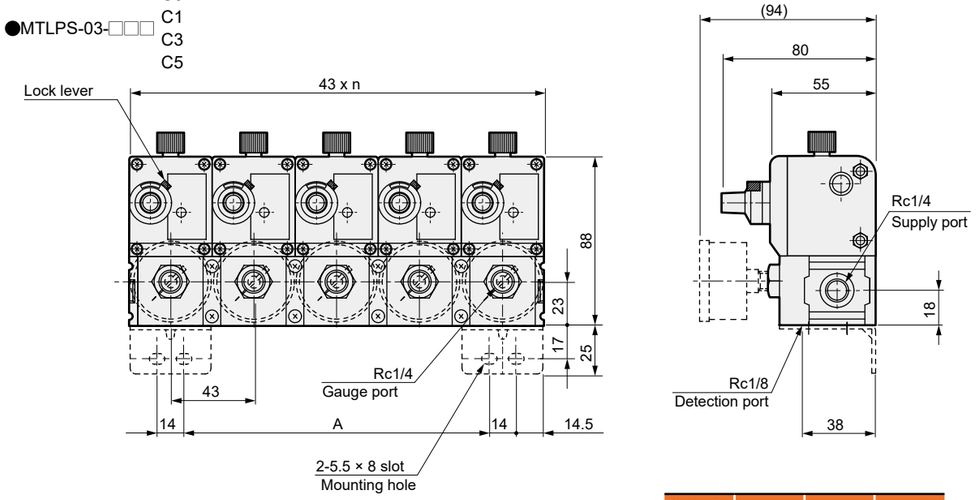
Station No.	n	A	Weight (g)
2 stations	2	29	680
3 stations	3	72	1030
4 stations	4	115	1370
5 stations	5	158	1710

Note: Bracket and pressure gauge options are not included.

Dimensions

●Manifold (connector: C□)

●MTLPS-03-□□□ C0 C1 C3 C5

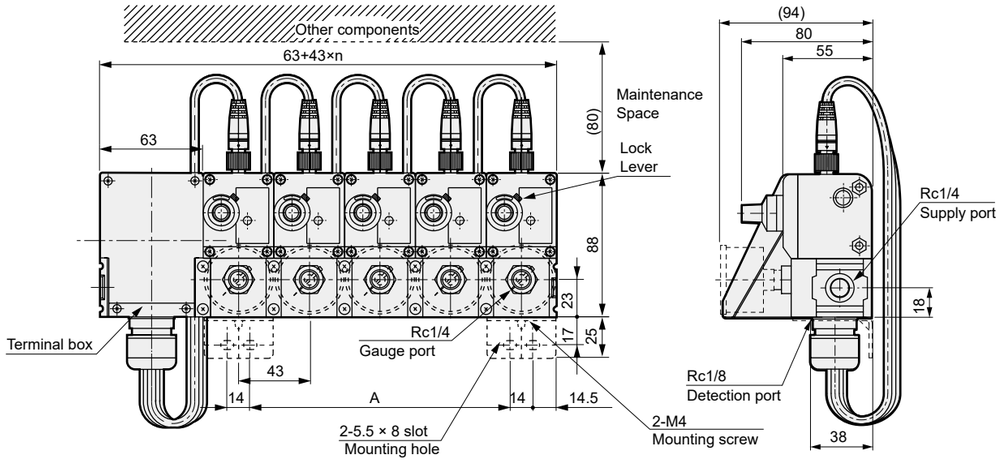


Station No.	n	A	Weight (g) (For C0)
2 stations	2	29	590
3 stations	3	72	890
4 stations	4	115	1190
5 stations	5	158	1490

*1: Bracket and pressure gauge (option) are not included.
*2: The "C1", "C3", and "C5" cables are attached.
(For the cable weight, refer to the option pages.)

●Manifold (connector common terminal box: CTL/CTR)

●MTLPS-03-□□□ CTL (CTR)



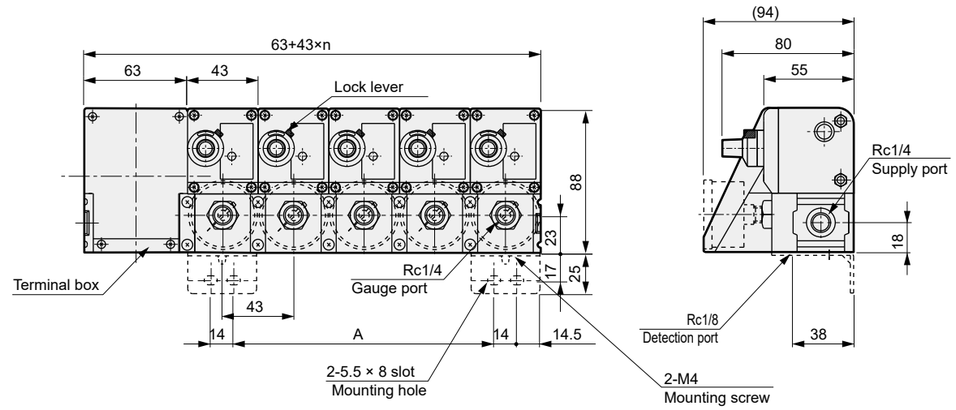
Station No.	n	A	Weight (g)
2 stations	2	29	930
3 stations	3	72	1270
4 stations	4	115	1620
5 stations	5	158	1980

Note: Bracket and pressure gauge (option) are not included.

Dimensions

●Manifold (lead wire common terminal box: TL/TR)

●MTLPS-03-□□□ TL (TR)



Station No.	n	A	Weight (g)
2 stations	2	29	830
3 stations	3	72	1140
4 stations	4	115	1460
5 stations	5	158	1770

Note: Bracket and pressure gauge (option) are not included.

●For information on Options and Peripheral Dimensions diagrams, refer to P. 196 to 201.



Cutting tool breakage detection switch unit

UTLPS Series

●Solenoid valve with needle, regulator integrated general purpose unit

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

UTLPS - 03 - 2 N Y TL - B - GW2 - 2H - 1

- UTLPS: Model No.
- 03: Orifice size: ø0.3 For detecting nozzle
- 2: ❶Station No.
- N: ❷Output style
- Y: Lamp color: Yellow
- TL: ❸Electrical connection option
- B: ❹Bracket
- GW2: ❺Pressure gauge
- 2H: ❻Solenoid valve electrical connection
- 1: ❼Solenoid valve voltage

*1: Refer to P. 202 for the model No. of the detecting nozzle.
*2: Refer to P. 196 to 201 for option and model No. of related components.

❶Station No.

Code	Description
1	1 station
2	2 stations
3	3 stations
4	4 stations
5	5 stations

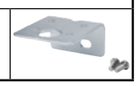
❷Output style

Code	Description
N	NPN open collector
P	PNP open collector

❸Electrical connection option

Code	Description	
F	DIN terminal box (Pg11)	
C0	Connector	Without cable
C1		Cable 1 m attached
C3		Cable 3 m attached
C5		Cable 5 m attached
CTL	Connector common terminal box	Left side assembly
CTR		Right side assembly
TL	Lead wire common terminal box	Left side assembly
TR		Right side assembly

❹Bracket

Code	Description	
Blank	Without bracket	
B	With bracket	

❺Pressure gauge

Code	Description
Blank	Without (*1)
GW2	Pressure gauge assembly with safety marker (G40D-8-P02-S501)

*1: Regulator pressure gauge is also provided.

❻Solenoid valve electrical connection

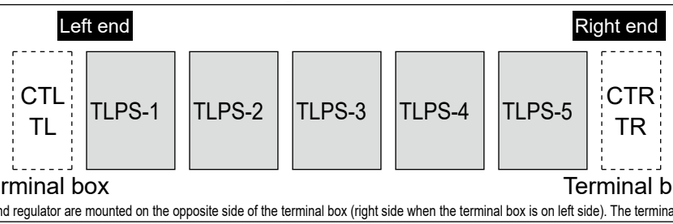
Code	Description
2E	DIN terminal box
2H	DIN terminal box with lamp
3N	HP terminal box with lamp

Note: For CE marking/UKCA-compatible parts, select from "2E" and "2H".

❼Solenoid valve voltage

Code	Description
1	100 VAC
2	200 VAC
3	24 VDC

Terminal box installation position relation diagram



Note: The solenoid valve with needle and regulator are mounted on the opposite side of the terminal box (right side when the terminal box is on left side). The terminal box does not have a supply port.

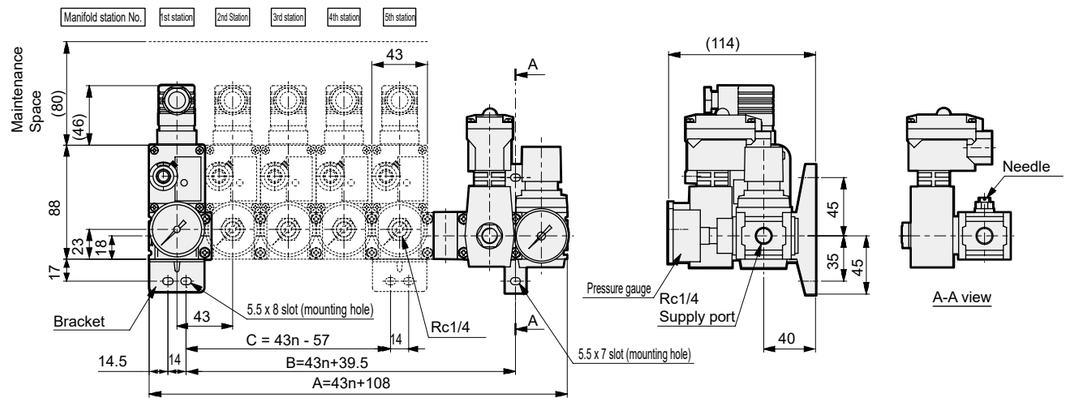
Specifications

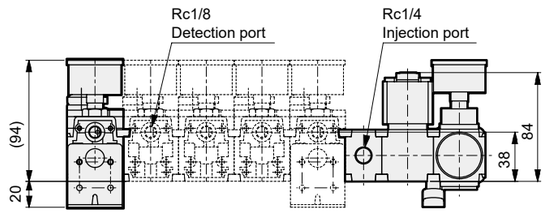
Basic specifications are the same as the Discrete on page 183 .

Dimensions

●Unit (DIN terminal box: F)

●UTLPS-03-□□□ F





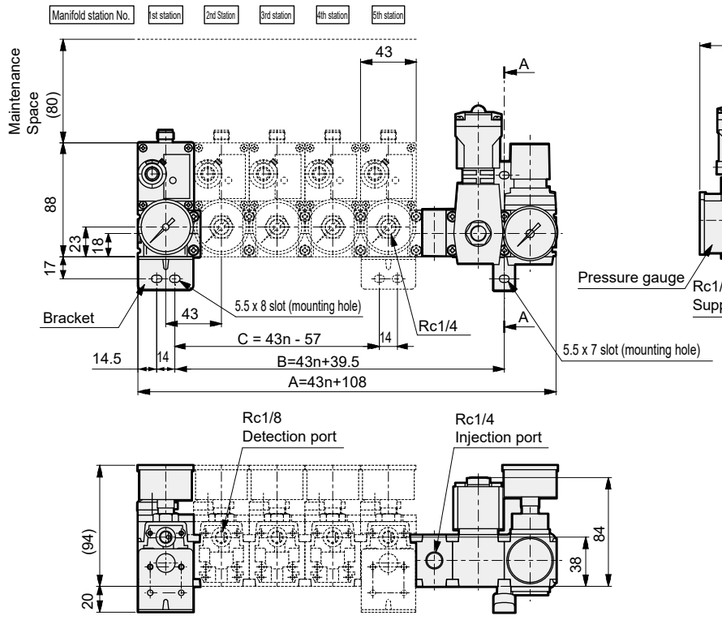
		Station No.				
		1	2	3	4	5
Dimensions (mm)	A	151	194	237	280	323
	B	82.5	125.5	168.5	211.5	254.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2
Weight (g)		1070	1420	1800	2150	2490

*1: pressure gauge option is not included.
*2: When solenoid valve is electrical connection "3N".

Dimensions

●Unit (connector: C□)

●UTLPS-03-□□□ C0 C1 C3 C5



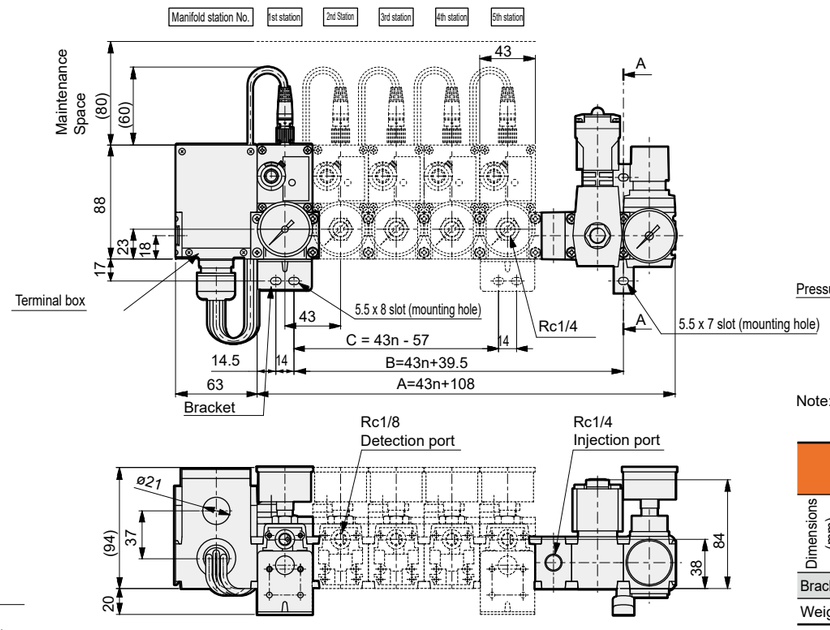
Note: Refer to the "A-A view" on P. 193 for needle position.

		Station No.				
		1	2	3	4	5
Dimensions (mm)	A	151	194	237	280	323
	B	82.5	125.5	168.5	211.5	254.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2
Weight(For C0) g		1030	1330	1670	1970	2270

*1: pressure gauge option is not included.
*2: When solenoid valve is electrical connection "3N".
*3: "C1", "C3", and "C5" cables are attached.
(For the cable weight, refer to the option pages.)

●Unit (connector common terminal box: CTL/CTR)

●UTLPS-03-□□□ CTL (CTR)



Note: Refer to the "A-A view" on P. 193 for needle position.

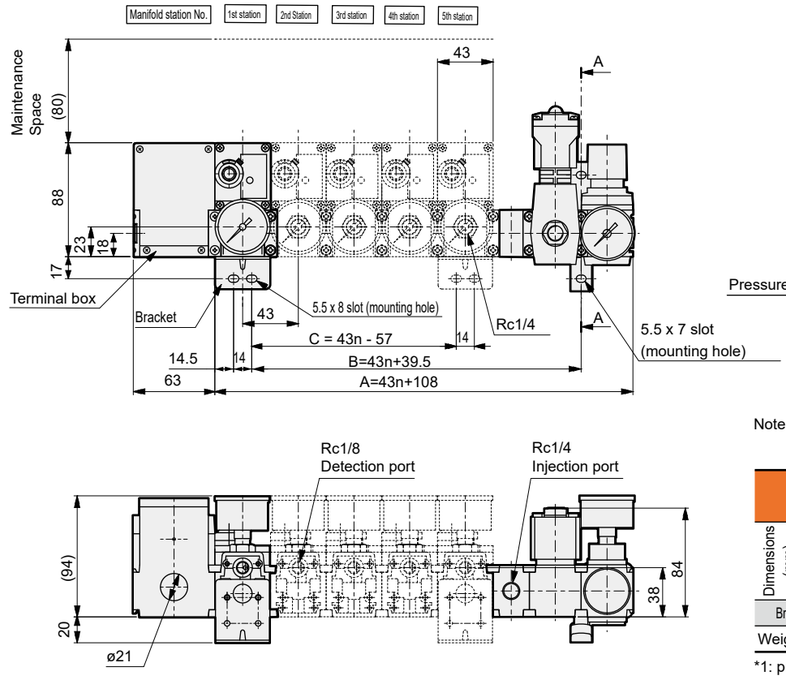
		Station No.				
		1	2	3	4	5
Dimensions (mm)	A	151	194	237	280	323
	B	82.5	125.5	168.5	211.5	254.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2
Weight (g)		1320	1660	2050	2400	2750

*1: pressure gauge option is not included.
*2: When solenoid valve is electrical connection "3N".

Dimensions

●Unit (lead wire common terminal box: TL/TR)

●UTLPS-03-□□□ TL (TR)



Note: Refer to the "A-A view" on P. 193 for needle position.

		Station No.				
		1	2	3	4	5
Dimensions (mm)	A	151	194	237	280	323
	B	82.5	125.5	168.5	211.5	254.5
	C	–	–	72	115	158
Bracket set		1	1	2	2	2
Weight (g)		1250	1560	1920	2230	2540

*1: pressure gauge option is not included.
*2: When solenoid valve is electrical connection "3N".

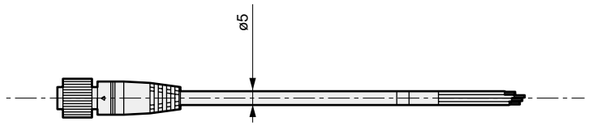
●For information on Options and Peripheral Dimensions diagrams, refer to P. 196 to 201.

Model No. Notation Method options/Dimensions diagrams

●Model No. Notation Method connector cable

GPS2-C1

Cable length



❶Cable length

Code	Description	Weight (g)
C1	1 m	45
C3	3 m	123
C5	5 m	195

Lead wire color	Applications
Brown	Power supply +
White	NC
Blue	Power supply -
Black	Output

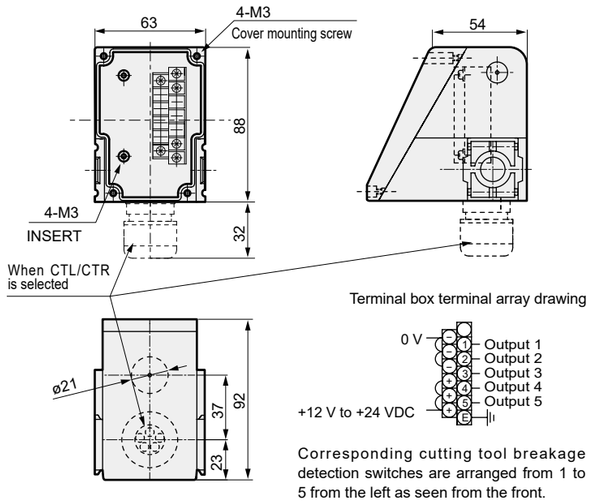
●Model No. Notation Method terminal box

GPS2-CTL

❶Terminal box

❶Terminal box

Code	Description	Weight (g)
CTL	For connector common terminal box left assembly	234 (for up to 4 stations) 245 (for 5 stations)
CTR	For connector common terminal box right assembly	
TL	For lead wire common terminal box left assembly	207
TR	For lead wire common terminal box right assembly	
TW	For lead wire common terminal box intermediate assembly	



●Model No. Notation Method pressure gauge with safety marker

GPS2-G40D-8-P02-S501

Model No. with safety marker pressure gauge

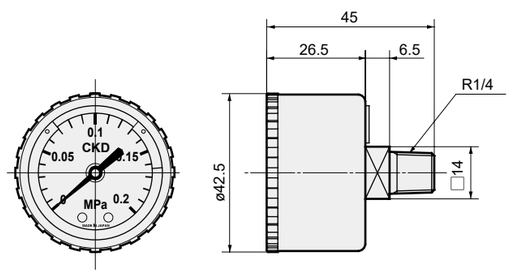
Port size R1/4

❶Pressure display

❶Pressure display

Code	Description
P02	0 to 0.2 MPa
P04	0 to 0.4 MPa
P10	0 to 1.0 MPa

Weight: 85 g

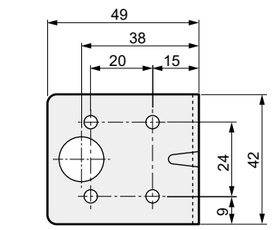


*1: Safety zone setting range: 0.03 to 0.2 MPa
*2: Safety zone setting max. width: 0.09 MPa
*3: Gage accuracy: JIS B 7505, Former 3.0 grade
*4: Cover material: Transparent nylon

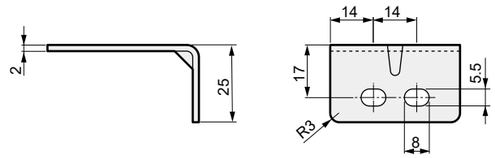
Model No. Notation Method options/Dimensions diagrams

●Model No. Notation Method L-bracket

GPS2-B

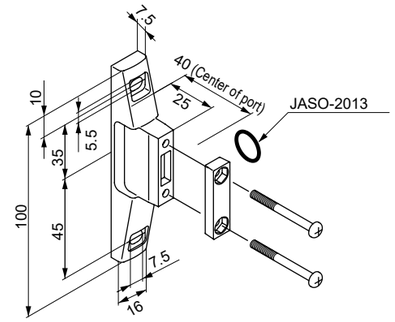


·Weight: 41 g
· Material: Iron
Trivalent chromate treatment



●Model No. Notation Method T-bracket set

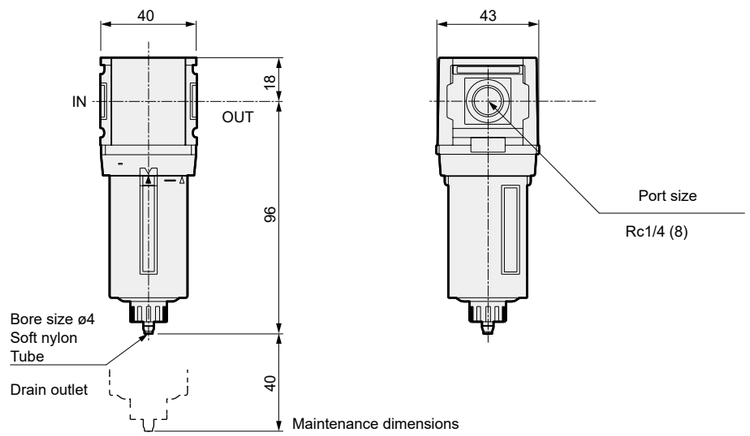
B110-W



·Weight: 24 g
· Material: Polyamide resin

●Model No. Notation Method air filter

F1000-8-W

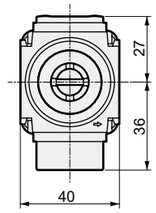


Weight: 87 g

Model No. Notation Method Peripheral components / Dimensions diagram

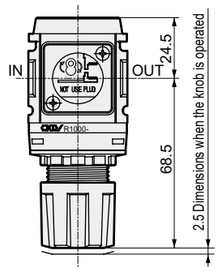
●Model No. Notation Method regulator

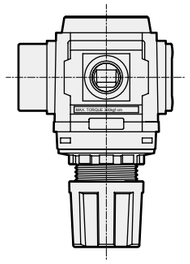
R1000-8-W-LT





Panel cut dimension
(Panel plate thickness: max. 6 mm)

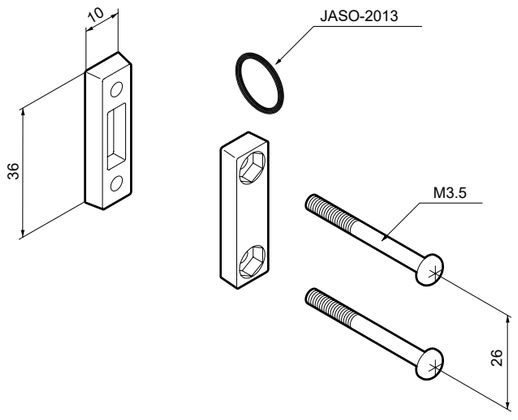




Weight: 150 g

●Model No. Notation Method joiner set

C1000-J100-W

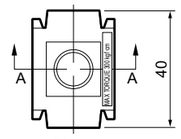


·Weight: 11 g
· Material: Polyamide resin

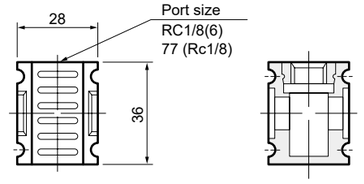
●Model No. Notation Method distributor

D101-00-8-W

Note: A joiner set and one gasket are attached.



Plane



Front

Cross section A-A

·Weight: 45 g
· Material: Polyamide resin

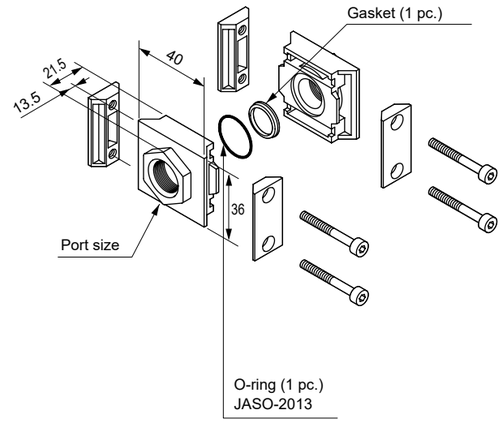
TLPS, MTLPS, UTLPS Series
Model No. Notation Method Peripheral components / Dimensions diagram

●Pipe adaptor set
(with joiner set)

A100-8-W
❶Port size

❶Port size

Code	Description
8	Rc1/4
10	Rc3/8



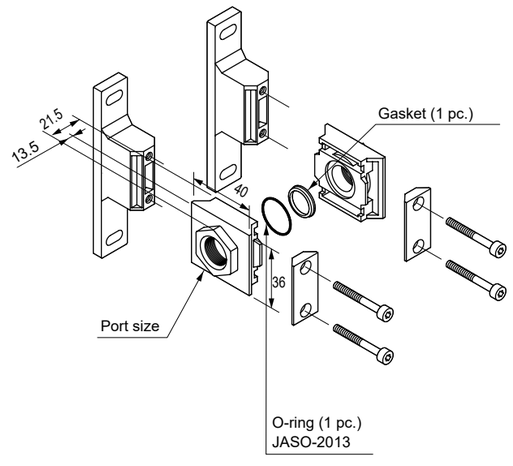
·Weight: 90 g
·Material: Aluminum alloy die-casting
Painting

●Pipe adaptor set
(with T-bracket set)

A100-8-W-B11W
❶Port size

❶Port size

Code	Description
8	Rc1/4
10	Rc3/8



·Weight: 90 g
·Material: Aluminum alloy die-casting
Painting

Model No. Notation Method Peripheral components / Dimensions diagram

Solenoid valve with needle

GPS2-AB3X-2E-FL-AC100V

❶Terminal box ❷Voltage

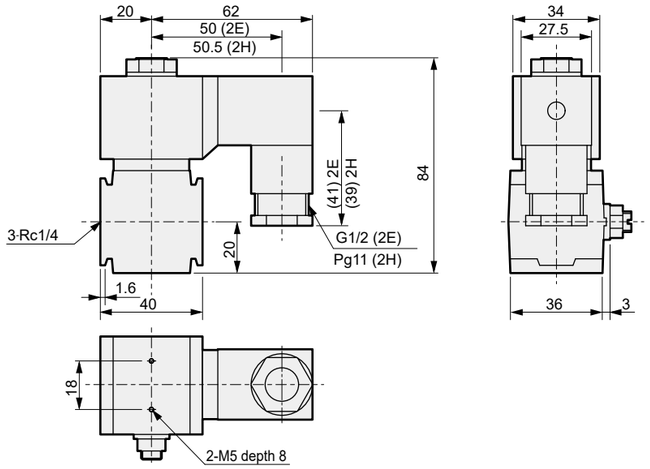
❶Terminal box

Code	Description
2E	DIN terminal box
2H	DIN terminal box with lamp
3N	HP terminal box with lamp

❷Voltage

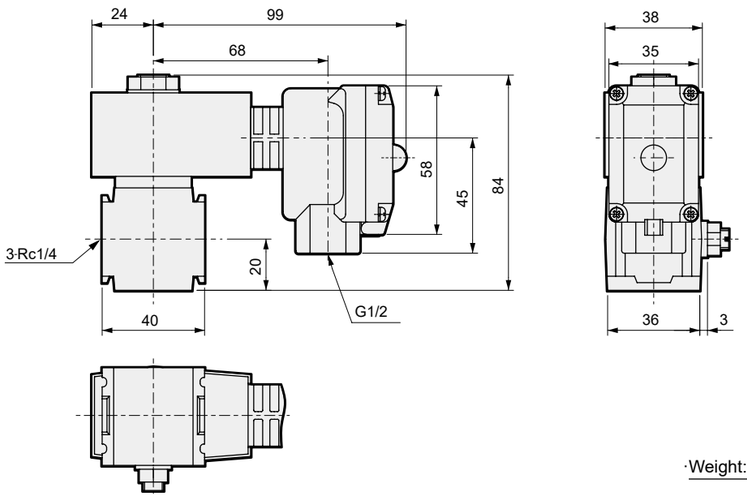
Code	Description
AC100V	100 VAC
AC200V	200 VAC
DC24V	24 VDC

●GPS2-AB3X-2E/2H-FL-AC100V/AC200V



·Weight: 280 g

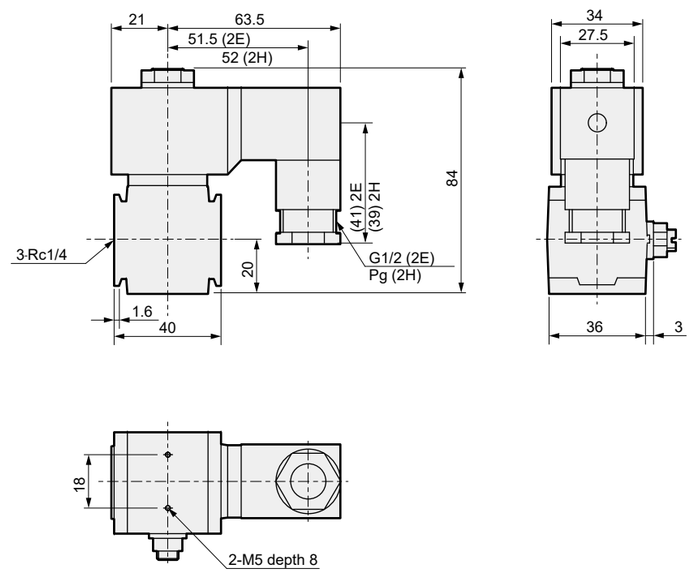
●GPS2-AB3X-3N-FL-AC100V/AC200V



·Weight: 445 g

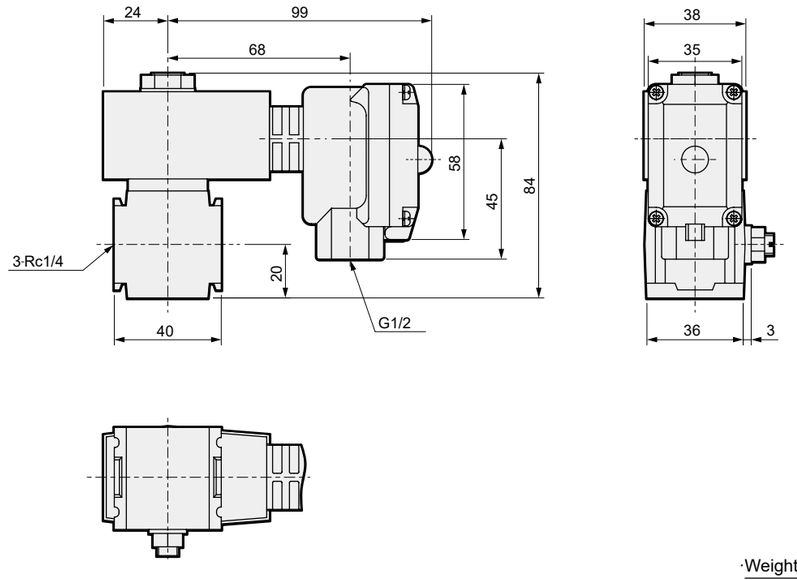
Model No. Notation Method Peripheral components / Dimensions diagram

●GPS2-AB3X-2E/2H-FL-DC24V



·Weight: 280 g

●GPS2-AB3X-3N-FL-DC24V



·Weight: 445 g

Model No. Notation Method Detecting nozzle/Dimensions diagram

TLPS-J 0310

❶Nozzle specifications

❶Nozzle specifications

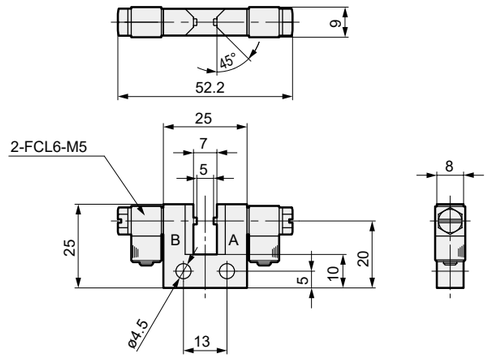
Code	Description	
	Injection nozzle diameter (A side)	Nozzle pressurized diameter (B side)
0310	ø0.3	ø1.0
0510	ø0.5	ø1.0
0715	ø0.7	ø1.5

Specifications

Item	TLPS-J0310	TLPS-J0510	TLPS-J0715
Applicable drill diameter mm	ø0.3 to 3	ø1 to 10	ø3 to 30
Distance between nozzles mm	5	12	32
Guide to the number of needle rotations	1.8 to 2.2	2.3 to 2.7	5.3 to 5.7

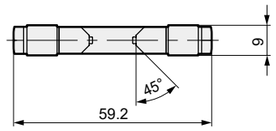
*1: The table above shows reference values when supply pressure is 0.1 MPa and pipe length is 5 m.
*2: Contact CKD for made to order nozzle and multi spindle.
*3: Jet nozzle is indicated as A, and pressurizing nozzle is indicated as B.
*4: Pipe the injection nozzle (A side) to the supply source (injection port for units) and the pressurized nozzle (B side) to the TLPS detection port.

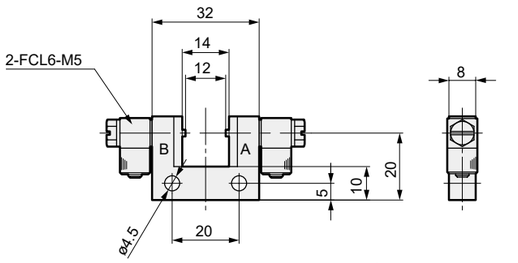
●J0310



Weight: 30 g

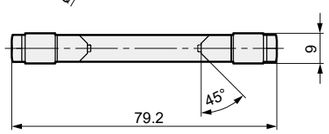
●J0510

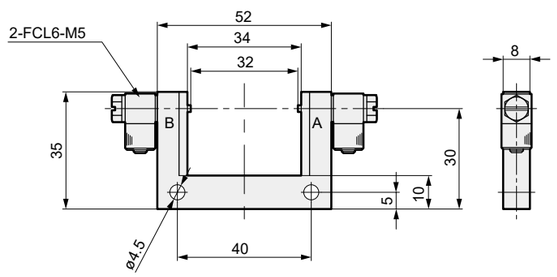




Weight: 31 g

●J0715



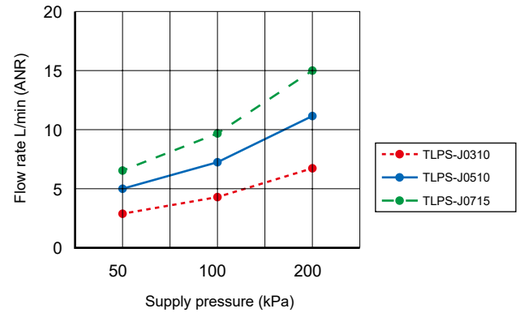


Weight: 39 g

Characteristics data (TLPS Series)

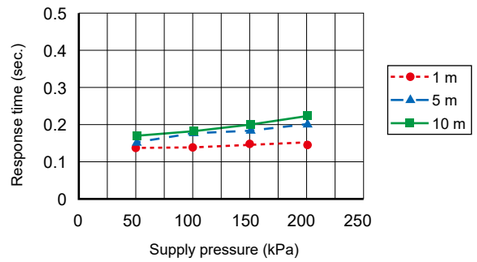
Characteristics data is data of TLPS single unit

Air consumption

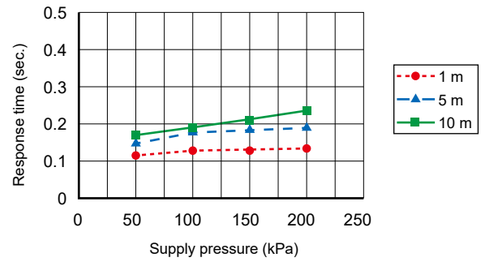


Response time - influence by pipe length

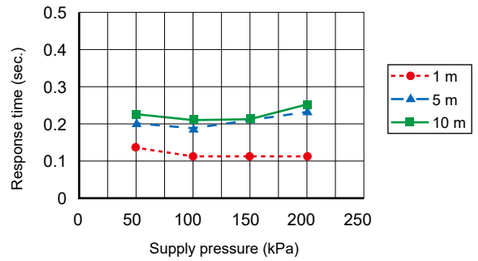
●Detecting nozzle TLPS-J0310



●Detecting nozzle TLPS-J0510



●Detecting nozzle TLPS-J0715



Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

Product-specific cautions: Cutting tool breakage detection switch TLPS Series

Installation / Selection

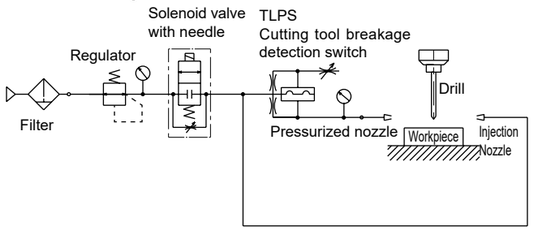
⚠WARNING

■Use the product in the range of conditions specified for the product. Contact CKD when using the product outside specifications or for special applications.
Use of the product outside the specifications range may result in insufficient performance, and its safety cannot be guaranteed.

■Confirm before use that the product will withstand the working environment.
- This product cannot be used in environments where functional obstacles could occur.
- The main materials of this product are aluminum and resin. Do not use in atmospheres where corrosive gases are generated. Such environments include high temperatures, chemical atmospheres, where chemical liquids, vibration, moisture, water dripping, coolant, or gas is present; where ozone is generated; chemical plants, semiconductor pre-processing, outdoors, etc.
- Compressed air quality must satisfy JIS1.4.1, "oilless clean dry air."

■Understand compressed air features before designing a pneumatic circuit.
This product has a small orifice, so to prevent the entry of foreign matter, use clean air with the recommended circuit shown below (Fig. 1).

Fig. 1 Recommended circuit



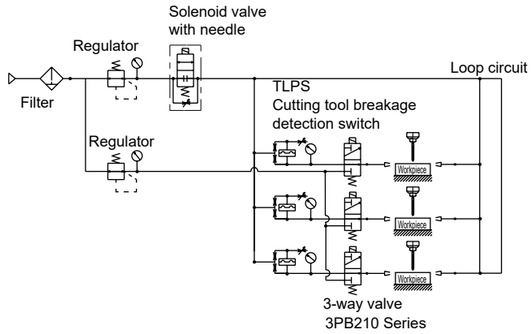
⚠CAUTION

■The entry of compressor oil and tarry substances may obstruct the flow of air and result in problems. Regularly inspect the compressor and discharge drainage.

■Keep the air flow constant so coolant and oil do not flow back from the detection nozzle, or use a solenoid valve with needle and let in a small amount of air from the bypass as shown in the recommended circuit (Fig. 1).

■Swarf and grinder chips, etc., could clog the nozzle. Increasing the supply pressure to blow these out will have no effect. Provide a 3-way valve on the pressurized nozzle as shown below (Fig. 2). The orifice for the 3-way valve should be ø2.5 mm or larger.

Fig. 2 With air blow used by several applications



■Select an output format (NPN, PNP) matching the input unit of the programmable controller being used.

■Operation may be disabled if a capacitance load such as an AC/DC buzzer is connected to the load. Turn power OFF and restart in this case. A protection circuit is provided to prevent damage from incorrect wiring or overcurrent. A relay must be used when connecting a capacitance load.

■Precautions for TLPS
- Use a ø4 bore and ø6 outer diameter pipe. When using 3, 4, or 5 nozzles in a row, try to keep the jet flow of each nozzle as even as possible. For branching, use outer diameter ø8 and inner diameter ø6 in this pipe as shown in Fig. 2, and form a loop circuit.
- Signals for the cutting tool breakage detection switch are shown below.

Drill Status	Drill present	Without drill
Air stop	OFF	OFF
Air supply	OFF	ON

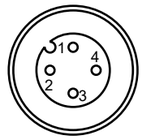
- When using the recommended circuit (Fig. 1) having a solenoid valve with needle, a small amount of air is supplied constantly. Even if the solenoid valve with needle is OFF, the cutting tool breakage detection switch may activate depending on the air supply.
- The recommended supply pressure when using the standard detecting nozzle is 100 kPa. Contact CKD on the detecting nozzle shape and air circuit when a width larger than the standard nozzle detection width of 32 mm is required.
- Air flows only during detection
  Let air flow for at least two seconds. After the solenoid valve is released, wait at least 1 second for the state to stabilize before retrieving signals. The remaining 1 second acts as judgment time, and the signal turns OFF when the drill is normal.
  · Continuously flowing air
  Response time differs with the pipe length and supply pressure, but is approx. 0.2 secs (Page 203). As a reference, the judgment time should be set to 0.5 seconds.

■Observe the following items when installing:
- Install this product so the detection port faces downward.
- Install this product at a position higher than the seating surface to prevent coolant from entering.
- Provide enough space for adjustment, monitoring, and maintenance.
- Use rust-resistant material such as nylon tubes or stainless steel pipes for piping material.
- When installing this product on a device, check that no load is applied to the device.
- When using steel pipes, securely fix the pipe to prevent excessive bending force from being applied to the connection.
- When welding near this product, cover it to prevent spatter from coming in contact.
- When housing this product in a box, provide an exhaust port so atmospheric pressure is maintained in the box.

■Observe the following items when wiring:
- When using a switching regulator for the power supply, ground the F.G. (frame ground).
- Avoid using in a transient state, continuing 1s after power is turned ON.
- Take special care to prevent load short-circuits or incorrect wiring. The protective circuit is activated. Turn power OFF to restart the product.
- Connector pins are arranged as shown in Fig. 3. Take special care to prevent incorrect wiring.

Brown → 24 VDC
Blue → 0 VDC
Black → signal, open collector

Fig. 3 Connector pin array (body side)

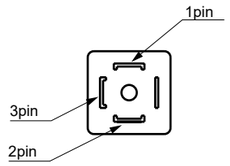


PIN array/lead wire color list

PIN No.	Electrical connection option (-C1, -C3, -C5) lead wire color	Applications
1pin	Brown	Power supply +
2pin	White	NC
3pin	Blue	Power supply -
4pin	Black	Output

- The assignment of the DIN terminal box terminal numbers is shown in Fig. 4.

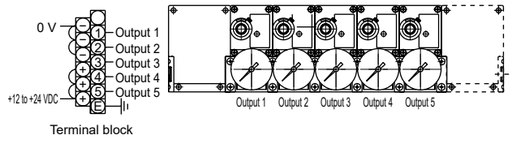
Fig. 4 DIN terminal box pin array (body side)



PIN No.	Applications
1pin	Power supply +
2pin	Power supply -
3pin	Output

- When using the common terminal box, power supply terminals are on the lower side of the gland. Signal wire terminals are on the upper row. This product is wired as shown in Fig. 5.

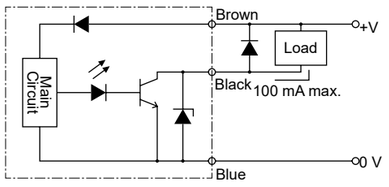
Fig. 5 Terminal box layout



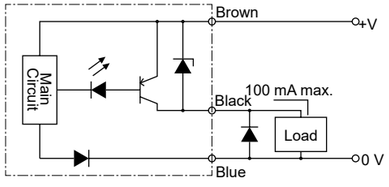
- When using a load with a large rush current, such as a motor, the protection circuit will activate. In this case, use a relay.
- If there is a device (motor, welder) that generates a large surge near this product, insert a surge absorber, such as a varistor, at the source of the surge.
- If this product's lead wire is wired with the drive cable or power cable, it is affected by surge and noise deteriorating or damaging the sensor element in the switch. Use separate wiring.
- NPN output and PNP output contact confirmation switches are available. The lamp turns ON even if program controller compliance is incorrect, but signals are not retrieved. Wire the switch based on the output as shown in Fig. 6.

Fig. 6 Output circuit

(NPN output)

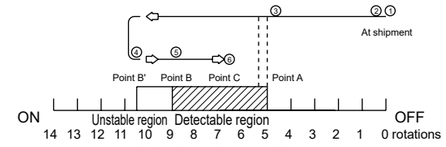


(PNP output)

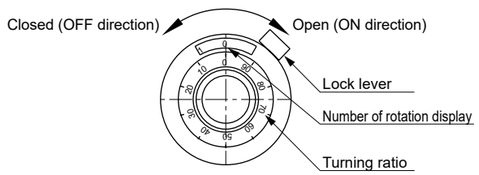


■Adjustment sequence

1. When this product is shipped from CKD, the adjustment dial is set to display 0 rotations as the number of rotations, and rotation angle 0.
2. Supply air. The indicator lamp turns OFF.
3. Turn the value of the knob rotation of the adjustment needle in the direction in which it increases (open) in the no drill state, and obtain the switching point A for OFF→ON.
4. Insert the drill tip of 1 mm between the nozzles (turns OFF) and turn it in the direction in which the value rises (open) to obtain the switching point B' for OFF→ON. Point B' may not be found if more than 1 mm of the end of the nozzle, or a nozzle other than the standard nozzle is used. In this case, turn the dial half a turn (50 scale) from point A, and set that point as setting point C.
5. Turn the motor in the direction in which the rotation speed decreases (closed), and obtain switch point B for ON→OFF. The adjusting range is found by counting the number of rotations from point A to point B.
6. Rotate the adjustment needle in the closed direction, and set to the middle point between point A and point B. This position is point C. If point C is near point B, the signal turns ON easily and response time is short. However, it will take time to return. Stable detection is possible by setting adjustment point C between point A and point B.
7. Lock the dial after adjusting.



Adjustment dial setting



Needle adjustment dial

Do not turn the dial with force at extremities of the rotation. The dial can be rotated up to 14 times.

■One detection nozzle can be used for one of these product units.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual

MEMO

Pressure switch
Electronic pressure Switch
Contact Confirm Switch
For Coolant Pressure Switch
Ending

CPE / CPD

Pressure switches for coolants

■ Pressure switch



Overview

These low/high-pressure switches are compatible with coolants. The diaphragm structure used at pressurized section achieves superior stability, so the product can be used to check the pressure of coolant in machine tools, and to check the pressure of water or oil in other industrial machines.

Features

Degree of protection IP65 equivalent (dust proof/water jet proof)

The high-pressure switch incorporates an electronic structure, enabling highly accurate detection and setting.

CONTENTS

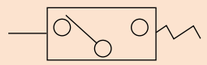
● Mechanical pressure switch for coolants (for low pressure) CPE 210
● Electronic pressure switch for coolants (with digital display) CPD 214



Mechanical pressure switch for coolants (for low pressure)

CPE Series

●Pressure adjusting range: 0.05 to 0.8 MPa

Circuit Diagram Symbol 

RoHS

Model No. Notation Method

CPE - 8 - 0 G - 3

- CPE: Model No.
- 8: Connection port: Rc1/4 downward
- 0: ❶Sealant
- G: Switch: Standard
- 3: ❷Lamp

❶Sealant

Code	Description
0	Nitrile Rubber
B	Fluoro rubber

❷Lamp

Code	Description
1	For 100/200 VAC
3	For 24 VDC

Specifications

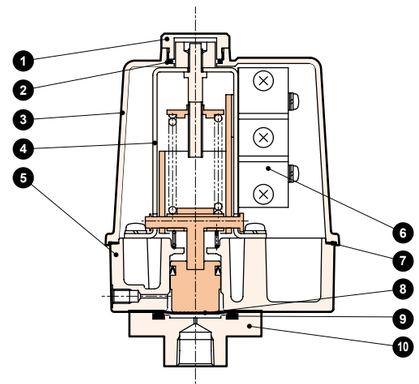
Item		CPE
Working fluid		Coolant, air, other non-corrosive liquids, gases
Rated pressure	MPa	0 to 1.0
Proof pressure (water pressure)	MPa	1.5
Pressure adjusting range	MPa	0.05 to 0.8
Fluid temperature	°C	0 to 50
Ambient temperature	°C	0 to 50
Port size		Rc1/4
Micro switch		Z-15GD-B (OMRON)
Contact array		1ab
Hysteresis	MPa	0.04 or less (set pressure 0.05 to 0.3)
		0.1 or less (set pressure 0.31 to 0.8)
Repeatability	MPa	±0.02
Allowable operating frequency cycles/min.		20
Rated voltage		100 VAC, 200 VAC, 24 VDC
Insulation resistance	MΩ	100 or more (with 500 VDC megger)
Weight	kg	0.58
Mounting orientation		Vertical direction with the adjusting screw up
Degree of Protection		IP65 (dust proof/water jet proof) equivalent

Micro switch rated

Load circuit		Non-inductive load (A)				Inductive load (A)			
		Resistance load		Lamp load		Inductive load		Electric motor load	
		N.C	NO	N.C	NO	N.C	NO	N.C	NO
Voltage	125 VAC	15		3	1.5	15		3	2.5
	250 VAC	15		2.5	1.25	15		3	1.5
	30 VDC	6		3	1.5	5		5	2.5

Internal Structure Diagram / Material

●CPE

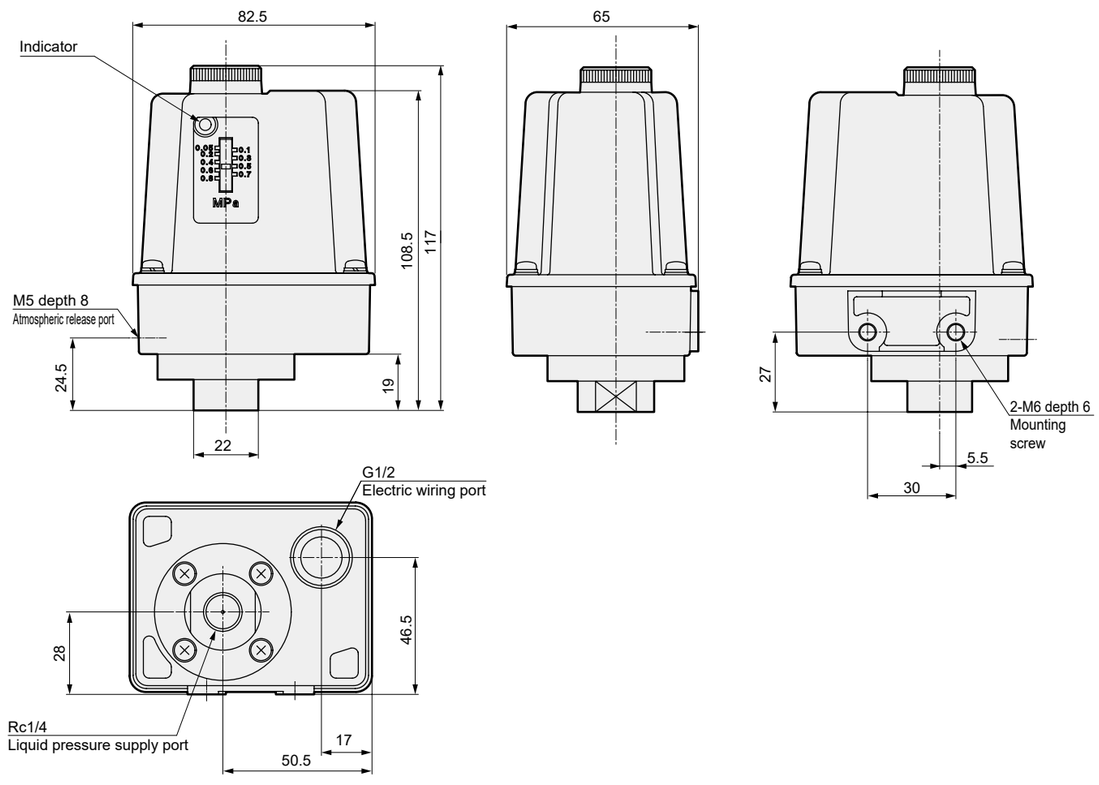


Part No.	Part name	Material	
1	Cap	A 5056	Aluminum
2	O-ring	NBR	Nitrile Rubber
3	Cover	ABS	ABS resin
4	Frame	SPC	Steel
5	Body	ADC12	Aluminum die-casting
6	Micro switch	–	–
7	Gasket	NBR	Nitrile Rubber
8	Diaphragm	NBR (FKM)	Nitrile rubber (fluoro rubber)
9	O-ring	NBR (FKM)	Nitrile rubber (fluoro rubber)
10	Port	SUS 303	Stainless steel

Options are shown in ( ).

Dimensions

●CPE



Pneumatic components (pressure switch for coolants)

Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

Specific cautions: Mechanical pressure switch for coolants (for low pressure) CPE Series

Design / Selection

⚠CAUTION

■The lamp is connected to the micro switch's NC terminal and NO terminal. An extremely small current flows even when the load (relay, etc.) is not energized. Pay attention to load selection.
100 VAC 1.5 mA 200 VAC 2.0 mA
24 VDC 1.5 mA

■Select with considerations to rush current.

Micro switch contact specifications

Rush current	Normally closed circuit	Max. 30 A
	Normally open circuit	Max. 15 A

Starting current should be measured beforehand.

■Never use this product in an explosive gas atmosphere.
The pressure switch does not have an explosive-proof structure. Never use in an explosive gas atmosphere as explosions or fires could result.

■Install a damper, absorber or accumulator as necessary if the water hammer, rush pressure or pulsation must be reduced. Pressure exceeding proof pressure even momentarily could damage the CPE.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual

MEMO

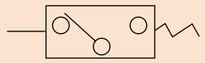
Pressure switch
Electronic pressure Switch
Contact Confirm Switch
For Coolant Pressure Switch
Ending



Electronic pressure switch for coolants (with digital display)

CPD Series

●Pressure adjusting range: 0 to 7 MPa

Circuit Diagram Symbol 

RoHS

Model No. Notation Method

CPD - P70 N - 8

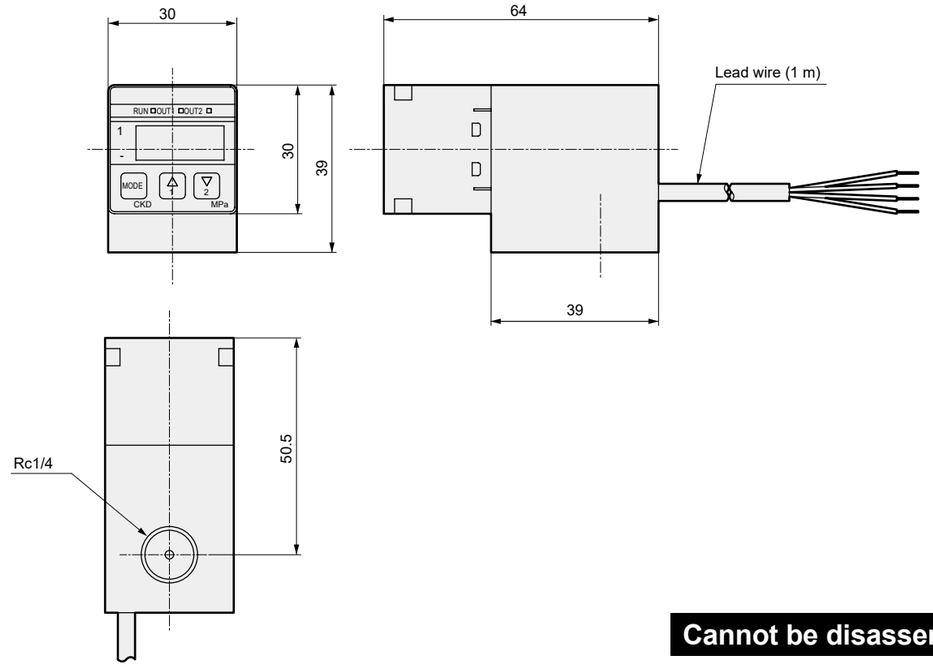
- CPD: Model No.
- P70: Rated pressure: 0 to 7 MPa
- N: Switch output: NPN Transistor output 2 point
- 8: Connection port: Rc1/4 Downward outlet

Specifications

Item		CPD
Pressure sensitive element		Stainless steel diaphragm pressure sensor
Working fluid		Coolant/other non-corrosive fluids
Rated pressure	MPa	0 to 7
Proof pressure (water pressure)	MPa	10.5
Pressure adjusting range	MPa	0 to 7
Fluid temperature	°C	0 to 50
Ambient temperature	°C	0 to 50
Ambient humidity	% RH	0 to 85 (no condensation)
Port size		Rc1/4
Indicator		3-digit LED display, character height 8 mm
Indicator accuracy (25°C)		±2%F.S. (±0.14 MPa)
Temperature characteristics (0 to 50°C)		±4%F.S. (±0.28 MPa)
Repeatability MPa		±0.02
Power supply voltage		12 to 24 VDC±10% (ripple rate 1% or less)
Current consumption	mA	50 or less
Output response time msec		Approx. 5
Switch output		NPN transistor open collector output 2 points
Switch output current	mA	MAX 50
Switch output voltage drop	V	2.4 or less
Set value hold		EEPROM
Lead wire		Oil resistant vinyl cable 4-conductor (0.2 mm^2) 1m
Weight kg		0.36
Mounting orientation		Unrestricted
Degree of Protection		IP65 (dust proof/water jet proof) or equivalent

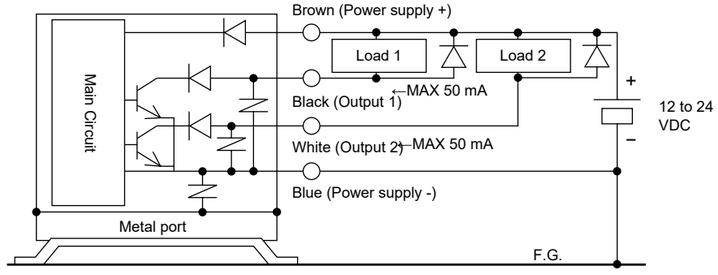
Dimensions

●CPD

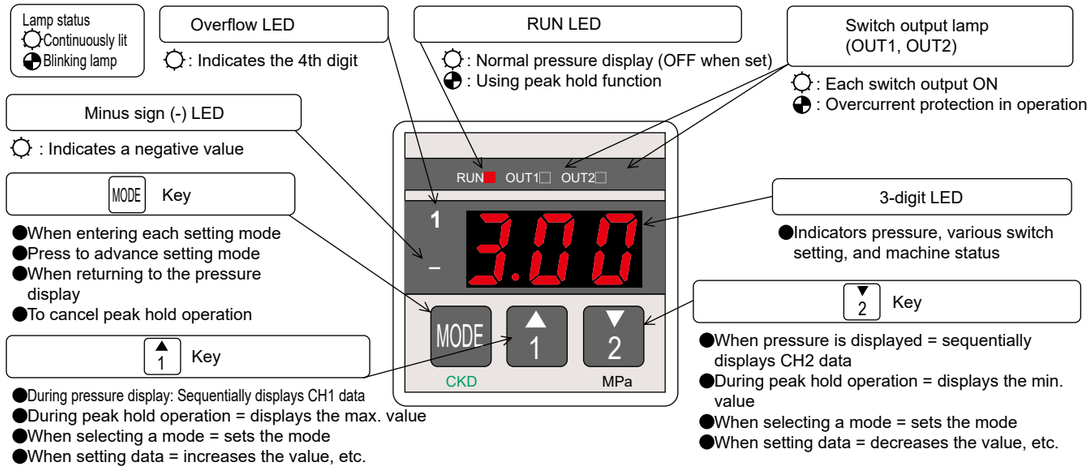


Cannot be disassembled

Wiring method



Indicator and function



LED display

Numbers and letters are displayed with a combination of LED displays.

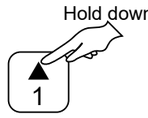
Numerals	0	1	2	3	4	5	6	7	8	9
Indicator	0	1	2	3	4	5	6	7	8	9

Numerals	A	B (b)	C	D (d)	H	I (i)	J	L	N (n)	O (o)	P
Indicator	A	b	C	d	H	i	J	L	n	o	P

Confirmation of set value

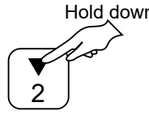
CH1 data display

Hold down

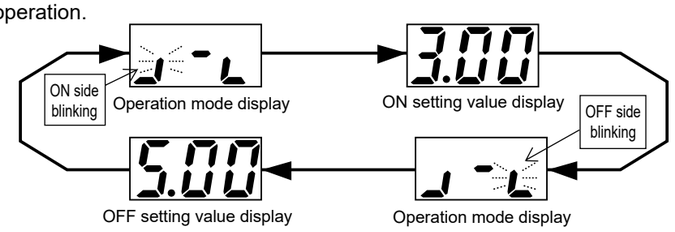


CH2 data display

Hold down



By pressing each key during pressure display, the switch data ON setting/OFF setting/operation waveform, zero point adjustment value, pressure range, and output can be confirmed. Switch operation is not affected during the following operation.



Zero point adjustment value/model No. display



The zero point adjustment value and model No. are displayed alternately.
The switch operation is not affected during this operation.



For details on operation and setting method, refer to CKD components product website (https://www.ckd.co.jp/kiki/en/) → "Model No."→ Instruction manual

Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

Electronic pressure switch for coolants (with digital display) CPD Series

Design / Selection

⚠WARNING

■Use this product in accordance with specifications.
Use for applications or at load currents, voltages, temperatures, impacts or sites outside of the specifications could result in damage or malfunctions.

■Do not use with high pressure gas.
This product is not approved under the High Pressure Gas Safety Act. Do not use for devices subject to the High Pressure Gas Safety Act.

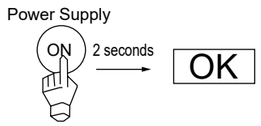
■Never use this product in an explosive gas atmosphere.
The pressure switch does not have an explosive-proof structure. Never use in an explosive gas atmosphere as explosions or fires could result.

■Be careful of internal voltage drop.
When using with a voltage less than the specified voltage, the pressure switch may be activated correctly, but the load may not function correctly. Check the load working voltage to see that the following formula is satisfied:

Power supply voltage - internal voltage drop > load working voltage

⚠CAUTION

■The product self-diagnoses the internal circuit immediately after power is turned ON, so pressure is not detected immediately. Set the control circuit so that signals are ignored for about 2 seconds after power is turned ON.



■This product's overcurrent protection turns the output OFF when an overcurrent is detected. However, the output is repeatedly turned ON for a short time at a set cycle. This causes power supply voltage to fluctuate and may adversely affect peripheral devices.

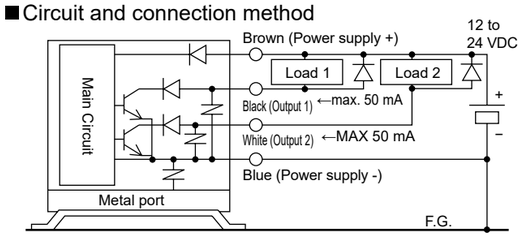
■Determine the setting, taking error caused by accuracy limitations and temperature characteristics into consideration.

■Take care when using this product for an interlock circuit.
When using the pressure switch for an interlock signal requiring high reliability, provide a double interlock by installing a mechanical protection function or a switch (sensor) other than a pressure switch as a safeguard against breakdown. Regularly inspect and confirm that the interlock activates correctly.

■Take the following countermeasures to prevent malfunction caused by noise.
●Insert a line filter in the AC power supply line.
●Use a surge suppressor such as a CR or diode on the inductive load (solenoid valve, relay, etc.) and remove noise from the source.
●Separate wiring from strong magnetic fields.
●Connect wiring with shielded wire.
●Ground the shield wire on the power supply side.

■Working environment
Check the temperature of fluid being measured and the environmental temperature in piping.

■Circuit and connection method



●Install the CPD on a frame or panel connected to the frame ground (F.G.) and, if necessary, directly connect from the CPD port to the F.G. When leading fluids in from an external device, connect via a relay fitting connected to the F.G. (To provide safety when using conductive fluids)

●This CPD power supply is a DC stabilized power supply completely isolated from the AC primary side. Connect either the + side or - side of the power to the FG. A varistor (limit voltage approx. 40 V) is connected between the internal power circuit and port/mounting section of this CPD to prevent dielectric breakdown of the sensor. Avoid withstand voltage and insulation resistance tests between the CPD's internal power supply circuit and port/mounting section. Disconnect CPD wiring first if this testing is required. An excessive potential difference between the CPD power supply and port/installation section could burn internal parts. After installing, connecting and wiring the CPD, electrical welding of the device/frame, short-circuit accidents, etc., could cause welding current, excessively high voltage caused by welding, or surge voltage, etc., to run through the wiring, ground wire, or fluid path connected between the above devices, damaging wires or devices. Conduct any work such as electrical welding after removing this device and disconnecting all electric wires connected to the FG.

■Install a damper, absorber or accumulator as necessary if the water hammer, rush pressure or pulsation must be reduced. Pressure exceeding proof pressure even momentarily could damage the CPD.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual

Flow rate sensor/flow rate controller

		Page
Flow rate sensor		
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	Compact flow rate sensor [RAPIFLOW®] separated display FSM2-D Series	355
	Miniature flow rate sensor [RAPIFLOW®] FSM Series	369
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	Capacitance electromagnetic flow sensor WFC Series	447
	Karman vortex flow rate sensor for water [FLUEREX flow sensor®] WFK3000 Series	465
	Integrated unit for water control WXU series	483
Flow rate controller		
For gases	Compact flow rate controller [RAPIFLOW®] FCM Series	517

Flow rate sensor for air

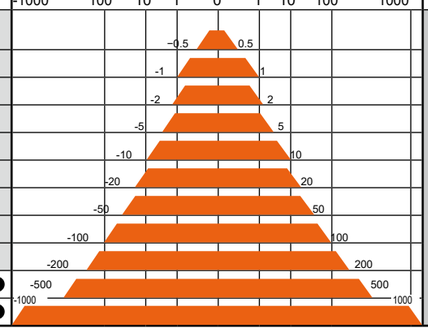
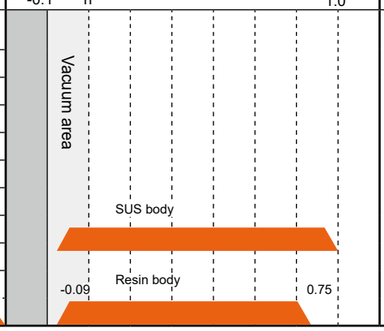
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Series variation		222
Compact flow rate sensors (RAPIFLOW®)		
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Pneumatic flow rate sensor (FLUEREX®) Separated display PFD Series		403

Flow rate sensor for air

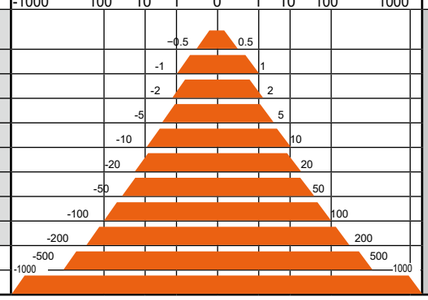
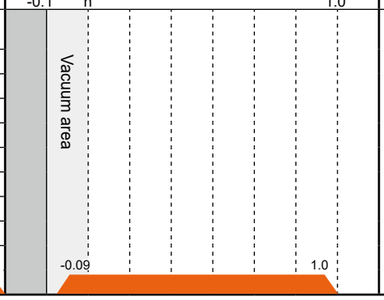
*Refer to P. 224 for FSM-X/V and PFD Series.

[(For air/nitrogen gas/argon/carbon dioxide/mixed gases (argon + carbon dioxide) RAPIFLOW® FSM3 Series >

RAPIFLOW FSM3/model No. series variation				Body material			Port size									Flow rate range L/min * For bi-directional detection (option)	Working pressure MPa (gauge pressure)	Listed on Page
LCD display		Bar display	IO-Link															
Analog output 1 point NPN output 1 point/2 points FSM3-L□ Series	Analog output 1 point PNP output 1 point/2 points FSM3-L□ Series	Analog output 1 point Capable of mounting display (optional) FSM3-B□ Series	IO-Link communication	Resin body	Stainless steel body		ø4 (BH)	ø6 (CH)	ø8 (DH)	ø10 (EH)	ø1/4 (HH)	ø3/8 (JH))	Rc1/8 (AA)	Rc1/4 (BA)	Rc1/2 (CA)			
																-1000 100 10 1 0 1 10 100 1000	-0.1 n 1.0	
FSM3-L005□1/2/3 -A/B/E/F	FSM3-L005□1/2/3 -C/D/G/H	FSM3-B005□1/2/3 -J/K	FSM3-C005□1/2/3 -L	●	●		●	●			●		●					229
FSM3-L010	FSM3-L010	FSM3-B010	FSM3-C010	●	●		●	●			●		●					
FSM3-L020	FSM3-L020	FSM3-B020	FSM3-C020	●	●		●	●			●		●					
FSM3-L050	FSM3-L050	FSM3-B050	FSM3-C050	●	●		●	●			●		●					
FSM3-L100	FSM3-L100	FSM3-B100	FSM3-C100	●	●		●	●			●		●					
FSM3-L200	FSM3-L200	FSM3-B200	FSM3-C200	●	●		●	●			●		●					
FSM3-L500	FSM3-L500	FSM3-B500	FSM3-C500		●			●	●		●		●	●				
FSM3-L101	FSM3-L101	FSM3-B101	FSM3-C101						●	●		●		●				
FSM3-L201	FSM3-L201	FSM3-B201	FSM3-C201						●	●		●		●				
FSM3-L501	FSM3-L501	FSM3-B501	FSM3-C501												●			
FSM3-L102	FSM3-L102	FSM3-B102	FSM3-C102												●			

Note: Refer to "Model No. Notation Method" for details on body material and port size combinations.

[(For air/nitrogen gas/argon/carbon dioxide/mixed gases (argon + carbon dioxide) RAPIFLOW® FSM3 Series Environment-Resistant Specifications]

RAPIFLOW FSM3/model No. series variation			Body material			Port size			Flow rate range L/min * For bi-directional detection (option)	Working pressure MPa (gauge pressure)	Listed on Page
LCD display		Bar display									
Analog output 1 point NPN output 1 point/2 points FSM3-L□ Series	Analog output 1 point PNP output 1 point/2 points FSM3-L□ Series	Analog output 1 point FSM3-B□ Series	Resin body	Stainless steel body		Rc1/8 (AA)	Rc1/4 (BA)	Rc1/2 (CA)			
									-1000 100 10 1 0 1 10 100 1000	-0.1 n 1.0	
FSM3-L005□4/5 -A/B/E/F	FSM3-L005□4/5 -C/D/G/H	FSM3-B005□4/5 -J/K		●		●					323
FSM3-L010	FSM3-L010	FSM3-B010		●		●					
FSM3-L020	FSM3-L020	FSM3-B020		●		●					
FSM3-L050	FSM3-L050	FSM3-B050		●		●					
FSM3-L100	FSM3-L100	FSM3-B100		●		●					
FSM3-L200	FSM3-L200	FSM3-B200		●		●					
FSM3-L500	FSM3-L500	FSM3-B500		●		●	●				
FSM3-L101	FSM3-L101	FSM3-B101		●			●				
FSM3-L201	FSM3-L201	FSM3-B201		●			●				
FSM3-L501	FSM3-L501	FSM3-B501		●				●			
FSM3-L102	FSM3-L102	FSM3-B102		●				●			

Note: Refer to "Model No. Notation Method" for details on body material and port size combinations.

[Separated display]

RAPIFLOW FSM2-D Series variation		Page
Analog output 1 point NPN output 2 points	Analog output 1 point PNP output 2 points	
		355
FSM2-D-N	FSM2-D-P	

[(Air/nitrogen gas) Miniature flow rate switch RAPIFLOW® FSM-X/V Series]

RAPIFLOW FSM-X/model No. series variation		Body material		Port size			Flow rate range L/min	Working pressure MPa (gauge pressure)	Listed on Page
Analog output 1 point Discrete sensor head	Analog output 1 point flow path block			No fitting (Discrete sensor head)	ø4	M5			
		Resin body		●	●	●	Capable of detecting bi-directional flow −100 −10 −1 −0.1 −0.01 0 0.01 0.1 1 10 100 0 0.5 / 0 1 / 0 5 / 0 10 / −0.5 0.5 / −1 1 / −5 5 / −10 10	−0.1 n 1.0 Vacuum area -0.09 0.2	
FSM-X-AF005	FSM-X-AF005-□	●		●	●	●			369
FSM-X-AF010	FSM-X-AF010-□	●		●	●	●			
FSM-X-AF050	FSM-X-AF050-□	●		●	●	●			
FSM-X-AF100	FSM-X-AF100-□	●		●	●	●			
FSM-X-AR005	FSM-X-AR005-□	●		●	●	●			
FSM-X-AR010	FSM-X-AR010-□	●		●	●	●			
FSM-X-AR050	FSM-X-AR050-□	●		●	●	●			
FSM-X-AR100	FSM-X-AR100-□	●		●	●	●			

Note: Refer to "Model No. Notation Method" for details on body material and port size combinations.

RAPIFLOW FSM-V/model No. series variation			Body material		Port size				Flow rate range L/min	Working pressure MPa (gauge pressure)	Listed on Page
Analog output	Switch output										
Analog output 1 point Capable of mounting display (optional) FSM-V-A□3-□Series	NPN output 2 points FSM-V-N□3-□Series	PNP output 2 points FSM-V-P□3-□Series			ø1.8	ø4	ø4 (L-type)	M5	Capable of detecting bi-directional flow −100 −10 −1 −0.1 −0.01 0 0.01 0.1 1 10 100 −0.05 0.05 / −0.1 0.1 / −0.5 0.5 / −1 1 / −5 5 / −10 10	−0.1 n 1.0 Vacuum area -0.09 0.2	
			Resin body		●	●	●	●			369
FSM-V-A□3-R0005	FSM-V-N□3-R0005	FSM-V-P□3-R0005	●		●	●	●	●			
FSM-V-A□3-R0010	FSM-V-N□3-R0010	FSM-V-P□3-R0010	●		●	●	●	●			
FSM-V-A□3-R0050	FSM-V-N□3-R0050	FSM-V-P□3-R0050	●		●	●	●	●			
FSM-V-A□3-R0100	FSM-V-N□3-R0100	FSM-V-P□3-R0100	●		●	●	●	●			
FSM-V-A□3-R0500	FSM-V-N□3-R0500	FSM-V-P□3-R0500	●		●	●	●	●			
FSM-V-A□3-R1000	FSM-V-N□3-R1000	FSM-V-P□3-R1000	●		●	●	●	●			

[FLUEREX® pneumatic flow rate sensor PFD Series]

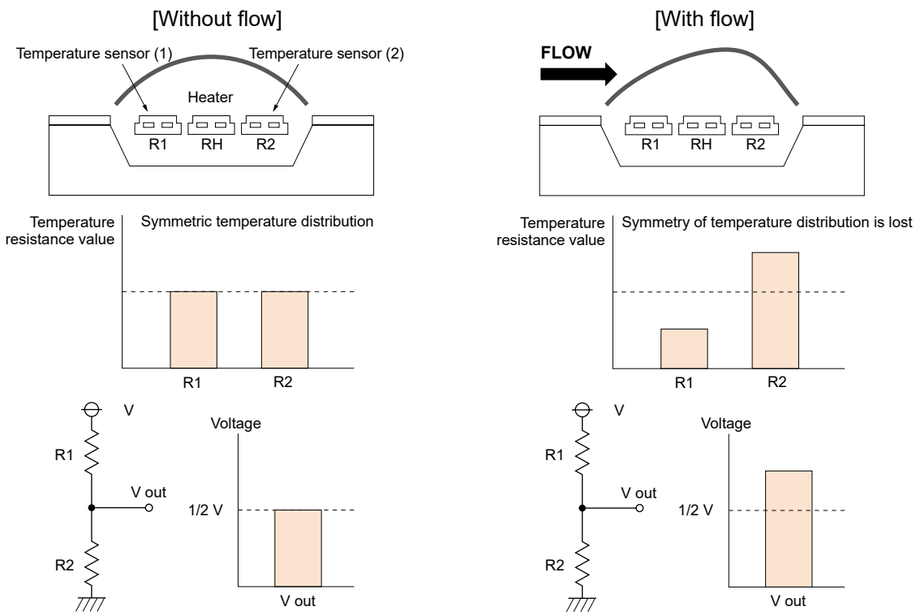
FLUEREX flow sensor PFD/model No. series variation		Flow rate range L/min (normal)
Separated display		10 100 1,000 10,000 100,000
		25 500 / 50 1,000 / 100 2,000 / 200 4,000 / 400 8,000 / 800 16,000
PFD-501		
PFD-102		
PFD-202		
PFD-402		
PFD-802		
PFD-163		

	Model No.	Port size						Page
		10 A	15 A	20 A	25 A	40 A	50 A	
Separated display	PFD-501	●						403
	PFD-102		●					
	PFD-202			●				
	PFD-402				●			
	PFD-802					●		
	PFD-163						●	

Compact flow rate sensor

Measurement principle of FSM Series

The FSM Series incorporates a platinum sensor chip machined with silicon micro-machining. The sensor is thermally insulated from the silicon substrate. The heating capacity is extremely low, enabling high sensitivity with a high-speed response. At the sensor, two temperature sensors are arranged with a heater in between. Platinum, which has a resistance that changes based on temperature, is used for the temperature sensor. When the heater is turned ON and heating occurs, the temperature distribution is symmetrical to the center of the heater if there is no flow. When flow is received, the symmetrical property of the temperature distribution is lost, temperature upstream from the heater drops, and temperature downstream rises. This temperature difference appears as the difference in temperature sensor resistance, and varies with the flow rate. When the flow is reversed, the temperature difference (difference in resistance) will be inverted. By using this method, the bi-directional flow rate can be detected. A bi-directional flow rate is thus detected. This is suitable for detecting relatively small flows.



MEMO

Flow rate sensor
Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit
Ending

Compact flow rate sensor

RAPIFLOW® FSM3

■ Flow rate sensor



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LCD display 236
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IO-Link 254

● Stainless steel body
LCD display 272
Bar display 282
IO-Link 290

Safety Precautions 316

Flow rate sensor

Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit

FSM3 Series

Diversified



5 gas types can be measured with just one unit

Gas switching function

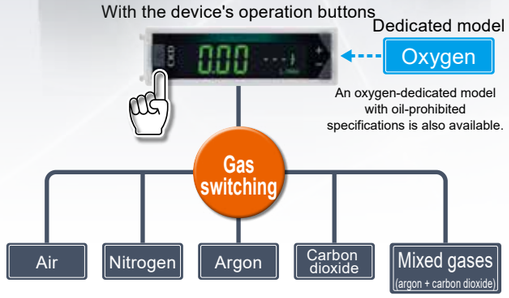
(LCD display, IO-Link)
(Model with full scale flow rate of 200 L/min or below)

Air, nitrogen, argon, carbon dioxide, gas mixture (Ar:CO_2 mixture (8:2)) is supported with this single flow rate sensor.

Gases can be switched with operation buttons

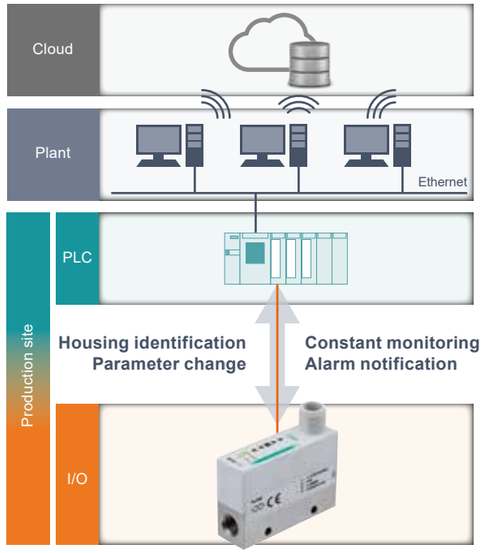
With the IO-Link specifications, gases can be switched remotely using the host controller.

*Contact CKD Sales if you have a request for the mixing ratio.



IO-Link model available

IO-Link is a digital communication standard for sensors/actuators at factory sites. (IEC 61131-9)
Unlike analog communication, it enables the transmission of parameters and event data.



Features of IO-Link

- Digital Signal — Constant monitoring via digital data is possible.
- Parameter remote control — Parameters can be set and changed via the network, enabling remote equipment operation.
- Housing identification — Models, serial numbers, etc., can be confirmed on the network.
- Plug & Play — The settings can be copied from the master, making parameter reconfiguration after maintenance obsolete.
- Error notification — Device failure and disconnection can be confirmed.
- Connection to fieldbus — It can also be converted to Ethernet networks and connected, enabling devices to be IoT-ready.

High performance



MEMS stands for Micro Electro Mechanical Systems and refers to ultra-compact devices based on microfabrication technology used in the manufacture of semiconductor integrated circuits.

Clean-room specifications (Option)

Anti-dust generation packaging (P70) and oil-prohibited specifications (P80) available

Usage according to the grade of the device is possible.

*Refer to catalog No.CB-033SA for details.

Outgassing supported

Because the stainless steel body does not use resin in its flow path, it is ideal for processes where outgassing is a problem.

High precision/high-speed response

Repeatability: Within ±1%F.S.
Indicator accuracy: Within ±3% F.S.
Response time: 50 msec

Reduction of pressure loss

Up to 50% reducution with flow path redesign

Bi-directional fluid measurement

Contributes to reducing tact time.

The flow direction can be measured as desired.



Easy to use

Rotatable LCD display

Indicator can be vertically inverted



Easy mounting (option)

DIN rail mount



Panel mount



Variety of fitting variations.

Resin body



Push-in elbow | Push-in straight | Screw-in elbow | Screw-in straight

Stainless steel body



JXR fitting | Double barbed fitting | Screw-in | Screw-in G thread (ISO)

Solution examples

Leakage inspection

Fill the drinking water container with gas to detect the presence or absence of leakage.

Filter unit



Digital Pressure Sensor

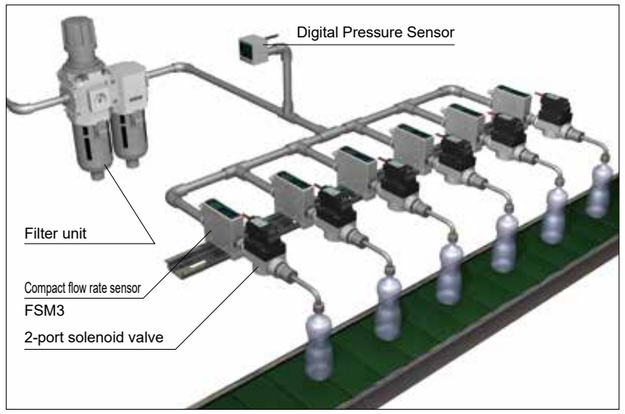


2-port solenoid valve



Compact flow rate sensor





Controlling air consumption

Monitor the air consumption of facilities that use air components.

Filter unit

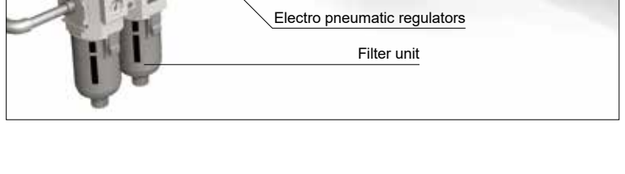


Digital Pressure Sensor



Compact flow rate sensor





Painting air flow rate control

Change the air pressure and controls flow rate used during coating with the electro pneumatic regulator.

Filter unit

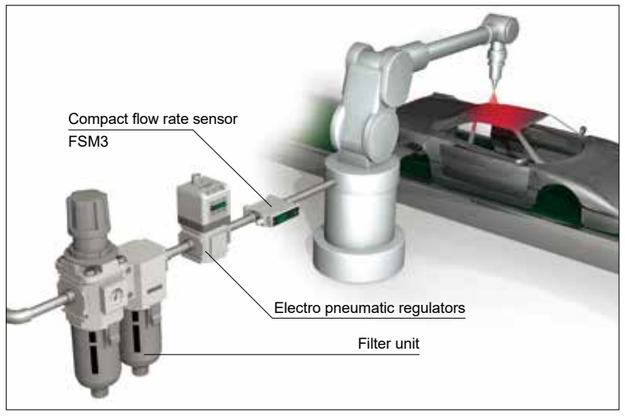


Electro pneumatic regulators



Compact flow rate sensor





Biochemical culture apparatus

Co_2flow rate of is measured to promote the photosynthesis of organisms.

Inline clean filter



Digital Pressure Sensor



Compact flow rate sensor





Arc welding

Manages argon, gas mixtures (argon + carbon dioxide), and other shielding gases.

Rotary clamp cylinder



Guided cylinder



Cylinder switch with connector



Compact flow rate sensor (IO-Link model)





Electronic part installation

Control the tension of gold wire for installing electronic parts.

Inline clean filter

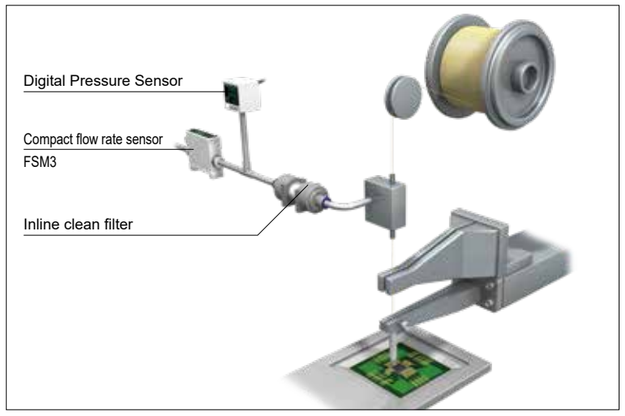


Digital Pressure Sensor



Compact flow rate sensor





Flow rate sensor
Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit
Ending

Series Variation
Compact flow rate sensor (RAPIFLOW)
FSM3 Series

	Appearance	Applicable fluids	Flow rate adjustment valve *2	EXA connecting fitting *3		Port size	Max. flow rate (L/min) 0.5	1	2	5	10	20	50	100	200	500	1000	Page
Resin body	LCD display Bar display IO-Link 	Air Nitrogen Carbon dioxide (*1) Argon Mixed gases (argon + carbon dioxide)	●			ø4	●	●	●	●	●	●						• LCD display Page 236 • Bar display* Page 246 • IO-Link Page 254
			●			ø6	●	●	●	●	●	●	●					
			●			ø8							●	●	●			
			●			ø10								●	●			
			●			ø1/4"	●	●	●	●	●	●	●					
			●			ø3/8								●	●			
			●			Rc1/8	●	●	●	●	●	●	●					
			●	●		Rc1/4							●	●	●			
						Rc1/2										●*	●*	
			●			NPT1/8	●	●	●	●	●	●	●					
			●			NPT1/4							●	●	●			
						NPT1/2										●*	●*	
			●			G1/8	●	●	●	●	●	●	●					
			●			G1/4							●	●	●			
						G1/2										●*	●*	
Stainless steel body	LCD display Bar display IO-Link 	(1) Air Nitrogen Carbon dioxide (*1) Argon Mixed gases (argon + carbon dioxide) (2) Oxygen	●			Rc1/8	●	●	●	●	●	●	●					• LCD display Page 272 • Bar display* Page 282 • IO-Link Page 290
			●			Rc1/4							●	●	●			
						Rc1/2										●*	●*	
			●			G1/8	●	●	●	●	●	●	●					
			●			G1/4							●	●	●			
						G1/2										●*	●*	
			●			NPT1/8	●	●	●	●	●	●	●					
			●			NPT1/4							●	●	●			
						NPT1/2										●*	●*	
			●			1/4" double barbed fitting	●	●	●	●	●	●	●	●	●			
			●			1/4" JXR male fitting	●	●	●	●	●	●	●	●	●			

*1: With the gas type switching function, the full scale flow rate after switching to carbon dioxide is half the flow rate range.
*2: Supports LCD display.
*3: Compatible with LCD display and bar display.

*Applicable fluids are air and nitrogen only.



Compact flow rate sensor (RAPIFLOW)

FSM3 Series

LCD display

●Resin body (flow rate range: 500 mL/min to 1000 L/min)

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

FSM3 - L 005 U 1 BH 1 A 1 N - B M R

- FSM3: Model No.
- L: display: LCD display
- 005: ❶Flow rate range (full scale flow rate)
- U: ❷Flow direction
- 1: Body material: Resin applicable fluid: Air
- BH: ❸Port size
- 1: ❹Piping direction
- A: ❺Output specifications
- 1: ❻Unit Specifications
- N: ❼Valve option
- B: ❽Lead wire
- M: ❾Mounting Attachment
- R: ❿Included documents

❶Flow rate range (full scale flow rate)

Code	Description	Code	Description
005	500 mL/min	500	50 L/min
010	1000 mL/min	101	100 L/min
020	2 L/min	201	200 L/min
050	5 L/min	501	500 L/min
100	10 L/min	102	1000 L/min
200	20 L/min		

Note: Refer to the compatibility table below for combinations of the flow rate range and port size.

❷Flow direction

Code	Description
U	Uni-direction
B	Bi-direction

Note: For models with flow direction "B" bi-directional, ❼the valve option is only available without "N". Note that fittings with "T" needle valve and "E" EXA connection cannot be selected.

❸Port size

Description		Code	
Push-in	For ø4 mm tube	BH	
	For ø6 mm tube	CH	
	For ø8 mm tube	DH	
	For ø10 mm tube	EH	
	For ø1/4" tube	HH	
	For ø3/8" tube	JH	
Rc thread	Rc1/8	AA	
	Rc1/4	BA	
	Rc1/2	CA	
G thread ISO 16030	G1/8	AF	
	G1/4	BF	
	G1/2	CF	
G thread JIS B 2351-1 O-type (*1)	G1/8	AB	
	G1/4	BB	
	G1/2	CB	
NPT thread	NPT1/8	AC	
	NPT1/4	BC	
	NPT1/2	CC	

*1: Check the G thread connection shape with the dimensions diagrams (pages 241 to 243) when making a selection. (G thread connection shape is JIS B 2351-1 O-type compliant)
*2: Refer to the compatibility table on the right for the combinations of the flow rate range and port size.

❹Piping direction

Code	Description	
1	Straight	
2	Elbow	

Note: Note that if you mount the elbow fitting in an upward position, it will interfere with the connector, and if you mount the elbow fitting in a downward position, it will interfere with the DIN rail mounting.

Compatibility table of flow rate range and port size, needle valve option, and EXA connection fitting

❸Port size ❹Piping direction

❶Flow rate range	BH1	CH1	DH1	EH1	HH1	JH1	BH2	CH2	DH2	EH2	HH2	JH2	AA1	BA1	CA1	AA2
005	● ○	● ○			● ○		● ○	● ○			● ○		● ○			● ○
010	● ○	● ○			● ○		● ○	● ○			● ○		● ○			● ○
020	● ○	● ○			● ○		● ○	● ○			● ○		● ○			● ○
050	● ○	● ○			● ○		● ○	● ○			● ○		● ○			● ○
100	● ○	● ○			● ○		● ○	● ○			● ○		● ○			● ○
200	● ○	● ○			● ○		● ○	● ○			● ○		● ○			● ○
500		● ○	● ○		● ○			● ○	● ○		● ○		● ○	● ○ ★		● ○
101			● ○	● ○		● ○			● ○	● ○		● ○		● ○ ★		
201			● ○	● ○		● ○			● ○	● ○		● ○		● ○ ★		
501															●	
102															●	
❶Flow rate range	BA2	AF1	BF1	CF1	AF2	BF2	AB1	BB1	CB1	AB2	BB2	1 VAC	BC1	CC1	2 VAC	BC2
005		● ○			● ○		● ○			● ○		● ○			● ○	
010		● ○			● ○		● ○			● ○		● ○			● ○	
020		● ○			● ○		● ○			● ○		● ○			● ○	
050		● ○			● ○		● ○			● ○		● ○			● ○	
100		● ○			● ○		● ○			● ○		● ○			● ○	
200		● ○			● ○		● ○			● ○		● ○			● ○	
500	● ○	● ○	● ○		● ○	● ○	● ○	● ○		● ○	● ○	● ○	● ○		● ○	● ○
101	● ○		● ○			● ○		● ○			● ○		● ○			● ○
201	● ○		● ○			● ○		● ○			● ○		● ○			● ○
501				●					●					●		
102				●					●					●		

●: Port size compatibility ○: Needle valve option compatible ★: EXA connection fitting compatible

❺Output specifications

Code	Description		
	Analog Output	Switch Output	Setting copy function
A	1 points (Voltage output) 1-5V	1 point (NPN)	Yes
B		2 point (NPN)	—
C		1-point output (PNP)	Yes
D		2-point output (PNP)	—
E	1 points Current output 4-20mA	1 point (NPN)	Yes
F		2 point (NPN)	—
G		1-point output (PNP)	Yes
H		2-point output (PNP)	—

❻Unit Specifications

Code	Description
1	SI units only
2	With unit switching function (only for overseas)

Note: "2" unit switching function model cannot be sold in Japan.

❼Valve option

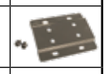
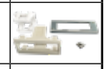
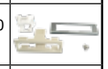
Code	Description	
N	None	
T	With needle valve (only for models 200 L or less)	
*1 *2 E	EXA connecting fitting (EXA sold separately)	

*1: Connection to solenoid valves (EXA Series) is possible with the dedicated fitting. Page 267.
*2: Be sure to set EXA to the OUT side of the product. Use a lead wire for the EXA coil option. The DIN terminal box cannot be mounted because it will cause interference. After making sure it is connected firmly, confirm that there is no external leakage.

❽Lead wire

Code	Description	
Blank	None	
A	5 conductor 1 m	
B	5 conductor 3 m	

❾Mounting Attachment *1,*2

Code	Description	
Blank	None	
H	Bracket 1 (for models 200 L or less)	
J	Bracket 2 (for 500 or 1000 L models)	
K	Panel mounting (for sensor products of models 200 L or less)	
L	Panel mounting (for needle valves of models 200 L or less)	
M	DIN rail mounting (for models 200 L or less)	

*1: Note that the bracket mounting position may interfere with the elbow fitting.
*2: Optional parts will come with the product.

❿Included documents

Code	Description
Blank	None
R	Inspection certificate
S	Inspection certificate + calibration certificate + traceability system diagram

Clean-room specifications (Catalog No. CB-033SAA)

FSM3 -••••- P70

FSM3 -••••- P80

Model No. Notation for Options

FSM3 - K

- K: ❶Option

Note: Refer to P. 262 for dimensions diagram.

❶Option

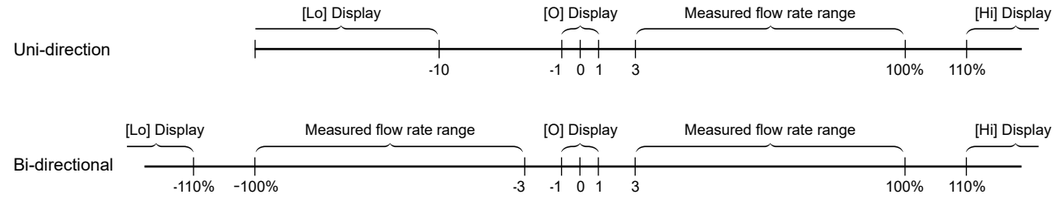
Code	Description
A	5-conductor lead wire 1 m (for LCD display)
B	5-conductor lead wire 3 m (for LCD display)
H	Bracket 1 (for models with a flow rate range below 200 L/min)
J	Bracket 2 (for models with a flow rate range of 500 L/min or 1000 L/min)
K	Panel mounting kit 1 (for sensor unit models with a flow rate range below 200 L/min)
L	Panel mounting kit 2 (for needle valve integrated models with a flow rate range below 200 L/min)
M	DIN rail mounting kit (for models with a flow rate range below 200 L/min)

Specifications

Item			FSM3-L[❶][❷][❸][❹][❺][❻][❼]-[ ]										
			[❶] Flow rate range (full scale flow rate) code										
			005	010	020	050	100	200	500	101	201	501	102
Flow direction	[❷]	U	Uni-direction										
		B	Bi-direction										
Measured flow rate range (□/min) *1	[❷]	U	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.15 to 5.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L	15 to 500 L	30 to 1000 L
		B	-500 to -15, 15 to 500 mL	-1000 to -30, 30 to 1000 mL	-2.00 to -0.06, 0.06 to 2.00 L	-5.00 to -0.15, 0.15 to 5.00 L	-10.00 to -0.30, 0.30 to 10.00 L	-20.0 to -0.6, 0.6 to 20.0 L	-50.0 to -1.5, 1.5 to 50.0 L	-100.0 to -3.0, 3.0 to 100.0 L	-200 to -6, 6 to 200 L	-500 to -15, 15 to 500 L	-1000 to -30, 30 to 1000 L
Indicator type			4 digit + 4 digit 2 color LCD										
Flow rate display range (□/min) *2	[❷]	U	-49 to 549 mL	-99 to 1099 mL	-0.19 to 2.19 L	-0.49 to 5.49 L	-0.99 to 10.99 L	-1.9 to 21.9 L	-4.9 to 54.9 L	-9.9 to 109.9 L	-19 to 219 L	-49 to 549 L	-99 to 1099 L
		B	-549 to 549 mL	-1099 to 1099 mL	-2.19 to 2.19 L	-5.49 to 5.49 L	-10.99 to 10.99 L	-21.9 to 21.9 L	-54.9 to 54.9 L	-109.9 to 109.9 L	-219 to 219 L	-549 to 549 L	-1099 to 1099 L
Integration display (*3)		Indicator range	0 to ±9999999 mL		0.00 to ±99999.99 L			0.0 to ±999999.9 L			0 to ±9999999 L		
		Pulse output rate	5 mL	10 mL	0.02 L	0.05 L	0.1 L	0.2 L	0.5 L	1L	2 L	5L	10 L
Working Conditions		Applicable fluids *4	Clean air (ISO 8573-1 2010 1.1.1 to 5.6.2), compressed air (ISO 8573-1 2010 1.1.1 to 1.6.2), nitrogen gas										
			Argon, carbon dioxide (*5), and gas mixture (argon + carbon dioxide)									–	
		Temperature range	0 to 50°C (no condensation)										
		Pressure range	-0.09 to 0.75 MPa										
		Proof pressure	1 MPa										
Operating ambient temperature / humidity			0 to 50 °C, 90% RH or less										
Storage temperature			-10 to 60°C										
Accuracy *6 (Fluid: in dry air)		Accuracy *7	Within ±3%F.S. (Secondary side released to atmosphere) (The scope of warranty is in accordance with the "measurement flow rate range.")										
		Repeatability*8	Within ±1%F.S. (Secondary side released to atmosphere)										
		Temperature characteristics	Within ±0.2% F.S./°C (15 to 35°C, base temperature 25°C)										
		Pressure characteristics	Within ±5%F.S. (-0.09 to 0.7 MPa, where secondary side is released to atmosphere)								Within ±5% F.S. (-0.09 to 0.7 MPa, base temperature 0.35 MPa)		
Response time *9			50 msec. or less (setting response time OFF)										
Switch Output	[❺]	A, B, E, F	NPN open collector output (50 mA or less, voltage drop 2.4 V or less)										
		C, D, G, H	PNP open collector output (50 mA or less, voltage drop 2.4 V or less)										
Analog Output *10		A, B, C, D	1 to 5 V voltage output (connecting load impedance 50 kΩ or more)										
		E, F, G, H	4-20mA current output (connecting load impedance 0 to 300 Ω)										
Power supply voltage *11		A, B, C, D	12 to 24 VDC (10.8 to 26.4 V) ripple rate 1% or less										
		E, F, G, H	24 VDC (21.6 to 26.4 V) ripple rate 1% or less										
Current consumption *12			45 mA or less										
Lead wire			ø3.7, AWG26 or equivalent x 5-conductor (connector), insulator O.D. 1.0										
Functions *13			①Gas switching, ②Setting copy function, ③Flow rate integration, ④Peak hold, etc.										
Degree of Protection			IP40 or equivalent (IEC standard)										
Protection circuit *14			Power reverse connection protection, switch output reverse connection protection, switch output load short-circuit protection										
Vibration resistance			10 to 150 Hz, max. 100 m/s^2, X, Y, Z directions, every 2 hours										
EMC Directive			EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8										
Mounting		Mounting orientation *15	Unrestricted in vertical/horizontal direction										
		Straight piping section *16	Not required										

*1: The value converted to volumetric flow rate at standard conditions (20°C, 1 barometric pressure (101 kPa), 65% RH).
(For gases other than air: 20°C, 1 barometric pressure (101 kPa), 0% RH)

*2: The displays of various flow rates are as shown below.



*3: The accumulated flow is a calculated (reference) value. When using the integrated save function, take care to prevent the number of saves from exceeding the access count limit of the storage device (1 million times). (Changes to the settings are counted in number of accesses.)

$$\text{Number of saves} = \frac{\text{Usage time}}{5 \text{ min.}} < 1 \text{ million times}$$

When instantaneous flow rate is below 1% it is not counted as integrating flow.

*4: Use dry gas which does not contain corrosive elements such as chlorine, sulphur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air that complies with ISO 8573-1 2010 Class 1.1.1 to 1.6.2. Compressed air from the compressor contains drainage-water, oil oxide, foreign substances, etc. To maintain the function of this product, a filter, air dryer (min. pressure dew point 10°C or less), and oil mist filter (max. oil content 0.1 mg/m³) for operation. (Refer to P. 316 for details on recommended circuit.)

*5: With the gas type switching function, the full scale flow rate after switching to carbon dioxide is half the flow rate range. Output type can also be selected for analog output.

Gas type	Flow direction	Measured flow rate range (□/min)							
		005	010	020	100	200	500	101	201
Carbon dioxide	Uni-direction	15 to 250 mL	30 to 500 mL	0.06 to 1.00 L	0.30 to 5.00 L	0.6 to 10.0 L	1.5 to 25.0 L	3.0 to 50.0 L	6 to 100 L
	Bi-direction	-250 to -15 mL	-500 to -30 mL	-1.00 to 0.06 L	-5.00 to 0.30 L	-10.0 to -0.6 L	-25.0 to -1.5 L	-50.0 to -3.0 L	-100 to -6 L
		15 to 250 mL	30 to 500 mL	0.06 to 1.00 L	0.30 to 5.00 L	0.6 to 10.0 L	1.5 to 25.0 L	3.0 to 50.0 L	6 to 100 L

Gas type	Flow direction	Analog Output			
		Output A		Output B	
		Voltage	Current	Voltage	Current
Carbon dioxide	Uni-direction	1 to 3 V	4 to 12 mA	1 to 5 V	4 to 20 mA
	Bi-direction	2 to 4 V	8 to 16 mA	1 to 5 V	4 to 20 mA

*6: Compressed air is used for adjusting and inspecting this product. Accuracy for gas-types other than air is a guideline.

*7: Accuracy is based on CKD's standard flow rate meter and does not indicate absolute accuracy. Repeatability, temperature characteristics, and pressure characteristics are not included for an accuracy of ± 3%F.S. Consider separately according to the working environment and working conditions.

*8: Repeatability is calculated during a short period of time. Change over time is not included. (Refer to the product specifications for details.)

*9: The actual response time changes depending on the piping conditions. As a guideline, the response time can be set within the range of 50 msec. to 1.5 sec.

*10: The output impedance of the analog output section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.

*11: The power supply voltage specifications differ for the voltage output type and current output type.

*12: Current for when 24 VDC is connected, and no load is applied. Please note that the current consumption changes depending on the load connection status.

*13: The gas type switching function enables switching to argon, carbon dioxide and a gas mixture of argon 80% + carbon dioxide 20%. (Note that the 500 L/min and 1000 L/min models do not have a gas change function.)
For carbon dioxide, refer to *5.

Gas type	Flow direction	Measured flow rate range (□/min)							
		005	010	020	100	200	500	101	201
• Air • Nitrogen • Argon • argon 80% +carbon dioxide 20%	Uni-direction	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L
	Bi-direction	-500 to -15 mL	-1000 to -30 mL	-2.00 to -0.06 L	-10.00 to -0.30 L	-20.0 to -0.6 L	-50.0 to -1.5 L	-100.0 to -3.0 L	-200 to -6 L
		15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L

The "setting copy function" can be selected under ❺"Output Specifications".
Note that the "External input" function is not available on models on which the "Copy function setting" is enabled.

*14: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.

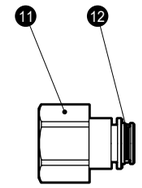
*15: This product measures the change in heat distribution caused by flow. If installed vertically, the heat distribution may change due to the effect of convection, and the zero point may be shifted.

*16: Piping conditions may affect accuracy. For more accurate measurements, use a straight pipe with a ten-times greater internal diameter. With the 500 L/min and 1,000 L/min models, use piping with an internal diameter of 9 mm or more. If it is less than 9 mm, accuracy may be negatively affected.

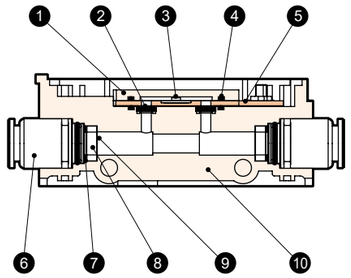
*17: Refer to P. 245 for weight.

Internal Structure Diagram / Material

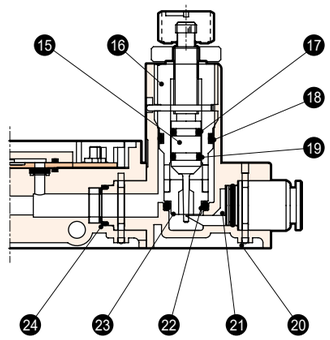
●FSM3-□005 to 201

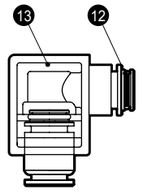


Screw-in fitting



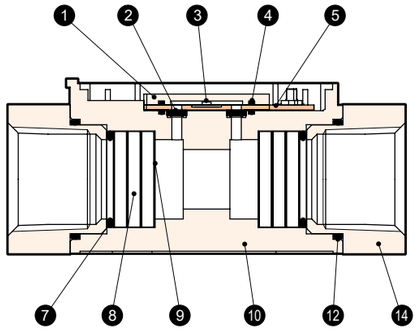
With needle valve





Elbow fitting

●FSM3-□501 to 102



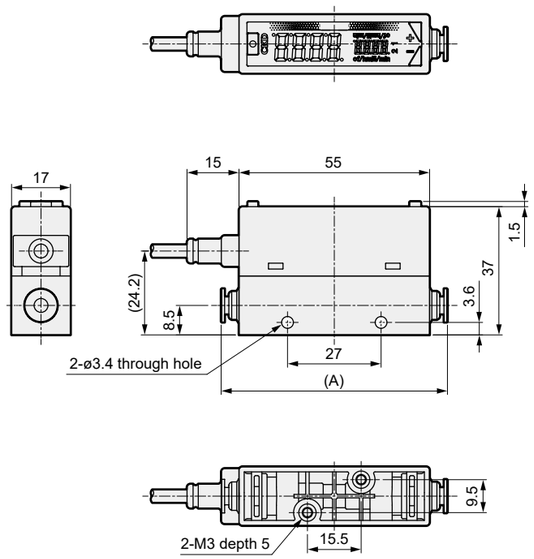
Do not disassemble

Part No.	Part name	Material	Part No.	Part name	Material
1	Sensor cover	Stainless steel	13	Elbow adaptor	Polyamide Resin
2	Filter	Stainless steel	14	Fitting	Aluminum
3	Sensor chip	Semiconductor silicon	15	Needle	Brass/nickeling
4	Gasket	Fluoro rubber	16	Needle guide	Brass/nickeling
5	Sensor board	Glass epoxy resin	17	O-ring	Fluoro rubber
6	Fitting	–	18	O-ring	Fluoro rubber
7	O-ring	Fluoro rubber	19	O-ring	Fluoro rubber
8	Spacer	Aluminum	20	Needle valve body	Polyamide Resin
9	Filter	Stainless steel	21	Filter	Stainless steel
10	Sensor body	Polyamide Resin	22	O-ring	Fluoro rubber
11	Fitting	Aluminum	23	Orifice	Brass/nickeling
12	O-ring	Fluoro rubber	24	O-ring	Fluoro rubber

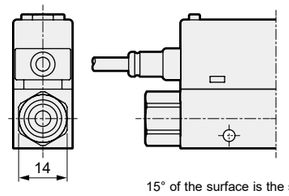
Dimensions (LCD display)

Port size: Straight ø4 mm, ø6 mm, ø1/4", Rc1/8, G1/8, NPT1/8

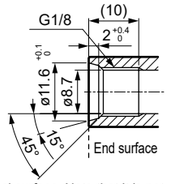
●FSM3-L❶❷1/BH1/CH1/HH1/AA1/AF1/AB1/AC1 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Rc1/8, NPT1/8, G1/8 (AB1)

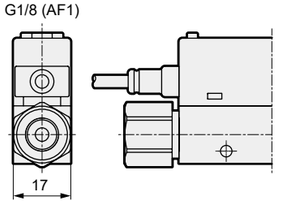


G thread shape (AB)



15° of the surface is the seal surface. Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

G1/8 (AF1)

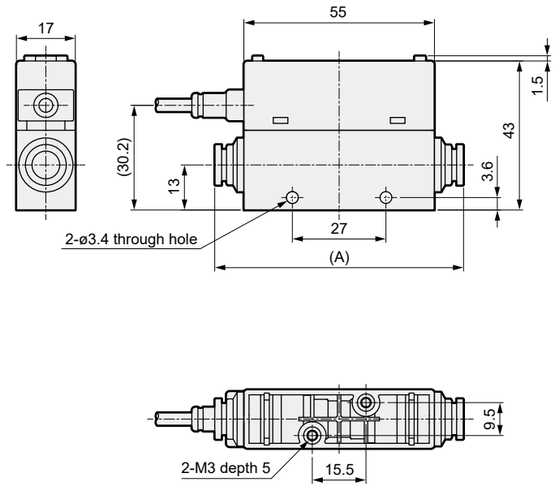


Model No.	Fitting	Dimension (A)
FSM3-L□□1BH1	Push-in ø4 mm	(65)
FSM3-L□□1CH1	Push-in ø6 mm	(67.2)
FSM3-L□□1HH1	Push-in 1/4"	(70.4)
FSM3-L□□1AA1	Rc1/8	(75)
FSM3-L□□1AF1	G1/8	(87)
FSM3-L□□1AB1	G1/8	(87)
FSM3-L□□1AC1	NPT1/8	(75)

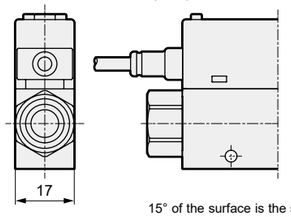
Port size: Straight ø8 mm, ø10 mm, ø3/8", Rc1/4, G1/4, NPT1/4

●FSM3-L❶❷1/DH1/EH1/JH1/BA1/BF1/BB1/BC1 (full scale flow rate: 50, 100, 200 L/min)

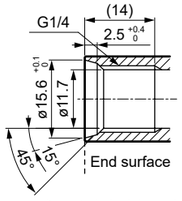
* For the EXA connection type, the secondary side (right side in the diagram below) uses a dedicated adapter. Refer to P. 267 for the external dimensions when connected.



Rc1/4, NPT1/4, G1/4 (BB1)

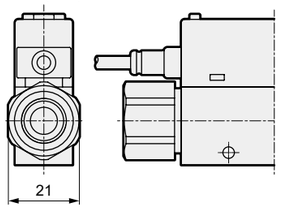


G thread shape (BB)



15° of the surface is the seal surface. Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

G1/4 (BF1)

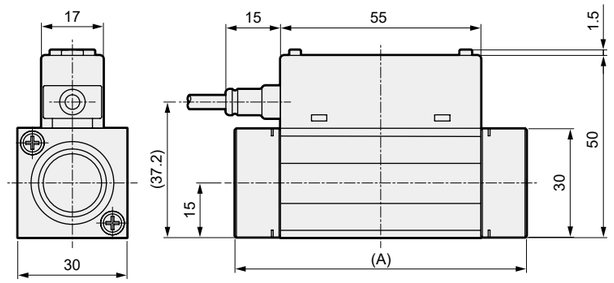


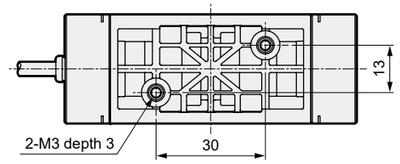
Model No.	Fitting	Dimension (A)
FSM3-L□□1DH1	Push-in ø8 mm	(70.6)
FSM3-L□□1EH1	Push-in ø10 mm	(82.1)
FSM3-L□□1JH1	Push-in 3/8"	(83.4)
FSM3-L□□1BA1	Rc1/4	(75)
FSM3-L□□1BF1	G1/4	(89)
FSM3-L□□1BB1	G1/4	(89)
FSM3-L□□1BC1	NPT1/4	(75)

Dimensions (LCD display)

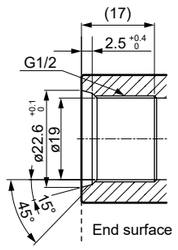
Port size: Straight Rc1/2, G1/2, NPT1/2

●FSM3-L❶❷1/CA1/CF1/CB1/CC1 (full scale flow rate: 500, 1000 L/min)



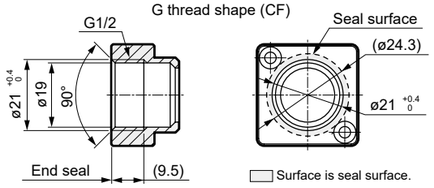


G thread shape (CB)



15° of the surface is the seal surface.
Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

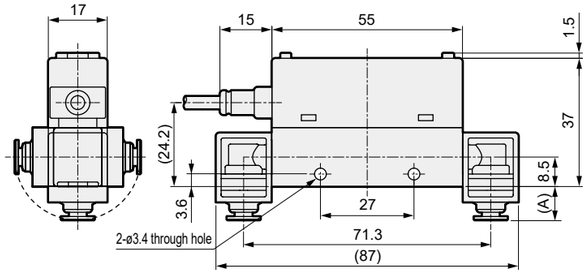
G thread shape (CF)



Model No.	Fitting	Dimension (A)
FSM3-L□□1CA1	Rc1/2	(80)
FSM3-L□□1CF1	G1/2	(80)
FSM3-L□□1CB1	G1/2	(95.4)
FSM3-L□□1CC1	NPTG1/2	(80)

Port size: Elbow ø4 mm, ø6 mm, ø1/4", Rc1/8, G1/8, NPT1/8

●FSM3-L❶❷1/BH2/CH2/HH2/AA2/AF2/AB2/AC2 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



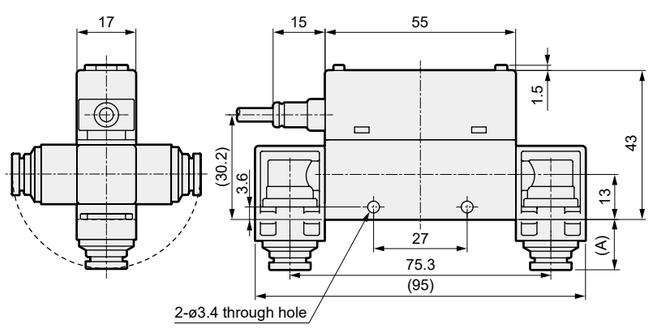
The shape of the top and bottom surfaces of the body is the same as the straight type.

Model No.	Fitting	Dimension (A)
FSM3-L□□1BH2	Push-in ø4 mm	(9.5)
FSM3-L□□1CH2	Push-in ø6 mm	(10.6)
FSM3-L□□1HH2	Push-in 1/4"	(12.2)
FSM3-L□□1AA2	Rc1/8	(14.5)
FSM3-L□□1AF2	G1/8 *	(20.5)
FSM3-L□□1AB2	G1/8 *	(20.5)
FSM3-L□□1AC2	NPT1/8	(14.5)

*: For G thread shape, refer to the straight type.

Port size: Elbow ø8 mm, ø10 mm, ø3/8", Rc1/4, G1/4, NPT1/4

●FSM3-L❶❷1/DH2/EH2/JH2/BA2/BF2/BB2/BC2 (full scale flow rate: 50, 100, 200 L/min)



The shape of the top and bottom surfaces of the body is the same as the straight type.

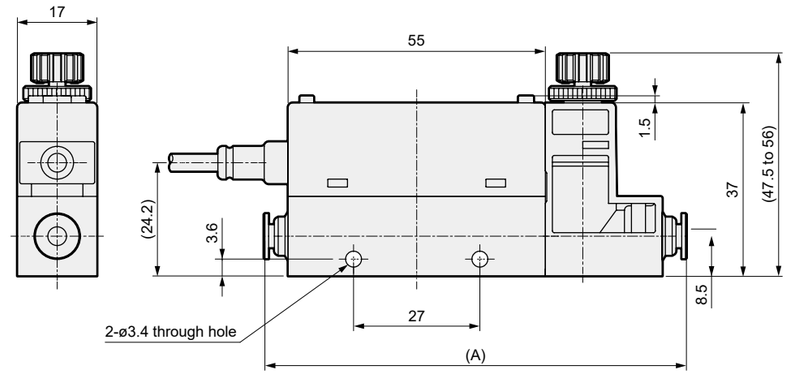
Model No.	Fitting	Dimension (A)
FSM3-L□□1DH2	Push-in ø8 mm	(13.6)
FSM3-L□□1EH2	Push-in ø10 mm	(19.3)
FSM3-L□□1JH2	Push-in 3/8"	(20.0)
FSM3-L□□1BA2	Rc1/4	(15.8)
FSM3-L□□1BF2	G1/4 Note	(22.8)
FSM3-L□□1BB2	G1/4 Note	(22.8)
FSM3-L□□1BC2	NPT1/4	(15.8)

Note: For G thread shape, refer to the straight type.

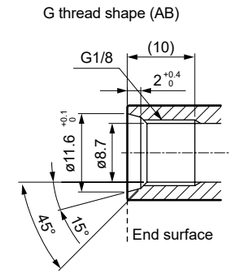
With needle valve dimensions

Port size: straight ø4 mm, ø6 mm, ø1/4", Rc1/8, G1/8, NPT1/8

●FSM3-L❶❷1/BH1/CH1/HH1/AA1/AF1/AB1/AC1/❻❼T (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



G thread shape (AB)



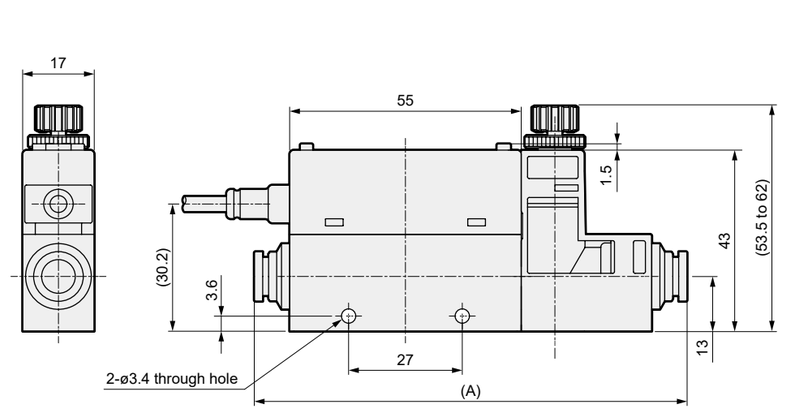
15° of the surface is the seal surface.
Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

The shape of the top and bottom surfaces of the body is the same as the straight type.

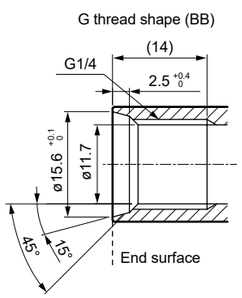
Model No.	Fitting	Dimension (A)
FSM3-L□□1BH1	Push-in ø4 mm	(90)
FSM3-L□□1CH1	Push-in ø6 mm	(92.2)
FSM3-L□□1HH1	Push-in 1/4"	(95.4)
FSM3-L□□1AA1	Rc1/8	(100)
FSM3-L□□1AF1	G1/8	(112)
FSM3-L□□1AB1	G1/8	(112)
FSM3-L□□1AC1	NPT1/8	(100)

Port size: straight ø8 mm, ø10mm, ø3/8", Rc1/4, G1/4, NPT1/4

●FSM3-L❶❷1/DH1/EH1/JH1/BA1/BF1/BB1/BC1/❻❼T (full scale flow rate: 50, 100, 200 L/min)



G thread shape (BB)



15° of the surface is the seal surface.
Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

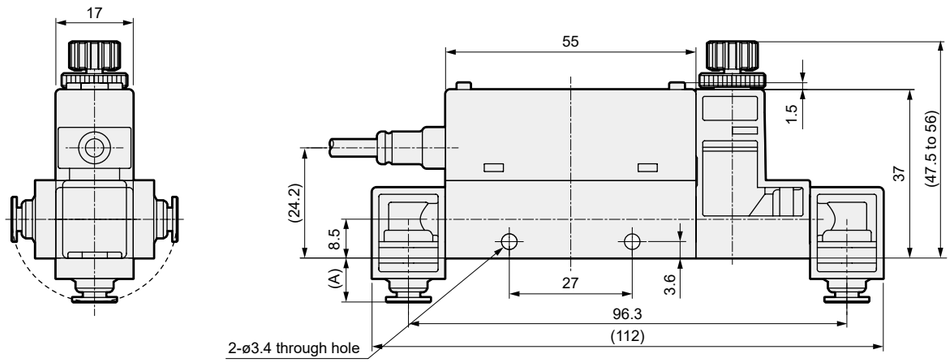
The shape of the top and bottom surfaces of the body is the same as the straight type.

Model No.	Fitting	Dimension (A)
FSM3-L□□1DH1	Push-in ø8 mm	(101.6)
FSM3-L□□1EH1	Push-in ø10 mm	(113.1)
FSM3-L□□1JH1	Push-in 3/8"	(114.4)
FSM3-L□□1BA1	Rc1/4	(106)
FSM3-L□□1BF1	G1/4	(120)
FSM3-L□□1BB1	G1/4	(120)
FSM3-L□□1BC1	NPT1/4	(106)

With needle valve dimensions

Port size: Elbow ø4 mm, ø6 mm, ø1/4", Rc1/8, G1/8, NPT1/8

●FSM3-L❶❷1/BH2/CH2/HH2/AA2/AF2/AB2/AC2 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



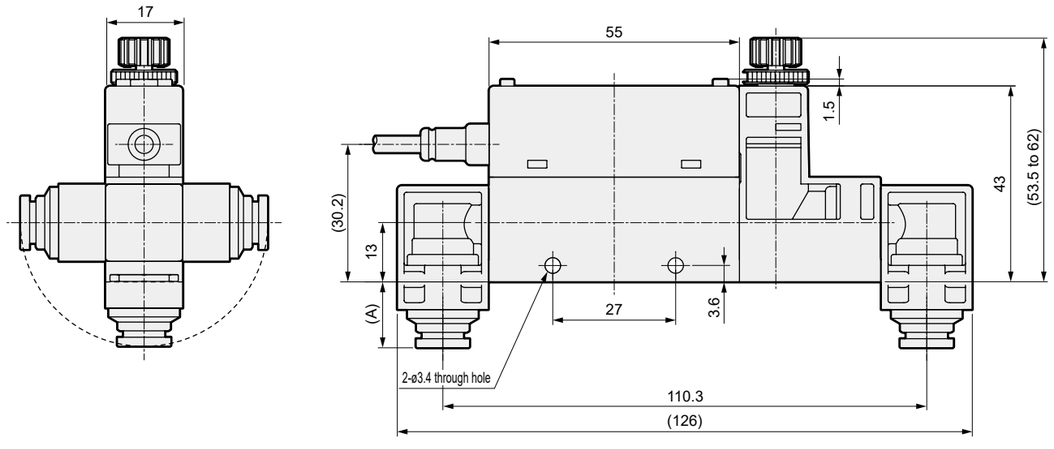
The shape of the top and bottom surfaces of the body is the same as the straight type.

Model No.	Fitting	Dimension (A)
FSM3-L□□1BH2	Push-in ø4 mm	(9.5)
FSM3-L□□1CH2	Push-in ø6 mm	(10.6)
FSM3-L□□1HH2	Push-in 1/4"	(12.2)
FSM3-L□□1AA2	Rc1/8	(14.5)
FSM3-L□□1AF2	G1/8 *	(20.5)
FSM3-L□□1AB2	G1/8 *	(20.5)
FSM3-L□□1AC2	NPT1/8	(14.5)

*: For G thread shape, refer to the straight type.

Port size: Elbow ø8 mm, ø10 mm, ø3/8", Rc1/4, G1/4, NPT1/4

●FSM3-L❶❷1/DH2/EH2/JH2/BA2/BF2/BB2/BC2 (full scale flow rate: 50, 100, 200 L/min)



The shape of the top and bottom surfaces of the body is the same as the straight type.

Model No.	Fitting	Dimension (A)
FSM3-L□□1DH2	Push-in ø8 mm	(13.6)
FSM3-L□□1EH2	Push-in ø10 mm	(19.3)
FSM3-L□□1JH2	Push-in 3/8"	(20.0)
FSM3-L□□1BA2	Rc1/4	(15.8)
FSM3-L□□1BF2	G1/4 Note	(22.8)
FSM3-L□□1BB2	G1/4 Note	(22.8)
FSM3-L□□1BC2	NPT1/4	(15.8)

Note: For G thread shape, refer to the straight type.

Product weight

[Unit: g]

Port size / Piping direction		Weight	
Code [❸] [❹]	Description	Without needle valve	With needle valve
BH1	Push-in (for ø4 mm straight)	60	90
CH1	Push-in (for ø6 mm straight)	50	80
DH1	Push-in (for ø8 mm straight)	80	120
EH1	Push-in (for ø10 mm straight)	80	120
HH1	Push-in (for ø1/4” straight)	60	90
JH1	Push-in (for ø3/8” straight)	80	120
AA1	Rc1/8 Straight	60	90
BA1	Rc1/4 Straight	60	100
CA1	Rc1/2 Straight	120	–
AF1	G1/8 Straight	70	100
BF1	G1/4 Straight	85	125
CF1	G1/2 Straight	120	–
AB1	G1/8 Straight	60	90
BB1	G1/4 Straight	70	110
CB1	G1/2 Straight	140	–
1 VAC	NPT 1/8 Straight	50	80
BC1	NPT 1/4 Straight	60	100
CC1	NPT 1/2 Straight	120	–
BH2	Push-in (for ø4 mm elbow)	70	100
CH2	Push-in (for ø6 mm elbow)	60	90
DH2	Push-in (for ø8 mm elbow)	100	140
EH2	Push-in (for ø10 mm elbow)	100	140
HH2	Push-in (for ø1/4” elbow)	70	100
JH2	Push-in (for ø3/8” elbow)	100	140
AA2	Rc1/8 elbow	70	100
BA2	Rc1/4 elbow	80	120
AF2	G1/8 elbow	80	110
BF2	G1/4 elbow	105	145
AB2	G1/8 elbow	70	100
BB2	G1/4 elbow	90	130
2 VAC	NPT1/8 elbow	70	100
BC2	NPT1/4 elbow	80	120



Compact flow rate sensor (RAPIFLOW)

FSM3 Series

Bar display

●Resin body (flow rate range: 500 mL/min to 1000 L/min)

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

FSM3 - B 005 U 1 BH 1 J 1 N - D H S

- FSM3: Model No.
- B: Bar Display
- 005: ❶Flow rate range (full scale flow rate)
- U: ❷Flow direction
- 1: Body material: Resin applicable fluid: Air
- BH: ❸Port size
- 1: ❹Piping direction
- J: ❺Output specifications
- 1: Unit specifications: SI units only
- N: ❻Valve option
- D: ❼Lead wire
- H: ❽Mounting Attachment
- S: ❾Included documents

❶Flow rate range (full scale flow rate)

Code	Description	Code	Description
005	500 mL/min	500	50 L/min
010	1000 mL/min	101	100 L/min
020	2 L/min	201	200 L/min
050	5 L/min	501	500 L/min
100	10 L/min	102	1000 L/min
200	20 L/min		

Note: Refer to the compatibility table below for combinations of the flow rate range and port size.

❷Flow direction

Code	Description
U	Uni-direction
B	Bi-direction

Note: For flow direction "B" bi-directional models, ❻lve option is "N" only. Note that an "E" EXA connecting fitting cannot be selected.

❸Port size

Description	Code	
Push-in: For ø4 mm tube	BH	
Push-in: For ø6 mm tube	CH	
Push-in: For ø8 mm tube	DH	
Push-in: For ø10 mm tube	EH	
Push-in: For ø1/4" tube	HH	
Push-in: For ø3/8" tube	JH	
Rc thread: Rc1/8	AA	
Rc thread: Rc1/4	BA	
Rc thread: Rc1/2	CA	
G thread ISO 16030: G1/8	AF	
G thread ISO 16030: G1/4	BF	
G thread ISO 16030: G1/2	CF	
G thread JIS B 2351-1 O-type (*1): G1/8	AB	
G thread JIS B 2351-1 O-type (*1): G1/4	BB	
G thread JIS B 2351-1 O-type (*1): G1/2	CB	
NPT thread: NPT1/8	AC	
NPT thread: NPT1/4	BC	
NPT thread: NPT1/2	CC	

*1: Check the G thread connection shape with the dimensions diagrams (P. 251 and 252) when making a selection. (G thread connection shape is JIS B 2351-1 O-type compliant)
*2: Refer to the compatibility table on the right for the combinations of the flow rate range and port size.

❹Piping direction

Code	Description	
1	Straight	
2	Elbow	

Note: Note that if you mount the elbow fitting in an upward position, it will interfere with the connector, and if you mount the elbow fitting in a downward position, it will interfere with the DIN rail mounting.

Compatibility table of flow rate range and port size, and EXA connection fitting

❶Flow rate range \ ❸Port size ❹Piping direction	BH1	CH1	DH1	EH1	HH1	JH1	BH2	CH2	DH2	EH2	HH2	JH2	AA1	BA1	CA1	AA2
005	●	●			●		●	●			●		●			●
010	●	●			●		●	●			●		●			●
020	●	●			●		●	●			●		●			●
050	●	●			●		●	●			●		●			●
100	●	●			●		●	●			●		●			●
200	●	●			●		●	●			●		●			●
500		●	●		●			●	●		●		●	●★		●
101			●	●		●			●	●		●		●★		
201			●	●		●			●	●		●		●★		
501															●	
102															●	

❶Flow rate range \ ❸Port size ❹Piping direction	BA2	AF1	BF1	CF1	AF2	BF2	AB1	BB1	CB1	AB2	BB2	1 VAC	BC1	CC1	2 VAC	BC2
005		●			●		●			●		●			●	
010		●			●		●			●		●			●	
020		●			●		●			●		●			●	
050		●			●		●			●		●			●	
100		●			●		●			●		●			●	
200		●			●		●			●		●			●	
500	●	●	●		●	●	●	●		●	●	●	●		●	●
101	●		●			●		●			●		●			●
201	●		●			●		●			●		●			●
501				●					●					●		
102				●					●					●		

●: Port compatibility ★: EXA connection fitting compatibility

❺Output specifications

Code	Description
J	Analog voltage output 1 point
K	Analog current output 1 point

Note: When using in combination with a separated display (FSM2-D), select "J" analog voltage output 1 point.

❻Valve option

Code	Description	
N	None	
*1 *2 E	EXA connecting fitting (EXA sold separately)	

*1: Connection to solenoid valves (EXA series) is possible with the dedicated fitting. Refer to P. 267.
*2: Be sure to set EXA to the OUT side of the product. Use a lead wire for the EXA coil option. The DIN terminal box cannot be mounted because it will cause interference. After making sure it is connected firmly, confirm that there is no external leakage.

❼Lead wire

Code	Description	
Blank	None	
C	4 conductor 1 m	
D	4 conductor 3 m	

❽Mounting attachment*1, *2

Code	Description	
Blank	None	
H	Bracket 1 (for models 200 L or less)	
J	Bracket 2 (for 500 or 1000 L models)	
M	DIN rail mounting (for models 200 L or less)	

*1: "Panel mount" option cannot be selected. Note that the bracket mounting position may interfere with the elbow fitting.
*2: Optional parts will come with the product.

❾Included documents

Code	Description
Blank	None
R	Inspection certificate
S	Inspection certificate + calibration certificate + traceability system diagram

Clean-room specifications (Catalog No. CB-033SA)

FSM3 - ····- P70

FSM3 - ····- P80

Model No. Notation for Options

FSM3 - H

❶Option

Note: Refer to P. 262 for dimensions diagram.

❶Option

Code	Description
C	4-conductor lead wire 1 m (for bar display)
D	4-conductor lead wire 3 m (for bar display)
H	Bracket 1 (for models with a flow rate range below 200 L/min)
J	Bracket 2 (for models with a flow rate range of 500 L/min or 1000 L/min)
M	DIN rail mounting kit (for models with a flow rate range below 200 L/min)

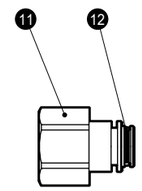
Specifications

Item			FSM3-B[❶][❷][❸][❹][❺][❻]-[❼]-[]										
			[❶] Flow rate range (full scale flow rate) code										
			005	010	020	050	100	200	500	101	201	501	102
Flow direction	[❷]	U	Uni-direction										
		B	Bi-direction										
Measured flow rate range (□/min) *1	[❷]	U	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.15 to 5.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L	15 to 500 L	30 to 1000 L
		B	-500 to -15, 15 to 500 mL	-1000 to -30, 30 to 1000 mL	-2.00 to -0.06, 0.06 to 2.00 L	-5.00 to -0.15, 0.15 to 5.00 L	-10.00 to -0.30, 0.30 to 10.00 L	-20.0 to -0.6, 0.6 to 20.0 L	-50.0 to -1.5, 1.5 to 50.0 L	-100.0 to -3.0, 3.0 to 100.0 L	-200 to -6, 6 to 200 L	-500 to -15, 15 to 500 L	-1000 to -30, 30 to 1000 L
Indicator type			LED bar display										
Working fluid		Applicable fluids *2	Clean air (ISO 8573-1 2010 1.1.1 to 5.6.2), compressed air (ISO 8573-1 2010 1.1.1 to 1.6.2), nitrogen gas										
		Temperature range	0 to 50°C (no condensation)										
		Pressure range	-0.09 to 0.75 MPa										
		Proof pressure	1 MPa										
Operating ambient temperature / humidity			0 to 50°C, 90% RH or less										
Storage temperature			-10 to 60°C										
Accuracy		Accuracy *3	Within ±3%F.S. (Secondary side released to atmosphere) (The scope of warranty is in accordance with the "measurement flow rate range.")										
		Repeatability*4	Within ±1%F.S. (Secondary side released to atmosphere)										
		Temperature characteristics	Within ±0.2% F.S./°C (15 to 35°C, base temperature 25°C)										
		Pressure characteristics	Within ±5%F.S. (-0.09 to 0.7 MPa, where secondary side is released to atmosphere)								Within ±5% F.S. (-0.09 to 0.7 MPa, base temperature 0.35 MPa)		
Response time *5			50 msec. or less										
Analog Output *6	[❺]	J	1 to 5 V voltage output (connecting load impedance 50 kΩ or more)										
		K	4-20 mA current output (connecting load impedance 0 to 300 Ω)										
Power supply voltage *7		J	12 to 24 VDC (10.8 to 26.4 V) ripple rate 1% or less										
		K	24 VDC (21.6 to 26.4 V) ripple rate 1% or less										
Current consumption *8			45 mA or less										
Lead wire			ø3.7 AWG26 or equivalent ×4-conductor (connector wiring), insulator outer diameter ø1.0										
Degree of Protection			IP40 or equivalent (IEC standard)										
Protection circuit *9			Power reverse connection protection										
Vibration resistance			10 to 150 Hz, max. 100 m/s^2, X, Y, Z directions, every 2 hours										
EMC Directive			EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8										
Mounting		Mounting orientation *10	Unrestricted in vertical/horizontal direction										
		Straight piping section *11	Not required										

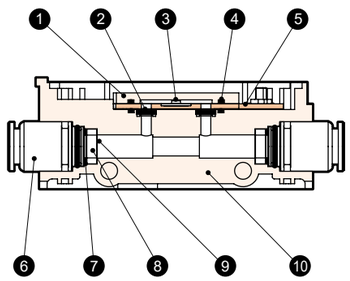
*1: The value converted to volumetric flow rate at standard condition (20°C, 1 barometric pressure (101 kPa), 65% RH)
*2: Use dry gas which does not contain corrosive elements such as chlorine, sulphur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air that complies with ISO 8573-1 2010 Class 1.1.1 to 1.6.2. Compressed air from the compressor contains drainage-water, oil oxide, foreign substances, etc. To maintain the function of this product, a filter, air dryer (min. pressure dew point 10°C or less), and oil mist filter (max. oil content 0.1 mg/m^3) for operation. (Refer to P. 316 for details on recommended circuit.)
*3: Accuracy is based on a CKD standard flow rate meter. It does not indicate absolute accuracy. Repeatability, temperature characteristics, and pressure characteristics are not included for an accuracy of ± 3%F.S. Consider separately according to the working environment and working conditions.
*4: Repeatability is calculated during a short period of time. Change over time is not included. (Refer to the product specifications for details.)
*5: The actual response time changes depending on the piping conditions.
*6: The output impedance of the analog output section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.
*7: The power supply voltage specifications differ for the voltage output type and current output type.
*8: Current for when 24 VDC is connected, and no load is applied. Please note that the current consumption changes depending on the load connection status.
*9: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.
*10: This product measures changes in heat distribution that are caused by flow. If installed vertically, the heat distribution may change due to the effect of convection, and the zero point may be shifted.
*11: Piping conditions may affect accuracy. For more accurate measurements, use a straight pipe with a ten-times greater internal diameter. With the 500 L/min and 1,000 L/min models, use piping with an internal diameter of 9 mm or more. If it is less than 9 mm, accuracy may be negatively affected.
*12: Refer to P. 253 for weight.

Internal Structure Diagram / Material

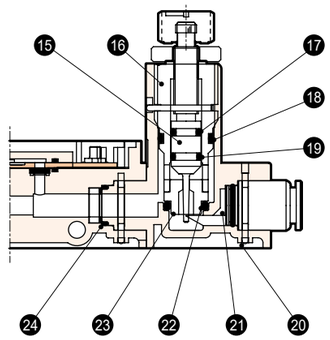
●FSM3-□005 to 201

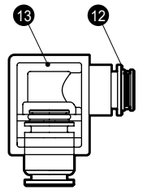


Screw-in fitting



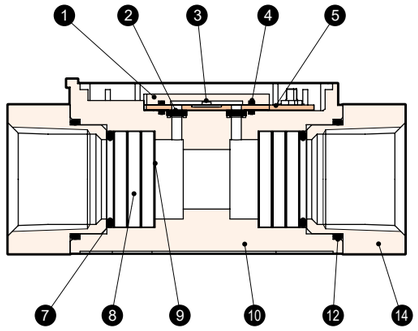
With needle valve





Elbow fitting

●FSM3-□501 to 102



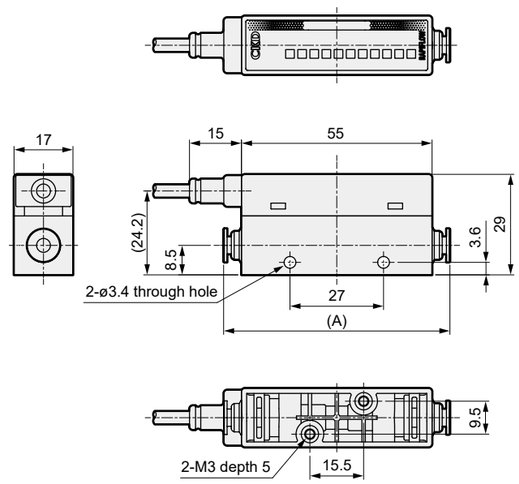
Do not disassemble

Part No.	Part name	Material	Part No.	Part name	Material
1	Sensor cover	Stainless steel	13	Elbow adaptor	Polyamide Resin
2	Filter	Stainless steel	14	Fitting	Aluminum
3	Sensor chip	Semiconductor silicon	15	Needle	Brass/nickeling
4	Gasket	Fluoro rubber	16	Needle guide	Brass/nickeling
5	Sensor board	Glass epoxy resin	17	O-ring	Fluoro rubber
6	Fitting	–	18	O-ring	Fluoro rubber
7	O-ring	Fluoro rubber	19	O-ring	Fluoro rubber
8	Spacer	Aluminum	20	Needle valve body	Polyamide Resin
9	Filter	Stainless steel	21	Filter	Stainless steel
10	Sensor body	Polyamide Resin	22	O-ring	Fluoro rubber
11	Fitting	Aluminum	23	Orifice	Brass/nickeling
12	O-ring	Fluoro rubber	24	O-ring	Fluoro rubber

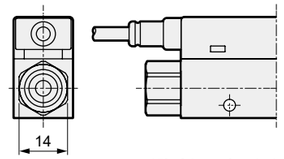
Dimensions (bar display)

Port size: Straight ø4 mm, ø6 mm, ø1/4", Rc1/8, G1/8, NPT1/8

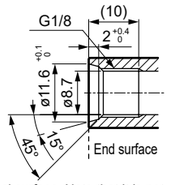
●FSM3-B❶❷1/BH1/CH1/HH1/AA1/AF1/AB1/AC1 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Rc1/8, NPT1/8, G1/8 (AB1)

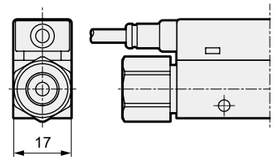


G thread shape (AB)



15° of the surface is the seal surface. Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

G1/8 (AF1)

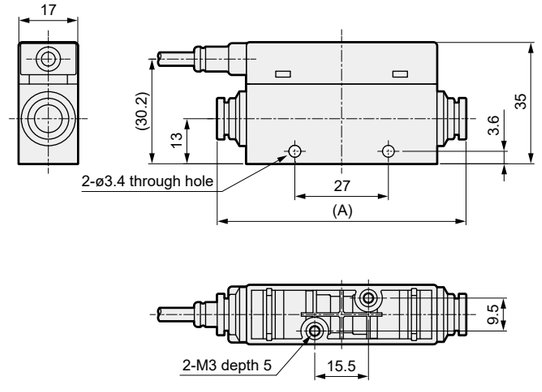


Model No.	Fitting	Dimension (A)
FSM3-B□□1BH1	Push-in ø4 mm	(65)
FSM3-B□□1CH1	Push-in ø6 mm	(67.2)
FSM3-B□□1HH1	Push-in 1/4"	(70.4)
FSM3-B□□1AA1	Rc1/8	(75)
FSM3-B□□1AF1	G1/8	(87)
FSM3-B□□1AB1	G1/8	(87)
FSM3-B□□1AC1	NPT1/8	(75)

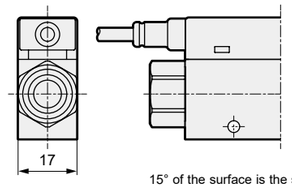
Port size: Straight ø8 mm, ø10 mm, ø3/8", Rc1/4, G1/4, NPT1/4

●FSM3-B❶❷1/DH1/EH1/JH1/BA1/BF1/BB1/BC1 (full scale flow rate: 50, 100, 200 L/min)

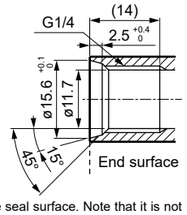
* For the EXA connection, the dedicated adaptor is provided on the secondary side (right side in the figure below). Dimensions diagram Refer to P. 267 on how to connect.



Rc1/4, NPT1/4, G1/4 (BB1)

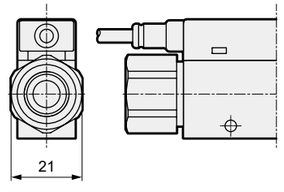


G thread shape (BB)



15° of the surface is the seal surface. Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

G1/4 (BF1)

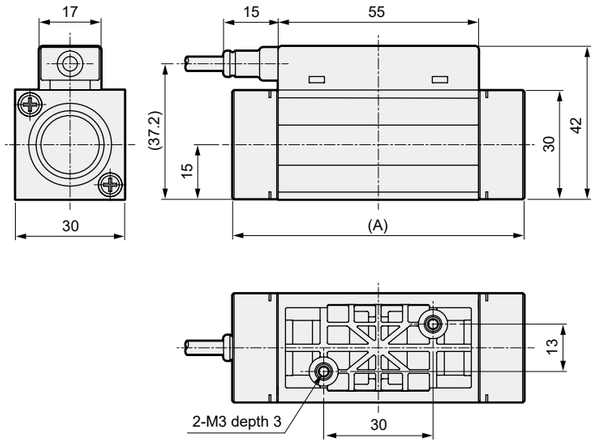


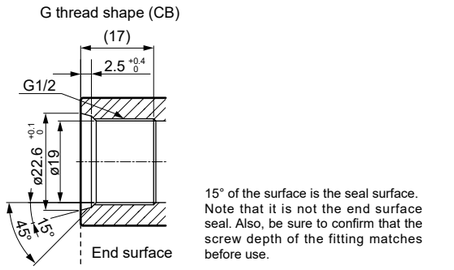
Model No.	Fitting	Dimension (A)
FSM3-B□□1DH1	Push-in ø8 mm	(70.6)
FSM3-B□□1EH1	Push-in ø10 mm	(82.1)
FSM3-B□□1JH1	Push-in 3/8"	(83.4)
FSM3-B□□1BA1	Rc1/4	(75)
FSM3-B□□1BF1	G1/4	(89)
FSM3-B□□1BB1	G1/4	(89)
FSM3-B□□1BC1	NPT1/4	(75)

Dimensions (bar display)

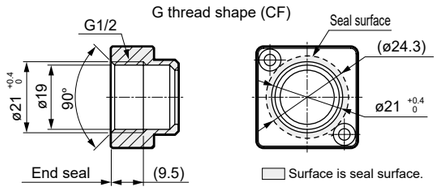
Port size: Straight Rc1/2, G1/2, NPT1/2

●FSM3-B❶❷1/CA1/CF1/CB1/CC1 (full scale flow rate: 500, 1000 L/min)





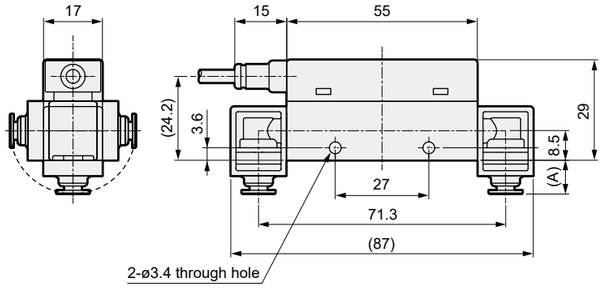
15° of the surface is the seal surface. Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.



Model No.	Fitting	Dimension (A)
FSM3-B□□1CA1	Rc1/2	(80)
FSM3-B□□1CF1	G1/2	(80)
FSM3-B□□1CB1	G1/2	(95.4)
FSM3-B□□1CC1	NPT1/2	(80)

Port size: Elbow ø4 mm, ø6 mm, ø1/4", Rc1/8, G1/8, NPT1/8

●FSM3-B❶❷1/BH2/CH2/HH2/AA2/AF2/AB2/AC2 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



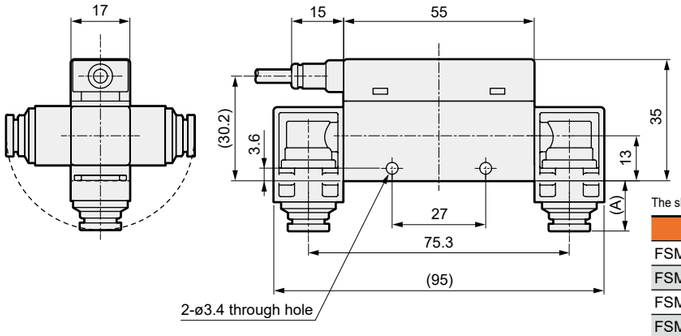
The shape of the top and bottom surfaces of the body is the same as the straight type.

Model No.	Fitting	Dimension (A)
FSM3-B□□1BH2	Push-in ø4 mm	(9.5)
FSM3-B□□1CH2	Push-in ø6 mm	(10.6)
FSM3-B□□1HH2	Push-in 1/4"	(12.2)
FSM3-B□□1AA2	Rc1/8	(14.5)
FSM3-B□□1AF2	G1/8 Note	(20.5)
FSM3-B□□1AB2	G1/8 Note	(20.5)
FSM3-B□□1AC2	NPT1/8	(14.5)

Note: For G thread shape, refer to the straight type.

Port size: Elbow ø8 mm, ø10 mm, ø3/8", Rc1/4, G1/4, NPT1/4

●FSM3-B❶❷1/DH2/EH2/JH2/BA2/BF2/BB2/BC2 (full scale flow rate: 50, 100, 200 L/min)



The shape of the top and bottom surfaces of the body is the same as the straight type.

Model No.	Fitting	Dimension (A)
FSM3-B□□1DH2	Push-in ø8 mm	(13.6)
FSM3-B□□1EH2	Push-in ø10 mm	(19.3)
FSM3-B□□1JH2	Push-in 3/8"	(20.0)
FSM3-B□□1BA2	Rc1/4	(15.8)
FSM3-B□□1BF2	G1/4 Note	(22.8)
FSM3-B□□1BB2	G1/4 Note	(22.8)
FSM3-B□□1BC2	NPT1/4	(15.8)

Note: For G thread shape, refer to the straight type.

Product weight

[Unit: g]

Port size / Piping direction		Weight
Code [❸] [❹]	Description	
BH1	Push-in (for ø4 mm straight)	50
CH1	Push-in (for ø6 mm straight)	40
DH1	Push-in (for ø8 mm straight)	70
EH1	Push-in (for ø10 mm straight)	70
HH1	Push-in (for ø1/4” straight)	50
JH1	Push-in (for ø3/8” straight)	70
AA1	Rc1/8 Straight	50
BA1	Rc1/4 Straight	50
CA1	Rc1/2 Straight	110
AF1	G1/8 Straight	60
BF1	G1/4 Straight	75
CF1	G1/2 Straight	110
AB1	G1/8 Straight	50
BB1	G1/4 Straight	60
CB1	G1/2 Straight	130
1 VAC	NPT 1/8 Straight	50
BC1	NPT 1/4 Straight	50
CC1	NPT 1/2 Straight	110
BH2	Push-in (for ø4 mm elbow)	60
CH2	Push-in (for ø6 mm elbow)	50
DH2	Push-in (for ø8 mm elbow)	90
EH2	Push-in (for ø10 mm elbow)	90
HH2	Push-in (for ø1/4” elbow)	60
JH2	Push-in (for ø3/8” elbow)	90
AA2	Rc1/8 elbow	60
BA2	Rc1/4 elbow	70
AF2	G1/8 elbow	70
BF2	G1/4 elbow	95
AB2	G1/8 elbow	60
BB2	G1/4 elbow	80
2 VAC	NPT1/8 elbow	60
BC2	NPT1/4 elbow	70



Compact flow rate sensor (RAPIFLOW)

FSM3 Series

IO-Link

●Resin body (flow rate range: 500 mL/min to 1000 L/min)

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

FSM3 - C 005 U 1 BH 1 L 1 N - G H R

- FSM3: Model No.
- C: IO-Link Display
- 005: ❶Flow rate range (full scale flow rate)
- U: ❷Flow direction
- 1: Body material: Resin applicable fluid: Air
- BH: ❸Port size
- 1: ❹Piping direction
- L: Output specifications: IO-Link communication
- 1: Unit specifications: SI units only
- N: Valve option: None
- G: ❺Lead wire
- H: ❻Mounting Attachment
- R: ❼Included documents

❶Flow rate range (full scale flow rate)

Code	Description	Code	Description
005	500 mL/min	500	50 L/min
010	1000 mL/min	101	100 L/min
020	2 L/min	201	200 L/min
050	5 L/min	501	500 L/min
100	10 L/min	102	1000 L/min
200	20 L/min		

Note: Refer to the compatibility table below for combinations of the flow rate range and port size.

❷Flow direction

Code	Description
U	Uni-direction
B	Bi-direction

❸Port size

Description		Code	
Push-in	For ø4 mm tube	BH	
	For ø6 mm tube	CH	
	For ø8 mm tube	DH	
	For ø10 mm tube	EH	
	For ø1/4" tube	HH	
	For ø3/8" tube	JH	
Rc thread	Rc1/8	AA	
	Rc1/4	BA	
	Rc1/2	CA	
G thread ISO 16030	G1/8	AF	
	G1/4	BF	
	G1/2	CF	
G thread JIS B 2351-1 O-type (*1)	G1/8	AB	
	G1/4	BB	
	G1/2	CB	
NPT thread	NPT1/8	AC	
	NPT1/4	BC	
	NPT1/2	CC	

*1: Check the G thread connection shape with dimensions diagrams (P. 259 and 260) when making a selection. (G thread connection shape is JIS B 2351-1 O-type compliant)
*2: Refer to the compatibility table on the right for the combinations of the flow rate range and port size.

❹Piping direction

Code	Description	
1	Straight	
2	Elbow	

Note: Note that if you mount the elbow fitting in an upward position, it will interfere with the connector, and if you mount the elbow fitting in a downward position, it will interfere with the DIN rail mounting.

Compatibility table of flow rate range and port size

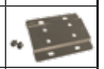
❶Flow rate range	❸Port size ❹Piping direction															
	BH1	CH1	DH1	EH1	HH1	JH1	BH2	CH2	DH2	EH2	HH2	JH2	AA1	BA1	CA1	AA2
005	●	●			●		●	●			●		●			●
010	●	●			●		●	●			●		●			●
020	●	●			●		●	●			●		●			●
050	●	●			●		●	●			●		●			●
100	●	●			●		●	●			●		●			●
200	●	●			●		●	●			●		●			●
500		●	●		●			●	●		●		●	●		●
101			●	●		●			●	●		●		●		
201			●	●		●			●	●		●		●		
501															●	
102															●	
	BA2	AF1	BF1	CF1	AF2	BF2	AB1	BB1	CB1	AB2	BB2	1 VAC	BC1	CC1	2 VAC	BC2
005		●			●		●			●		●			●	
010		●			●		●			●		●			●	
020		●			●		●			●		●			●	
050		●			●		●			●		●			●	
100		●			●		●			●		●			●	
200		●			●		●			●		●			●	
500	●	●	●		●	●	●	●		●	●	●	●		●	●
101	●		●			●		●			●		●			●
201	●		●			●		●			●		●			●
501				●					●					●		
102				●					●					●		

●: Port size compatibility

❺Lead wire

Code	Description	
Blank	None	
G	M12 both-end lead wire with connector (3 m)	

❻Mounting attachment*1, *2

Code	Description	
Blank	None	
H	Bracket 1 (for models 200 L or less)	
J	Bracket 2 (for 500 or 1000 L models)	
M	DIN rail mounting (for models 200 L or less)	

*1: Note that the bracket mounting position may interfere with the elbow fitting.
*2: Optional parts are provided with the product.

❼Included documents

Code	Description
Blank	None
R	Inspection certificate
S	Inspection certificate + calibration certificate + traceability system diagram

Clean-room specifications (Catalog No. CB-033SA)

FSM3 - ····· - P70

FSM3 - ····· - P80

Model No. Notation for Options

FSM3 - H

- H: ❶Option

❶Option

Code	Description
G	M12 both-end lead wire with connector (3 m) (for IO-Link)
H	Bracket 1 (for models with a flow rate range below 200 L/min)
J	Bracket 2 (for models with a flow rate range of 500 L/min or 1000 L/min)
M	DIN rail mounting kit (for models with a flow rate range below 200 L/min)

Note: Refer to P. 262 for dimensions diagram.

Specifications

Item			FSM3-C[❶] [❷]1[❸] [❹]L1N-[ ]									
			[❶] Flow rate range (full scale flow rate) code									
			005	010	020	050	100	200	500	101	201	501	102
Flow direction	[❷]	U	Uni-direction									
		B	Bi-direction									
Measured flow rate range (□/min) *1	[❷]	U	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.15 to 5.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L	15 to 500 L	30 to 1000 L
		B	-500 to -15, 15 to 500 mL	-1000 to -30, 30 to 1000 mL	-2.00 to -0.06, 0.06 to 2.00 L	-5.00 to -0.15, 0.15 to 5.00 L	-10.00 to -0.30, 0.30 to 10.00 L	-20.0 to -0.6, 0.6 to 20.0 L	-50.0 to -1.5, 1.5 to 50.0 L	-100.0 to -3.0, 3.0 to 100.0 L	-200 to -6, 6 to 200 L	-500 to -15, 15 to 500 L	-1000 to -30, 30 to 1000 L
Indicator type			LED display (power and status indicators)										
Working fluid		Applicable fluid *2	Clean air (ISO 8573-1 2010 1.1.1 to 5.6.2), compressed air (ISO 8573-1 2010 1.1.1 to 1.6.2), nitrogen gas										
			Argon, carbon dioxide (*3), and gas mixture (argon + carbon dioxide)									–	
		Temperature range	0 to 50°C (no condensation)										
		Pressure range	-0.09 to 0.75 MPa										
		Proof pressure	1 MPa										
Operating ambient temperature / humidity			0 to 50°C, 90% RH or less										
Storage temperature			-10 to 60°C										
Accuracy*4 (Fluid: in dry air)		Accuracy *5	Within ±3%F.S. (Secondary side released to atmosphere) (The scope of warranty is in accordance with the "measurement flow rate range.")										
		Repeatability *6	Within ±1%F.S. (Secondary side released to atmosphere)										
		Temperature characteristics	Within ±0.2% F.S./°C (15 to 35°C, base temperature 25°C)										
		Pressure characteristics	Within ±5%F.S. (-0.09 to 0.7 MPa, where secondary side is released to atmosphere)									Within ±5% F.S. (-0.09 to 0.7 MPa, base temperature 0.35 MPa)	
Response time *7			50 msec. or less (setting response time OFF)										
Power supply voltage			18 to 30 VDC (ripple rate 1% or less)										
Current consumption *8			45 mA or less										
Lead wire *9			M12 both-end connector lead wire (3 m), AWG23 or equivalent, 4-conductor										
Functions *10			①Gas switching, ②Flow rate integration, ③Peak hold, etc.										
Degree of Protection			IP40 or equivalent (IEC standard)										
Protection circuit *11			Power reverse connection protection										
Vibration resistance *12			10 to 150 Hz, max. 100 m/s², X, Y, Z directions, every 2 hours										
EMC Directive			EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8										
Mounting		Mounting orientation *13	Unrestricted in vertical/horizontal direction										
		Straight piping installation section *14	Not required										

*Refer to P. 314 for communication specifications.

*1: The value converted to volumetric flow rate at standard condition (20°C, 1 barometric pressure (101 kPa), 65% RH)
(For gases other than air: 20°C, 1 barometric pressure (101 kPa), 0% RH)

*2: Use dry gas which does not contain corrosive elements such as chlorine, sulphur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air that complies with ISO 8573-1 2010 Class 1.1.1 to 1.6.2. Compressed air from the compressor contains drainage-water, oil oxide, foreign substances, etc. To maintain the function of this product, a filter, air dryer (min. pressure dew point 10°C or less), and oil mist filter (max. oil content 0.1 mg/m³) for operation. (Refer to P. 316 for details on recommended circuit.)

*3: With the gas type switching function, the full scale flow rate after switching to carbon dioxide is half the flow rate range.

Gas type	Flow direction	Measured flow rate range (□/min)							
		005	010	020	100	200	500	101	201
Carbon dioxide	Uni-direction	15 to 250 mL	30 to 500 mL	0.06 to 1.00 L	0.30 to 5.00 L	0.6 to 10.0 L	1.5 to 25.0 L	3.0 to 50.0 L	6 to 100 L
	Bi-direction	-250 to -15 mL	-500 to -30 mL	-1.00 to -0.06 L	-5.00 to -0.30 L	-10.0 to -0.6 L	-25.0 to -1.5 L	-50.0 to -3.0 L	-100 to -6 L
		15 to 250 mL	30 to 500 mL	0.06 to 1.00 L	0.30 to 5.00 L	0.6 to 10.0 L	1.5 to 25.0 L	3.0 to 50.0 L	6 to 100 L

*4: Compressed air is used for adjusting and inspecting this product. Accuracy for gas-types other than air is a guideline.

*5: Accuracy is based on a CKD standard flow rate meter. It does not indicate absolute accuracy. Repeatability, temperature characteristics, and pressure characteristics are not included for an accuracy of ± 3%F.S. Consider separately according to the working environment and working conditions.

*6: Repeatability is calculated during a short period of time. Change over time is not included. (Refer to the product specifications for details.)

*7: The actual response time changes depending on the piping conditions. As a guideline, the response time can be set within the range of 50 msec. to 1.5 sec.

*8: Current for when 24 VDC is connected, and no load is applied. Please note that the current consumption changes depending on the load connection status.

*9: The male end is straight, and the female end is angled. (Refer to P. 262.) Tighten the M12 connector with a torque of 0.5 N·m or lower. Tightening with excessive force may lead to damage.

*10: The gas type switching function enables switching to argon, carbon dioxide and a gas mixture of argon 80% + carbon dioxide 20%. The measurement flow rate ranges after switching are as follows. (Note that the 500 L/min and 1000 L/min models do not have a gas change function.)
Refer to Note 3 for carbon dioxide.

Gas type	Flow direction	Measured flow rate range (□/min)							
		005	010	020	100	200	500	101	201
• Air • Nitrogen • Argon • argon 80% +carbon dioxide 20%	Uni-direction	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L
	Bi-direction	-500 to -15 mL	-1000 to -30 mL	-2.00 to -0.06 L	-10.00 to -0.30 L	-20.0 to -0.6 L	-50.0 to -1.5 L	-100.0 to -3.0 L	-200 to -6 L
		15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L

The integrating flow is a reference value.
When using the integrated save function, take care to prevent the number of saves from exceeding the access count limit of the storage device (1 million times).
(Changes to the settings are counted in number of accesses.)

$$\text{Number of saves} = \frac{\text{Usage time}}{5 \text{ min.}} < 1 \text{ million times}$$

*11: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.

*12: A communication error might occur depending on the vibration conditions. Install this product in a place not subject to vibration.

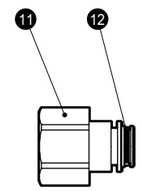
*13: This product measures changes in heat distribution that are caused by flow. If installed vertically, the heat distribution may change due to the effect of convection, and the zero point may be shifted.

*14: Piping conditions may affect accuracy. For more accurate measurements, use a straight pipe with a ten-times greater internal diameter. With the 500 L/min and 1,000 L/min models, use piping with an internal diameter of 9 mm or more. If it is less than 9 mm, accuracy may be negatively affected.

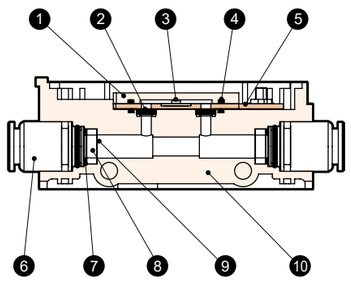
*15: Refer to P. 261 for weight.

Internal Structure Diagram / Material

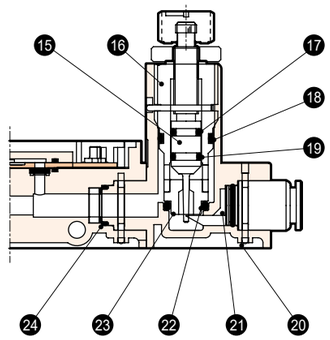
●FSM3-□005 to 201

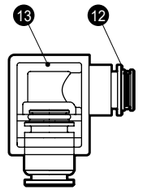


Screw-in fitting



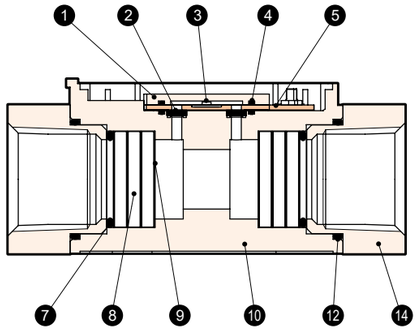
With needle valve





Elbow fitting

●FSM3-□501 to 102



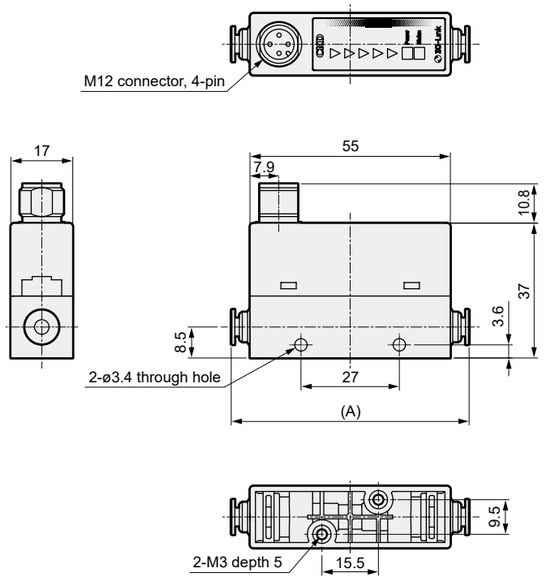
Do not disassemble

Part No.	Part name	Material	Part No.	Part name	Material
1	Sensor cover	Stainless steel	13	Elbow adaptor	Polyamide Resin
2	Filter	Stainless steel	14	Fitting	Aluminum
3	Sensor chip	Semiconductor silicon	15	Needle	Brass/nickeling
4	Gasket	Fluoro rubber	16	Needle guide	Brass/nickeling
5	Sensor board	Glass epoxy resin	17	O-ring	Fluoro rubber
6	Fitting	–	18	O-ring	Fluoro rubber
7	O-ring	Fluoro rubber	19	O-ring	Fluoro rubber
8	Spacer	Aluminum	20	Needle valve body	Polyamide Resin
9	Filter	Stainless steel	21	Filter	Stainless steel
10	Sensor body	Polyamide Resin	22	O-ring	Fluoro rubber
11	Fitting	Aluminum	23	Orifice	Brass/nickeling
12	O-ring	Fluoro rubber	24	O-ring	Fluoro rubber

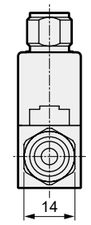
Dimensions diagram (IO-Link)

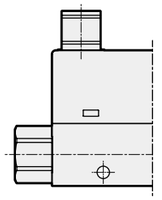
Port size: Straight ø4 mm, ø6 mm, ø1/4", Rc1/8, G1/8, NPT1/8

●FSM3-C❶❷/BH1/CH1/HH1/AA1/AF1/AB1/AC1 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)

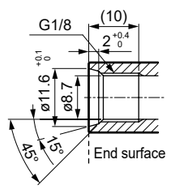


Rc1/8, NPT1/8, G1/8 (AB1)



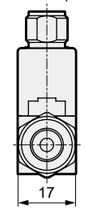


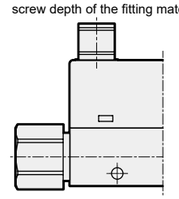
G thread shape (AB)



15° of the surface is the seal surface. Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

G1/8 (AF1)

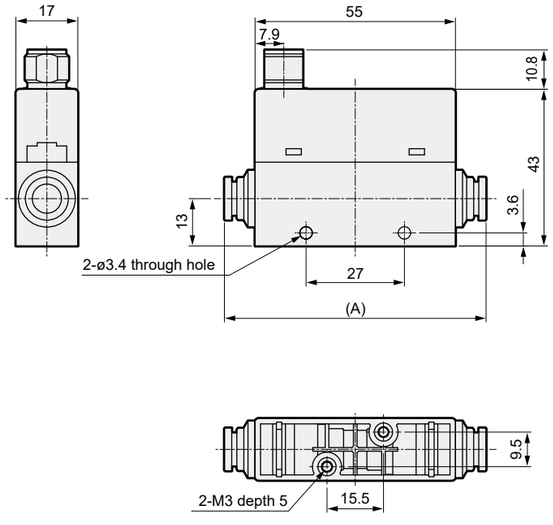




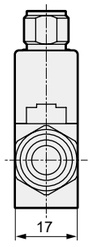
Model No.	Fitting	Dimension (A)
FSM3-C□□1BH1	Push-in ø4 mm	(65)
FSM3-C□□1CH1	Push-in ø6 mm	(67.2)
FSM3-C□□1HH1	Push-in 1/4"	(70.4)
FSM3-C□□1AA1	Rc1/8	(75)
FSM3-C□□1AF1	G1/8	(87)
FSM3-C□□1AB1	G1/8	(87)
FSM3-C□□1AC1	NPT1/8	(75)

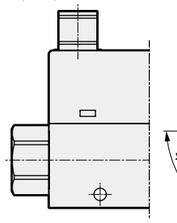
Port size: Straight ø8 mm, ø10 mm, ø3/8", Rc1/4, G1/4, NPT1/4

●FSM3-C❶❷1/DH1/EH1/JH1/BA1/BF1/BB1/BC1 (full scale flow rate: 50, 100, 200 L/min)

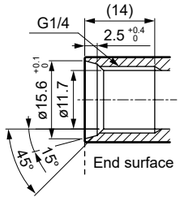


Rc1/4, NPT1/4, G1/4 (BB1)



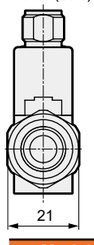


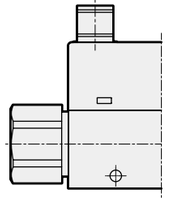
G thread shape (BB)



15° of the surface is the seal surface. Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

G1/4 (BF1)



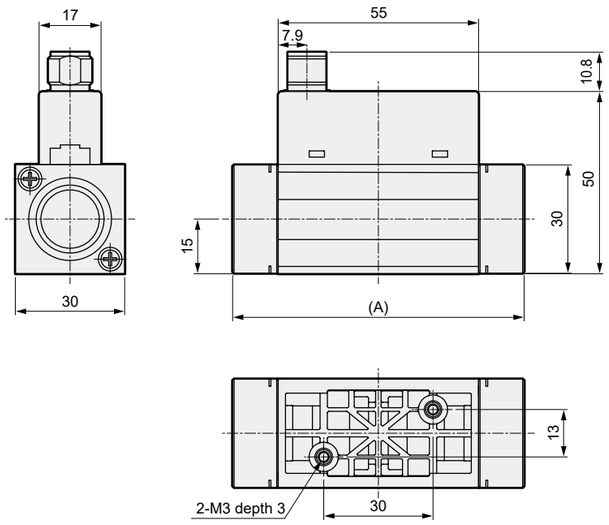


Model No.	Fitting	Dimension (A)
FSM3-C□□1DH1	Push-in ø8 mm	(70.6)
FSM3-C□□1EH1	Push-in ø10 mm	(82.1)
FSM3-C□□1JH1	Push-in 3/8"	(83.4)
FSM3-C□□1BA1	Rc1/4	(75)
FSM3-C□□1BF1	G1/4	(89)
FSM3-C□□1BB1	G1/4	(89)
FSM3-C□□1BC1	NPT1/4	(75)

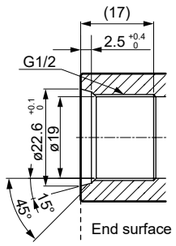
Dimensions diagram (IO-Link)

Port size: Straight Rc1/2, G1/2, NPT1/2

●FSM3-C❶❷1/CA1/CF1/CB1/CC1 (full scale flow rate: 500, 1000 L/min)

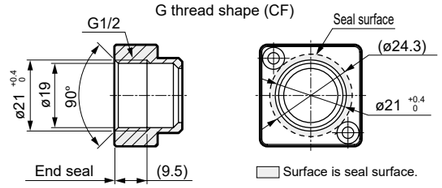


G thread shape (CB)



15° of the surface is the seal surface. Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

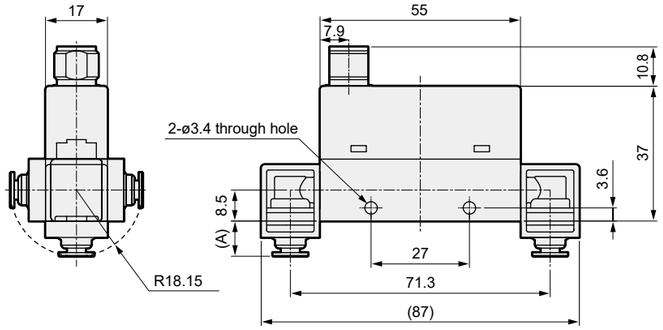
G thread shape (CF)



Model No.	Fitting	Dimension (A)
FSM3-C□□1CA1	Rc1/2	(80)
FSM3-C□□1CF1	G1/2	(80)
FSM3-C□□1CB1	G1/2	(95.4)
FSM3-C□□1CC1	NPT1/2	(80)

Port size: Elbow ø4 mm, ø6 mm, ø1/4", Rc1/8, G1/8, NPT1/8

●FSM3-C❶❷1/BH2/CH2/HH2/AA2/AF2/AB2/AC2 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



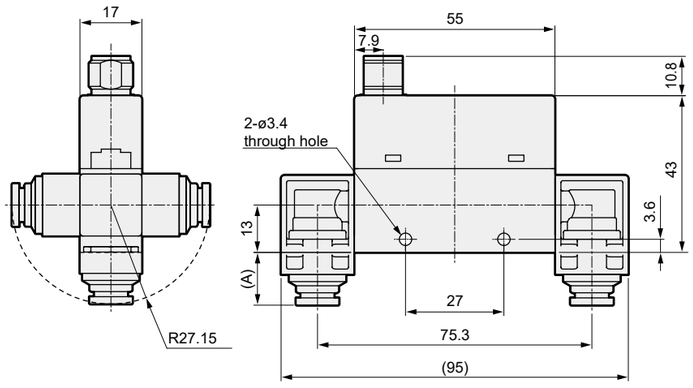
The shape of the top and bottom surfaces of the body is the same as the straight type.

Model No.	Fitting	Dimension (A)
FSM3-C□□1BH2	Push-in ø4 mm	(9.5)
FSM3-C□□1CH2	Push-in ø6 mm	(10.6)
FSM3-C□□1HH2	Push-in 1/4"	(12.2)
FSM3-C□□1AA2	Rc1/8	(14.5)
FSM3-C□□1AF2	G1/8 Note	(20.5)
FSM3-C□□1AB2	G1/8 Note	(20.5)
FSM3-C□□1AC2	NPT1/8	(14.5)

Note: For G thread shape, refer to the straight type.

Port size: Elbow ø8 mm, ø10 mm, ø3/8", Rc1/4, G1/4, NPT1/4

●FSM3-C❶❷1/DH2/EH2/JH2/BA2/BF2/BB2/BC2 (full scale flow rate: 50, 100, 200 L/min)



The shape of the top and bottom surfaces of the body is the same as the straight type.

Model No.	Fitting	Dimension (A)
FSM3-C□□1DH2	Push-in ø8 mm	(13.6)
FSM3-C□□1EH2	Push-in ø10 mm	(19.3)
FSM3-C□□1JH2	Push-in 3/8"	(20.0)
FSM3-C□□1BA2	Rc1/4	(15.8)
FSM3-C□□1BF2	G1/4 Note	(22.8)
FSM3-C□□1BB2	G1/4 Note	(22.8)
FSM3-C□□1BC2	NPT1/4	(15.8)

Note: For G thread shape, refer to the straight type.

Product weight

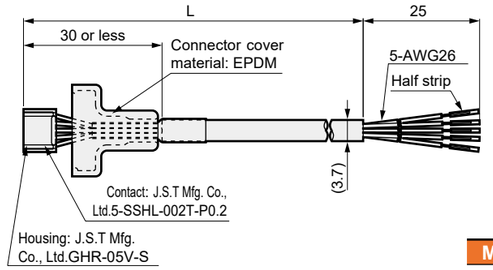
[Unit: g]

Port size / Piping direction		Weight
Code [❸] [❹]	Description	
BH1	Push-in (for ø4 mm straight)	50
CH1	Push-in (for ø6 mm straight)	50
DH1	Push-in (for ø8 mm straight)	80
EH1	Push-in (for ø10 mm straight)	80
HH1	Push-in (for ø1/4” straight)	50
JH1	Push-in (for ø3/8” straight)	80
AA1	Rc1/8 Straight	50
BA1	Rc1/4 Straight	60
CA1	Rc1/2 Straight	120
AF1	G1/8 Straight	70
BF1	G1/4 Straight	85
CF1	G1/2 Straight	120
AB1	G1/8 Straight	60
BB1	G1/4 Straight	70
CB1	G1/2 Straight	140
1 VAC	NPT 1/8 Straight	50
BC1	NPT 1/4 Straight	60
CC1	NPT 1/2 Straight	120
BH2	Push-in (for ø4 mm elbow)	60
CH2	Push-in (for ø6 mm elbow)	60
DH2	Push-in (for ø8 mm elbow)	90
EH2	Push-in (for ø10 mm elbow)	100
HH2	Push-in (for ø1/4” elbow)	60
JH2	Push-in (for ø3/8” elbow)	100
AA2	Rc1/8 elbow	60
BA2	Rc1/4 elbow	80
AF2	G1/8 elbow	80
BF2	G1/4 elbow	105
AB2	G1/8 elbow	70
BB2	G1/4 elbow	90
2 VAC	NPT1/8 elbow	60
BC2	NPT1/4 elbow	80

Resin body optional products

Option dimensions diagram (lead wire)

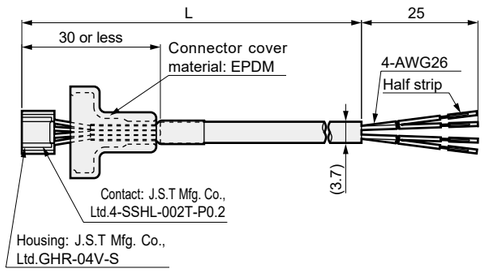
●5-conductor lead wire (for LCD display, for separated display)
FSM3-A,B



Model No.	L dimensions	Weight (g)
FSM3-A	1040±20	21
FSM3-B	3040±20	57

Terminal No.	Cable color
1	Brown
2	Black
3	White
4	Gray
5	Blue

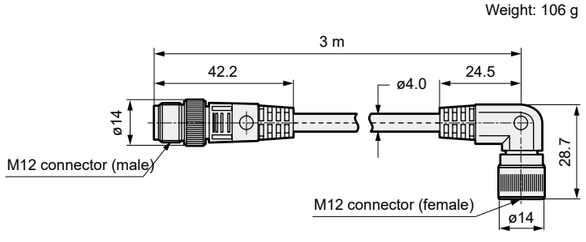
●4-conductor lead wire (for bar display)
FSM3-C,D



Model No.	L dimensions	Weight (g)
FSM3-C	1040±20	19
FSM3-D	3040±20	52

Terminal No.	Cable color
1	Brown
2	Black
3	White
4	Blue

●M12 both-end lead wire with connector (for IO-Link)
FSM3-G



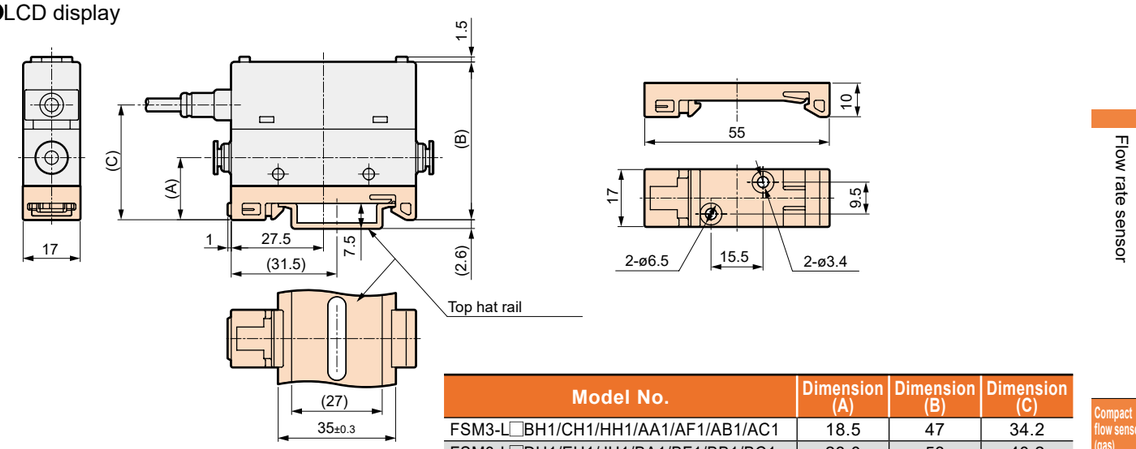
Terminal No.	Cable color
1	Brown
2	White
3	Blue
4	Black

Option dimensions diagram (DIN rail mounting kit)

FSM3-M

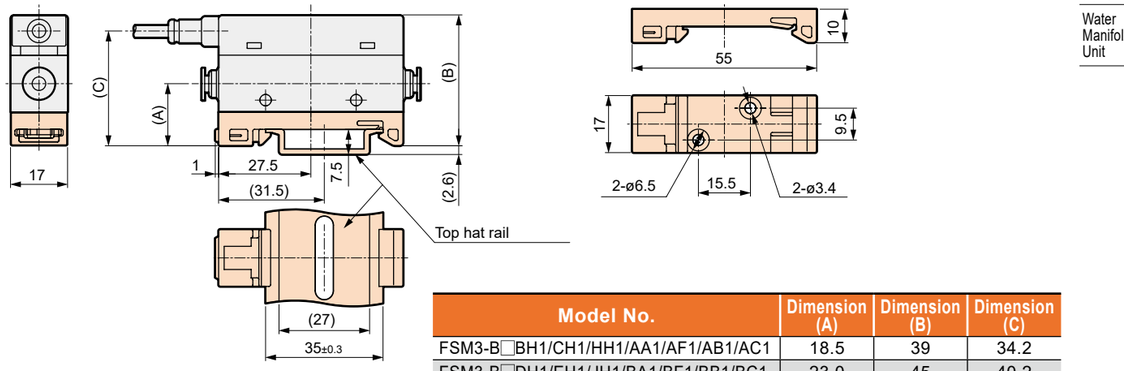
Discrete weight: 7 g

●LCD display



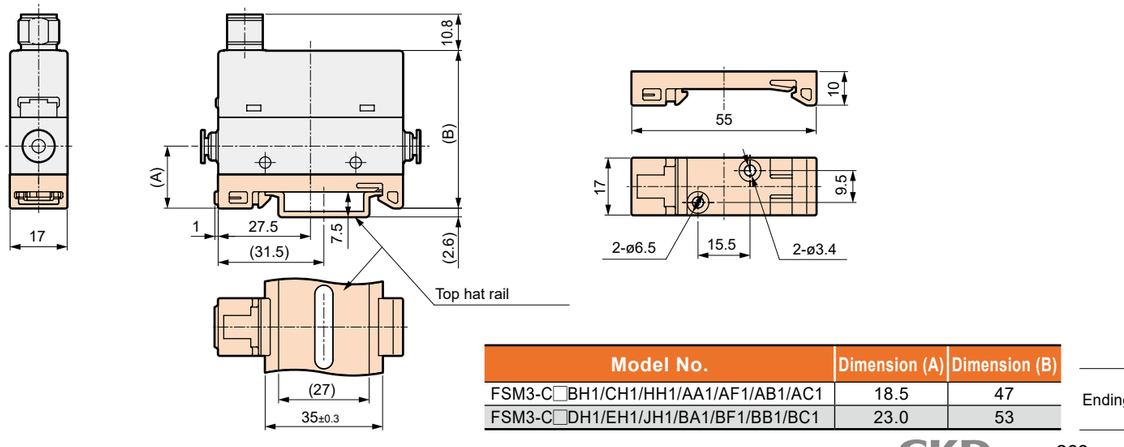
Model No.	Dimension (A)	Dimension (B)	Dimension (C)
FSM3-L□BH1/CH1/HH1/AA1/AF1/AB1/AC1	18.5	47	34.2
FSM3-L□DH1/EH1/JH1/BA1/BF1/BB1/BC1	23.0	53	40.2

●Bar display



Model No.	Dimension (A)	Dimension (B)
FSM3-B□BH1/CH1/HH1/AA1/AF1/AB1/AC1	18.5	39	34.2
FSM3-B□DH1/EH1/JH1/BA1/BF1/BB1/BC1	23.0	45	40.2

●IO-Link



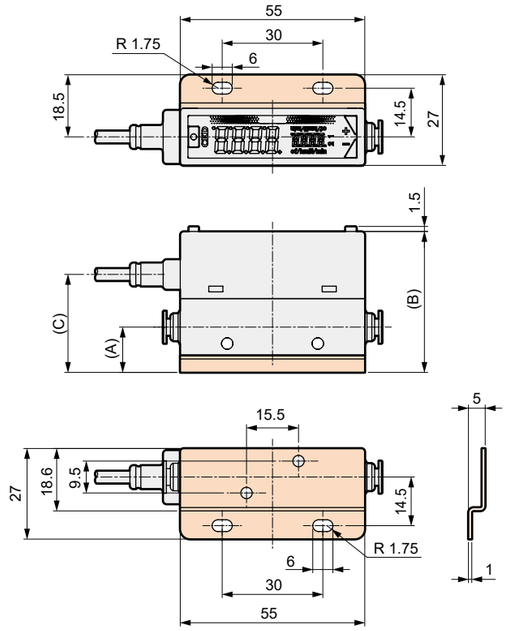
Model No.	Dimension (A)	Dimension (B)
FSM3-C□BH1/CH1/HH1/AA1/AF1/AB1/AC1	18.5	47
FSM3-C□DH1/EH1/JH1/BA1/BF1/BB1/BC1	23.0	53

Option dimensions diagram (for models with bracket 1: 200 L or less)

FSM3-H

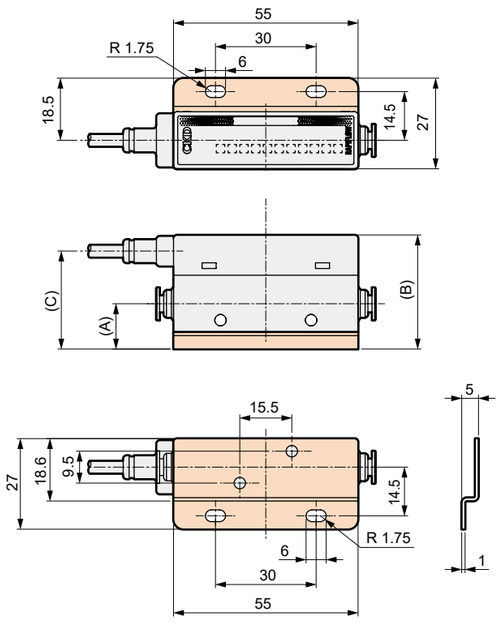
Discrete weight: 13 g

●LCD display



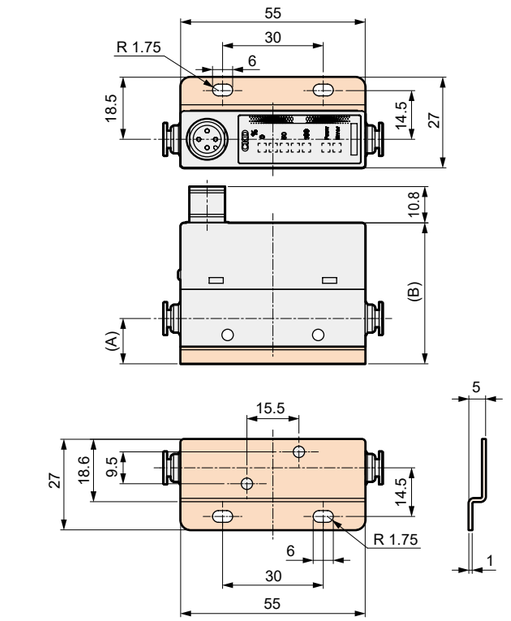
Model No.	Dimension (A)	Dimension (B)	Dimension (C)
FSM3-L□BH1/CH1/HH1/AA1/AF1/AB1/AC1	13.5	42	29.2
FSM3-L□DH1/EH1/JH1/BA1/BF1/BB1/BC1	18.0	48	35.2

●Bar display



Model No.	Dimension (A)	Dimension (B)	Dimension (C)
FSM3-B□BH1/CH1/HH1/AA1/AF1/AB1/AC1	13.5	34	29.2
FSM3-B□DH1/EH1/JH1/BA1/BF1/BB1/BC1	18.0	40	35.2

●IO-Link



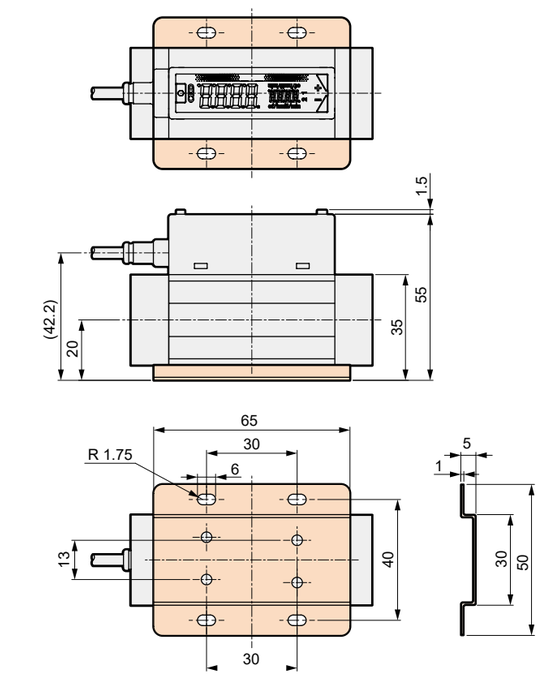
Model No.	Dimension (A)	Dimension (B)
FSM3-C□BH1/CH1/HH1/AA1/AF1/AB1/AC1	13.5	42
FSM3-C□DH1/EH1/JH1/BA1/BF1/BB1/BC1	18.0	48

Option dimensions diagram (for models with bracket 2: 500 L or 1000 L)

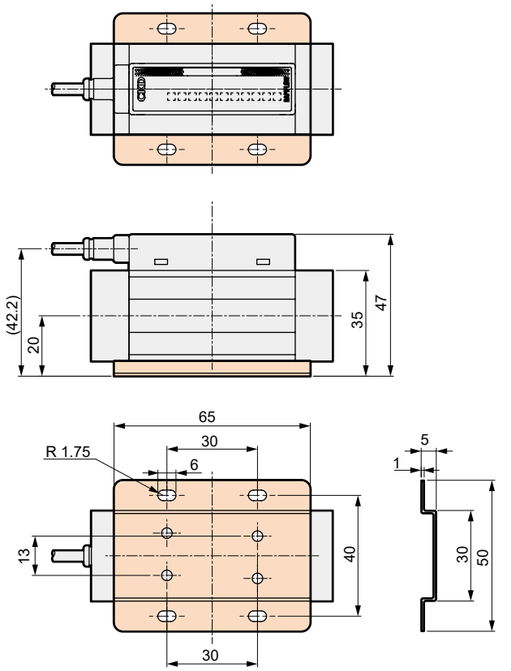
FSM3-J

Discrete weight: 28 g

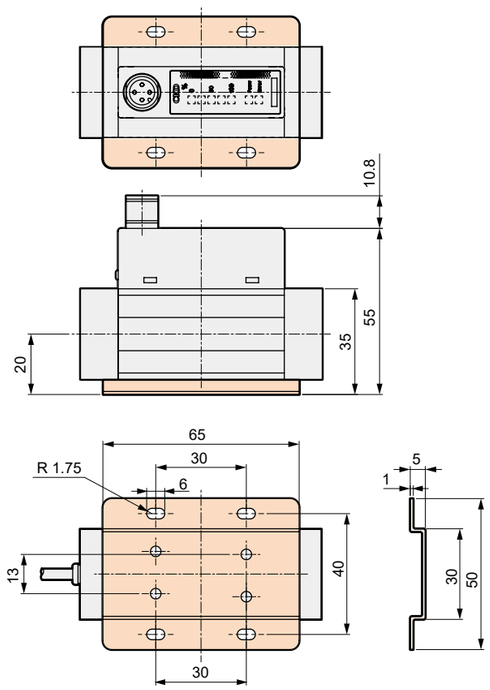
●LCD display



●Bar display



●IO-Link



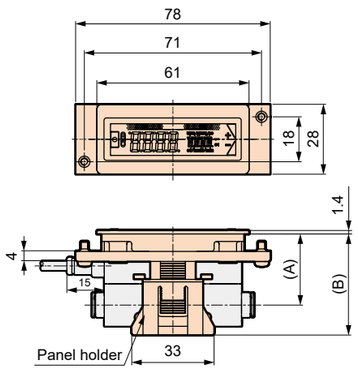
Option dimensions diagram (panel mounting kit)

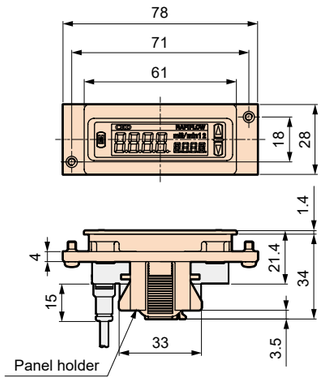
●Panel mounting kit 1 (for LCD display, separated display)

FSM3-K

・LCD display ・Separated display

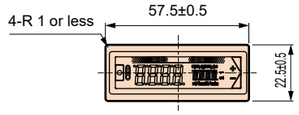
Unit weight: 21g



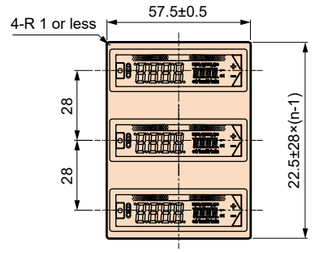


[Panel cut dimension]

In case of single installation



In the case of close mounting

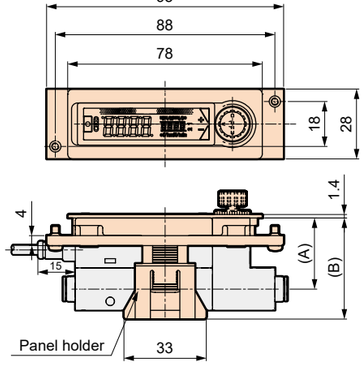


●Panel mounting kit 2 (for needle valve integrated model)

FSM3-L

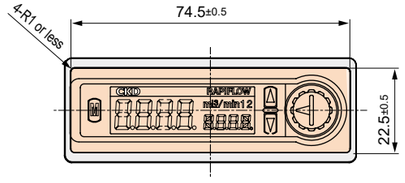
・Integrated needle valve

Unit weight: 24 g



[Panel cut dimension]

In case of single installation



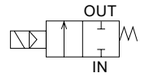
Model No.	Dimension (A)	Dimension (B)
FSM3-□□□□/BH/CH/HH/AA/AF/AB/AC/AD/AE/□□□/N/T	28.5	40.5
FSM3-□□□□/DH/EH/JH/BA/BF/BB/BC/BD/BE/□□□/N/T	30	46.5

Connection image



Circuit diagram Symbol

●NC (normally closed)



Model No. Notation Method

EXA - 02 - 1 2C - 3

Model No.

❷Sealant/pilot operated combination

❶Port size

Coil option: Lead wire (without lamp/surge suppressor)

❸Voltage

*1: Contact CKD for G thread and NPT thread support.
*2: Refer to the FSM3 instruction manual for the connection method to FSM3.

❶Port size

Code	Description
02	Rc1/4
03	Rc3/8

❷Sealant/pilot operated combination

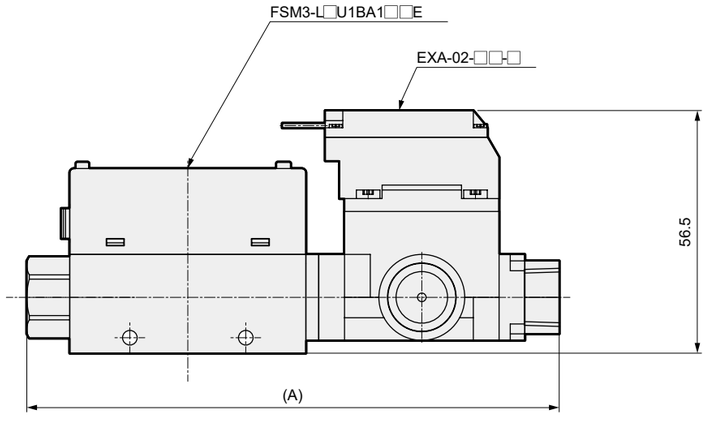
Code	Description
0	H-NBR, internal exhaust specifications
1	H-NBR/external exhaust specifications

Note: Check the pressure specifications.

❸Voltage

Code	Description
1	480 VAC
3	24 VDC
4	12 VDC

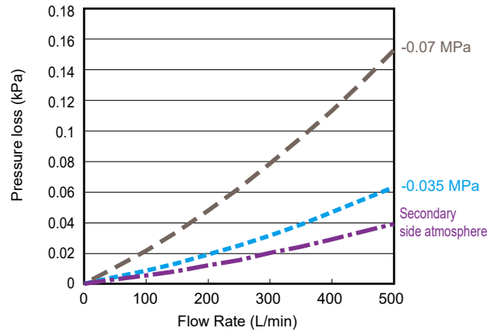
FSM3 connection dimensions



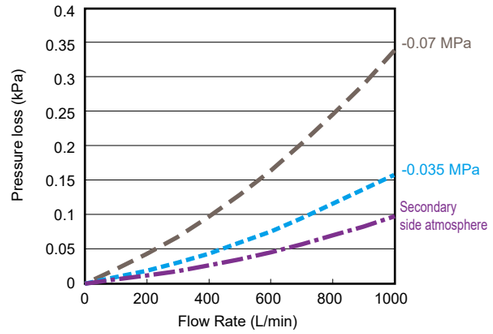
Configuration	Dimension (A)
FSM3+EXA-02	124
FSM3+EXA-03	130

Pressure loss characteristics (resin body, air)

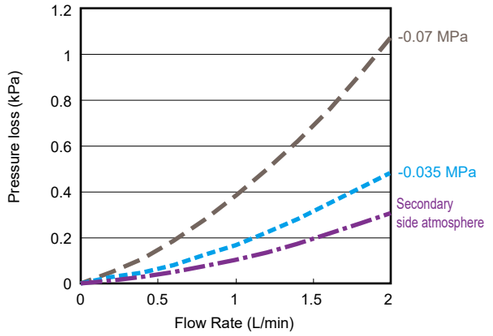
FSM3-□005□1



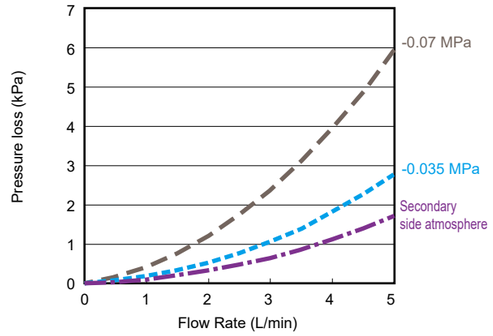
FSM3-□010□1



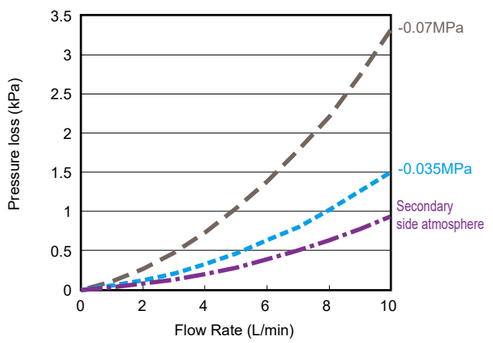
FSM3-□020□1



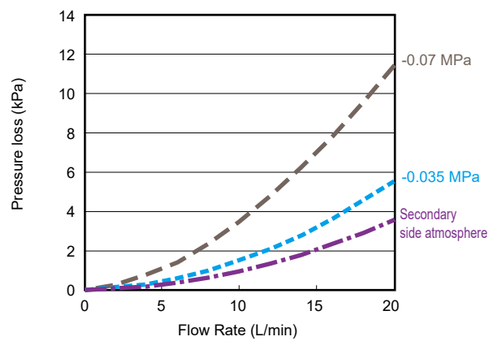
FSM3-□050□1



FSM3-□100□1



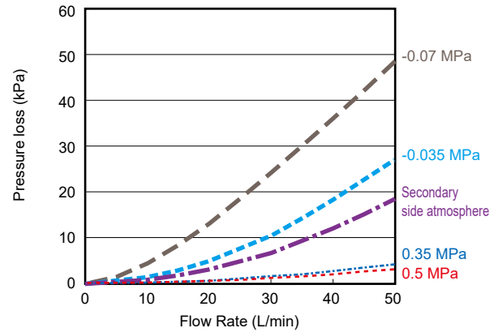
FSM3-□200□1



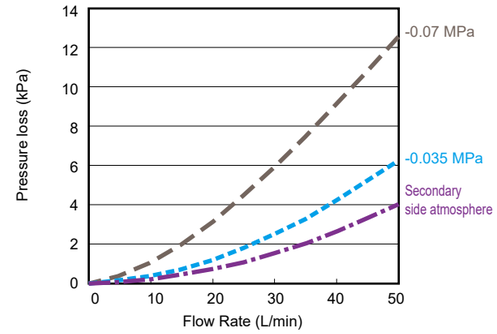
The graphs show data for air. For gases other than air, multiply by the following specific gravity as a guideline.
Argon: 1.38, carbon dioxide: 1.53, argon 80% + carbon dioxide 20%: 1.41

Pressure loss characteristics (resin body, air)

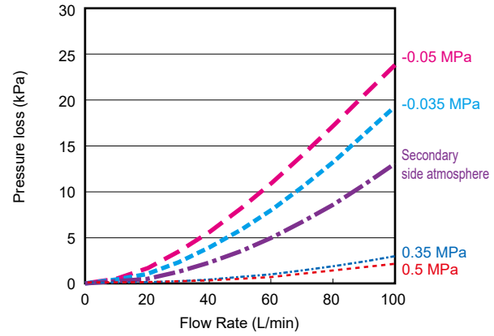
FSM3-□500□1 (small body)



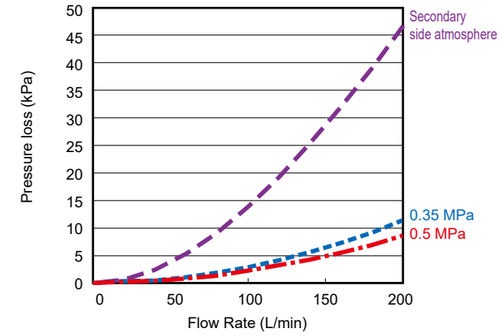
FSM3-□500□1 (medium body)



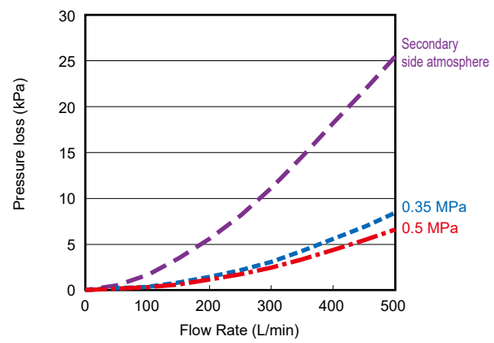
FSM3-□101□1



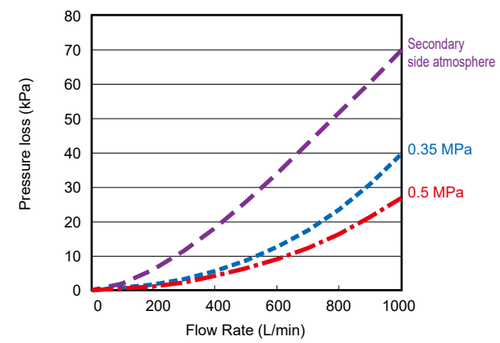
FSM3-□201□1



FSM3-□501□1



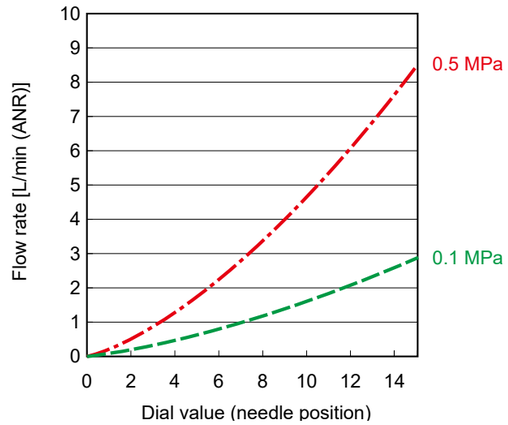
FSM3-□102□1



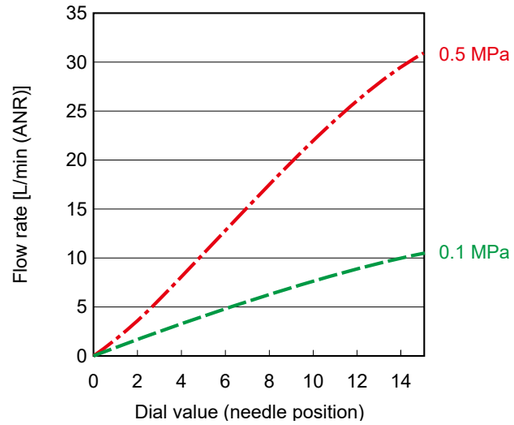
The graphs show data for air. For gases other than air, multiply by the following specific gravity as a guideline.
Argon: 1.38, carbon dioxide: 1.53, argon 80% + carbon dioxide 20%: 1.41 (excluding 501 and 102)

Needle valve flow characteristics (Resin body, for air, nitrogen gas)

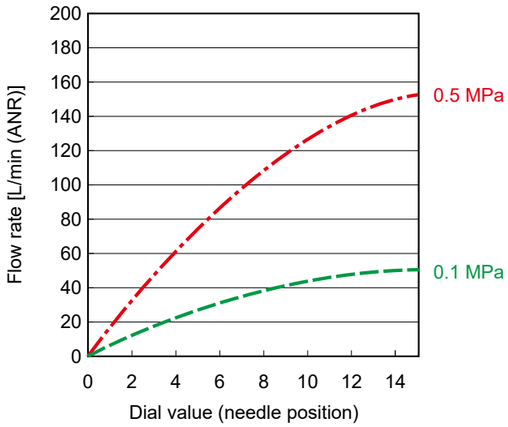
●FSM3-L005/010/020



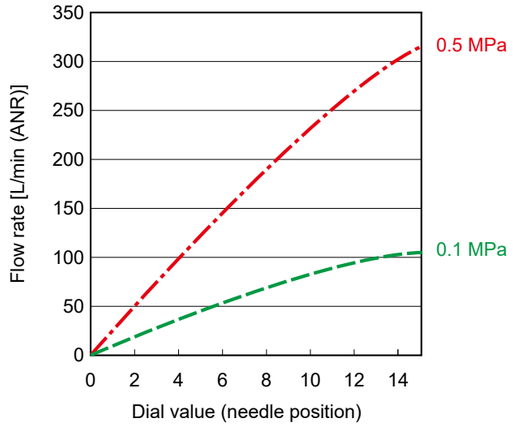
●FSM3-L050/100



●FSM3-L200/500-H04/H06



●FSM3-L500/101/201-H08/H10



MEMO

Flow rate sensor
Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit
Ending



Compact flow rate sensor (RAPIFLOW)

FSM3 Series

LCD display

●Stainless steel body (flow rate range: 500 mL/min to 1000 L/min)

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

FSM3 - L 005 U 2 AA 1 A 1 N - B M R

- FSM3 - L: Model No. Display: Liquid crystal display
- 005: ❶Flow rate range (full scale flow rate)
- U: ❷Flow direction
- 2: ❸Body material/applicable fluids
- AA: ❹Port size
- 1: Piping direction: Straight
- A: ❺Output specifications
- 1: ❻Unit Specifications
- N: ❼Valve option
- B: ❽Lead wire
- M: ❾Mounting Attachment
- R: ❿Included documents

❶Flow rate range (full scale flow rate) *1

Code	Description	Code	Description
005	500 mL/min	500	50 L/min
010	1000 mL/min	101	100 L/min
020	2 L/min	201	200 L/min
050	5 L/min	501	500 L/min *2
100	10 L/min	102	1000 L/min *2
200	20 L/min		

*1: Refer to the compatibility table on the following Page for combinations of the flow rate range and port size.
*2: For 500L/min and 1000L/min, ❸" Oxygen cannot be selected under Applicable Fluids.

❷Flow direction

Code	Description
U	Uni-direction
B	Bi-direction

Note: For models with flow direction "B" bi-directional, the ❼valve option is only available without "N". Note that models with a "T" needle valve cannot be selected.

❸Body material/applicable fluids

Code	Description	
	Body material	Applicable fluid
2	SUS	Air (Gas can be changed)
3		Oxygen (oil-prohibited specifications) *1, *2

*1: ❶oxygen cannot be selected with the flow rate ranges for "501" is 500 L/min and for "102" is 1000 L/min.
*2: The "3" oxygen model is only available without "N" ❼valve option. Note that models with a "T" needle valve cannot be selected.

❹Port size

Description		Code	
Rc thread	Rc1/8	AA	Screw-in
	Rc1/4	BA	
	Rc1/2	CA	
G thread ISO 16030	G1/8	AF	
	G1/4	BF	
	G1/2	CF	
G thread JIS B 2351-1 O-type (*1)	G1/8	AB	
	G1/4	BB	
	G1/2	CB	
NPT thread	NPT1/8	AC	
	NPT1/4	BC	
	NPT1/2	CC	
1/4" Double barbed fitting	50 L/min or less	AD	Double barbed Fitting
	50 to 200 L/min	BD	
1/4" JXR male fitting	50 L/min or less	AE	JXR fitting
	50 to 200 L/min	BE	

*1: Check the G thread connection shape with dimensions diagrams (pages 277 to 279) when selecting. (G thread connection shape is JIS B 2351-1 O-type compliant)
*2: Refer to the compatibility table on the following Page for combinations of the flow rate range and port size.

❺Output specifications

Code	Description		
	Analog Output	Switch Output	Setting copy function
A	1 points (Voltage output) 1-5 V	1 point (NPN)	Yes
B		2 point (NPN)	—
C		1-point output (PNP)	Yes
D		2-point output (PNP)	—
E	1 points Current output 4-20 mA	1 point (NPN)	Yes
F		2 point (NPN)	—
G		1-point output (PNP)	Yes
H		2-point output (PNP)	—

Compatibility table of flow rate range and port size

❶Flow rate range	❹Port size															
	AA	BA	CA	AF	BF	CF	AB	BB	CB	AC	BC	CC	AD	BD	AE	BE
	Rc1/8	Rc1/4	Rc1/2	G1/8	G1/4	G1/2	G1/8	G1/4	G1/2	NPT1/8	NPT1/4	NPT1/2	1/4" double barbed fitting		1/4" JXR male fitting	
005	● ○			● ○			● ○			● ○			● ○		● ○	
010	● ○			● ○			● ○			● ○			● ○		● ○	
020	● ○			● ○			● ○			● ○			● ○		● ○	
050	● ○			● ○			● ○			● ○			● ○		● ○	
100	● ○			● ○			● ○			● ○			● ○		● ○	
200	● ○			● ○			● ○			● ○			● ○		● ○	
500	● ○	● ○		● ○	● ○		● ○	● ○		● ○	● ○		● ○	● ○	● ○	● ○
101		● ○			● ○			● ○			● ○			● ○		● ○
201		● ○			● ○			● ○			● ○			● ○		● ○
501			●			●			●			●				
102			●			●			●			●				

●: Port size compatibility ○: Needle valve option supported

❻Unit Specifications

Code	Description
1	SI units only
2	With unit change function (For overseas only)

Note: The model with unit change function of "2" cannot be sold in Japan.

❼Valve option

Code	Description	
N	None	
T	With needle valve (Only for models 200 L or less)	

Note: Models with ❷flow direction "B" bidirectional and models with oxygen as the ❸applicable fluid are only available without "N". Note that models with a "T" needle valve cannot be selected.

❽Lead wire

Code	Description	
Blank	None	
A	5 conductor 1 m	
B	5 conductor 3 m	

❾Mounting Attachment

Code	Description	
Blank	None	
H	Bracket 1 (For models 200 L or less)	
J	Bracket 2 (For 500 L and 1000 L models)	
K	Panel mount (For sensor products of models 200 L or less)	
L	Panel mount (For needle valves of models 200 L or less)	
M	DIN rail mount (For models 200 L or less)	

Note: Optional parts will come with the product.

❿Included documents

Code	Description
Blank	None
R	Inspection certificate
S	Inspection certificate + calibration certificate + traceability system diagram

Clean-room specifications

(Catalog No. CB-033SA)

FSM3 - ····- P70

FSM3 - ····- P80

Specifications for Rechargeable Batteries

(Catalog No.CC-1226AA)

Conforms to CKD P4 Series equivalent specifications as standard.
(Excluding models with needle valves)

Model No. Notation for Options

FSM3 - K

❶Option

❶Option

Code	Description
A	5-conductor lead wire 1 m (for LCD display)
B	5-conductor lead wire 3 m (for LCD display)
H	Bracket 1 (for models with a flow rate range below 200 L/min)
J	Bracket 2 (for models with a flow rate range of 500 L/min or 1000 L/min)
K	Panel mounting kit 1 (for sensor unit models with a flow rate range below 200 L/min)
L	Panel mounting kit 2 (for needle valve integrated models with a flow rate range below 200 L/min)
M	DIN rail mounting kit (for models with a flow rate range below 200 L/min)

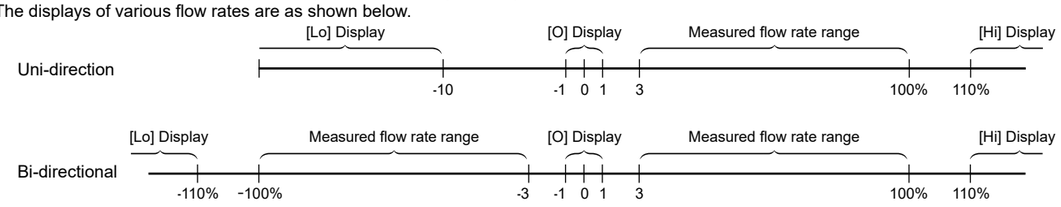
Note: Refer to P. 298 for dimensions diagram.

Specifications

Item			FSM3-L[❶] [❷] [❸] [❹]1[❺][❻]1[❼]-[ ]										
			[❶] Flow rate range (full scale flow rate) code										
			005	010	020	050	100	200	500	101	201	501	102
Flow direction	[❷]	U	Uni-direction										
		B	Bi-direction										
Measured flow rate range (□/min) *1	[❷]	U	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.15 to 5.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L	15 to 500 L	30 to 1000 L
		B	-500 to -15, 15 to 500 mL	-1000 to -30, 30 to 1000 mL	-2.00 to -0.06, 0.06 to 2.00 L	-5.00 to -0.15, 0.15 to 5.00 L	-10.00 to -0.30, 0.30 to 10.00 L	-20.0 to -0.6, 0.6 to 20.0 L	-50.0 to -1.5, 1.5 to 50.0 L	-100.0 to -3.0, 3.0 to 100.0 L	-200 to -6, 6 to 200 L	-500 to -15, 15 to 500 L	-1000 to -30, 30 to 1000 L
Indicator type			4 digit + 4 digit 2 color LCD										
Flow rate display range (□/min) *2	[❷]	U	-49 to 549 mL	-99 to 1099 mL	-0.19 to 2.19 L	-0.49 to 5.49 L	-0.99 to 10.99 L	-1.9 to 21.9 L	-4.9 to 54.9 L	-9.9 to 109.9 L	-19 to 219 L	-49 to 549 L	-99 to 1099 L
		B	-549 to 549 mL	-1099 to 1099 mL	-2.19 to 2.19 L	-5.49 to 5.49 L	-10.99 to 10.99 L	-21.9 to 21.9 L	-54.9 to 54.9 L	-109.9 to 109.9 L	-219 to 219 L	-549 to 549 L	-1099 to 1099 L
Integration display *3		Indicator range	0 to ±9999999 mL		0.00 to ±99999.99 L			0.0 to ±999999.9 L			0 to ±9999999 L		
		Pulse output rate	5 mL	10 mL	0.02 L	0.05 L	0.1 L	0.2 L	0.5 L	1L	2 L	5L	10 L
Working Conditions		Applicable fluid *4	Clean air (ISO 8573-1 2010 1.1.1 to 5.6.2), compressed air (ISO 8573-1 2010 1.1.1 to 1.6.2), nitrogen gas										
			Argon, carbon dioxide (*5), and gas mixture (argon + carbon dioxide)									–	
			Oxygen (oil-prohibited specifications will automatically become available if oxygen specifications are selected.)									–	
		Temperature range	0 to 50°C (no condensation)										
		Pressure range	-0.09 to 1.00 MPa									-0.09 to 0.75 MPa	
		Proof pressure	1.5 MPa										
Operating ambient temperature / humidity			0 to 50 °C, 90% RH or less										
Storage temperature			-10 to 60°C										
Accuracy *6 (fluid: in dry air)		Accuracy *7	Within ±3%F.S. (Secondary side released to atmosphere) (The scope of warranty is in accordance with the "measurement flow rate range.")										
		Repeatability*8	Within ±1%F.S. (Secondary side released to atmosphere)										
		Temperature characteristics	Within ±0.2% F.S./°C (15 to 35°C, base temperature 25°C)										
		Pressure characteristics	Within ±5%F.S. (-0.09 to 0.7 MPa, where secondary side is released to atmosphere)								Within ±5% F.S (-0.09 to 0.7 MPa, base temperature 0.35 MPa)		
Response time		*9	50 msec. or less (setting response time OFF)										
Switch Output	[❺]	A, B, E, F	NPN open collector output (50 mA or less, voltage drop 2.4 V or less)										
		C, D, G, H	PNP open collector output (50 mA or less, voltage drop 2.4 V or less)										
Analog Output *10		A, B, C, D	1 to 5 V voltage output (connecting load impedance 50 kΩ or more)										
		E, F, G, H	4-20 mA current output (connecting load impedance 0 to 300 Ω)										
Power supply voltage *11		A, B, C, D	12 to 24 VDC (10.8 to 26.4 V) ripple rate 1% or less										
		E, F, G, H	24 VDC (21.6 to 26.4 V) ripple rate 1% or less										
Current consumption *12			45 mA or less										
Lead wire			ø3.7, AWG26 or equivalent x 5-conductor (connector), insulator O.D. 1.0										
Functions *13			①Gas switching, ②Setting copy function, ③Flow rate integration, ④Peak hold, etc.										
Degree of Protection			IP40 or equivalent (IEC standard)										
Protection circuit *14			Power reverse connection protection, switch output reverse connection protection, switch output load short-circuit protection										
Vibration resistance			10 to 150 Hz, max. 100 m/s^2, X, Y, Z directions, every 2 hours										
EMC Directive			EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8										
Mounting		Mounting orientation *15	Unrestricted in vertical/horizontal direction										
		Straight piping section *16	Not required										

*1: The value converted to volumetric flow rate at standard condition (20°C 1 barometric pressure (101 kPa) 65% RH). (For gases other than air: 20°C, 1 barometric pressure (101 kPa), relative humidity 0% RH)

*2: The displays of various flow rates are as shown below.



*3: The accumulated flow is a calculated (reference) value. When using the integrated save function, take care to prevent the number of saves from exceeding the access count limit of the storage device (1 million times). (Changes to the settings are counted in number of accesses.)

$$\text{Number of saves} = \frac{\text{Usage time}}{\text{5 min.}} \quad \text{<1 million times}$$

When instantaneous flow rate is below 1% it is not counted as integrating flow.

*4: Use dry gas which does not contain corrosive elements such as chlorine, sulphur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air that complies with ISO 8573-1 2010 Class 1.1.1 to 1.6.2. Compressed air from the compressor contains drainage-water, oil oxide, foreign substances, etc. To maintain the function of this product, a filter, air dryer (min. pressure dew point 10°C or less), and oil mist filter (max. oil content 0.1 mg/m³) for operation. (Refer to P. 316 for details on recommended circuit.) The sensor for oxygen gas is a custom model. To prevent ignition accidents, do not allow oxygen to flow again when it has been used on fluids other than oxygen to flow even once.

*5: With the gas type switching function, the full scale flow rate after switching to carbon dioxide is half the flow rate range. Output type can also be selected for analog output.

Gas type	Flow direction	Measured flow rate range (□/min)							
		005	010	020	100	200	500	101	201
Carbon dioxide	Uni-direction	15 to 250 mL	30 to 500 mL	0.06 to 1.00 L	0.30 to 5.00 L	0.6 to 10.0 L	1.5 to 25.0 L	3.0 to 50.0 L	6 to 100 L
	Bi-direction	-250 to -15 mL	-500 to -30 mL	-1.00 to 0.06 L	-5.00 to 0.30 L	-10.0 to -0.6 L	-25.0 to -1.5 L	-50.0 to -3.0 L	-100 to -6 L
		15 to 250 mL	30 to 500 mL	0.06 to 1.00 L	0.30 to 5.00 L	0.6 to 10.0 L	1.5 to 25.0 L	3.0 to 50.0 L	6 to 100 L

Gas type	Flow direction	Analog Output			
		Output A		Output B	
		Voltage	Current	Voltage	Current
Carbon dioxide	Uni-direction	1 to 3 V	4 to 12 mA	1 to 5 V	4 to 20 mA
	Bi-direction	2 to 4 V	8 to 16 mA	1 to 5 V	4 to 20 mA

*6: Compressed air is used for adjusting and inspecting this product. Accuracy for gas-types other than air is a guideline.

*7: Accuracy is based on CKD's standard flow rate meter and does not indicate absolute accuracy. Repeatability, temperature characteristics, and pressure characteristics are not included for an accuracy of ± 3%F.S. Consider separately according to the working environment and working conditions.

*8: Repeatability is calculated during a short period of time. Change over time is not included. (Refer to the product specifications for details.)

*9: The actual response time changes depending on the piping conditions. As a guideline, the response time can be set within the range of 50 msec. to 1.5 sec.

*10: The output impedance of the analog output section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.

*11: The power supply voltage specifications differ for the voltage output type and current output type.

*12: Current for when 24 VDC is connected, and no load is applied. Please note that the current consumption changes depending on the load connection status.

*13: The gas type switching function enables switching to argon, carbon dioxide and a gas mixture of argon 80% + carbon dioxide 20%. (Note that the 500 L/min and 1000 L/min models do not have a gas change function.)
For carbon dioxide, refer to *5.

Gas type	Flow direction	Measured flow rate range (□/min)							
		005	010	020	100	200	500	101	201
• Air • Nitrogen • Argon • argon 80% +carbon dioxide 20%	Uni-direction	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L
	Bi-direction	-500 to -15 mL	-1000 to -30 mL	-2.00 to -0.06 L	-10.00 to -0.30 L	-20.0 to -0.6 L	-50.0 to -1.5 L	-100.0 to -3.0 L	-200 to -6 L
		15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L

The "setting copy function" can be selected under "❺Output Specifications".
Note that the "External input" function is not available on models on which the "Copy function setting" is enabled.

*14: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.

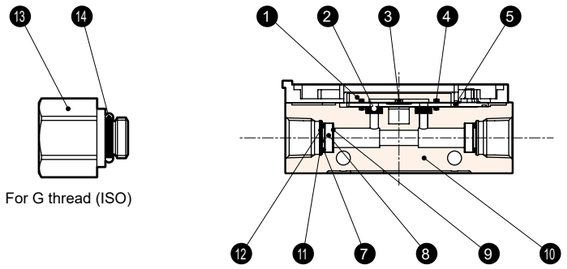
*15: This product measures changes in heat distribution that are caused by flow. If installed vertically, the heat distribution may change due to the effect of convection, and the zero point may be shifted.

*16: Piping conditions may affect accuracy. For more accurate measurements, use a straight pipe with a ten-times greater internal diameter. With the 500 L/min and 1,000 L/min models, use piping with an internal diameter of 9 mm or more. If it is less than 9 mm, accuracy may be negatively affected.

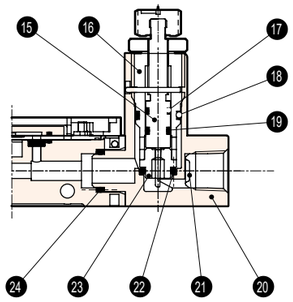
*17: Refer to P. 280 for weight.

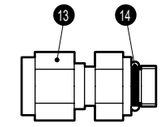
Internal Structure Diagram / Material

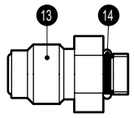
●FSM3-□005 to 201



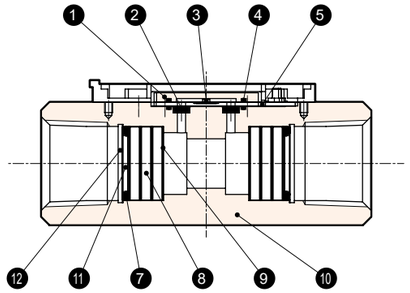
With needle valve







●FSM3-□501 to 102



Do not disassemble

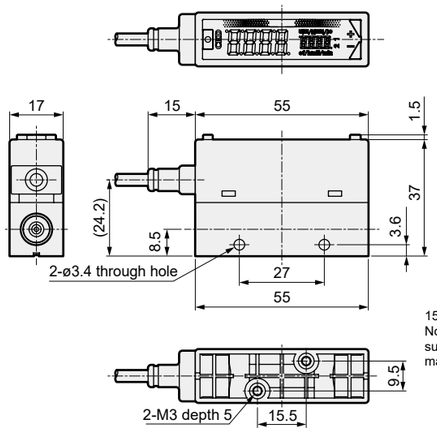
Part No.	Part name	Material	Part No.	Part name	Material
1	Sensor cover	Stainless steel	14	O-ring	Fluoro rubber
2	Filter	Stainless steel	15	Needle	Stainless steel
3	Sensor chip	Semiconductor silicon	16	Needle guide	Stainless steel
4	Gasket	Fluoro rubber	17	O-ring	Fluoro rubber
5	Sensor board	Aluminum	18	O-ring	Fluoro rubber
7	O-ring	Fluoro rubber	19	O-ring	Fluoro rubber
8	Spacer	Stainless steel	20	Needle valve body	Stainless steel
9	Filter	Stainless steel	21	Filter	Stainless steel
10	Sensor body	Stainless steel	22	O-ring	Fluoro rubber
11	O-ring holder	Stainless steel	23	Orifice	Tetra fluoro resin
12	C-snap ring	Stainless steel	24	O-ring	Fluoro rubber
13	Fitting	Stainless steel			

Dimensions diagram (LCD display/flow rate range: 500 mL/min to 50 L/min)

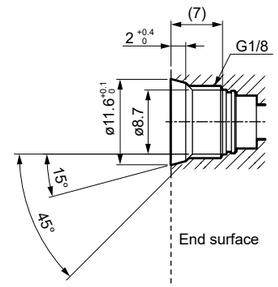
Port size: Straight Rc1/8, G1/8, NPT1/8

●FSM3-L❶❷$^{2}_{3}$/AA1/AB1/AC1

(full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



G thread shape (AB)



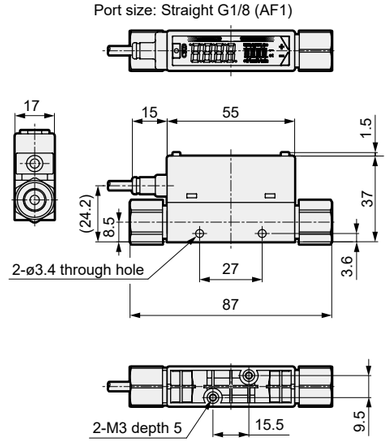
15° of the surface is the seal surface.
Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

Port size: Straight G1/8

●FSM3-L❶❷$^{2}_{3}$/AF1

(Full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)

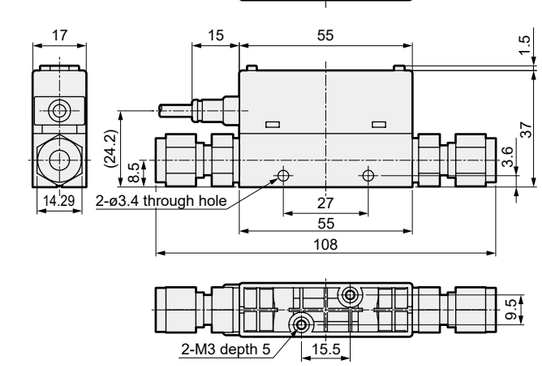
Port size: Straight G1/8 (AF1)



Port size: Straight 1/4" double barbed fitting

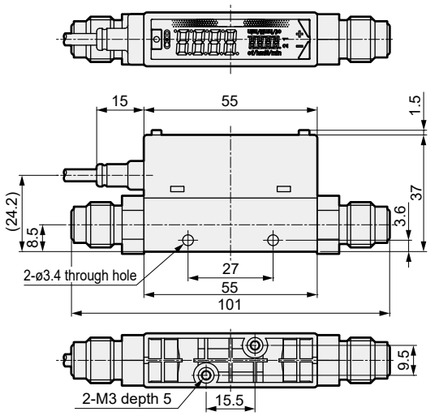
●FSM3-L❶❷$^{2}_{3}$/AD1

(full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Port size: Straight 1/4" JXR male fitting

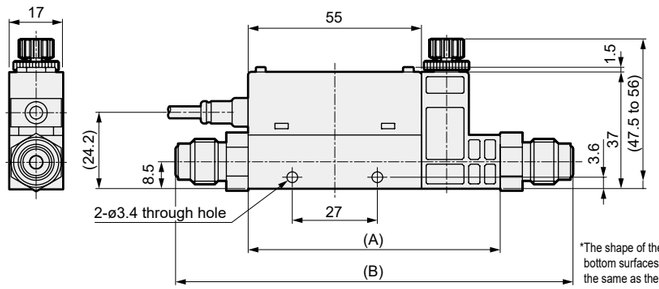
●FSM3-L❶❷$^{2}_{3}$/AE1 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



With needle valve dimensions

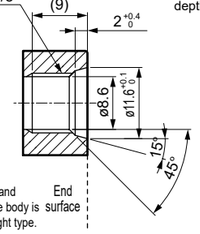
Port size: Rc1/8, G1/8, NPT1/8, 1/4" double barbed fitting, 1/4" JXR male fitting

●FSM3-L❶❷$^{2}_{3}$/AA1/AF1/AB1/AC1/AD/AE❺❻T (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



G thread shape (* AB/needle valve side)

*Refer to the figure above for the G thread shape (AB) on the sensor side.



15° of the surface is the seal surface.
Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

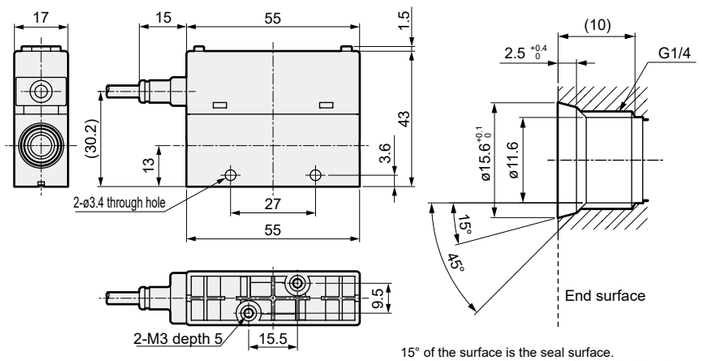
Port size	Dimension (A)	Dimension (B)
Rc 1/8	80	–
G 1/8(AF1)	80	112
G 1/8(AB1)	80	–
NPT 1/8	80	–
1/4" double barbed fitting	80	133
1/4" JXR male fitting	80	126

Dimensions diagram (LCD display/flow rate range: 50 L/min to 200 L/min)

Port size: Straight Rc1/4, G1/4, NPT1/4

●FSM3-L❶❷$^{2}_{3}$/BA1/BB1/BC1

(full scale flow rate: 50, 100, 200 L/min)



G thread shape (BB)

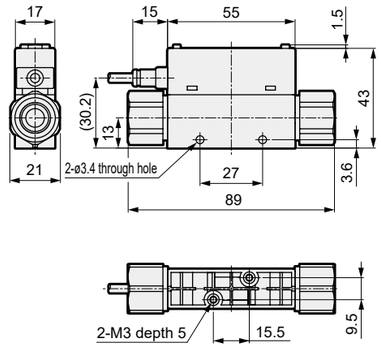
15° of the surface is the seal surface.
Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

Port size: Straight G1/4 (BF1)

●FSM3-L❶❷$^{2}_{3}$/BF1

(full scale flow rate: 50, 100, 200 L/min)

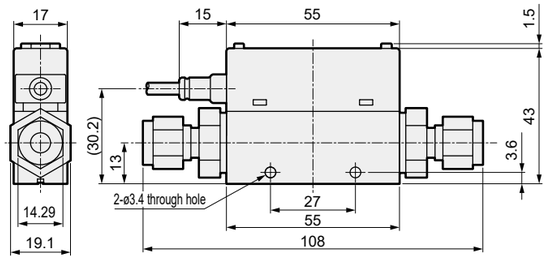
Port size: Straight G1/4 (BF1)



Port size: Straight 1/4" double barbed fitting

●FSM3-L❶❷$^{2}_{3}$/BD1

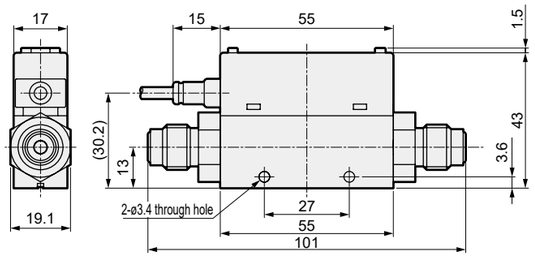
(full scale flow rate: 50, 100, 200 L/min)



Port size: Straight 1/4" JXR male fitting

●FSM3-L❶❷$^{2}_{3}$/BE1

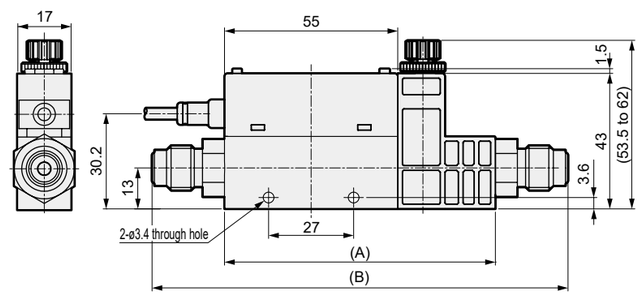
(full scale flow rate: 50, 100, 200 L/min)



With needle valve dimensions

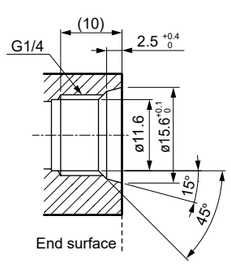
Port size: Rc1/4, G1/4, NPT1/4, 1/4" double barbed fitting, 1/4" JXR male fitting

●FSM3-L$^{2}_{3}$/BA1/BF1/BB1/BC1/BD/BE❺❻T (full scale flow rate: 50, 100, 200 L/min)



G thread shape (BB*needle valve side)

*Refer to the figure above for the G thread shape (BB) on the sensor side.



15° of the surface is the seal surface. Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

Port size	Dimension (A)	Dimension (B)
Rc 1/4	86	–
G 1/4 (BF1)	86	120
G 1/4 (BB1)	86	–
NPT 1/4	86	–
1/4" double barbed fitting	86	139
1/4" JXR male fitting	86	132

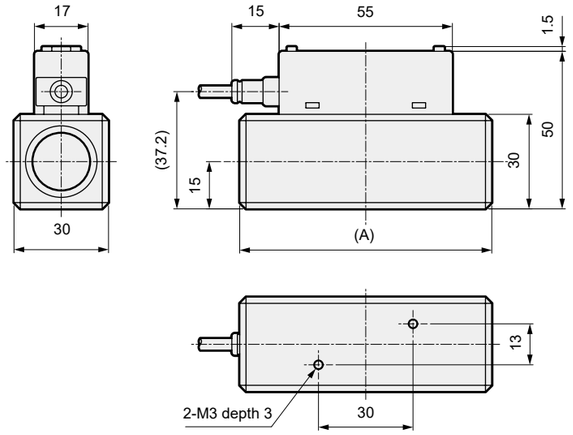
*The shape of the top and bottom surfaces of the body is the same as the straight type.

Dimensions diagram (LCD display) (flow rate range: 500 L/min to 1000 L/min)

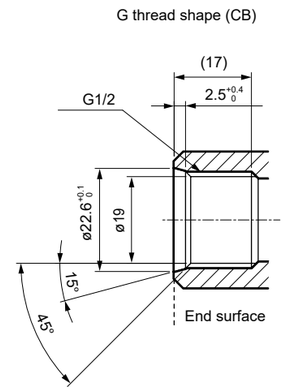
Port size: Straight Rc1/2, G1/2, NPT1/2

●FSM3-L❶❷2/CA1/CF1/CB1/CC1

(full scale flow rate: 500, 1000 L/min)



G thread shape (CB)



15° of the surface is the seal surface. Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

Model No.	Port size	Dimension (A)
FSM3-L□□2CA1	Rc1/2	(80)
FSM3-L□□2CF1	G1/2	(80)
FSM3-L□□2CB1	G1/2	(95.4)
FSM3-L□□2CC1	NPT1/2	(80)

Product weight

[Unit: g]

Port size		Weight	
Code [4]	Description	Without needle valve	With needle valve
AA	Rc1/8 Straight	100	165
BA	Rc1/4 Straight	115	200
CA	Rc1/2 Straight	420	–
AF	G1/8 Straight	155	220
BF	G1/4 Straight	190	275
CF	G1/2 Straight	420	–
AB	G1/8 Straight	100	165
BB	G1/4 Straight	110	195
CB	G1/2 Straight	440	–
AC	NPT 1/8 Straight	100	165
BC	NPT 1/4 Straight	115	200
CC	NPT 1/2 Straight	420	–
AD	1/4" double barbed fitting (500 mL/min to 50 L/min)	155	220
BD	1/4" double barbed fitting (50 L/min to 200 L/min)	190	275
AE	1/4" JXR male fitting (500 mL/min to 50 L/min)	155	220
BE	1/4" JXR male fitting (50 L/min to 200 L/min)	190	275

MEMO

Flow rate sensor
Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit
Ending



Compact flow rate sensor (RAPIFLOW)

FSM3 Series

Bar display

●Stainless steel body (flow rate range: 500 mL/min to 1000 L/min)

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

FSM3 - B 005 U 2 AA 1 J 1 N - D H S

- FSM3: Model No.
- B: Bar Display
- 005: ❶Flow rate range (full scale flow rate)
- U: ❷Flow direction
- 2: ❸Body material/applicable fluids
- AA: ❹Port size
- 1: Piping direction: Straight
- J: ❺Output specifications
- 1: Unit specifications: SI units only
- N: Valve option: None
- D: ❻Lead wire
- H: ❼Mounting Attachment
- S: ❽Included documents

❶Flow rate range (full scale flow rate)*1

Code	Description	Code	Description
005	500 mL/min	500	50 L/min
010	1000 mL/min	101	100 L/min
020	2 L/min	201	200 L/min
050	5 L/min	501	500 L/min *2
100	10 L/min	102	1000 L/min *2
200	20 L/min		

❷Flow direction

Code	Description
U	Uni-direction
B	Bi-direction

❸Body material/applicable fluids

Code	Description	
	Body material	Applicable fluid
2	SUS	Air
3	SUS	Oxygen (oil-prohibited specifications) *1

*1: ❶ oxygen cannot be selected with the flow rate ranges for “501” is 500 L/min and for “102” is 1000 L/min.

*1: Refer to the compatibility table on the following Page for combinations of the flow rate range and port size.
*2: ❸Applicable fluid "3" oxygen cannot be selected for 500 L/min and 1000 L/min.

❹Port size

Description		Code	
Rc thread	Rc1/8	AA	 Screw-in
	Rc1/4	BA	
	Rc1/2	CA	
G thread ISO 16030	G1/8	AF	
	G1/4	BF	
	G1/2	CF	
G thread JIS B 2351-1 O-type (*1)	G1/8	AB	
	G1/4	BB	
	G1/2	CB	
NPT thread	NPT1/8	AC	
	NPT1/4	BC	
	NPT1/2	CC	
1/4" Double barbed fitting	50 L/min or less	AD	 Double barbed fitting
	50 to 200 L/min	BD	
1/4" JXR male fitting	50 L/min or less	AE	 JXR fitting
	50 to 200 L/min	BE	

*1: Check the G thread connection shape with dimensions diagrams (P. 287 and 288) when selecting. (G thread connection shape is JIS B 2351-1 O-type compliant)
*2: Refer to the compatibility table on the following page for combinations of the flow rate range and port size.

Compatibility table of flow rate range and port size

❶Flow rate range	❹Port size	AA	BA	CA	AF	BF	CF	AB	BB	CB	AC	BC	CC	AD	BD	AE	BE
		Rc1/8	Rc1/4	Rc1/2	G1/8	G1/4	G1/2	G1/8	G1/4	G1/2	NPT1/8	NPT1/4	NPT1/2	1/4" double barbed fitting		1/4" JXR male fitting	
005		●			●			●			●			●		●	
010		●			●			●			●			●		●	
020		●			●			●			●			●		●	
050		●			●			●			●			●		●	
100		●			●			●			●			●		●	
200		●			●			●			●			●		●	
500		●	●		●	●		●	●		●	●		●	●	●	●
101			●			●			●			●			●		●
201			●			●			●			●			●		●
501				●			●			●			●				
102				●			●			●			●				

❺Output specifications

Code	Description
J	Analog voltage output 1 point
K	Analog current output 1 point

Note: When using in combination with a separated display (FSM2-D), select "J".

❻Lead wire

Code	Description	
Blank	None	
C	4 conductor 1 m	
D	4 conductor 3 m	

❼Mounting Attachment

Code	Description	
Blank	None	
H	Bracket 1 (for models 200 L or less)	
J	Bracket 2 (for 500 or 1000 L models)	
M	DIN rail mounting (for models 200 L or less)	

Note: Optional parts are provided with the product.

❽Included documents

Code	Description
Blank	None
R	Inspection certificate
S	Inspection certificate + calibration certificate + traceability system diagram

Clean-room specifications (Catalog No. CB-033SA)

FSM3 - ····· - P70

FSM3 - ····· - P80

Specifications for Rechargeable Batteries (Catalog No.CC-1226AA)

Conforms to CKD P4 Series equivalent specifications as standard.

Model No. Notation for Options

FSM3 - H

❶Option

❶Option

Code	Description
C	4-conductor lead wire 1 m (for bar display)
D	4-conductor lead wire 3 m (for bar display)
H	Bracket 1 (for models with a flow rate range below 200 L/min)
J	Bracket 2 (for models with a flow rate range of 500 L/min or 1000 L/min)
M	DIN rail mounting kit (for models with a flow rate range below 200 L/min)

Note: Refer to P. 298 for dimensions diagram.

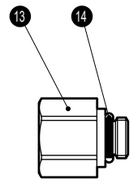
Specifications

Item			FSM3-B[❶] [❷] [❸] [❹]1[❺]1N-[ ]										
			[❶] Flow rate range (full scale flow rate) code										
			005	010	020	050	100	200	500	101	201	501	102
Flow direction	❷	U	Uni-direction										
		B	Bi-direction										
Measurement flow rate range (xxx/min)*1	❷	U	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.15 to 5.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L	15 to 500 L	30 to 1000 L
		B	-500 to -15, 15 to 500 mL	-1000 to -30, 30 to 1000 mL	-2.00 to -0.06, 0.06 to 2.00 L	-5.00 to -0.15, 0.15 to 5.00 L	-10.00 to -0.30, 0.30 to 10.00 L	-20.0 to -0.6, 0.6 to 20.0 L	-50.0 to -1.5, 1.5 to 50.0 L	-100.0 to -3.0, 3.0 to 100.0 L	-200 to -6, 6 to 200 L	-500 to -15, 15 to 500 L	-1000 to -30, 30 to 1000 L
Indicator type			LED bar display										
Working Conditions		Applicable fluid *2	Clean air (ISO 8573-1 2010 1.1.1 to 5.6.2), compressed air (ISO 8573-1 2010 1.1.1 to 1.6.2), nitrogen gas										
			Oxygen (oil-prohibited specifications will automatically become available if oxygen specifications are selected.)									–	
		Temperature range	0 to 50°C (no condensation)										
		Pressure range	-0.09 to 1.00 MPa									-0.09 to 0.75 MPa	
		Proof pressure	1.5 MPa										
Operating ambient temperature / humidity			0 to 50°C, 90% RH or less										
Storage temperature			-10 to 60°C										
Accuracy		Accuracy *3	Within ±3%F.S. (Secondary side released to atmosphere) (The scope of warranty is in accordance with the "measurement flow rate range.")										
		Repeatability *4	Within ±1%F.S. (Secondary side released to atmosphere)										
		Temperature characteristics	Within ±0.2% F.S./°C (15 to 35°C, base temperature 25°C)										
		Pressure characteristics	Within ±5%F.S. (-0.09 to 0.7 MPa, where secondary side is released to atmosphere)								Within ±5% F.S. (-0.09 to 0.7 MPa, base temperature 0.35 MPa)		
Response time *5			50 msec. or less										
Analog Output *6	❺	J	1 to 5 V voltage output (connecting load impedance 50 kΩ or more)										
		K	4-20 mA current output (connecting load impedance 0 to 300 Ω)										
Power supply voltage *7		J	12 to 24 VDC (10.8 to 26.4 V) ripple rate 1% or less										
		K	24 VDC (21.6 to 26.4 V) ripple rate 1% or less										
Current consumption *8			45 mA or less										
Lead wire			ø3.7 AWG26 or equivalent ×4-conductor (connector wiring), insulator outer diameter ø1.0										
Degree of Protection			IP40 or equivalent (IEC standard)										
Protection circuit *9			Power reverse connection protection										
Vibration resistance			10 to 150 Hz, max. 100 m/s^2, X, Y, Z directions, every 2 hours										
EMC Directive			EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8										
Mounting		Mounting orientation *10	Unrestricted in vertical/horizontal direction										
		Straight piping section *11	Not required										

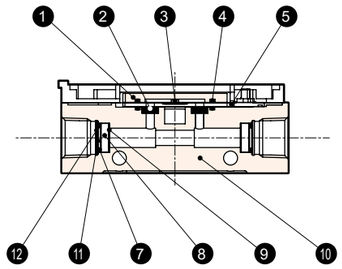
*1: The value converted to volumetric flow rate at standard condition (20°C 1 barometric pressure (101 kPa) 65% RH) (for gas types other than air, 20°C, 1 barometric pressure (101 kPa), relative humidity 0% RH)
*2: Use dry gas which does not contain corrosive elements such as chlorine, sulphur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air that complies with ISO 8573-1 2010 Class 1.1.1 to 1.6.2. Compressed air from the compressor contains drainage-water, oil oxide, foreign substances, etc. To maintain the function of this product, a filter, air dryer (min. pressure dew point 10°C or less), and oil mist filter (max. oil content 0.1 mg/m^3) for operation. (Refer to P. 316 for details on recommended circuit.) The sensor for oxygen gas is a custom model. To prevent ignition accidents, do not allow oxygen to flow again when it has been used on fluids other than oxygen to flow even once.
*3: Accuracy is based on a CKD standard flow rate meter. It does not indicate absolute accuracy. Repeatability, temperature characteristics, and pressure characteristics are not included for an accuracy of ± 3%F.S. Consider separately according to the working environment and working conditions.
*4: Repeatability is calculated during a short period of time. Change over time is not included. (Refer to the product specifications for details.)
*5: The actual response time changes depending on the piping conditions.
*6: The output impedance of the analog output section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.
*7: The power supply voltage specifications differ for the voltage output type and current output type.
*8: Current for when 24 VDC is connected, and no load is applied. Please note that the current consumption changes depending on the load connection status.
*9: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.
*10: This product measures changes in heat distribution that are caused by flow. If installed vertically, the heat distribution may change due to the effect of convection, and the zero point may be shifted.
*11: Piping conditions may affect accuracy. For more accurate measurements, use a straight pipe with a ten-times greater internal diameter. With the 500 L/min and 1,000 L/min models, use piping with an internal diameter of 9 mm or more. If it is less than 9 mm, accuracy may be negatively affected.
*12: Refer to P. 289 for weight.

Internal Structure Diagram / Material

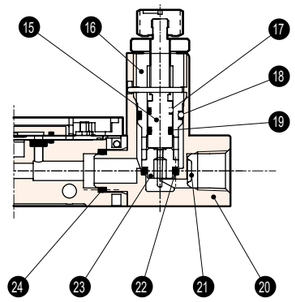
●FSM3-□005 to 201

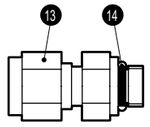


For G thread (ISO)

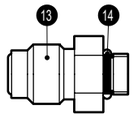


With needle valve



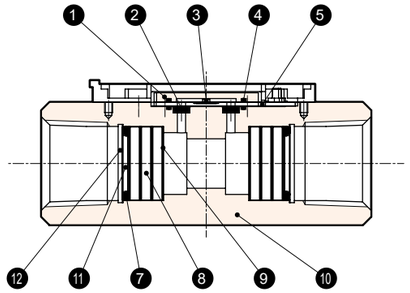


For double barbed fitting



With JXR male fitting

●FSM3-□501 to 102



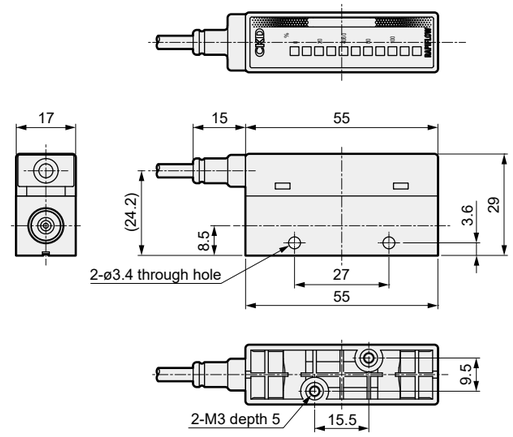
Do not disassemble

Part No.	Part name	Material	Part No.	Part name	Material
1	Sensor cover	Stainless steel	14	O-ring	Fluoro rubber
2	Filter	Stainless steel	15	Needle	Stainless steel
3	Sensor chip	Semiconductor silicon	16	Needle guide	Stainless steel
4	Gasket	Fluoro rubber	17	O-ring	Fluoro rubber
5	Sensor board	Aluminum	18	O-ring	Fluoro rubber
7	O-ring	Fluoro rubber	19	O-ring	Fluoro rubber
8	Spacer	Stainless steel	20	Needle valve body	Stainless steel
9	Filter	Stainless steel	21	Filter	Stainless steel
10	Sensor body	Stainless steel	22	O-ring	Fluoro rubber
11	O-ring holder	Stainless steel	23	Orifice	Tetra fluoro resin
12	C-snap ring	Stainless steel	24	O-ring	Fluoro rubber
13	Fitting	Stainless steel			

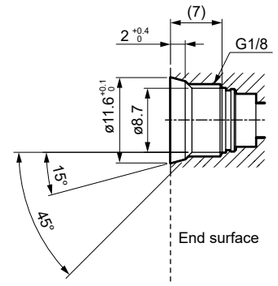
Dimensions diagram (bar display/flow rate range: 500 mL/min to 50 L/min)

Port size: Straight Rc1/8, G1/8, NPT1/8

●FSM3-B❶❷$^{2}_{3}$/AA1/AB1/AC1 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



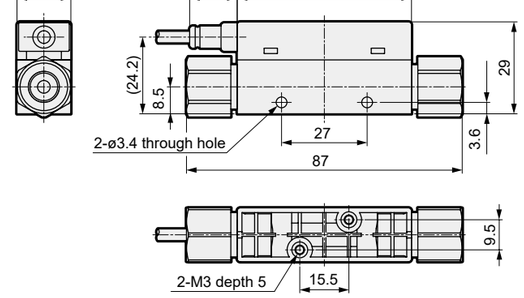
G thread shape (AB)



15° of the surface is the seal surface. Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

Port size: Straight G1/8

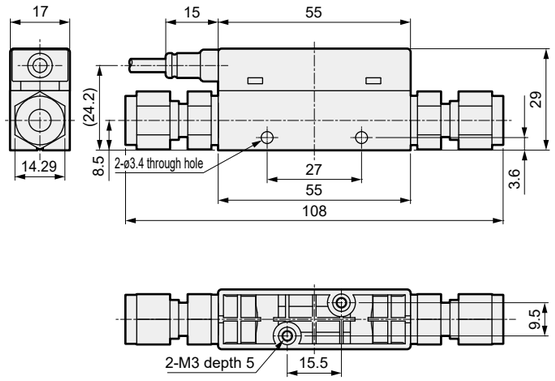
●FSM3-B$^{2}_{3}$/AF1 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Port size: Straight 1/4" double barbed fitting

●FSM3-B❶❷$^{2}_{3}$/AD1

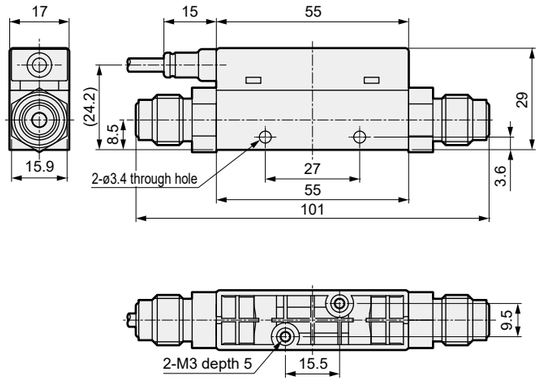
(full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Port size: Straight 1/4" JXR male fitting

●FSM3-B❶❷$^{2}_{3}$/AE1

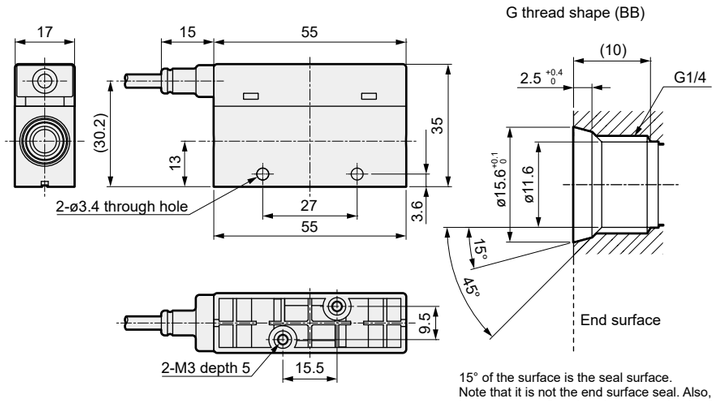
(full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Dimensions diagram (bar display/flow rate range: 50 L/min to 1000 L/min)

Port size: Straight Rc1/4, G1/4, NPT1/4

●FSM3-B❶❷$^{2}_{3}$/BA1/BB1/BC1 (full scale flow rate: 50, 100, 200 L/min)



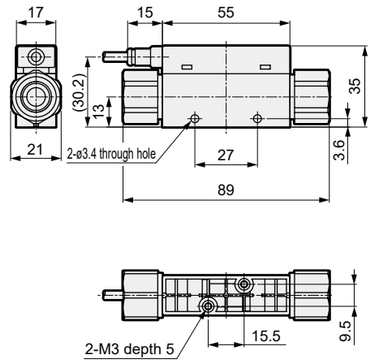
G thread shape (BB)

15° of the surface is the seal surface. Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

Port size: Straight G1/4

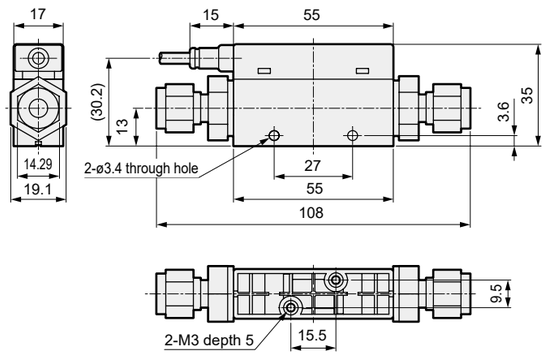
●FSM3-B❶❷$^{2}_{3}$/BF1

(full scale flow rate: 50, 100, 200 L/min)



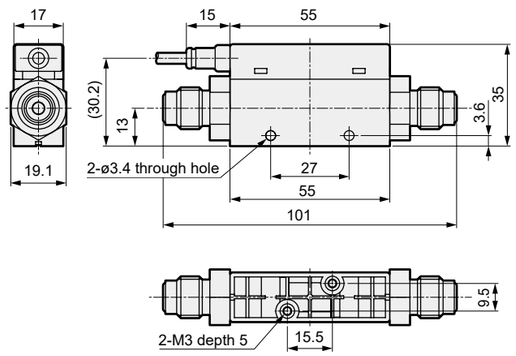
Port size: Straight 1/4" double barbed fitting

●FSM3-B❶❷$^{2}_{3}$/BD1 (full scale flow rate: 50, 100, 200 L/min)



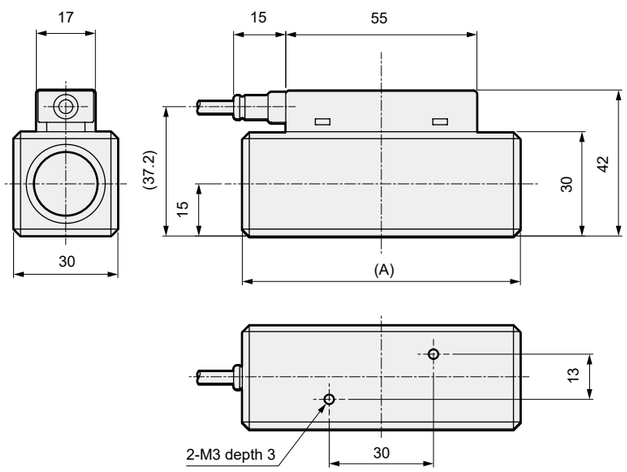
Port size: Straight 1/4" JXR male fitting

●FSM3-B❶❷$^{2}_{3}$/BE1 (full scale flow rate: 50, 100, 200 L/min)

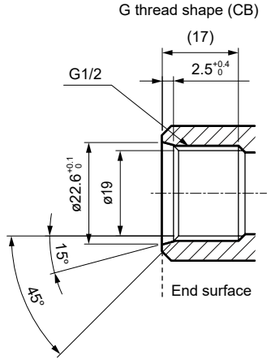


Port size: Straight Rc1/2, G1/2, NPT1/2

●FSM3-B2/CA1/CF1/CB1/CC1 (full scale flow rate: 500, 1000 L/min)



G thread shape (CB)



15° of the surface is the seal surface. Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

Model No.	Port size	Dimension (A)
FSM3-B□□2CA1	Rc1/2	(80)
FSM3-B□□2CF1	G1/2	(80)
FSM3-B□□2CB1	G1/2	(95.4)
FSM3-B□□2CC1	NPT1/2	(80)

Product weight

[Unit: g]

Port size		Weight
Code [❹]	Description	
AA	Rc1/8 Straight	90
BA	Rc1/4 Straight	105
CA	Rc1/2 Straight	410
AF	G1/8 Straight	145
BF	G1/4 Straight	180
CF	G1/2 Straight	410
AB	G1/8 Straight	90
BB	G1/4 Straight	100
CB	G1/2 Straight	430
AC	NPT 1/8 Straight	90
BC	NPT 1/4 Straight	105
CC	NPT 1/2 Straight	410
AD	1/4" double barbed fitting (500 mL/min to 50 L/min)	145
BD	1/4" double barbed fitting (50 L/min to 200 L/min)	180
AE	1/4" JXR male fitting (500 mL/min to 50 L/min)	145
BE	1/4" JXR male fitting (50 L/min to 200 L/min)	180



Compact flow rate sensor (RAPIFLOW)

FSM3 Series

IO-Link

●Stainless steel body (flow rate range: 500 mL/min to 1000 L/min)

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

FSM3 - C 005 U 2 AA 1 L 1 N - G H R

- FSM3: Model No.
- C: Bar / Display
- 005: ❶Flow rate range (full scale flow rate)
- U: ❷Flow direction
- 2: ❸Body material/applicable fluids
- AA: ❹Port size
- 1: Piping direction: Straight
- L: Output specifications: IO-Link communication
- 1: Unit specifications: SI units only
- N: Valve option: None
- G: ❺Lead wire
- H: ❻Mounting Attachment
- R: ❼Included documents

❶Flow rate range (full scale flow rate)*1

Code	Description	Code	Description
005	500 mL/min	500	50 L/min
010	1000 mL/min	101	100 L/min
020	2 L/min	201	200 L/min
050	5 L/min	501	500 L/min *2
100	10 L/min	102	1000 L/min *2
200	20 L/min		

*1: Refer to the compatibility table on the following Page for combinations of the flow rate range and port size.

*2: ❸Applicable fluid "3" oxygen cannot be selected for 500 L/min and 1000 L/min.

❷Flow direction

Code	Description
U	Uni-direction
B	Bi-direction

❸Body material/applicable fluids

Code	Description	
	Body material	Applicable fluid
2	SUS	Air
3		Oxygen (oil-prohibited specifications)

Note: ❶ oxygen cannot be selected with the flow rate ranges for “501” is 500 L/min and for “102” is 1000 L/min.

❹Port size

Description		Code	
Rc thread	Rc1/8	AA	Screw-in
	Rc1/4	BA	
	Rc1/2	CA	
G thread ISO 16030	G1/8	AF	
	G1/4	BF	
	G1/2	CF	
G thread JIS B 2351-1 O-type (*1)	G1/8	AB	
	G1/4	BB	
	G1/2	CB	
NPT thread	NPT1/8	AC	
	NPT1/4	BC	
	NPT1/2	CC	
1/4" double barbed fitting	50 L/min or less	AD	Double barbed fitting
	50 to 200 L/min	BD	
1/4" JXR male fitting	50 L/min or less	AE	JXR fitting
	50 to 200 L/min	BE	

*1: Check the G thread connection shape with dimensions diagrams (pages 295 and 296) when making a selection. (G thread connection shape is JIS B 2351-1 O-type compliant)

*2: Refer to the compatibility table on the following Page for combinations of the flow rate range and port size.

Compatibility table of flow rate range and port size

❶Flow rate range	❹Port size: AA Rc1/8	BA Rc1/4	CA Rc1/2	AF G1/8	BF G1/4	CF G1/2	AB G1/8	BB G1/4	CB G1/2	AC NPT1/8	BC NPT1/4	CC NPT1/2	AD 1/4" double barbed fitting	BD 1/4" double barbed fitting	AE 1/4" JXR male fitting	BE 1/4" JXR male fitting
005	●			●			●			●			●		●	
010	●			●			●			●			●		●	
020	●			●			●			●			●		●	
050	●			●			●			●			●		●	
100	●			●			●			●			●		●	
200	●			●			●			●			●		●	
500	●	●		●	●		●	●		●	●		●	●	●	●
101		●			●			●			●			●		●
201		●			●			●			●			●		●
501			●			●			●			●				
102			●			●			●			●				

❺Lead wire

Code	Description	
Blank	None	
G	M12 both-end lead wire with connector (3 m)	

❻ Mounting Attachment

Code	Description	
Blank	None	
H	Bracket 1 (for models 200 L or less)	
J	Bracket 2 (for 500 or 1000 L models)	
M	DIN rail mounting (for models 200 L or less)	

Note: Optional parts will come with the product.

❼Included documents

Code	Description
Blank	None
R	Inspection certificate
S	Inspection certificate + calibration certificate + traceability system diagram

Clean-room specifications (Catalog No. CB-033SA)

FSM3 - ····- P70

FSM3 - ····- P80

Specifications for Rechargeable Batteries (Catalog No.CC-1226AA)

Conforms to CKD P4 Series equivalent specifications as standard.

Model No. Notation for Options

FSM3 - H

- H: ❶Option

❶Option

Code	Description
G	M12 both-end lead wire with connector (3 m) (for IO-Link)
H	Bracket 1 (for models with a flow rate range below 200 L/min)
J	Bracket 2 (for models with a flow rate range of 500 L/min or 1000 L/min)
M	DIN rail mounting kit (for models with a flow rate range below 200 L/min)

Note: Refer to P. 298 for dimensions diagram.

IO-Link specifications

Item			FSM3-C[❶] [❷] [❸] [❹]1L1N-[]										
			[❶] Flow rate range (full scale flow rate) code										
			005	010	020	050	100	200	500	101	201	501	102
Flow direction	❷	U	Uni-direction										
		B	Bi-direction										
Measured flow rate range (□/min) *1	❷	U	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.15 to 5.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L	15 to 500 L	30 to 1000 L
		B	-500 to -15, 15 to 500 mL	-1000 to -30, 30 to 1000 mL	-2.00 to -0.06, 0.06 to 2.00 L	-5.00 to -0.15, 0.15 to 5.00 L	-10.00 to -0.30, 0.30 to 10.00 L	-20.0 to -0.6, 0.6 to 20.0 L	-50.0 to -1.5, 1.5 to 50.0 L	-100.0 to -3.0, 3.0 to 100.0 L	-200 to -6, 6 to 200 L	-500 to -15, 15 to 500 L	-1000 to -30, 30 to 1000 L
Indicator type			LED display (power and status indicators)										
Working Conditions		Applicable fluid *2	Clean air (ISO 8573-1 2010 1.1.1 to 5.6.2), compressed air (ISO 8573-1 2010 1.1.1 to 1.6.2), nitrogen gas										
			Argon, carbon dioxide (*3), and gas mixture (argon + carbon dioxide)									–	
			Oxygen (oil-prohibited specifications will automatically become available if oxygen specifications are selected.)									–	
		Temperature range	0 to 50°C (no condensation)										
		Pressure range	-0.09 to 1.00 MPa									-0.09 to 0.75 MPa	
		Proof pressure	1.5 MPa										
Operating ambient temperature / humidity			0 to 50°C, 90% RH or less										
Storage temperature			-10 to 60°C										
Accuracy *4		Accuracy *5	Within ±3%F.S. (Secondary side released to atmosphere) (The scope of warranty is in accordance with the "measurement flow rate range.")										
		Repeatability *6	Within ±1%F.S. (Secondary side released to atmosphere)										
		Temperature characteristics	Within ±0.2% F.S./°C (15 to 35°C, base temperature 25°C)										
		Pressure characteristics	Within ±5%F.S. (-0.09 to 0.7 MPa, where secondary side is released to atmosphere)								Within ±5%F.S. (-0.09 to 0.7 MPa, 0.35 MPa reference)		
Response time *7			50 msec. or less (setting response time OFF)										
Power supply voltage			18 to 30 VDC (ripple rate 1% or less)										
Current consumption *8			45 mA or less										
Lead wire *9			M12 both-end connector lead wire (3 m), AWG23 or equivalent, 4-conductor										
Functions *10, *11			①Gas switching, ②Flow rate integration, ③Peak hold, etc.										
Degree of Protection			IP40 or equivalent (IEC standard)										
Protection circuit *12			Power reverse connection protection										
Vibration resistance *13			10 to 150 Hz, max. 100 m/s², X, Y, Z directions, every 2 hours										
EMC Directive			EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8										
Mounting		Mounting orientation *14	Unrestricted in vertical/horizontal direction										
		Straight piping section *15	Not required										

*Refer to P. 314 for communication specifications.

*1: The value converted to volumetric flow rate at standard condition (20°C 1 barometric pressure (101 kPa) 65%).
(For gases other than air: 20°C, 1 barometric pressure (101 kPa), 0% RH)

*2: Use dry gas which does not contain corrosive elements such as chlorine, sulphur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air that complies with ISO 8573-1 2010 Class 1.1.1 to 1.6.2. Compressed air from the compressor contains drainage-water, oil oxide, foreign substances, etc. To maintain the function of this product, a filter, air dryer (min. pressure dew point 10°C or less), and oil mist filter (max. oil content 0.1 mg/m³) for operation. (Refer to P. 316 for details on recommended circuit.)
The sensor for oxygen gas is a custom model. To prevent ignition accidents, do not allow oxygen to flow again when it has been used on fluids other than oxygen to flow even once.

*3: With the gas type switching function, the full scale flow rate after switching to carbon dioxide is half the flow rate range.

Gas type	Flow direction	Measured flow rate range (□/min)							
		005	010	020	100	200	500	101	201
Carbon dioxide	Uni-direction	15 to 250 mL	30 to 500 mL	0.06 to 1.00 L	0.30 to 5.00 L	0.6 to 10.0 L	1.5 to 25.0 L	3.0 to 50.0 L	6 to 100 L
	Bi-direction	-250 to -15 mL	-500 to -30 mL	-1.00 to -0.06 L	-5.00 to -0.30 L	-10.0 to -0.6 L	-25.0 to -1.5 L	-50.0 to -3.0 L	-100 to -6 L
		15 to 250 mL	30 to 500 mL	0.06 to 1.00 L	0.30 to 5.00 L	0.6 to 10.0 L	1.5 to 25.0 L	3.0 to 50.0 L	6 to 100 L

*4: Compressed air is used for adjusting and inspecting this product. Accuracy for gas-types other than air is a guideline.

*5: Accuracy is based on a CKD standard flow rate meter. It does not indicate absolute accuracy. Repeatability, temperature characteristics, and pressure characteristics are not included for an accuracy of ± 3%F.S. Consider separately according to the working environment and working conditions.

*6: Repeatability is calculated during a short period of time. Change over time is not included. (Refer to the product specifications for details.)

*7: The actual response time changes depending on the piping conditions. As a guideline, the response time can be set within the range of 50 msec. to 1.5 sec.

*8: Current for when 24 VDC is connected, and no load is applied. Please note that the current consumption changes depending on the load connection status.

*9: The male end is straight, and the female end is angled. (Refer to P. 298.) Tighten the M12 connector with a torque of 0.5 N·m or lower. Tightening with excessive force may lead to damage.

*10: The gas type switching function enables switching to argon, carbon dioxide and a gas mixture of argon 80% + carbon dioxide 20%. The measurement flow rate ranges after switching are as follows. (Note that the gas-type cannot be changed with the oxygen, 500 L/min, and 1000 L/min models.)
Refer to Note 3 for carbon dioxide.

Gas type	Flow direction	Measured flow rate range (□/min)							
		005	010	020	100	200	500	101	201
・Air ・Nitrogen ・Argon ・argon 80% +carbon dioxide 20%	Uni-direction	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L
	Bi-direction	-500 to -15 mL	-1000 to -30 mL	-2.00 to -0.06 L	-10.00 to -0.30 L	-20.0 to -0.6 L	-50.0 to -1.5 L	-100.0 to -3.0 L	-200 to -6 L
		15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L

*11: The accumulated flow is a calculated (reference) value. When using the integrated save function, take care to prevent the number of saves from exceeding the access count limit of the storage device (1 million times). (Changes to the settings are counted in number of accesses.)

$$\text{Number of saves} = \frac{\text{Usage time}}{5 \text{ min.}} < 1 \text{ million times}$$

When the instantaneous flow rate is 1% or less, the flow rate is counted as integrated flow rate.

*12: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.

*13: A communication error might occur depending on the vibration conditions. Install this product in a place not subject to vibration.

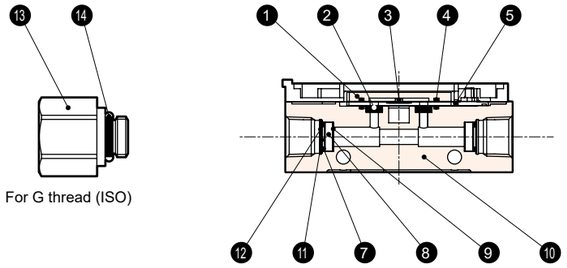
*14: This product measures changes in heat distribution that are caused by flow. If installed vertically, the heat distribution may change due to the effect of convection, and the zero point may be shifted.

*15: Piping conditions may affect accuracy. For more accurate measurements, use a straight pipe with a ten-times greater internal diameter. With the 500 L/min and 1,000 L/min models, use piping with an internal diameter of 9 mm or more. If it is less than 9 mm, accuracy may be negatively affected.

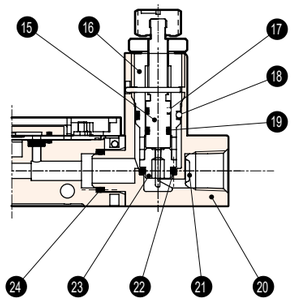
*16: Refer to P. 297 for weight.

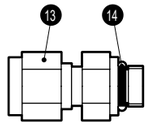
Internal Structure Diagram / Material

●FSM3-□005 to 201

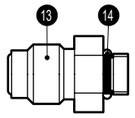


With needle valve



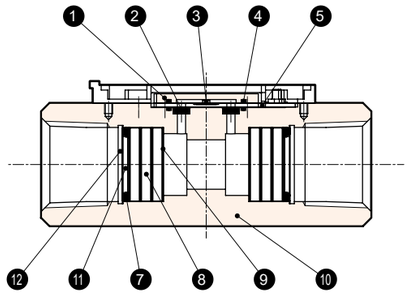


For double barbed fitting



With JXR male fitting

●FSM3-□501 to 102



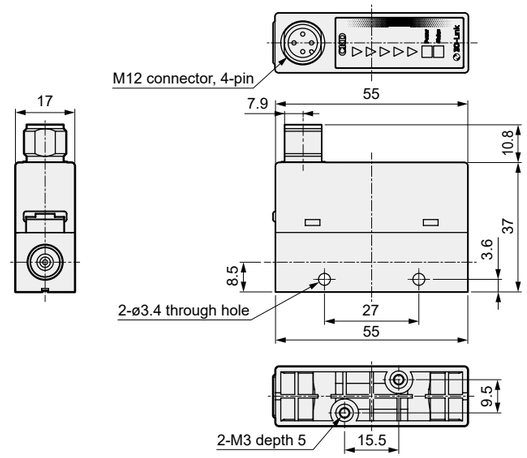
Do not disassemble

Part No.	Part name	Material	Part No.	Part name	Material
1	Sensor cover	Stainless steel	14	O-ring	Fluoro rubber
2	Filter	Stainless steel	15	Needle	Stainless steel
3	Sensor chip	Semiconductor silicon	16	Needle guide	Stainless steel
4	Gasket	Fluoro rubber	17	O-ring	Fluoro rubber
5	Sensor board	Aluminum	18	O-ring	Fluoro rubber
7	O-ring	Fluoro rubber	19	O-ring	Fluoro rubber
8	Spacer	Stainless steel	20	Needle valve body	Stainless steel
9	Filter	Stainless steel	21	Filter	Stainless steel
10	Sensor body	Stainless steel	22	O-ring	Fluoro rubber
11	O-ring holder	Stainless steel	23	Orifice	Tetra fluoro resin
12	C-snap ring	Stainless steel	24	O-ring	Fluoro rubber
13	Fitting	Stainless steel			

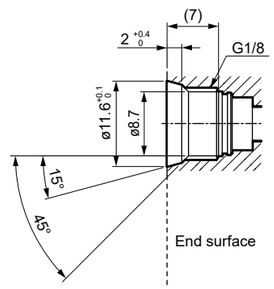
Dimensions diagram (IO-Link/flow rate range: 500 mL/min to 50 L/min)

Port size: Straight Rc1/8, G1/8, NPT1/8

●FSM3-C❶❷²₃/AA1/AB1/AC1 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



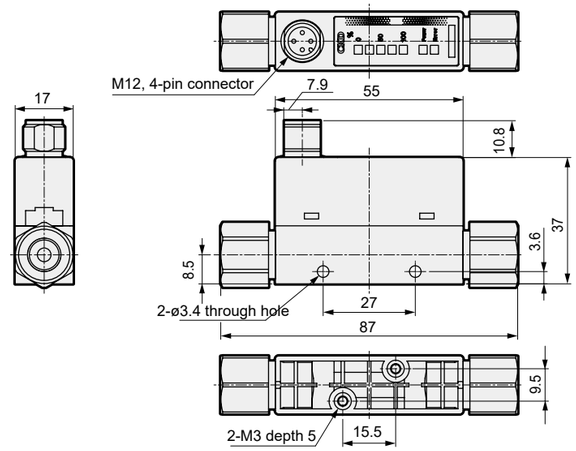
G thread shape (AB)



15° of the surface is the seal surface. Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

Port size: Straight G1/8

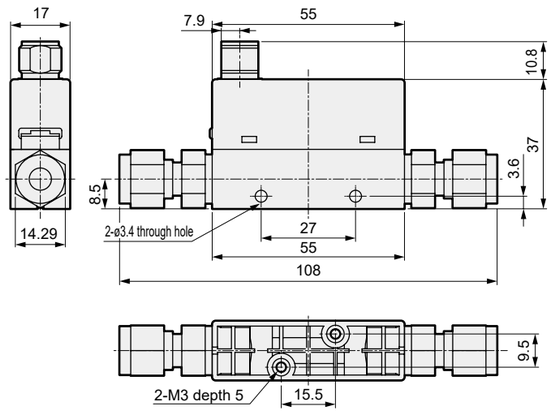
●FSM3-C❶❷²₃/AF1 (full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Port size: Straight 1/4" double barbed fitting

●FSM3-C❶❷²₃/AD1

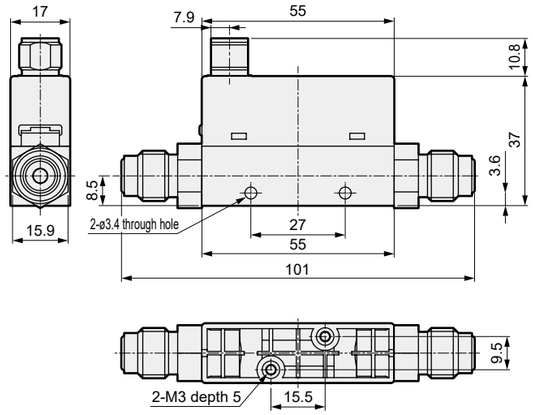
(full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



Port size: Straight 1/4" JXR male fitting

●FSM3-C❶❷²₃/AE1

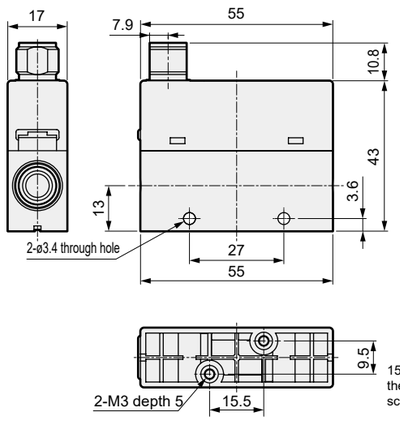
(full scale flow rate: 500 mL/min, 1, 2, 5, 10, 20, 50 L/min)



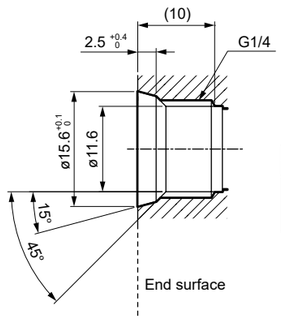
Dimensions diagram (IO-Link/flow rate range: 50 L/min to 1000 L/min)

Port size: Straight Rc1/4, G1/4, NPT1/4

●FSM3-C❶❷$^{2}_{3}$/BA1/BB1/BC1 (full scale flow rate: 50, 100, 200 L/min)



G thread shape (BB)

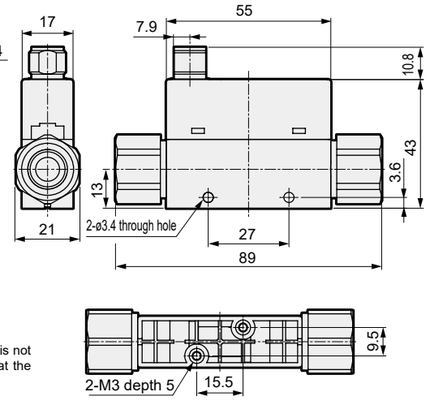


15° of the surface is the seal surface. Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

Port size: Straight G1/4

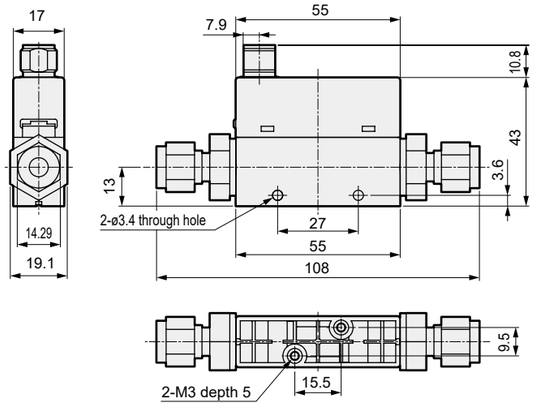
●FSM3-C❶❷$^{2}_{3}$/BF1

(full scale flow rate: 50,100,200 L/min)



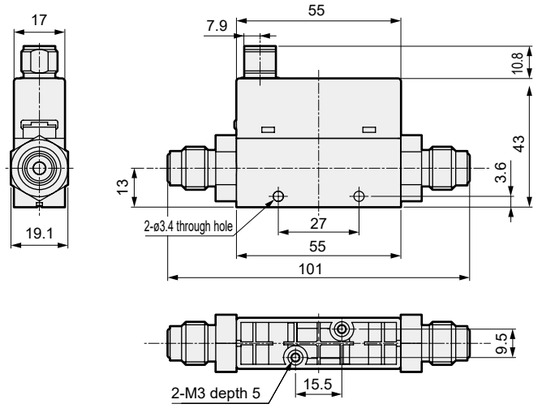
Port size: Straight 1/4" double barbed fitting

●FSM3-C❶❷$^{2}_{3}$/BD1 (full scale flow rate: 50, 100, 200 L/min)



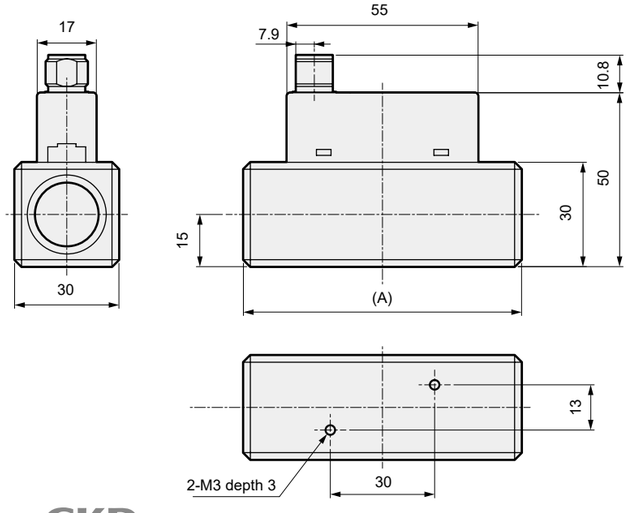
Port size: Straight 1/4" JXR male fitting

●FSM3-C❶❷$^{2}_{3}$/BE1 (full scale flow rate: 50, 100, 200 L/min)

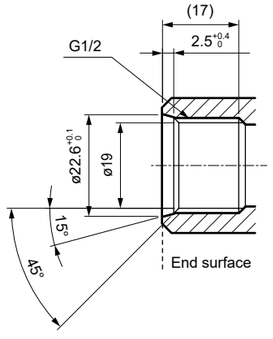


Port size: Straight Rc1/2, G1/2, NPT1/2

●FSM3-C❶❷2/CA1/CF1/CB1/CC1 (full scale flow rate: 500, 1000 L/min)



G thread shape (CB)



15° of the surface is the seal surface. Note that it is not the end surface seal. Also, be sure to confirm that the screw depth of the fitting matches before use.

Model No.	Port size	Dimension (A)
FSM3-C□□2CA1	Rc1/2	(80)
FSM3-C□□2CF1	G1/2	(80)
FSM3-C□□2CB1	G1/2	(95.4)
FSM3-C□□2CC1	NPT1/2	(80)

Product weight

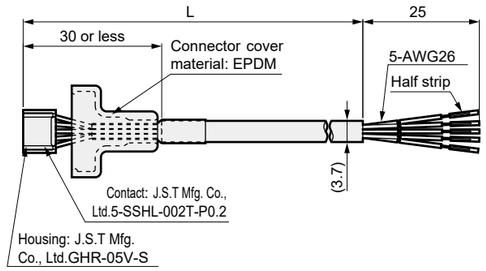
[Unit: g]

Port size		Weight
Code [❹]	Description	
AA	Rc1/8 Straight	95
BA	Rc1/4 Straight	110
CA	Rc1/2 Straight	420
AF	G1/8 Straight	150
BF	G1/4 Straight	185
CF	G1/2 Straight	420
AB	G1/8 Straight	95
BB	G1/4 Straight	105
CB	G1/2 Straight	440
AC	NPT 1/8 Straight	95
BC	NPT 1/4 Straight	110
CC	NPT 1/2 Straight	420
AD	1/4" double barbed fitting (500 mL/min to 50 L/min)	150
BD	1/4" double barbed fitting (50 L/min to 200 L/min)	190
AE	1/4" JXR male fitting (500 mL/min to 50 L/min)	150
BE	1/4" JXR male fitting (50 L/min to 200 L/min)	190

Stainless steel body optional products

Option dimensions diagram (lead wire)

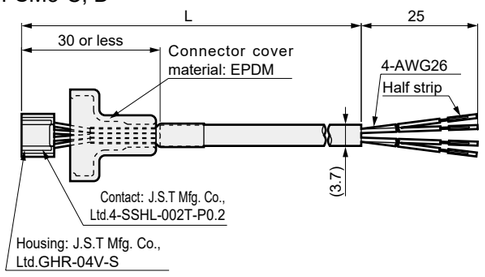
●5-conductor lead wire (for LCD display, for separated display)
FSM3-A, B



Model No.	L dimensions	Weight (g)
FSM3-A	1040±20	21
FSM3-B	3040±20	57

Terminal No.	Cable color
1	Brown
2	Black
3	White
4	Gray
5	Blue

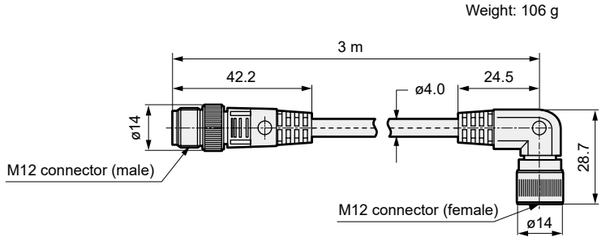
●4-conductor lead wire (for bar display)
FSM3-C, D



Model No.	L dimensions	Weight (g)
FSM3-C	1040±20	19
FSM3-D	3040±20	52

Terminal No.	Cable color
1	Brown
2	Black
3	White
4	Blue

●M12 both-end lead wire with connector (for IO-Link)
FSM3-G



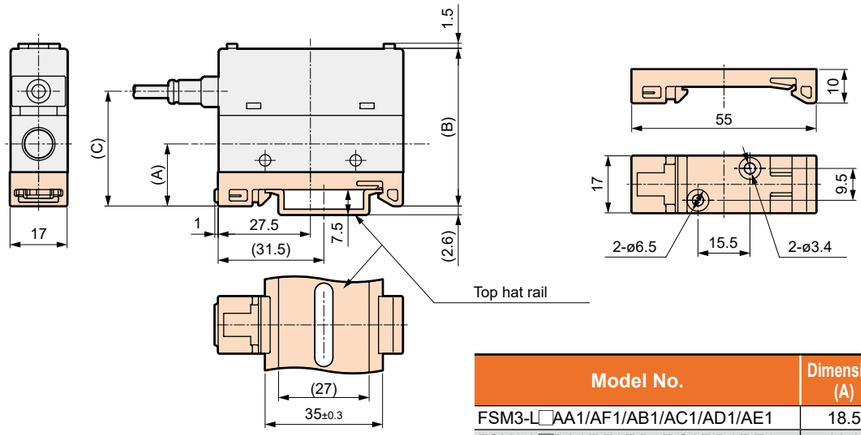
Terminal No.	Cable color
1	Brown
2	White
3	Blue
4	Black

Option dimensions diagram (DIN rail mounting kit)

FSM3-M

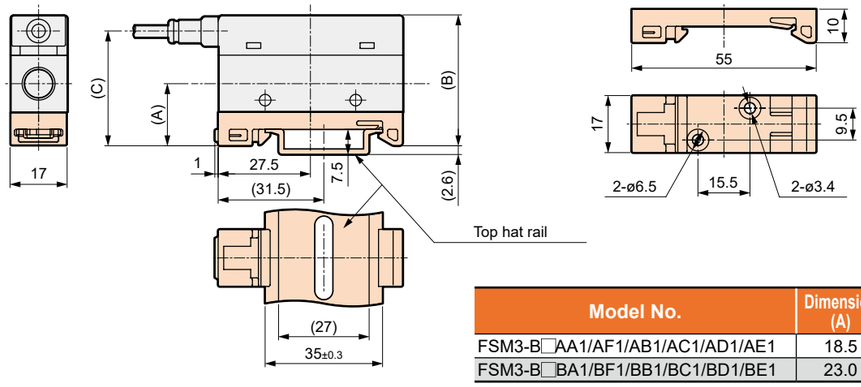
Discrete weight: 7 g

●LCD display



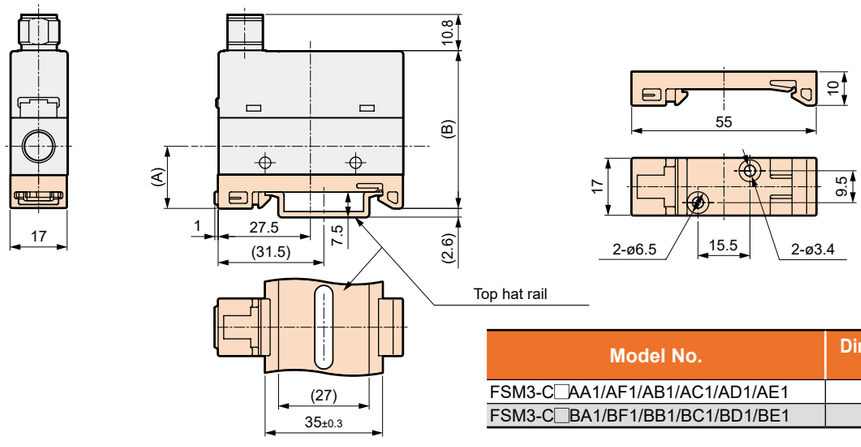
Model No.	Dimension (A)	Dimension (B)	Dimension (C)
FSM3-L□AA1/AF1/AB1/AC1/AD1/AE1	18.5	47	34.2
FSM3-L□BA1/BF1/BB1/BC1/BD1/BE1	23.0	53	40.2

●Bar display



Model No.	Dimension (A)	Dimension (B)	Dimension (C)
FSM3-B□AA1/AF1/AB1/AC1/AD1/AE1	18.5	39	34.2
FSM3-B□BA1/BF1/BB1/BC1/BD1/BE1	23.0	45	40.2

●IO-Link



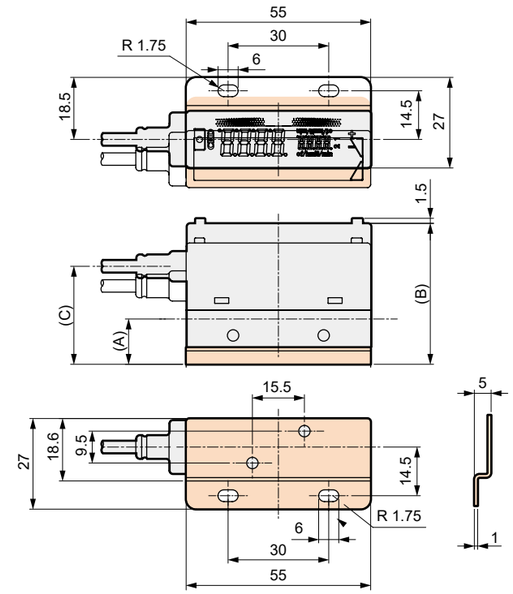
Model No.	Dimension (A)	Dimension (B)
FSM3-C□AA1/AF1/AB1/AC1/AD1/AE1	18.5	47
FSM3-C□BA1/BF1/BB1/BC1/BD1/BE1	23.0	53

Option dimensions diagram (for models with bracket 1: 200 L or less)

FSM3-H

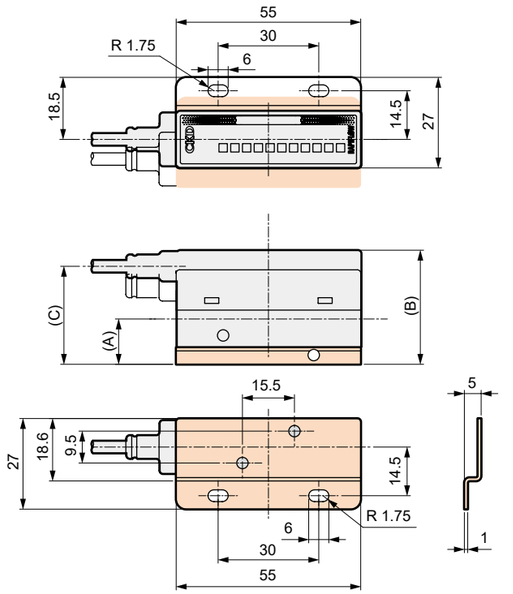
Discrete weight: 13 g

●LCD display



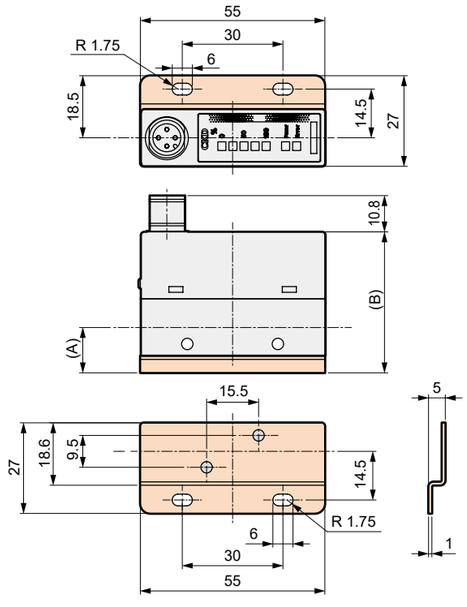
Model No.	Dimension (A)	Dimension (B)	Dimension (C)
FSM3-L□AA1/AF1/AB1/AC1/AD1/AE1	13.5	42	29.2
FSM3-L□BA1/BF1/BB1/BC1/BD1/BE1	18.0	48	35.2

●Bar display



Model No.	Dimension (A)	Dimension (B)	Dimension (C)
FSM3-B□AA1/AF1/AB1/AC1/AD1/AE1	13.5	34	29.2
FSM3-B□BA1/BF1/BB1/BC1/BD1/BE1	18.0	40	35.2

●IO-Link



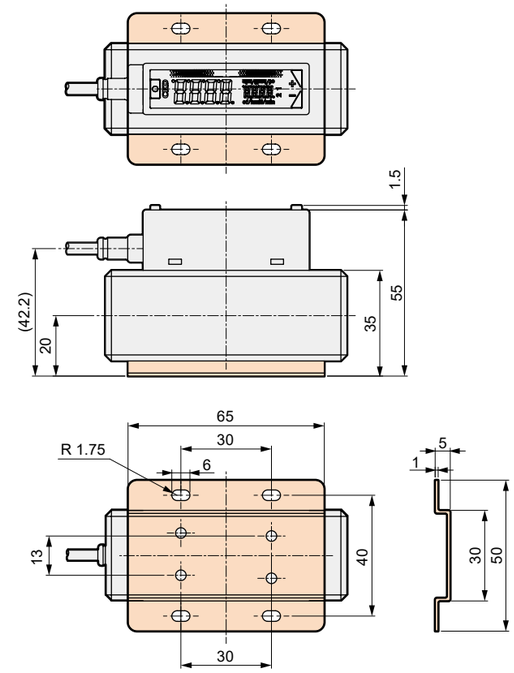
Model No.	Dimension (A)	Dimension (B)
FSM3-C□AA1/AF1/AB1/AC1/AD1/AE1	13.5	42
FSM3-C□BA1/BF1/BB1/BC1/BD1/BE1	18.0	48

Option dimensions diagram (for models with bracket 2: 500 L or 1000 L)

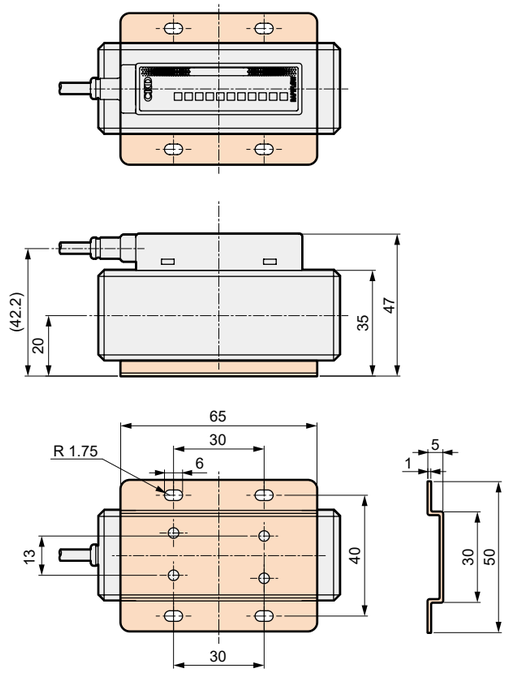
FSM3-J

Discrete weight: 28 g

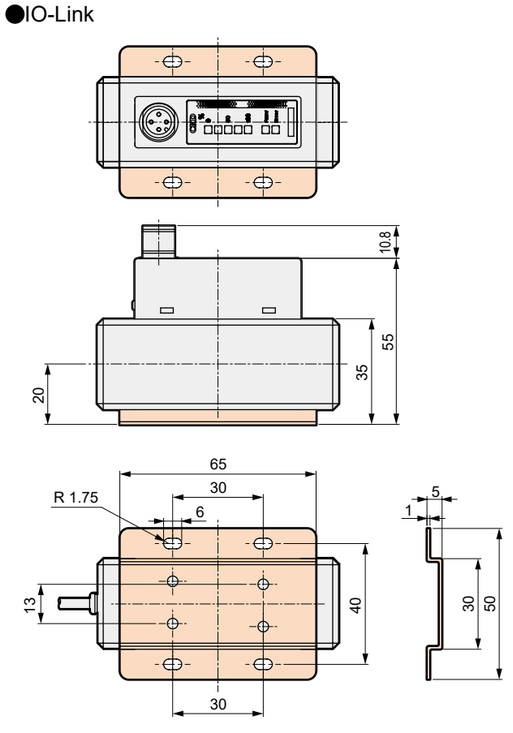
●LCD display



●Bar display



●IO-Link



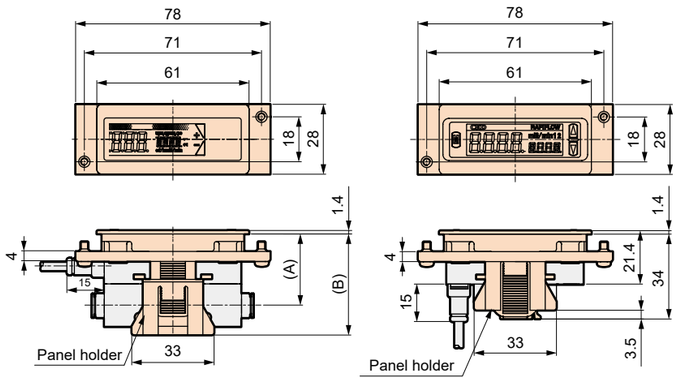
Option dimensions diagram (panel mounting kit)

●Panel mounting kit 1 (for LCD display, separated display)

FSM3-K

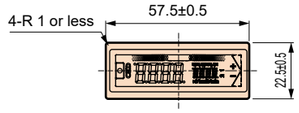
・LCD display・Separated display

Unit weight: 21g

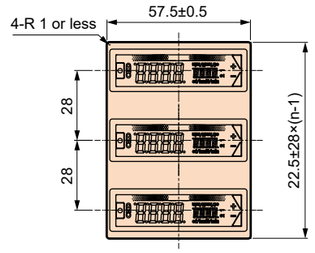


[Panel cut dimension]

In case of single installation



In the case of close mounting

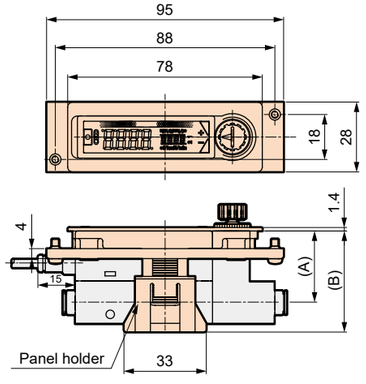


●Panel mounting kit 2 (for needle valve integrated model)

FSM3-L

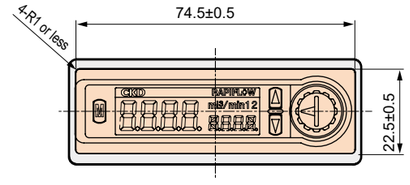
・Needle valve integrated

Unit weight: 24 g



[Panel cut dimension]

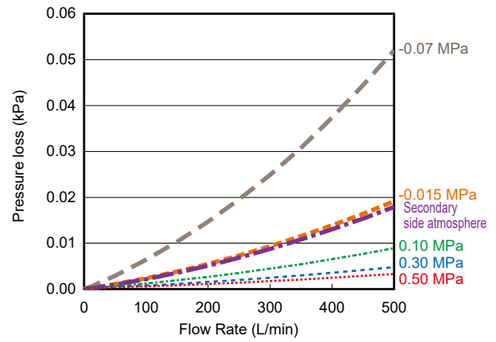
In case of single installation



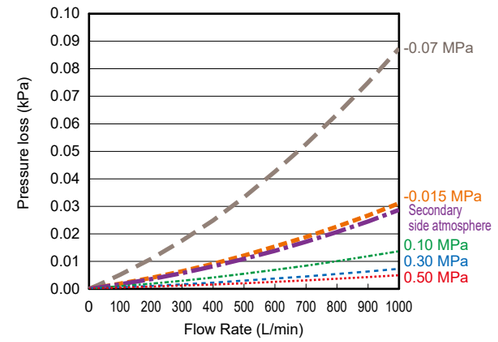
Model No.	Dimension (A)	Dimension (B)
FSM3-□□□□/BH/CH/HH/AA/AF/AB/AC/AD/AE/□□□/N/T	28.5	40.5
FSM3-□□□□/DH/EH/JH/BA/BF/BB/BC/BD/BE/□□□/N/T	30	46.5

Pressure loss characteristics (stainless steel body/air)

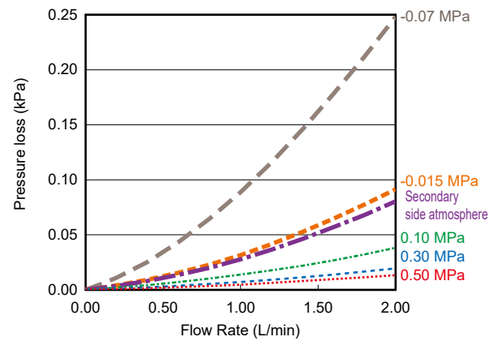
FSM3-□005U2□



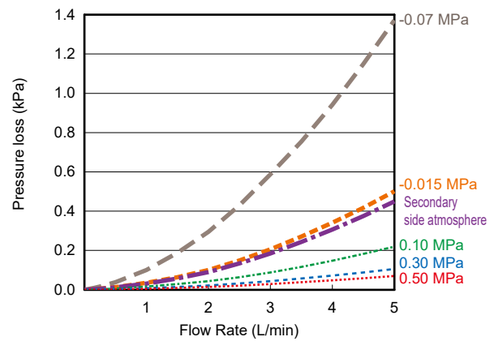
FSM3-□010U2□



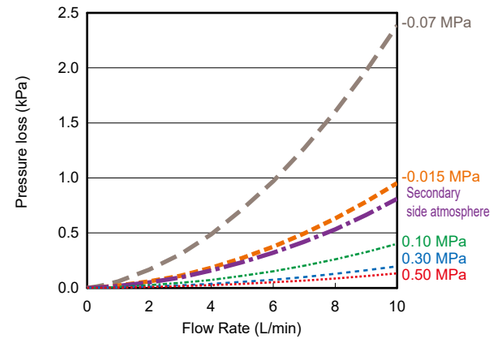
FSM3-□020U2□



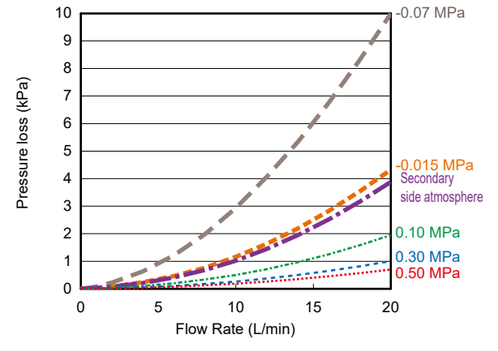
FSM3-□050U2□



FSM3-□100U2□



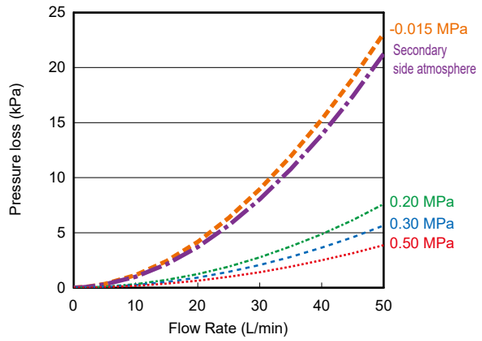
FSM3-□200U2□



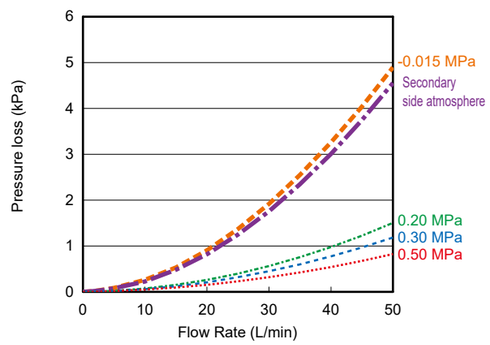
The graphs show data for air. For gases other than air, multiply by the following specific gravity as a guideline.
Argon: 1.38, carbon dioxide: 1.53, argon 80% + carbon dioxide 20%: 1.41, oxygen: 1.11

Pressure loss characteristics (stainless steel body/air)

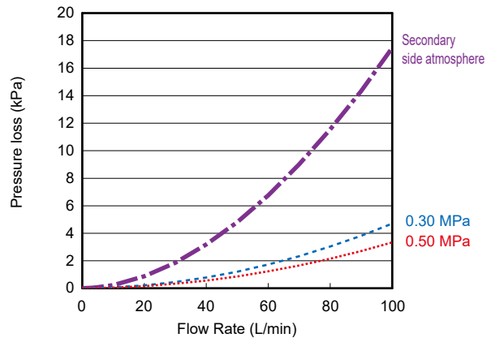
FSM3-□500U2□ (small body)



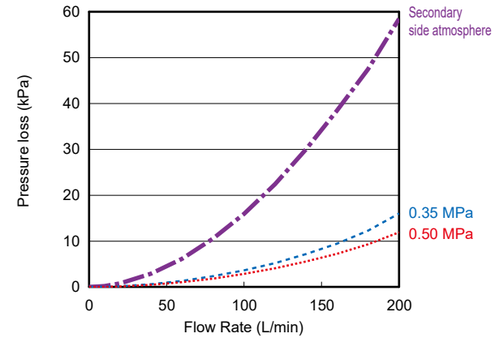
FSM3-□500U2□ (medium body)



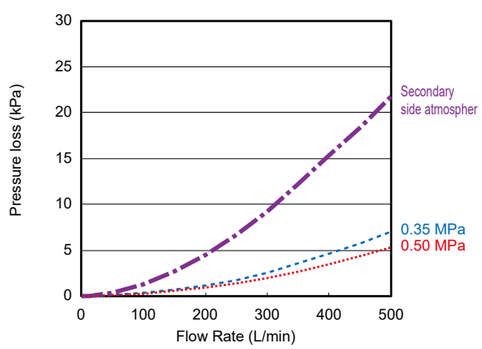
FSM3-□101U2□



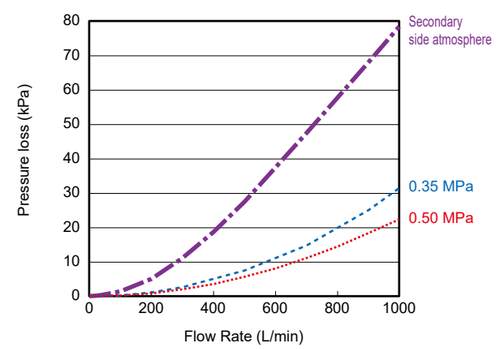
FSM3-□201U2□



FSM3-□501U2□



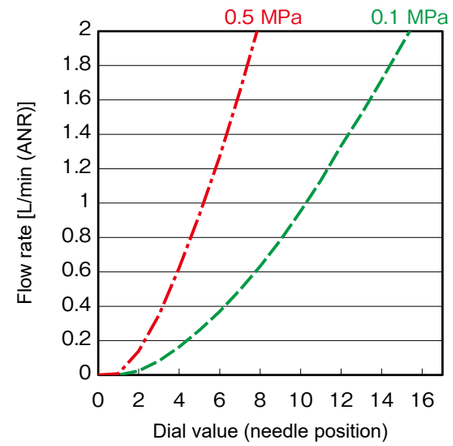
FSM3-□102U2□



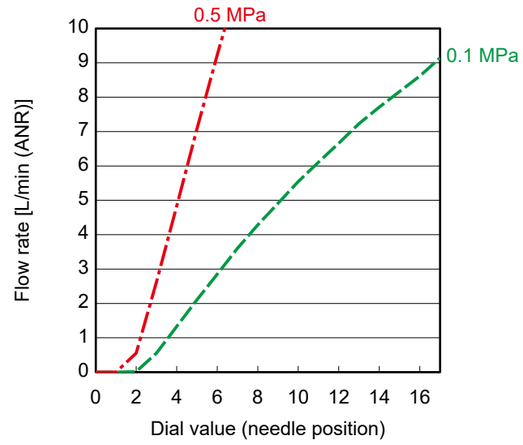
The graphs show data for air. For gases other than air, multiply by the following specific gravity as a guideline.
Argon: 1.38, carbon dioxide: 1.53, argon 80% + carbon dioxide 20%: 1.41, oxygen: 1.11
(Excluding flow rate range (full scale flow rate) "501" and "102")

Needle valve flow characteristics (Stainless steel body, for air, nitrogen gas)

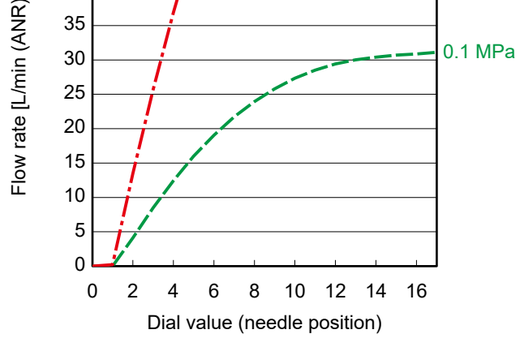
●FSM3-L005/010/020U2AA



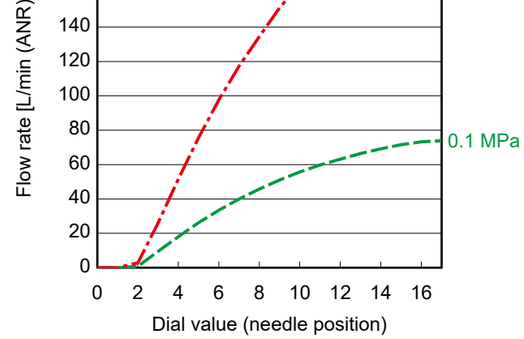
●FSM3-L050/100U2AA



●FSM3-L200/500U2AA



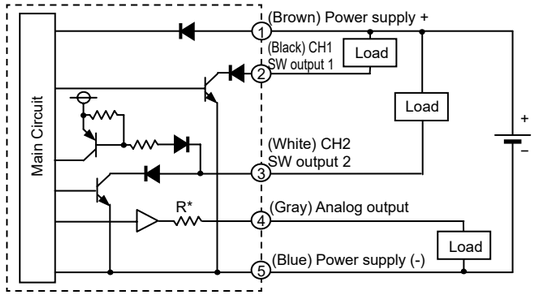
●FSM3-L500/101/201U2BA



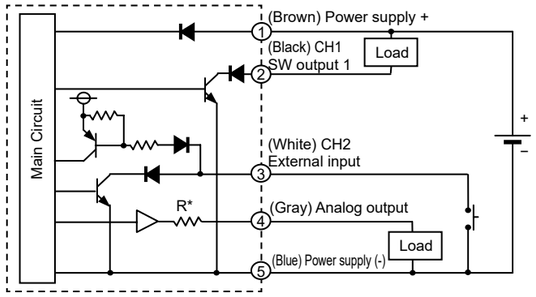
Example of internal circuit and load connection

●FSM3-L□□□□□B/F/□□ (LCD display type NPN output)

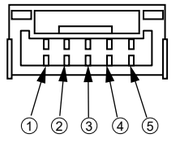
[When using CH2 as SW output]



[CH2 is used as external input]



*Analog output voltage output R: approx. 1 kΩ
Current output R: approx. 100 Ω

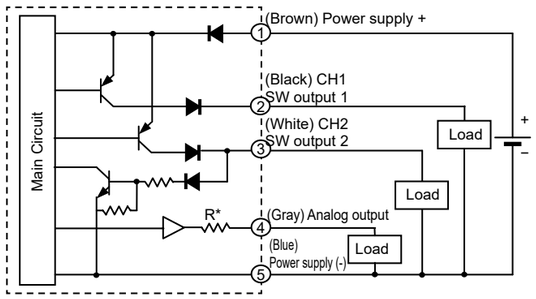


(FSM3 side)

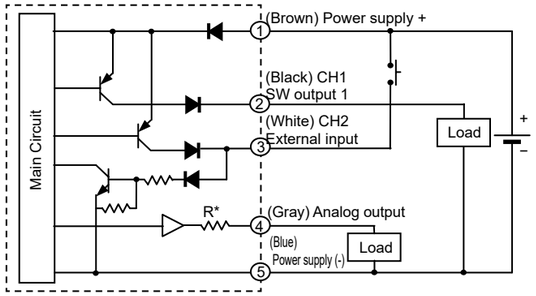
Terminal No.	Option Lead wire color	Name
①	Brown	Power supply (+) (voltage output: 12 to 24 V, current output: 24 V)
②	Black	CH1 (switch output 1:max 50 mA)
③	White	CH2 (switch output 2: max. 50 mA or external input)
④	Gray	Analog Output Voltage output: 1 to 5 V load impedance 50 kΩ or more Current output: 4-20 mA load impedance 300 Ω or less
⑤	Blue	Power supply - (GND)

●FSM3-L□□□□□D/H/□□ (LCD display type PNP output)

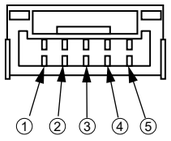
[When using CH2 as SW output]



[CH2 is used as external input]



*Analog output voltage output R: approx. 1 kΩ
Current output R: approx. 100 Ω

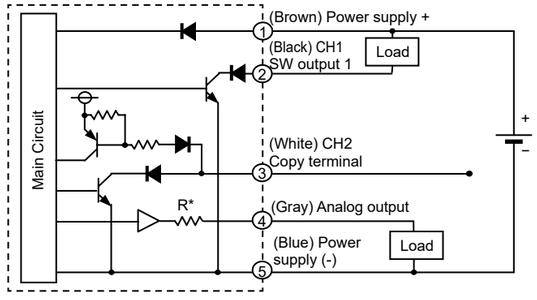


(FSM3 side)

Terminal No.	Option Lead wire color	Name
①	Brown	Power supply (+) (voltage output: 12 to 24 V, current output: 24 V)
②	Black	CH1 (switch output 1:max 50 mA)
③	White	CH2 (switch output 2: max. 50 mA or external input)
④	Gray	Analog Output Voltage output: 1 to 5 V load impedance 50 kΩ or more Current output: 4-20 mA load impedance 300 Ω or less
⑤	Blue	Power supply - (GND)

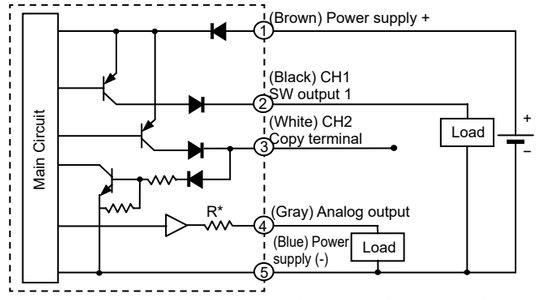
Example of internal circuit and load connection

●FSM3-L□□□□□A/E/□□
(LCD display, NPN output, with setting copy function)

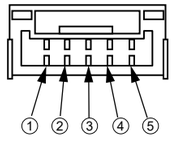


*Analog output voltage output R: approx. 1 kΩ
Current output R: approx. 100 Ω

●FSM3-L□□□□□C/G/□□
(LCD display, PNP output, with setting copy function)



*Analog output voltage output R: approx. 1 kΩ
Current output R: approx. 100 Ω

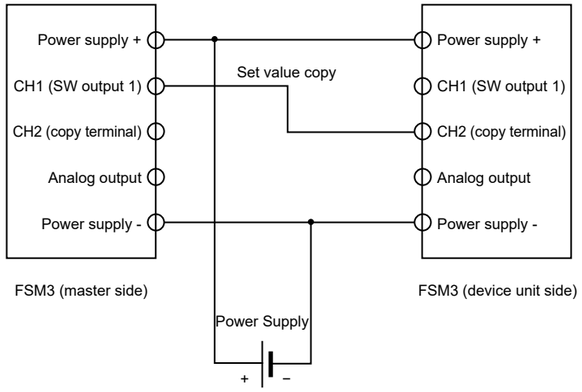


(FSM3 side)

Terminal No.	Option Lead wire color	Name
①	Brown	Power supply (+) (voltage output: 12 to 24 V, current output: 24 V)
②	Black	CH1 (switch output 1:max 50 mA)
③	White	CH2 (copy terminal)
④	Gray	Analog Output Voltage output: 1 to 5 V load impedance 50 kΩ or more Current output: 4-20 mA load impedance 300 Ω or less
⑤	Blue	Power supply - (GND)

●FSM3-L□□□□□A/C/E/G/□□ (LCD display, with setting copy function)

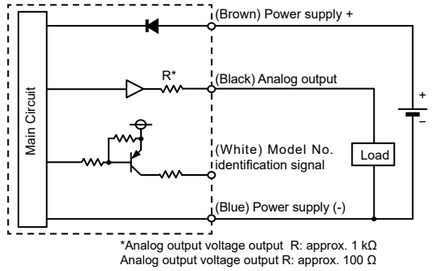
[When using the setting copy function]



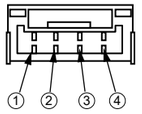
Connect CH1 (SW output 1) on the master side to CH2 (copy terminal) on the device unit side and power ON the sensor to use the setting copy function (F93). Note that this connection can only be used when using the setting copy function. As with the load connection example above, if copying is performed with the load connected to CH1, or the switch is operated with CH1 and CH2 connected, the device side may operate unexpectedly or breakdown the device and FSM3. Never use the product while connected to the copy terminal.

Example of internal circuit and load connection

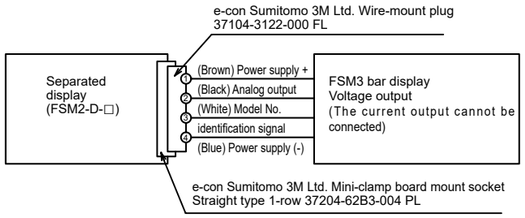
●FSM3-B□□□□□J/K/□□ (bar display)



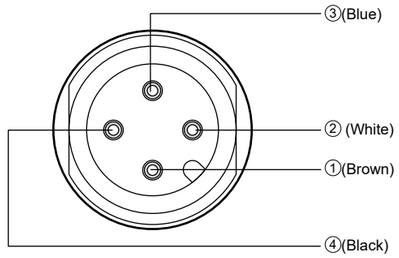
Terminal No.	Option Lead wire color	Name
①	Brown	Power supply (+) (voltage output: 12 to 24 V, current output: 24 V)
②	Black	Analog Output Voltage output: 1-5 V Load impedance 50 kΩ and over Current output: 4-20 mA Load impedance 300 Ω or less
③	White	Model identification signal: do not connect when using as a single unit
④	Blue	Power supply - (GND)



●Connecting the separate display and the FSM3 bar display

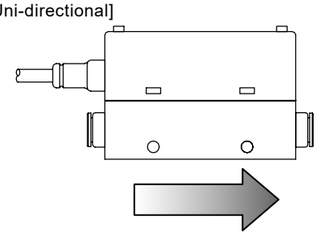
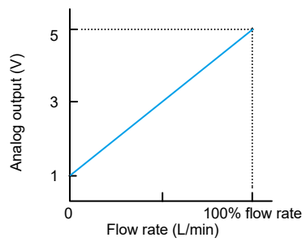
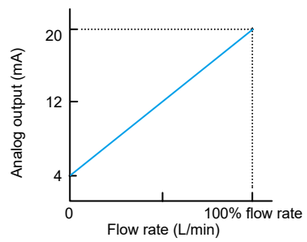
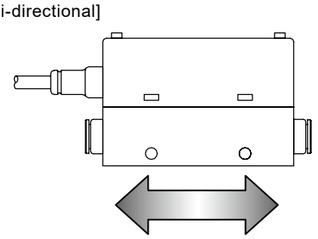
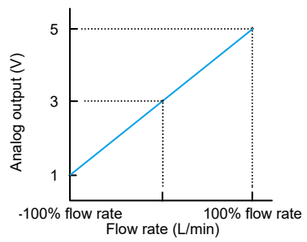
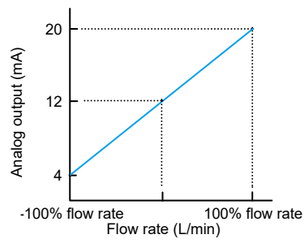


●FSM3-C□□□□□L□□ (IO-Link type)



Terminal No.	Lead wire color	Name
①	Brown	Power supply + (18 to 30 V)
②	White	N.C.
③	Blue	Power supply - (GND)
④	Black	C/Q (IO-Link)

Analog output characteristics

Flow direction	Voltage output	Current output
[Uni-directional] 		
[Bi-directional] 		

*1: The full scale of the uni-directional-type is 0 to 100%, and full scale of the bi-directional-type is -100% to 100%. With the integrated display bi-directional type, output can be changed to uni-direction. The value after switching is a reference value. For details, refer to P. 311.

*2: When switched to carbon dioxide, for analog output refer to P. 239.

*3: Analog output is available even outside the measurement flow rate range. Although the accuracy is not guaranteed, the lower and upper limits for voltage can be output at about 0.6 V and 5.4 V, respectively, and the lower and upper limits for current can be output at about 2.4 mA and 21.6 mA, respectively. For bi-direction, the lower and upper limits for voltage can be output at about 0.8 V and 5.2 V, respectively, while the lower and upper limits for current can be output at about 3.2 mA and 20.8 mA, respectively.

Flow rate sensor selection method

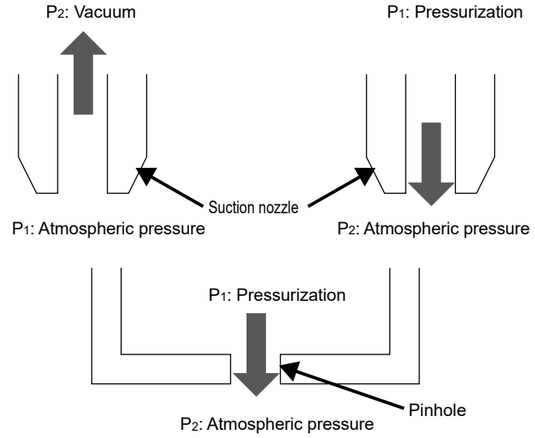
Use as a guideline for selection of the flow rate range when using the flow rate sensor for suction nozzle suction/release confirmation or leakage inspection.

The flow rate can be calculated using the effective cross-sectional area of nozzle (pinhole) and the pressure difference inside and outside the nozzle.

●$P1 \geq 1.89P_2$ (acoustic velocity)
$Q=113.2\times S\times P_1$

●$P1 < 1.89P_2$ (subsonic velocity)
$Q=226.4\times S\times\sqrt{P_2\,(P1-P_2)}$

Q : Flow rate L/min
P_1 : Primary side absolute pressure MPa
P_2 : Secondary side absolute pressure MPa
S : Effective cross-sectional area of nozzle (pinhole) m**m2**



●Example of calculation

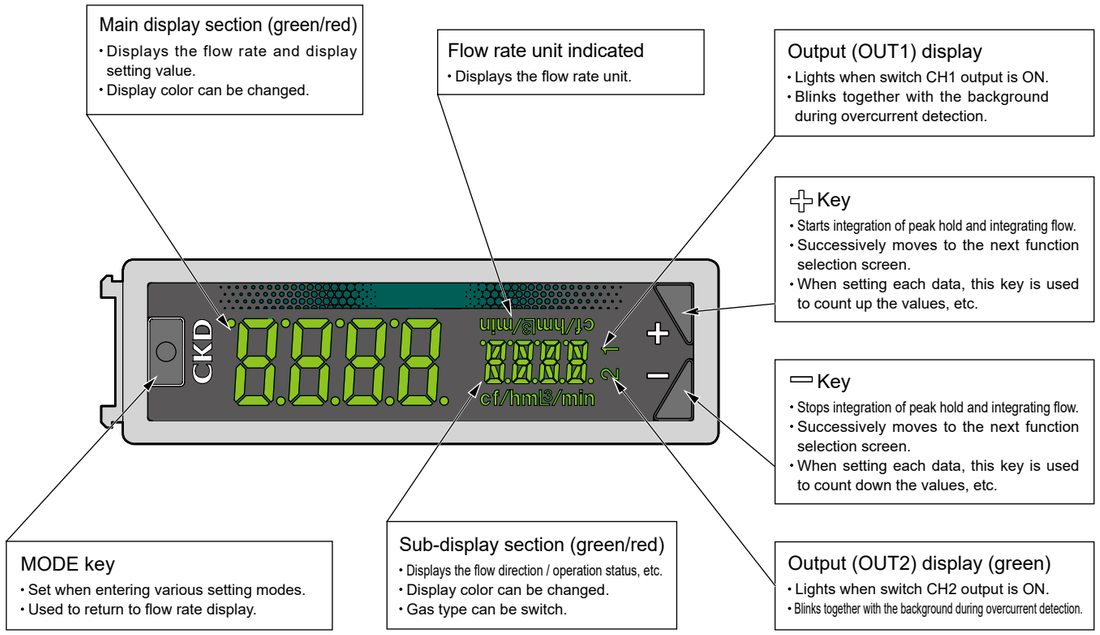
The calculated value of flow rate when the nozzle diameter is 0.1 to 2 øand P2 is varied is shown in the figure below.

	P_1 (MPa) Absolute pressure	P_1 (MPa) Gauge pressure	P_2 (MPa) Absolute pressure	P_2 (MPa) Gauge pressure	Acoustic velocity/ subsonic velocity	Calculated flow rate value (L/min) ø0.1	ø0.2	ø0.3	ø0.4	ø0.5	ø0.7	ø1	ø1.5	ø2
Vacuum	0.1013	0	0.0313	−0.07	Acoustic velocity	0.090	0.360	0.810	1.440	2.250	4.411	9.002	20.254	36.007
	0.1013	0	0.0413	−0.06	Acoustic velocity	0.090	0.360	0.810	1.440	2.250	4.411	9.002	20.254	36.007
	0.1013	0	0.0513	−0.05	Acoustic velocity	0.090	0.360	0.810	1.440	2.250	4.411	9.002	20.254	36.007
	0.1013	0	0.0613	−0.04	Subsonic velocity	0.088	0.352	0.792	1.408	2.200	4.312	8.800	19.801	35.202
	0.1013	0	0.0713	−0.03	Subsonic velocity	0.082	0.329	0.740	1.315	2.055	4.028	8.220	18.494	32.878
	0.1013	0	0.0813	−0.02	Subsonic velocity	0.072	0.287	0.645	1.147	1.792	3.512	7.166	16.125	28.666
	0.1013	0	0.0913	−0.01	Subsonic velocity	0.054	0.215	0.483	0.859	1.343	2.631	5.370	12.083	21.480
Blow (leakage inspection)	0.1113	0.01	0.1013	0	Subsonic velocity	0.057	0.226	0.509	0.905	1.414	2.772	5.657	12.727	22.626
	0.1213	0.02	0.1013	0	Subsonic velocity	0.080	0.320	0.720	1.280	2.000	3.920	8.000	17.999	31.998
	0.1413	0.04	0.1013	0	Subsonic velocity	0.113	0.453	1.018	1.810	2.828	5.543	11.313	25.454	45.252
	0.1613	0.06	0.1013	0	Subsonic velocity	0.139	0.554	1.247	2.217	3.464	6.789	13.856	31.175	55.423
	0.1813	0.08	0.1013	0	Subsonic velocity	0.160	0.640	1.440	2.560	4.000	7.840	15.999	35.998	63.996
	0.2013	0.1	0.1013	0	Acoustic velocity	0.179	0.716	1.610	2.862	4.472	8.765	17.888	40.248	71.552
	0.3013	0.2	0.1013	0	Acoustic velocity	0.268	1.071	2.410	4.284	6.694	13.119	26.774	60.242	107.096
	0.4013	0.3	0.1013	0	Acoustic velocity	0.357	1.426	3.209	5.706	8.915	17.474	35.660	80.236	142.641
	0.5013	0.4	0.1013	0	Acoustic velocity	0.445	1.782	4.009	7.127	11.137	21.828	44.547	100.230	178.186
	0.6013	0.5	0.1013	0	Acoustic velocity	0.534	2.137	4.809	8.549	13.358	26.182	53.433	120.224	213.731

(CAUTION)
●If there is a leak in the piping etc., the actual flow rate will be larger than the calculated value. When selecting the flow rate, consider the amount of leakage in the piping.
●If there is a portion thinner than the suction nozzle diameter in the middle of the piping, the flow rate may be reduced, resulting in a flow rate lower than the calculated value. In addition, suction confirmation, etc., may become impossible.
●The effective cross-sectional area is only a guideline. When the nozzle is long and thin, the effective cross-sectional area becomes smaller than the opening area.
●The response time is determined by the inner volume of the piping from the flow rate sensor to suction nozzle (pinhole). For high-speed detection, reduce the inner volume of the piping as much as possible by installing a flow rate sensor near the suction nozzle, etc.

Names and functions of display/operation section (LCD display)

●Indicator section name



Names and functions of display/operation section (LCD display)

The function and various settings may be performed during normal flow rate display or after entering each mode. The modes are also divided into Maintenance mode, SET mode, and Setting Monitor mode according to the frequency of use.

●Normal Operation (RUN mode)

Item	Explanation	Default setting
Instantaneous flow rate display	Indicators the instantaneous flow rate.	Indicator (measurement)
Peak hold function	Max. and min. values for the flow rate within a set interval are displayed.	Hidden (Stopped)
CO_2 Discharge rate display	By setting the power, discharge pressure, and flow rate of the compressor, as well as the power ↔CO_2 conversion coefficient, you can learn how much CO_2 is being discharged. (reference value obtained by calculation) Available only when the gas type is set to air.	Hidden (Stopped)
Accumulated flow display	The accumulated flow can be displayed. The switch output function includes a function to turn the switch ON/OFF at a level higher than the recommended cumulative value, and an integrated pulse function to output the pulse at a set cumulative value.	Non-display (measurement)

●SET mode

No.	Item	Explanation	Default setting
F.01	Selection of CH1 operation	Select the CH1 feature. Switch output operation and integrated pulse settings can be set.	Without switch output
F.02	Selection of CH2 operation	Select the CH2 feature. Select whether to use CH2 as a switch output, or to use as an external input (integrated value reset/auto reference).	Without switch output
F.03	Integrating function settings	You can choose to acquire integrating flow values consecutively or at set times. You can also choose to keep the data or not.	Continuous acquisition: Data hold OFF
F.04	Sub-screen display setting	Sets the display method for the sub-display. The display can be switched to "flow direction", "reference state", "gas type", or "numbering display".	Flow direction
F.05	Indicator color setting	Set the display color. (red, green) Display color can be set for normal display and when switch output is ON.	At normal: Green At switch ON: Red
F.06	Setting flow direction (bi-directional only)	Setting the flow direction. Setting available for bi-directional, one-sided forward direction or one-sided reverse direction.	Bi-direction
F.07	Indicator inversion function	The LCD display can be vertically inverted.	Standard display
F.08	Reference state setting	Select from the standard state or reference state. Standard condition (ANR): flow rate converted to volume at 20°C, 1 atm, 65%RH (For gas-types other than air: 20 °C, 1 barometric pressure, 0% RH) Reference condition (NOR): flow rate converted to volume at 0°C, 1 atm, 0% RH	ANR
F.09	Unit setting (overseas models only)	The units can be set. Can be selected from L/min, cf/h (cf/min).	Domestic model: L/min Overseas model: L/min
F.10	Indicator cycle setting	The digital display refresh cycle can be set in three stages from 0.25 sec to 1 sec. If the display flickers, it can be improved by increasing the display refresh cycle.	0.5 sec
F.11	Setting response time of analog output	Set the response time. The response can be set in seven steps from 0.05 sec to 1.50 sec. Chattering and mis-operation caused by sudden flow rate changes or noise are prevented.	0.05 sec
F.12	Numbering setting	You can set the numbering.	0000
F.13	Gas switching	The measured gas can be switched. (Model with full scale flow rate of 200 L/min or below) (O_2 The gas type cannot be switched.)	Air
F.14	Setting ECO mode	An ECO mode can be set. If the buttons are not operated for approx. 1 minute, the eco mode will activate and turn OFF the display's backlight. Current consumption can be reduced with this mode.	OFF
F.15	CO_2 Discharge rate calculation setting	CO_2 The discharge rate calculation can be set. Power, discharge pressure, flow rate, C of the compressor O_2 Set the conversion factor.	• Power: 0.20 KW • Pressure: 0.10 MPa • Flow rate: 100 L/min • Conversion factor: 0.000kg (CO_2) / kwh
F.16	Lock setting	Key lock method and PIN method can be set. Use selectively depending on the working environment.	OFF
F.17	Peak hold setting	You can choose to acquire peak bottom values consecutively or at set times. You can also choose to keep the data or not.	Continuous acquisition: Data hold OFF

●Maintenance mode

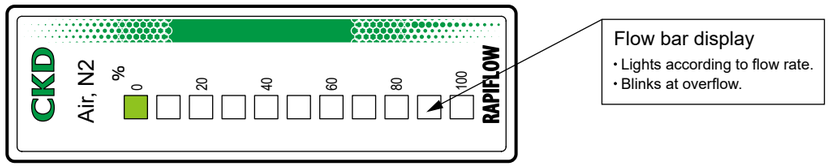
No.	Item	Explanation	Default setting
F.91	Forced output function	Forces the switch output to turn ON and is used to check the initial operation of wiring connections and input devices.	-
F.92	Zero adjustment	The zero point deviation is compensated.	Adjust value: 000
F.93	Setting copy function	Set values can be copied if the model supports copying between two FSM3's. (Copying is only possible between products with the same model No.)	-
F.99	Reset function	Returns the settings to the default settings.	-

●Setting Monitor mode

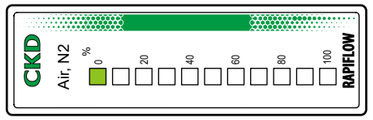
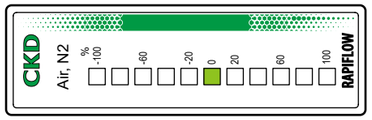
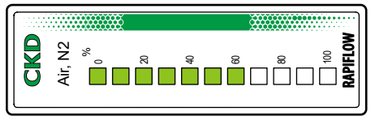
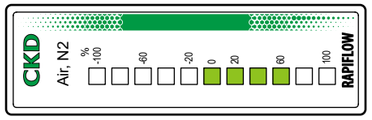
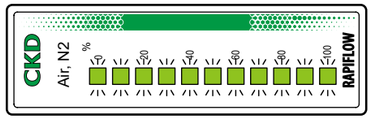
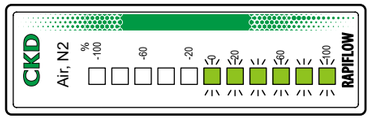
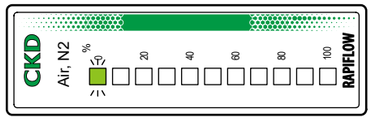
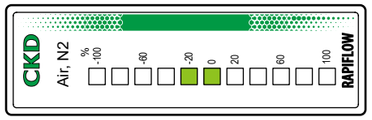
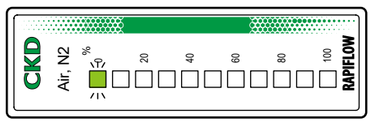
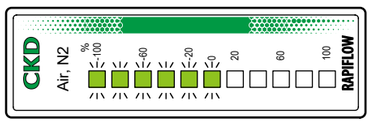
Item	Explanation	Default setting
Settings monitor function	You can check the settings made in the SET mode. (Setting details cannot be edited.)	-

Names and functions of display/operation section (bar display-type)

●Indicator section name



[Display example]Display for FSM3-B101□□□□□□□.

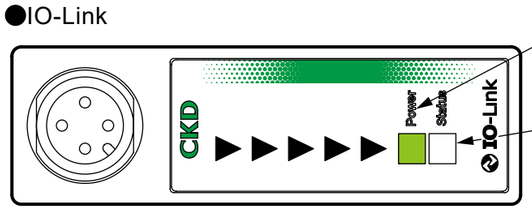
Flow rate	Uni-direction	Bi-directional
0%		
+60% (Forward direction)		
+110% (Forward direction) Blinks at overflow. *Blinks at +110%F.S. and over.		
-10% (Reverse direction)		
-110% (Reverse direction)		

MEMO

Flow rate sensor
Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit
Ending

Names and functions of display/operation section (IO-Link)

●IO-Link



Power lamp (green)
- Lights when power supply is ON.
- Blinks during IO-Link communication.

Status lamp (green, orange, red)
- Green…Lights when the flow rate is within the specified range.
- Orange…Lights when flow rate exceeds 100%F.S. and is 110%F.S. or less.
  Lights when a warning occurs.
- Red…Lights when flow rate exceeds 110%F.S.
  Lights when an error occurs.

*The lamp turns OFF if the flow rate is less than ±3%F.S.

●Communication specifications

Item	Details
Communication protocol	IO-Link
Communication protocol version	V1.1
Transmission bit rate	COM2 (38.4 kbps)
Port	Class A
Process data length (input)	4 byte
Process data length (output)	0 byte
Min. cycle time	5 ms
Data storage	1 kbyte
SIO mode support	None

Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
Data name	MSB															LSB
	Instantaneous flow rate															
Data range	Refer to Table 1															
Format	Integer16															

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Data name	Error	WARNING	-	-	-	-	Switch Output		Vacant							
							2	1								
Data range	True/False															
Format	Boolean															

Data range (Table 1)

			005	010	020	050	100	200	500	101	201	501	102
Data range (□/min)	[❷]	U	-50 to 550 mL	-100 to 1100 mL	-0.20 to 2.20 L	-0.50 to 5.50 L	-1.00 to 11.00 L	-2.0 to 22.0 L	-5.0 to 55.0 L	-10.0 to 110.0 L	-20 to 220 L	-50 to 550 L	-100 to 1100 L
		B	-550 to 550 mL	-1100 to 1100 mL	-2.20 to 2.20 L	-5.50 to 5.50 L	-11.00 to 11.00 L	-22.0 to 22.0 L	-55.0 to 55.0 L	-110.0 to 110.0 L	-220 to 220 L	-550 to 550 L	-1100 to 1100 L

* When setting the gas type to CO_2, the data range changes. Please refer to P. 293.
* Download the IO-Link setting file (IODD) from the CKD website (https://www.ckd.co.jp/en/).

●Explanation of functions (IO-Link)

Item	Explanation	Default setting
Instantaneous flow rate display	Indicators the instantaneous flow rate.	–
Accumulated flow display	Indicators the integrating flow counted after indicating to start logging.	Stop
Instantaneous flow rate peak value display (Peak hold function)	Indicators the maximum and minimum instantaneous flow rate values during the period between indicating to start logging and stop logging.	Stop
Error display	Indicators the error details.	–
Warning display (WARNING)	Indicators the warning details.	–
Power ON time display	Indicators the total power ON time from the start of use. This time is not reset even if the power turns OFF. (Also not reset when using the reset setting.)	–
Switch output function	The switch output operation function can be set. This function can be used to monitor whether the flow rate is within the set range or monitor whether it exceeds the set flow rate.	Not set
Flow rate standard setting	The flow rate standard can be selected. Standard condition (ANR): Converted into volumetric flow rate at 20°C, 1 barometric pressure, 65% RH (For gases other than air: 20°C, 1 barometric pressure, 0% RH) Standard condition (NOR): Converted into volumetric flow rate at 0°C, 1 barometric pressure, 0% RH	ANR
Gas switching	The measured gas can be switched. (For models with a full-scale flow rate of 200 L/min or less. Gas type switching is not available for the O_2 type.)	Air
Change travel average (Setting response time)	The travel average when measuring can be set. The average can be set in seven steps from 50 msec. to 1500 msec. Chattering and mis-operation caused by sudden flow rate changes or noise are prevented.	50 msec
Lock setting	Parameter Lock can be set, which disables changing the parameters of the unit. Data Storage Lock can be set, which prohibits uploading and downloading set values to the master. (Parameter Lock and Data Storage Lock and be set simultaneously)	Not set
Zero adjustment	The zero point deviation is compensated. (Within ±10% F.S.)	Not set
Data storage function	Uploading set values to the master and downloading set values from the master are possible. (Can be copied by the same model No.)	–
Reset function	Returns the settings to the factory settings. (Cannot reset while Parameter Lock is enabled)	–
Unit identification function	Models, serial numbers, etc., can be confirmed on the network.	–

Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

Product-specific cautions: Compact flow rate sensor FSM3 Series

Design / Selection

Working fluids

DANGER

■Never use this product with flammable fluids.

WARNING

■This product cannot be used as a billing meter. Do not use this product for commercial transactions as it is not compliant with the Measurement Act. Intended applications include industrial sensors.

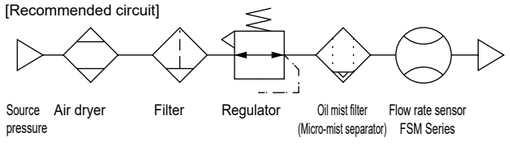
■Do not use fluids which are not applicable.

■Use dry gas which does not contain corrosive elements such as chlorine, sulfur or acids, and which is clean and does not contain dust or oil mist.

■When installing the product during piping or fitting assembly, use the above clean gas for the fluid used to blow out for cleaning. Check that foreign matter does not enter the product from the port of the product. When using compressed air in this process, use clean air compliant with the air quality listed in the following item (ISO 8573-1 Class 2010 1.1.1 to 1.6.2).

■When using compressed air, use clean air that complies with ISO 8573-1 2010 Class 1.1.1 to 1.6.2. Since compressed air from the compressor contains drainage (water, oil oxides, foreign matter, etc.), attach a filter, an air dryer and an oil mist filter (Micro-mist separator) to the primary side (upstream) of the sensor. The sensor's mesh rectifies flow in the pipe. It does not filter out foreign matter, so provide a filter.

[Recommended circuit]



■Depending on the fluid, retaining the fluid for long periods could adversely affect the performance. Do not seal the fluid in the pipe for long periods of time.

■Working pressure / flow rate range
Applications exceeding the max. working pressure and specified flow rate range may result in breakdown. Use this product only within the specified range. If energized in a vacuum state of -0.09 MPa or less, the sensor's heat dissipation will suffer, leading to degradation of the sensor.

■When using a valve on the primary side of the sensor, use only valves with oil-prohibited specifications. This sensor could malfunction or fail if exposed to splattering grease, oil, etc. As friction powder may be generated depending on the valve, mount a filter to prevent the powder from entering the sensor.

■The sensor for oxygen gas is a custom model. To prevent ignition accidents, treat the inside of the flow paths on oxygen models in accordance with oil free specifications. Do not allow oxygen to flow again when it has been used on fluids other than oxygen to flow even once.

■When using liquefied gas such as carbon dioxide, always vaporize it first. Failure may result if liquefied gas enters the product.

Working environment

DANGER

■Flammable environment
Never use this product in an explosive gas atmosphere. The structure is not explosion-proof, and explosions or fires could occur.

WARNING

■Corrosive environment
Do not use this product in an atmosphere containing corrosive gases such as sulfur dioxide.

■Ambient/fluid temperatures
Use at ambient/fluid temperatures within the specified range of 0 to 50°C. Even if the temperature is within the specified range, do not use this product if the ambient temperature and fluid temperature could suddenly change and cause dew to condense.

■Drip-proof environment
The degree of protection of this product is equivalent to IP40. Do not install this product where water, salt, dust, or swarf is present or in a pressurized or depressurized environment. The product cannot be used with large temperature variations or high temperature/humidity since condensation may occur inside the body.

Flow rate unit

CAUTION

■This product's flow rate is measured at a mass flow rate unaffected by temperature or pressure. The unit is L/min, but this is the display when the mass flow rate is converted to volumetric flow rate at 20°C 1 atmosphere (101 kPa) relative humidity 65%RH. (Conditions for gas-types other than air are 20 °C, 1 barometric pressure (101 kPa), relative humidity 0%)

Overflow

CAUTION

■With each series, no problem will occur in the sensor, even in an overflow double the measured range. If dynamic pressure is applied near the maximum working pressure (when a pressure difference exceeding the max. working pressure is applied between primary and secondary sides), a problem could occur with the sensor. When dynamic pressure is applied, such as when filling a workpiece for leakage inspection, be sure to provide a bypass circuit or a squeezer to prevent dynamic pressure from being applied to the sensor.

Needle valve integrated

CAUTION

■This valve cannot be used as a stop valve that requires no leakage. Slight leakage is allowed for in the product specifications.

■The needle valve does not change linearly along with the rotation speed, so be sure to use it as fixed restriction.

■Vibration could cause the needle to turn and the flow rate to change.

Use for suction confirmation, etc.

CAUTION

■Mount an air filter upstream from suction in compliance with the working status to prevent the entry of foreign matter.

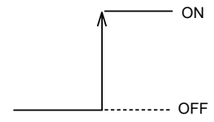
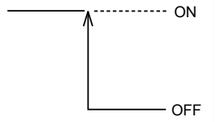
■Use the product under conditions where no condensation occurs in the piping, taking into consideration the dew point of the atmosphere and the ambient temperature of the product.

■When this product is used for vacuum applications such as air supply, do not bend the tube near the push-in fitting. If stress is applied to the tube near the push-in fitting, insert an insert ring into the tube, and connect the tube to the push-in fitting.

■Select the flow rate range based on the operating vacuum pressure and suction nozzle.

■Response speed may be delayed by the piping volume between the suction nozzle and this product. In this case, take countermeasures to reduce piping capacity.

■When the suction confirmation sensor is switched from a pressure sensor (switch) to a flow rate sensor (switch), sensor output (switch output) logic will be reversed. (Refer to the drawing below.) Note that the PLC sequence program must be changed or revised. If source pressure or vacuum source is not supplied when device power is turned ON, "flow rate 0" = "sensor output (switch output) ON" status is set at the flow rate sensor (switch). Check that this occurs with the PLC sequence program, etc.

	Pressure sensor (switch)	Flow rate sensor (switch)
Suction confirmation	ON at setting value or more	ON at setting value or less
		
	Atmospheric pressure side / High vacuum side	Flow rate 0 side / High flow rate side

Piping

⚠CAUTION

■Do not install a pressure reducing valve (regulator), solenoid valve, etc. immediately before this product. Deflected currents may occur and cause errors. Provide a straight pipe with approx. 10 times the bore size when necessary.

■The resin body screw-in fittings of this product are compliant with push-in fittings for pneumatic pressure. Do not use this product for pneumatic pressure circuits with steel pipe connections. If this product is used for steel pipe connection, the misalignment of the IN side steel pipe bore and OUT side steel pipe bore will cause excessive force to be applied to the body, as well as external leakage, risking damage to the product.

■Connect a fitting even when using the metal body with the out side opened. The port filter could come off.

■Do not rotate fittings while fluid pressure is still applied to this product. The sealant parts could seize or wear, leading to external leakage.

■The resin body elbow fitting or screw-in fitting (1/8, 1/4) can be rotated about 10 times, but it cannot be rotated further or constantly. Do not rotate it beyond the required number of times. Rotating the sealant more than necessary may cause the sealant to-bite or wear, and lead to external leakage.

■Establish the installation method, piping order, and fitting assembly method from the design stage before use. Check that sealing tape, sealant, and foreign matter do not enter the product during installation and fitting assembly. In particular, freshly piped sections may contain unexpected foreign matter. Be sure to discharge air with air blow, etc., before installing this product.

Mounting

⚠CAUTION

■The LCD display flow rate meter uses a liquid crystal display. This may be difficult to read depending on the angle.

■Do not install multiple product bodies in close contact. The generation of heat on each part could cause the product's temperature to rise, hastening changes in characteristics or deterioration of the resin material. When using the products in a row, set intervals of distance of 10 mm and over.

■Although the mounting is "unrestricted in vertical/horizontal direction", the flow rate may vary depending on difference in the mounting orientation or piping conditions.

■If you mount the elbow fitting in a downward position, it may interfere with the DIN rail mounting.

■The bracket mounting position may interfere with the elbow fitting.

■The inside of the upper resin case of this product contains wiring parts, including the electronic circuit board. If stress is applied to the resin case during installation, fitting installation, and piping, stress will be transmitted internally as well, and internal parts may be damaged. Establish from the design stage, mounting methods that do not apply stress to the resin case area or fitting mounting methods before use.

Wiring

⚠WARNING

■Install the product and wiring as far away as possible from sources of noise such as power distribution wires. Provide separate countermeasures for surge applied to the power cable. The display or output could fluctuate.

■The output impedance of the analog output section is approx. 1 kΩ. If the impedance of the connecting load is small, output error increases. Check error with the impedance of the connecting load before using. (The analog/current output type is excluded.)

Example of calculation

FSM3-voltage output impedance: Ro = 1kΩ
Load internal impedance: Rx = 1 MΩ

$$\text{Output value} = \left(1 - \frac{Ro}{Ro + Rx}\right) \times 100\%$$

$$= \left(1 - \frac{1\ k\Omega}{1\ k\Omega + 1\ M\Omega}\right) \times 100\% \Rightarrow \text{Output value error approx. 0.1\%}$$

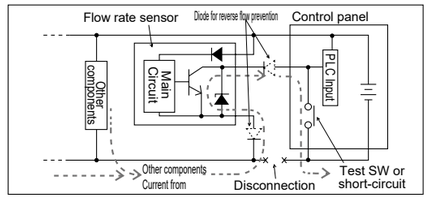
■Use a DC stabilized power supply within the specified rating, insulated from the AC power supply. A non-isolated power supply could result in electrical shock. If power is not stabilized, the peak value could be exceeded. This could damage the product or impair accuracy.

■The power supply for the metal body (stainless steel body) type is a DC stabilized power supply completely isolated from the AC primary side. Connect either the + side or - side of the power to the FG. Between the metal body internal power circuit and metal body, a varistor (limit voltage approx. 40 V) is connected to prevent dielectric breakdown of the sensor. Do not conduct a withstand voltage test or insulation resistance test between the internal power circuit and metal body. Disconnect wiring first if this testing is required. An excessive potential difference between power and metal body will burn internal parts. After installing, connecting and wiring the metal body, electrical welding of the equipment/frame or short-circuit accidents, etc., could cause welding current, excessive high voltage caused by welding, or surge voltage, etc., to run through the wiring, ground wire, or fluid path connected between such devices, damaging wires or devices. Conduct any work such as electrical welding after removing this device and disconnecting all electric wires connected to the FG.

■Check that stress (7 N and over) is not directly applied to lead wire leadouts or connectors.

⚠CAUTION

■Pay attention to reverse currents caused by disconnected wires and wiring resistance. If other devices, including a flow rate sensor, are connected to the same power supply as the flow rate sensor, and the switch output wire and power cable negative (-) side are short-circuited to check the operation of the control panel input unit, or if the power cable negative (-) side is disconnected, reverse current could flow to the flow rate sensor's switch output circuit and cause damage.



■Take the following measures to prevent damage caused by reverse current:

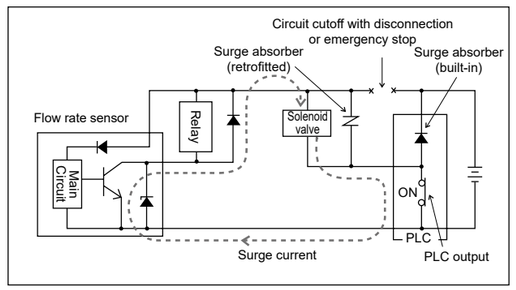
①Avoid centralizing current at the power cable, especially the minus side power cable, and use as thick a cable as possible.

②Limit the number of devices connected to the same power source as the flow rate sensor.

③Insert a diode parallel to the flow rate sensor's output line to prevent reverse current.

④Insert a diode parallel to the flow rate sensor power wire's negative (-) side to prevent reverse current.

■Pay attention to surge current flow-around.
When flow rate sensor power is shared with an inductive load that generates surges, such as a solenoid valve or relay, if the circuit is cut off while the inductive load is functioning, surge current could enter the switch output circuit and cause damage depending on where the surge absorber is installed.

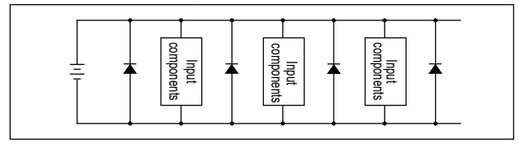


Take the measures below to prevent damage from sneak surge current.

①Separate the power supply for output including the inductive load, such as the solenoid valve and relay, and input, such as the flow rate sensor.

②If a separate power supply cannot be used, directly install a surge absorption element for all inductive loads. Consider that the surge absorber connected to the PLC, etc., protects only the individual device.

③Connect a surge absorber to places on the power wiring shown in the figure below, as a measure against disconnections in unspecified areas.



When the devices are connected to a connector, the output circuit could be damaged by the above phenomenon if the connector is disconnected while the power is ON. Turn power OFF before connecting or disconnecting the connector.

Other

⚠WARNING

■CE-compliance working conditions
This product is CE-marked, indicating conformity with the EMC Directives. The standard for the immunity for industrial environments applied to this product is EN61000-6-2; the following requirements must be satisfied in order to conform to this standard.
Conditions
- The evaluation of this product is performed by using a lead wire that has a power supply line and a signal line paired to assess the product's performance.
- This product is not equipped with surge protection. Implement surge protection measures on the system side.

■Output accuracy is affected by self-heating due to energization as well as temperature characteristics. Provide a standby time (5 minutes or more) after turning the power ON for use.

■Immediately after power is turned ON, flow rate detection switch operation is not performed for approx. 5 seconds to complete self-diagnosis. Provide a control circuit/program that ignores signals for at least two seconds after power is turned ON.

⚠CAUTION

■The flow path is not completely free of dust generation, so if dust generation is a problem, a final clean filter should be used in conjunction.

■If the actual flow rate is fluctuating, the measured flow rate value also fluctuates. Increase the FSM3 display cycle or response time, or average the analog output on the device. In particular, note that it can easily occur if a control valve such as a solenoid valve is opened and closed at a high frequency in a short time or near a pump.

■Measuring the pulsating flow rate may cause errors in the measured flow rate. Restrict the flow rate with the fixed orifice and needle valve, etc., and use in a laminar flow state (normal flow without irregular fluctuations).

■The flow rate measured with the gas switching function is a reference value calculated inside the product based on the converted value. Accuracy other than in air mode is a guideline.

■This product uses a micro-sensor chip, and must be installed where it will not be subject to dropping, impact or vibration. Treat the product as a precision components during installation and transportation.

■Use the product within the rated flow range.

■Use within the working pressure.

■Analog output continues even if the flow rate range is exceeded. With the LCD display, "Hi" or "Lo" will be displayed. With the bar display, the bar display will blink. Note that this is outside the guaranteed precision.

■The accuracy may vary from the initial status depending on the working environment or working conditions. It is recommended to check the operation of the product periodically.

■Since the sensor chip will change its detection flow rate due to deterioration after prolonged use, periodic inspections should be performed.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual

MEMO

Compact flow rate sensor
Environment-resistant specifications

RAPIFLOW® FSM3

■ Flow rate sensor



CONTENTS

Product Introduction 324
● LCD display 326
● Bar display 332
⚠Safety Precautions 347

Flow rate sensor

Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit

Ending

FSM3 Series (environment-resistant specifications)

Dust-proof / Water-resistant structure IP65

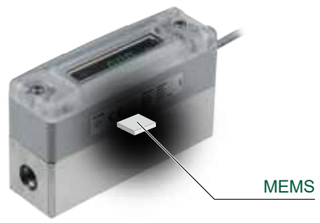


Can be used in environments where it is exposed to dust or water

Has the degree of protection of IP65 or equivalent. This valve can be used safely even if water is applied to the environment where dust is present, during maintenance and cleaning.



High performance



MEMS stands for Micro Electro Mechanical Systems and refers to ultra-compact devices based on microfabrication technology used in the manufacture of semiconductor integrated circuits.

Clean-room specifications (Option)

Anti-dust generation packaging (P70) and oil-prohibited specifications (P80) available

Usage according to the grade of the device is possible.

*Refer to catalog No.CB-033SA for details.

Outgassing supported

Because the flow path is not resin, it is ideal for processes where outgassing is a problem.

ATEX Directive compliant (Option)

Refer to "ATEX compatible" on P. 352 for specifications.



With the LCD display, button operation is possible by opening the cover.

*The protective structure will not be used when the cover is opened.

High precision/high-speed response

Repeatability: Within ±1%F.S.

Indicator accuracy: Within ±3% F.S.

Response time: 50 msec

Bi-directional fluid measurement

Contributes to reducing tact time.

The flow direction can be measured as desired.



Diversity

Five-types of gases can be measured with just one unit

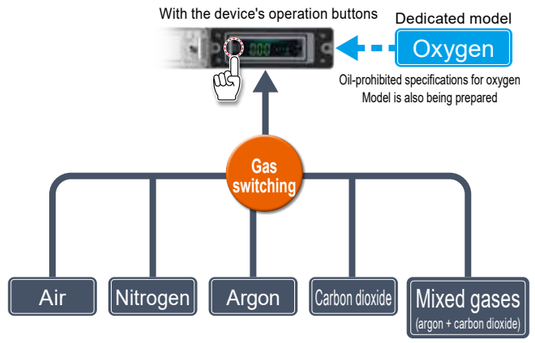
Gas switching function

(LCD display) (Model with full scale flow rate of 200 L/min or below:)

Air, nitrogen, argon, carbon dioxide, gas mixture (Mixing ratio Ar: CO_2 (8:2)) can be supported with the single flow rate sensor.

Gases can be switched with operation buttons

*Contact CKD Sales if you have a request for the mixing ratio.



Solution examples

Painting air flow rate control

Change the air pressure and controls flow rate used during coating with the electro pneumatic regulator.



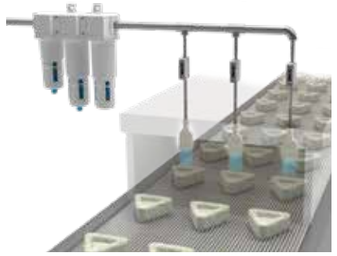
Arc welding

Manages argon, gas mixtures (argon + carbon dioxide), and other shielding gases.



Cooling cooked rice

After cooking, rice is cooled over a short period using safe compressed air that has been filtrated with a bacteria-removing filter to prevent bacteria growth.



Series Variation

Appearance	Applicable Fluid	Connection Port Size	Max. flow rate (L/min)	Page
 FSM3 Series	① Air, Nitrogen, Carbon dioxide, Argon, Mixed gases (Argon + Carbon dioxide) ② Oxygen	Rc1/8, Rc1/4, Rc1/2, G1/8, G1/4, G1/2, NPT1/8, NPT1/4, NPT1/2	0.5, 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000	• LDC display P. 326 • Bar display P. 332

* Applicable fluids are air and nitrogen only.

Compatible with clean-room specifications P70 and P80 Series.

*Refer to catalog No.CB-033SA for details.



Compact flow rate sensor (RAPIFLOW) Environment-resistant specifications

FSM3 Series

LCD display

●Stainless steel body (flow rate range: 500 mL/min to 1000 L/min)

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

FSM3 - L 005 U 4 AA 1 A 1 N - B J R - EX

- FSM3: Model No.
- L: LCD display
- 005: ❶ Flow rate range (Full scale flow rate)
- U: ❷ Flow direction
- 4: ❸ Body material/applicable fluids
- AA: ❹ Port size
- 1: Piping direction: Straight
- A: ❺ Output specifications
- 1: ❻ Unit Specifications
- N: Valve option: None
- B: ❼ Lead wire
- J: ❽ Mounting Attachment
- R: ❾ Included documents
- EX: ❿ Option (ATEX Compliant)

❶Flow rate range (full scale flow rate)*1

Code	Description	Code	Description
005	500 mL/min	500	50 L/min
010	1000 mL/min	101	100 L/min
020	2 L/min	201	200 L/min
050	5 L/min	501	500 L/min *2
100	10 L/min	102	1000 L/min *2
200	20 L/min		

*1: Refer to the compatibility table below for combinations of the flow rate range and port size.
*2: For 500 L/min and 1000 L/min, "5" Oxygen cannot be selected for ❸ Applicable fluids.

❷Flow direction

Code	Description
U	Uni-direction
B	Bi-direction

❸Body material/applicable fluids

Code	Description	
	Body material	Applicable fluid
4	SUS (Environment-resistant specifications)	Air (Gas can be changed)
5		Oxygen (oil-prohibited specifications)*1

*1: "5" oxygen cannot be selected with the ❶ flow rate ranges "501" 500 L/min and "102" 1000 L/min.

❹Port size

Description		Code
Rc thread	Rc1/8	AA
	Rc1/4	BA
	Rc1/2	CA
G thread ISO16030	G1/8	AF
	G1/4	BF
	G1/2	CF
NPT thread	NPT1/8	AC
	NPT1/4	BC
	NPT1/2	CC

Note: Refer to the compatibility table below for combinations of the flow rate range and port size.

Compatibility table of flow rate range and port size

❶Flow rate range \ ❹Port size	AA Rc1/8	BA Rc1/4	CA Rc1/2	AF G1/8	BF G1/4	CF G1/2	AC NPT1/8	BC NPT1/4	CC NPT1/2
005	●			●			●		
010	●			●			●		
020	●			●			●		
050	●			●			●		
100	●			●			●		
200	●			●			●		
500		●			●			●	
101		●			●			●	
201		●			●			●	
501			●			●			●
102			●			●			●

❺Output specifications

Code	Description		
	Analog Output	Switch Output	Setting copy function
A	1 points (Voltage output) 1-5V	1 point (NPN)	Yes
B		2 point (NPN)	—
C		1-point output (PNP)	Yes
D		2-point output (PNP)	—
E	1 points Current output 4-20mA	1 point (NPN)	Yes
F		2 point (NPN)	—
G		1-point output (PNP)	Yes
H		2-point output (PNP)	—

❻Unit Specifications

Code	Description
1	SI units only
2	With unit switching function (only for overseas)

Note: "2" unit switching function model cannot be sold in Japan.

❼Lead wire

Code	Description
A	5 conductor 1 m
B	5 conductor 3 m

❽Mounting Attachment

Code	Description	
Blank	None	
J	Bracket 2	

Note: Optional parts are provided with the product.

❾Included documents

Code	Description
Blank	None
R	Inspection certificate
S	Company certification + Traceability certification

❿Option (ATEX Compliant)

Code	Description
Blank	None
EX	ATEX Compliant

Note: Refer to "ATEX compatible" on Page 352 for specifications. ATEX-compliant products are available only in Europe.

Clean-room specifications (Catalog No.CC-1537A)

FSM3 - ····- P70

FSM3 - ····- P80

Model No. Notation for Options

●Bracket Discrete

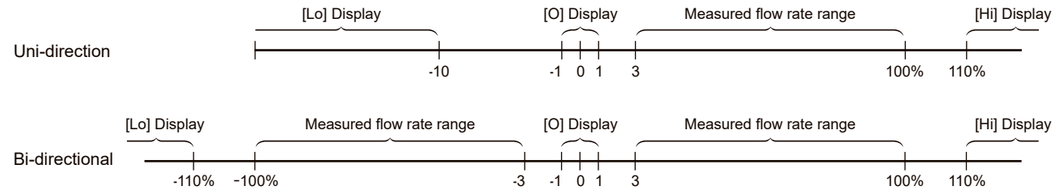
FSM3 - J

Specifications

Item			FSM3-L[❶] [❷] [❸] [❹] 1 [❺][❻]N-[ ]										
			[❶] Flow rate range (full scale flow rate) code										
			005	010	020	050	100	200	500	101	201	501	102
Flow direction	❷	U	Uni-direction										
		B	Bi-direction										
Measured flow rate range (□/min) *1	❷	U	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.15 to 5.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L	15 to 500 L	30 to 1000 L
		B	-500 to -15, 15 to 500 mL	-1000 to -30, 30 to 1000 mL	-2.00 to -0.06, 0.06 to 2.00 L	-5.00 to -0.15, 0.15 to 5.00 L	-10.00 to -0.30, 0.30 to 10.00 L	-20.0 to -0.6, 0.6 to 20.0 L	-50.0 to -1.5, 1.5 to 50.0 L	-100.0 to -3.0, 3.0 to 100.0 L	-200 to -6, 6 to 200 L	-500 to -15, 15 to 500 L	-1000 to -30, 30 to 1000 L
Indicator type			4 digit + 4 digit 2 color LCD										
Flow rate display range (□/min) *2	❷	U	-49 to 549 mL	-99 to 1099 mL	-0.19 to 2.19 L	-0.49 to 5.49 L	-0.99 to 10.99 L	-1.9 to 21.9 L	-4.9 to 54.9 L	-9.9 to 109.9 L	-19 to 219 L	-49 to 549 L	-99 to 1099 L
		B	-549 to 549 mL	-1099 to 1099 mL	-2.19 to 2.19 L	-5.49 to 5.49 L	-10.99 to 10.99 L	-21.9 to 21.9 L	-54.9 to 54.9 L	-109.9 to 109.9 L	-219 to 219 L	-549 to 549 L	-1099 to 1099 L
Integration display (*3)		Indicator range	0 to ±9999999 mL		0.00 to ±99999.99 L			0.0 to ±999999.9 L			0 to ±9999999 L		
		Pulse output rate	5 mL	10 mL	0.02 L	0.05 L	0.1 L	0.2 L	0.5 L	1L	2 L	5L	10 L
Working Conditions		Applicable fluid *4	Clean air (ISO 8573-1 2010 1.1.1 to 5.6.2), compressed air (ISO 8573-1 2010 1.1.1 to 1.6.2), nitrogen gas										
			Argon, carbon dioxide (*5), and gas mixture (argon + carbon dioxide)									–	
			Oxygen (oil-prohibited specifications will automatically become available if oxygen specifications are selected.)									–	
		Temperature range	0 to 50°C (no condensation)										
		Pressure range	-0.09 to 1.00 MPa									-0.09 to 0.75 MPa	
		Proof pressure	1.5 MPa										
Operating ambient temperature / humidity			0 to 50 °C, 90% RH or less										
Storage temperature			-10 to 60°C										
Accuracy *6 (Fluid: in dry air)		Accuracy *7	Within ±3%F.S. (Secondary side released to atmosphere) (The scope of warranty is in accordance with the "measurement flow rate range.")										
		Repeatability *8	Within ±1%F.S. (Secondary side released to atmosphere)										
		Temperature characteristics	Within ±0.2% F.S./°C (15 to 35°C, base temperature 25°C)										
		Pressure characteristics	Within ±5%F.S. (-0.09 to 0.7 MPa, where secondary side is released to atmosphere)								Within ±5% F.S. (-0.09 to 0.7 MPa, base temperature 0.35 MPa)		
Response time *9			50 msec. or less (setting response time OFF)										
Switch Output	❺	A, B, E, F	NPN open collector output (50 mA or less, voltage drop 2.4 V or less)										
		C, D, G, H	PNP open collector output (50 mA or less, voltage drop 2.4 V or less)										
Analog Output *10		A, B, C, D	1 to 5 V voltage output (connecting load impedance 50 kΩ or more)										
		E, F, G, H	4-20 mA current output (connecting load impedance 0 to 300 Ω)										
Power supply voltage *11		A, B, C, D	12 to 24 VDC (10.8 to 26.4 V) ripple rate 1% or less										
		E, F, G, H	24 VDC (21.6 to 26.4 V) ripple rate 1% or less										
Current consumption *12			45 mA or less										
Lead wire			ø3.7 AWG26 or equivalent ×5-conductor, insulator outer diameter ø1.0										
Functions *13			①Gas switching, ②Setting copy function, ③Flow rate integration, ④Peak hold, etc.										
Degree of protection *14			IP65Equivalent										
Protection circuit *15			Power reverse connection protection, switch output reverse connection protection, switch output load short-circuit protection										
EMC Directive			EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8										
Mounting		Mounting orientation *16	Unrestricted in vertical/horizontal direction										
		Straight piping section *17	Not required										
Weight			Refer to P. 303.										

*1: The value converted to volumetric flow rate at standard condition (20°C 1 barometric pressure (101 kPa) 65% RH).
(For gases other than air: 20°C, 1 barometric pressure (101 kPa), relative humidity 0% RH)

*2: The displays of various flow rates are as shown below.



*3: The accumulated flow is a calculated (reference) value. When using the integrated save function, take care to prevent the number of saves from exceeding the access count limit of the storage device (1 million times). (Changes to the settings are counted in number of accesses.)

$$\text{Number of saves} = \frac{\text{Usage time}}{\text{5 min.}} < \text{1 million times}$$

When instantaneous flow rate is below 1% it is not counted as integrating flow.

*4: Use dry gas which does not contain corrosive elements such as chlorine, sulphur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air that complies with ISO8573-1 2010 Class 1.1.1 to 1.6.2. Compressed air from the compressor contains drainage-water, oil oxide, foreign substances, etc. To maintain the function of this product, a filter, air dryer (min. pressure dew point 10°C or less), and oil mist filter (max. oil content 0.1 mg/m³) for operation. (Refer to P. 347 for details on recommended circuit.) The sensor for oxygen gas is a custom model. To prevent ignition accidents, do not allow oxygen to flow again when it has been used on fluids other than oxygen to flow even once.

*5: With the gas type switching function, the full scale flow rate after switching to carbon dioxide is half the flow rate range. Output type can also be selected for analog output.

Gas type	Flow direction	Measured flow rate range (□/min)							
		005	010	020	100	200	500	101	201
Carbon dioxide	Uni-direction	15 to 250 mL	30 to 500 mL	0.06 to 1.00 L	0.30 to 5.00 L	0.6 to 10.0 L	1.5 to 25.0 L	3.0 to 50.0 L	6 to 100 L
	Bi-direction	-250 to -15 mL	-500 to -30 mL	-1.00 to 0.06 L	-5.00 to 0.30 L	-10.0 to -0.6 L	-25.0 to -1.5 L	-50.0 to -3.0 L	-100 to -6 L
		15 to 250 mL	30 to 500 mL	0.06 to 1.00 L	0.30 to 5.00 L	0.6 to 10.0 L	1.5 to 25.0 L	3.0 to 50.0 L	6 to 100 L

Gas type	Flow direction	Analog Output			
		Output A		Output B	
		Voltage	Current	Voltage	Current
Carbon dioxide	Uni-direction	1 to 3 V	4 to 12 mA	1 to 5 V	4 to 20 mA
	Bi-direction	2 to 4 V	8 to 16 mA	1 to 5 V	4 to 20 mA

*6: Compressed air is used for adjusting and inspecting this product. Accuracy for gas-types other than air is a guideline.

*7: Accuracy is based on CKD's standard flow rate meter and does not indicate absolute accuracy. Repeatability, temperature characteristics, and pressure characteristics are not included for an accuracy of ± 3%F.S. Consider separately according to the working environment and working conditions.

*8: Repeatability is calculated during a short period of time. Change over time is not included. (Refer to the product specifications for details.)

*9: The actual response time changes depending on the piping conditions. As a guideline, the response time can be set within the range of 50 msec. to 1.5 sec.

*10: The output impedance of the analog output section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.

*11: The power supply voltage specifications differ for the voltage output type and current output type.

*12: Current for when 24 VDC is connected, and no load is applied. Please note that the current consumption changes depending on the load connection status.

*13: The gas type switching function enables switching to argon, carbon dioxide and a gas mixture of argon 80% + carbon dioxide 20%. Full scale flow rate and analog output after changing gas is as follows.
(Note that the gas change function cannot be set with the oxygen, 500 L/min, and 1000 L/min models.)
For carbon dioxide, refer to *5.

Gas type	Flow direction	Measured flow rate range (□/min)							
		005	010	020	100	200	500	101	201
・Air ・Nitrogen ・Argon ・argon 80% +carbon dioxide 20%	Uni-direction	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L
	Bi-direction	-500 to -15 mL	-1000 to -30 mL	-2.00 to -0.06 L	-10.00 to -0.30 L	-20.0 to -0.6 L	-50.0 to -1.5 L	-100.0 to -3.0 L	-200 to -6 L
		15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L

The "setting copy function" can be selected under "❺Output Specifications". Note that the "External input" function is not available on models on which the "Copy function setting" is enabled.

*14: Be sure to read the precautions in "Working environment" on P. 347 and "ATEX compatible" on P. 352.

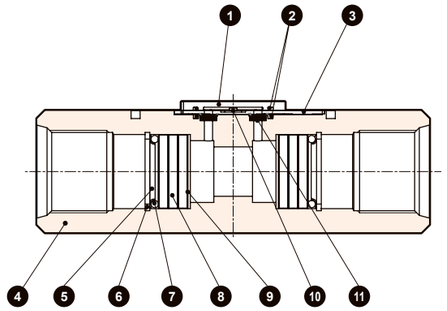
*15: The protection circuitry in this product is only effective against certain misconnections and short-circuits in the load and does not protect against all misconnections.

*16: This product measures changes in heat distribution that are caused by flow. If installed vertically, the heat distribution may change due to the effect of convection, and the zero point may be shifted.

*17: Piping conditions may affect accuracy. For more accurate measurements, use a straight pipe with a ten-times greater internal diameter. With the 500 L/min and 1,000 L/min models, use piping with an internal diameter of 9 mm or more. If it is less than 9 mm, accuracy may be negatively affected.

Internal Structure Diagram / Material

● LCD display FSM3-L



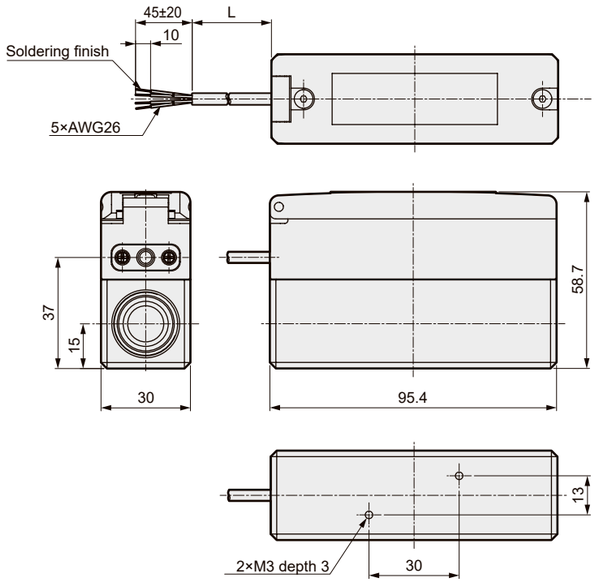
Part No.	Part name	Material		Part No.	Part name	Material	
1	Sensor cover	SUS316 or equivalent	Stainless steel	7	O-ring	FKM	Fluoro rubber
2	Gasket	FKM	Fluoro rubber	8	Spacer	SUS304	Stainless steel
3	Sensor board	—	Aluminum	9	Filter	SUS304	Stainless steel
4	Sensor body	SUS316L	Stainless steel	10	Sensor chip	—	Semiconductor silicon
5	O-ring holder	SUS304	Stainless steel	11	Filter	SUS304	Stainless steel
6	C-snap ring	SUS304	Stainless steel				

Product weight

[Unit: g]

Port size		Weight
Code [4]	Description	
AA	Rc1/8 Straight	750
BA	Rc1/4 Straight	690
CA	Rc1/2 Straight	590
AF	G1/8 Straight	750
BF	G1/4 Straight	690
CF	G1/2 Straight	590
AC	NPT 1/8 Straight	750
BC	NPT 1/4 Straight	690
CC	NPT 1/2 Straight	590

Dimensions

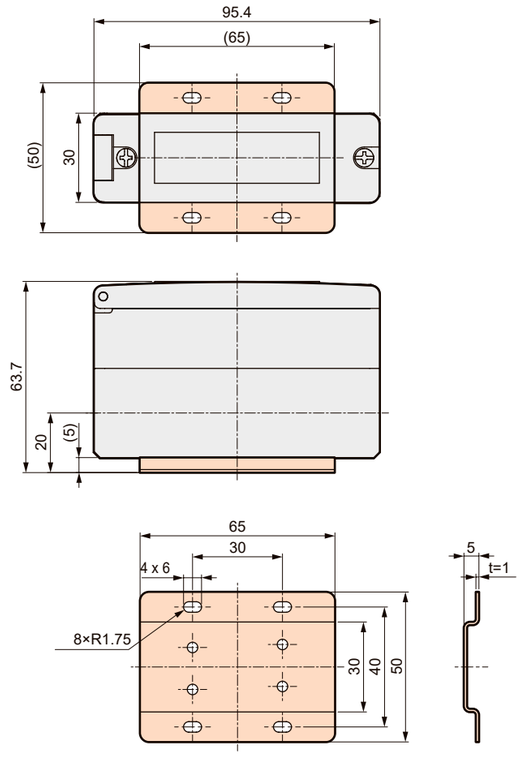


[Lead wire length]

Lead wire code	L dimensions
A	1000±20
B	3000±20

Optional dimensions

●FSM3-J
Bracket 2





Compact flow rate sensor (RAPIFLOW) Environment-resistant specifications

FSM3 Series

Bar display

●Stainless steel body (flow rate range: 500 mL/min to 1000 L/min)

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

FSM3 - B 005 U 4 AA 1 J 1 N - D J S - EX

- FSM3: Model No.
- B: Bar display
- 005: ❶Flow rate range (Full scale flow rate)
- U: ❷Flow direction
- 4: ❸Body material/applicable fluids
- AA: ❹Port size
- 1: Piping direction: Straight
- J: ❺Output specifications
- 1: Unit specifications: SI units only
- N: Valve option: None
- D: ❻Lead wire
- J: ❼Mounting Attachment
- S: ❽Included documents
- EX: ❾Option (ATEX Compliant)

❶Flow rate range (full scale flow rate)*1

Code	Description	Code	Description
005	500 mL/min	500	50 L/min
010	1000 mL/min	101	100 L/min
020	2 L/min	201	200 L/min
050	5 L/min	501	500 L/min *2
100	10 L/min	102	1000 L/min *2
200	20 L/min		

*1: Refer to the compatibility table below for combinations of the flow rate range and port size.
*2: For 500 L/min and 1000 L/min, "5" Oxygen cannot be selected for ❸Applicable fluids.

❷Flow direction

Code	Description
U	Uni-direction
B	Bi-direction

❸Body material/applicable fluids

Code	Description	
	Body material	Applicable fluid
4	SUS (Environment-resistant specifications)	Air
5		Oxygen (Oil-prohibited specifications) *1

*1: For ❶Flow rate range "501" 500 L/min and "102" 1000 L/min, “5" oxygen cannot be selected.

❹Port size

Description		Code
Rc thread	Rc1/8	AA
	Rc1/4	BA
	Rc1/2	CA
G thread ISO16030	G1/8	AF
	G1/4	BF
	G1/2	CF
NPT thread	NPT1/8	AC
	NPT1/4	BC
	NPT1/2	CC

Note: Refer to the compatibility table below for combinations of the flow rate range and port size.

Compatibility table of flow rate range and port size

❶Flow rate range \ ❹Port size	AA Rc1/8	BA Rc1/4	CA Rc1/2	AF G1/8	BF G1/4	CF G1/2	AC NPT1/8	BC NPT1/4	CC NPT1/2
005	●			●			●		
010	●			●			●		
020	●			●			●		
050	●			●			●		
100	●			●			●		
200	●			●			●		
500		●			●			●	
101		●			●			●	
201		●			●			●	
501			●			●			●
102			●			●			●

❺Output specifications

Code	Description
J	Analog voltage output × 1 point
K	Analog current output × 1 point

Note: When using in combination with a separated display (FSM2-D), select "J".

❻Lead wire

Code	Description
C	4 conductor 1 m
D	4 conductor 3 m

❼Mounting Attachment

Code	Description	
Blank	None	
J	Bracket 2	

Note: Optional parts will come with the product.

❽Included documents

Code	Description
Blank	None
R	Inspection certificate
S	Company certification + Traceability certification

❾Option (ATEX Compliant)

Code	Description
Blank	None
EX	ATEX Compliant

Note: Refer to "ATEX compatible" on Page 352 for specifications. ATEX-compliant products are available only in Europe.

Clean-room specifications (Catalog No.CC-1537A)

FSM3 - ・・・・ - P70

FSM3 - ・・・・ - P80

Model No. Notation for Options

●Bracket Discrete

FSM3 - J

Specifications

Item			FSM3-B[❶] [❷] [❸] [❹] [❺] [❻]N-[ ]										
			[❶] Flow rate range (full scale flow rate) code										
			005	010	020	050	100	200	500	101	201	501	102
Flow direction	❷	U	Uni-direction										
		B	Bi-direction										
Measured flow rate range (□/min) *1	❷	U	15 to 500 mL	30 to 1000 mL	0.06 to 2.00 L	0.15 to 5.00 L	0.30 to 10.00 L	0.6 to 20.0 L	1.5 to 50.0 L	3.0 to 100.0 L	6 to 200 L	15 to 500 L	30 to 1000 L
		B	-500 to -15, 15 to 500 mL	-1000 to -30, 30 to 1000 mL	-2.00 to -0.06, 0.06 to 2.00 L	-5.00 to -0.15, 0.15 to 5.00 L	-10.00 to -0.30, 0.30 to 10.00 L	-20.0 to -0.6, 0.6 to 20.0 L	-50.0 to -1.5, 1.5 to 50.0 L	-100.0 to -3.0, 3.0 to 100.0 L	-200 to -6, 6 to 200 L	-500 to -15, 15 to 500 L	-1000 to -30, 30 to 1000 L
Indicator type			LED bar display										
Working Conditions		Applicable fluid *2	Clean air (ISO 8573-1 2010 1.1.1 to 5.6.2), compressed air (ISO 8573-1 2010 1.1.1 to 1.6.2), nitrogen gas										
			Oxygen (oil-prohibited specifications will automatically become available if oxygen specifications are selected.)									–	
		Temperature range	0 to 50°C (no condensation)										
		Pressure range	-0.09 to 1.00 MPa									-0.09 to 0.75 MPa	
		Proof pressure	1.5 MPa										
Operating ambient temperature / humidity			0 to 50°C, 90% RH or less										
Storage temperature			-10 to 60°C										
Accuracy		Accuracy *3	Within ±3%F.S. (Secondary side released to atmosphere) (The scope of warranty is in accordance with the "measurement flow rate range.")										
		Repeatability *4	Within ±1%F.S. (Secondary side released to atmosphere)										
		Temperature characteristics	Within ±0.2% F.S./°C (15 to 35°C, base temperature 25°C)										
		Pressure characteristics	Within ±5%F.S. (-0.09 to 0.7 MPa, where secondary side is released to atmosphere)								Within ±5%F.S. (-0.09 to 0.7 MPa, 0.35 MPa reference)		
Response time *5			50 msec. or less										
Analog Output *6	❺	J	1 to 5 V voltage output (connecting load impedance 50 kΩ or more)										
		K	4-20 mA current output (connecting load impedance 0 to 300 Ω)										
Power supply voltage *7		J	12 to 24 VDC (10.8 to 26.4 V) ripple rate 1% or less										
		K	24 VDC (21.6 to 26.4 V) ripple rate 1% or less										
Current consumption *8			45 mA or less										
Lead wire			ø3.7 AWG26 or equivalent × 4-conductor, insulator outer diameter ø1.0										
Degree of protection *9			IP65Equivalent										
Protection circuit *10			Power reverse connection protection										
EMC Directive			EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8										
Mounting		Mounting orientation *11	Unrestricted in vertical/horizontal direction										
		Straight piping section *12	Not required										
Weight			Refer to P. 303.										

*1: The value converted to volumetric flow rate at standard condition (20°C 1 barometric pressure (101 kPa) 65% RH)
(Conditions for gas-types other than air are 20 °C, 1 barometric pressure (101 kPa), relative humidity 0%)

*2: Use dry gas which does not contain corrosive elements such as chlorine, sulphur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air that complies with ISO 8573-1 2010 Class 1.1.1 to 1.6.2. Compressed air from the compressor contains drainage-water, oil oxide, foreign substances, etc. To maintain the function of this product, a filter, air dryer (min. pressure dew point 10°C or less), and oil mist filter (max. oil content 0.1 mg/m³) for operation. (Refer to P. 347 for details on recommended circuit.) The sensor for oxygen gas is a custom model. To prevent ignition accidents, do not allow oxygen to flow again when it has been used on fluids other than oxygen to flow even once.

*3: Accuracy is based on a CKD standard flow rate meter. It does not indicate absolute accuracy. Repeatability, temperature characteristics, and pressure characteristics are not included for an accuracy of ± 3%F.S. Consider separately according to the working environment and working conditions.

*4: Repeatability is calculated during a short period of time. Change over time is not included. (Refer to the product specifications for details.)

*5: The actual response time changes depending on the piping conditions.

*6: The output impedance of the analog output section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.

*7: The power supply voltage specifications differ for the voltage output type and current output type.

*8: Current for when 24 VDC is connected, and no load is applied. Please note that the current consumption changes depending on the load connection status.

*9: Be sure to read the precautions in "Working environment" on Page 347 and "ATEX compatible" on P. 352.

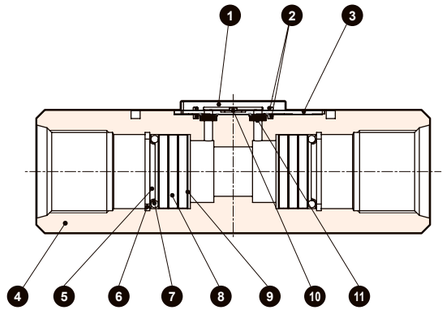
*10: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.

*11: This product measures changes in heat distribution that are caused by flow. If installed vertically, the heat distribution may change due to the effect of convection, and the zero point may be shifted.

*12: Piping conditions may affect accuracy. For more accurate measurements, use a straight pipe with a ten-times greater internal diameter. With the 500 L/min and 1,000 L/min models, use piping with an internal diameter of 9 mm or more. If it is less than 9 mm, accuracy may be negatively affected.

Internal Structure Diagram / Material

●Bar display FSM3-B



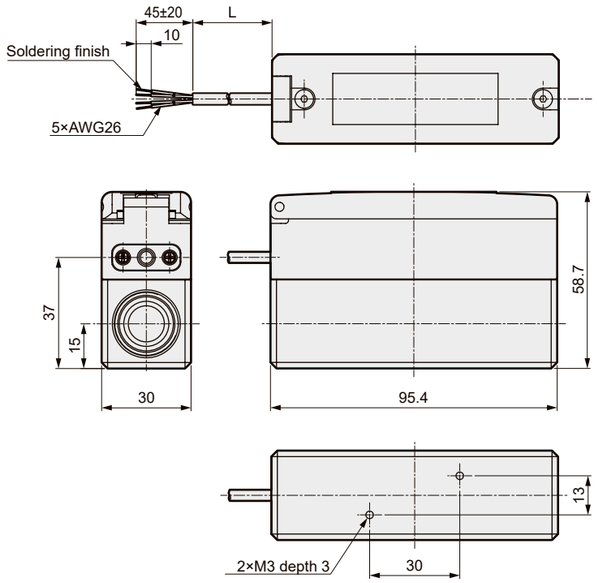
Part No.	Part name	Material		Part No.	Part name	Material	
1	Sensor cover	SUS316 or equivalent	Stainless steel	7	O-ring	FKM	Fluoro rubber
2	Gasket	FKM	Fluoro rubber	8	Spacer	SUS304	Stainless steel
3	Sensor board	—	Aluminum	9	Filter	SUS304	Stainless steel
4	Sensor body	SUS316L	Stainless steel	10	Sensor chip	—	Semiconductor silicon
5	O-ring holder	SUS304	Stainless steel	11	Filter	SUS304	Stainless steel
6	C-snap ring	SUS304	Stainless steel				

Product weight

[Unit: g]

Port size		Weight
Code [4]	Description	
AA	Rc1/8 Straight	740
BA	Rc1/4 Straight	680
CA	Rc1/2 Straight	580
AF	G1/8 Straight	740
BF	G1/4 Straight	680
CF	G1/2 Straight	580
AC	NPT 1/8 Straight	740
BC	NPT 1/4 Straight	680
CC	NPT 1/2 Straight	580

Dimensions

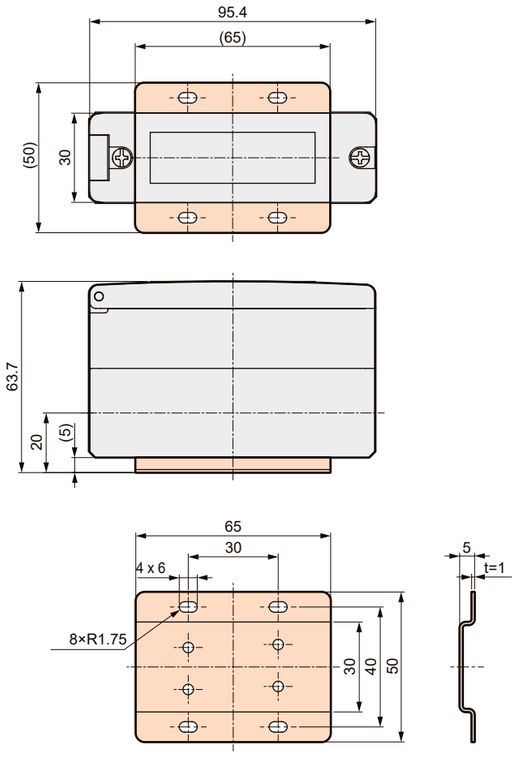


[Lead wire length]

Lead wire code	L dimensions
C	1000±20
D	3000±20

Optional dimensions

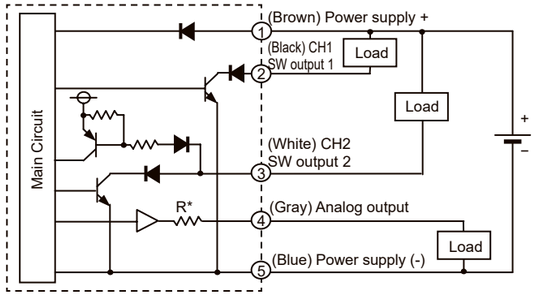
●FSM3-J
Bracket 2



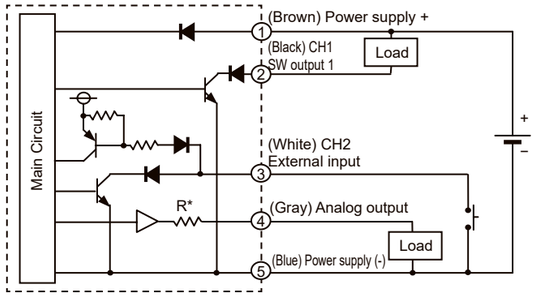
Example of internal circuit and load connection

●FSM3-L□□□□□B/F/□□ (LCD display type NPN output)

[When using CH2 as SW output]



[CH2 is used as external input]

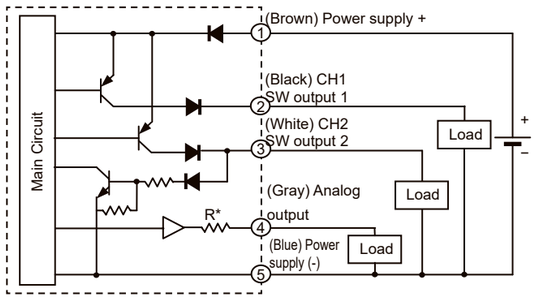


*Analog output voltage output R: approx. 1 kΩ
Current output R: approx. 100 Ω

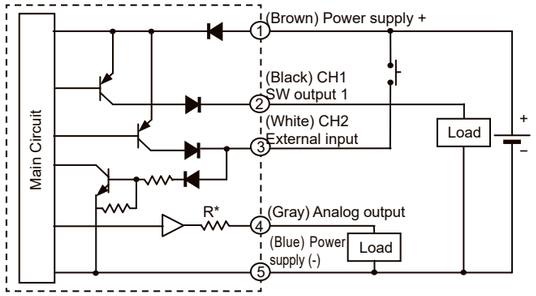
Terminal No.	Lead wire color	Name
①	Brown	Power supply (+) (voltage output: 12 to 24 V, current output: 24 V)
②	Black	CH1 (switch output 1:max 50 mA)
③	White	CH2 (switch output 2: max. 50 mA or external input)
④	Gray	Analog Output Voltage output: 1 to 5 V load impedance 50 kΩ or more Current output: 4-20 mA load impedance 300 Ω or less
⑤	Blue	Power supply - (GND)

●FSM3-L□□□□□D/H/□□ (LCD display type PNP output)

[When using CH2 as SW output]



[CH2 is used as external input]

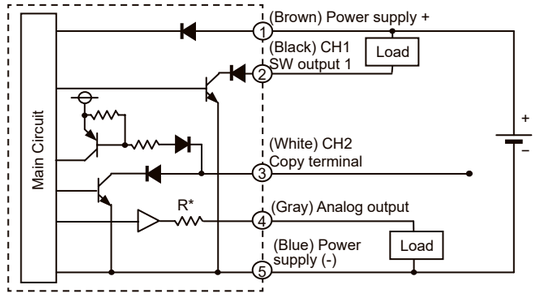


*Analog output voltage output R: approx. 1 kΩ
Current output R: approx. 100 Ω

Terminal No.	Lead wire color	Name
①	Brown	Power supply (+) (voltage output: 12 to 24 V, current output: 24 V)
②	Black	CH1 (switch output 1:max 50 mA)
③	White	CH2 (switch output 2: max. 50 mA or external input)
④	Gray	Analog Output Voltage output: 1 to 5 V load impedance 50 kΩ or more Current output: 4-20 mA load impedance 300 Ω or less
⑤	Blue	Power supply - (GND)

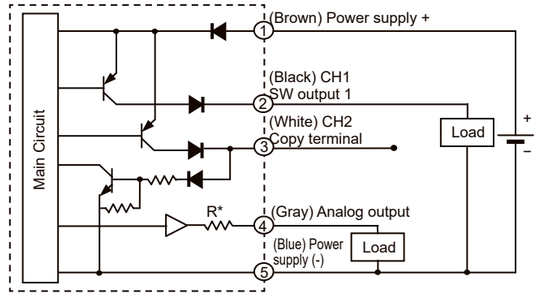
Example of internal circuit and load connection

●FSM3-L□□□□□A/E/□□
(LCD display, NPN output, with setting copy function)



*Analog output voltage output R: approx. 1 kΩ
Current output R: approx. 100 Ω

●FSM3-L□□□□□C/G/□□
(LCD display, PNP output, with setting copy function)

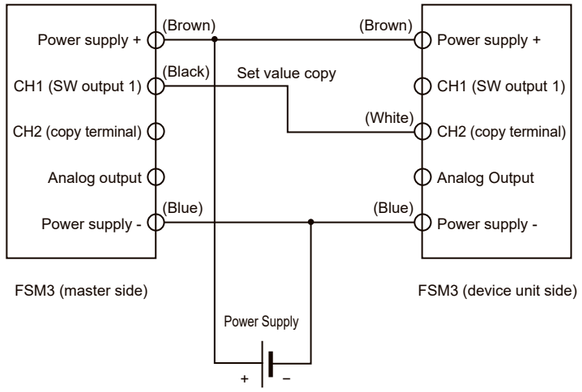


*Analog output voltage output R: approx. 1 kΩ
Current output R: approx. 100 Ω

Terminal No.	Lead wire color	Name
①	Brown	Power supply (+) (voltage output: 12 to 24 V, current output: 24 V)
②	Black	CH1 (switch output 1:max 50 mA)
③	White	CH2 (copy terminal)
④	Gray	Analog Output Voltage output: 1 to 5 V load impedance 50 kΩ or more Current output: 4-20 mA load impedance 300 Ω or less
⑤	Blue	Power supply - (GND)

●FSM3-L□□□□□A/C/E/G/□□ (LCD display, with setting copy function)

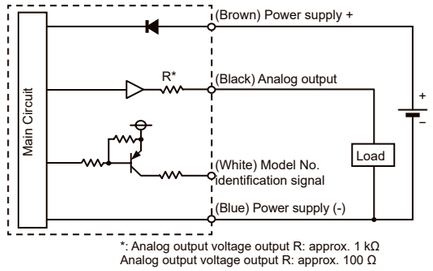
[When using the setting copy function]



Connect CH1 (SW output 1) on the master side to CH2 (copy terminal) on the device unit side and power ON the sensor to use the setting copy function (F93). Note that this connection can only be used when using the setting copy function. As in the above load connection example, if copying is performed with the load connected to CH1 or the switch is operated with CH1 and CH2 connected, the device may operate unexpectedly or the device and NS-QFS may breakdown. Never use the product while connected to the copy terminal.

Example of internal circuit and load connection

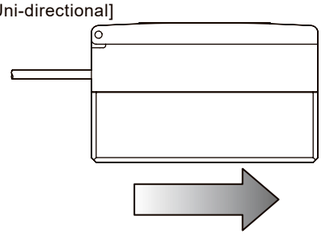
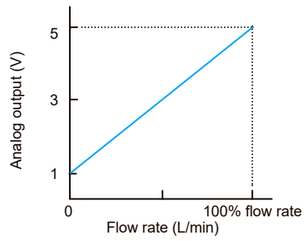
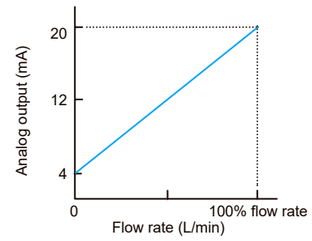
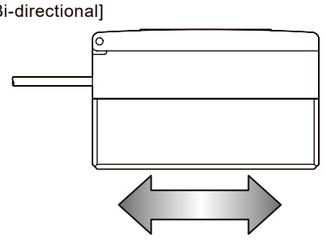
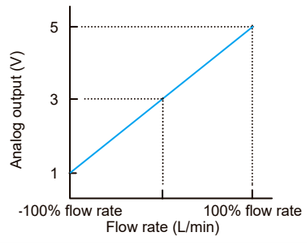
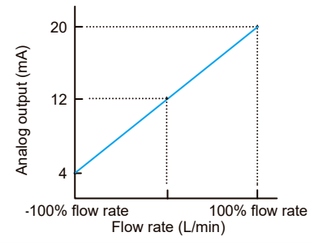
●FSM3-B□□□□□J/K/□□ (bar display)



*: Analog output voltage output R: approx. 1 kΩ
Analog output voltage output R: approx. 100 Ω

Terminal No.	Lead wire color	Name
①	Brown	Power supply (+) (voltage output: 12 to 24 V, current output: 24 V)
②	Black	Analog Output Voltage output: 1-5 V Load impedance 50 kΩ and over Current output: 4-20 mA Load impedance 300 Ω or less
③	White	Model identification signal: do not connect when using as a single unit
④	Blue	Power supply - (GND)

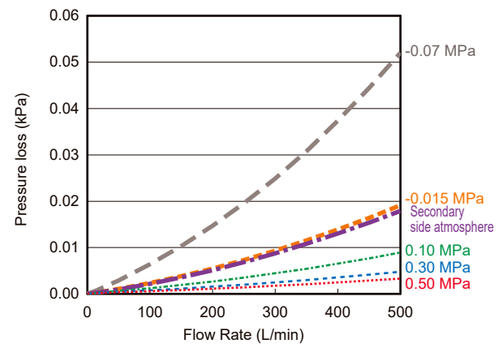
Analog output characteristics

Flow direction	Voltage output	Current output
[Uni-directional] 		
[Bi-directional] 		

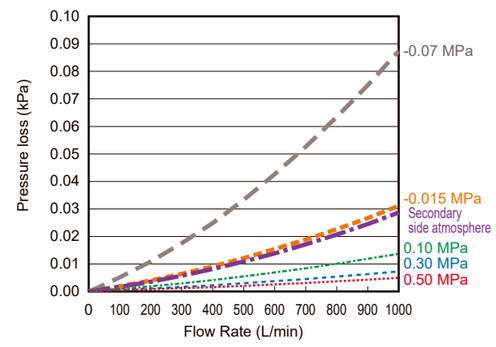
*1: The full scale of the uni-directional-type is 0 to 100%, and full scale of the bi-directional-type is -100% to 100%. With the integrated display bi-directional type, output can be changed to uni-direction. The value after switching is a reference value. Refer to P. 345 for details.
*2: Refer to P. 329 for analog output when carbon dioxide is switched to.
*3: Analog output is available even outside the measurement flow rate range. Although the accuracy is not guaranteed, the lower and upper limits for voltage can be output at about 0.6 V and 5.4 V, respectively, and the lower and upper limits for current can be output at about 2.4 mA and 21.6 mA, respectively. For bi-direction, the lower and upper limits for voltage can be output at about 0.8 V and 5.2 V, respectively, while the lower and upper limits for current can be output at about 3.2 mA and 20.8 mA, respectively.

Pressure loss characteristics (air)

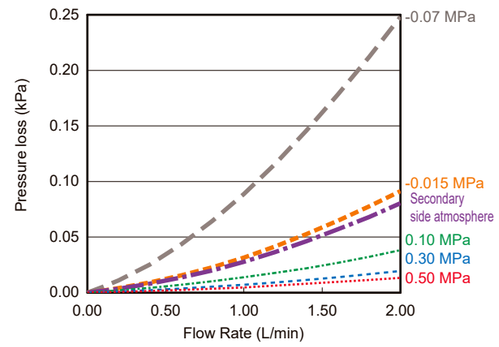
FSM3-□005U4□



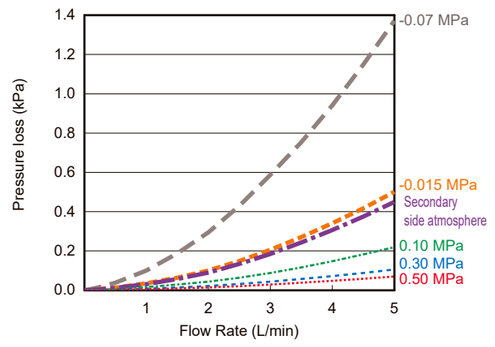
FSM3-□010U4□



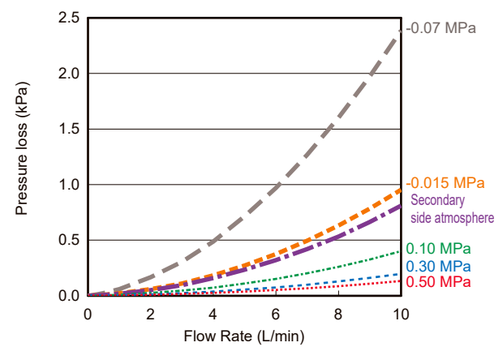
FSM3-□020U4□



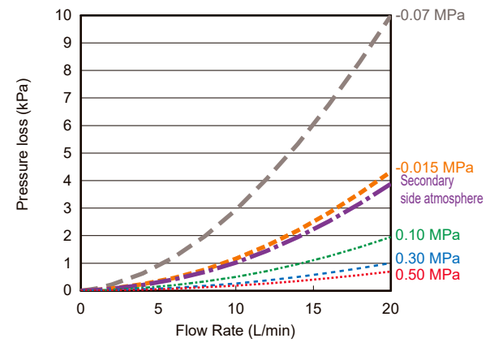
FSM3-□050U4□



FSM3-□100U4□



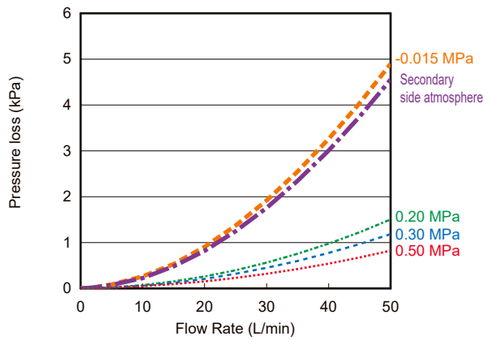
FSM3-□200U4□



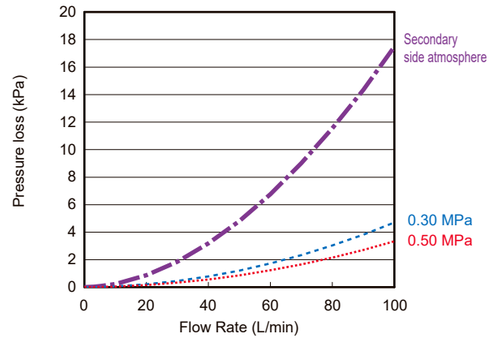
The graphs show data for air. For gases other than air, multiply by the following specific gravity as a guideline.
Argon: 1.38, carbon dioxide: 1.53, argon 80% + carbon dioxide 20%: 1.41, oxygen: 1.11

Pressure loss characteristics (air)

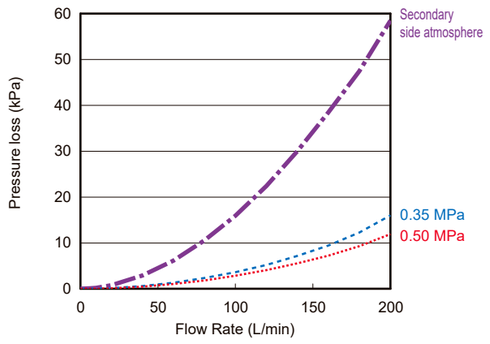
FSM3-□500U4□



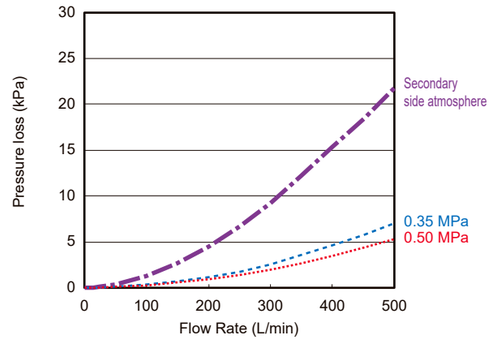
FSM3-□101U4□



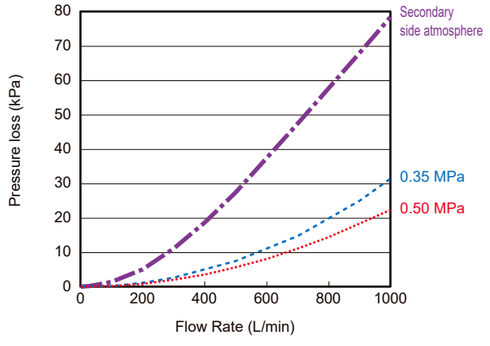
FSM3-□201U4□



FSM3-□501U4□



FSM3-□102U4□



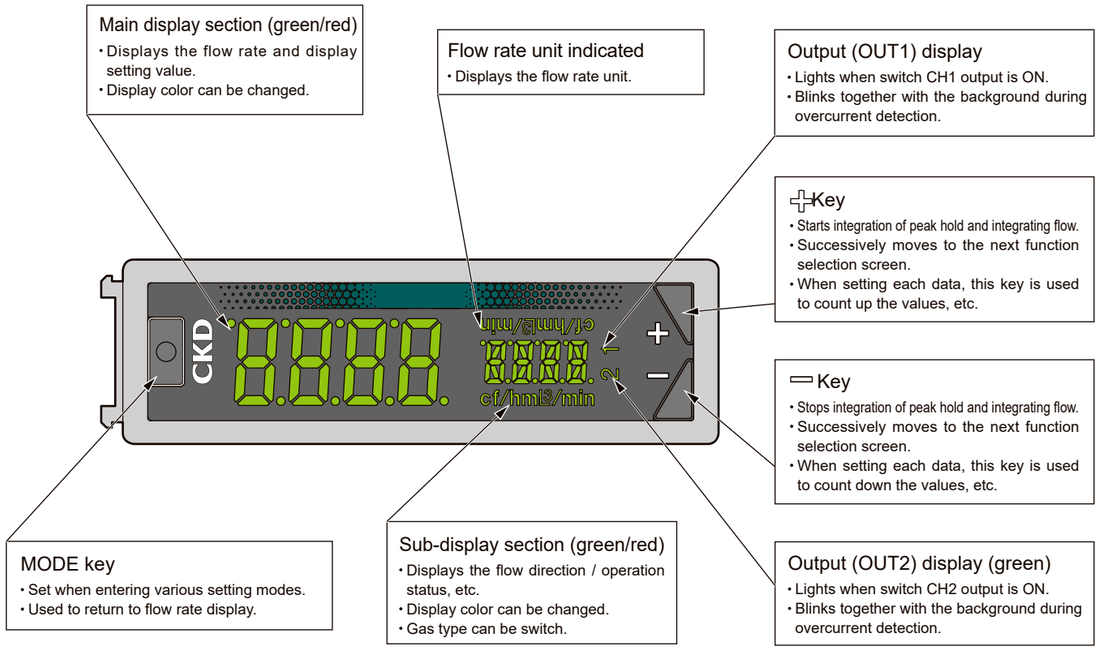
The graphs show data for air. For gases other than air, multiply by the following specific gravity as a guideline.
Argon: 1.38, carbon dioxide: 1.53, argon 80% + carbon dioxide 20%: 1.41, oxygen: 1.11
(Excluding flow rate range (full scale flow rate) 501 and 102)

MEMO

Flow rate sensor
Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit
Ending

Names and functions of display/operation section (LCD display)

●Indicator section name



Names and functions of display/operation section (LCD display)

The function and various settings may be performed during normal flow rate display or after entering each mode.
The modes are also divided into Maintenance mode, SET mode, and Setting Monitor mode according to the frequency of use.

●Normal Operation (RUN mode)

Item	Explanation	Default setting
Instantaneous flow rate display	Indicators the instantaneous flow rate.	Indicator (measurement)
Peak hold function	Max. and min. values for the flow rate within a set interval are displayed.	Hidden (Stopped)
CO_2 Discharge rate display	By setting the power, discharge pressure, and flow rate of the compressor, as well as the power ↔CO_2 conversion coefficient, you can learn how much CO2 is being discharged. (reference value obtained by calculation) This is available only when the gas-type is set to air.	Hidden (Stopped)
Accumulated flow display	The accumulated flow can be displayed. The switch output function includes a function to turn the switch ON/OFF at a level higher than the recommended cumulative value, and an integrated pulse function to output the pulse at a set cumulative value.	Non-display (measurement)

●SET mode

No.	Item	Explanation	Default setting
F.01	Selection of CH1 operation	Select the CH1 feature. Switch output operation and integrated pulse settings can be set.	No switch output
F.02	Selection of CH2 operation	Select the CH2 feature. Select whether to use CH2 as a switch output, or to use as an external input (integrated value reset/auto reference).	No switch output
F.03	Integrating function settings	You can choose to acquire integrating flow values consecutively or at set times. You can also choose to keep the data or not.	Continuous acquisition: Data hold OFF
F.04	Sub-screen display setting	Sets the display method for the sub-display. The display can be switched to "flow direction", "reference state", "gas type", or "numbering display".	Flow direction
F.05	Indicator color setting	Set the display color. (red, green) Display color can be set for normal display and when switch output is ON.	At normal: Green At switch ON: Red
F.06	Flow rate direction setting (Bi-directional only)	Setting the flow direction. Setting available for bi-directional, one-sided forward direction or one-sided reverse direction.	Bi-direction
F.07	Indicator inversion function	The LCD display can be vertically inverted.	Standard display
F.08	Reference state setting	Select from the standard state or reference state. Standard condition (ANR): flow rate converted to volume at 20°C, 1 atm, 65%RH (For gas-types other than air: 20 °C, 1 barometric pressure, 0% RH) Reference condition (NOR): flow rate converted to volume at 0°C, 1 atm, 0% RH	ANR
F.09	Unit setting (For overseas only)	The units can be set. Can be selected from L/min, cf/h (cf/min).	Domestic model: L/min Overseas model: L/min
F.10	Indicator cycle setting	The digital display refresh cycle can be set in three stages from 0.25 sec to 1 sec. If the display flickers, it can be improved by increasing the display refresh cycle.	0.5 sec
F.11	Analog output Setting response time	Set the response time. The response can be set in seven steps from 0.05 sec to 1.50 sec. Chattering and mis-operation caused by sudden flow rate changes or noise are prevented.	0.05 sec
F.12	Numbering setting	You can set the numbering.	0000
F.13	Gas switching	The measured gas can be switched. (Model with full scale flow rate of 200 L/min or below) (O_2 The gas type cannot be switched.)	Air
F.14	Setting ECO mode	An ECO mode can be set. If the buttons are not operated for approx. 1 minute, the eco mode will activate and turn OFF the display's backlight. Current consumption can be reduced with this mode.	OFF
F.15	CO_2 Discharge rate calculation setting	CO_2 The discharge rate calculation can be set. Power, discharge pressure, flow rate, C of the compressor O_2 Set the conversion factor.	• Power: 0.20 KW • Pressure: 0.10 MPa • Flow rate: 100 L/min • Conversion factor: 0.000kg (CO_2) / kwh
F.16	Lock setting	Key lock method and PIN method can be set. Use selectively depending on the working environment.	OFF
F.17	Peak hold setting	You can choose to acquire peak bottom values consecutively or at set times. You can also choose to keep the data or not.	Continuous acquisition: Data hold OFF

●Maintenance mode

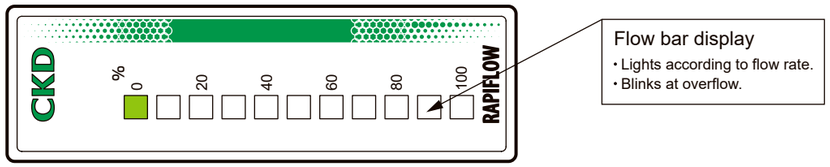
No.	Item	Explanation	Default setting
F.91	Forced output function	Forces the switch output to turn ON and is used to check the initial operation of wiring connections and input devices.	-
F.92	Zero adjustment	The zero point deviation is compensated.	Adjust value: 000
F.93	Setting copy function	Set values can be copied if the model supports copying between two FSM3's. (Copying is only possible between products with the same model No.)	-
F.99	Reset function	Returns the settings to the default settings.	-

●Setting Monitor mode

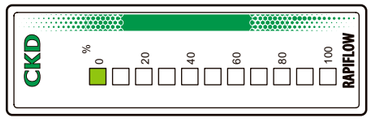
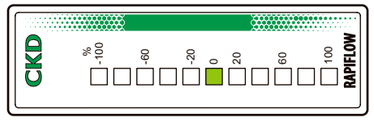
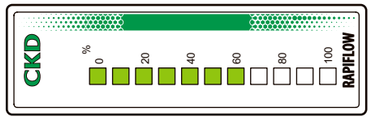
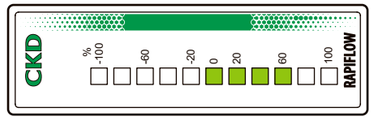
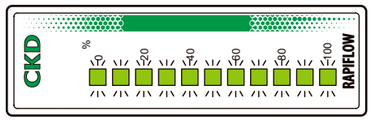
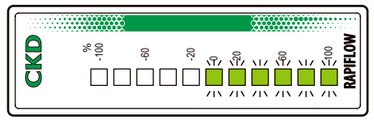
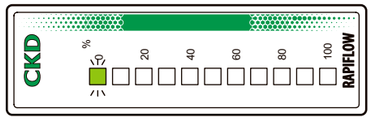
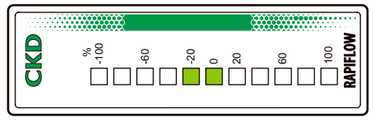
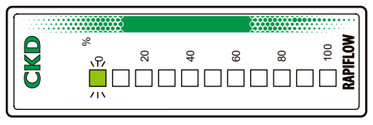
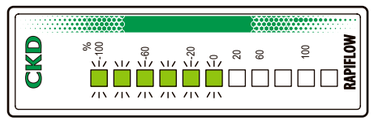
Item	Explanation	Default setting
Settings monitor function	You can check the settings made in the SET mode. (Setting details cannot be edited.)	-

Names and functions of display/operation section (bar display-type)

●Indicator section name



[Display example] Display for FSM3-B101□□□□□□□.

Flow rate	Uni-direction	Bi-directional
0		
60 (Forward direction)		
+110% (Forward direction) Blinks at overflow. *Blinks at +110%F.S. and over.		
-10% (Reverse direction)		
-110% (Reverse direction)		

Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

Product-specific cautions: Compact flow rate sensor FSM3 Series Environment-resistant specifications

Design / Selection

Working fluids

DANGER

■Never use this product with flammable fluids.

WARNING

■This product cannot be used as a billing meter. Do not use this product for commercial transactions as it is not compliant with the Measurement Act. Intended applications include industrial sensors.

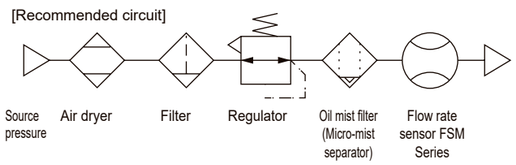
■Do not use fluids which are not applicable.

■Use dry gas which does not contain corrosive elements such as chlorine, sulfur or acids, and which is clean and does not contain dust or oil mist.

■When installing the product during piping or fitting assembly, use the above clean gas for the fluid used to blow out for cleaning. Check that foreign matter does not enter the product from the port of the product. When using compressed air in this process, use clean air compliant with the air quality listed in the following item (ISO 8573-1 Class 2010 1.1.1 to 1.6.2).

■When using compressed air, use clean air that complies with ISO 8573-1 2010 Class 1.1.1 to 1.6.2. Since compressed air from the compressor contains drainage (water, oil oxides, foreign matter, etc.), attach a filter, an air dryer and an oil mist filter (Micro-mist separator) to the primary side (upstream) of the sensor. The sensor's mesh rectifies flow in the pipe. It does not filter out foreign matter, so provide a filter.

[Recommended circuit]



■Depending on the fluid, retaining the fluid for long periods could adversely affect the performance. Do not seal the fluid in the pipe for long periods of time.

■Working pressure/flow rate range
Applications exceeding the max. working pressure and specified flow rate range may result in breakdown. Use this product only within the specified range. If energized in a vacuum state of -0.09 MPa or less, the sensor's heat dissipation will suffer, leading to degradation of the sensor.

■When using a valve on the primary side of the sensor, use only valves with oil-prohibited specifications. This sensor could malfunction or fail if exposed to splattering grease, oil, etc. As friction powder may be generated depending on the valve, mount a filter to prevent the powder from entering the sensor.

■The sensor for oxygen gas is a custom model. To prevent ignition accidents, treat the inside of the flow paths on oxygen models in accordance with oil free specifications. Do not allow oxygen to flow again when it has been used on fluids other than oxygen to flow even once.

■When using liquefied gas such as carbon dioxide, always vaporize it first. Failure may result if liquefied gas enters the product.

Working environment

DANGER

■Flammable environment
Refer to "ATEX Compliance" on P. 352 for safety precautions.

WARNING

■Corrosive environment
Do not use this product in an atmosphere containing corrosive gases such as sulfur dioxide.

■Ambient/fluid temperatures
Use at ambient/fluid temperatures within the specified range of 0 to 50°C. Even if the temperature is within the specified range, do not use this product if the ambient temperature and fluid temperature could suddenly change and cause dew to condense.

■ Degree of protection

The degree of protection of this product is equivalent to IP65. This product employs a dust-proof, waterproof structure that provides reliability during maintenance and cleaning, during which it may be exposed to water splashing. Note that this product cannot be used in environments where it will be constantly exposed to water, or in water or where water or oil may exude violently. Also refer to the precautions regarding "explosion-proof structures and protective structures" on Page 351 for design and selection.

Flow rate unit

⚠CAUTION

■ This product's flow rate is measured at a mass flow rate unaffected by temperature or pressure. The unit is L/min, but this is the display when the mass flow rate is converted to volumetric flow rate at 20°C 1 atmosphere (101 kPa) relative humidity 65%RH. (Conditions for gas-types other than air are 20°C, 1 barometric pressure (101 kPa), relative humidity 0%)

Overflow

⚠CAUTION

■ With each series, no problem will occur in the sensor, even in an overflow double the measured range. If dynamic pressure is applied near the maximum working pressure (when a pressure difference exceeding the max. working pressure is applied between primary and secondary sides), a problem could occur with the sensor. When dynamic pressure is applied, such as when filling a workpiece for leakage inspection, be sure to provide a bypass circuit or a squeezer to prevent dynamic pressure from being applied to the sensor.

Use for suction confirmation, etc.

⚠CAUTION

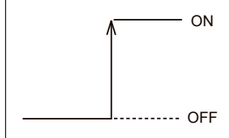
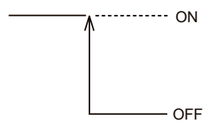
■ Mount an air filter upstream from suction in compliance with the working status to prevent the entry of foreign matter.

■ Use the product under conditions where no condensation occurs in the piping, taking into consideration the dew point of the atmosphere and the ambient temperature of the product.

■ Select the flow rate range based on the operating vacuum pressure and suction nozzle.

■ Response speed may be delayed by the piping volume between the suction nozzle and this product. In this case, take countermeasures to reduce piping capacity.

■ When the suction confirmation sensor is switched from a pressure sensor (switch) to a flow rate sensor (switch), sensor output (switch output) logic will be reversed. (Refer to the drawing below.)
Note that the PLC sequence program must be changed or revised. If source pressure or vacuum source is not supplied when device power is turned ON, "flow rate 0" = "sensor output (switch output) ON" status is set at the flow rate sensor (switch). Check that this occurs with the PLC sequence program, etc.

Suction confirmation	Pressure sensor (switch)	Flow rate sensor (switch)
	ON at setting value or more	ON at setting value or less
		

Piping

⚠CAUTION

■ Do not install a pressure reducing valve (regulator), solenoid valve, etc. immediately before this product. Deflected currents may occur and cause errors. Provide a straight pipe with approx. 10 times the bore size when necessary.

■ Be sure to connect a fitting even when using with the OUT side opened. The port filter could come off.

■ Do not rotate fittings while fluid pressure is still applied to this product. The sealant parts could seize or wear, leading to external leakage.

■ Establish the installation method, piping order, and fitting assembly method from the design stage before use. Check that sealing tape, sealant, and foreign matter do not enter the product during installation and fitting assembly. In particular, freshly piped sections may contain unexpected foreign matter. Be sure to discharge air with air blow, etc., before installing this product.

Mounting

⚠CAUTION

■ The LCD display flow rate meter uses a liquid crystal display. This may be difficult to read depending on the angle.

■ Do not install multiple product bodies in close contact. The generation of heat on each part could cause the product's temperature to rise, hastening changes in characteristics or deterioration of the resin material. When using the products in a row, set intervals of distance of 10 mm and over.

■ Although the mounting is "unrestricted in vertical/horizontal direction", the flow rate may vary depending on difference in the mounting orientation or piping conditions.

Wiring

⚠WARNING

■ Install the product and wiring as far away as possible from sources of noise such as power distribution wires. Provide separate countermeasures for surge applied to the power cable. The display or output could fluctuate.

■ The output impedance of the analog output section is approx. 1 kΩ. If the impedance of the connecting load is small, output error increases. Check error with the impedance of the connecting load before using. (The analog/current output type is excluded.)

Example of calculation

(FSM3-voltage output impedance: Ro = 1kΩ
Load internal impedance: Rx = 1 MΩ

$$\text{Output value} = \left(1 - \frac{Ro}{Ro + Rx}\right) \times 100\%$$

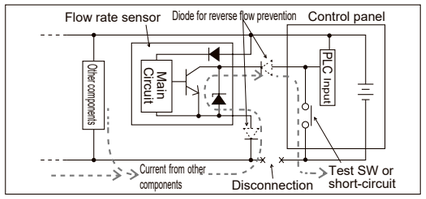
$$= \left(1 - \frac{1\ k\Omega}{1\ k\Omega + 1\ M\Omega}\right) \times 100\% \quad \text{Output value error} \Rightarrow \text{approx. } 0.1\%$$

■ Use a DC stabilized power supply within the specified rating, insulated from the AC power supply. A non-isolated power supply could result in electrical shock. If power is not stabilized, the peak value could be exceeded. This could damage the product or impair accuracy.

■ The power supply is a DC stabilized power supply completely isolated from the AC primary side. Connect either the + side or - side of the power to the FG. Between the internal power circuit and metal body, a varistor (limit voltage approx. 40 V) is connected to prevent dielectric breakdown of the sensor. Do not conduct a withstand voltage test or insulation resistance test between the internal power circuit and metal body. Disconnect wiring first if this testing is required. An excessive potential difference between power and metal body will burn internal parts. An excessive potential difference between the power supply and product housing will burn internal parts. After installing, connecting and wiring the unit, electrical welding of the device/frame, short-circuit accidents, etc., could cause welding current, excessively high voltage caused by welding, or surge voltage, etc., to run through the wiring, ground wire, or fluid path connected between the above devices, damaging wires or devices. Conduct any work such as electrical welding after removing this device and disconnecting all electric wires connected to the FG.

■ Check that stress (10 N and over) is not directly applied to lead wire leadouts.

■Pay attention to reverse currents caused by disconnected wires and wiring resistance. If other devices, including a flow rate sensor, are connected to the same power supply as the flow rate sensor, and the switch output wire and power cable negative (-) side are short-circuited to check the operation of the control panel input unit, or if the power cable negative (-) side is disconnected, reverse current could flow to the flow rate sensor's switch output circuit and cause damage.



■Take the following measures to prevent damage caused by reverse current:

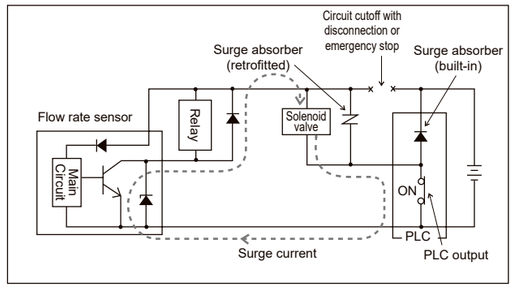
①Avoid centralizing current at the power cable, especially the minus side power cable, and use as thick a cable as possible.

②Limit the number of devices connected to the same power source as the flow rate sensor.

③Insert a diode parallel to the flow rate sensor's output line to prevent reverse current.

④Insert a diode parallel to the flow rate sensor power wire's negative (-) side to prevent reverse current.

■Pay attention to surge current flow-around. When flow rate sensor power is shared with an inductive load that generates surges, such as a solenoid valve or relay, if the circuit is cut off while the inductive load is functioning, surge current could enter the switch output circuit and cause damage depending on where the surge absorber is installed.

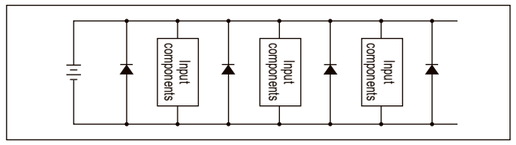


Take the measures below to prevent damage from sneak surge current.

①Separate the power supply for output including the inductive load, such as the solenoid valve and relay, and input, such as the flow rate sensor.

②If a separate power supply cannot be used, directly install a surge absorption element for all inductive loads. Consider that the surge absorber connected to the PLC, etc., protects only the individual device.

③Connect a surge absorber to places on the power wiring shown in the figure below, as a measure against disconnections in unspecified areas.



When the devices are connected to a connector, the output circuit could be damaged by the above phenomenon if the connector is disconnected while the power is ON. Turn power OFF before connecting or disconnecting the connector.

Other

⚠WARNING

■CE-compliance working conditions
This product is CE-marked, indicating conformity with the EMC Directives. The standard for the immunity for industrial environments applied to this product is EN61000-6-2; the following requirements must be satisfied in order to conform to this standard:
Conditions
- The evaluation of this product is performed by using a lead wire that has a power supply line and a signal line paired to assess the product's performance.
- This product is not equipped with surge protection. Implement surge protection measures on the system side.

■Output accuracy is affected by self-heating due to energization as well as temperature characteristics. Provide a standby time (5 minutes or more) after turning the power ON for use.

■Immediately after power is turned ON, flow rate detection switch operation is not performed for approx. 5 seconds to complete self-diagnosis. Provide a control circuit/ program that ignores signals for at least two seconds after power is turned ON.

⚠CAUTION

■The flow path is not completely free of dust generation, so if dust generation is a problem, a final clean filter should be used in conjunction.

■If the actual flow rate is fluctuating, the measured flow rate value also fluctuates. Increase the FSM3 display cycle or response time, or average the analog output on the device. In particular, using a circuit that opens and closes the control valve such as a solenoid valve frequently in a short time or near a pump is likely to cause damage.

■Measuring the pulsating flow rate may cause errors in the measured flow rate. Use the fixed orifice and needle valve, etc., to restrict the flow rate and set the laminar flow state (normal flow without irregular fluctuations).

■The flow rate measured with the gas switching function is a reference value calculated inside the product based on the converted value. Accuracy other than in air mode is a guideline.

■This product uses a micro-sensor chip, and must be installed where it will not be subject to dropping, impact or vibration. Handle this product as a precision component during installation and transportation.

■Use the product within the rated flow range.

■Use within the working pressure.

■Analog output continues even if the flow rate range is exceeded. With the LCD display, "Hi" or "Lo" will be displayed. With the bar display, the bar display will blink. Note that this is outside the guaranteed precision.

■The accuracy may vary from the initial status depending on the working environment or working conditions. It is recommended to check the operation of the product periodically.

■Since the sensor chip will change its detection flow rate due to deterioration after prolonged use, periodic inspections should be performed.

■The explosion-proof and protective structures function with the protective cover (transparent cover) correctly attached. Regularly confirm that the cover bolt (M3) for fixing the protective cover is tightened to the following torque. Also, when opening and closing the protective cover, make sure that there is no floating or displacement of the protective cover and that there is no adhered foreign matter, etc., on the seal surface. Tighten and fix with the following torque.
Cover bolt tightening torque: 0.6 N·m ±10%

ATEX Compliance

■ The following are supported.
II3 G Ex ec II C T6 Gc 0°C ≤ Ta ≤ 50°C

■ Working conditions
1) There is a risk of static electric discharge. Attach to grounded metal and wipe with a wet cloth.
2) Use in a clean environment with a contamination level of 2 or more.
3) This product's cable fixing parts do not have sufficient fixing functions. Provide the cable with an additional retainer function to ensure that tension is not transmitted to the end when using.
4) The protective cover of this product can be opened and closed, but it has an explosion-proof structure only when the protective cover is closed and the cover bolt is tightened with the specified torque. Cover bolt tightening torque: 0.6 N·m±10%

■ Fluid temperature rating
The temperature of the fluid measured for explosion-proof specifications is 50°C.

■ ATEX command 2014/34/EU
EN standards for explosive atomosheres
EN IEC 60079-0:2018
EN IEC 60079-7:2015/A1:2018

⚠ WARNING
■ Do not remove or insert cables while energized in an explosive atmosphere.
■ Do not loosen the cover bolt while energized in an explosive atmosphere. Also, do not open the protective cover.
■ Do not disassemble or modify the product.

⚠ CAUTION
■ The separated display (FSM2-D) is not compliant with the ATEX standard.
When using the separated display (FSM2-D) together, install it outside the explosive atmosphere.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual

MEMO

Compact flow rate sensor Separated display

RAPIFLOW® FSM2-D

■ Flow rate sensor



CONTENTS

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Safety Precautions 366

Flow rate sensor

Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit



Compact flow rate sensor (RAPIFLOW)

FSM2-D Series

Separated display

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

FSM2 - D - N V - 3 P

- FSM2: Model No.
- N: ❶Output
- V: ❷Analog output
- 3: ❸Lead wire
- P: ❹Bracket

Note: The corresponding sensor is the voltage output (1-5 V)-type. If the current output-type or other voltage output-type is connected, it will not operate properly. When using FSM3, Use the bar display voltage output.

❶Output

Code	Description
N	Switch output (NPN) 2 points, analog output 1 point
P	Switch output (PNP) 2 points, analog output 1 point

❷Analog output

Code	Description
V	Voltage output (1 to 5 V)
A	Current output (4 to 20 mA)

❸Lead wire

Code	Description	
Blank	None	
1	1 m	
3	3 m	

❹Bracket

Code	Description	
Blank	None	
P	Panel mounting kit	

Clean-room specifications (Catalog No. CB-033SA)

FSM2-D - · · · · - P70

Model No. Notation for Options

●Sensor connection connector (e-con) 5 sets

FSM2-EC

●5-conductor lead wire 1 m

FSM3-A

●5-conductor lead wire 3 m

FSM3-B

●Panel mounting kit

FSM3-K

Specifications

Item				Separated display FSM2-D-[❶] [❷]-[❸] [❹]
Settable flow rate range *1			mL	5, 10, 50, 100, 500, 1000
			L	2, 4, 5, 10, 12, 20, 25, 32, 50, 100, 200, 500, 1000
			m³	1.5
Operating ambient temperature / humidity				0 to 50 °C
Indicator type				4 digit + 4 digit 2 color LCD
Input voltage				1 to 5 V
Output	Switch Output	❶	N	Output 2 points (NPN open collector output, 50 mA or less, voltage drop 2.4 V or less)
			P	Output 2 points (PNP open collector output, 50 mA or less, voltage drop 2.4 V or less)
	Analog Output	❷	V	1 to 5 V voltage output 1 point (connecting load impedance 50 kΩ and over) *5
			A	4 to 20 mA current output 1 point (connecting load impedance 0 to 300 Ω)
Power supply voltage		❷	V	12 to 24 VDC (10.8 to 26.4V)
			A	24 VDC (21.6 to 26.4V)
Current consumption *2				40 mA or less (when 24 VDC is connected, and no load is connected)
Lead wire				ø3.7, AWG26 or equivalent x 5-conductor (connector), insulator O.D. 1.0
Functions				Flow rate display, flow rate display peak hold, switch output, analog output
Degree of Protection				IEC standards IP40 or equivalent
Protection circuit *3				Power reverse connection protection
EMC Directive				EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8
Accessory				1 connector for sensors (e-con), compatible cable AWG 24 to 26,insulated outside diameter 1.0 to 1.2
Weight (main body only)				Approx. 40 g

*1:FSM3 The flow rate range, flow direction and gas type are automatically recognized only when the bar display is connected. (Default state)
The FSM-H Series, FSM-V Series and WFK3000 Series flow rate ranges are supported, but automatic recognition is not. Always set the product's flow rate range, flow direction and gas before use. The connectable flow rate ranges are shown in "Display by flow rate range" below. The "Gas Type Setting" function of this product is not a "Gas Type Switching" function that switches the sensor characteristics to match the gas type.
If a “Gas-type Switching” function is required, use the LCD display-type.
When the sensor section is changed, the previous flow rate range settings, etc., will still be recorded. Always reset the settings before using.
*2: Current for when 24 VDC is connected, and no load is connected. Please note that the current consumption changes depending on the load connection status.
*3: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.
*4: When connecting to the FSM-V Series or WFK3000 Series, the lead wire size is different so a separate compatible sensor connector (e-con) will be required. Contact your nearest CKD Sales or dealer. The attached sensor connector (e-con) can be used with the FSM2 Series, FSM3 Series and FSM-H Series.
*5: The output impedance of the analog output section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.
*6: FSM3 bar display When connected to oxygen specifications, the gas display will be "Ai" (air, N2), but this does not constitute a problem for use.

Display by flow rate range

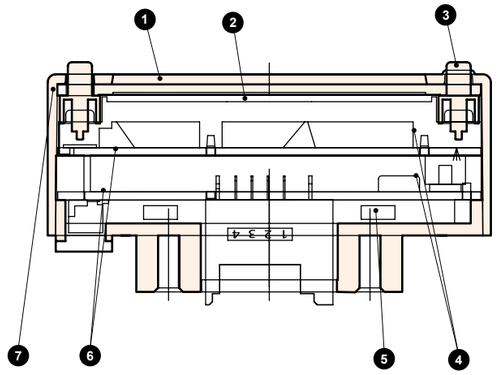
Flow rate display	Indicator range	Uni-direction	0 to 500 mL/min	0 to 1000 mL/min	0 to 2.00 L/min	0 to 4.00 L/min	0 to 5.00 L/min	0 to 10.00 L/min	0 to 2.0 L/min	0 to 20.0 L/min	0 to 25.0 L/min	0 to 32.0 L/min	0 to 50.0 L/min	0 to 100.0 L/min	0 to 200 L/min	0 to 500 L/min	0 to 1000 L/min	0 to 1.50 m³/min	0 to 5.00 mL/min	0 to 10.00 mL/min	0 to 50.0 mL/min	0 to 100.0 mL/min
		Bi-direction	-500 to 500 mL/min	-1000 to 1000 mL/min	-2.00 to 2.00 L/min	–	-5.00 to 5.00 L/min	-10.00 to 10.00 L/min	–	-20.0 to 20.0 L/min	–	–	-50.0 to 50.0 L/min	-100.0 to 100.0 L/min	-200 to 200 L/min	-500 to 500 L/min	-1000 to 1000 L/min	-1.50 to 1.50 m³/min	-5.00 to 5.00 mL/min	-10.00 to 10.00 mL/min	-50.0 to 50.0 mL/min	-100.0 to 100.0 mL/min
	Indicator resolution		1 mL/min		0.01 L/min				0.1 L/min						1 L/min			0.01 m³/min	0.01 mL/min		0.1 mL/min	
Integrating functions *2	Indicator range		9999999 mL		99999.99 L				999999.9 L						9999999 L			99999.99 m³	99999.99 mL		999999.9 mL	
	Indicator resolution		1mL		0.01 L				0.1 L						1L			0.01 m³	0.01 mL		0.1 mL	
	Integrated pulse output rate		5 mL	10 mL	0.02 L	0.04 L	0.05 L	0.1 L	0.12 L	0.2 L	0.25 L	0.32 L	0.5 L	1L	2 L	5L	10 L	15 L	0.05 mL	0.1 mL	0.5 mL	1 mL

*The corresponding sensor is the voltage output (1-5 V) type. If the current output-type or other voltage output-type is connected, it will not operate properly.

*1: The flow rate display is rounded off at approximately ±1% or less (forced zero).
*2: The integrating flow is a calculated (reference) value. It is reset when the power is turned OFF.

Internal Structure Diagram / Material

●FSM2-D



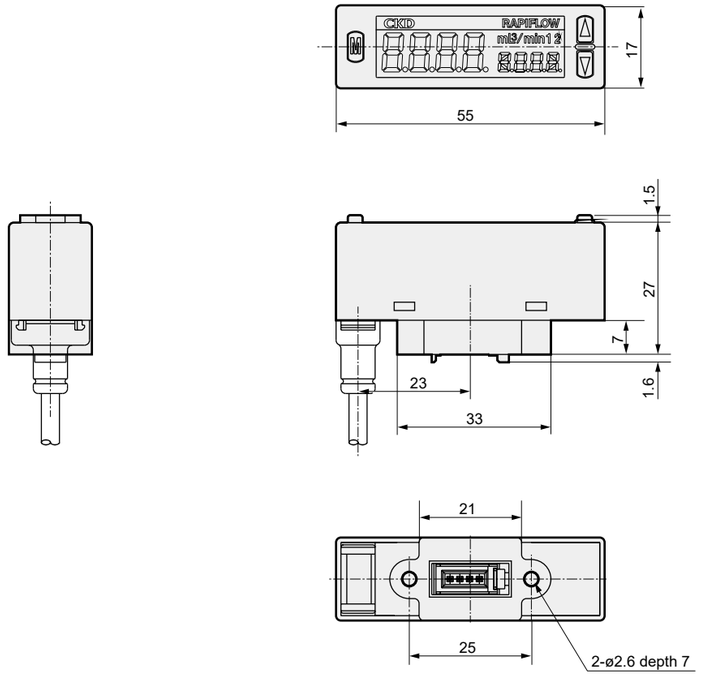
Do not disassemble

Note: Parts materials are subject to change without prior notice.

Part No.	Part name	Material
1	Liquid crystal cover	Acrylic resin
2	Liquid crystal	-
3	Switch	Ethylene/propylene rubber
4	Base spacer	Polycarbonate resin
5	Back surface cover	Polyamide Resin
6	Electronic circuit board	-
7	Case	ABS resin

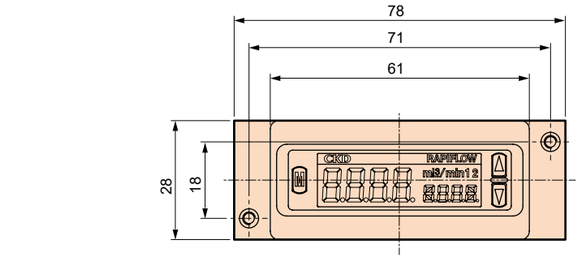
Dimensions

●FSM2-D-□



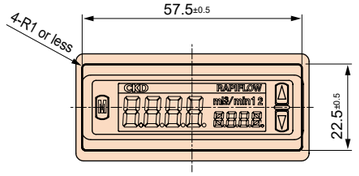
Optional dimensions

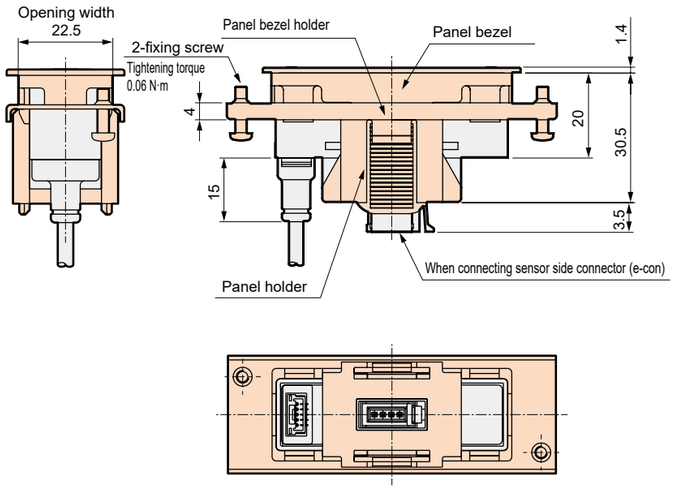
●Panel mounting kit with options Dimensions diagram



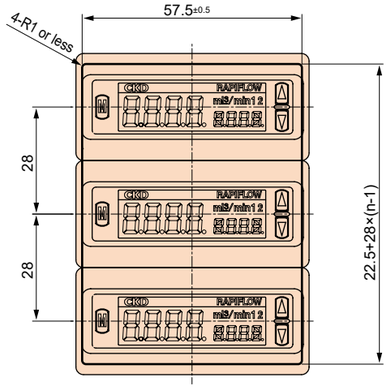
[Panel cut dimension]

In case of single installation





In case of continuous installation

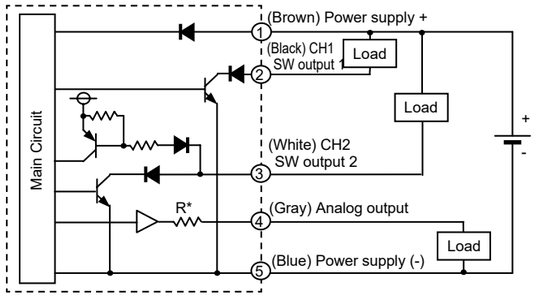


Panel thickness 6 mm or less

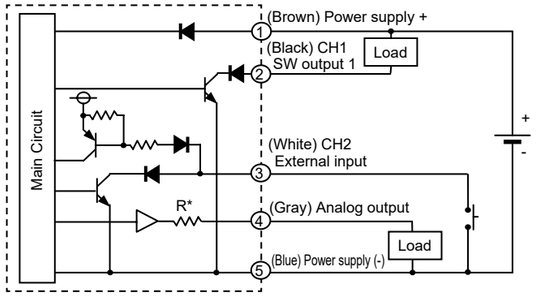
Example of internal circuit and load connection

●FSM2-D-N□-□ (separated display NPN output)

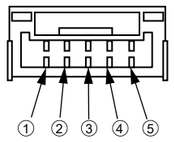
[CH2 is used as SW output]



[CH2 is used as external input]



*Analog output Voltage output R: approx. 1 kΩ
Current output R: approx. 100 Ω

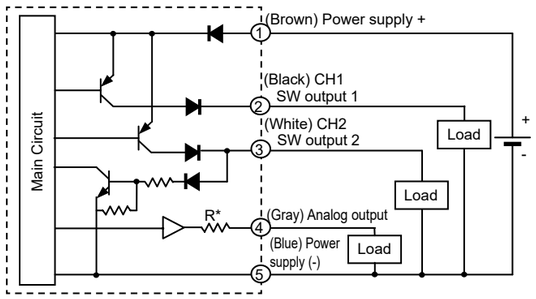


(FSM2 side)

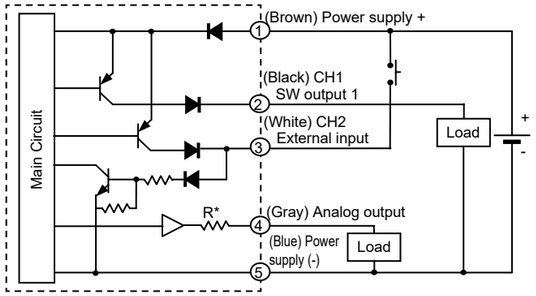
Terminal No.	Option cable color	Name
①	Brown	Power supply (+) (voltage output: 12 to 24 V, current output: 24 V)
②	Black	CH1 (switch output 1:max 50 mA)
③	White	CH2 (switch output 2: max. 50 mA or external input)
④	Gray	Analog output voltage output: 1-5 V load impedance 50 kΩ or more Current output: 4-20 mA load impedance 300 Ω or less
⑤	Blue	Power supply - (GND)

●FSM2-D-P□-□ (separated display PNP output)

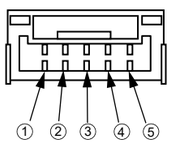
[CH2 is used as SW output]



[CH2 is used as external input]



*Analog output Voltage output R: approx. 1 kΩ
Current output R: approx. 100 Ω

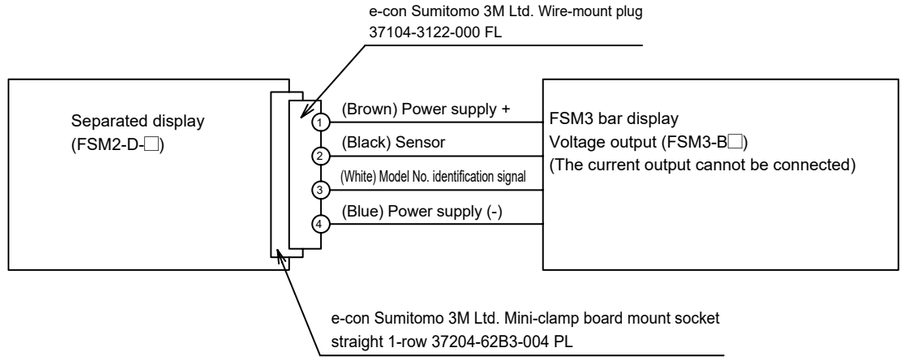


(FSM2 side)

Terminal No.	Option cable color	Name
①	Brown	Power supply (+) (voltage output: 12 to 24 V, current output: 24 V)
②	Black	CH1 (switch output 1:max 50 mA)
③	White	CH2 (switch output 2: max. 50 mA or external input)
④	Gray	Analog output voltage output: 1-5 V load impedance 50 kΩ or more Current output: 4-20 mA load impedance 300 Ω or less
⑤	Blue	Power supply - (GND)

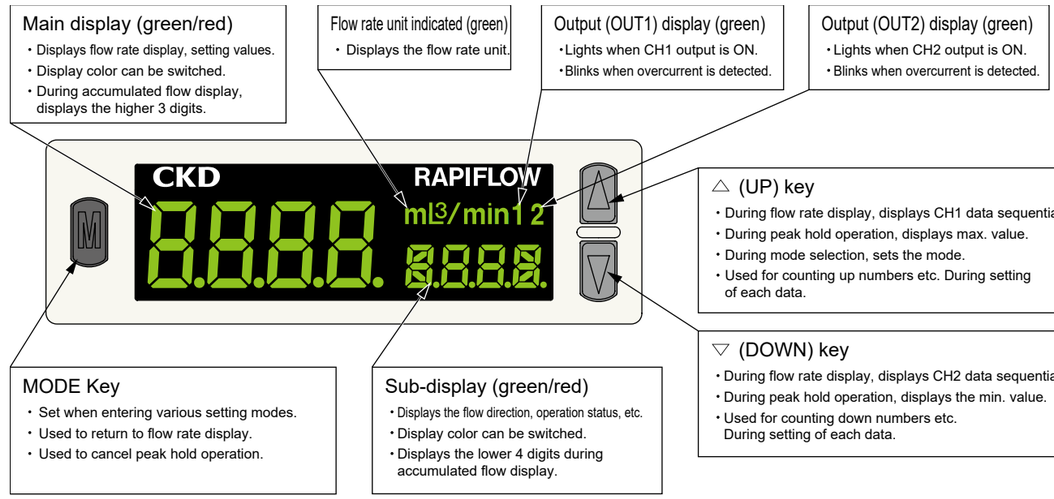
Example of internal circuit and load connection

● Connecting the separate display and the FSM3 bar display



When connecting to the FSM-V Series or WFK Series, the cable size is different so a separate compatible sensor connector (e-con) will be required.

Names and functions of display / operation section



Description of functions

The function and various settings may be performed during normal flow rate display or after entering each mode. The setting mode is divided into the standard setting mode and detailed setting mode according to the frequency of use.

●Normal operation

Item	Explanation	Default setting
Instantaneous flow rate display	Indicators the instantaneous flow rate.	-
Accumulated flow display	The accumulated flow can be displayed. The switch output function includes a function to turn the switch ON/OFF at a level higher than the recommended cumulative value, and an integrated pulse function to output the pulse at a set cumulative value. Reset when powered OFF. Can also be reset with button operations or external inputs.	Instantaneous flow rate display
Peak hold function	Max. and min. values for the flow rate within a set interval are displayed.	Peak hold OFF
Key lock function	The key operations can be locked to prevent inadvertent operations.	Key operation possible
Error display function	The error status is displayed when a fault or error occurs.	-

●Standard setting mode

Item	Explanation	Default setting
Switch output function	This product has 2-point switch output, and uses seven operation patterns and a stop operation.	Switch is set to OFF for both CH1 and CH2
Forced output function	Forces the switch output to turn ON and is used to check the initial operation of wiring connections and input devices.	-
Zero adjustment	The zero point deviation is compensated. (Range: 0±10%F.S.)	Adjust value: 0

●Detailed setting mode

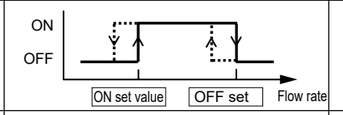
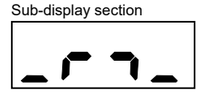
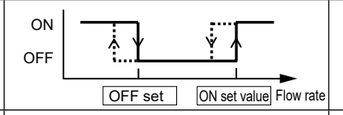
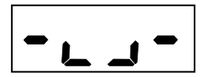
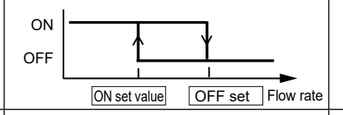
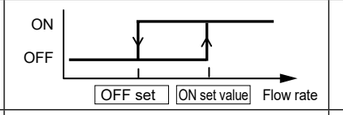
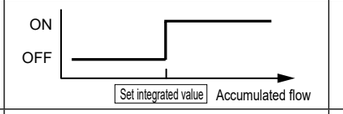
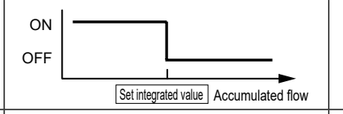
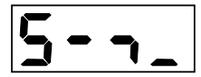
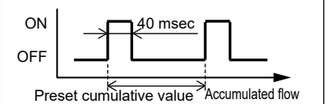
Item	Explanation	Default setting
Selection of flow rate direction	Setting the flow direction. Setting available for bi-directional, one-sided forward direction or one-sided reverse direction.	Bi-directional setting
Selection of CH2 operation	Select the CH2 feature. Select whether to use CH2 as a switch output, or to use as an external input (integrated value reset/auto reference).	Switch Output
Auto reference function	When CH2 is selected as auto reference, the switch's output threshold can be imported with external inputs or button operations. The threshold can be changed automatically if the switch threshold value changes, such as when the workpiece is changed.	Auto reference function OFF
Response time setting	Set the response time. The response can be set in seven steps from 50 ms to approx. 1.5 s. Chattering and mis-operation caused by sudden flow rate changes or noise are prevented.	Response time: 50 ms
Indicator speed setting	The digital display refresh cycle can be set in three stages from 250 ms to 1 s. If the display flickers, it can be improved by increasing the display refresh cycle.	Display speed: 250 ms
Sub-display setting	Sets the display method for the sub-display. The display can be changed to flow direction, flow rate unit or gas type display.	Flow direction display
Setting of display color	Set the display color. Display color can be set for normal display and when switch output is ON.	When normally displayed for both main and sub: Green At switch ON: Red
Setting hysteresis	Set the switch setting value hysteresis. Use this if the flow rate pulsates or if the switch chatters near the threshold, etc.	Hysteresis: 1%FS
Setting flow rate unit	Select the display unit from the standard state or reference state. Standard condition (ANR): Converted into volumetric flow rate at 20°C, 1 barometric pressure Reference state (NOR): Converted into volumetric flow rate at 0°C, 1 barometric pressure (*1)	Flow rate unit: ANR
Setting ECO MODE	An ECO mode can be set. If the buttons are not operated for approx. 1 minute, the eco mode will activate and turn OFF the display's backlight. Current consumption can be reduced with this mode.	ECO MODE OFF
Reset setting	It will return to the factory settings. For the separated indicator, if the power is switched ON again with the FSM2 separated display (sensor unit) connected after setting reset, the flow range is automatically recognized.	-
Model selection	Select the flow rate range, flow direction and gas type.	Not set (*2)

*1: The reference state display is a calculated (reference) value.

*2: The default setting is "Not set". If "Not set" is selected during use, the operation will start from the model selection mode after the power is turned ON. Always set the model before starting use. The model is automatically recognized in the "Not set" state (default state) only when the FSM3 bar display (sensor) is connected.

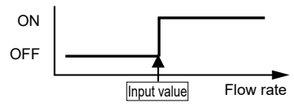
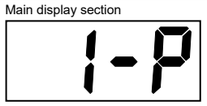
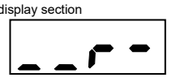
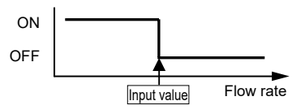
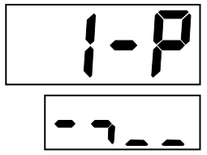
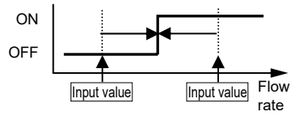
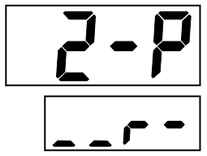
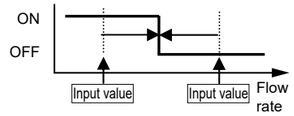
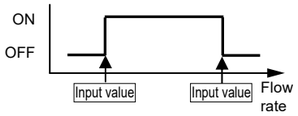
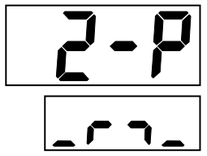
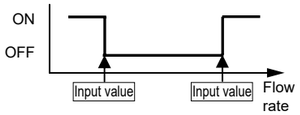
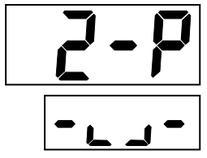
Switch output functions

The output function can be selected from seven types of switch operations according to the required application. The functions are compatible with both CH1 and CH2.

Name of operation pattern	Explanation	Operation waveform	LCD display
Window operation① (ON when inside the range)	The switch turns ON when the level is within the designated flow rate range.		Sub-display section 
Window operation② (ON when outside the range)	The switch turns ON when the level is not within the designated flow rate range.		
Hysteresis operation① (ON at low flow rate side)	The hysteresis is randomly set, and the switch output turns OFF at the designated flow rate and higher.		
Hysteresis operation② (ON at high flow rate side)	The hysteresis is randomly set, and the switch output turns ON at the designated flow rate and higher. (The output is held even during the Hi display.)		
Cumulative value output① (ON at accumulated flow or higher)	Switch output turns ON at set cumulative value and higher.		
Cumulative value output② (OFF at accumulated flow or higher)	Switch output turns OFF at set cumulative value and higher.		
Integrated pulse output	The integrated pulse is output at the preset cumulative value. Refer to the "Integrating function" in the specifications for details on the preset integration value. (Page 357)		
Switch operation OFF	The switch operation is turned OFF.	———	

Automatic reference function

When CH2 is selected as auto reference, the switch's output threshold can be imported with external inputs or button operations. The threshold can be changed automatically if the switch threshold value changes, such as when the workpiece is changed. The flow rate value at the point where the external input is turned ON is read for the input value. The CH2 switch settings are invalid during auto referencing.

No. of inputs	Name of operation pattern	Explanation	Operation waveform	LCD display
1 points	ON at input value or higher	ON when higher than imported value. (Threshold : input value)		Main display section  Sub-display section 
	OFF at input value or higher	OFF when higher than imported value. (Threshold : input value)		
2 points	ON when higher than middle value of two points.	ON when higher than middle value of two imported points. (Threshold: (input① + Input②) / 2)		
	OFF when higher than middle value of two points.	OFF when higher than middle value of two imported points. (Threshold: (input① + Input②) / 2)		
	ON between 2 points	ON when between two imported points. (Threshold①: Input value①) (Threshold②: Input value②)		
	OFF between 2 points	OFF when between two imported points. (Threshold①: Input value①) (Threshold②: Input value②)		

MEMO

Flow rate sensor
Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit
Ending

Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

Product-specific cautions: Compact flow rate sensor separated display FSM2-D Series

Design / Selection

Working environment

DANGER

■Flammable environment
Never use this product in an explosive gas atmosphere. The structure is not explosion-proof, and explosions or fires could occur.

WARNING

■Corrosive environment
Do not use this product in an atmosphere containing corrosive gases such as sulfur dioxide.

■Ambient temperature
Use at ambient temperatures within the specified range of 0 to 50°C. Even if the temperature is within the specified range, do not use this product if the ambient temperature could suddenly change and cause dew to condense.

■Drip-proof environment
The degree of protection of this product is equivalent to IP40. Do not install this product where water, salt, dust, or swarf is present or in a pressurized or depressurized environment. The product cannot be used with large temperature variations or high temperature/ humidity since condensation may occur inside the body.

Mounting

CAUTION

■The LCD display-type flow rate meter uses a liquid crystal display. This may be difficult to read depending on the angle.

■Do not install multiple product bodies in close contact. The generation of heat on each part could cause the product's temperature to rise, hastening changes in characteristics or deterioration of the resin material. When using the products in a row, set intervals of distance of 10 mm and over.

Wiring

WARNING

■Use a DC stabilized power supply within the specified rating, insulated from the AC power supply. A non-isolated power supply could result in electrical shock. If power is not stabilized, the peak value could be exceeded. This could damage the product or impair accuracy.

■Always attach the connector bar after connecting the connector.

■Check that stress (7 N and over) is not directly applied to cable leadouts or connectors.

■Connecting load
The output impedance of the analog output section is approx. 1 kΩ. If the impedance of the connecting load is small, output error increases. Check error with the impedance of the connecting load before using. (The analog/current output type is excluded.)

Example of calculation

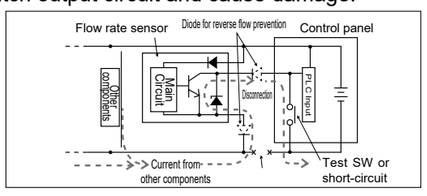
(FSM2-□V output impedance: Ro=1 KΩ
Load internal impedance: Rx = 1 MΩ

$$\text{Output value} = \left(1 - \frac{Ro}{Ro + Rx}\right) \times 100\%$$

$$= \left(1 - \frac{1\ k\Omega}{1\ k\Omega + 1\ M\Omega}\right) \times 100\% \Rightarrow \text{Output value error approx. } 0.1\%$$

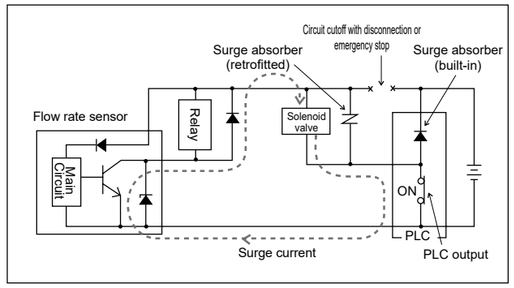
CAUTION

■Pay attention to reverse currents caused by disconnected wires and wiring resistance. If other devices, including a flow rate sensor, are connected to the same power supply as the flow rate sensor, and the switch output wire and power cable negative (-) side are short-circuited to check the operation of the control panel input unit, or if the power cable negative (-) side is disconnected, reverse current could flow to the flow rate sensor's switch output circuit and cause damage.

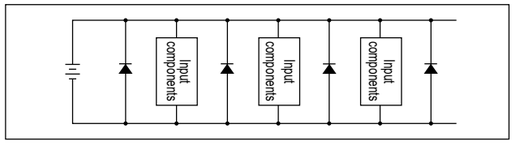


■Take the following measures to prevent damage caused by reverse current:
①Avoid centralizing current at the power cable, especially the minus side power cable, and use as thick a cable as possible.
②Limit the number of devices connected to the same power source as the flow rate sensor.
③Insert a diode parallel to the flow rate sensor's output line to prevent reverse current.
④Insert a diode parallel to the flow rate sensor power wire's negative (-) side to prevent reverse current.

■Pay attention to surge current flow-around. When flow rate sensor power is shared with an inductive load that generates surges, such as a solenoid valve or relay, if the circuit is cut off while the inductive load is functioning, surge current could enter the switch output circuit and cause damage depending on where the surge absorber is installed.



Take the measures below to prevent damage from sneak surge current.
①Separate the power supply for output including the inductive load, such as the solenoid valve and relay, and input, such as the flow rate sensor.
②If a separate power supply cannot be used, directly install a surge absorption element for all inductive loads. Consider that the surge absorber connected to the PLC, etc., protects only the individual device.
③In addition, connect surge absorbing elements at various locations in the power supply wiring as shown in the figure below to prepare for disconnection at unspecified locations.



When the devices are connected to a connector, the output circuit could be damaged by the above phenomenon if the connector is disconnected while the power is ON. Turn power OFF before connecting or disconnecting the connector.

Other

WARNING

■Output accuracy is affected by temperature characteristics and heat generated when energized. Provide a standby time (5 minutes or more) after turning the power ON for use.

■Immediately after power is turned ON, flow rate detection switch operation is not performed for approx. 4 seconds to complete self-diagnosis. Provide a control circuit/program that ignores signals for at least two seconds after power is turned ON.

CAUTION

■Analog output continues even if the flow rate range is exceeded. Hi or "Lo" will be displayed. Note that this is outside the guaranteed precision.

■CE-compliance working conditions
This product is CE-marked, indicating conformity with the EMC Directives. The standard for the immunity for industrial environments applied to this product is EN61000-6-2; the following requirements must be satisfied in order to conform to this standard:
Conditions
●The evaluation of this product is performed by using a cable that has a power supply line and a signal line paired to assess the product's performance.
●This product is not equipped with surge protection. Implement surge protection measures on the system side.

■The corresponding sensor is the voltage output (1-5 V) type. If the current output-type or other voltage output-type is connected, it will not operate properly.

■It does not have the function to detect signal interruption due to cable disconnection or the state of connection with the sensor. If detection is required, the customer must prepare it separately.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual

Miniature flow rate sensor

RAPIFLOW® FSM

■ Flow rate sensor



CONTENTS

Product Introduction 370
● Miniature analog output (FSM-X) 372
● Miniature analog output/switch output (FSM-V) 378
● Series dedicated inline filter (FSM-VFM) 394
⚠ Safety Precautions 396

Flow rate sensor

Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit

FSM-X/V Series

Miniature/lightweight & high response

Demonstrates its power in confirmation of suction/release for electronic parts, etc.

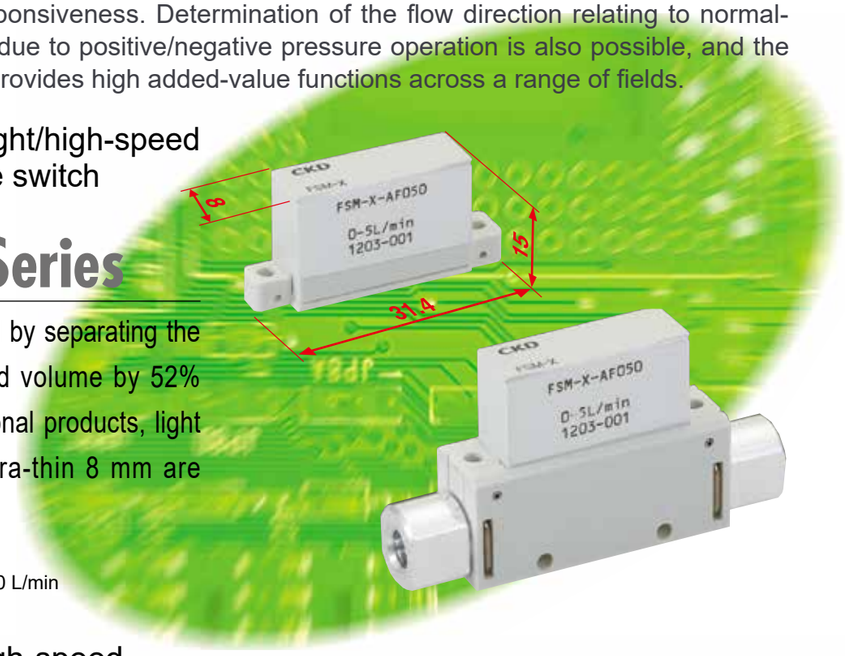
Functions focus on equipment integration to create a more compact and lighter system. It can be mounted on the tip of a moving part near the measuring section, contributing to improved system responsiveness. Determination of the flow direction relating to normal-reverse inverted flow due to positive/negative pressure operation is also possible, and the wide flow rate range provides high added-value functions across a range of fields.

Miniature/lightweight/high-speed response flow rate switch

FSM-X Series

Compact body enabled by separating the sensor head. Reduced volume by 52% compared to conventional products, light weight of 4 g and ultra-thin 8 mm are achieved.

Flow rate range
±0.5, ±1, ±5, ±10, 0.5, 1, 5, 10 L/min

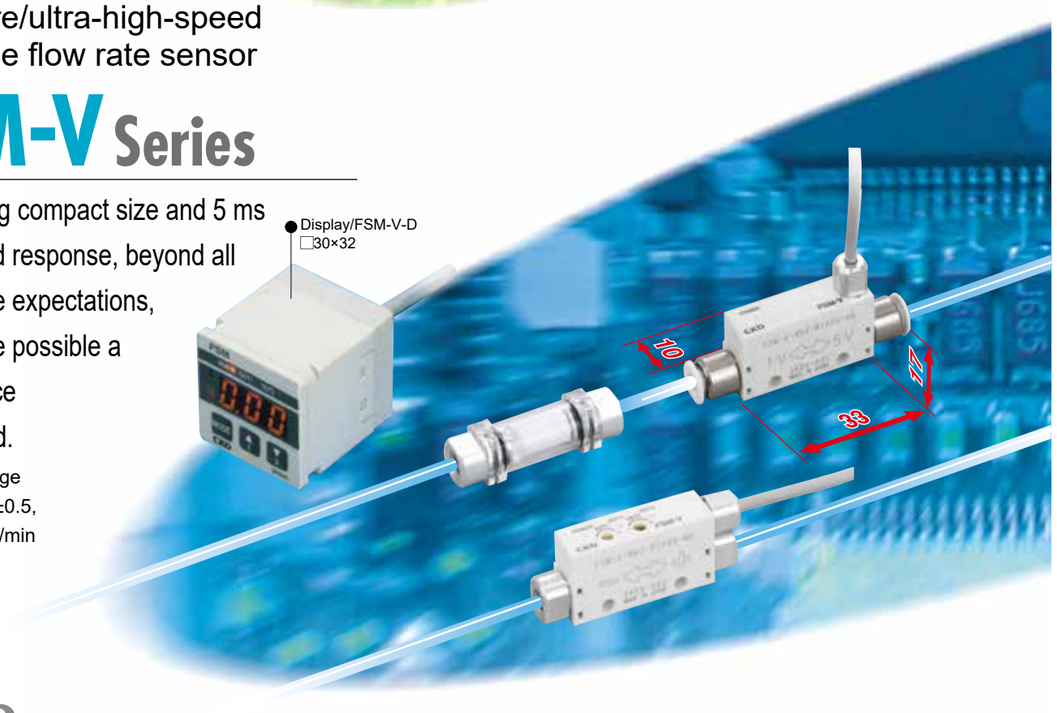


Miniature/ultra-high-speed response flow rate sensor

FSM-V Series

Astonishing compact size and 5 ms high-speed response, beyond all reasonable expectations, have made possible a design once abandoned.

Flow rate range
±0.05, ±0.1, ±0.5, ±1, ±5, ±10 L/min



RAPIFLOW Series variation

FSM-X Series

Analog output: Discrete sensor head	Analog output: Flow path block	Body material	Flow direction	Connection	Full scale flow rate: mL/min 500	Full scale flow rate: L/min 1	5	10	Accuracy (Linearity) % F.S.	Working pressure range MPa	Analog Output
FSM-X-AF005	FSM-X-AF005□	Resin	Uni-direction	Sensor head ø4 push-in fitting M5	●				Non-linear	Negative Pressure −0.09 / Positive Pressure +0.2	0 to +FULL (5 V / 1 V / 0 / FULL flow rate)
FSM-X-AF010	FSM-X-AF010□					●					
FSM-X-AF050	FSM-X-AF050□						●				
FSM-X-AF100	FSM-X-AF100□							●			
FSM-X-AR005	FSM-X-AR005□		Bi-direction		●						-FULL to +FULL (5 V / 3 V / 1 V / -FULL flow rate / FULL flow rate)
FSM-X-AR010	FSM-X-AR010□					●					
FSM-X-AR050	FSM-X-AR050□						●				
FSM-X-AR100	FSM-X-AR100□							●			

Note: Applicable only for AR type.

FSM-V Series

Analog output	Switch output	Body material	Connection	Full scale flow rate: mL/min 50	100	500	L/min 1	5	10	Accuracy (Linearity) % F.S.	Working pressure range MPa	Analog Output
FSM-V-A-R0005	FSM-V-N/P-R0005	Resin	ø1.8 Fiber tube ø4 push-in fitting M5	●						±5%	Negative Pressure -0.09 / Positive Pressure +0.2	5 V / 3 V / 1 V / -FULL / 0 / +FULL
FSM-V-A-R0010	FSM-V-N/P-R0010				●							
FSM-V-A-R0050	FSM-V-N/P-R0050					●						
FSM-V-A-R0100	FSM-V-N/P-R0100						●					
FSM-V-A-R0500	FSM-V-N/P-R0500							●				
FSM-V-A-R1000	FSM-V-N/P-R1000								●			



Miniature flow rate switch Rapiflow

FSM-X Series (for air/nitrogen gas)

●Flow rate range: ±0.5, ±1, ±5, ±10, 0 to 0.5, 0 to 1, 0 to 5, 0 to 10 L/min

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

FSM-X - A F 005 - H04 - 3

- FSM-X: Model No.
- A: Output: Analog output
- F: ❶Flow Direction
- 005: ❷Flow rate range
- H04: ❸Fitting
- 3: ❹Cable

❶Flow direction

Code	Description
F	Uni-direction
R	Bi-direction

❷Flow rate range

Code	Description
005	Full scale: 0.5 L/min
010	Full scale: 1 L/min
050	Full scale: 5 L/min
100	Full scale: 10 L/min

❸Fitting

Code	Description		
Blank	Single sensor head (without fitting)		
H04	With flow path block	ø4 mm with push-in fitting	
M05	With flow path block	With M5	

❹Cable

Code	Description	
Blank	Without cable	
3	Cable with connector (3-conductor, 3 m)	

Model No. Notation for Options

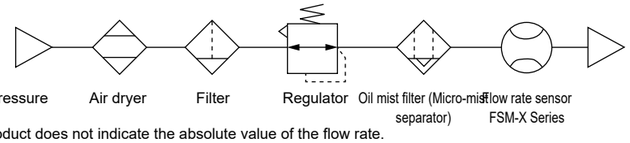
●Cable with connector (3-conductor, 3 m)

FSM-X-C33

Specifications

Model No. / Item		Analog output							
		FSM-X-AR005	FSM-X-AR010	FSM-X-AR050	FSM-X-AR100	FSM-X-AF005	FSM-X-AF010	FSM-X-AF050	FSM-X-AF100
Flow rate range (L/min) *1		-0.5 to +0.5	-1 to +1	-5 to +5	-10 to +10	0 to 0.5	0 to 1	0 to 5	0 to 10
Working Conditions	Applicable fluids *2	Clean air ISO 8573-1: 2010 [1:1:1 to 1:6:2], nitrogen gas							
	Max. Working Pressure, MPa	0.2							
	Min. working pressure MPa	−0.09							
	Proof pressure MPa	0.3							
	Ambient temperature/humidity °C	0 to 50, 80% RH or less							
	Working fluid temperature °C	0 to 50 (no condensation)							
Storage ambient temperature °C		−20 to 60 (no condensation)							
Output		Analog output 1 point (1-5 V voltage output, connected load impedance 50 kΩ and over) *3							
Accuracy *4	Linearity	Non-linear characteristics							
	Pressure characteristics	Bi-direction: ±5%F.S. or less (-0.09 to 0.2 MPa, 0.1 MPa reference) Uni-direction: ±10%F.S. or less (-0.09 to 0.2 MPa, 0.1 MPa reference)							
	Temperature characteristics	Bi-direction: ±0.3%F.S./°C or less (0 to 50°C, base temperature 25°C) Uni-direction: ±0.6%F.S./°C or less (0 to 50°C, base temperature 25°C)							
	Reproducibility (repeatability) *5	±2% F.S. or less							
Response time *6		5 ms or less (8 ms or less for 10 L/min)							
External leakage *7		1 mL/min or less (single sensor head), 2 mL/min (with flow path block)							
Current consumption *8		30 mA or less							
Power supply voltage		24 VDC (21.6 to 26.4 VDC) ripple rate 1% or less							
Power supply voltage fluctuation		±2% F.S. or less (21.6 to 26.4 V)							
Lead wire		ø2.9 mm 3-conductor (ø0.38 mm insulator outer diameterø0.8 mm)							
Connector	Product side	SM03B-SRSS-TB (JST Mfg. Co. Ltd.), without lock mechanism							
Compatible connector	Housing	SHR-03V-S (JST Mfg. Co. Ltd.)							
	Connector pin	SSH-003T-P0.2-H (JST Mfg. Co. Ltd.)							
Mounting	Mounting orientation	Unrestricted in vertical/horizontal direction							
	Straight piping section	Not required							
Vibration resistance		10 to 150 Hz, compound amplitude 1.5 mm, max. 10 G, 2 hours per X, Y, Z direction							
EMC Directive		EN61000-6-4, EN61000-6-2							
Weight (g)	Blank	Approx. 4 (cable not included)							
	H04	Approx. 17 (cable not included)							
	M05	Approx. 17 (cable not included)							

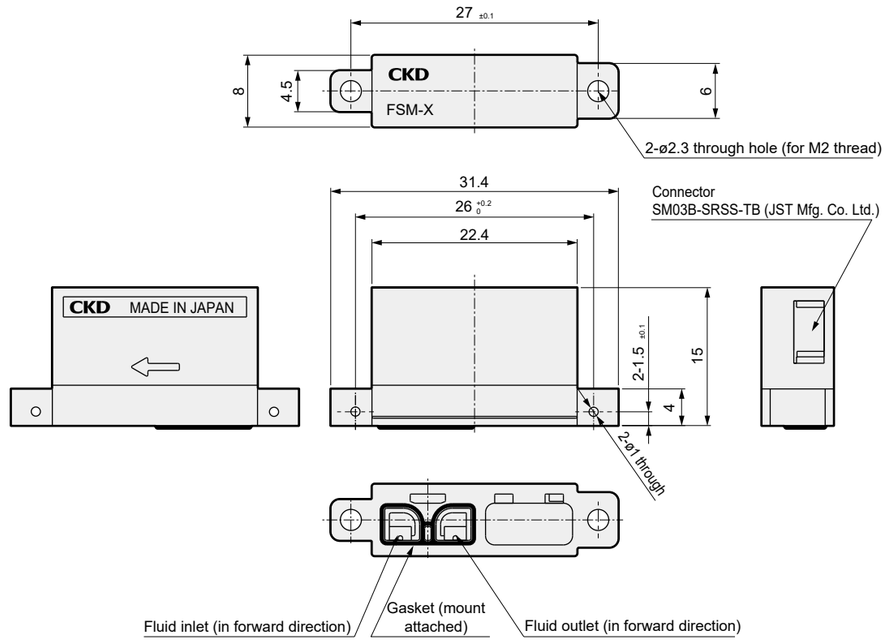
*1: Flow rate converted to volumetric flow rate at 20°C, 1 atm (101 kPa) and 65% relative humidity.
*2: Use air which does not contain corrosive elements such as chlorine, sulfur or acids. When using compressed air, use clean air compliant with ISO 8573-1: 2010 Class [1:1:1 to 1:6:2]. Compressed air from the compressor contains drainage-water, oil oxide, foreign substances, etc. To maintain the function of this product, install a filter, air dryer, and oil mist filter on the primary side (upstream side) of this product. When using this product to confirm suction, be sure to install an air filter between the suction nozzle and this product to prevent intake of foreign matter.



*3: The flow rate output of this product does not indicate the absolute value of the flow rate.
* Connecting load
The output impedance of the analog output section is 1 kΩ . If the impedance of the connecting load is small, output error increases. Check error with the impedance of the connecting load before using.
■ Example of calculation
・Output impedance of FSM-X Ro=1kΩ
・Load internal impedance Rx=1MΩ
・Output value = (1-Ro/(Ro+Rx))×100% = (1 - (1 kΩ/(1 kΩ+1 MΩ))×100%
→ Output value error = approx. 0.1%
* Wiring resistance
The voltage used for this product is the voltage at the connector. When using the optional cable (FSM-X-C33), note that the voltage varies due to the cable wiring resistance (0.23 Ω/m or less).
■ Example of calculation
・Wiring resistance of optional cable (FSM-X-C33) (3 m): 0.23 Ω/m×3 m=0.69 Ω
・Voltage generated between power supply and wire = Current consumption of product (=30 mA) x Wiring resistance 0.69 Ω = approx. 0.02 V
・Output value error = 0.02 V / 4 V (full scale) = 0.5%F.S.
*4: Calibrate the sensor using uni-direction analog output of 1 to 5 V and bi-direction analog output of 3 to 5 V.
Accuracy conditions: Temperature 25±3°C, power supply voltage 24±0.01 VDC
F.S. is defined as analog output 1 to 5 V.
*5: When the flow rate is ON, the average value of data taken for 20 seconds at a sampling cycle of 0.5 ms is determined as a measurement value for 1 time, and the repeatability is determined by a flow rate of ON-OFF continuously 10 times. Change over time is not included.
*6: The time required for the output to reach 80% of the full scale of flow rate after the flow is detected. The response time varies depending on the piping conditions.
*7: The value obtained when an internal pressure of 0.2 MPa is applied in an environment of 25°C±3°C. It is an initial value, not including change over time.
*8: Current for when 24 VDC is connected, and no load is connected. Please note that the current consumption changes depending on the load connection status.

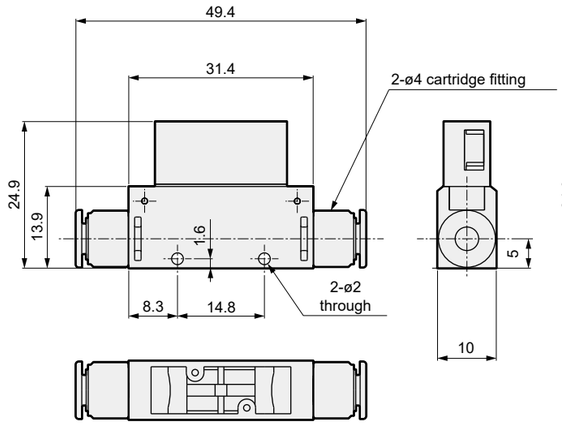
Dimensions

●Discrete sensor head

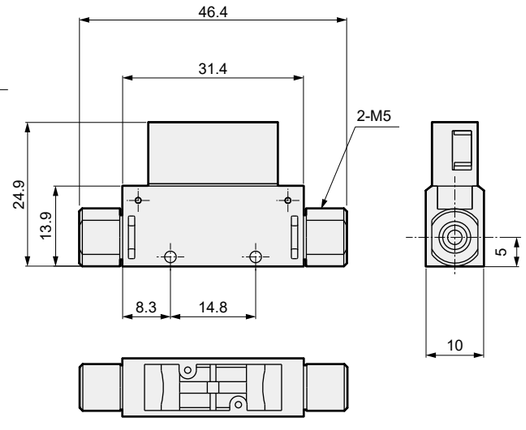


●With flow path block

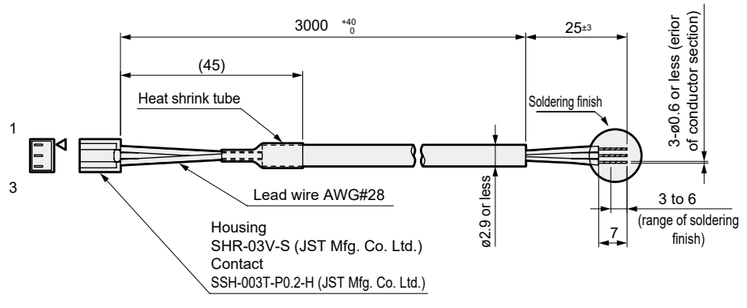
• ø4 with push-in fitting



• With M5



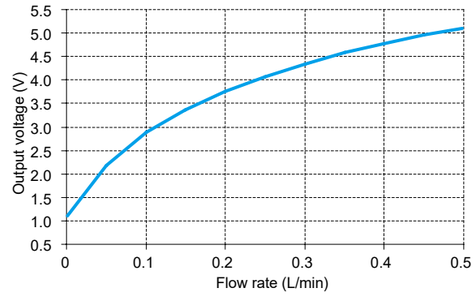
●Optional cable



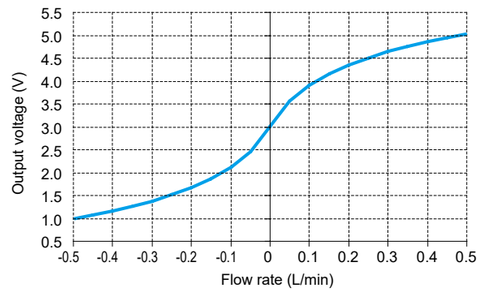
Pin No.	Line color	Type of signal
1	Brown	Power supply +24 VDC
2	Blue	Power supply - GND
3	Black	Analog output (1 to 5 V)

Analog output characteristics (reference value)

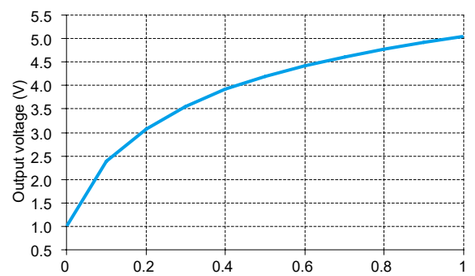
Flow rate-output characteristics (typical value)
FSM-X-AF005



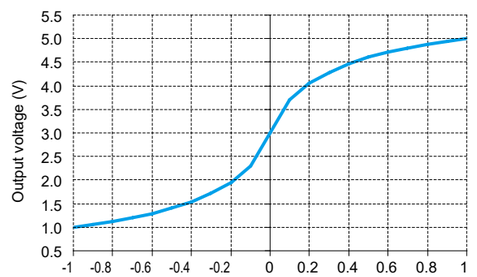
Flow rate-output characteristics (typical value)
FSM-X-AR005



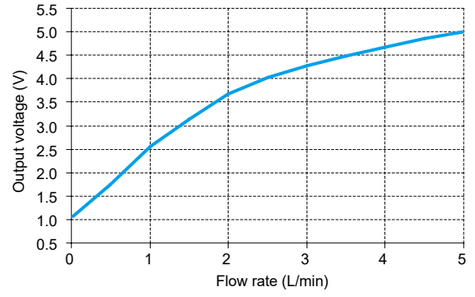
Flow rate-output characteristics (typical value)
FSM-X-AF010



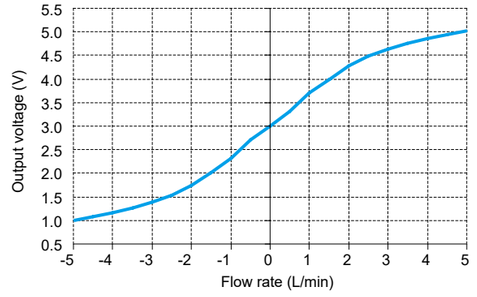
Flow rate-output characteristics (typical value)
FSM-X-AR010



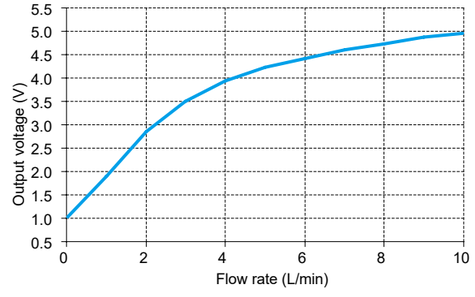
Flow rate-output characteristics (typical value)
FSM-X-AF050



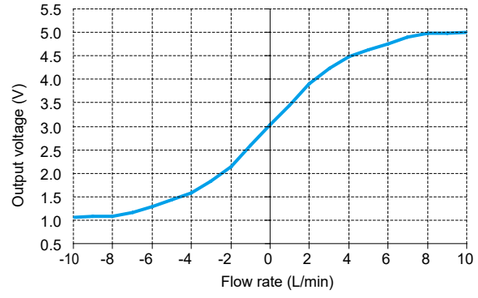
Flow rate-output characteristics (typical value)
FSM-X-AR050



Flow rate-output characteristics (typical value)
FSM-X-AF100



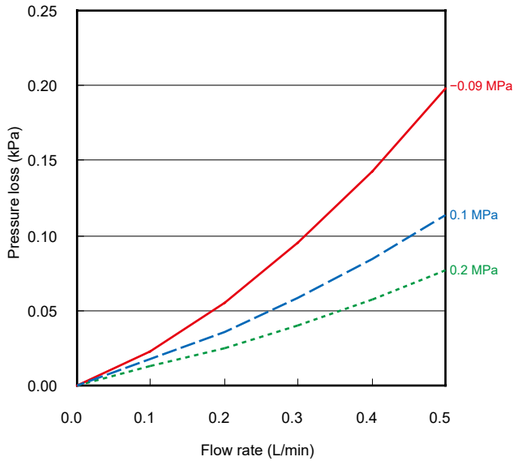
Flow rate-output characteristics (typical value)
FSM-X-AR100



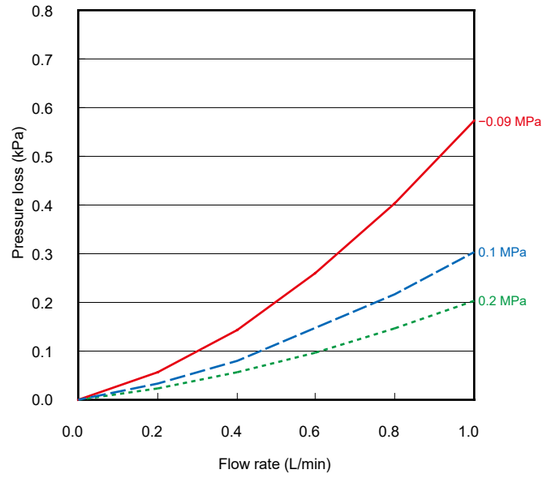
Note: The output voltage may vary depending on the working pressure and piping conditions.

Pressure loss characteristics

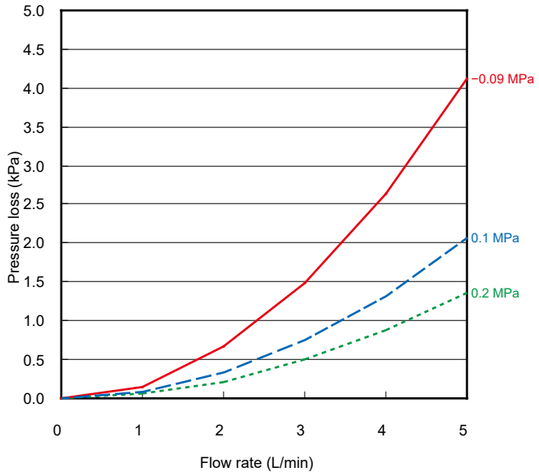
●FSM-X-AF005-H04



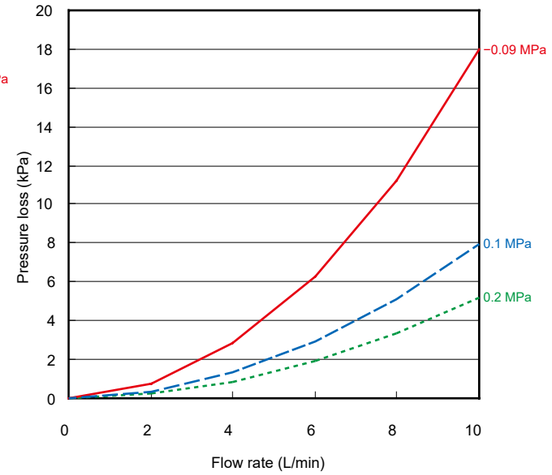
●FSM-X-AF010-H04



●FSM-X-AF050-H04



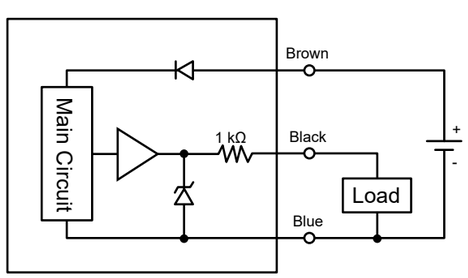
●FSM-X-AF100-H04



Note: The pressure loss may increase depending on the piping conditions.

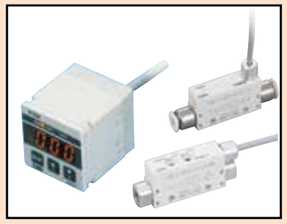
Example of internal circuit and load connection

●FSM-X (analog output)



Line color	Description
Brown	Power supply 24 VDC
Blue	0 V (GND)
Black	Analog output: (1 to 5 V) connected load impedance 50 kΩ or more

MEMO



Miniature flow rate sensor RAPIFLOW
Analog output/switch output

FSM-V Series (for air/nitrogen gas)

●Flow rate range: ±0.05, ±0.1, ±0.5, ±1, ±5, ±10 L/min

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

●Sensor body

FSM - V - A H 3 - R0005 - H2

- FSM: Model No.
- A: ❶Output
- H: ❷Lead wire direction
- 3: Lead wire length: 3 m
- R0005: ❸Flow rate range
- H2: ❹Fitting

❶Output

Code	Description
A	Analog Output
N	Switch output (NPN)
P	Switch output (PNP)

❷Lead wire direction

Code	Description	
H	Straight	
V	L-shaped	

❸Flow rate range

Code	Description
R0005	±0.05 L/min
R0010	±0.1 L/min
R0050	±0.5 L/min
R0100	±1 L/min
R0500	±5 L/min
R1000	±10 L/min

❹Fitting

Code	Description	
H2	Straight ø1.8 fiber tube (Note)	
H4	Straight ø4 push-in	
HL4	L-shaped ø4 push-in	
M5	Port size M5	

Note: The “H2” fitting cannot be selected when the ❸ flow range is “R1000”.

●Separated display (dedicated for analog output)

FSM - V - D N - R0050

- FSM: Model No.
- N: ❶Switch output
- R0050: ❷Flow rate range

❶Switch output

Code	Description
N	NPN output
P	PNP output

❷Flow rate range

Code	Description
R0005	±0.05 L/min
R0010	±0.1 L/min
R0050	±0.5 L/min
R0100	±1 L/min
R0500	±5 L/min
R1000	±10 L/min

●Mounting bracket for separated display

Note: Refer to P. 388 and 389 for mounting bracket Dimensions and mounting dimensions.

PPD3 - KL-D

- KL-D: ❶Mounting bracket kit

❶Mounting bracket kit

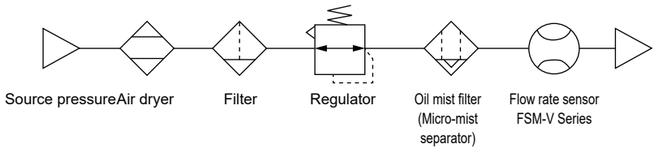
Code	Description	
KL-D	One-side mounting foot (L-shaped mounting)	
KD-D	Two-side mounting foot (parallel mounting)	
KHS-D	Panel mounting bracket set with cover	
KC	Operation protective cover	

Sensor body specifications

Model No.		Analog output						Switch output					
Item		FSM-V-A-R0005	FSM-V-A-R0010	FSM-V-A-R0050	FSM-V-A-R0100	FSM-V-A-R0500	FSM-V-A-R1000	FSM-V-N/P-R0005	FSM-V-N/P-R0010	FSM-V-N/P-R0050	FSM-V-N/P-R0100	FSM-V-N/P-R0500	FSM-V-N/P-R1000
Flow rate range (L/min)*1		-0.05 to +0.05	-0.1 to +0.1	-0.5 to +0.5	-1 to +1	-5 to +5	-10 to +10	-0.05 to +0.05	-0.1 to +0.1	-0.5 to +0.5	-1 to +1	-5 to +5	-10 to +10
(Reference) Applicable nozzle for suction/release applications		ø0.1 nozzle		ø0.2 nozzle	ø0.3 nozzle	Collet nozzle		ø0.1 nozzle		ø0.2 nozzle	ø0.3 nozzle	Collet nozzle	
Working Conditions	Applicable fluid	Clean air ISO 8573-1: 2010 [1:1:1 to 5:6:2], compressed air ISO 8573-1: 2010 [1:1:1 to 1:6:2]*2, Nitrogen gas											
	Max. Working Pressure, MPa	0.2											
	Min. working pressure MPa	−0.09											
	Proof pressure MPa	0.3											
	Ambient temperature/humidity °C	0 to 50, 90% RH or less (no condensation)											
	Working fluid temperature °C	0 to 50											
Indicator		Power display (green)						Power display (green), switch output display (yellow)					
Output		Analog output 1 point *3 (1 to 5 V voltage output, connecting load impedance 50 kΩ and over) *5						Switch output 2 points *4 (NPN or PNP open collector output, 30 VDC or less and 50 mA or less, PLC/relay compatible)					
Accuracy *6	Linearity	±5% F.S. or less (0.1 MPa, flow rate range ±100% F.S.)						———					
	Pressure characteristics	±5% F.S. or less (-0.09 to 0.2 MPa, 0.1 MPa reference)						———					
	Temperature characteristics	±0.2% F.S./°C or less (15 to 35°C, base temperature 25°C)						———					
	Reproducibility (repeatability)	±1% F.S. or less				±2% F.S. or less		±2% F.S. or less					
Response time		5 ms or less (when 90% of the sensor Discrete/final attained output voltage is reached) *7											
Power supply voltage		12/24 VDC (10.8 to 26.4 V)											
Current consumption		30 mA or less											
Lead wire		ø2.6 3-conductor (0.15 mm² Outer diameter of insulator ø0.81) 3 m						ø2.6 4-conductor (0.15 mm² Outer diameter of insulator ø0.81) 3 m					
Mounting	Mounting orientation	Unrestricted in vertical/horizontal direction											
	Straight piping section	Not required											
Degree of Protection		IEC standards IP40											
Vibration resistance		10 to 150 Hz, compound amplitude 1.5 mm, max. 10 G, 2 hours per X, Y, Z direction											
EMC Directive		EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8											
Weight g		Approx. 8 (excluding lead wire and fitting)											

*1: Converted to volumetric flow rate at 20°C, 1 atm (101 Kpa) and 65% relative humidity.

*2: Use air which does not contain corrosive elements such as chlorine, sulfur or acids.
When using compressed air, use clean air compliant with ISO 8573-1: 2010 Class [1:1:1 to 1:6:2].
Compressed air from the compressor contains drainage-water, oil oxide, foreign substances, etc. A filter, air dryer (minimum pressure dew point 10°C or less) and oil mist filter (maximum oil concentration 0.1 mg/m3) must be installed on the primary side (upstream) of the product to maintain the product's function.
When using this product in the suction check, be sure to install an air filter (filtering thickness of 30 µm or less) between the suction nozzle and the product to prevent inhalation of foreign matter.



*3: The analog output indicates 3 V when the flow rate is 0, and changes to 5 V when the fluid flows to the right (when the lead wire is to the right of the body). In addition, it changes to 1 V with reverse flow.

*4: The switch output uses the method of one boundary-value determination with fixed hysteresis, and can be set with all flow rate ranges by rotating the trimmer. In addition, the operation modes of OUT1 and OUT2 are opposite to each other.

*5: The output impedance of the analog output section is 1 kΩ . If the impedance of the connecting load is small, output error increases. Check error with the impedance of the connecting load before using.
■ Example of calculation
・Output impedance of FSM-V Ro=1 kΩ
・Load internal impedance Rx=1MΩ
・Output value = (1-Ro/(Ro+Rx))×100% = (1 - (1 kΩ/(1 kΩ+1 MΩ))×100%
→ Output value error = approx. 0.1%

*6: Calibrate the sensor at 1 to 5 V.
Accuracy conditions: Temperature 25±3°C, power supply voltage 24±0.01 VDC
F.S. (full scale) in these specifications indicates the flow rate range. For example, the F.S. for the flow rate range: -10 to +10 L/min is 20 L/min.

*7: The response time varies depending on the piping conditions.

Separated display specifications (dedicated for analog output)*8

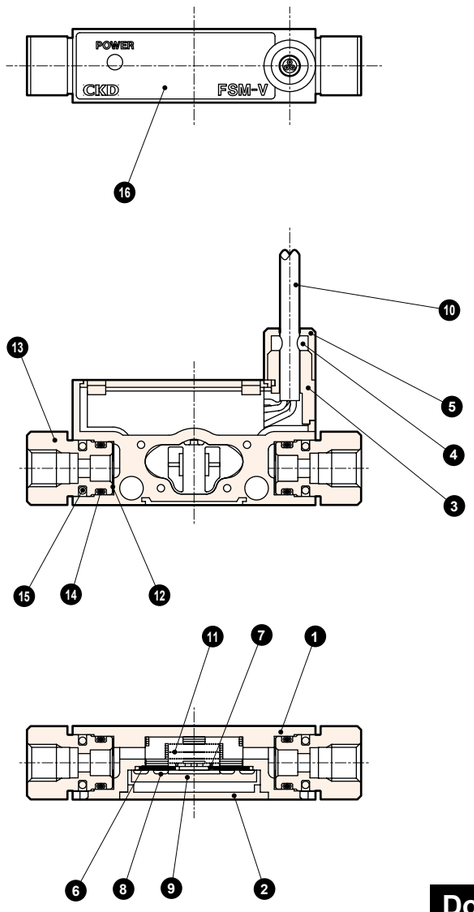
Model No.		Separated display					
Item		FSM-V-DN/P-R0005	FSM-V-DN/P-R0010	FSM-V-DN/P-R0050	FSM-V-DN/P-R0100	FSM-V-DN/P-R0500	FSM-V-DN/P-R1000
Connectable analog output model No.		FSM-V-A-R0005	FSM-V-A-R0010	FSM-V-A-R0050	FSM-V-A-R0100	FSM-V-A-R0500	FSM-V-A-R1000
Indicator	Indicator type	Flow rate display (7-segment 3-digit orange), operation and switch output display (orange)					
	Min. display unit*9	0.1 mL/min *8	1 mL/min *8		0.01 L/min *8		0.1 L/min *8
Output		Switch output 2 points (NPN or PNP open collector output, 30 VDC / 50 mA or less, voltage drop 2.4 V, PLC / relay compatible) Analog output 1 point (1 to 5 V voltage output, connecting load impedance 50 kΩ and over)					
Power supply voltage		12/24 VDC (10.8 to 26.4 V)					
Current consumption		50 mA or less (display only)					
Lead wire		ø3.7 5-conductor (0.2 mm² Outer diameter of insulatorø1.0) 1 m					
Functions		Flow rate display, flow rate display peak hold, switch output, analog output					
Operating ambient temperature / humidity		0 to 50°C, 85% RH or less (no condensation)					
Degree of Protection		IEC standards IP40					
EMC Directive		EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8					
Weight (g)		Approx. 55 (including lead wire 1 m)					

*8: The separated display is dedicated for analog output. Note that the switch output type cannot be connected.

*9: This indicates min. display unit of flow rate, and does not guarantee indicator accuracy.

Internal Structure Diagram / Material

●FSM-V-□□3-R□-M5 / Analog output
(switch output type also has the same internal structure)



Do not disassemble

Part No.	Part name	Material	Part No.	Part name	Material
1	Body	Polybutylene terephthalate	9	Electronic circuit board	Glass epoxy resin
2	Case	Polybutylene terephthalate	10	Lead wire	Halogen-free polyethylene resin blend
3	Lead wire holder	Polybutylene terephthalate	11	Rectifier	Stainless steel
4	Bush	Nitrile Rubber	12	Filter	Stainless steel
5	Bush holder	Aluminum alloy	13	Cartridge fitting (M5)	Aluminum alloy
6	Sensor gasket	Fluoro rubber	14	O-ring	Nitrile Rubber
7	Sensor chip	Silicone	15	Fitting fixing pin	Stainless steel
8	P-TITE screw	Steel (zinc plated)	16	Front sheet	Polyester film

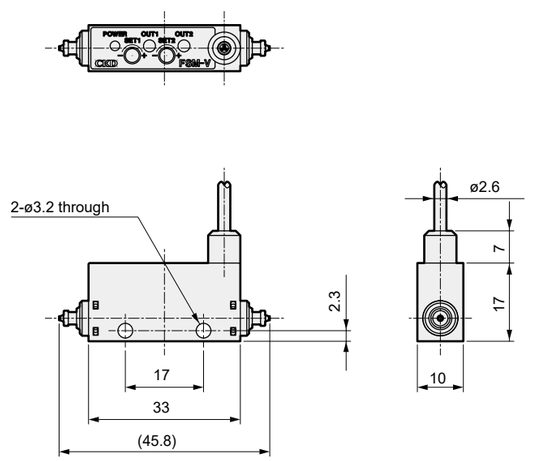
Note: The analog output type and the switch output type differ in appearance of the front sheet section.

●Separated display FSM-V-D□-R□

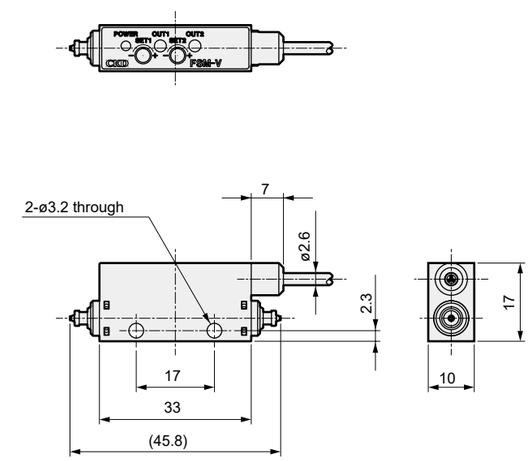
Refer to P. 388 for internal structure.

Dimensions (common to analog output and switch output)

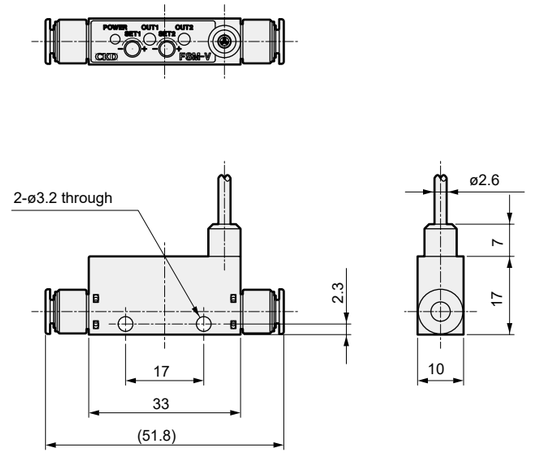
●FSM-V-□V3-R□-H2
(Radial lead wire, straight ø1.8 fiber tube)



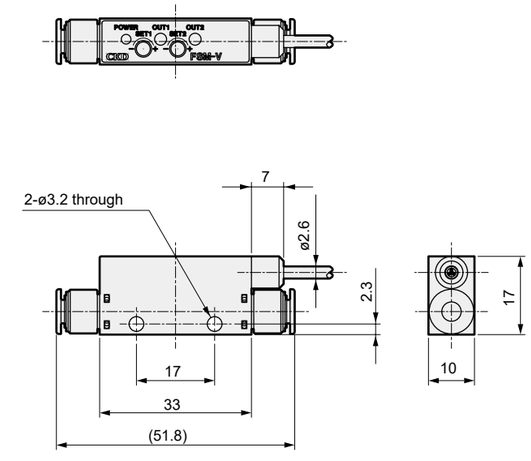
●FSM-V-□H3-R□-H2
(Axial lead wire, straight ø1.8 fiber tube)



●FSM-V-□V3-R□-H4
(Radial lead wire, straight ø4 push-in)



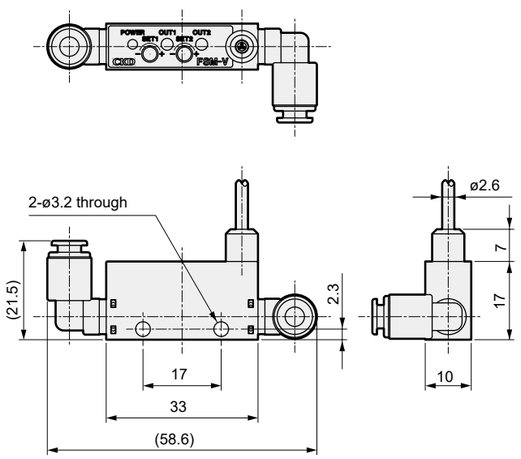
●FSM-V-□H3-R□-H4
(Axial lead wire, straight ø4 push-in)



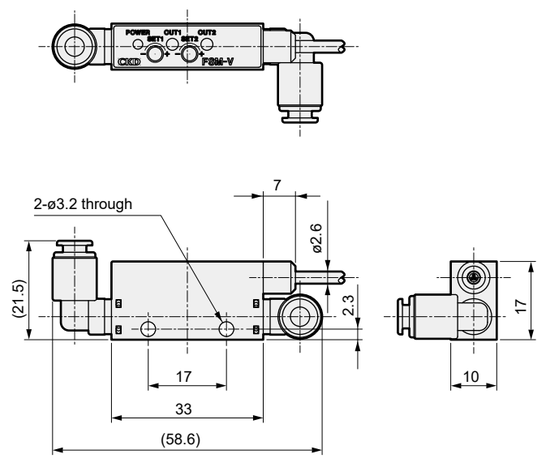
Note: The analog output type and the switch output type differ in appearance of the front sheet section.

Dimensions

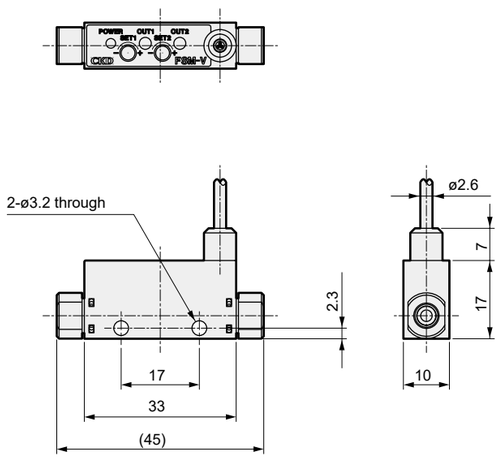
●FSM-V-□V3-R□-HL4
(Radial lead wire, L-shaped ø4 push-in)



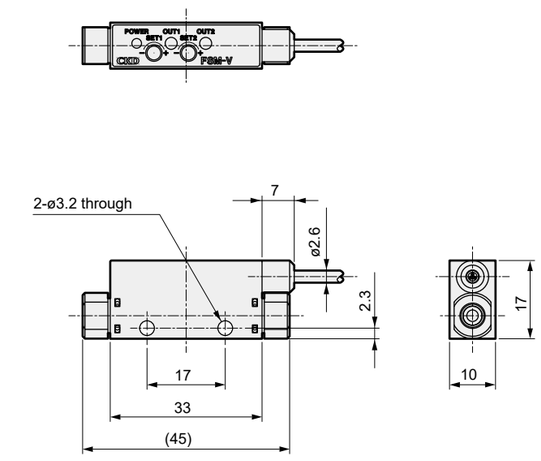
●FSM-V-□H3-R□-HL4
(Axial lead wire, L-shaped ø4 push-in)



●FSM-V-□V3-R□-M5
(Radial lead wire, port size M5)



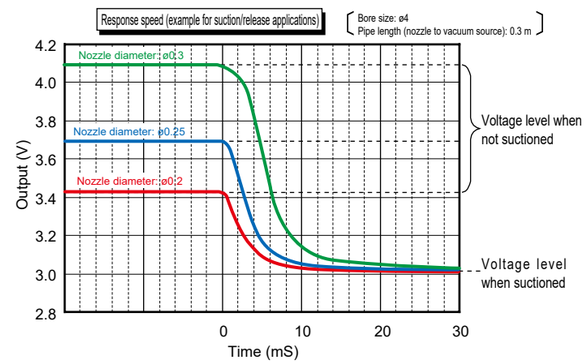
●FSM-V-□H3-R□-M5
(Lead wire straight, port size M5)

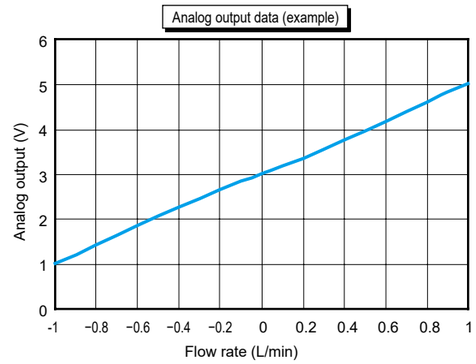


Note: The analog output type and the switch output type differ in appearance of the front sheet section.

Analog output characteristics

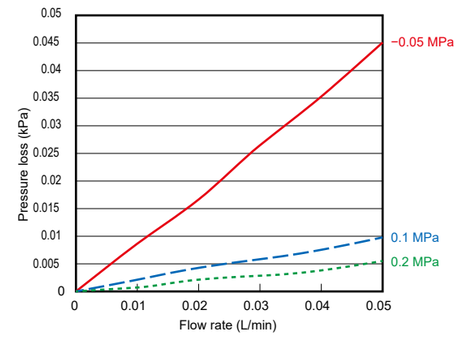
●FSM-V-A-R0100



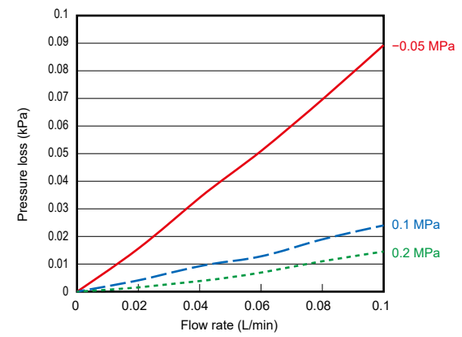


Pressure loss characteristics

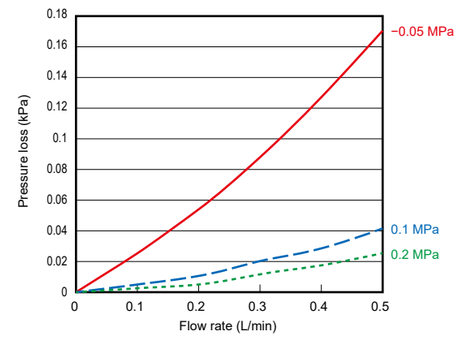
●FSM-V-□-R0005-H4



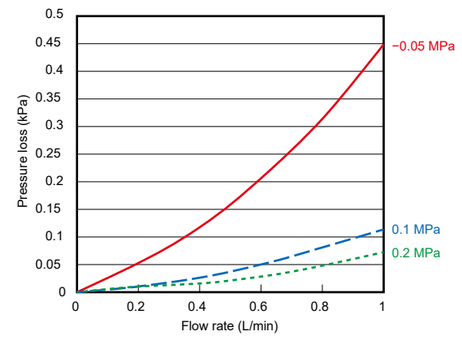
●FSM-V-□-R0010-H4



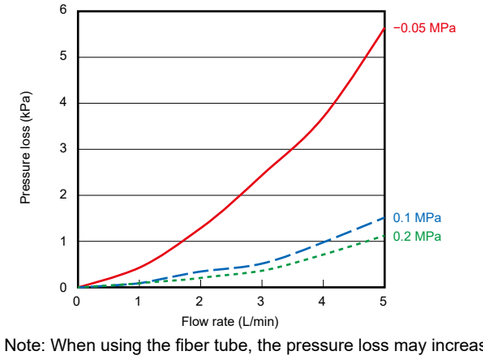
●FSM-V-□-R0050-H4



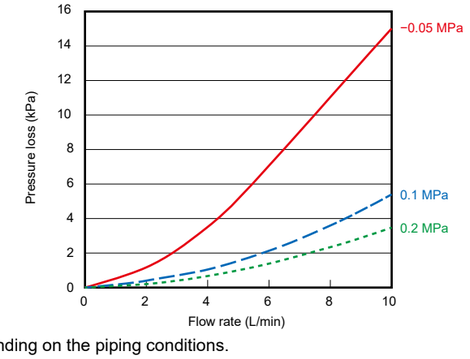
●FSM-V-□-R0100-H4



●FSM-V-□-R0500-H4



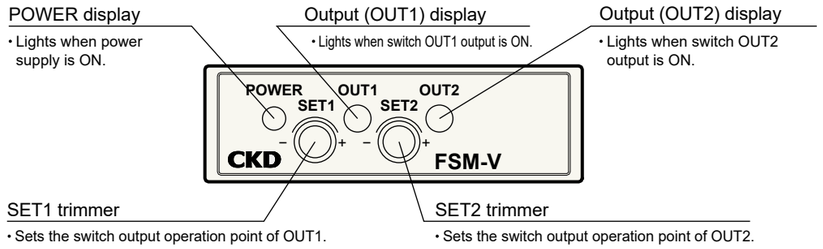
●FSM-V-□-R1000-H4



Note: When using the fiber tube, the pressure loss may increase depending on the piping conditions.

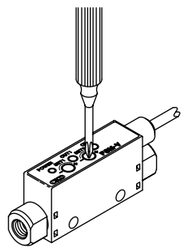
Names, functions and setting method of operation section

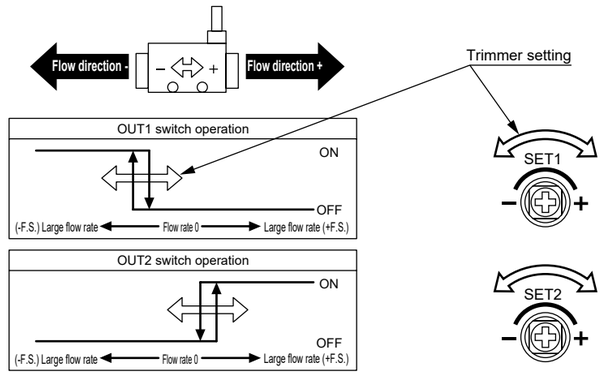
●Switch output



Switch setting method (switch operation and flow direction of fluid)

- Rotate the trimmers of SET1 and SET2 to set ON/OFF of 2 switch output points (OUT1/OUT2). Note that the switch operations at 2 output points differ as indicated in the figure at right.
- Use a Phillips screwdriver for 0-bit.





(Precautions) • The hysteresis of the switch output is a fixed value (10% F.S. or less).
• Do not press the trimmer forcibly with the screwdriver. The trimmer will be damaged.

●Separated display

Refer to P. 391 for names and functions of the separated display.

MEMO

Flow rate sensor
Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit
Ending



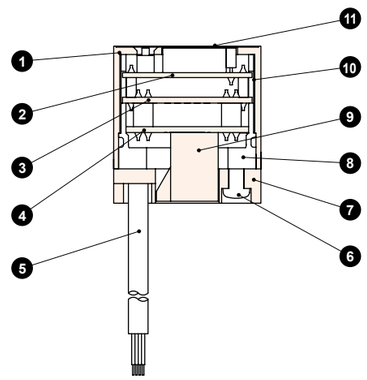
Separated display

FSM-V-D□ Series (For FSM-V)

Refer to the CKD website for detailed compatible model Nos.

Internal Structure Diagram / Material

● FSM-V-D□-□ (Separated display)

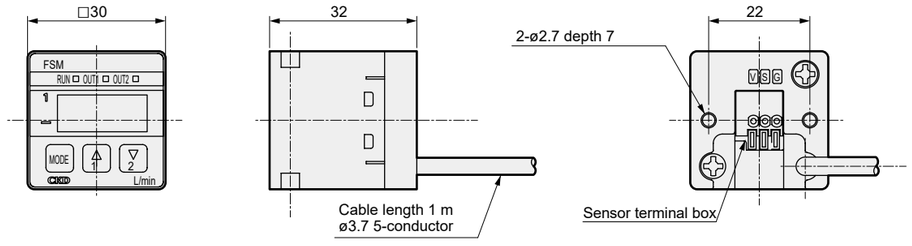


Do not disassemble

Part No.	Part name	Material
1	On the case	Polybutylene terephthalate
2	Indicator base	Glass epoxy resin
3	CPU board	Glass epoxy resin
4	Sensor board	Glass epoxy resin
5	Lead wire (1 m)	Polyvinyl chloride
6	Thread	Brass/nickeling
7	Back surface cover	Polybutylene terephthalate
8	Inside the case	Polybutylene terephthalate
9	Terminal block	Polyamide/copper alloy (plating)
10	Shield sheet	Aluminum
11	Front surface sheet	Polyester film

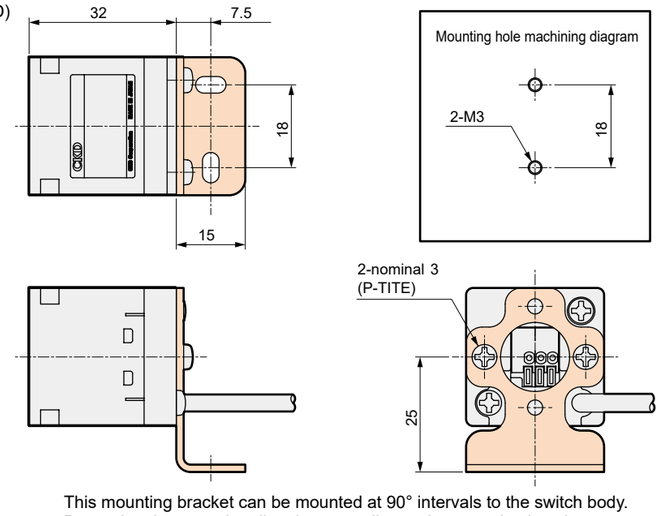
Dimensions

● FSM-V-D□-□



Mounting bracket dimensions

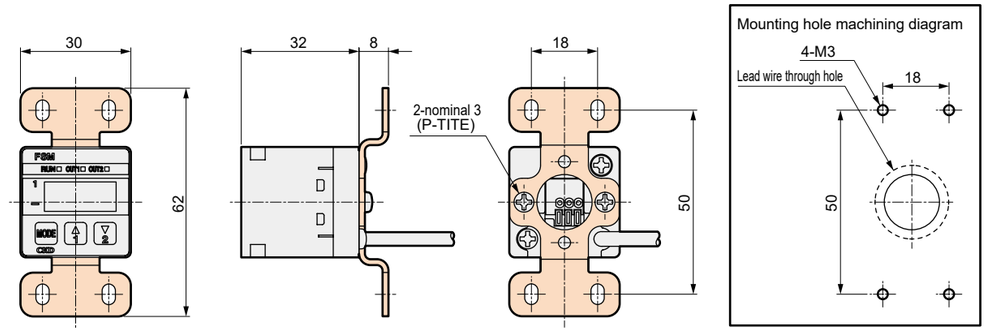
● One-side mounting foot attached (PPD3-KL-D)
*L-bracket, 2 mounting screws



This mounting bracket can be mounted at 90° intervals to the switch body.
Determine the mounting direction according to the mounting location.

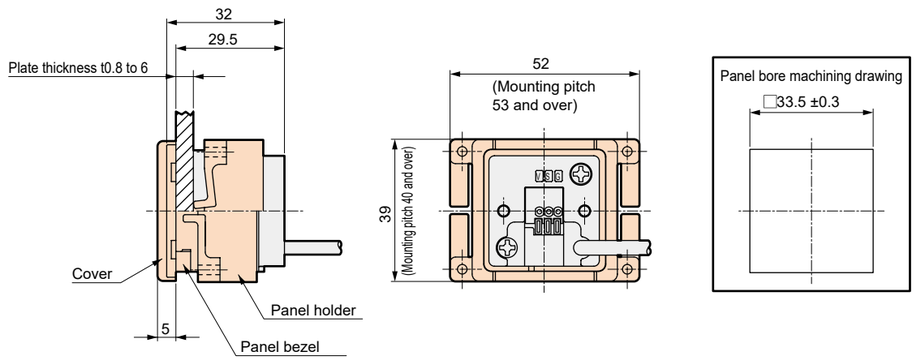
Mounting bracket dimensions

● Two-side mounting foot attached (PPD3-KD-D)
*D-bracket, 2 mounting screws



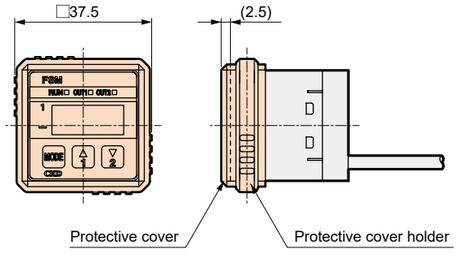
This mounting bracket can be mounted at 90° intervals.
Determine the mounting direction according to the mounting location.

● Panel mounting bracket set with cover (PPD3-KHS-D)
*Panel vessel, panel holder, panel key, panel cover



The mounting direction of the panel holder can be changed by 90°.

● Operation protective cover attached (PPD3-KC)
*Protective cover, protective cover holder

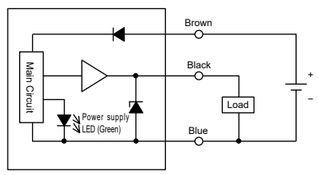


Note: Cannot be combined with PPD3-KHS-D.

Example of internal circuit and load connection

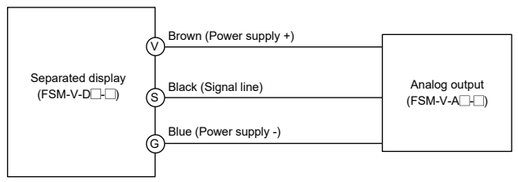
[FSM-V Series]

● FSM-V-A□ (Analog output)



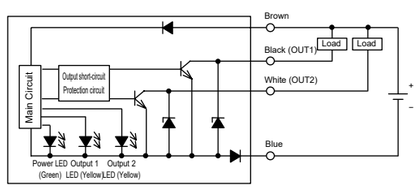
Line color	Description
Brown	Power supply 12 to 24 VDC
Blue	0 V (GND)
Black	Analog output (1 to 5 V)

● Connection method of separated display with analog output



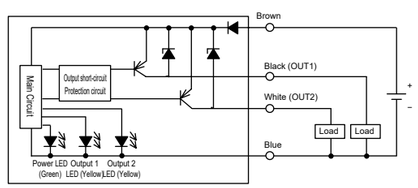
Note: The switch output type cannot be combined with separated display.

● FSM-V-N□ (switch output type NPN output)



Line color	Description
Brown	Power supply 12 to 24 VDC
Blue	0 V (GND)
Black	OUT1 (max. 50 mA)
White	OUT2 (max. 50 mA)

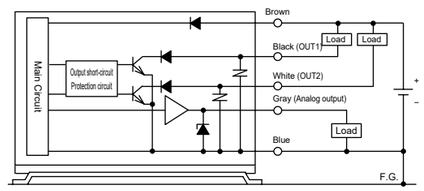
● FSM-V-P□ (switch output type PNP output)



Line color	Description
Brown	Power supply 12 to 24 VDC
Blue	0 V (GND)
Black	OUT1 (max. 50 mA)
White	OUT2 (max. 50 mA)

[Separated display]

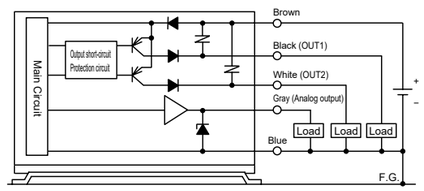
● FSM-V-DN-□ (separated display NPN output)



Line color	Description
Brown	Power supply 12 to 24 VDC
Blue	0 V (GND)
Gray	Analog output (1 to 5 V)
Black	OUT1 (max. 50 mA)
White	OUT2 (max. 50 mA)

・To reset short-circuit protection, turn OFF feed power supply, correct wiring mistakes, etc., then turn the power ON again.

● FSM-V-DP-□ (separated display PNP output)

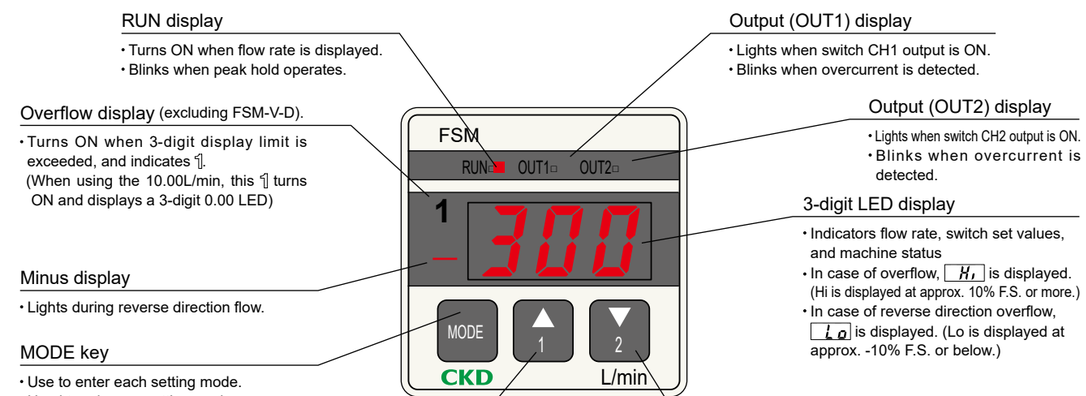


Line color	Description
Brown	Power supply 12 to 24 VDC
Blue	0 V (GND)
Gray	Analog output (1 to 5 V)
Black	OUT1 (max. 50 mA)
White	OUT2 (max. 50 mA)

・To reset short-circuit protection, turn OFF feed power supply, correct wiring mistakes, etc., then turn the power ON again.

Names and functions of display / operation section

● Separated display (FSM-V-D)



Item	Description	Initial state
Set value confirmation	The switch operation mode, switch ON set value, and switch OFF set value can be confirmed.	-
Peak hold function	The max. and min. values within the mode setting period can be confirmed.	-
Switch output setting	Set the switch operation mode, ON value setting value, and OFF setting value. [Operation mode] Window operation 1 (ON when inside the range), window operation 2 (ON when outside the range), hysteresis operation 1 (ON at low pressure), hysteresis operation 2 (ON at high pressure), stop operation	Stop operation
Forced output function Switch output test function	Forces the switch output to turn ON and is used to check the initial operation of wiring connections and input devices.	-
Zero point adjustment function	Deviation of the display from the zero point is compensated in the atmospheric pressure pressurized state.	-

For details on operation and setting method, refer to CKD components product website (https://www.ckd.co.jp/kiki/en/) → "Model No."→ Instruction manual

Flow rate sensor selection method

Use as a guideline for selection of the flow rate range when using the flow rate sensor for suction nozzle suction/release confirmation or leakage inspection.

The flow rate can be calculated using the effective cross-sectional area of nozzle (pinhole) and the pressure difference inside and outside the nozzle.

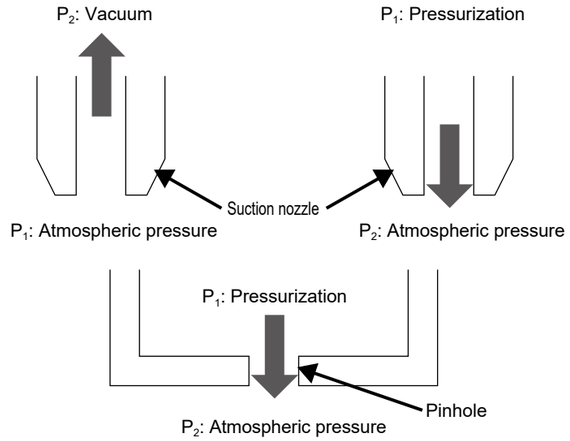
●$P_1 \geq 1.89P_2$ For (acoustic velocity)

$Q=113.2\times S\times P_1$

●$P_1 < 1.89P_2$ For (subsonic velocity)

$Q=226.4\times S\times \sqrt{P_2(P_1-P_2)}$

Q: Flow rate L/min
P_1: Primary side absolute pressure MPa
P_2: Secondary side absolute pressure MPa
S: Effective cross-sectional area of nozzle (pinhole) m㎡



■ Example of calculation

The table below shows the calculated flow rate values when P2 is varied for nozzle diameters from ø0.1 to ø2.

	P_1 (MPa) Absolute pressure	P_1 (MPa) Gauge pressure	P_2 (MPa) Absolute pressure	P_2 (MPa) Gauge pressure	Acoustic velocity/ subsonic velocity	Calculated flow rate value (L/min)								
						ø0.1	ø0.2	ø0.3	ø0.4	ø0.5	ø0.7	ø1	ø1.5	ø2
Vacuum	0.1013	0	0.0313	−0.07	Acoustic velocity	0.090	0.360	0.810	1.440	2.250	4.411	9.002	20.254	36.007
	0.1013	0	0.0413	−0.06	Acoustic velocity	0.090	0.360	0.810	1.440	2.250	4.411	9.002	20.254	36.007
	0.1013	0	0.0513	−0.05	Acoustic velocity	0.090	0.360	0.810	1.440	2.250	4.411	9.002	20.254	36.007
	0.1013	0	0.0613	−0.04	Subsonic velocity	0.088	0.352	0.792	1.408	2.200	4.312	8.800	19.801	35.202
	0.1013	0	0.0713	−0.03	Subsonic velocity	0.082	0.329	0.740	1.315	2.055	4.028	8.220	18.494	32.878
	0.1013	0	0.0813	−0.02	Subsonic velocity	0.072	0.287	0.645	1.147	1.792	3.512	7.166	16.125	28.666
	0.1013	0	0.0913	−0.01	Subsonic velocity	0.054	0.215	0.483	0.859	1.343	2.631	5.370	12.083	21.480
Blow (leakage inspection)	0.1113	0.01	0.1013	0	Subsonic velocity	0.057	0.226	0.509	0.905	1.414	2.772	5.657	12.727	22.626
	0.1213	0.02	0.1013	0	Subsonic velocity	0.080	0.320	0.720	1.280	2.000	3.920	8.000	15.679	31.998
	0.1413	0.04	0.1013	0	Subsonic velocity	0.113	0.453	1.018	1.810	2.828	5.543	11.313	17.999	45.252
	0.1613	0.06	0.1013	0	Subsonic velocity	0.139	0.554	1.247	2.217	3.464	6.789	13.856	24.454	55.423
	0.1813	0.08	0.1013	0	Subsonic velocity	0.160	0.640	1.440	2.560	4.000	7.840	15.999	31.175	63.996
	0.2013	0.1	0.1013	0	Acoustic velocity	0.179	0.716	1.610	2.862	4.472	8.765	17.888	35.998	71.552
	0.3013	0.2	0.1013	0	Acoustic velocity	0.268	1.071	2.410	4.284	6.694	13.119	26.774	60.242	107.096
	0.4013	0.3	0.1013	0	Acoustic velocity	0.357	1.426	3.209	5.706	8.915	17.474	35.660	80.236	142.641
	0.5013	0.4	0.1013	0	Acoustic velocity	0.445	1.782	4.009	7.127	11.137	21.828	44.547	100.230	178.186
	0.6013	0.5	0.1013	0	Acoustic velocity	0.534	2.137	4.809	8.549	13.358	26.182	53.433	120.224	213.731

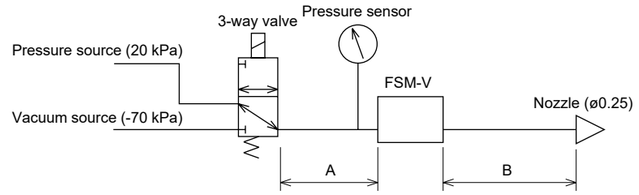
(CAUTION)

- If there is a leak in the piping etc., the actual flow rate will be larger than the calculated value. When selecting the flow rate, consider the amount of leakage in the piping.
- If there is a portion thinner than the suction nozzle diameter in the middle of the piping, the flow rate may be reduced, resulting in a flow rate lower than the calculated value. In addition, suction confirmation, etc., may become impossible.
- The effective cross-sectional area is only a guideline. When the nozzle is long and thin, the effective cross-sectional area becomes smaller than the opening area.
- The response time is determined by the inner volume of the piping from the flow rate sensor to suction nozzle (pinhole). For high-speed detection, reduce the inner volume of the piping as much as possible by installing a flow rate sensor near the suction nozzle, etc.

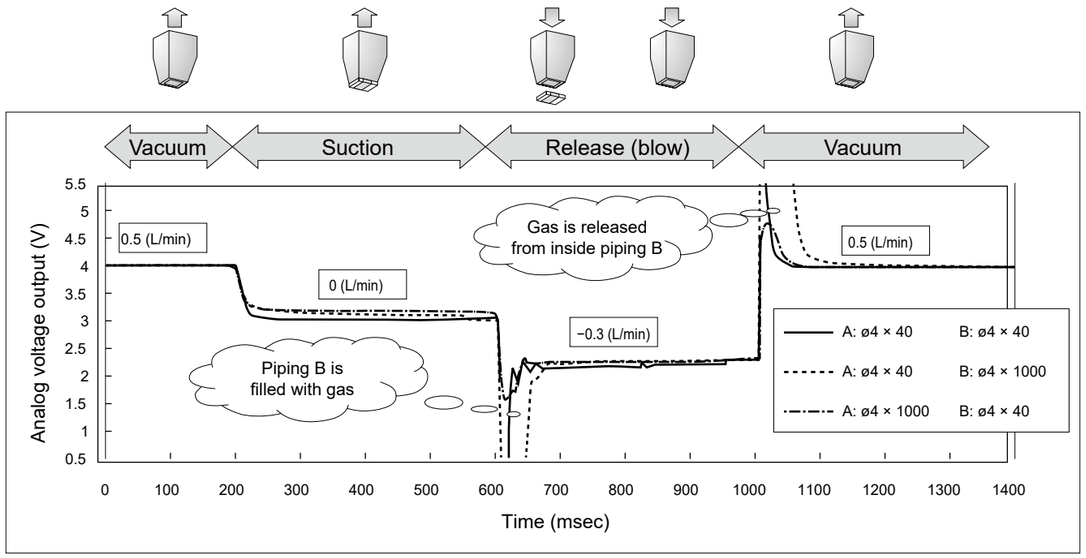
Suction confirmation

Response time

The response time at suction confirmation is determined by inner volume of the piping or exhaust capacity of the vacuum pump, etc.
For example, with piping as in the figure at right, the response time piping dependency is as in the figure below. This result demonstrates that it is effective to reduce the inner volume of the piping from sensor to suction nozzle as small as possible in order to decrease the response time.



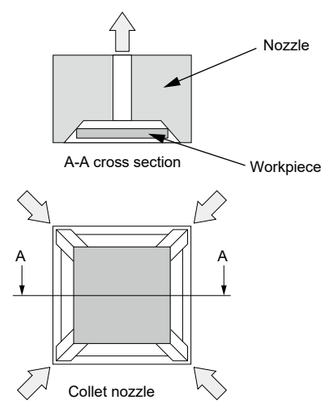
Test piping



Response piping dependency

When using the collet nozzle

The collet nozzle is commonly used when you do not want the workpiece to be suctioned to contact the nozzle directly. The inside of the collet nozzle is pyramid-shaped, with a structure that creates gaps at the four corners when the workpiece is contacted, generating leaks during suction. If the effective cross-sectional area of the piping (including valves and fittings, etc.) compared to the clearance between the collet nozzle and workpiece is small, the flow rate is determined by the effective cross-sectional area of the piping, and accordingly the flow rate difference between when suctioned and when not suctioned becomes small. In this instance, secure suction confirmation is enabled by making the effective cross-sectional area of the piping as large as possible, larger than the clearance between the collet nozzle and workpiece.





Dedicated for FSM-X, FSM-V Series
Miniature inline filter

FSM-VFM Series

RoHS

Features

Inline filter dedicated for miniature flow rate sensor (RAPIFLOW) FSM-X/FSM-V Series
Due to the small inner volume, the high-speed response at suction confirmation is not affected.

- Miniature type which stays out of the way and helps save space
- Easy element replacement
- Polyamide resin with superior chemical resistance is used for the case material
- As the case is transparent, any dirt on the element can be checked from the outside

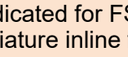
Model No. Notation Method

●Body

FSM - VFM - H44 - B

Model No.
1 Tube O.D.
2 Included

1 Tube O.D.

Code	Description	
H22	ø1.8 (fiber tube)	
H44	ø4 (push-in)	
M55	Port size M5	

2 Included

Code	Description	
Blank	Without bracket	
B	Bracket included	

●Bracket part model No. (cross-recessed flat head tapping screw M2.5×6:1 pcs.)

FSM - VFM - B

●Maintenance part model No. (element: 5 pcs., fitting fixing pin: 1 pc.)

FSM - VFM - E

Clean-room specifications (Catalog No. CB-033SA)

●Anti-dust generation structure for use in cleanrooms

FSM-VFM - · · · · - P7□

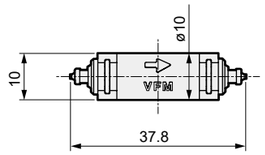
Specifications

Item		FSM-VFM-H22	FSM-VFM-H44	FSM-VFM-M55
Working fluid		Clean air (ISO 8573-1: 2010 [1:1:1 to 5:6:2]), compressed air (ISO 8573-1: 2010 [1:1:1 to 1:6:2]) *1		
Applicable tube bore		ø1.8 (Fiber tube)	ø4 (Push-in)	Port size M5
Proof pressure MPa		0.75		
Working pressure MPa		−0.1 to 0.5		
Ambient temperature °C		0 to 50		
Material	Case	Polyamide		
	Element	Polypropylene, polyethylene		
Degree of Filtration µm		10		
Weight g		5.2	9.5	4.2
Recommended flow rate L/min		10 *2		

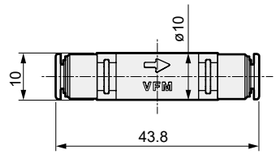
***1: Refer to P. 373 for the compressed air quality class according to ISO 8573-1: 2010.**
*2: As the pressure loss increases if the flow rate exceeds 10L/min, use at 10L/min or less.

Dimensions

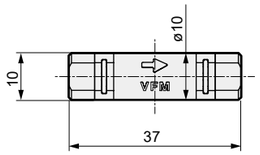
●FSM-VFM-H22



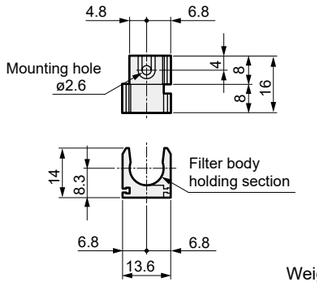
●FSM-VFM-H44



●FSM-VFM-M55

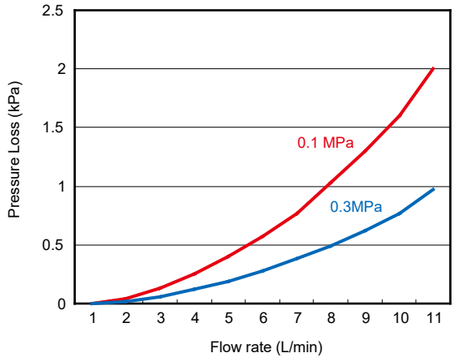


●FSM-VFM-B [Bracket]



Weight: 2 g

Flow Characteristics (FSM-VFM-H44)

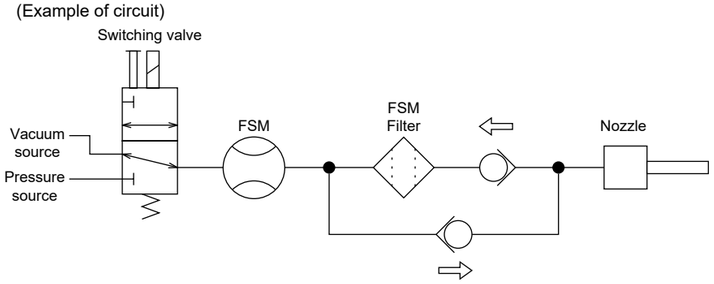


●When using the fiber tube, the pressure loss may increase depending on the piping conditions. Please be careful.

Caution

●This filter has orientation.
Use a check valve as a countermeasure against the outflow of dirt when used for suction confirmation, etc.

(Example of circuit)



●Refer to P. 400 for other precautions.

Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

Product-specific cautions: Miniature flow rate sensor FSM-X/FSM-V Series

Design / Selection

Working fluids

⚠ DANGER

■Never use this product with flammable fluids.

⚠ WARNING

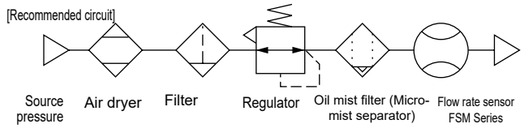
■This product cannot be used as a billing meter. Do not use this product for commercial transactions as it is not compliant with the Measurement Act. Intended applications include industrial sensors.

■Do not use fluids other than the applicable fluids, because accuracy cannot be guaranteed.

■Use dry gas which does not contain corrosive elements such as chlorine, sulfur or acids, and which is clean and does not contain dust or oil mist.

■When installing the product during piping or fitting assembly, use the above clean gas for the fluid used to blow out for cleaning. Check that foreign matter does not enter the product from the port of the product. When using compressed air in this process, use clean air compliant with the air quality listed in the following item (ISO 8573-1 Class 2010 1.1.1 to 1.6.2).

■When using compressed air, use clean air that complies with ISO 8573-1 2010 Class 1.1.1 to 1.6.2. Since compressed air from the compressor contains drainage (water, oil oxides, foreign matter, etc.), attach a filter, an air dryer and an oil mist filter (Micro-mist separator) to the primary side (upstream) of the sensor. The sensor's mesh rectifies flow in the pipe. It does not filter out foreign matter, so provide a filter.



■Depending on the fluid, retaining the fluid for long periods could adversely affect the performance. Do not seal the fluid in the pipe for long periods of time.

■When using a valve on the primary side of the sensor, use only valves with oil-prohibited specifications. This sensor could malfunction or fail if exposed to splattering grease, oil, etc. As friction powder may be generated depending on the valve, mount a filter to prevent the powder from entering the sensor.

Working environment

⚠ DANGER

■Flammable environment
Never use this product in an explosive gas atmosphere. The structure is not explosion-proof, and explosions or fires could occur.

⚠ WARNING

■Corrosive environment
Do not use this product in an atmosphere containing corrosive gases such as sulfur dioxide.

■Ambient/fluid temperatures
Use at ambient/fluid temperatures within the specified range of 0 to 50°C. Even if the temperature is within the specified range, do not use this product if the ambient temperature and fluid temperature could suddenly change and cause dew to condense.

■Working pressure / flow rate range
Applications exceeding the max. working pressure and specified flow rate range may result in breakdown. Use this product only within the specified range.

■Drip-proof environment
Degree of protection is equivalent to IP40. Do not install this product where water, salt, dust, or swarf is present or in a pressurized or depressurized environment. The product cannot be used with large temperature variations or high temperature/humidity since condensation may occur inside the body.

⚠ CAUTION

■CE-compliance working conditions
This product is CE-marked, indicating conformity with the EMC Directives. The standard for the immunity for industrial environments applied to this product is EN61000-6-2; the following requirements must be satisfied in order to conform to this standard:
Conditions
- The evaluation of this product is performed by using a cable that has a power supply line and a signal line paired to assess the product's performance.
- This product is not equipped with surge protection. Implement surge protection measures on the system side.

Flow rate unit

⚠ CAUTION

■This product's flow rate is measured at a mass flow rate unaffected by temperature or pressure. The unit is L/min, but this is an indication of the mass flow rate converted to volume flow rate at 20°C, 1 atm (101 kPa), and 65% relative humidity.

Proof pressure

⚠ CAUTION

■Proof pressure differs depending on the series. Take note at selection.

Overflow

⚠ CAUTION

■For each series, there is no problem with the sensor even if the overflow is about twice the measuring range. However, if dynamic pressure is applied near the maximum operating pressure (when the secondary side is open and pressure is applied to the primary side), there is a possibility that the sensor will malfunction. When dynamic pressure is applied, such as when filling a workpiece for leakage inspection, be sure to provide a bypass circuit or a squeezer to prevent dynamic pressure from being applied to the sensor.

Use for suction confirmation, etc.

⚠ CAUTION

■When the product is used to confirm suction, etc., select the flow rate range based on the operating vacuum pressure and suction nozzle. Refer to separate sheet "Selection guide for flow rate sensor" on page 392 .

■When using the filter to confirm suction, etc., provide an air filter (Degree of filtration 30 μm or less) upstream from suction to prevent the entry of foreign matter. (We recommend the miniature inline filter dedicated for FSM and FSM-V. Refer to P. 394 for details.)

■When using the fiber tube model within the flow rate range of ±5 L/min, or ±10 L/min in the FSM-V Series, the required flow rate may not flow due to large pressure loss depending on the operating pressure.

■When the product is used to confirm suction, etc., consider the atmospheric dew point and this product's ambient temperature, and use the product under conditions in which dew does not condense in pipes.

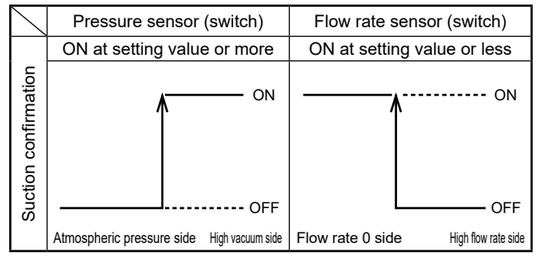
■When used to confirm suction, etc., response time may be delayed by the piping volume between the suction nozzle and this product. In this case, take countermeasures to reduce piping capacity.

When used for leakage inspection

■The working pressure range is -0.09 to 0.2 MPa. In particular, if the sensor is energized in a vacuum of -0.09 MPa or less, the heat dissipation of the sensor will be poor, leading to deterioration of the sensor.

■When this product is used for vacuum applications such as air supply, do not bend the tube near the push-in fitting. If stress is applied to the tube near the push-in fitting, insert an insert ring into the tube, and connect the tube to the push-in fitting.

■When the suction confirmation sensor is switched from a pressure sensor (switch) to a flow rate sensor (switch), sensor output (switch output) logic will be reversed. (Refer to the drawing below.) Note that the PLC sequence program must be changed or revised. If source pressure or vacuum source is not supplied when device power is turned ON, "flow rate 0" = "sensor output (switch output) ON" status is set at the flow rate sensor (switch). Check that this occurs with the PLC sequence program, etc.



■FSM-X Series
- Because the flow rate-output characteristics may vary depending on the flow path structure, when preparing the flow path block, use after checking the actual flow rate-output characteristics.
- Depending on the fluid, retaining the fluid in the flow path for long periods could adversely affect the performance. Do not seal the fluid in the pipe for long periods of time.

Wiring

⚠ WARNING

■Use a DC stabilized power supply within the specified rating, insulated from the AC power supply. A non-isolated power supply could result in electrical shock. If power is not stabilized, the peak value in summer could exceed the rating and damage the product or reduce precision.

■Stop the control device and equipment and turn power OFF before wiring. Starting operation suddenly could cause unpredictable and dangerous operation. Conduct an energized test with controls and machine devices stopped, and set target switch data. Be sure to discharge any accumulated electrostatic charge among personnel, tools, or equipment before and during work. Connect and wire bend-resistant material, such as robot wire material, for movable sections.

■Install this product and wiring as far away as possible from sources of noise such as power distribution wires. Provide separate countermeasures for surge applied to the power cable.

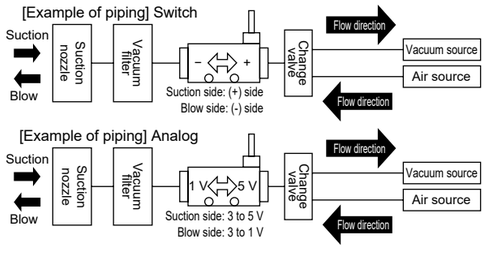
⚠CAUTION

■The power supply for the metal body (stainless steel body, aluminum body) type is a DC stabilized power supply completely isolated from the AC primary side. Connect either the + side or - side of the power to the FG. Between the metal body internal power circuit and metal body, a varistor (limit voltage approx. 40 V) is connected to prevent dielectric breakdown of the sensor. Do not conduct a withstand voltage test or insulation resistance test between the internal power circuit and metal body. Disconnect wiring first if this testing is required. An excessive potential difference between power and metal body will burn internal parts. After installing, connecting and wiring the metal body, electrical welding of the equipment/frame or short-circuit accidents, etc., could cause welding current, excessive high voltage caused by welding, or surge voltage, etc., to run through the wiring, ground wire, or fluid path connected between such devices, damaging wires or devices. Conduct any work such as electrical welding after removing this device and disconnecting all electric wires connected to the FG.

Piping

⚠CAUTION

■Before installation of piping and FSM-V, check the direction of arrow on the body and consider the fluid direction and switch operation.



■About FSM-X

- Make sure that the lead wire is free of repeated bends and tension. Otherwise, this could lead to disconnection.
- Make sure that no external force is applied to the connector section during use. The internal base or body may be deformed, resulting in output deviation or external leakage.
- Bi-direction (uni-direction) indicates 3 V (1 V) when the flow rate is 0, and changes to 5 V when the fluid flows to the right (when the connector is to the right of the body).

■Establish the installation method, piping order, and fitting assembly method from the design stage before use. Check that sealing tape, sealant, and foreign matter do not enter the product during installation and fitting assembly. In particular, freshly piped sections may contain unexpected foreign matter. Be sure to discharge air with air blow, etc., before installing this product.

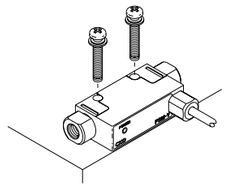
Mounting

⚠CAUTION

■The sensor can be installed in any direction; top, bottom, left, or right.

■FSM-V Series

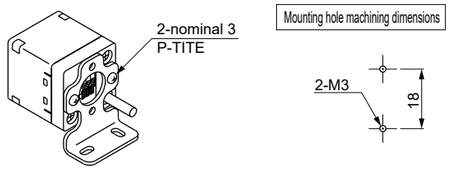
■For miniature flow rate sensor Discrete
Install using the 2 through holes (ø3.2) on the side.



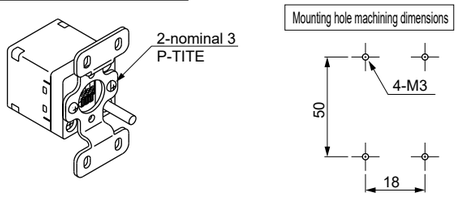
■Do not install multiple product bodies in close contact. The generation of heat on each part could cause the product's temperature to rise, hastening changes in characteristics or deterioration of the resin material. When using the products in a row, set intervals of distance of 10 mm and over.

■Separated display FSM-H-D□, FSM-V-D□ common
Mounting brackets/kits (optional) for installing and mounting the separated display are available.

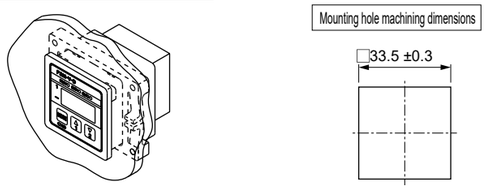
Mounting bracket model No.: PPD3-KL-D : One-side mounting foot (L-shaped mounting)



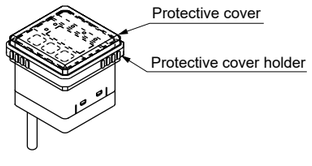
Mounting bracket model No.: PPD3-KD-D : Two-side mounting foot (parallel mounting)



Mounting bracket model No.: PPD3-KHS-D : Panel mounting bracket set, with panel cover



Mounting bracket model No.: PPD3-KC : Operation protective cover



Other

⚠WARNING

■Output accuracy is affected by temperature characteristics and heat generated when energized. Provide a standby time (5 minutes or more after energizing) before use.

■Immediately after power is turned ON, flow rate detection switch operation is not performed for approx. 2 seconds to complete self-diagnosis. Provide a control circuit/program that ignores signals for at least two seconds after power is turned ON.

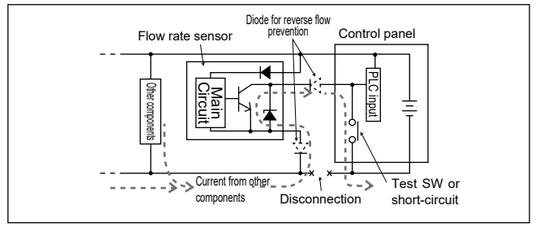
⚠CAUTION

■Use the product within the rated flow range.

■Use within the working pressure.

■The accuracy may vary from the initial status depending on the working environment or working conditions. It is recommended to check the operation of the product periodically.

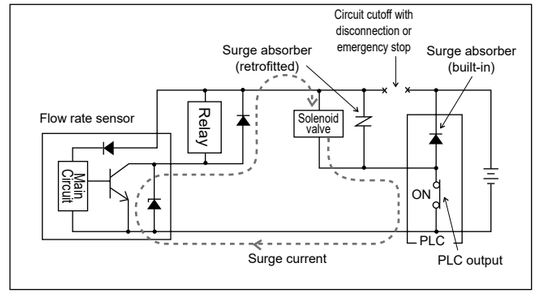
■Pay attention to reverse currents caused by disconnected wires and wiring resistance. If other devices, including a flow rate sensor, are connected to the same power supply as the flow rate sensor, and the switch output wire and power cable negative (-) side are short-circuited to check the operation of the control panel input unit, or if the power cable negative (-) side is disconnected, reverse current could flow to the flow rate sensor's switch output circuit and cause damage.



Take the following measures to prevent damage caused by reverse current:

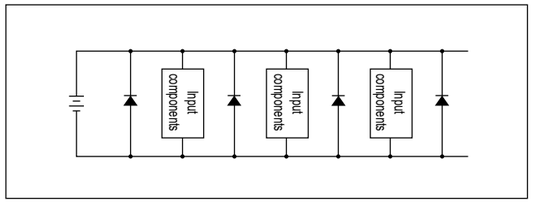
①Avoid centralizing current at the power cable, especially the minus side power cable, and use as thick a cable as possible.
②Limit the number of devices connected to the same power source as the flow rate sensor.
③Insert a diode parallel to the flow rate sensor's output line to prevent reverse current.
④Insert a diode parallel to the flow rate sensor power wire's negative (-) side to prevent reverse current.

■Pay attention to surge current flow-around. When flow rate sensor power is shared with an inductive load that generates surges, such as a solenoid valve or relay, if the circuit is cut off while the inductive load is functioning, surge current could enter the switch output circuit and cause damage depending on where the surge absorber is installed.



Take the measures below to prevent damage from sneak surge current.

①Separate the power supply for output including the inductive load, such as the solenoid valve and relay, and input, such as the flow rate sensor.
②If a separate power supply cannot be used, directly install a surge absorber for all inductive loads. Consider that the surge absorber connected to the PLC, etc., protects only the individual device.
③Connect a surge absorber to places on the power wiring shown in the figure below, as a measure against disconnections in unspecified areas.



When the devices are connected to a connector, the output circuit could be damaged by the above phenomenon if the connector is disconnected while the power is ON. Turn power OFF before connecting or disconnecting the connector.

■Analog output continues even if the flow rate range is exceeded. Indicatored is the "Hi" display. Note that this is outside the guaranteed precision. Analog output continues even if the flow is reversed. (Note that this is outside the guaranteed precision. Excluding the FSM-V Series.) When confusion with the forward direction signal occurs, use the PLC sequence program to avoid trouble.

Product-specific cautions: Miniature inline filter FSM-VFM Series

Design / Selection

⚠CAUTION

■Do not use this product for vacuum circuits that could come in contact with acids, alkalis, carboxylic acids, other organic compounds, screw-lock agents, solvents, alcohol solutions, or air containing these substances. The body may be damaged, which is dangerous.

■Use the designated tube and plastic plug.
Tube outer diameter accuracy
- Polyamide tube.....Within ±0.1 mm
- Polyurethane tube
  (≤ ø6).....Within ±0.1 mm
  (ø8 ≤)..... Within $^{+\ 0.1}_{-\ 0.15}$ mm

CKD recommended model No.

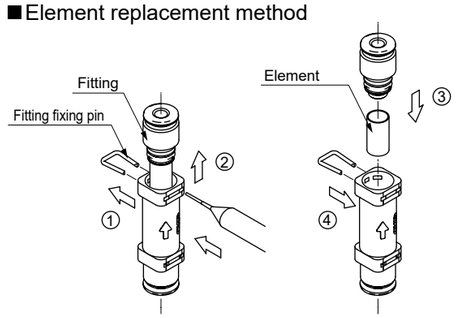
Plastic plug	GWP□-B Series
Soft nylon tube	F15□ □ Series
Polyurethane tube	U95□ □ Series
New urethane tube	NU-04, 06 Series

■For cautions regarding push-in fittings, also read "Safety precautions for fittings/tubes".

■To check the polyamide case for cracks, damage, and other deterioration, perform periodical inspection/cleaning/replacement.

■As a clogged filter element may cause degradation of the vacuum source, perform periodical inspection/cleaning/replacement of the element.

■Element replacement method



①Remove the fitting fixing pin using a jig with a pointed tip, etc. (Make sure not to lose the fitting fixing pin because it will be used again.)
②Pull out the fitting.
③Replace the element and push in the fitting.
④Push in the fitting fixing pin to fix the fitting.

■When the body is detached to clean or replace the filter element, the bowl pressure must be reduced to atmospheric pressure before starting work. Because the flow direction has orientation, check the arrow display on body before reassembly. After reassembly, check if the required degree of vacuum is reached.

■Rinse the body with water after washing with household neutral detergent.

■If small objects with small particle diameter such as dust during the suction enter the flow path, the foreign matter may flow to the secondary side without being filtered. Select a filter suited to the purpose.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual

MEMO

Compressed air flow rate sensor

Separated display FLUEREX flow sensor ® PFD

■ Flow rate sensor



CONTENTS

Product Introduction	404
FLUEREX flow sensor (PFD) separated display	406
Electric wiring	412
Functions/operations for monitor	414
⚠Safety Precautions	415

Flow rate sensor

Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit

Ending

Flow Sensor for Compressed Air
FLUEREX flow sensor®

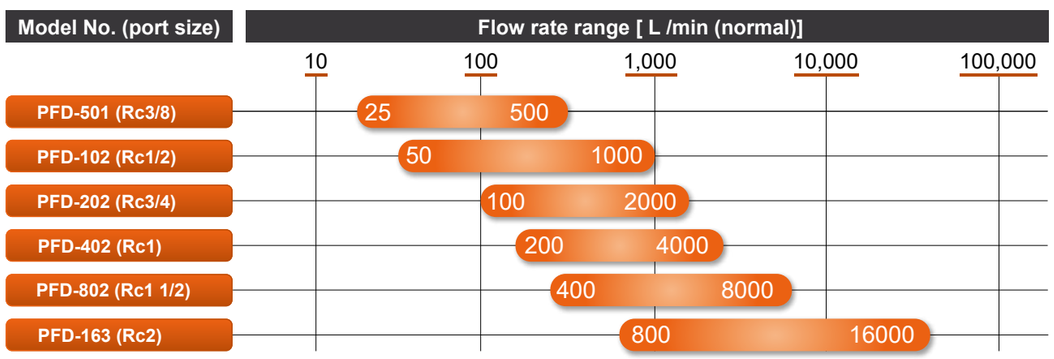
PFD Series

Contributing to carbon neutrality with energy-saving management

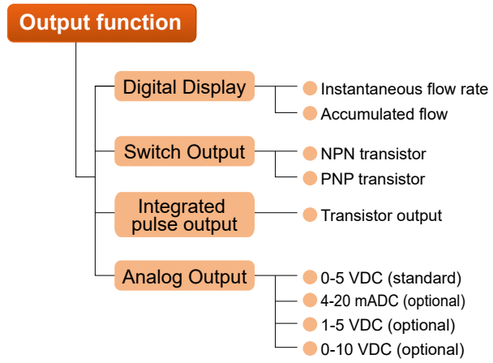


Grasp the current situation	Implement measures	Effect confirmation	Correction / Continuation
■ Measure the status of flow rate	■ Stop the air pressure supply during non-operation	■ Measurement with flow rate sensor	■ Standardized consumption of equipment and lines
■ Consider countermeasures	■ Blow time reduction	■ Cost conversion is possible with integrating function	■ Application in other lines
	■ Application of energy saving nozzle		
	■ Lower pressure		

Cover a wide range of flow rates with 6 varieties



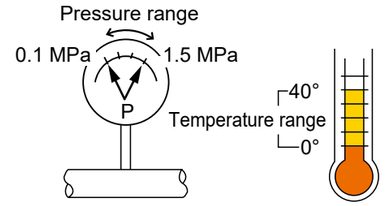
A wide range of output variations



Digital direct-reading, correction not needed

The digital display value does not require complicated pressure and temperature correction, and can be read as is.

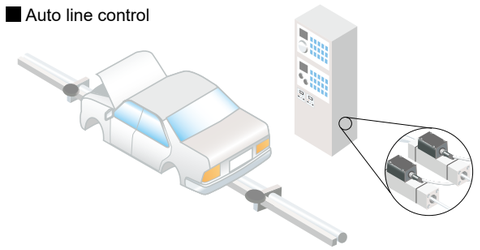
- **No need for pressure correction**
  Method of detecting the mass flow rate
- **Temperature correction not required**
  Built-in automatic temperature correction function



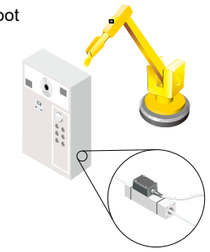
Examples of applications

For flow rate management of production line of an auto plant

■ Auto line control

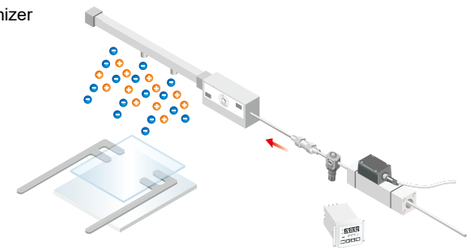


■ Paint line robot

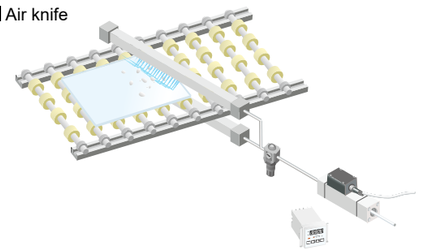


For flow rate management of FPD manufacturing equipment

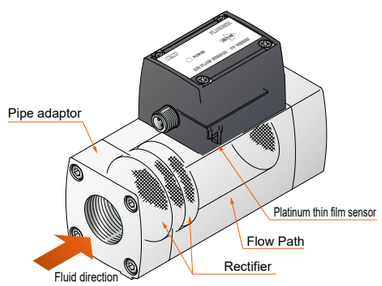
■ Ionizer



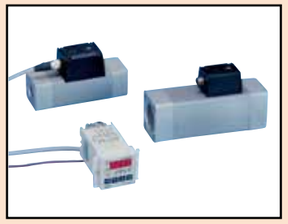
■ Air knife



Functions



The sensor of FLUEREX consists of a rectifier that converts the compressed air to a uniform flow and a platinum thin film resistor that detects the flow rate. The rectifier works to make the flow uniform when a bent pipe such as an elbow is installed immediately before the sensor. Through the use of multiple rectification plates, the pressure loss is suppressed and an adequate rectification effect is realized. When the compressed air does not flow, the platinum thin film sensor that detects the flow rate is heated from the fluid temperature to a certain constant temperature. When the compressed air flows, the amount of heat proportional to the weight of air is detracted and the current that intends to maintain the constant temperature flows in the circuit inside the platinum thin film sensor that detects the flow rate. By receiving this current as a flow rate signal, the display section displays a practical atmospheric pressure, instantaneous flow rate or accumulated flow of the air converted to 0°C. In addition, by the platinum thin film sensor that detects the fluid temperature, the temperature of the compressed air is measured and the temperature correction is performed.



Pneumatic flow rate sensor FLUEREX

PFD Series

●Flow rate range: 25 to 500, 50 to 1000, 100 to 2000, 200 to 4000, 400 to 8000, 800 to 16000 L/min (normal)

Refer to the CKD website for detailed compatible model Nos.

Features

●Correction due to pressure fluctuation or temperature fluctuation is not required.
●The flow rate converted to the reference state (0°C, 101.3 kPa) is displayed.
●Integration display and integrated value pulse output are possible.
●A wide range of functions and variations such as flow rate range and various electric outputs.

Model No. Notation Method

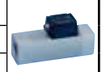
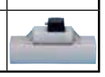
PFD - 501 - 10 N 0 - B

Model No. ❶Flow rate range ❸Switch Output ❺Bracket
❷Port size ❹Analog Output

Note: The product consists of sensor, monitor and cable.
The description on the plate is as follows.
The model No. is not indicated on the cable.

Product: PFD-(❶)-(❷)(❸)(❹)-(❺)
Sensor section: PFD-(❶)-(❷)
Monitor section: PFD-(❶)-(❸)(❹)

❶Flow rate range

Code	Description	
501	25 to 500 L /min (normal)	
102	50 to 1000 L /min (normal)	
202	100 to 2000 L /min (normal)	
402	200 to 4000 L /min (normal)	
802	400 to 8000 L /min (normal)	
Note 163	0.80 to 16.00 m³/min (normal)	

Note: Bracket option is not available for PFD-163.

❷Port size

Code	Description	❶Flow rate range 501	102	202	402	802	163
10	Rc3/8	●					
15	Rc1/2		●				
20	Rc3/4			●			
25	Rc1				●		
40	Rc1-1/2					●	
50	Rc2						●

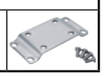
❸Switch Output

Code	Description
N	NPN transistor output x 2
P	PNP transistor output x 2

❹Analog Output

Code	Description
0	0 to 5 VDC Standard
1	4 to 20 mA DC Option
2	1 to 5 VDC Option
3	0 to 10 VDC Option

❺Bracket

Code	Description	
Blank	None Standard	
B	Bracket included Option	

Note: Bracket option is not available for PFD-163.

●Discrete option model No.

PFD - C3
❶Option

❶Option

Code	Description	
C3	Standard cable	
B	Bracket (for 501/102/202/402)	
B1	Bracket (for 802)	

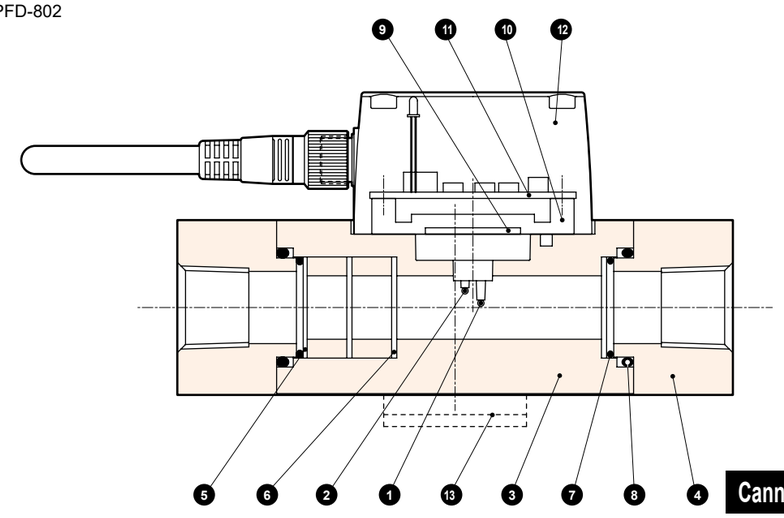
Specifications

Item		PFD-501-10	PFD-102-15	PFD-202-20	PFD-402-25	PFD-802-40	PFD-163-50
Specs.	Flow rate range L/min (normal)	25 to 500	5 to 50	100to 2000	100 to 200	400 to 8000	800 to 16000
	Port size	Rc3/8	Rc1/2	Rc3/4	Rc1	Rc1-1/2	Rc2
Working Conditions	Applicable fluid	Compressed clean air/nitrogen gas					
	Air quality	ISO 8573-1: 2010 [1:1:1 to 1:6:1] *1					
	Max. Working Pressure MPa	1.0					
	Min. working pressure MPa	0.1					
	Proof pressure MPa	1.5					
	Ambient temperature °C	0 to 50					
	Ambient humidity	85%R.H. or less (no condensation)					
	Fluid temperature °C	0 to 40					
Accuracy	Linearity	±3.0% F.S. (0.5 MPa, at 20°C)					
	Pressure characteristics	±2.0% F.S. (0.5 MPa reference, at 0.2 to 0.7 MPa)					
	Temperature characteristics	±2.0% F.S. (20°C reference, at 10 to 30°C)					
Pressure loss MPa		0.015 or less (max. flow rate, at 0.5 MPa)					
Response time sec		2.5 or less					
Output	Indicator	Instant/accumulated flow 4-digit LED display					
	Resolution L/min (normal)	1	5	5	10	20	50
	Min. displayed flow rate L/min (normal)	10	20	40	80	160	320
	Accumulated flow	Max. 9 digits (switching display using change key) *2					
	Analog Output	Standard: 0 to 5 VDC, option: 4 to 20 mA DC, 1 to 5 V, 0 to 10 V					
	Switch Output	2 points (NPN/PNP transistor output: selection)					
	Pulse output *3	10 L (normal) / pulse				100 L (normal) / pulse	
Power supply voltage V		24 VDC (6 W or less/excluding load current of switch output)					
Cable		Accessory (3 m, 4-conductor, final diameter ø6, core wire 0.5 m㎡, insulator outer diameter 1.72 mm, with connector)					
Mounting	Mounting orientation	Unrestricted in vertical/horizontal directions					
	Straight piping section	IN side: 10D, OUT side: 5D, these are recommended *4					
Degree of Protection		IP64 equivalent (only for sensor)					
Weight kg		1.1	1.1	1.3	1.4	1.7	4.5
Bracket weight g		61 (including screws)				92 (including screws)	-

*1: Note that condensation may be formed when used in a state in which the ambient temperature is lower than the fluid temperature. Note that detection failure may occur if transmitted oil is accumulated. Because this kit does not have clean specifications for equipment, the generation of particles occurs on the secondary side. When ultra clean air is required, it is recommended to install a filter for precise filtration on the end side.
***2: The data of accumulated flow value is backed up regularly.**
*3: The pulse output is shared with the switch output. Use this output by switching the function.
*4: Installing straight pipes is recommended so that the piping conditions do not affect the performance (D is inner diameter of the pipe).

Internal Structure Diagram / Material

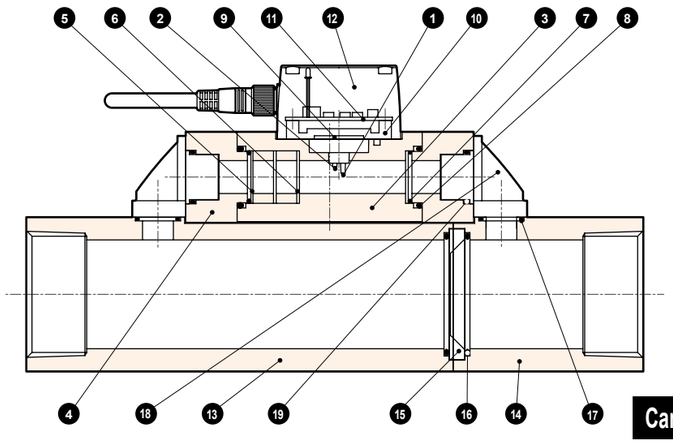
●PFD-501 to PFD-802



Cannot be disassembled

Part No.	Part name	Material		Part No.	Part name	Material	
1	Platinum thin film sensor 1		Aluminum/platinum	8	O-ring	NBR	Nitrile Rubber
2	Platinum thin film sensor 2		Aluminum/platinum	9	Sensor base board		Glass epoxy
3	Body	A6063S	Aluminum alloy	10	Sensor base	PBT	Polybutylene terephthalate
4	Adapter	A6063S	Aluminum alloy	11	Sensor board		Glass epoxy
5	Rectification plate	SUS304	Stainless steel	12	Cover	ABS	ABS resin
6	Mesh	SUS304	Stainless steel	13	Bracket	SUS304	Stainless steel
7	O-ring	NBR	Nitrile Rubber				

●PFD-163

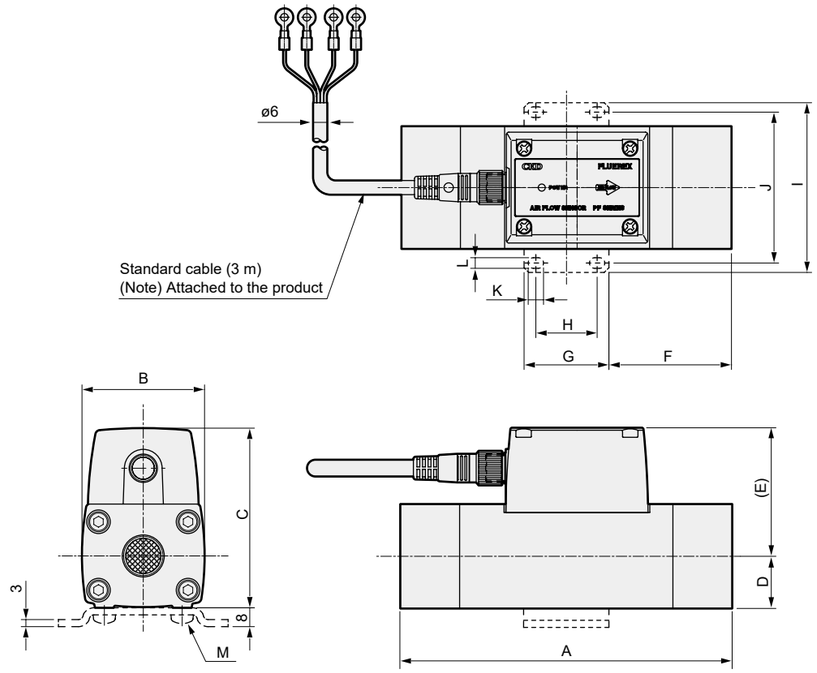


Cannot be disassembled

Part No.	Part name	Material		Part No.	Part name	Material	
1	Platinum thin film sensor 1		Aluminum/platinum	11	Sensor board		Glass epoxy
2	Platinum thin film sensor 2		Aluminum/platinum	12	Cover	ABS	ABS resin
3	Body	A6063S	Aluminum alloy	13	Flow path 1	A6063S	Aluminum alloy
4	Split-flow adaptor	A6063S	Aluminum alloy	14	Flow path 2	A6063S	Aluminum alloy
5	Rectification plate	SUS304	Stainless steel	15	Orifice	C3604BD	Brass
6	Mesh	SUS304	Stainless steel	16	O-ring	NBR	Nitrile Rubber
7	O-ring	NBR	Nitrile Rubber	17	O-ring	NBR	Nitrile Rubber
8	O-ring	NBR	Nitrile Rubber	18	Sub-attachment	SCS13	Stainless steel
9	Sensor base board		Glass epoxy	19	O-ring	NBR	Nitrile Rubber
10	Sensor base	PBT	Polybutylene terephthalate				

Dimensions

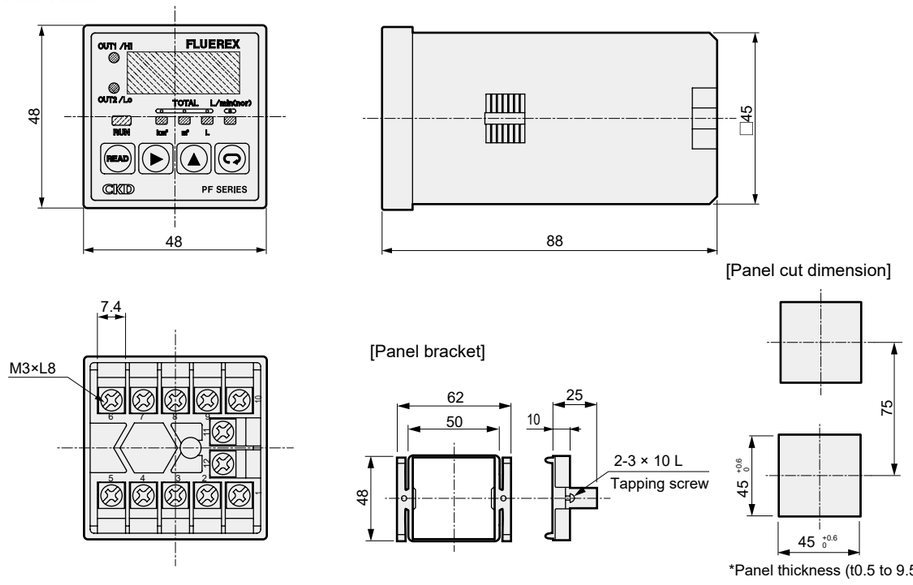
●PFD-501 to 802



Model No.	Port size
PFD-501-10	Rc3/8
PFD-102-15	Rc1/2
PFD-202-20	Rc3/4
PFD-402-25	Rc1
PFD-802-40	Rc1-1/2

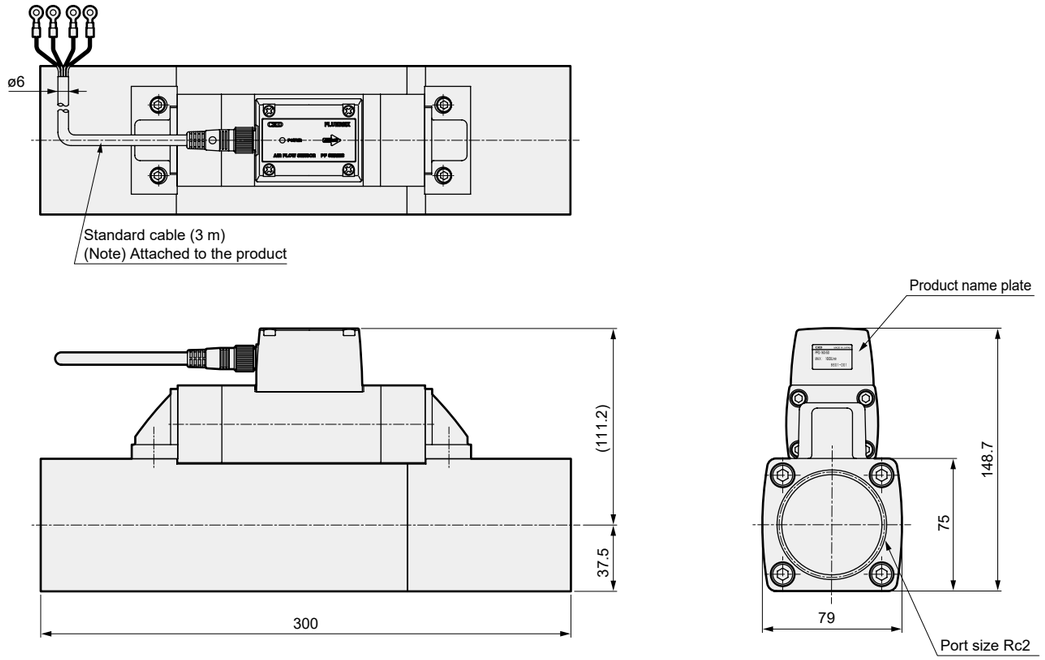
Model No.	A	B	C	D	(E)	F	G	H	I	J	K	L	M
PFD-501/102	140	52	76.2	22	54.2	52	36	26	72	64	6.5	4.5	M4 thread depth 6
PFD-202	150	55	87.2	27.5	59.7	57	36	26	72	64	6.5	4.5	M4 thread depth 6
PFD-402	175	55	90.7	27.5	63.2	69.5	36	26	72	64	6.5	4.5	M4 thread depth 6
PFD-802	190	65	103.7	34	69.7	75	40	26	94	80	8	6	M5 thread depth 8

●Monitor section



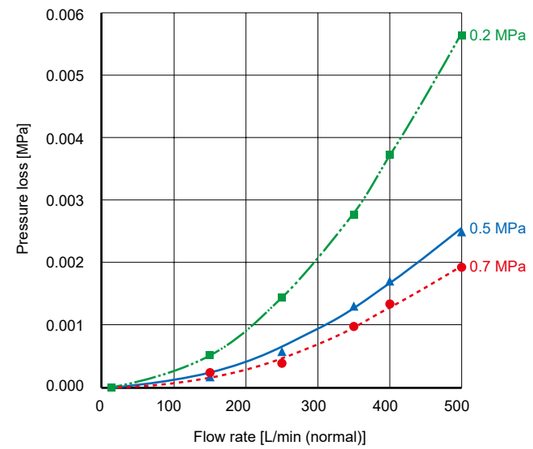
Dimensions

●PFD-163

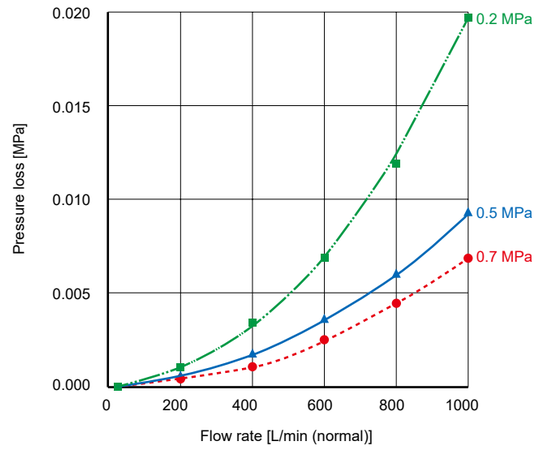


Pressure loss characteristics

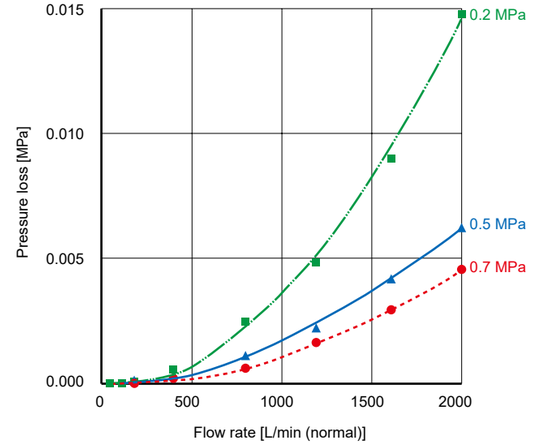
●PFD-501-10



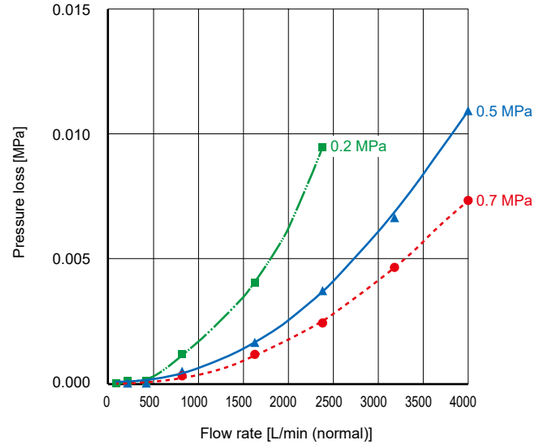
●PFD-102-15



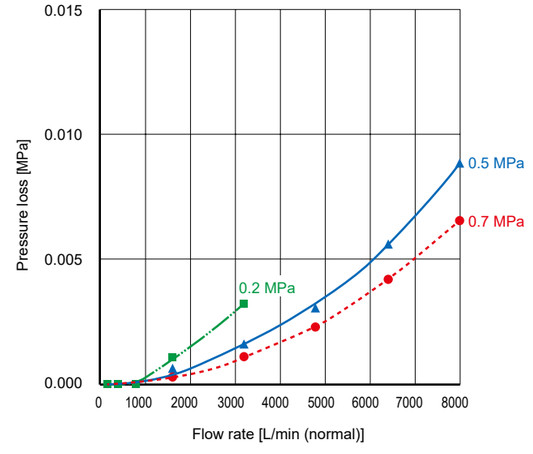
●PFD-202-20



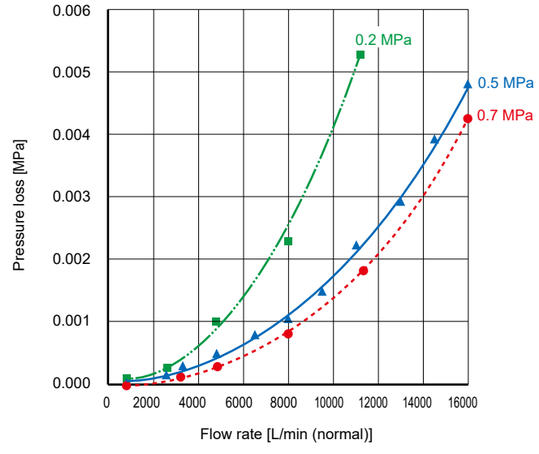
●PFD-402-25



●PFD-802-40

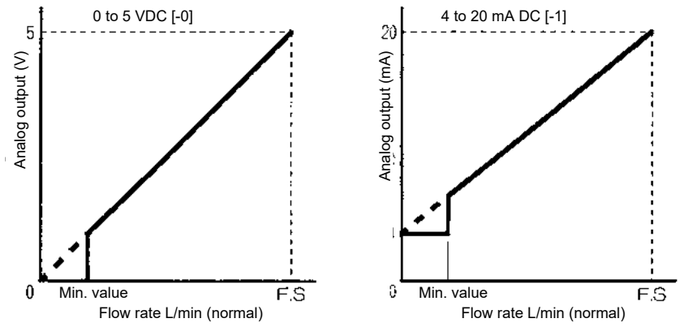


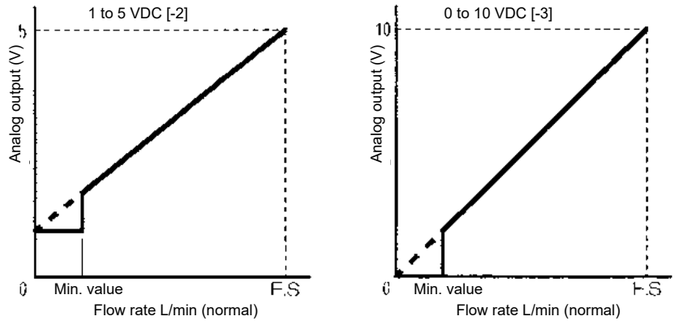
●PFD-163-50



PFD Series electric wiring

1 Analog output [Option code: -0 (standard), -1, -2, -3]





Load resistance of analog output

Item / Analog Output	Load resistance
0 to 5 VDC	50 kΩ or more
4 to 20 mADC	300 Ω or less
1 to 5 VDC	50 kΩ or more
0 to10 VDC	50 kΩ or more

Model No.	Min. value L/min (normal)	FS L/min (normal)
PFD-501-10	25	500
PFD-102-15	50	1000
PFD-202-20	100	2000
PFD-402-25	200	4000
PFD-802-40	400	8000
PFD-163-50	800	16000

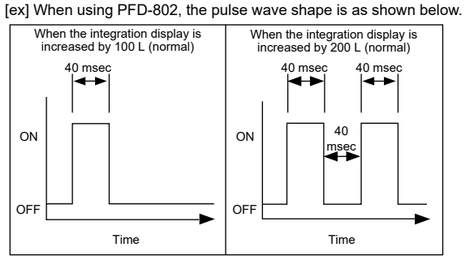
- The relation between the flow rate and the analog output is as in the figure on the left. Note that the analog output is not output normally at the min. value or less.
- Never make a short circuit between the analog output terminal and another terminal. This may lead to failure.
- Make the cable short so as not to be affected by noise and keep it away from all noise sources such as power distribution wires.

2 Integrated pulse output [Switching to switch output. Only OUT2 can be used]

●For the integrated pulse output, a pulse is output per the integrated value below. L (normal)

Model No.	PFD-501	PFD-102	PFD-202	PFD-402	PFD-802	PFD-163
Accumulated flow per pulse	10				100	

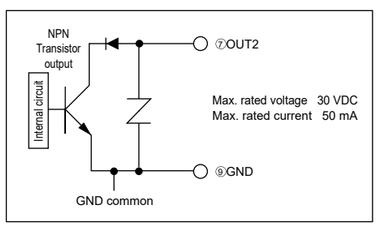
[ex] When using PFD-802, the pulse wave shape is as shown below.



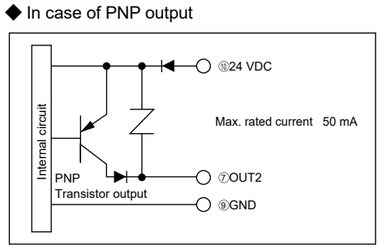
The integration display is updated at intervals of approx. 1 sec.

●Output circuit

◆ In case of NPN output

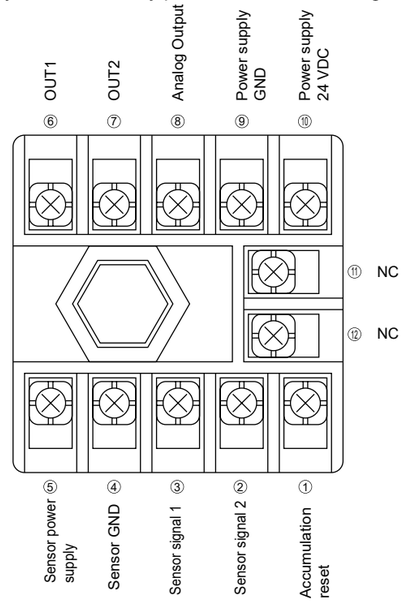


◆ In case of PNP output



3 Wiring method for sensor and monitor

●Always read the safety precautions before wiring.



●Use the cables attached to the product.

[Specifications]

With DC 4-conductor connector

Finish diameter: ø6

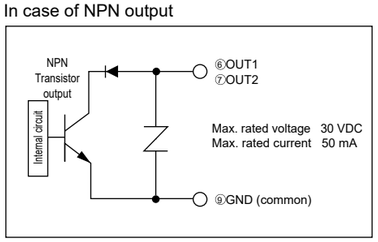
Core wire: 0.5 mm²

Insulator outer diameter: ø1.72 mm

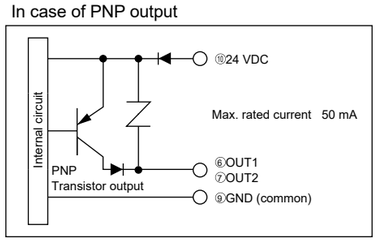
No.	Function	
1	Accumulation reset	Use this terminal⑨By connecting to GND terminal, the accumulated flow value can be cleared.
2	Sensor signal 2	Connect to accessory cable [BLACK]
3	Sensor signal 1	Connect to accessory cable [WHITE]
4	Sensor GND	Connect to accessory cable [BLUE]
5	Sensor power supply	Connect to accessory cable [BROWN]
6	OUT1	NPN/PNP transistor output
7	OUT2	NPN/PNP transistor output
8	Analog Output	Voltage/current output
9	Power supply GND	Connect to power supply 0 VDC
10	Power supply 24 VDC	Connect to power supply 24 VDC
11	NC	Connect nothing.
12	NC	Connect nothing.

●Switch output circuit

In case of NPN output

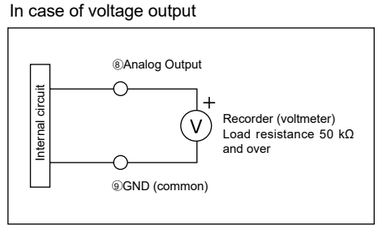


In case of PNP output

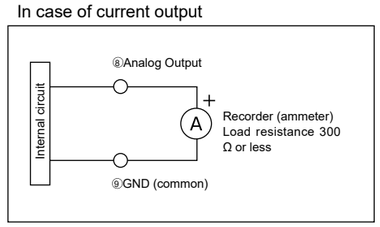


●Analog output circuit

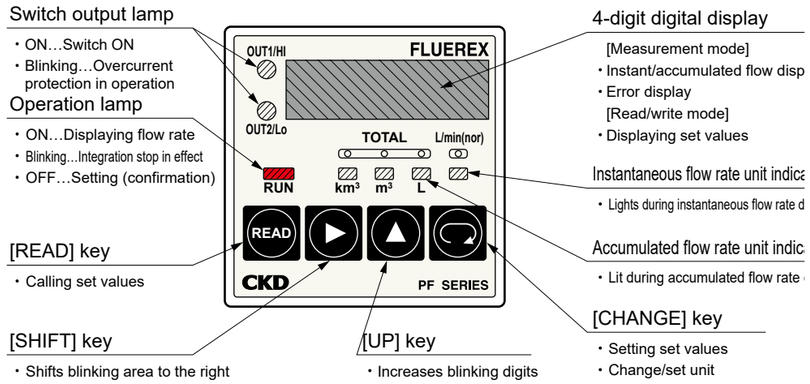
In case of voltage output



In case of current output



Functions and operations for monitor



Functions

Item	Description	Initial state
Switch parameter setting	Switch output (OUT1, OUT2) operation can be set. ●Parameter 0: Instantaneous flow rate ON when inside the range ●Parameter 1: Instantaneous flow rate ON when outside the range ●Parameter 2: Accumulated flow ON at setting value or more ●Parameter 3 (OUT2 only): Integrated pulse output * Refer to Page 412 (Integrated pulse output) for details. ●Low, High ●Hysteresis setting • Hysteresis setting is not there in integrated switch.	Parameter 0 for both OUT1 and OUT2 Low: 0000 High: 0000
Peak value display	The max. value of flow rate display can be confirmed.	-
Instantaneous flow rate/ accumulated flow display switching	The display can be changed between the instantaneous flow rate and accumulated flow.	Instantaneous flow rate
Integration measurement Halt/Integration clear	The pause/value can be cleared during accumulated flow display.	-

For details on operation and setting method, refer to CKD components product website (https://www.ckd.co.jp/kiki/en/) → "Model No."→ Instruction manual

Pneumatic components (sensors)

Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro Page 17.

Product-specific cautions: Pneumatic flow rate sensor PFD Series

Design / Selection

1 .Checking the specifications

⚠DANGER

■Never use this product with flammable fluids.

⚠WARNING

■Use the product in the range of conditions specified for the product. The product in this catalog is designed for use only in a compressed air system. Use with pressures or temperatures outside the specifications range may result in damage or operation failure.

■This product cannot be used as a billing meter. Do not use this product for commercial transactions as it is not compliant with the Measurement Act. Intended applications include industrial sensors.

■Because compressed air or nitrogen gas is used as an applicable fluid, do not use fluids other than these, because accuracy cannot be guaranteed.

2.Safety Design

⚠WARNING

■Take measures to prevent physical harm or property damage in the event of breakdown of this product.

⚠CAUTION

■Understand compressed air features before designing a pneumatic circuit.
●Pop-out, air discharge, or leakage due to air compression and expansion may occur.
●Design the circuit so that compressed air in the system is exhausted.

■Check for leakage current to avoid malfunction caused by the leakage current.
When using a programmable controller, leakage current may cause malfunction.

■Because both the sensor and monitor of this product are independent, they can be replaced with a model that has the same flow rate range.
●They cannot be replaced with a model that has a different flow rate range.
●The sensor and monitor must be used in a set. By using only either one of them, this kit does not operate.

■Although there is no movable section in the flow rate sensor, when repeating ON/OFF of the solenoid valve, the mesh section or fixed section of the rectifier may move slightly and this may result in the generation of particles. When the generation of particles must be eliminated, be sure to install a filter on the secondary side (downstream side) of the flow rate sensor.

3. Design by Application

⚠CAUTION

■Exerts no influence on performance as it uses compressed air and a small amount of leakage is tolerable. Contact CKD if no-leakage is required.

4. Working Environment

⚠DANGER

■Never use this product in an explosive gas atmosphere. The structure is not explosion-proof, and explosions or fires could occur.

■When using nitrogen gas as an applicable fluid, oxygen deficiency could be caused. Observe the following instructions.
①Use in well ventilated locations.
②Ventilate the work area when nitrogen gas is being used.
③Inspect nitrogen gas piping regularly to avoid leaks.

⚠WARNING

■Install in a place where the product is not exposed to rain, water, or direct sunlight.

■Do not use this product in an environment where corrosion may occur. Use in such an environment could lead to damage or operation failure.

■Consult with CKD if ozone is generated in the supplied air.

■Avoid using this product in environments where ozone is generated.

■Use with fluid temperature within the range of 0 to 40°C. Even if the ambient temperature is within the specified range, do not use this product in a location where the temperature could suddenly change and cause condensation.

■Do not use at a pressure exceeding the max. working pressure, as excessive pressure can cause product failure.

■The sensor section employs a dust-proof, drip-proof structure that provides reliability during maintenance and cleaning, during which it may be exposed to water splashing. However, avoid using this product in a location where it may be constantly exposed to water or intense splattering of water and/or oil.

⚠CAUTION

■Confirm before use that it will withstand the working environment.
This product cannot be used in environments where functional obstacles could occur. Such environments include high temperatures, chemical atmospheres, or those where chemical liquids, vibration, moisture, dripping water, coolant or gas are present. Environments where ozone is generated.

■Be sure to use within ambient temperature range of 0 to 50°C.

■Avoid using the product for vibration of 49 m/s^2 or more and shock of 294 m/s^2 or more.

■CE-compliance working conditions
This product is CE-marked, indicating conformity with the EMC Directives. The standard for the immunity for industrial environments applied to this product is EN61000-6-2; the following requirements must be satisfied in order to conform to this standard:
Conditions
●The power cable connected to the terminal block must be less than 3 m long.
●This product is not equipped with surge protection. Implement surge protection measures on the system side.

5. Securing of space

⚠WARNING

■Secure sufficient space around the pneumatic components for installation, removal, wiring, and piping work.

6. Others

⚠WARNING

■When suddenly opening the valve that connects to the sensor, fluid with a flow rate dozens of times greater than the rated flow rate may flow, and this can cause damage to the platinum thin film sensor or rectifier and flow out to the secondary side. When opening the valve that connects to the sensor, open it slowly so that the value in the monitor display may not exceed the rated flow rate.

■Keep away from high voltage lines, high voltage components and power components such as motors.

⚠CAUTION

■After the power supply is turned ON, internal settings such as hardware check are performed for 10 seconds. During this time, the display/output cannot operate normally. Particularly, if a switch output is used in the control of an interlock circuit, an abnormal stop may occur. Mask the output during this period.

■When using this product for an interlock circuit, provide multiple interlock circuits as a precaution against breakdown, and also perform regular inspections to confirm normal operation.

■Even when the instantaneous flow rate display is 0, if there is a minimal flow rate signal (including error), the integrating flow rate (integration count) may be displayed. If measuring the integrating flow with the flow rate display at 0 will be a problem, use the integrating flow measurement start/stop function as required.

■Keep the cable away from all noise sources, including power distribution wires. Noise can cause malfunctions.

■Do not short-circuit the output transistor. When a load is short-circuited, overcurrent protection circuit is triggered to prevent damage to the output transistor; however, if this state persists, the output transistor could be damaged.

■Do not use a load that can produce surge voltage. When directly running the load that generates a surge such as relay and solenoid valve, use a surge absorber built-in type. If there is a surge source on the same power supply line, similarly implement surge protection.

■This product has no protection against lightning surge. This product is CE marking compliant but has no protection against lightning surge. For the protection against lightning surge, take countermeasures on the equipment side.

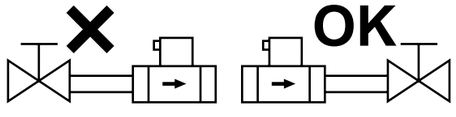
■Regularly inspect the product at least once a year to check that it operates correctly.

■Make sure that the lead wire is free of repeated bends and tension. This may lead to disconnection.

■For the wiring to the sensor and monitor, use the accessory cable (3 m).

■When mounting a pneumatic components, do not use a mounting method that relies on support from the piping.

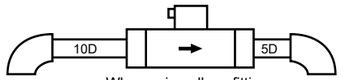
■When adjusting the flow rate using a metering valve (glove valve, ball valve, etc.), install the metering valve on the secondary side (downstream side) of the sensor. Generated drift (turbulence in the flow) could cause errors.



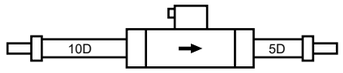
■Do not install the regulator immediately before the sensor. Generated drift may cause errors.
●When installing the regulator on the primary side, provide a straight piping section of 10D and over.
* "D" here indicates the inner diameter of the piping material.
●Select a regulator that has sufficient margin of flow characteristics for the max. flow rate of the sensor.

■Align the fluid flow direction to the direction indicated on the sensor when connecting the pipes. When connecting it in reverse, the larger value is displayed.

■When using an elbow or bush in the piping, it is recommended to provide straight piping sections of 10D and over on the primary side and 5D and over on the secondary side.
●For PFD-163 Series, be sure to provide straight piping sections.
●Bore size change by bush should be limited to one size.



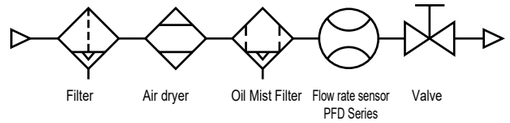
When using elbow fitting



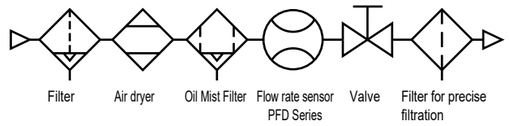
When using bush fitting

■Install a pneumatic filter just before the pneumatic component in the circuit.

■Air Quality
●Use CKD clean air system components appropriate for your application.
●Use compressed air that does not contain oil oxides, tar, carbon, etc., from the air compressor.
●Use compressed air that does not contain solid foreign matter.
●Install a filter, air dryer, and oil mist filter on the primary side (upstream side) of the sensor. The sensor's rectifier (mesh) rectifies the flow in the pipe. It does not filter out foreign matter, so provide a filter.



・When ultra clean air is required



For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual

Flow rate sensor for liquids

CONTENTS

Karman Vortex Flow Sensor WFK2 Series 421

Capacitance electromagnetic flow sensor WFC Series 447

Karman vortex flow rate sensor for water WFK3000 Series 465

Integrated unit for water control WXU series 483

Karman Vortex Flow Rate Sensor

FLUEREX ® WFK2

■ Flow rate sensor



CONTENTS

Product Introduction	422
●FLUEREX WFK2	426
Wiring method	438
Indicator screen details	439
⚠Safety Precautions	443

Flow rate sensor
Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit
Ending

KARMAN VORTEX FLOW SENSOR FLUEREX® WFK2 Series

Diverse and easier to use

2018 Good Design Award



Needle
Manual valve
Compatible

Fluorine
Fluid
compatible

Model variations	Port size	Flow rate range (L/min)	Option
WFK2-005	Rc G NPT 3/8 1/2 3/4	0.4 – 5	Manual valve integrated: Cock type, Needle type
WFK2-020		1.6 – 20	
WFK2-050		4 – 50	
WFK2-100	Rc G NPT 1 1 1/4 1 1/2	8 – 100	
WFK2-250		20 – 250	

Compatible with fluorine liquids

Compatible with fluorine liquids with excellent electrical insulation. Ideal for managing coolant, etc., of semiconductor manufacturing equipment. Compatible with liquids with low global warming potential.

Fluorinert™	Galden®	Novec™	Opteon™
FC-3283	HT135	Novec7300	SF10
FC-40	HT200		

*Compatible models: WFK2-005, WFK2-020, WFK2-050

Compatible with flow rates of 0.4 to 250 L/min

Compatible with a wide range of flow rates.

All models equipped as standard with fluid temperature measuring function

Saves space and wiring time with no need for a separately installed temperature sensor. The product is not easily affected by ambient temperature as there is a temperature sensor inside.



Easy flow rate adjustment (Option)

Cock: Valve can be easily opened and closed.
Needle type: Manual valve for fine adjustment.







Cock type



Needle type

Various output functions available

OUT1		OUT2	
Analog Output	Switch Output NPN/PNP can be switched	Analog Output	Switch Output NPN/PNP can be switched
› Instantaneous flow rate › Temperature	› Instant flow rate1/2 › Temp1/2 › Accumulated flow	› Instantaneous flow rate › Temperature	› Instant flow 1/2 › Temp1/2 › Accumulated flow
Pulse Output	External Input	Pulse Output	IO-Link
› Accumulated flow	› Accumulated flow reset › Peak hold reset	› Accumulated flow	

*Fluorinert ™ Novec ™ is a trademark of 3M Corporation.
*Galden® is a registered trademark of Solvay Specialty Polymers Japan Co., Ltd.
*Opteon ™ is a trademark of Chemours-Mitsui Fluoroproducts.

Easy to read 2-screen color LCD

Temperature, integrating flow, set value, etc., can be displayed simultaneously. The display color can be selected from white, green, and red.



Upper row: Instantaneous flow rate
Lower row: Fluid temperature



Upper row: Instantaneous flow rate (green)
Lower row: Fluid temperature (red)



Upper row: Accumulated flow
Lower row: Instantaneous flow rate



Upper row: Instantaneous flow rate
Lower row: OUT1 output setting value

Indicator screen rotation

The liquid crystal display can be rotated 90° in each direction without moving the body. There is no interference even when installing in parallel.



Easy setting function

Frequently used settings can be set from the normal screen using shortcut operations. Example: Output threshold can be changed while viewing the current flow rate value.



Supports fluid temperatures up to 95°C

Ideal for detecting the return flow of cooling liquid, which tends to get hot.



Casting machine coolant



Heated fluid for mold temperature controlling



Laser oscillator cooling

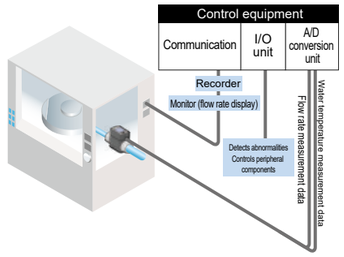
ATEX compliant (option)

ATEX compliant.

Examples of applications

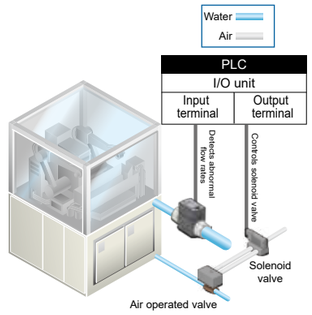
Semiconductor — Semiconductor manufacturing equipment

Cooling and temperature control of semiconductor manufacturing equipment. Etching, grinder, dicer, CVD.



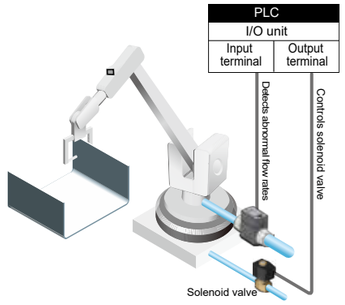
Tempering — Induction hardening device

Quantitative management of cooling fluid.



Welding — Spot welding machine

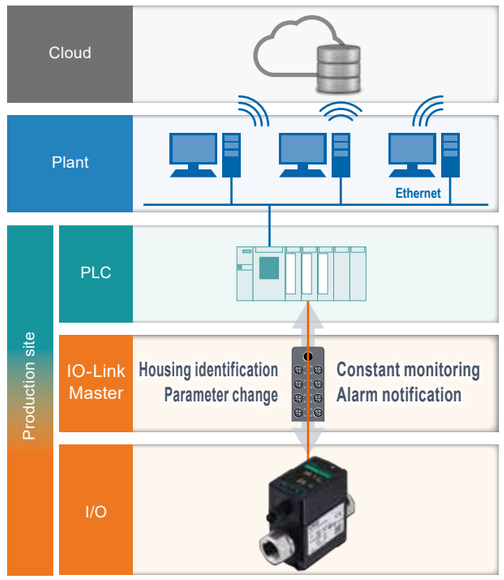
Spot welding machine coolant control and flow rate abnormality detection for chip fallout.



IO-LINK compatible

IO-Link

IO-Link is a digital communication standard for sensors/actuators at factory sites. (IEC 61131-9)
Unlike analog communication, it enables the transmission of parameters and event data.



Features of IO-Link

- Constant monitoring via digital data is possible.
- Parameters can be set and changed via the network, enabling remote equipment operation.
- Models, serial numbers, etc., can be confirmed on the network.
- The settings can be copied from the master, making parameter reconfiguration after maintenance obsolete.
- Device failure and disconnection can be confirmed.
- It can also be converted to Ethernet networks and connected, enabling devices to be IoT-ready.

FP Food Process™

Contact CKD for support for food manufacturing processes FP series.



Karman Vortex Flow Rate Sensor FLUEREX

WFK2 Series

Small body

●Flow rate range: 0.4 to 5, 1.6 to 20, 4 to 50 L/min

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

WFK2 - 005 AA A A N - A C -

Model No. ❶Flow rate range ❷Port size ❸IO-Link analog output ❹Unit indicated ❺Manual valve ❻Option (cable included) ❼Option (Bracket included) ❽Option (other)

❶Flow rate range

Code	Description
005	0.4 to 5 L/min
020	1.6 to 20 L/min
050	4 to 50 L/min

❷Port size

Code	Description
AA	Rc3/8
BA	Rc1/2
CA	Rc3/4
AB	G3/8
BB	G1/2
CB	G3/4
AC	NPT3/8
BC	NPT1/2
CC	NPT3/4

❸IO-Link / Analog output

Code	Description	
A	Switch / Analog output	0 to 5 VDC, 1 to 5 VDC
B		4 to 20 mA DC
C		0 to 10 VDC, 1 to 10 VDC
D	IO-Link compatible (Note)	0 to 5 VDC, 1 to 5 VDC
E		4 to 20 mA DC
F		0 to 10 VDC, 1 to 10 VDC

Note: IO-Link "D", "E" and "F" after not in use have analog output specifications.

❹Unit indicated

Code	Description
A	L/min L m^3 °C
B	L/min, us gal/min L, m^3us gal °C, °F

Note: The display unit code "B" is for overseas use and cannot be used in Japan.

❺Manual valve

	Code	Description	
	N	Sensor only	
*1 *2	A	With manual valve (cock type)	
*2	B	With manual valve (needle-type)	

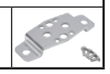
*1: ❸ Manual valve (cock) cannot be selected for the option "SF" (fluorine-based liquid compatible).
*2: Select "A", "B" (with manual valve), ❼ if the included bracket is selected, two sets of brackets are included.

❻Option (attached cable)

Code	Description	
Blank	None	
A	Standard cable (M12/4-conductor/ 3 m) attached	
B	Double ended connector cable (M12/4-conductor/ 3 m) attached	

Note: For ❸option "EX" (ATEX compatible), cable attachment cannot be selected.

❼Option (attached bracket)

Code	Description	
Blank	None	
C	Bracket attached (Note)	

Note: When selecting "A" or "B" with ❺manual valves in Item, two sets of brackets are attached.

❽Option (other)

	Code	Description
	Blank	None
*1 *2	EX	ATEX Compliant
*3	SF	Compatible with fluorinated liquids

*1: For ❻"EX" (ATEX compatible), Item "Cable included" cannot be selected.
*2: For details of specifications, refer to "Options (ATEX compatible)" on Page 445.
*3: Type with manual valve (cock) cannot be selected for "SF" (fluorine-based liquid compatible).

Discrete option model No.

For dimensions diagram, refer to Page 431.

●Cable option

Standard cable

WF-FL-280741

Double ended connector cable

WF-FL-662453

●Bracket option

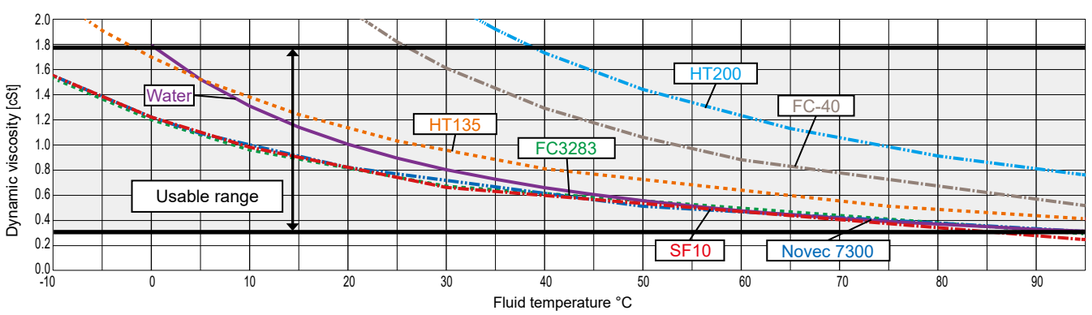
WF-FL-315544

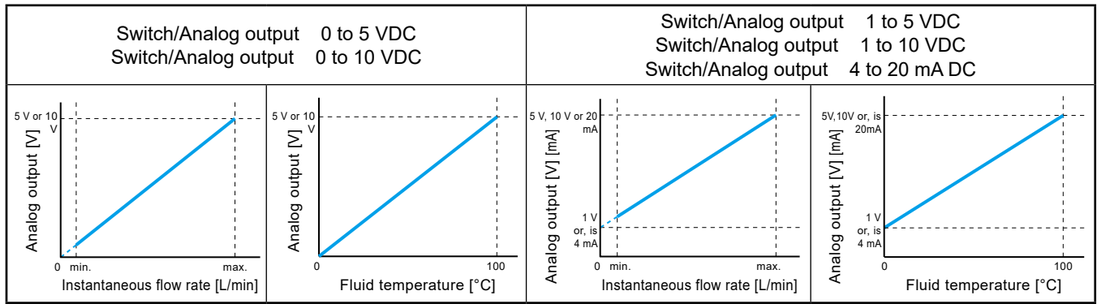
Specifications

Item			WFK2-005	WFK2-020	WFK2-050
Connection	Port size	Rc, G, NPT	3/8, 1/2, 3/4		
	Port material		Stainless steel		
Working Conditions	Applicable fluid		Pure water, industrial water Fluorine liquid compatibility option: Fluorinert™ (FC-3283, FC-40), Galden® (HT135, HT200) Novec™ 7300, Opteon™ SF10 *1		
	Max. working pressure	MPa	1.0		
	Proof pressure	MPa	1.5		
	Manual valve (cock type) Internal leakage	mL/min	0		
	Manual valve (cock type) allowable back pressure	MPa	0.3		
	Ambient temperature	°C	0 to 50 (85% RH or less, no condensation)		
	Fluid temperature *2	°C	Standard: 1 to 95 Fluorine liquid compatibility option: -10 to 95		
Flow rate	Flow rate range	L/min	0.4 to 5	1.6 to 20	4 to 50
	Repeatability *3		Analog output accuracy: ±2.5%F.S. Display accuracy: ±2.5%F.S.±1digit (min. display unit)		
	Temperature characteristics *3, *4		±5%F.S. (base temperature 25°C, 10 to 50°C)		
	Low flow cut		5% of F.S.		
	Accumulated flow range *5		99999 L or 99999 m³ (Unit can be selected) Reset when the power is turned OFF		
	Integrated pulse rate *5	L/pulse	0.1, 0.5, 1	0.1, 0.5, 1, 10	0.5, 1, 10, 50
	Pressure loss (for water)	MPa	0.07 (at F.S.)	0.05 (at F.S.)	0.05 (at F.S.)
	Response time *6	sec	0.25, 0.5, 1, 5, 10 (default 1)		
Temperature	Measurement temperature	°C	−10 to 100		
	Accuracy	°C	0 to 50: analog output accuracy ±2, display accuracy ±2±1digit (min. display unit 1)		
			50 to 100: analog output accuracy ±3, display accuracy ±3±1digit (min. display unit 1)		
Output	Indicator		Two-screen LCD display, instantaneous flow rate: 3 digits, liquid temperature: 2 digits, accumulated flow: 5 digits, with screen rotation		
	Analog output *7		Standard: 0 to 5V, 1 to 5 VDC Option: 4 to 20 mA DC, 0 to 10 V, 1 to 10 VDC		
	Switch Output		NPN or PNP open collector output (can be switched from settings)		
		Max. load current	50 mA		
		Max. applied voltage	30 VDC		
		Internal voltage drop	2.0 V or less		
Power supply voltage			Analog output standard: 12 to 24 VDC±10% Analog output option: 24 VDC±10%		
Current consumption *8			50 mA or less		
Mounting	Mounting orientation		Unrestricted in vertical/horizontal direction		
	Straight piping section		None		
	Degree of Protection		IP 65 or equiv.		
	Weight	g	3/8 (Rc, G, NPT): approx. 320, approx. 510 with manual valve (cock type), approx. 820 with manual valve (needle type) 1/2 (Rc, G, NPT): approx. 320, approx. 510 with manual valve (cock type), approx. 820 with manual valve (needle type) 3/4 (Rc, G, NPT): approx. 400, approx. 590 with manual valve (cock type), approx. 880 with manual valve (needle type)		

*1: Fluorinert™ Novec™ is a trademark of 3M Corporation. Galden® is a registered trademark of Solvay Specialty Polymers Japan Co., Ltd. Opteon™ is a trademark of Chemours-Mitsui Fluoroproducts.
*2: For fluorine liquids, depending on the type, the measurable fluid temperature range will differ. Refer to the measurable fluid temperature range graph.
*3: Accuracy is the average value over 10 sec. (for conditions not containing air bubbles). F.S. stands for full scale flow rate.
*4: This temperature characteristic is for water. For fluorine liquids, check the corresponding dynamic viscosity range.
*5: The integrating flow is a calculated (reference) value. It is reset when the power is turned OFF. Errors may occur between the accumulated flow display and integrated pulse output.
*6: The time to attain 70% of the original output after the normal flow rate (used) drops instantly to 0.
*7: Check the allowable load on the wiring method page.
*8: Current for when 24 VDC is connected, and no load is applied. Please note that the current consumption changes depending on the load connection status.

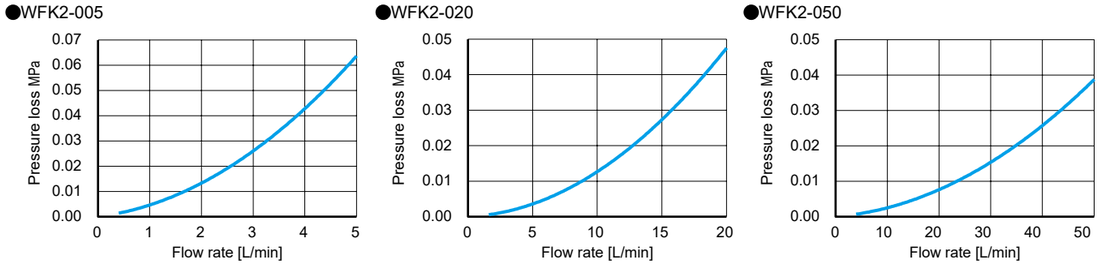
Measurable fluid temperature range





Note: Output value without adjustment of original range analog output or span.

Pressure loss (when the fluid is water)



Note: Conversion to fluorine liquid If the flow path volume and flow rate are the same, the pressure loss is proportional to the specific gravity because the formula below holds.

$$\frac{\Delta p_1}{G_1} = \frac{\Delta p_2}{G_2}$$

Δp: Pressure loss (MPa)
G: Specific gravity (ratio of density to water)

Manual valve (needle) Flow characteristics (when the fluid is water)

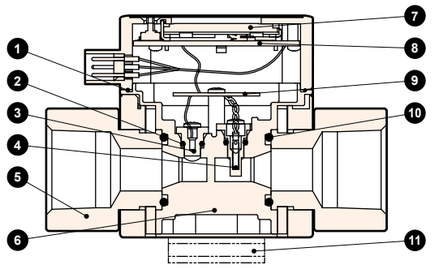
*1: Internal leakage occurs even when the needle valve is at 0 rotation speed (fully closed).
*2: Needle flow characteristics conversion
The following formula is valid when the number of knob rotations is the same as the pressure loss.
Thus, the fluorine liquid flow rate Q_2can be calculated as the square root of the flow rate of water Q_1 divided by the specific gravity G_2 of the liquid.

$$Q_1^2 G_1 = Q_2^2 G_2$$

Q: Flow rate (L/min)
G: Specific gravity (ratio of density to water)
G_1: Specific gravity of water = 1

Internal Structure Diagram / Material

●WFK2-005,020,050

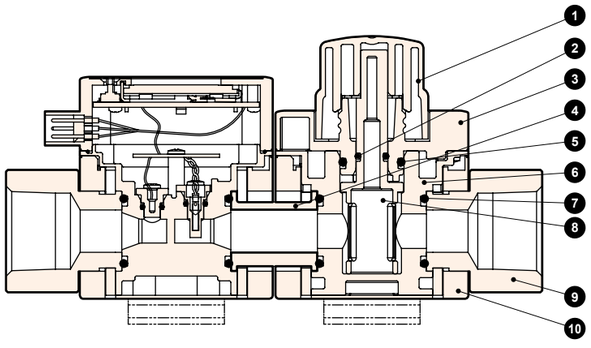


Cannot be disassembled

Part No.	Part name	Material		Quantity
1	Packing	FKM	Fluoro rubber	1 or 2
2	O-ring *1	FKM	Fluoro rubber	2
3	Temperature sensor	SUS316L	Thermistor	1
4	Karman's vortex street detection sensor	PPS resin	Piezoelectric element	1
5	Attachment	SUS304 or SCS13		2
6	Sensor body	PPS resin		1
7	Liquid crystal			1
8	CPU board			1
9	Sensor board			1
10	O-ring *1	FKM	Fluoro rubber	2
11	Bracket (option)	SUS304 or SPCC		(1)

*1: EPDM (ethylene propylene diene rubber) is used for fluorine-based liquids.
*2: Wetted parts are②,③,④,⑤,⑥,⑩.

●WFK2-005,020,050□□□□A (cock)

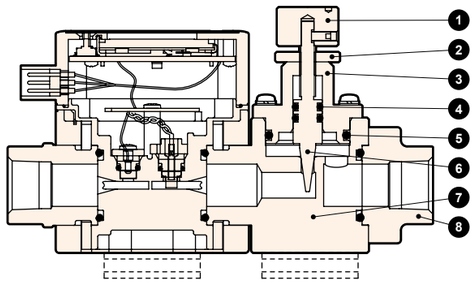


Cannot be disassembled

Part No.	Part name	Material		Quantity
1	Handle	POM resin		1
2	O-ring	FKM	Fluoro rubber	1
3	Stuffing	PPS resin		1
4	Spacer	SUS304 or SCS13		1
5	O-ring	FKM	Fluoro rubber	1
6	Cock body	PPS resin		1
7	O-ring	FKM	Fluoro rubber	2
8	Cock	PPS resin		1
		FKM	Fluoro rubber	
9	Attachment	SUS304 or SCS13		2
10	External case	PBT resin		1

Note: Wetted parts are ②, ③, ④, ⑤, ⑥, ⑦, ⑧ and ⑨.

●WFK2-005,020,050□□□□B (needle type)



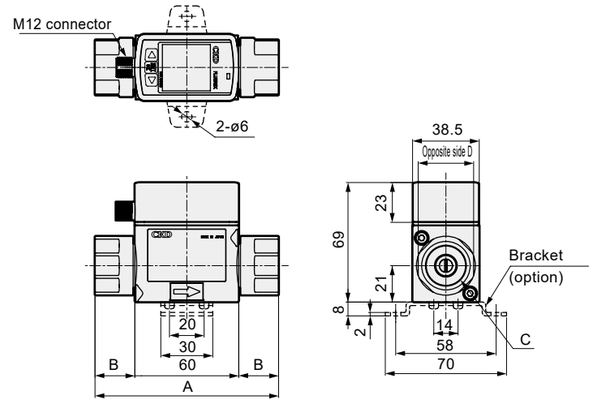
Cannot be disassembled

Part No.	Part name	Material		Quantity
1	Knob	Aluminum		1
2	Lock nut	SUS303		1
3	Needle guide	SUS304		1
4	O-ring *1	FKM	Fluoro rubber	1
5	O-ring *1	FKM	Fluoro rubber	2
6	Needle	SUS304		1
7	Needle body	SUS304		1
8	Attachment	SUS304 or SCS13		1

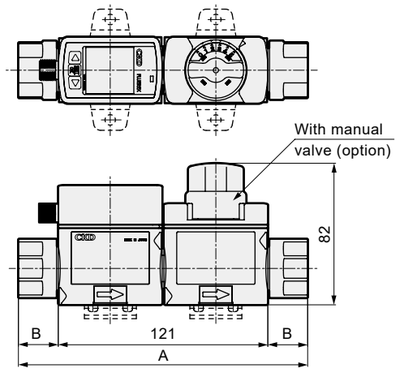
*1: For fluorine liquid compatibility, EPDM (ethylene propylene diene rubber) is used.
*2: Wetted parts are③,④,⑤,⑥,⑦,⑧.

Dimensions

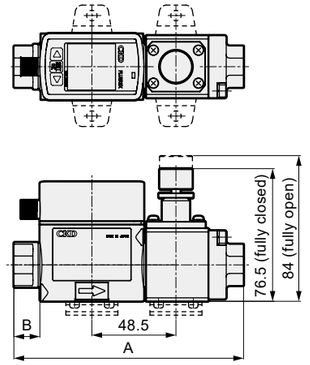
●WFK2-005,020,050



・With manual valve (cock type)



・With manual valve (needle type)



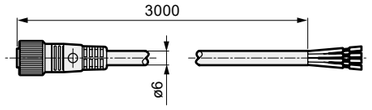
Model No.	A	B	C	Opposite side D
WFK2-[*1]A[*2]□□N	90	15	Rc3/8	24
WFK2-[*1]B[*2]□□N	90	15	Rc1/2	27
WFK2-[*1]C[*2]□□N	106	23	Rc3/4	32
WFK2-[*1]A[*2]□□A	151	15	Rc3/8	24
WFK2-[*1]B[*2]□□A	151	15	Rc1/2	27

Model No.	A	B	C	Opposite side D
WFK2-[*1]C[*2]□□A	167	23	Rc3/4	32
WFK2-[*1]A[*2]□□B	132.5	15	Rc3/8	24
WFK2-[*1]B[*2]□□B	132.5	15	Rc1/2	27
WFK2-[*1]C[*2]□□B	148.5	23	Rc3/4	32

[*1]: Select from 005, 020, and 050
[*2]: Select from A, B, and C (G thread and NPT thread also have the same Dimensions)

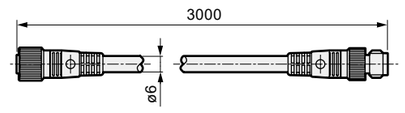
Optional dimensions

●Cable option
Common for WFK2
・Standard cable
Discrete option model No.: **WF-FL-280741**

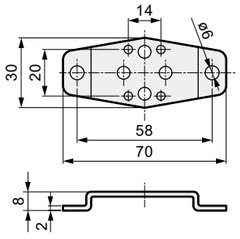


Finished outer diameter 6 mm, core wire 0.5 mm², insulator O.D. 1.9 mm

・Double ended connector cable
Discrete option model No.: **WF-FL-662453**



●Bracket option
WFK2-005,020,050
Discrete option model No.: **WF-FL-315544**





Karman Vortex Flow Rate Sensor FLUEREX

WFK2 Series

Large body

●Flow rate range: 8 to 100, 20 to 250 L/min

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

WFK2 - 100 DA A A N - A C -

Model No. ❶Flow rate range ❷Port size ❸IO-Link analog output ❹Unit indicated Sensor only ❺Option (cable included) ❻Bracket (included) ❼Option (other)

❶Flow rate range

Code	Description
100	8 to 100 L/min
250	20 to 250 L/min

❷Port size

Code	Description
DA	Rc1
EA	Rc1 1/4
FA	Rc2 1/2
DB	G1
EB	G1 1/4
FB	G2 1/2
DC	NPT1
EC	NPT1 1/4
FC	NPT1 1/2

❸IO-Link / Analog output

Code	Description	
A	Switch / Analog output	0 to 5 VDC, 1 to 5 VDC
B		4 to 20 mA DC
C		0 to 10 VDC, 1 to 10 VDC
D	IO-Link compatible (Note)	0 to 5 VDC, 1 to 5 VDC
E		4 to 20 mA DC
F		0 to 10 VDC, 1 to 10 VDC

Note: IO-Link "D", "E" and "F" after not in use have analog output specifications.

❹Unit indicated

Code	Description
A	L/min L m^3 °C
B	L/min, us gal/min L, m^3, us gal °C, °F

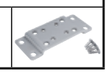
Note: The display unit code "B" is for overseas use and cannot be used in Japan.

❺Option (attached cable)

Code	Description	
Blank	None	
A	Standard cable (M12/4-conductor/ 3 m) included	
B	Double ended connector cable (M12/4-conductor/ 3 m) included	

Note: For option "EX" (ATEX compatible), cable attachment cannot be selected.

❻Option (attached bracket)

Code	Description	
Blank	None	
C	Bracket included	

❼Option (other)

Code	Description
Blank	None
EX	ATEX Compliant

*1 *2

*1: For "EX" (ATEX compatible), cable attachment cannot be selected.

*2: For details of specifications, refer to "Options (ATEX compatible)" on P. 445.

Discrete option model No.

For dimensions diagram, refer to Page 436.

●Cable option

Standard cable

WF-FL-280741

Double ended connector cable

WF-FL-662453

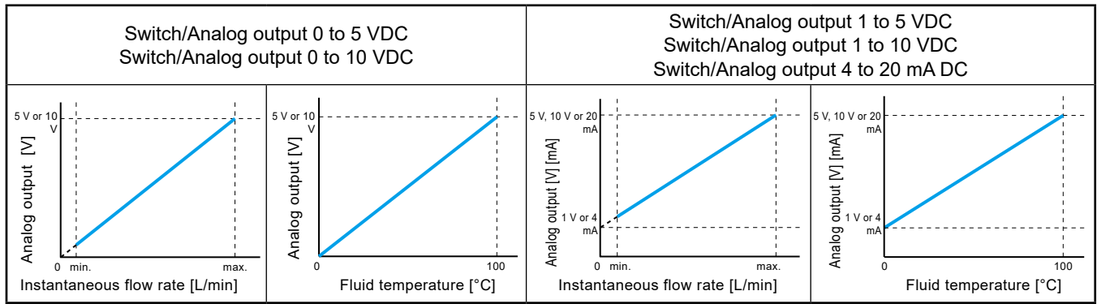
●Bracket option

WF-FL-636342

Specifications

Item			WFK2-100	WFK2-250
Connection	Port size	Rc, G, NPT	1, 1 1/4, 1 1/2	
	Port material		Stainless steel	
Working Conditions	Applicable fluid		Pure water, industrial water	
	Max. working pressure	MPa	1.0	
	Proof pressure	MPa	1.5	
	Ambient temperature	°C	0 to 50 (85% RH or less, no condensation)	
	Fluid temperature	°C	1 to 95	
Flow rate	Flow rate range	L/min	8 to 100	20 to 250
	Repeatability *1		Analog output accuracy: ±2.5%F.S. Display accuracy: ±2.5%F.S.±1digit (min. display unit)	
	Temperature characteristics *1		±5%F.S. (base temperature 25°C, 10 to 50°C)	
	Low flow cut		5% of F.S.	
	Accumulated flow range *2		99999 L or 99999 m³ (Unit can be selected) Resets when the power is turned OFF	
	Integrated pulse rate *2	L/pulse	1, 10, 50, 100	10, 50, 100
	Pressure loss	MPa	0.05 (at F.S.)	0.03 (at F.S.)
	Response time *3	sec	0.25, 0.5, 1, 5, 10 (default 1)	
Temperature	Measurement temperature	°C	0 to 100	
	Accuracy	°C	0 to 50: analog output accuracy ±2, display accuracy ±2±1digit (min. display unit 1)	
			50 to 100: analog output accuracy ±3, display accuracy ±3±1digit (min. display unit 1)	
Output	Indicator		Two-screen LCD display, instantaneous flow rate: 3 digits, liquid temperature: 2 digits, accumulated flow: 5 digits, with screen rotation	
	Analog output *4		Standard: 0 to 5 V, 1 to 5 VDC Option: 4 to 20 mA DC, 0 to 10 V, 1 to 10 VDC	
	Switch Output		NPN or PNP open collector output (can be switched from settings)	
		Max. load current	50 mA	
		Max. applied voltage	30 VDC	
		Internal voltage drop	2.0 V or less	
Power supply voltage			Analog output standard: 12 to 24 VDC±10% Analog output option: 24 VDC±10%	
Current consumption *5			50 mA or less	
Mounting	Mounting orientation		Unrestricted in vertical/horizontal direction	
	Straight piping section		IN side: 10 D, OUT side: 5 D	
	Degree of Protection		IP 65 or equiv.	
	Weight	g	1 (Rc, G, NPT): approx. 870 1 1/4 (Rc, G, NPT): approx. 1010 1 1/2 (Rc, G, NPT): approx. 1,100	

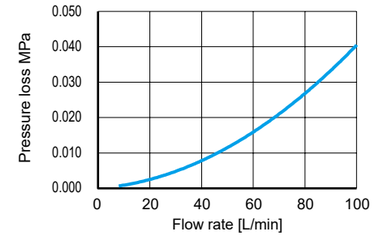
*1: Accuracy is the average value over 10 sec. (for conditions not containing air bubbles). F.S. stands for full scale flow rate.
*2: The integrating flow is a calculated (reference) value. It is reset when the power is turned OFF. Errors may occur between the accumulated flow display and integrated pulse output.
*3: The time to attain 70% of the original output after the normal flow rate (used) drops instantly to 0.
*4: Check the allowable load on the wiring method page.
*5: Current for when 24 VDC is connected, and no load is applied. Please note that the current consumption changes depending on the load connection status.



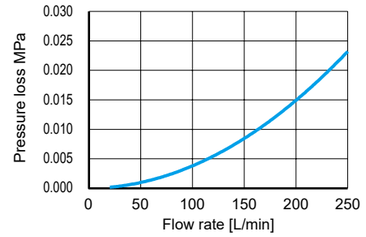
Note: Output value without adjustment of original range analog output or span.

Pressure loss (when the fluid is water)

●WFK2-100



●WFK2-250



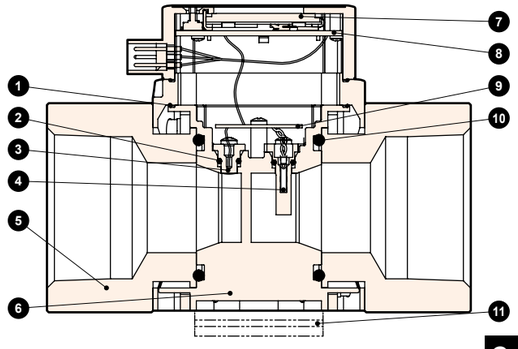
Note: Conversion to fluorine liquid If the flow path volume and flow rate are the same, pressure loss is proportional to specific gravity because the formula below holds.

$$\frac{\Delta p_1}{G_1} = \frac{\Delta p_2}{G_2}$$

Δp: Pressure loss (MPa)
G: Specific gravity (ratio of density to water)

Internal Structure Diagram / Material

●WFK2-100,250



Cannot be disassembled

Part No.	Part name	Material		Quantity	Part No.	Part name	Material		Quantity
1	Packing	FKM	Fluoro rubber	1 or 2	7	Liquid crystal			1
2	O-ring *1	FKM	Fluoro rubber	2	8	CPU board			1
3	Temperature sensor	SUS316L	Thermistor	1	9	Sensor board			1
4	Karman's vortex street detection sensor	PPS resin	Piezoelectric element	1	10	O-ring *1	FKM	Fluoro rubber	2
5	Attachment	SUS304 or SCS13		2	11	Bracket (option)	SUS304 or SPCC		(1)
6	Sensor body	PPS resin		1					

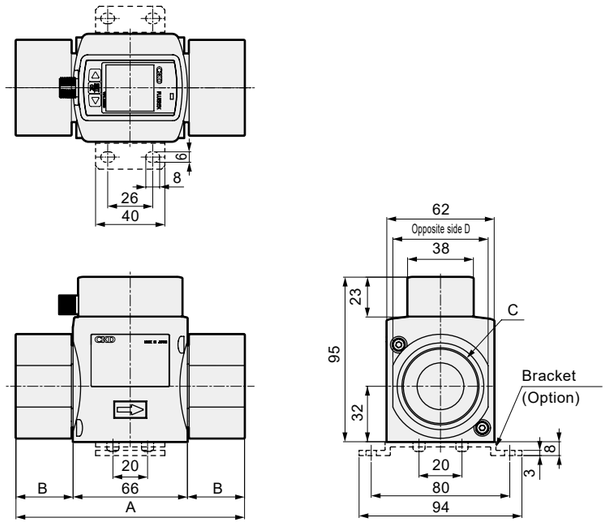
*1: EPDM (ethylene propylene diene rubber) is used for fluorine-based liquids.
*2: Wetted parts are ②,③,④,⑤,⑥,⑩.

WFK2 Series

Large body

Dimensions

●WFK2-100,250



Model No.	A	B	C	Opposite side D
WFK2-[*1]D[*2]□□N	106	20	Rc1	46
WFK2-[*1]E[*2]□□N	125	29.5	Rc1 1/4	50
WFK2-[*1]F[*2]□□N	132	33	Rc1-1/2	55

[*1]: Select from 100,250
[*2]: Select from A, B, and C (G thread and NPT thread also have the same Dimensions)

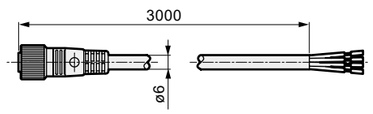
Optional dimensions

●Cable option

Common for WFK2

・Standard cable

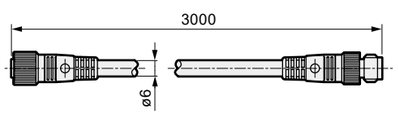
Discrete option model No.: **WF-FL-280741**



Finished outer diameter 6 mm, core wire 0.5 mm², insulator O.D. 1.9 mm

・Double ended connector cable

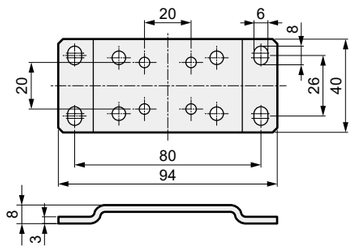
Discrete option model No.: **WF-FL-662453**



●Bracket option

WFK2-100,250

Discrete option model No.: **WF-FL-636342**



MEMO

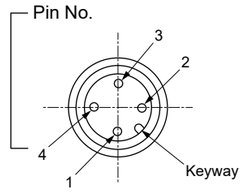
Flow rate sensor
Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit
Ending

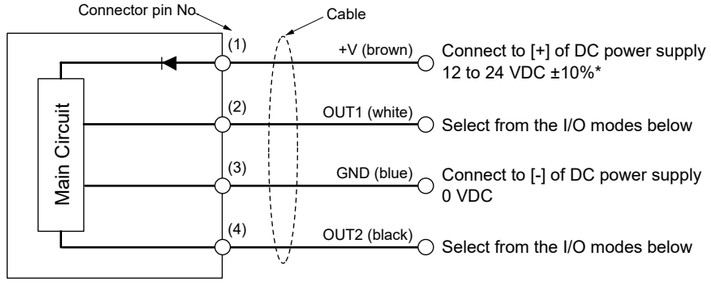
Wiring method

· Always read the safety precautions before wiring.
· The cable is a 4-conductor cabtyre cable with a core wire of 0.5 mm² made by Correns Corporation.
***Keep the cable far away from power cords or other things that may cause noise.**

Noise can cause malfunctions.

[Connector (male)]





*For analog output standard (0 to 5 V, 1 to 5 V). With option (4 to 20 mA, 0 to 10 V, 1 to 10 V), 24 VDC is ±10%.

I/O mode

OUT1: analog flow output, analog temperature output, flow switch 1 output, flow switch 2 output, temperature switch 1 output, temperature switch 2 output, integrated pulse output, integrated switch output, external input, Off

OUT2: analog flow output, analog temperature output, flow switch 1 output, flow switch 2 output, temperature switch 1 output, temperature switch 2 output, integrated pulse output, integrated switch output, IO-Link, Off

Item	[A,D] 0 to 5 V, 1 to 5 V	[B,E]4 to 20 mA	[C,F] 0 to 10 V, 1 to 10 V
Allowable load weight	50 kΩ or more	500 Ω or less	50 kΩ or more

The default settings (shipped) are as follows:

IO-Link / Analog output	OUT1	OUT2
Switch / Analog output	Analog flow rate output	Analog temperature output
IO-Link compatible	OFF	IO-Link

IO-Link parameter specifications

1. General

Item	Details
Communication protocol	IO-Link
Communication protocol version	V1.1
Transmission bit rate	COM2 (38.4 kbps)
Port	M12 Class A
Process data (input)	4 byte
Process data (output)	0 byte
Min. cycle time	5 ms
Data storage	1 kbyte
SIO mode support	None



Power lamp (green)
• Lights when power supply is ON.
• Blinks during IO-Link communication.

2. Process data

Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
Data name	MSB															LSB
	Instantaneous flow rate [Flow Rate]															
Data range	Refer to Table 1															
Format	UInteger16															

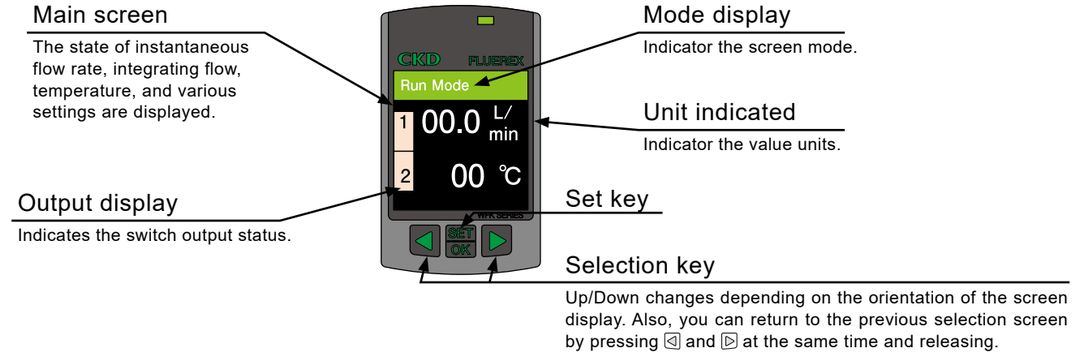
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Data name	Error	WARNING	–	–	Switch Output				MSB							LSB
					4	3	2	1	Fluid temperature							
Data range	True/False								-10 to 110°C							
Format	Boolean								Integer8							

Data range (Table 1)

Flow rate range	005	020	050	100	250
Data range	0.00 to 5.50 L/min	0.0 to 22.0 L/min	0.0 to 55.0 L/min	0 to 110 L/min	0 to 275 L/min

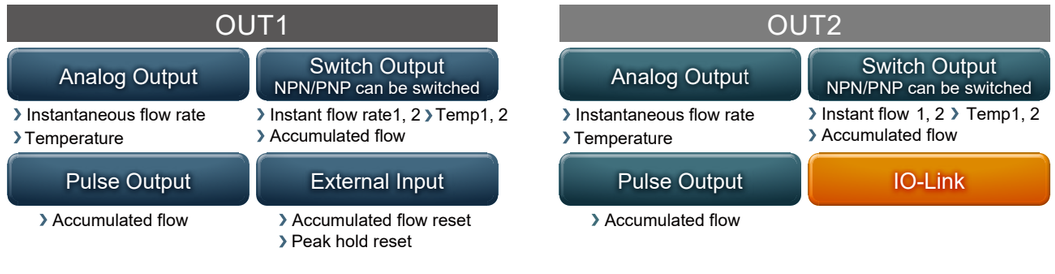
Note: IODD files can be downloaded from the CKD website. (https://www.ckd.co.jp/en/)

Names and functions of display / operation section

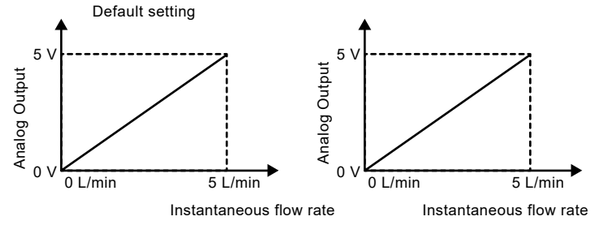
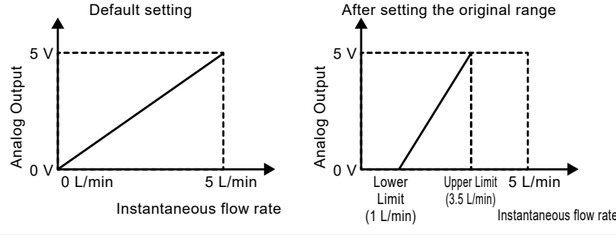


I/O setting method

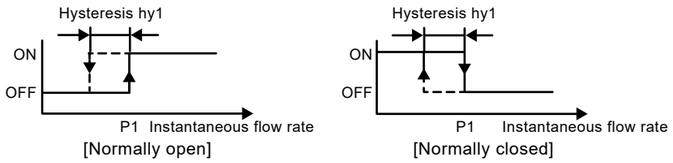
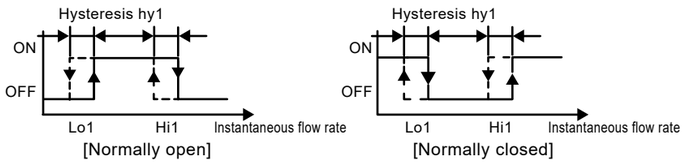
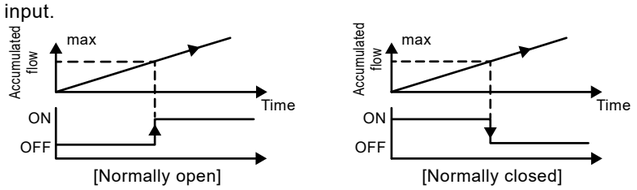
Input and output to be assigned to wiring OUT1 and OUT2 can be set randomly.



1. Analog output

(1) Output conversion *The output of 4 to 20 mA analog output cannot be switched.	0 to 5 V/1 to 5 V...Select between 0 to 5 V output and 1 to 5 V output 4 to 20 mA types...No output conversion 0 to 10 V/1 to 10 V...Select between 0 to 10 V output and 1 to 10 V output applied to instantaneous flow rate, temperature output 
(2) Original analog output	An analog output function that freely sets the upper and lower limits of normal analog output. *The setting range is equal to or less than the max. flow rate of each flow rate range [Ex.] When set to Lower Limit=1 L/min, Upper Limit=3.5 L/min 

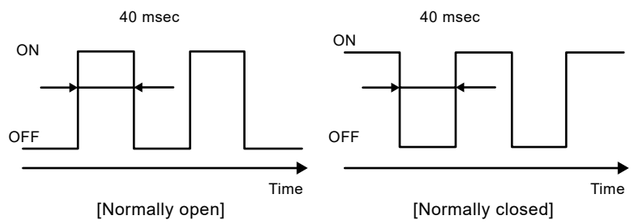
2. Switch output

(1) Hysteresis mode	OUT 1 and 2 can both be set. Can be set with instantaneous flow rate and temperature. Can memorize 2-types each of instantaneous flow rate and temperature. 
(2) Window mode	OUT 1 and 2 can both be set. Can be set with instantaneous flow rate and temperature. Can memorize 2-types each of instantaneous flow rate and temperature. 
(3) Accumulated output mode	OUT 1 and 2 can both be set. Integrating flow can be reset through turning the power OFF, button operation, or external input. 
(4) NPN/PNP conversion	NPN and PNP can be converted.

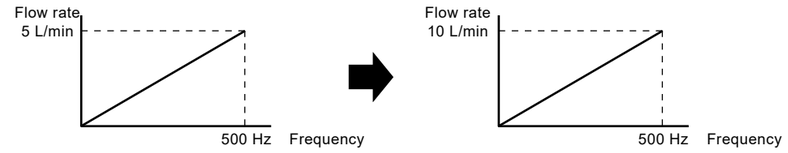
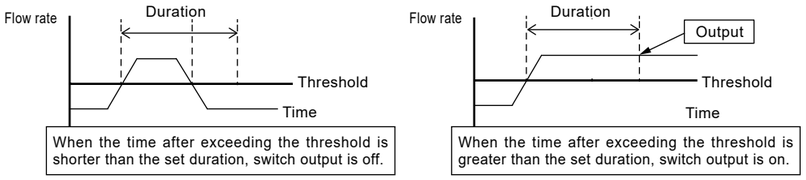
3. Pulse output

Accumulated flow	Pulse output matches the integrating flow count. Selectable pulse rates

Model	5L	20 L	50 L	100 L	250 L
0.1 L	○	○			
0.5 L	○	○	○		
1L	○	○	○	○	
10 L		○	○	○	○
50 L			○	○	○
100 L				○	○



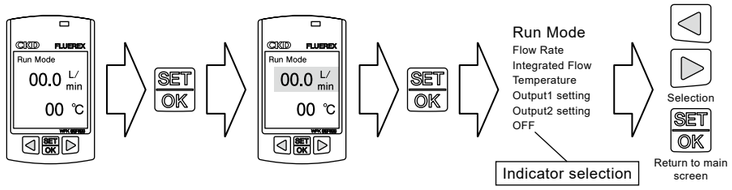
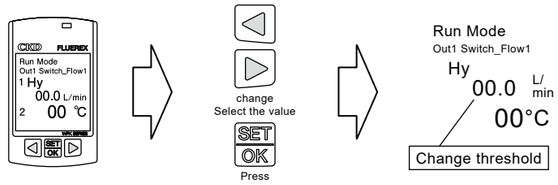
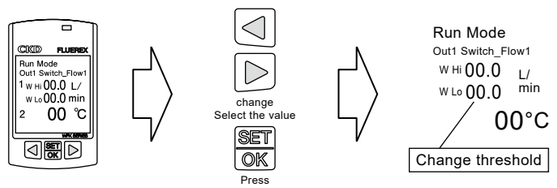
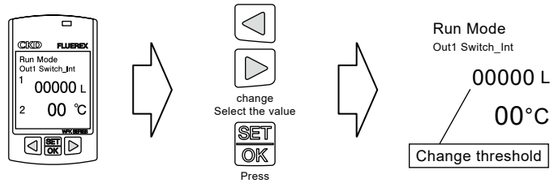
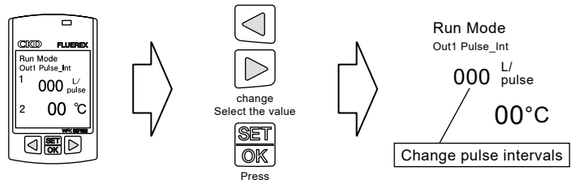
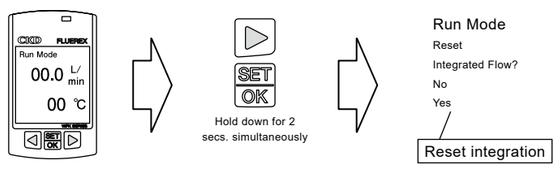
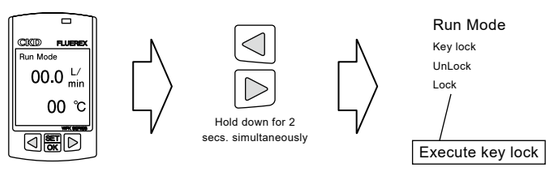
4. Details of functions and setting Items

(1) Span adjustment	Span adjustment can be set from 0.1 to 2.5 times with the initial flow rate value. [Ex.] When set to 2.0 times 
(2) Setting response time	(1) Timer selection Instantaneous flow rate response time (average movement time) can be changed. Select from 0.25 sec, 0.5 sec, 1 sec, 5 sec, and 10 sec (1 sec at factory settings) (2) Duration During switch output, the time it takes for the output to occur after exceeding the threshold can be set. Select from 0 to 9 seconds. 
(3) Peak hold function	The max. and min. values of instantaneous flow rate and fluid temperature can be displayed. The maximum and minimum values can be reset through turning the power OFF, button operation, or external input.
(4) Energy saving setting	Energy saving setting ON/OFF can be set. When the energy saving setting is ON, the liquid crystal backlight turns OFF after 1 minute of inactivity.
(5) IO-Link	Acquiring measurement data, changing the threshold, and other bi-direction communication are possible with an IO-Link connection (OUT2 only). *Option with IO-Link only
(6) Display	Brightness, rotation angle, and update time can be changed.
(7) Color	The display colors of the instantaneous flow rate, fluid temperature, and accumulated flow can be changed. (Select from white, green, and red) The display color can be changed when the value is above or below the upper limit.
(8) Output simulation	The switch output can be forced to turn ON.
(9) Copy mode	Two WFK2 units can be connected and the setting of the master can be copied to the device.
(10) External input	Integrating flow reset or peak hold value reset is possible from an external input.

For details on operation and setting method, refer to CKD components product website (https://www.ckd.co.jp/kiki/en/) → "Model No."→ Instruction manual

Easy setting function

Frequently used settings can be set from the normal screen using shortcut operations.

Change main screen display	
Switch setting Hysteresis mode	
Window mode	
Integrated Switch setting	
Integrated Pulse setting	
Accumulation reset	
Key lock	

Water-use components

Safety Precautions

Be sure to read this section before use.
Refer to Intro 17 for General Precautions.

Design / Selection

1. Working fluids

DANGER

■Do not use the water as drinking water.
As it does not conform to the requirements of the Food Sanitation Act, do not use this product for applications that measure water entering the human body. Intended applications include industrial sensors.

■Never use this product with flammable fluids.

WARNING

■This product cannot be used as a billing meter. Do not use this product for commercial transactions as it is not compliant with the Measurement Act. It cannot be calibrated, so use it as an industrial sensor.

■Applicable fluid is water (industrial water, pure water); do not use with any other fluid. When supporting fluorine-based fluids, the product can be used only with the fluids described in the applicable fluid.

2. Working environment

DANGER

■Flammable environment
Never use this product in an explosive gas atmosphere. The structure is not explosion-proof, and explosions or fires could occur. II3G Ex ec II C T4 Gc 0°C when option (ATEX compatible) is selected ≤Ta≤ Can be used in 50°C environments. Refer to "Options (ATEX compatible)" on P. 445 for use conditions.

WARNING

■Corrosive environment
Do not use this product in an atmosphere containing corrosive gases such as sulfur dioxide.

■Fluid/ambient temperatures
Use in a fluid temperature range of 1 to 95°C (-10 to 95°C for fluorine-based liquid) and an ambient temperature range of 0 to 50°C. If the fluid temperature rises to 95 °C or higher, cool it down using a cooling system such as a chiller. As well, if there is a risk of freezing, drain the product or keep it warm to prevent freezing. When the fluid and ambient temperatures are high, the product may also get hot. There is a risk of burns if it is touched directly. Even if the ambient temperature is within the specified range, do not use this product in a location where rapid changes in temperature can occur.

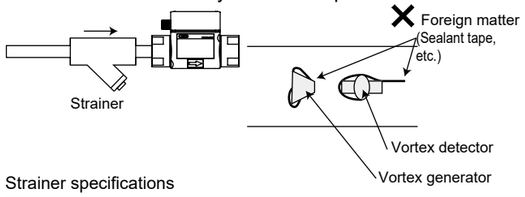
■Max. working pressure
Do not use at a pressure exceeding the max. working pressure, as excessive pressure can cause product failure. To prevent the pressure from reaching the max. working pressure, particularly due to water hammer, take the following measures:
(1) Using a water hammer reduction valve or other similar mechanism, reduce the valve closing speed.
(2) Using elastic piping material, e.g. rubber hose, and an accumulator, absorb the impact pressure.
(3) Make the pipe length as short as possible.

■Drip-proof environment
This product employs a dust-proof, drip-proof structure that provides reliability during maintenance and cleaning, during which it may be exposed to water splashing. However, avoid using this product in a location where it may be constantly exposed to water or intense splattering of water and/or oil.

■CE-compliance working conditions
This product is CE-marked, indicating conformity with the EMC Directives. The standard for the immunity for industrial environments applied to this product is EN61000-6-2; the following requirements must be satisfied in order to conform to this standard:
Conditions
●The evaluation of this product is performed by using a cable that has a power supply line and a signal line paired to assess the product's performance.
●This product is not equipped with surge protection. Implement surge protection measures on the system side.

CAUTION

■If there is a risk of foreign matter entering the fluid, install a filter (strainer) on the primary side. If foreign matter adheres to the vortex generator or vortex detector, measurement accuracy can be compromised.

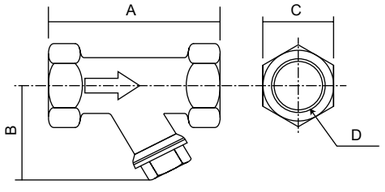


Strainer specifications

Item	Specifications
Specification fluid	Water
Proof pressure MPa	2
Working pressure range MPa	0 to 1
Ambient temperature°C	1 to 90
Main material	**Specifications**
Body	Bronze casting
Strainer	Stainless steel

When using after adjusting to a small flow rate with the manual valve, the valve's opening (clearance) becomes very small. If there are large foreign bodies in the fluid, they may clog the clearance and reduce the flow rate.

External view of strainer



Model No.	A	B	C	D
WF-FL-280730	70	44	23	Rc 3/8
WF-FL-280731	80	49	28	Rc 1/2
WF-FL-280732	100	57	35	Rc 3/4
WF-FL-280733	115	72	43	Rc1
WF-FL-280734	135	82	52	Rc1 1/4
WF-FL-280735	160	98	59	Rc1-1/2

■Vibration / Impact
Do not use this product in an environment exposed to vibration of 20 m/s^2 and over, and shock of 98 m/^{2} and over. This may cause malfunction and/or damage, as this product uses the Karman's vortex type detection principle.

■Hardware check and other internal settings are performed during the first two seconds or so after turning ON the power. Display and output do not function normally during this period. Particularly, if a transistor output is used in the control of an interlock circuit, an abnormal stop may occur. Mask the output during this period.

3. Regarding manual valves

⚠CAUTION

■Since the manual valve (needle) does not have a closing function, internal leakage will occur even when the valve is fully closed. If a closing function is required, select the manual valve (cock).

■After adjusting the flow rate with the manual valve, be sure to fix it with the push lock for the cock type and the lock nut for the needle type. If not fixed, the flow rate will fluctuate.

■Do not use the manual valve continuously.

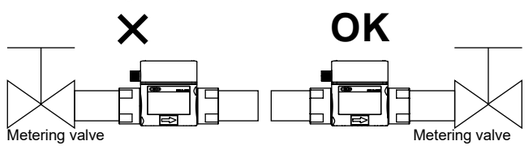
■The position of the dial mark on the needle type varies depending on the individual model. It does not indicate an absolute opening.

4. Piping

⚠CAUTION

■Pipes can be installed in any orientation, vertical, horizontal, etc. Note that pipes should be installed so that the fluid constantly fills the piping while it flows through the pipes. When installing a pipe vertically, making the fluid flow upward can reduce the influence of air bubbles inside.

■If a pipe is narrowed just before the flow rate sensor, or if there is a valve or other restricting component on the primary side, cavitation occurs inside the pipe, preventing accurate measurement. For this reason, such piping should be installed on the secondary side of the sensor. When it is unavoidable and the valve is arranged on the primary side, provide a straight pipe with a diameter of 10 times or more between the valve and the flow rate sensor.
Cavitation...(Vapor cavities that form due to the static pressure at end points, such as a ship propeller, dropping below the vapor pressure of the water. Reduced efficiency or screw damage may result.)

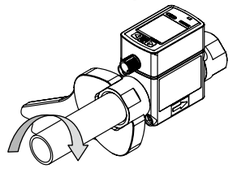


■Operating the pump with the secondary side valve closed may cause the flow rate sensor to detect pressure waves from the pump, resulting in incorrect indication. If this occurs, install the valve on the primary side. When doing so, ensure that a straight pipe with a diameter of 10 times or more bore size is installed between the valve and the flow rate sensor.

■Using an elbow or bush in the piping
When using an elbow or bush in the piping, provide straight piping sections of at least 10D on the IN side and 5D on the OUT side when using a WFK2-100 or WFK2-250 Series model. Note that bore size change by bush should be limited to one size. Without a straight pipe, measurement accuracy can be compromised due to disturbances in the flow rate and/or pressure distribution.
(Straight pipes are not necessary for the WFK2-005, WFK2-020 and WFK2-050 Series. However, it is recommended that a straight pipe is installed to ensure stable measurements.)
* Where "D" indicates the inner diameter of the piping material. Refer to the table below for specific values.

Bore size	Rc3/8 (10 A)	Rc1/2 (15 A)	Rc3/4 (20 A)	Rc1 (25 A)	Rc1 1/4 (32 A)	Rc1-1/2 (40 A)
5D	50 mm	75 mm	100 mm	125 mm	160 mm	200 mm
10D	100 mm	150 mm	200 mm	250 mm	320 mm	400 mm

■When mounting piping or fittings to this product, always hold the attachment on the mounting side with a tool. Holding the body of the product or the attachment on the opposite side may lead to damage.



■Keep the cable far away from power cords or other things that may cause noise. Noise can cause malfunctions.

Option (ATEX compatible)

■The following are supported.
II3 G Ex ec II C T4 Gc 0°C ≤ Ta ≤ 50°C

■Working conditions
1) When using, store in a protection box and protect the flow rate sensor from all directions.
Protection box strength: Higher than DC01, DC03, DC04, DC05, DC06, DC07.
Plate thickness: 1 mm or more
Clearance between flow rate sensor and plate: 70 mm or more
2) There is a risk of static electric discharge. Attach to grounded metal and wipe with a wet cloth.
3) Use in a clean environment with a contamination level of 2 or more.

■Fluid temperature rating
The temperature of the fluid measured for explosion-proof specifications is 95°C.

■ATEX Directive
EN standards for explosive atomosheres
EN IEC 60079-0:2018
EN 60079-7:2015

⚠WARNING

■Do not remove or insert cables while energized in an explosive atmosphere.

⚠CAUTION

■Use an M12 cable compliant with the ATEX Directive.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual

Capacitance electromagnetic flow sensor

WFC

■ Flow rate sensor



CONTENTS

Product Introduction	448
WFC standard	450
With WFC IO-Link, fluid temperature measurement function	452
Wiring method	456
Functions	459
⚠Safety Precautions	462

Flow rate sensor
Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit
Ending

WFC Series

Flow rate sensor with "No clogging" Flo-Thru structure





No clogging of foreign matter

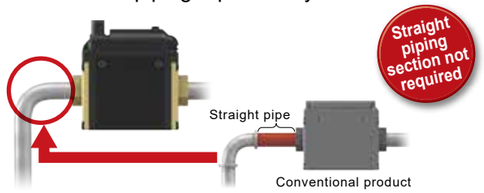
The Flo-Thru structure allows even water of poor quality to be used.

No detection failure

The capacitance structure reduces the likelihood of detection failures caused by foreign matter deposited onto the electrode.

Improved installation

Ensures elbow piping repeatability.



Noise resistance

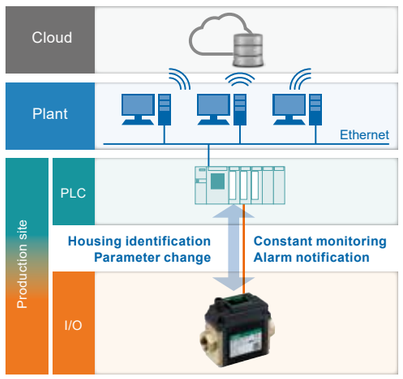
Stabilized power supply and anti-noise ferrite core are not required.



IO-Link model available

IO-Link

IO-Link is a digital communication standard for sensors/actuators at factory sites. (IEC 61131-9)
Unlike analog communication, it enables the transmission of parameters and event data.



Features of IO-Link

- Digital signal — Constant monitoring via digital data is possible.
- Plug & Play — The settings can be copied from the master, making parameter reconfiguration after maintenance obsolete.
- Parameter remote control — Parameters can be set and changed via the network, enabling remote equipment operation.
- Error notification — Device failure and disconnection can be confirmed.
- Housing identification — Models, serial numbers, etc., can be confirmed on the network.
- Connection to fieldbus — It can also be converted to Ethernet networks and connected, enabling devices to be IoT-ready.

Fluid temperature measuring function (option)

Saves space and wiring time with no need for a separately installed fluid temperature sensor.



Remote zero adjustment

Allows zero point adjustment by external input.



Allows parallel installation

Changing the mode allows parallel installation.



Max. working pressure 2.0 MPa

Usable even with medium pressure coolants.

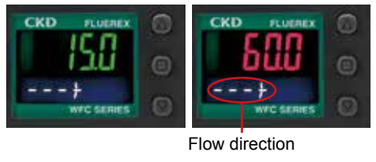
With 180° invertible display

It can be displayed flexibly to suit the device.



Improvement of visibility

The 2-color display and flow direction arrow allow easy recognition.



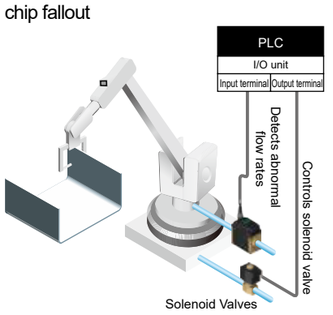
Easy setting

Settings can be easily changed using shortcut operation.

Examples of applications

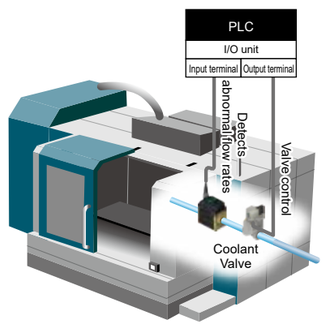
Welding Spot welding machine

Spot welding machine coolant control and flow rate abnormality detection for chip fallout



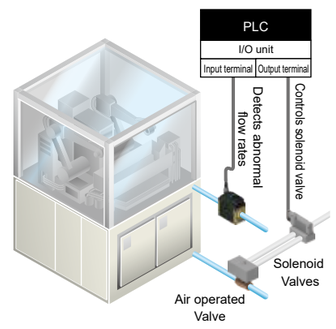
Machining Machine tools

Flow rate management of water-soluble coolant



Tempering Induction hardening device

Quantitative management of cooling water





Capacitance electromagnetic flow sensor

WFC Series

Standard

●Flow rate range: 0.5 to 15 / 2.0 to 60 L/min

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

WFC - 150 - 10A - N - V - C3

- WFC: Model No.
- 150: ❶Flow rate range
- 10A: ❷Port size
- N: ❸Switch Output
- V: ❹Analog Output
- C3: ❺Option (accessories)

❶Flow rate range

Code	Description
150	0.5 to 15 L/min
600	2.0 to 60 L/min

❷Port size

Code	Description	❶Flow rate range 150	❶Flow rate range 600
10*	3/8	●	
15*	1/2		●
20*	3/4		●
*Thread			
A	Rc thread		
G	G thread		
N	NPT thread		

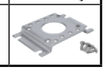
❸Switch Output

Code	Description
N	NPN transistor output
P	PNP transistor output

❹Analog Output

Code	Description
V	Voltage output (1 to 5 V)
A	Current output (4 to 20 mA)

❺Option (accessories)

Code	Description	
Blank	None	
C3	Cable (M12/4-conductor/3 m) attached	
L3	L-type cable (M12/4-conductor/3 m) attached	
B	Bracket included	

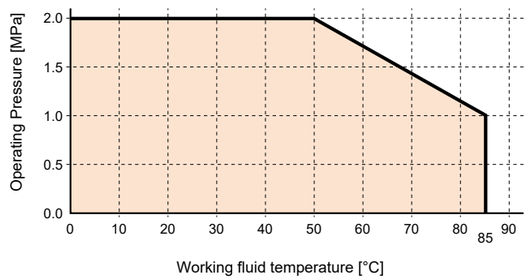
Note: Codes of attachments are not indicated in the product body model No. display section.
For example, with WFC-150-10A-NV-C3B
Product body (display): "WFC-150-10A-NV"
Cable (packaging display): "WFC-C3"
Bracket (packaging display): "WFC-B"
Of these three sets, "WFC-150-10A-NV-C3B" is displayed on the bag or box containing the entire package.

Discrete option (cable, bracket) model No.

WFC - C3

- C3: ❺Option

Operating ambient temperature range



Specifications

Item			WFC-150	WFC-600	
Port size			Rc3/8, G3/8, 3/8NPT	Rc1/2, G1/2, 1/2NPT	Rc3/4, G3/4, 3/4NPT
Applicable fluid			Fluids (conductive fluids) that do not corrode water/wetted part materials		
Available fluid conductivity			5 μs/cm or more		
Detection			Capacitance		
Rated flow range			0.5 to 15 L/min	2.0 to 60 L/min	
Low flow cut flow rate *1			Measured range max. flow rate of 3%		
Working fluid temperature *2			0 to 85°C (no freezing)		
Unit indicated			Instantaneous flow rate L/min Accumulated flow L, kL, ML		
Repeatability *3			±2.0% F.S.		
Temperature characteristics	Ambient temperature characteristics *3		±5.0%F.S (base temperature 25°C)		
	Liquid temperature characteristics *3		±5.0%F.S (base temperature 25°C)		
Working pressure (according to the fluid temperature conditions) *2			0 to 1.0 MPa (0 to 85°C), 0 to 2.0 MPa (0 to 50°C)		
Proof pressure			3.0 MPa		
Response time *4			0.25 s, 0.5 s, 1 s, 2 s, 5 s (default 1 s)		
Accumulated flow range			0.0 to 99999999.9 L		
			0.1 L increments		
Pressure loss *5			0.02 MPa or less (at max. rated flow)		
Switch Output			NPN or PNP transistor output		
	Max. load current		50 mA		
	Max. applied voltage		30 VDC		
	Internal voltage drop		NPN: 2.0 V or less PNP: 2.4 V or less		
	Output protection		Overcurrent abnormal alarm, overcurrent protection		
	Output mode		Select from hysteresis mode, window comparator mode, integrated output mode, integrated pulse output mode, alarm output mode		
Analog Output		Output voltage	Voltage output: 1 to 5 V load impedance: 50 kΩ or more		
		Output current	Current output: 4 to 20 mA Load impedance: 500 Ω or less		
Switch input		Input time	20 ms or more		
		Short-circuit current	Approx. 2 mA		
Indicator			2-screen display (main screen: green/red 2-color LED, sub-screen: white) Screen flip possible Instantaneous flow rate: 3 digits Integrating flow: 4 digits Screen refresh cycle 5 times/sec		
Power supply voltage			24 VDC ±10% (ripple P-P ±10% or less)		
Current consumption			65 mA or less		
Environmental resistance	Degree of Protection		IP65 equiv. *6		
	Operating ambient temperature range		0 to 50°C (no condensation)		
	Ambient humidity range		35 to 85% RH (no condensation)		
Mounting orientation			Unrestricted in vertical/horizontal direction		
Compliant standards			EC Directives (EMC Directive, RoHS Directive)		
Material of wetted parts			PPS, FKM, CAC804, C6931		
Weight	Body *7		Approx. 460 g	Approx. 490 g	Approx. 520 g
	Cable	Cable	Approx. 170 g		
		L-type cable			
	Bracket		Approx. 30 g		

*1: If the flow rate is less than the low flow cut flow rate, 0 L/min is displayed.
*2: Fluid temperature when the working pressure is 0 to 1.0 MPa. When working pressure is 0 to 2.0 MPa, use with a fluid temperature of 0 to 50 °C. (Refer to the graph on the previous page for the usable range.)
*3: Characteristics when the response time is 1 s.
*4: The response time to reach 63% of the value in relation to the step input.
*5: JIS B 8570-1, ISO 4064-1 and ISO 4064-3.
*6: Degree of protection is when the cable option is mounted.
*7: When using options, add the weight of optional parts.
*8: For parallel installation at intervals of 50 mm or less, please consult with us.
*9: Piping port and body metal part are grounded to DC (-) / blue wire. This product cannot be used in (+) ground power supply. Contact CKD if using in (+) ground power supply.



Capacitance electromagnetic flow sensor

WFC Series

With IO-Link, fluid temperature measurement function

●Flow rate range: 0.5 to 15 / 2.0 to 60 L/min

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

WFC - 150 - 10 A - CT - C3

- WFC: Model No.
- 150: ❶ Flow rate range
- 10 A: ❷ Port size
- CT: ❸ IO-Link/fluid temperature measurement
- C3: ❹ Option (accessories)

❶Flow rate range

Code	Description
150	0.5 to 15 L/min
600	2.0 to 60 L/min

❷Port size

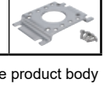
Code	Description	❶ Flow rate range 150	600
10*	3/8	●	
15*	1/2		●
20*	3/4		●
*Thread			
A	Rc thread		
G	G thread		
N	NPT thread		

❸IO-Link/fluid temperature measurement

Code	Description
C	IO-Link compatible
CT	With IO-Link compatible, fluid temperature measurement function
T	With fluid temperature measuring function

Note: Configuration to analog output/switch output is also possible. Refer to page 456 for details.

❹Option (accessories)

Code	Description	
Blank	None	
C3	Cable (M12/4-conductor/3 m) attached	
L3	L-type cable (M12/4-conductor/3 m) attached	
B3	Two-sided connector cable (M12/4-conductor/3 m) attached	
G3	L-type two-sided connector cable (M12/4-conductor/3 m) attached	
B	Bracket included	

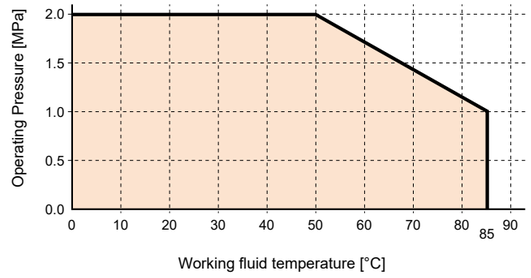
Note: Codes of attachments are not indicated in the product body model No. display section.
For example, with WFC-150-10A-CT-C3B
Product body (display): “WFC-150-10A-CT”
Cable (Packaging Display): “WFC-C3”
Bracket (Packaging Display): “WFC-B”
Of these three sets, "WFC-150-10A-CT-C3B" is displayed on the bag or box containing the entire package.

Discrete option (cable, bracket) model No.

WFC - C3

- C3: ❹ Option

Operating ambient temperature range

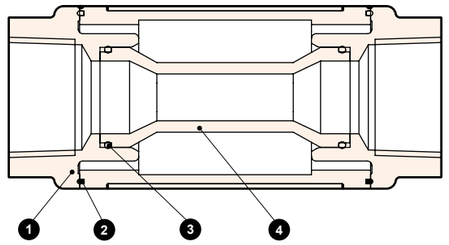


Specifications

Item			WFC-150	WFC-600	
Port size			Rc3/8, G3/8, 3/8NPT	Rc1/2, G1/2, 1/2NPT	Rc3/4, G3/4, 3/4NPT
Applicable fluid			Fluids (conductive fluids) that do not corrode water/wetted part materials		
Available fluid conductivity			5 μs/cm or more		
Detection			Capacitance		
Rated flow range			0.5 to 15 L/min	2.0 to 60 L/min	
Low flow cut flow rate *1			Measured range max. flow rate of 3%		
Working fluid temperature		*2	0 to 85°C (no freezing)		
Unit indicated			Instantaneous flow rate L/min Accumulated flow L, kL, ML Fluid temperature °C		
Flow rate		Repeatability *3	±2.0% F.S.		
		Ambient temperature characteristics *3	±5.0% F.S (base temperature 25 °C)		
		Fluid temperature characteristics *3	±5.0% F.S (base temperature 25 °C)		
Fluid temperature		Measurement range	0 to 85 °C (operational range is -10 to 110 °C)		
		Measurement accuracy	±2 °C (less than 50 °C) *The difference between the fluid temperature and the ambient temperature is within ±5 °C ±5°C (50°C and over) Ambient temperature within -35°C for*fluid temperature		
Working pressure (according to the fluid temperature conditions) *2			0 to 1.0 MPa (0 to 85°C), 0 to 2.0 MPa (0 to 50°C)		
Proof pressure			3.0 MPa		
Response time *4			0.1 s, 0.25 s, 0.5 s, 1 s, 2 s, 5 s (default 1 s)		
Accumulated flow range			0.0 to 99999999.9 L		
			0.1 L increments		
Pressure loss		*5	0.02 MPa or less (at max. rated flow)		
Switch Output			NPN or PNP MOS-FET output (switchable with settings)		
	Max. load current		50 mA		
	Max. applied voltage		30 VDC		
	Internal voltage drop		NPN: 2.0 V or less PNP: 2.4 V or less		
	Output protection		Overcurrent abnormal alarm, overcurrent protection		
	Output mode		Select from hysteresis mode, window comparator mode, integrated output mode, integrated pulse output mode, alarm output mode, and frequency pulse output mode		
Analog Output		Output voltage	Voltage output: 1 to 5 V load impedance: 50 kΩ or more		
		Output current	Current output: 4 to 20 mA Load impedance: 500 Ω or less		
Switch input		Input time	20 ms or more		
		Short-circuit current	Approx. 2 mA		
Indicator			2-screen display (main screen: green/red 2-color display, sub-screen: white) screen inversion possible Instantaneous flow rate: 3 digits Liquid temperature: 2 digits Integrating flow: 4 digits Screen refresh cycle 5 times/sec		
Power supply voltage			When setting switch output: 24 VDC ±10% (ripple P-P ±10% or less)		
			When setting IO-Link: 20 to 30 VDC (ripple P-P ±10% or less)		
Current consumption			65 mA or less (with 24 VDC, 25 °C)		
Environmental resistance		Degree of Protection	IP65 equiv. *6		
		Operating ambient temperature range	0 to 50°C (no condensation)		
		Ambient humidity range	35 to 85% RH (no condensation)		
Mounting orientation			Unrestricted in vertical/horizontal direction		
Compliant standards			EC Directives (EMC Directive, RoHS Directive)		
Material of wetted parts			PPS, FKM, CAC804, C6931		
Weight	Body *7		Approx. 460 g	Approx. 490 g	Approx. 520 g
	Cable	Cable	Approx. 170 g		
		L-type cable			
		Two-sided connector cable	Approx. 180 g		
		L-type two-sided connector cable	Approx. 100 g		
	Bracket		Approx. 30 g		

*1: If the flow rate is less than the low flow cut flow rate, 0 L/min is displayed.
*2: Fluid temperature when the working pressure is 0 to 1.0 MPa. When working pressure is 0 to 2.0 MPa, use with a fluid temperature of 0 to 50 °C. (Refer to the graph on the previous page for the usable range.)
*3: Characteristics when the response time is 1 s.
*4: The response time to reach 63% of the value in relation to the step input.
*5: JIS B 8570-1, ISO 4064-1 and ISO 4064-3.
*6: Degree of protection is when the cable option is mounted.
*7: When using options, add the weight of optional parts.
*8: For parallel installation at intervals of 50 mm or less, please consult with us.
*9: Piping port and body metal part are grounded to DC (-) / blue wire. This product cannot be used in (+) ground power supply. Contact CKD if using in (+) ground power supply.
*10: Refer to the instruction manual for IO-Link Parameter specifications. IODD files can be downloaded from the CKD website. https://www.ckd.co.jp/en/

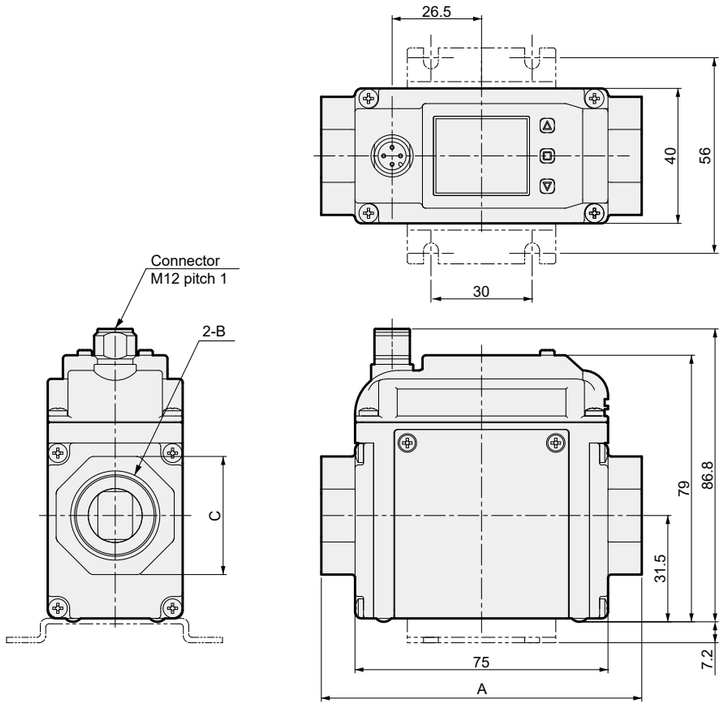
Internal Structure Diagram / Material



Note: This shows the structure of the parts when viewed from the front.

Part No.	Part name	Material		Quantity
1	Socket	CAC804 or C6931	Brass	2
2	Packing	FKM	Fluoro rubber	2
3	O-ring	FKM	Fluoro rubber	2
4	Measuring tube	PPS resin		1

Dimensions

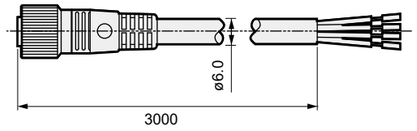


Model No.	A	B	C
WFC-150-10A	90	Rc3/8	24
WFC-150-10G		G3/8	
WFC-150-10N		3/8NPT	
WFC-600-15A	95	Rc1/2	28
WFC-600-15G		G1/2	
WFC-600-15N		1/2 NPT	
WFC-600-20A		Rc3/4	35
WFC-600-20G		G3/4	
WFC-600-20N		3/4NPT	

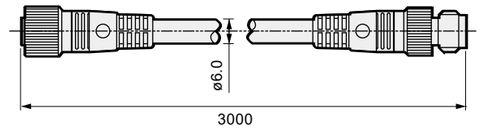
Optional dimensions

●Cable option

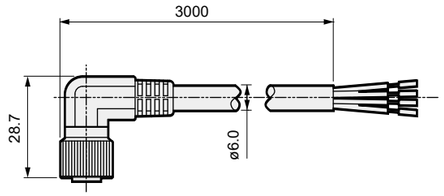
Discrete option model No.: **WFC-C3**



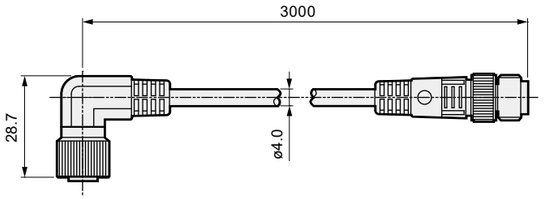
Discrete option model No.: **WFC-B3**



Discrete option model No.: **WFC-L3**

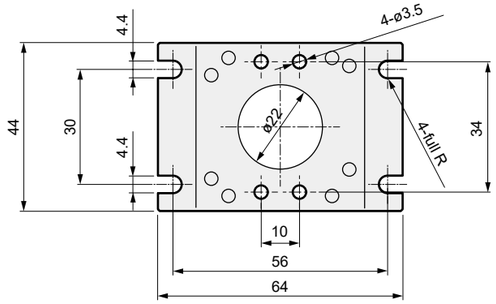


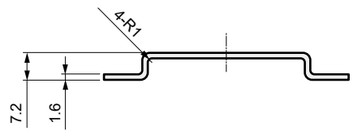
Discrete option model No.: **WFC-G3**



●Bracket option

Discrete option model No.: **WFC-B**



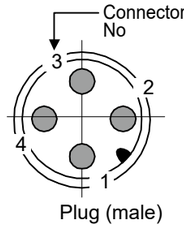


Wiring method

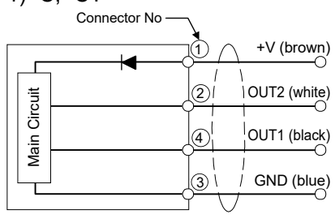
・Always read the safety precautions before wiring.

Note: Keep the cable far away from power cords or other things that may cause noise. Noise can cause malfunctions.

1), 2) are used with the "With IO-Link, fluid temperature measurement" wiring diagram, and 3), 4) are used with the "Standard" wiring diagram.

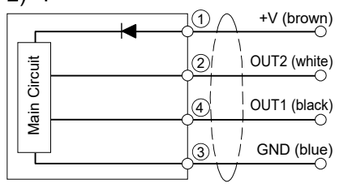


1) -C, -CT



… Connect to [+] of DC power supply: 20 to 30 VDC (when setting IO-Link)
24 VDC ±10% (when setting switch output)
…off. (If OUT1 is IO-Link) Analog output / Switch input (when OUT1 is switch output) : flow rate, or voltage or current in proportion to temperature (for -CT) output / remote zero adjustment or accumulation reset
… IO-Link / Switch output: IO-Link communication / max. 30 VDC 50 mA
… Connect to [-] of DC power supply: 0 VDC

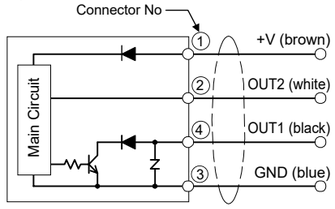
2) -T



… Connect to [+] of DC power supply: 24 V±10% of DC
... Analog output/switch input: Voltage or current output in proportion to flow rate or temperature/Remote zero adjustment or accumulation reset
... Switch output: Max.30 VDC 50 mA
… Connect to [-] of DC power supply: 0 VDC

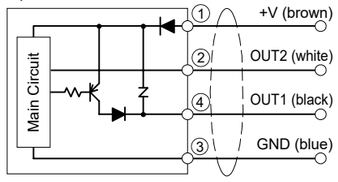
Note: With -C, -CT and -T, the switch output NPN/PNP can be switched from settings. The voltage/current of analog output can also be switched from settings.

3) -NV, -NA



… Connect to [+] of DC power supply: 24 V±10% of DC
... Analog output/switch input: Voltage outputs current in proportion to flow rate/Remote zero adjustment or accumulation reset
… Switch output (NPN): max. 30 VDC 50 mA
… Connect to [-] of DC power supply: 0 VDC

4) -PV, -PA



… Connect to [+] of DC power supply: 24 V±10% of DC
... Analog output/switch input: Voltage outputs current in proportion to flow rate/Remote zero adjustment or accumulation reset
... Switch output (PNP): MAX.50 mA
… Connect to [-] of DC power supply: 0 VDC

Note: Wiring when cable option is mounted.

	Switch output	Analog Output
-NV	NPN Transistor output	1 to 5 [V]
-NA		4 to 20 [mA]
-PV	PNP Transistor output	1 to 5 [V]
-PA		4 to 20 [mA]

Piping method

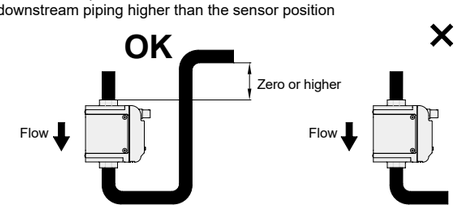
[Piping]
· Perform piping so that the flow path of the product is always full of water. If it is not full of water, a flow rate may be displayed even if the flow is halted.
· Only use the zero adjustment operation after confirming that the product's flow path is full and the flow is halted.
· Do not allow gas to enter the piping.
· Though mounting orientation is unrestricted, display surface horizontal to the ground is recommended in lateral pull piping so as to be less susceptible to the influence of air bubbles.
· Set the flow direction for piping and flow rate sensor correctly.
· Provide flow rate adjusting valve, etc. on the downstream side of the sensor.

[Piping method]

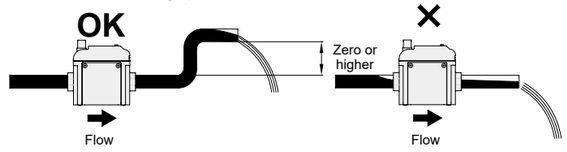
Install with the flow direction from bottom to top



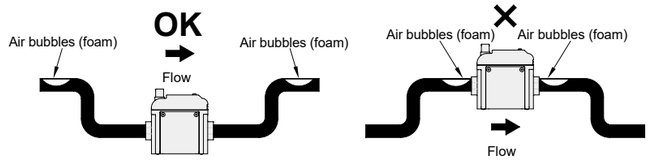
When the flow is from top to bottom
Route the downstream piping higher than the sensor position



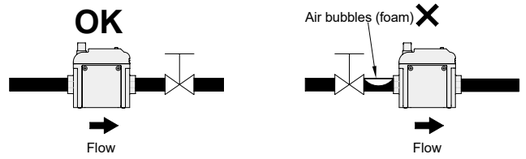
When the sensor downstream side is open to the atmosphere
Install the sensor below the discharge port



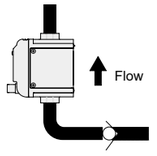
Mount the sensor in a position where air bubbles will not accumulate



Install a flow control valve, etc., downstream of the sensor



If the flow path may become empty due to reverse flow caused by water head pressure when water is stopped, installation of the check valve is recommended.



Use CKD's CCH Series check valve.

IO-Link parameter specifications

1. General

Item	Details
Communication protocol	IO-Link
Communication protocol version	V1.1
Transmission bit rate	COM2 (38.4 kbps)
Port	M12 Class A
Process data (input)	4 byte
Process data (output)	0 byte
Min. cycle time	5 ms
Data storage	1 kbyte
SIO mode support	None

2. Process data

Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
Data name	MSB															LSB
	Instantaneous flow rate															
Data range	Refer to Table 1															
Format	UInteger16															

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Data name	Error	WARNING	-	-	-	-	Switch Output		MSB							LSB
							2	1	Fluid temperature							
Data range	True/False								-10 to 110 °C							
Format	Boolean								Integer8							

Data range (Table 1)

Flow rate range	150	600
Data range	0.0 to 18.0 L/min	0.0 to 72.0 L/min

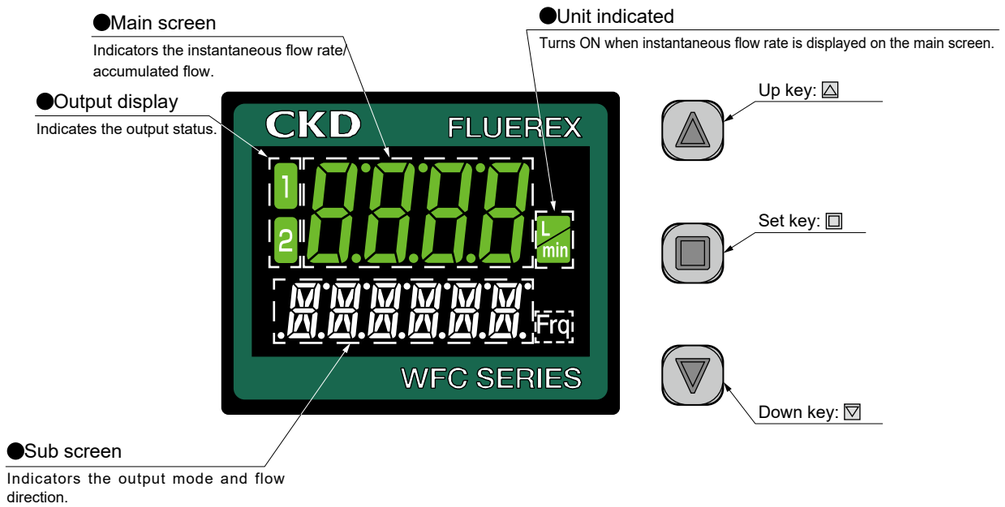
Note: IODD files can be downloaded from the CKD website. https://www.ckd.co.jp/en/

●Description of functions

Item	Explanation
Instantaneous flow rate	Instantaneous flow rate is sent to the master as cycle data.
Fluid temperature	Fluid temperature is sent to the master as cycle data.
Switch output function	The switch output operation function can be set. (Instantaneous flow rate, integrating flow, temperature)
Error notification	Errors and error details can be confirmed.
Peak hold function	The peak values of instantaneous flow rate and fluid temperature can be confirmed and reset.
Accumulated flow	Integrating flow can be confirmed and reset.
Power ON time	Total power ON time can be confirmed. (Power ON time cannot be reset.)
Indicator setting	The display contents, colors, and vertical inversion of the main screen and sub screen can be changed.
Key lock	Button operations can be locked and unlocked.
Flow direction	Flow direction can be changed.
Integrating flow unit	Integrating flow unit can be changed.
Eco mode	ECO mode can be set to ON and OFF.
Parallel mode	Parallel mode can be set to ON and OFF.
Response time	Response time can be changed.
Optional characters	The optional characters to be displayed on the sub screen can be changed.
Low flow cut	The threshold at which the flow rate value becomes 0 can be set.
Zero adjustment	The zero point of flow rate can be set.
Reset function	The product can be returned to factory settings.
Data storage function	Set values can be uploaded to and downloaded from the master.
Unit identification function	Manufacturer, model No., serial No., and other information can be confirmed.

Note: Refer to the Instruction Manual for details of IO-Link parameter specifications.

Functions

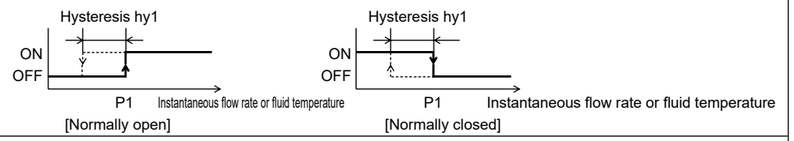
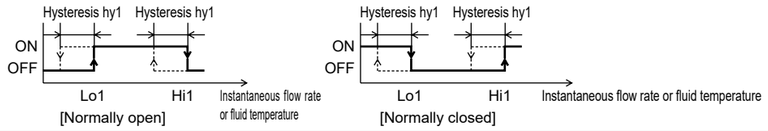
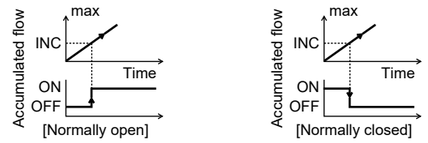
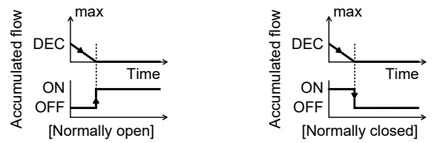
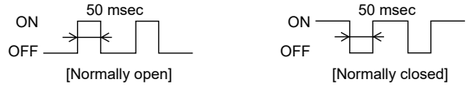
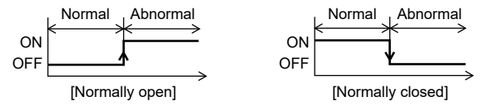
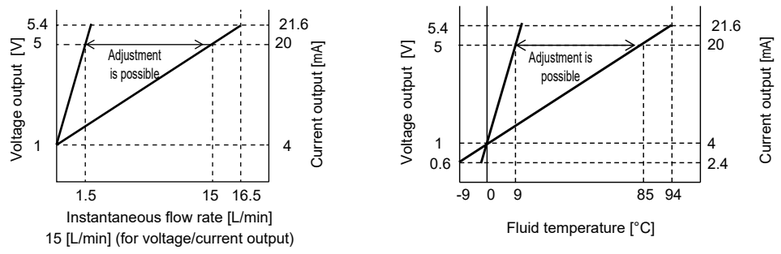
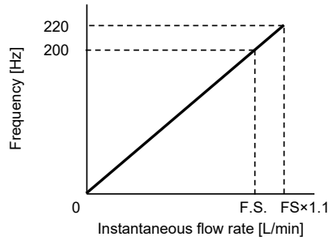


Measurement mode

[Normal screen]

Instantaneous flow rate display	Hysteresis mode	Window comparator mode	Accumulated output mode	Integrated pulse output mode
	Analog output (flow rate)	Analog output (fluid temperature)	Switch input: remote zero adjustment	Digital input: Accumulation reset
	Alarm output mode	Fluid temperature	Frequency pulse output mode	IO-Link communication mode
	Flow direction		Select any character	No sub-screen display
Total accumulated flow display	Accumulated units can be switched to "L", "kL", "ML" with up key: ▲ and down key: ▼.			

Output mode and output operation

(1) Hysteresis mode	
(2) Window comparator mode	
(3) Accumulated output mode	●Increment mode  ●Decrement mode 
(4) Integrated pulse output	
(5) Alarm output mode	
(6) Analog output mode	
(7) Frequency pulse output mode	

Easy setting (shortcut mode)

By shortcut operation, settings with high frequency of use can be moved from the normal screen to the settable state.

Main screen	Normal screen ⇄ (Current screen blinks) ⇄ 0.0 / 8888 L △ or ▽ select "instantaneous value display", "total integrated value display", and □ to confirm.
Hysteresis mode	0.0 P1 5.0 ⇄ (△ or ▽) ⇄ 0.0 P1 5.0 △ or ▽ set judgment value, and □ to confirm.
Accumulated output mode	0.0 1234L ⇄ (□ + ▽) ⇄ 0.0 1234L □ Integrated value is reset with .
Analog output mode	0.0 FS 10.0 ⇄ (△ or ▽) ⇄ 0.0 FS 10.0 △ or ▽ change F.S. with, and □ to confirm.
Flow direction	0.0 --→ ⇄ (△ or ▽) ⇄ 0.0 --→ / 0.0 ←-- △ or ▽ to change flow direction, and □ to confirm.
Total integrated value reset	8888 L ⇄ (□ + ▽) ⇄ 8888 L Reset by □. △ or ▽ can be canceled.
Setting key lock	Normal screen ⇄ (△ + ▽ (Hold down for 2 seconds or more)) ⇄ (1 second after setting) 8888 UNLOCK / 0.0 LocK △ or ▽ to change, and □ to confirm.

Safety Precautions

Be sure to read this section before use.
Refer to Intro 17 for General Precautions.

Design / Selection

1. Working environment/working fluids

⚠ CAUTION

- Do not exceed the specified range.
- This product is for fluids that do not corrode water/wetted part materials with conductivity 5 μs/cm or more. Fluids with low conductivity cannot be detected normally.
- Do not use with a positive ground.
- Do not use for applications in direct contact with beverages, foodstuffs, chemical liquids, etc.
- Do not use in flammable gas atmospheres.
- Observe the working fluid temperature and use. If using at low temperatures, take freeze prevention measures such as adding antifreeze.
- If a fluid with temperature lower than the ambient temperature flows, condensation may form inside the product, which may adversely affect performance. Use the product so that there is no condensation.
- Observe the working pressure range and use.
- Observe the rated flow range and use.
- This product cannot be used as a billing meter. Do not use this product for commercial transactions as it is not compliant with the Measurement Act. It cannot be calibrated, so use it as an industrial sensor.

2. Piping

⚠ WARNING

- Perform piping so that the flow path of the product is always full of water. If it is not full of water, a flow rate may be displayed even if the flow is halted.
- Only use the zero adjustment operation after confirming that the product's flow path is full and the flow is halted.

⚠ CAUTION

- Provide flow rate adjusting valve, etc. on the downstream side of the sensor.
- Do not wire together with the power wire/power cables.
- Keep this product away from high voltage components and power components such as motors for use.
- Do not bring this product near strong magnets or magnetic fields.
- Do not use the display and outputs for 10 seconds after power-on for a warm-up period.
- Although any mounting position is possible, in order to reduce the influence of air bubbles, it is recommended that the display surface be level with the ground in the case of horizontal piping.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual

MEMO

Flow rate sensor
Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit
Ending

Karman vortex flow rate sensor for water

FLUEREX flow sensor® WFK3000

■ Flow rate sensor



CONTENTS

Product Introduction 466
● Compact/equipment integrated WFK3000 468
Wiring method 478
⚠Safety Precautions 480

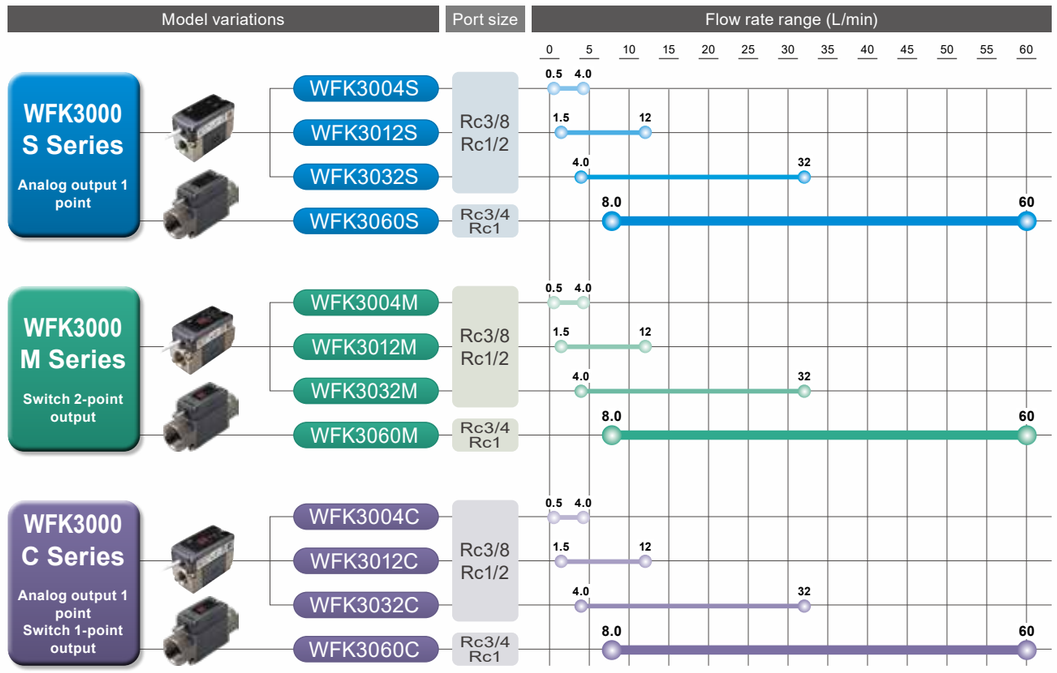
Flow rate sensor
Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit
Ending

WFK3000 Series

Sizes and ranges that simplify design



A wide variety of models



Simple operation, no manual required

Sensor is ready for use as soon as wiring is completed. Setting of switch is completed by simply turning the rotary switch. Cumbersome switch setting not required.

Analog/ switch output both supported

WFK3000S
Sensor type: analog 1-point output

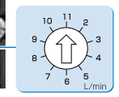


Power supply lamp
Water conduction lamp
Instantaneous flow rate display (integer part will be displayed for 10 L/min and over.)

WFK3000M
Switch type: Switch 2-point output



Output lamp



Rotary switch (set output in 10 steps.)

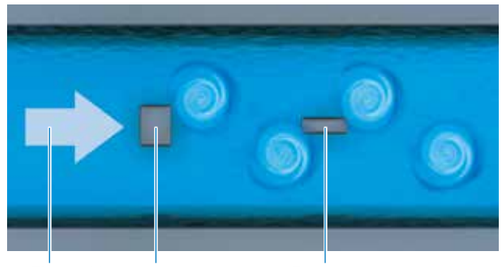
WFK3000C
Sensor/switch type:1-point analog output, 1-point switch output



Output lamp
Rotary switch
Instantaneous flow rate display (integer part will be displayed for 10 L/min and over.)

Measuring method with high reliability

Highly reliable Karman's vortex used. This method has no moving parts, unlike an impeller, eliminating problems caused by foreign materials and rust in piping.



Degree of protection IP65 or equivalent

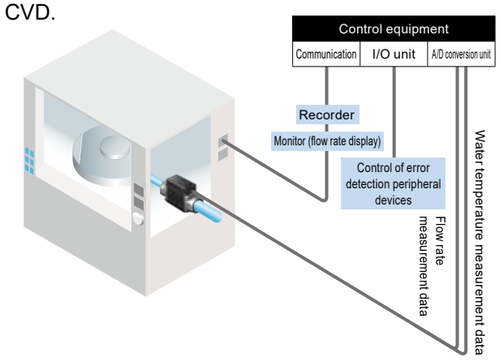
Safe to use in food equipment or similar equipment that requires drip-proofing.

IP65

Examples of applications

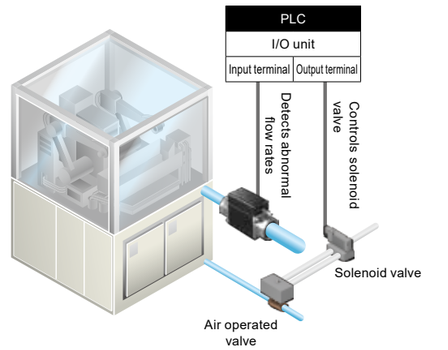
Semiconductor Semiconductor manufacturing equipment

Cooling and temperature control of semiconductor manufacturing equipment. Etching, grinder, dicer, CVD.



Tempering Induction hardening device

Quantitative management of cooling water.





Karman vortex flow rate sensor for water FLUEREX

WFK3000S Series

(Compact/equipment integrated sensor)

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

●Sensor

WFK3 **012** **S-** **10** **-** **A0** **B**

- WFK3: Model No.
- 012: ❶Flow rate range
- S-:
- 10: ❷Port size
- A0: ❸Analog Output
- B: ❹Bracket

❶Flow rate range

Code	Description
004	0.5 to 4.0 L/min
012	1.5 to 12 L/min
032	4.0 to 32 L/min
060	8.0 to 60 L/min

❷Port size

Code	Description		❶Flow rate range 004	012	032	060
10	Rc3/8		●	●	●	
15	Rc1/2		●	●	●	
20	Rc3/4					●
25	Rc1					●

Note: Contact CKD for G thread and NPT thread support.

❸Analog Output

Code	Description
A0	0 to 5 VDC
A1	4 to 20 mA DC
A2	1 to 5 VDC
A3	0 to 10 VDC

❹Bracket

Code	Description	
Blank	None	
B	Bracket attached (including mounting screws)	

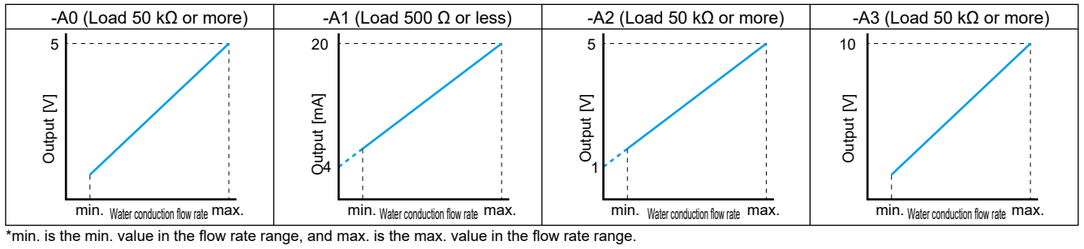
Specifications

Model No. / Item		WFK3004S-10	WFK3004S-15	WFK3012S-10	WFK3012S-15	WFK3032S-10	WFK3032S-15	WFK3060S-20	WFK3060S-25
Flow rate range L/min		0.5 to 4.0		1.5 to 12		4.0 to 32		8.0 to 60	
Port size Rc		3/8	1/2	3/8	1/2	3/8	1/2	3/4	1
Port material		Stainless steel: SCS13							
Working Conditions	Applicable fluid	Pure water, industrial water							
	Maximum Working Pressure, MPa	1.0							
	Proof pressure MPa	1.5							
	Ambient temperature °C	0 to 50 (85% RH or less)							
	Fluid temperature °C	1 to 70							
Accuracy		±2.5% F.S.							
Temperature characteristics		± 5% F.S. (10 to 50°C, base temperature 20°C)							
Pressure loss MPa		0.06 or less (at 4.0 L/min)		0.05 or less (at 12 L/min)		0.06 or less (at 32 L/min)		0.05 or less (at 60 L/min)	
Response time		1 sec *1							
Output	Indicator	None							
	Analog Output	Standard: 0 to 5 VDC, option: 4 to 20 mA DC, 1 to 5 V, 0 to 10 V							
Power supply voltage		12 to 24 VDC±10% (max. 80 mA) Option A3 is 15 to 24 VDC							
Cable		3 m, 4-conductor, final diameter 4.8 mm, core wire 0.2 m㎡, insulator O.D. 1.3 mm							
Mounting	Mounting orientation	Unrestricted in vertical/horizontal direction							
	Straight piping section	None *2						IN side: 10D, OUT side 5D	
	Degree of Protection	IP 65 or equiv.							
Weight g		380	410	380	410	380	410	470	510
Bracket weight g		28 (including screws)							

*1: The time to attain 70% of the original output after the normal flow rate (used) drops instantly to 0.

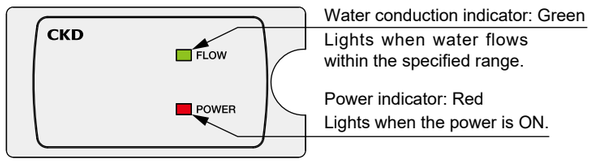
*2: Installing straight pipes (10D on the IN side and 5D on the OUT side) is recommended so that the piping conditions do not affect the performance.

Analog Output



*min. is the min. value in the flow rate range, and max. is the max. value in the flow rate range.

Functions





Karman vortex flow rate sensor for water FLUEREX

WFK3000M Series

(Compact/equipment integrated switch)

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

●Switch

WFK3 | 012 | M- | 10 | - | N0 | B

- WFK3: Model No.
- 012: ❶ Flow rate range
- M-:
- 10: ❷ Port size
- N0: ❸ Alarm output
- B: ❹ Bracket

❶ Flow rate range

Code	Description
004	0.5 to 4.0 L/min
012	1.5 to 12 L/min
032	4.0 to 32 L/min
060	8.0 to 60 L/min

❷Port size

Code	Description		❶Flow rate range 004	012	032	060
10	Rc3/8		●	●	●	
15	Rc1/2		●	●	●	
20	Rc3/4					●
25	Rc1					●

Note: Contact CKD for G thread and NPT thread support.

❸ Alarm output

Code	Description
N0	NPN transistor output, 2 points (a contact)
N1	NPN transistor output, 2 points (b contact)
P0	PNP transistor output, 2 points (a contact)
P1	PNP transistor output, 2 points (b contact)

❹Bracket

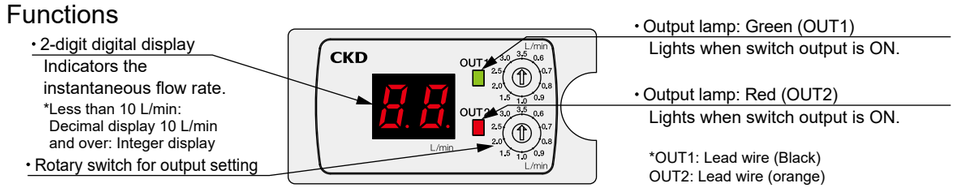
Code	Description	
Blank	None	
B	Bracket attached (including mounting screws)	

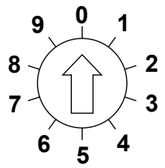
Specifications

Model No. / Item			WFK3004M-10	WFK3004M-15	WFK3012M-10	WFK3012M-15	WFK3032M-10	WFK3032M-15	WFK3060M-20	WFK3060M-25
Flow rate range L/min			0.5 to 4.0		1.5 to 12		4.0 to 32		8.0 to 60	
Port size Rc			3/8	1/2	3/8	1/2	3/8	1/2	3/4	1
Port material			Stainless steel: SCS13							
Working Conditions	Applicable fluid		Pure water, industrial water							
	Maximum Working Pressure, MPa		1.0							
	Proof pressure MPa		1.5							
	Ambient temperature °C		0 to 50 (85% RH or less)							
	Fluid temperature °C		1 to 70							
Accuracy			±2.5% F.S. ±1 digit (1 digit = 0.1 L/min (less than 10 L/min), 1 L/min (10 L/min and over))							
Temperature characteristics			± 5% F.S. (10 to 50°C, base temperature 20°C)							
Pressure loss MPa			0.06 or less (at 4.0 L/min)		0.05 or less (at 12 L/min)		0.06 or less (at 32 L/min)		0.05 or less (at 60 L/min)	
Response time			1 sec *1							
Output	Indicator		Instantaneous flow rate 2-digit LED display							
	Switch Output	Number of points	2-point transistor output (select NPN/PNP)							
		Rating	MAX. 50 mA DC							
		Internal voltage drop	(NPN) 2.0 V or less (PNP) 2.5 V or less							
Power supply voltage			12 to 24 VDC±10% (max. 80 mA)							
Cable			3 m, 4-conductor, final diameter 4.8 mm, core wire 0.2 mm², insulator O.D. 1.3 mm							
Mounting	Mounting orientation		Unrestricted in vertical/horizontal direction							
	Straight piping section		None *2						IN side: 10D, OUT side 5D	
	Degree of Protection		IP 65 or equiv.							
Weight g			380	410	380	410	380	410	470	510
Bracket weight g			28 (including screws)							

*1: When the switch output is set to 70% of the normal flow rate (used), the time until the switch output occurs after the flow rate drops instantly to 0.
*2: Installing straight pipes (10D on the IN side and 5D on the OUT side) is recommended so that the piping conditions do not affect the performance.

Functions





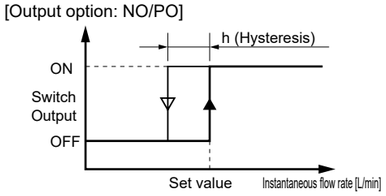
Allows you to set the switch output setting in 10 steps.
*Use a precision screwdriver, etc., to set the rotary switch. Be extremely careful, since applying excessive force to the rotating part may result in contact failure.
*Use the cylinder by making sure that the arrow aligns with the scale. If it is forcibly set at an intermediate point, the output may become unstable.
*Turn power OFF before setting switch outputs.
*After setting switch output, close the cover to display the set flow rate.

Switch output setting value [L/min]

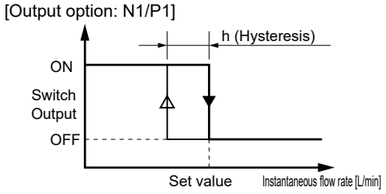
Rotary switch contact number	Model WFK3004M	WFK3012M	WFK3032M	WFK3060M
1	0.6	2.0	5.0	10
2	0.7	3.0	9.0	15
3	0.8	4.0	12	20
4	0.9	5.0	14	25
5	1.0	6.0	16	30
6	1.5	7.0	18	35
7	2.0	8.0	21	40
8	2.5	9.0	24	45
9	3.0	10	27	50
0	3.5	11	30	55
Hysteresis	0.1	0.5	1.0	3.0

Switch output operation

[Output option: NO/PO]



[Output option: N1/P1]





Karman vortex flow rate sensor for water FLUEREX

WFK3000C Series

(Compact/equipment integrated sensor/switch)

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

●Sensor/switch type

WFK3 **004** **C** - **10** - **A0** **N0** **B**

- WFK3: Model No.
- 004: ❶ Flow rate range
- C
- 10: ❷ Port size
- A0: ❸ Analog Output
- N0: ❹ Alarm output
- B: ❺ Bracket

❶Flow rate range

Code	Description
004	0.5 to 4.0 L/min
012	1.5 to 12 L/min
032	4.0 to 32 L/min
060	8.0 to 60 L/min

❷Port size

Code	Description		❶Flow rate range 004	012	032	060
10	Rc3/8		●	●	●	
15	Rc1/2		●	●	●	
20	Rc3/4					●
25	Rc1					●

Note: Contact CKD for G thread and NPT thread support.

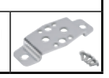
❸Analog Output

Code	Description
A0	0 to 5 VDC
A1	4 to 20 mA DC
A2	1 to 5 VDC
A3	0 to 10 VDC

❹Alarm output

Code	Description
N0	NPN transistor output, 2 points (a contact)
N1	NPN transistor output, 2 points (b contact)
P0	PNP transistor output, 2 points (a contact)
P1	PNP transistor output, 2 points (b contact)

❺Bracket

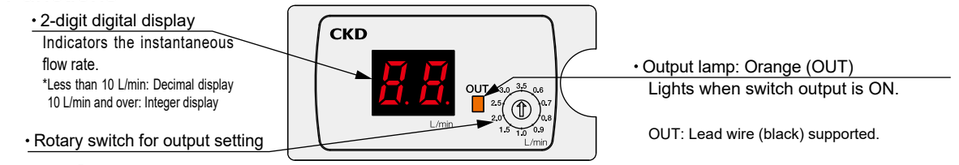
Code	Description	
Blank	None	
B	Bracket attached (including mounting screws)	

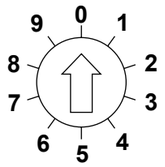
Specifications

Model No. / Item			WFK3004C-10	WFK3004C-15	WFK3012C-10	WFK3012C-15	WFK3032C-10	WFK3032C-15	WFK3060C-20	WFK3060C-25
Flow rate range L/min			0.5 to 4.0		1.5 to 12		4.0 to 32		8.0 to 60	
Port size Rc			3/8	1/2	3/8	1/2	3/8	1/2	3/4	1
Port material			Stainless steel: SCS13							
Working Conditions	Applicable fluid		Pure water, industrial water							
	Maximum Working Pressure, MPa		1.0							
	Proof pressure MPa		1.5							
	Ambient temperature °C		0 to 50 (85% RH or less)							
	Fluid temperature °C		1 to 70							
Accuracy			±2.5% F.S. ±1 digit (1 digit = 0.1 L/min (less than 10 L/min), 1 L/min (10 L/min and over))							
Temperature characteristics			± 5% F.S. (10 to 50°C, base temperature 20°C)							
Pressure loss MPa			0.06 or less (at 4.0 L/min)		0.05 or less (at 12 L/min)		0.06 or less (at 32 L/min)		0.05 or less (at 60 L/min)	
Response time			1 sec *1							
Output	Indicator		Instantaneous flow rate 2-digit LED display							
	Analog Output		Standard: 0 to 5 VDC/option : 4 to 20 mA DC, 1 to 5 V, 0 to 10 V							
	Switch Output	Number of points	1-point transistor output (select NPN/PNP)							
		Rating	MAX. 50 mA DC							
		Internal voltage drop	(NPN) 2.0 V or less (PNP) 2.5 V or less							
Power supply voltage			12 to 24 VDC±10% (max. 80 mA) Option A3 is 15 to 24 VDC							
Cable			3 m, 4-conductor, final diameter 4.8 mm, core wire 0.2 mm², insulator O.D. 1.3 mm							
Mounting	Mounting orientation		Unrestricted in vertical/horizontal direction							
	Straight piping section		None *2						IN side: 10D, OUT side 5D	
	Degree of Protection		IP 65 or equiv.							
Weight g			380	410	380	410	380	410	470	510
Bracket weight g			28 (including screws)							

*1: When the switch output is set to 70% of the normal flow rate (used), the time until the switch output occurs after the flow rate drops instantly to 0.
*2: Installing straight pipes (10D on the IN side and 5D on the OUT side) is recommended so that the piping conditions do not affect the performance.

Functions





Allows you to set the switch output setting in 10 steps.

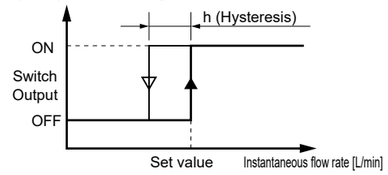
*Use a precision screwdriver, etc., to set the rotary switch. Applying excessive force to the rotating part may result in contact failurebe careful.
*Use the cylinder by making sure that the arrow aligns with the scale. If it is forcibly set at an intermediate point, the output may become unstable.
*Turn power OFF before setting switch outputs.
*After setting switch output, close the cover to display the set flow rate it will be .

Switch output setting value [L/min]

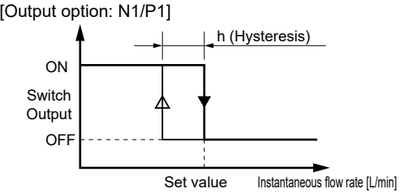
Rotary switch contact number	Model WFK3004C	WFK3012C	WFK3032C	WFK3060C
1	0.6	2.0	5.0	10
2	0.7	3.0	9.0	15
3	0.8	4.0	12	20
4	0.9	5.0	14	25
5	1.0	6.0	16	30
6	1.5	7.0	18	35
7	2.0	8.0	21	40
8	2.5	9.0	24	45
9	3.0	10	27	50
0	3.5	11	30	55
Hysteresis	0.1	0.5	1.0	3.0

Switch output operation

[Output option: NO/PO]

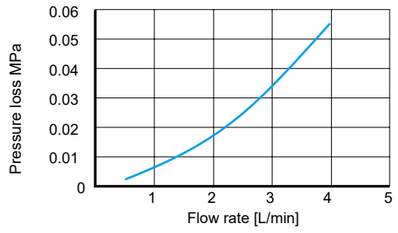


[Output option: N1/P1]

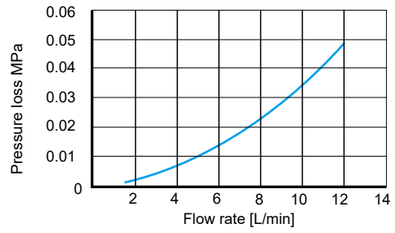


Pressure loss

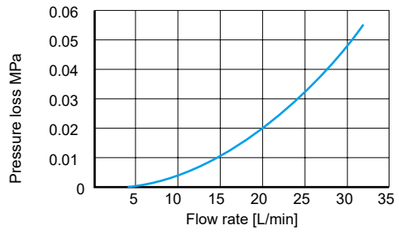
●WFK3004



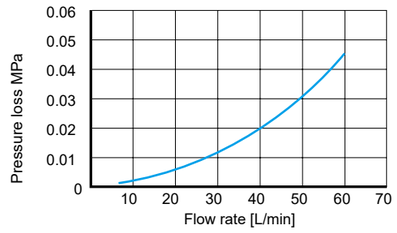
●WFK3012



●WFK3032

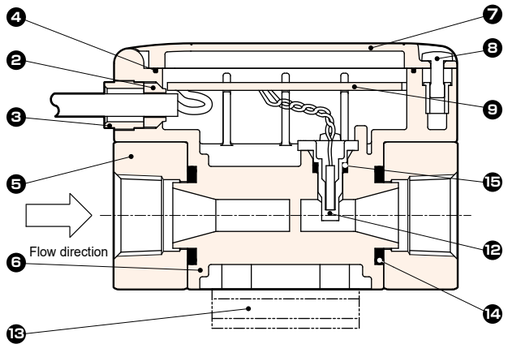


●WFK3060

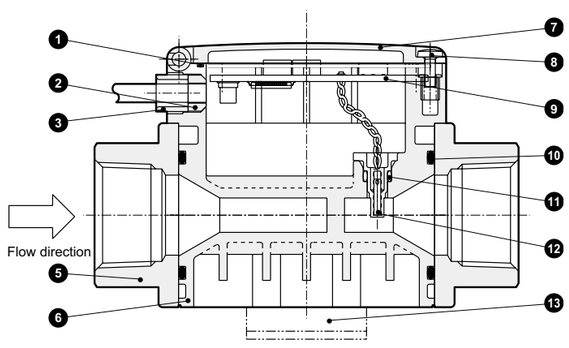


Internal Structure Diagram / Material

●WFK3004□, WFK3012□, WFK3032□



●WFK3060□



Do not disassemble

Part No.	Part name	Material		Quantity	Part No.	Part name	Material		Quantity
1	Cover packing	NBR	Nitrile Rubber	1	9	Wiring section			1
2	Cable packing	NBR	Nitrile Rubber	1	10	O-ring	NBR	Nitrile Rubber	2
3	Cable gland	PPS resin		1	11	O-ring	NBR	Nitrile Rubber	1
4	Cover packing	FKM	Fluoro rubber	1	12	Karman's vortex street detection sensor	PPS resin (interior: piezo ceramic)		1
5	Attachment	SCS13	Stainless steel casting	2	13	Bracket (option)	SPC	Steel	(1)
6	Body	PPS resin		1				Zinc plated	
7	Cover	PC resin		1	14	O-ring	FKM	Fluoro rubber	2
8	Screw for cover			1	15	O-ring	FKM	Fluoro rubber	1

Note: Wetted parts are (5), (6), (10), (11), (12), (14), (15).

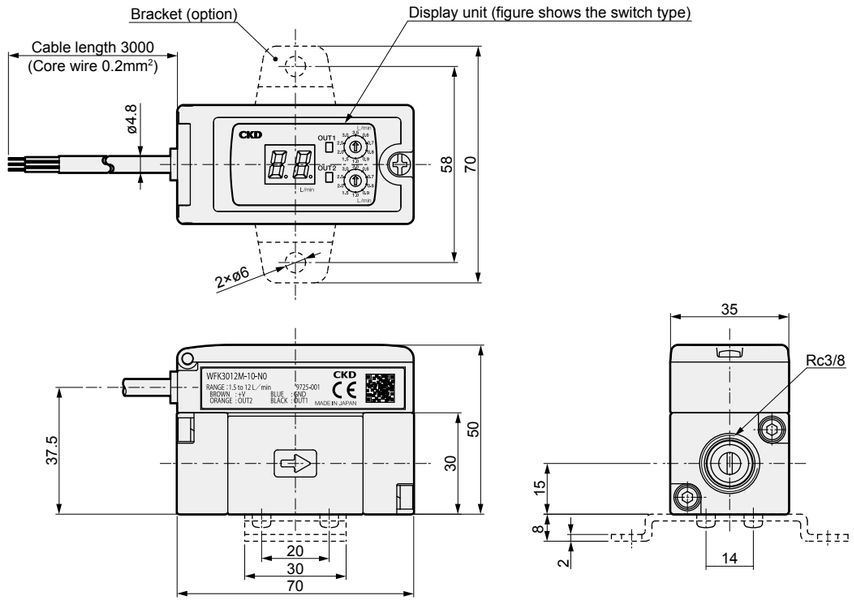
MEMO

Flow rate sensor
Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit
Ending

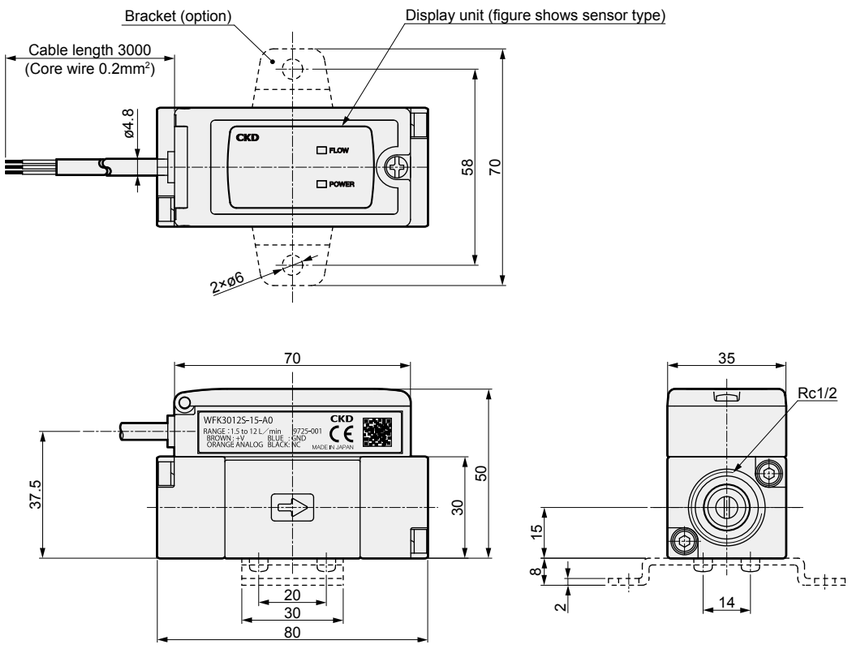
Dimensions

●WFK3004□, WFK3012□, WFK3032□

・Port size: 10 (Rc3/8)



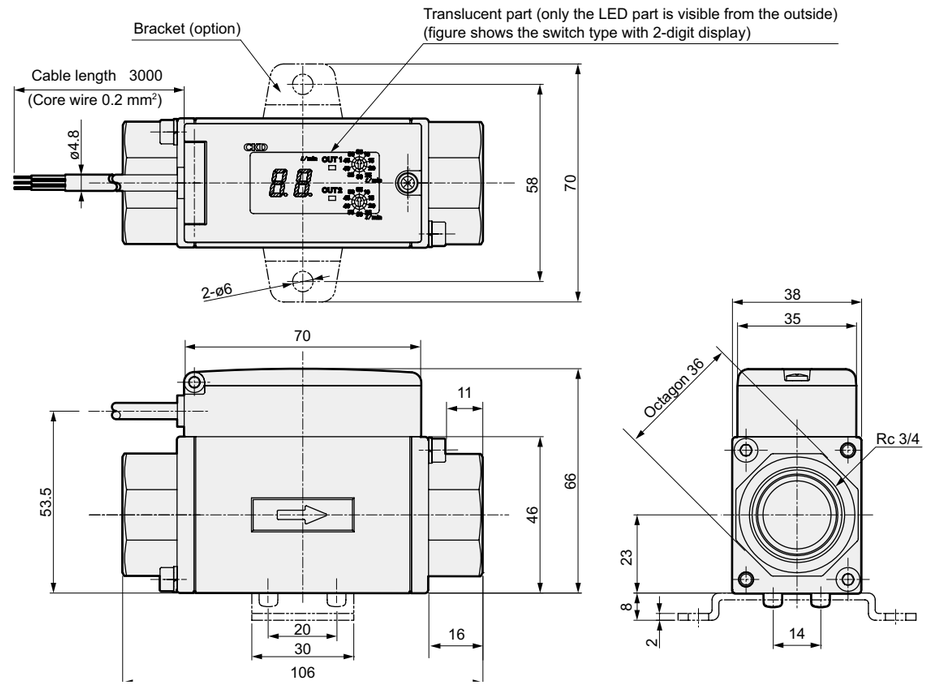
・Port size: 15 (Rc1/2)



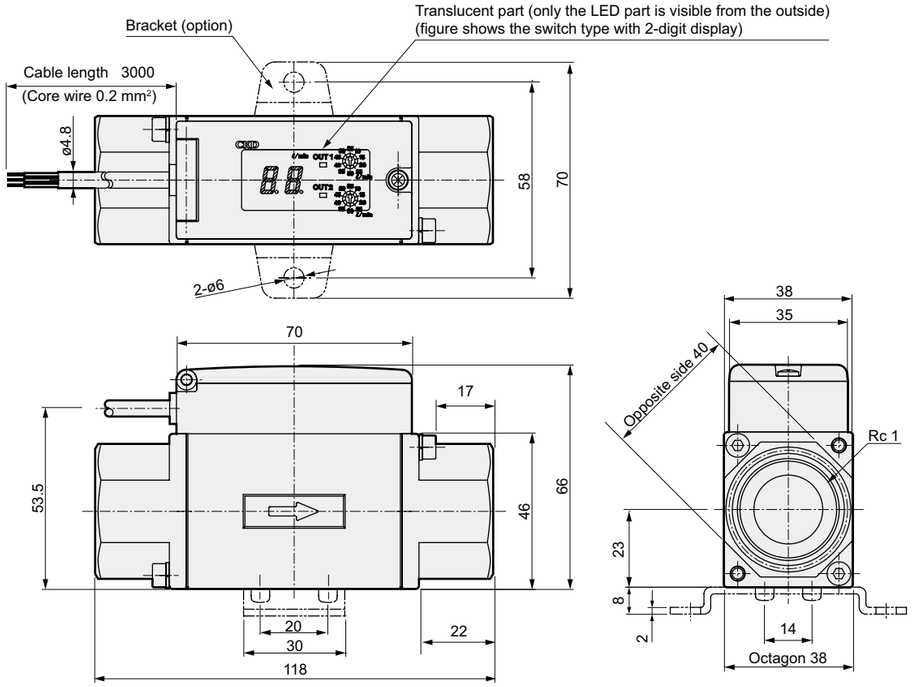
Dimensions

●WFK3060□

・Port size: 20 (Rc3/4)



・Port size: 25 (Rc1)



Wiring method

· Always read the safety precautions before wiring.

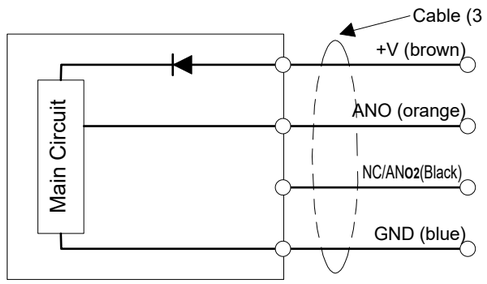
· The cable is a 4-conductor cabtyre cable with a core wire of 0.2 mm² made by Correns Corporation.

· Option

Sensor (analog output)	Switch (switch output)
-A0; (0 to 5 [V])	-N0; (NPN a-contact, 2 points)
-A1; (4 to 20 [mA])	-N1; (NPN b-contact, 2 points)
-A2; (1 to 5 [V])	-P0; (PNP a-contact, 2 points)
-A3; (0 to 10 [V])	-P1; (PNP b-contact, 2 points)

*Sensor/switch alarm output is one point.

●WFK3□□□S (sensor voltage output: -A0, -A2, -A3)



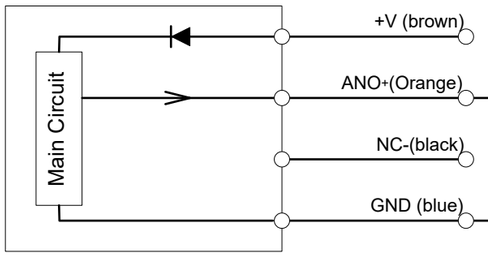
… DC power supply plus [+] Connection: 12 to 24 VDC±10%
(Option A3: 15 to 24 VDC ±10%)

… Analog output: Output voltage proportional to flow rate

...Standard: NC/

… Connect to [-] of DC power supply: 0 VDC

●WFK3□□□S (sensor current output: -A1)

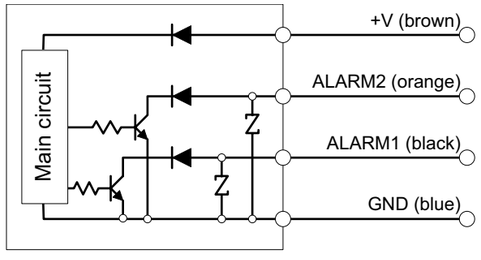


… DC power supply plus [+] Connection: 12 to 24 VDC±10%

...Connect to 4-20 mA input device

… Connect to [-] of DC power supply: 0 VDC

●WFK3□□□M (Switch NPN output: -N0, -N1)



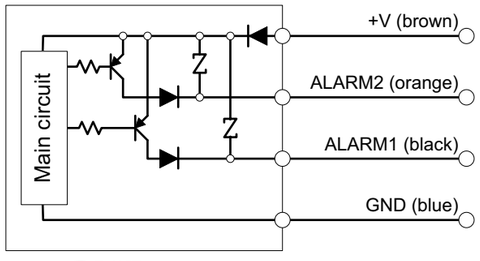
: Connect to [+] of DC power supply : 12 to 24 VDC ± 10%

: Switch 2 (OUT2) output : MAX 30 VDC/50 mA

: Switch 1 (OUT1) output : MAX 30 VDC/50 mA

: Connect to [-] of DC power supply : 0 VDC

●WFK3□□□M (Switch PNP output: -P0, -P1)



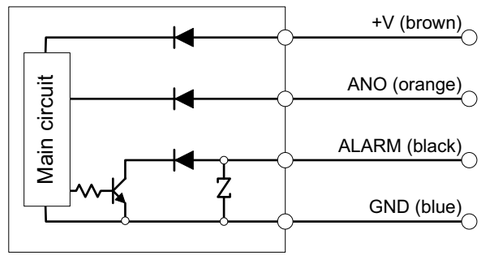
: Connect to [+] of DC power supply : 12 to 24 VDC ± 10%

: Switch 2 (OUT2) output : MAX 50 mA

: Switch 1 (OUT1) output : MAX 50 mA

: Connect to [-] of DC power supply : 0 VDC

●WFK3□□□C(Sensor voltage output: -A0, -A2, -A3, Switch NPN output: N0, N1)



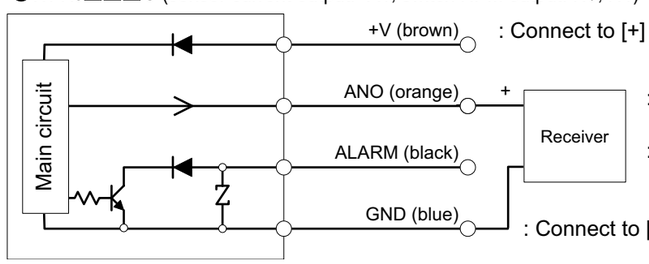
: Connect to [+] of DC power supply: 12 to 24 VDC ± 10%
(Option A3: 15 to 24 VDC ±10%)

: Analog output : Voltage in proportion to flow rate is output

: Switch (OUT) output : MAX 30 VDC/50 mA

: Connect to [-] of DC power supply : 0 VDC

●WFK3□□□C (sensor current output: -A1, switch NPM output: N0, N1)



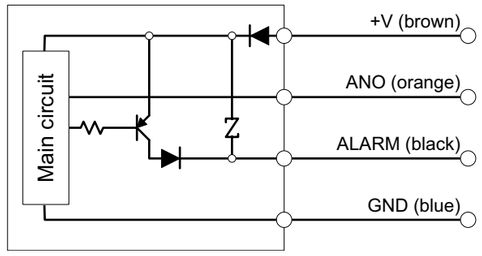
: Connect to [+] of DC power supply : 12 to 24 VDC ± 10%

: Connect to 4 to 20 mA input unit

: Switch (OUT) output
: MAX 30 VDC/50 mA

: Connect to [-] of DC power supply : 0 VDC

●WFK3□□□C (sensor voltage output: -A0, -A2, -A3, switch PNP output: P0, P1)



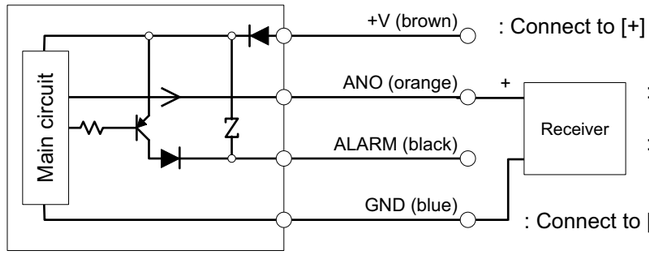
: Connect to [+] of DC power supply : 12 to 24 VDC ± 10%
(Option A3: 15 to 24 VDC ±10%)

: Analog output : Voltage in proportion to flow rate is output

: Switch (OUT) output : MAX 30 VDC/50 mA

: Connect to [-] of DC power supply : 0 VDC

●WFK3□□□C (sensor current output: -A1, switch PNP output: P0, P1)



: Connect to [+] of DC power supply : 12 to 24 VDC ± 10%

: Connect to 4 to 20 mA input unit

: Switch (OUT) output
: MAX 30 VDC/50 mA

: Connect to [-] of DC power supply : 0 VDC

Safety Precautions

Be sure to read this section before use.
Refer to Intro 17 for General Precautions.

Design / Selection

1. Working fluids

DANGER

■Do not use the water as drinking water.
As it does not conform to the requirements of the Food Sanitation Act, do not use this product for applications that measure water entering the human body. Intended applications include industrial sensors.

■Do not use this product with flammable fluids.

WARNING

■This product cannot be used as a billing meter.
Do not use this product for commercial transactions as it is not compliant with the Measurement Act. It cannot be calibrated, so use it as an industrial sensor.

■Applicable fluid is water (industrial water, pure water); do not use with any other fluid.

2. Working environment

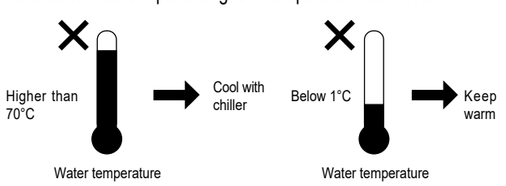
DANGER

■Flammable environment
Never use this product in an explosive gas atmosphere. The structure is not explosion-proof, and explosions or fires could occur.

WARNING

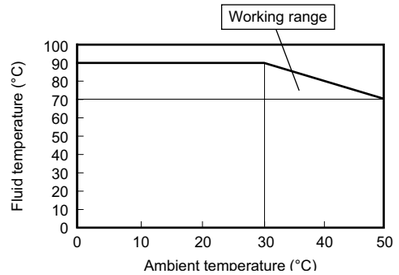
■Corrosive environment
Do not use this product in an atmosphere containing corrosive gases such as sulfur dioxide.

■Fluid/ambient temperatures
Use with fluid temperature within the range of 1 to 70°C. If the fluid temperature rises to 70°C and over, cool it down using a cooling system such as a chiller. As well, if there is a risk of freezing, drain the product or keep it warm to prevent freezing. Even if the ambient temperature is within the specified range, do not use this product in a location where rapid changes in temperature can occur.



Ambient temperature should be in the range of 0 to 50°C.

The WFK3060 Series can be used in the following ranges.



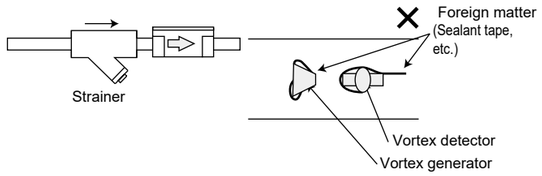
■Max. working pressure
Do not use at a pressure exceeding the max. working pressure, as excessive pressure can cause product failure. To prevent the pressure from reaching the max. working pressure, particularly due to water hammer, take the following measures:
(1) Using a water hammer reduction valve or other similar mechanism, regulate the valve closing speed.
(2) Using elastic piping material, e.g. rubber hose, and an accumulator, absorb the impact pressure.
(3) Make the pipe length as short as possible.

■Drip-proof environment
This product employs a dust-proof, drip-proof structure that provides reliability during maintenance and cleaning, during which it may be exposed to water splashing. However, avoid using this product in a location where it may be constantly exposed to water or intense splattering of water and/or oil.

■CE-compliance working conditions
This product is CE-marked, indicating conformity with the EMC Directives. The standard for the immunity for industrial environments applied to this product is EN61000-6-2; the following requirements must be satisfied in order to conform to this standard:
Conditions
●The evaluation of this product is performed by using a cable that has a power supply line and a signal line paired to assess the product's performance.
●This product is not equipped with surge protection. Implement surge protection measures on the system side.

CAUTION

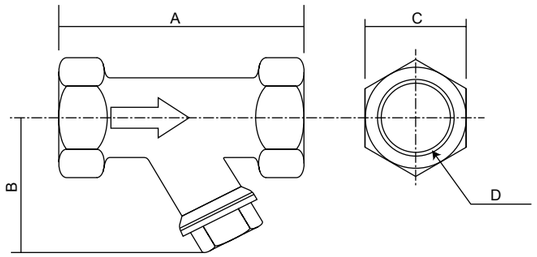
■If there is a risk of foreign matter entering the fluid, install a filter (strainer) on the primary side. If foreign matter adheres to the vortex generator or vortex detector, measurement accuracy can be compromised.



Strainer specifications

Item	Specifications
Specification fluid	Water
Proof pressure MPa	2
Working pressure range MPa	0 to 1
Ambient temperature °C	1 to 90
Main material	**Specifications**
Body	Bronze casting
Strainer	Stainless steel

External view of strainer



Model No.	A	B	C	D
WF-FL-280730	70	44	23	Rc 3/8
WF-FL-280731	80	49	28	Rc 1/2
WF-FL-280732	100	57	35	Rc 3/4
WF-FL-280733	115	72	43	Rc1
WF-FL-280734	135	82	52	Rc1 1/4
WF-FL-280735	160	98	59	Rc1-1/2

■Vibration / Impact
Do not use this product in an environment exposed to vibration of 20 m/s^2 and over, and shock of 98 m/s^2 and over. This may cause malfunction and/or damage, as this product uses the Karman's vortex type detection principle.

× Vibration 20 m/s^2 or more × Shock 98 m/s^2 or more

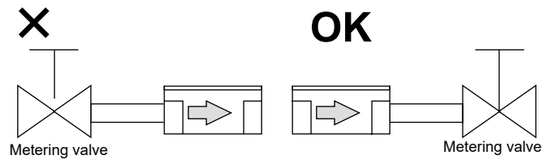
■Hardware check and other internal settings are performed during the first two seconds or so after turning ON the power. Display and output do not function normally during this period. Particularly, if a transistor output is used in the control of an interlock circuit, an abnormal stop may occur. Mask the output during this period.

3. Wiring

CAUTION

■Pipes can be installed in any orientation, vertical, horizontal, etc. Note that pipes should be installed so that the fluid constantly fills the piping while it flows through the pipes. When installing a pipe vertically, making the fluid flow upward can reduce the influence of air bubbles inside.

■If a pipe is narrowed just before the flow rate sensor, or if there is a valve or other restricting component on the primary side, cavitation occurs inside the pipe, preventing accurate measurement. For this reason, such piping should be installed on the secondary side of the sensor. Cavitation...(Vapor cavities that form due to the static pressure at end points, such as a ship propeller, dropping below the vapor pressure of the water. Reduced efficiency or screw damage may result.)



However, operating the pump with the secondary side valve closed may cause the flow rate sensor to detect pressure waves from the pump, resulting in incorrect indication. If this occurs, install the valve on the primary side. When doing so, ensure that a straight pipe with a diameter of 10 times or more bore size is installed between the valve and the flow rate sensor.

■Using an elbow or bush in the piping
●When using an elbow or bush in the piping, provide straight piping sections of at least 10 D on the IN side and 5 D on the OUT side when using a WFK3060 Series model. Note that bore size change by bush should be limited to one size. Without a straight pipe, measurement accuracy can be compromised due to disturbances in the flow rate and/or pressure distribution.
(Straight pipes are not necessary for the WFK3004, 3012, and 3032 Series. However, it is recommended that a straight pipe is installed to ensure stable measurements.)
* Where "D" indicates the inner diameter of the piping material. Refer to the table below for specific values.

Bore size	Rc3/8 (10 A)	Rc1/2 (15 A)	Rc3/4 (20 A)	Rc1 (25 A)
5D	50 mm	75 mm	100 mm	125 mm
10D	100 mm	150 mm	200 mm	250 mm

■Keep the cable away from all noise sources, including power distribution wires. Noise can cause malfunctions.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual

Integrated unit for water control

WXU

■ Flow rate sensor



CONTENTS

Product Introduction 484
● Integrated unit for water control WXU 486
⚠ Safety Precautions 514

Flow rate sensor

Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit

Ending

Water Manifold Unit **WXU** Series

Next-gen water control
Various water control components fitted into a space-saving structure



Piping-less footprint
80% reduced
Compact



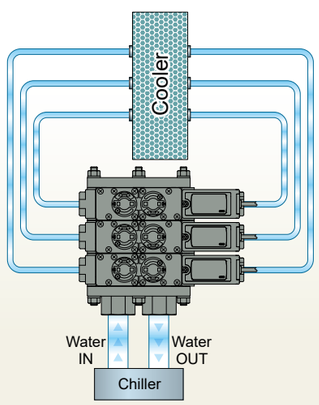


- No more individual piping work
- Preventing pipe leakage
- Minimizing design and arrangement work

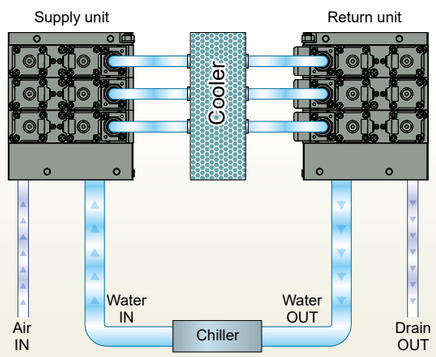
System image

The fluid is branched into individual pipes in the unit.

One-fluid control



Two-fluid control



WXU-H — One-fluid control



- A single unit serves as supply and return for the cooling piping.
- Valves can be mounted individually on the supply side and return side.
- Cock valve that opens and closes with a single operation allows easy visual inspections.
- Built-in structure and light valve housing make handling easier.

WXU-HC — One-fluid control



- A single-fluid cock valve that serves as both supply and return for the cooling piping in the same manner as WXU-H.
- Equipped with a capacitance electromagnetic flow sensor to reduce the risk of detection error due to water quality.

WXU-J — One-fluid control



- A single unit serves as supply and return for the cooling piping.
- Valves and needles mounted on the supply side can be controlled individually (ON/OFF) for each system.
- Mounted needle allows easy adjustment of the flow rate.

WXU-P — Two-fluid control



- Separate units for supply and return enable flow of two kinds of fluid (e.g., water and air).
- Suitable for a system with both coolant and air such as sputtering equipment.
- Individual control (water conduction/air purge control) by system is possible.

Application

LCD semiconductor Vacuum deposition apparatus



WXU-P/H

Spot welding apparatus



WXU-HC

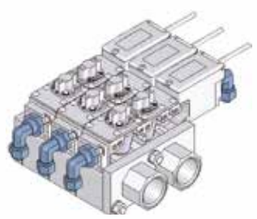
Casting



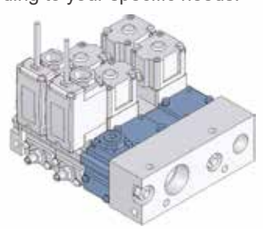
WXU-P/J/H

Customization example

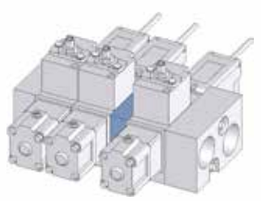
Customization is possible according to your specific needs.



With fitting



Masking



Intermediate block

- Separately installed display [Sensor section]
- Analog + SW output [Sensor section]
- Branched (WXU-P)
- Without cylinder valve (WXU-J)



Integrated unit for water control One-fluid control

WXU-H/HC Series

- Port size: Rc3/8, Rc1/2, Rc1
- Flow rate range: 0.5 to 32 L/min

RoHS

Model No. Notation Method

- Karman vortex flow rate sensor

WXU-H - 6 - L - 15 - 12 - A0N0

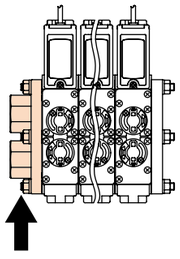
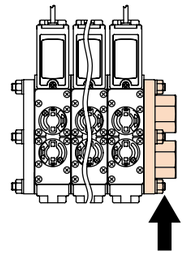
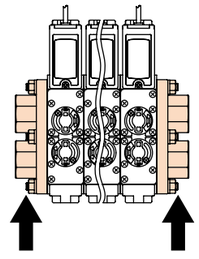
Model No. | ❶Station No. | ❷In-block position | ❸Port size (branching port) | ❹Flow rate range for flow sensor | ❺Flow rate sensor output (1) | ❻Flow rate sensor output (2)

When the configuration of all one-station assembly machines is identical, the entire unit can be displayed in the model number by selecting the codes. When assembling a unit from different configurations of one-station assembly components, specify the configuration in "Manifold specifications" (Page 509) for configuration.

❶Station No.

Code	Description
2	2 stations
to	to
10	10 stations

❷In-block position

Code	L	R	W
Description	Left	Right	Both sides
Layout			

❸Port size (branching port)

Code	Description
10	Rc3/8
15	Rc1/2

❹Flow rate range for flow sensor

Code	Description
04	0.5 to 4.0 L/min
12	1.5 to 12 L/min
32	4.0 to 32 L/min

❺Flow rate sensor output (1)

❻Flow rate sensor output (2)

Code	Description	Description				
		Not required	Transistor output 1 point			
			NPN a contact	NPN b contact	PNP a contact	PNP b contact
		Blank	N0	N1	P0	P1
A0	0 to 5 VDC	●	●	●	●	●
A1	4 to 20 mA DC	●	●	●	●	●
A2	1 to 5 VDC	●	●	●	●	●
A3	0 to 10 VDC	●	●	●	●	●
N0	NPN transistor output, 2 points (a contact)	●				
N1	NPN transistor output, 2 points (b contact)	●				
P0	PNP transistor output, 2 points (a contact)	●				
P1	PNP transistor output, 2 points (b contact)	●				

Model No. Notation Method

- Electromagnetic flow sensor

When the configuration of all one-station assembly machines is identical, the entire unit can be displayed in the model number by selecting the codes. When assembling a unit from different configurations of one-station assembly components, specify the configuration in "Manifold specifications" (Page 510) for configuration.

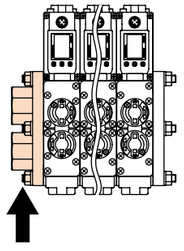
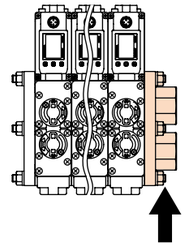
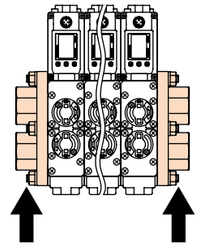
WXU-HC - 6 - L - 10 - 150 - N - V - C3

Model No. | ❶Station No. | ❷In-block position | ❸Port size (branching port) | ❹Flow rate range for flow sensor | ❺Switch Output | ❻Analog Output | ❼Cable

❶Station No.

Code	Description
2	2 stations
to	to
10	10 stations

❷In-block position

Code	L	R	W
Description	Left	Right	Both sides
Layout			

❸Port size (branching port)

Code	Description	❹Flow rate range for flow sensor	
		150	600
10	Rc3/8	●	
15	Rc1/2		●

❹Flow rate range for flow sensor

Code	Description
150	0.5 to 15 L/min
600	2.0 to 60 L/min

❺Switch Output

Code	Description
N	NPN transistor output
P	PNP transistor output

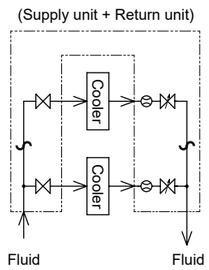
❻Analog Output

Code	Description
V	1 to 5 VDC
A	4 to 20 mA DC

❼Cable

Code	Description	
Blank	None	
C3	Cable (M12, 4-conductor, 3 m included)	
L3	L-type cable (M12, 4-conductor, 3 m included)	

Application examples



A single unit serves as supply and return units of coolant piping. Each circuit can be controlled separately. Adjust flow rate by using the valve at return side.

Common specifications

Item		WXU-H/HC
Working fluid		Water/hot water
Working pressure MPa		0 to 0.7
Proof pressure (water pressure) MPa		1.4
Fluid temperature °C		WXU-H: 1 to 70, WXU-HC: 1 to 85
Ambient temperature °C		5 to 50
Atmosphere		Place free of corrosive gas / explosive gas
Flow rate adjusting range %		0 to 100 (water) [with closing function]
Station No.		2 to 10 stations
Mounting orientation		Unrestricted
Sealant		Fluoro rubber
Port size	IN/OUT port	Rc1
	Branching ports	Rc3/8 or Rc1/2

Weight

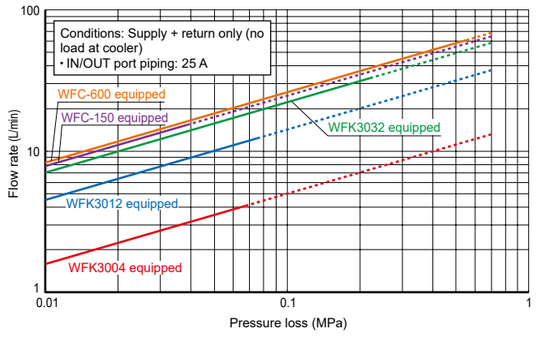
In-block (kg)	0.67
End block (kg)	0.63
One-station assembly (kg)	0.76
One-station assembly (WFC equipped)(kg)	1.00

Flow Characteristics

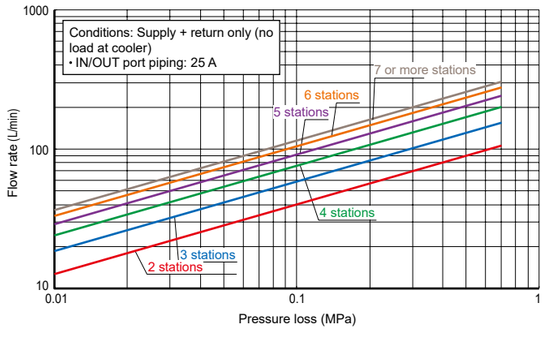
Supply/drain category	Configuration Flow rate sensor	Cv	Kv value *1
Supply side (one station)	-	3.00	2.60
Return side (one station)	WFK3004	0.35	0.30
	WFK3012	1.05	0.91
	WFK3032	1.80	1.56
	WFC-150	2.10	1.82
	WFC-600	2.30	2.00

*1: Refer to Kv values on Intro Page 11.
*2: Make sure to check the flow rate of one station (each system) and overall unit. (Refer to "Reading the Flow Properties Table" on Page 513.)

●One station

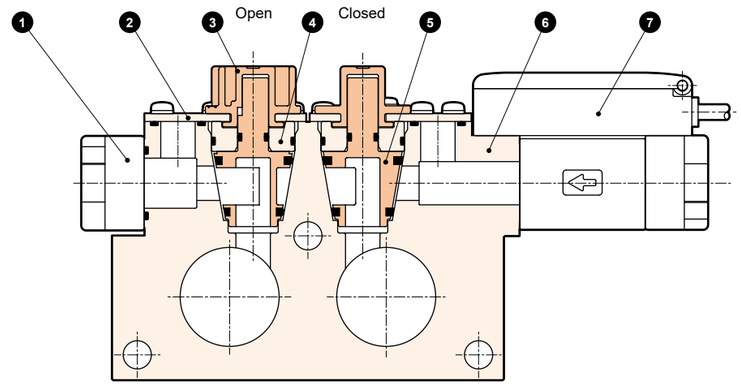


●Overall unit



Internal Structure Diagram / Material

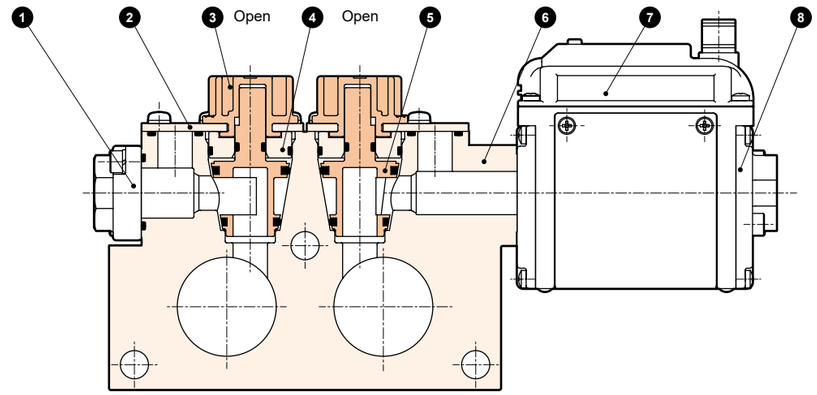
●Karman Vortex Flow Sensor WXU-H



[Valve is fully opened at shipment.]

Part No.	Part name	Material	
1	Attachment	SCS13	Stainless steel casting
2	Plate	SUS304	Stainless steel
3	Knob	PBT	Polybutylene terephthalate
4	Spacer	PPS	Polyphenylene sulfide
5	Cock	PPS FKM	Polyphenylene sulfide Fluoro rubber
6	Base	PPS	Polyphenylene sulfide
7	Flow rate sensor [WFK3000 Series]		

●Electromagnetic flow sensor WXU-HC

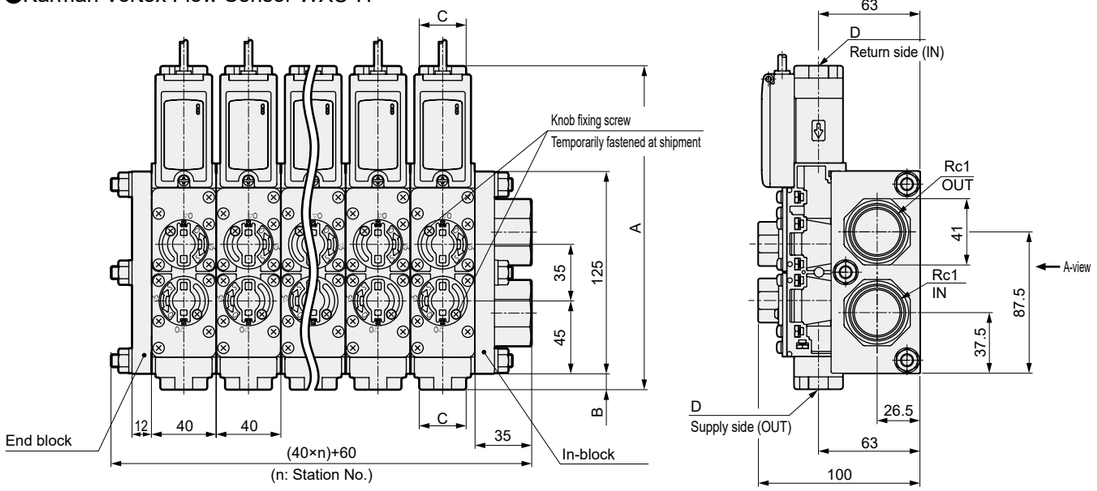


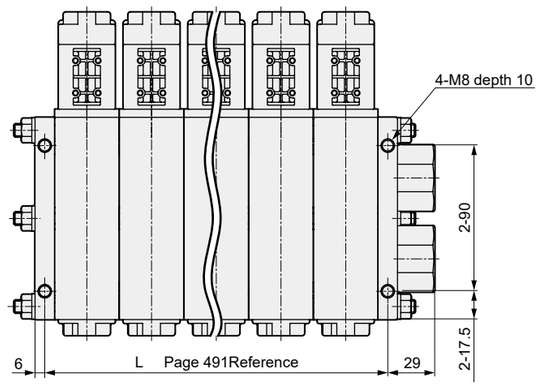
[Valve is fully opened at shipment.]

Part No.	Part name	Material	
1	Attachment	SCS13	Stainless steel casting
2	Plate	SUS304	Stainless steel
3	Knob	PBT	Polybutylene terephthalate
4	Spacer	PPS	Polyphenylene sulfide
5	Cock	PPS FFM	Polyphenylene sulfide Fluoro rubber
6	Base	PPS	Polyphenylene sulfide
7	Flow rate sensor [WFC Series]		
8	Socket	CAC804 or C6931	Brass

Dimensions

●Karman Vortex Flow Sensor WXU-H



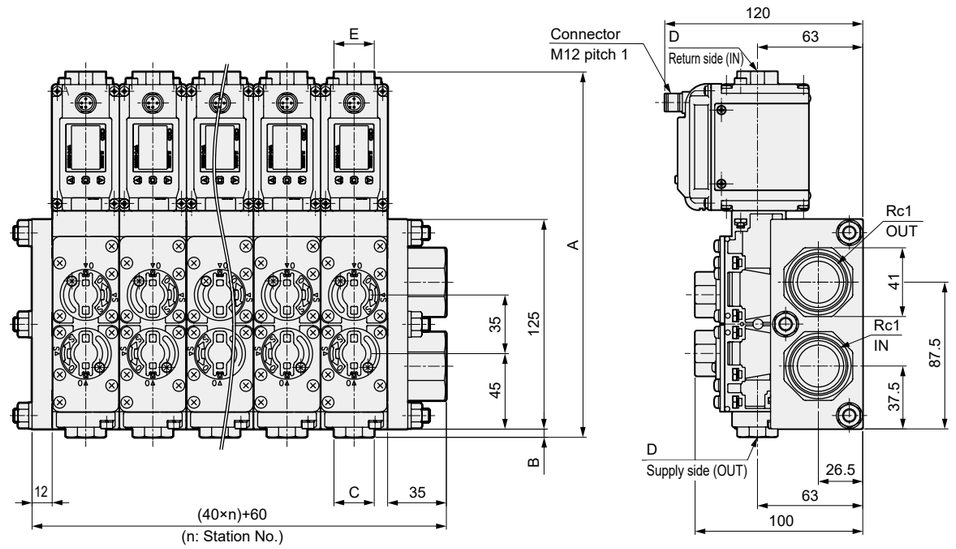


A-view

Model No.	A	B	C	D	E
WXU-H-□-□-10-□-□	190	5	24	Rc3/8	–
WXU-H-□-□-15-□-□	200	10	29	Rc1/2	–
WXU-HC-□-□-10-150-□□□	218	5	24	Rc3/8	24
WXU-HC-□-□-15-600-□□□	228	10	29	Rc1/2	28

Dimensions

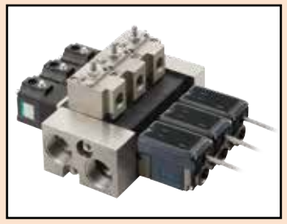
●Electromagnetic flow sensor WXU-HC



Pitch (L) for fixing main body

The screw pitch (L) is as follows.
Consider mounting holes by adopting a slotted hole at one side, etc.

Station No.	2	3	4	5	6	7	8	9	10
L: Screw pitch	92 $^{+1}_{-2}$	132 $^{+1.5}_{-2.5}$	172 $^{+1.5}_{-3}$	212 $^{+2}_{-3.5}$	252 $^{+2}_{-4}$	292 $^{+2}_{-4.5}$	332 $^{+2.5}_{-5}$	372 $^{+2.5}_{-5.5}$	412 $^{+3}_{-6}$



Integrated unit for water control One-fluid control

WXU-J Series

- Port size: Rc3/8, Rc1/2, Rc3/4, Rc1
- Flow rate range: 0.5 to 32 L/min

RoHS

Model No. Notation Method

When the configuration of all one-station assembly machines is identical, the entire unit can be displayed in the model number by selecting the codes. When assembling a unit from different configurations of one-station assembly components, specify the configuration in "Manifold specifications" (Page 511) for configuration.

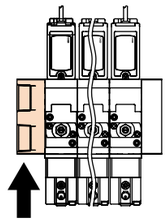
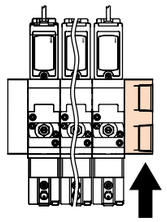
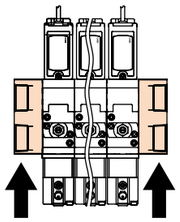
WXU-J - 6 - L - 25 - B1 - 15 - 12 - A0N0

Model No. | ❶Station No. | ❷In-block position | ❸Port size(IN/OUT port) | ❹Valve actuation | ❺Port size (branching port) | ❻Flow rate range for flow sensor | ❼Flow rate sensor output (1) | ❽Flow rate sensor output (2)

❶Station No.

Code	Description
2	2 stations
to	to
10	10 stations

❷In-block position

Code	L	R	W
Description	Left	Right	Both sides
Layout			

❸Port size (IN/OUT port)

Code	Description
20	Rc3/4
25	Rc1

❹Valve actuation

Code	Description
B1	NC (normally closed) (large flow rate specifications)
B2	NO (normally open) (large flow rate specifications)
00	None

❺Port size (branching port)

Code	Description
10	Rc3/8
15	Rc1/2

❻Flow rate range for flow sensor

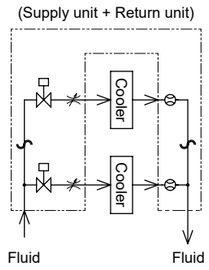
Code	Description
04	0.5 to 4.0 L/min
12	1.5 to 12 L/min
32	4.0 to 32 L/min

❼Flow rate sensor output (1)

❽Flow rate sensor output (2)

Code	Description	Not required	Transistor output 1 point			
			NPN a contact	NPN b contact	PNP a contact	PNP b contact
		Blank	N0	N1	P0	P1
A0	0 DCto5V	●	●	●	●	●
A1	4 to 20 mA DC	●	●	●	●	●
A2	1 DCto5V	●	●	●	●	●
A3	0 DCto10V	●	●	●	●	●
N0	NPN transistor output, 2 points (a contact)	●				
N1	NPN transistor output, 2 points (b contact)	●				
P0	PNP transistor output, 2 points (a contact)	●				
P1	PNP transistor output, 2 points (b contact)	●				

[Application examples]



A single unit serves as supply and return units of coolant piping. Each circuit can be controlled separately.

Common specifications

Item		WXU-J
Working fluid		Water/hot water
Working pressure MPa		0 to 0.4 (Note)
Proof pressure (water pressure) MPa		1.0
Fluid temperature °C		1 to 70
Ambient temperature °C		5 to 50
Atmosphere		Place free of corrosive gas / explosive gas
Flow rate adjusting range %		0 to 100 (water) [with closing function]
Station No.		2 to 10 stations
Mounting orientation		Unrestricted
Sealant		Fluoro rubber
Port size	IN/OUT port	Rc3/4 or Rc1
	Branching ports	Rc3/8 or Rc1/2

Note: Contact CKD about use at pressures higher than working pressure.

Weight

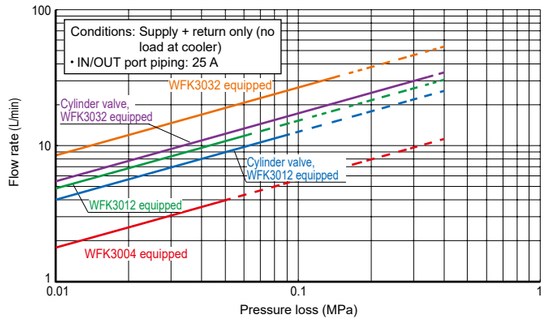
In-block (kg)	Port size	–
	20 A	1.30
	25 A	1.20
End block (kg)		1.05
One-station assembly (kg)	Supply side Cylinder valve	–
	Large flow rate specifications	1.29
	None	1.05

Flow Characteristics

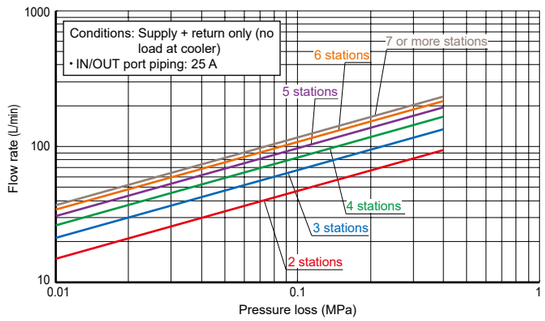
Supply/drain category	Configuration		Cv	Kv value *1
	Cylinder valve	Flow rate sensor		
Supply side (one station)	Large flow rate specifications	-	1.34	1.16
	None	-	2.51	2.18
Return side (one station)	-	WFK3004	0.41	0.36
		WFK3012	1.18	1.02
		WFK3032	2.82	2.45

*1: Refer to Kv values on Intro Page 11.
*2: Make sure to check the flow rate of one station (each system) and overall unit. (Refer to "Reading the Flow Properties Table" on Page 513.)

●One station



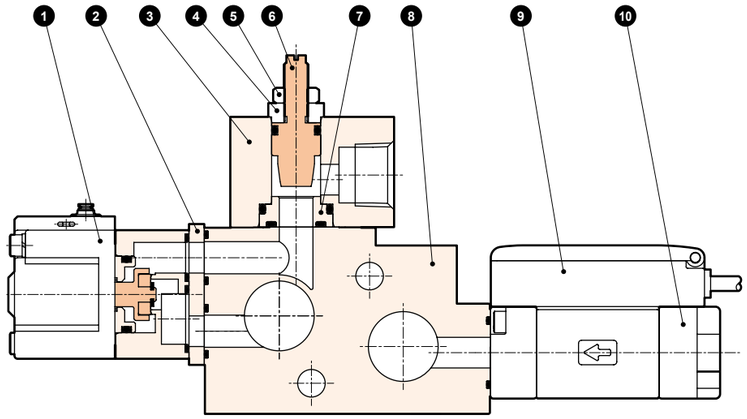
●Overall unit



Internal Structure Diagram / Material

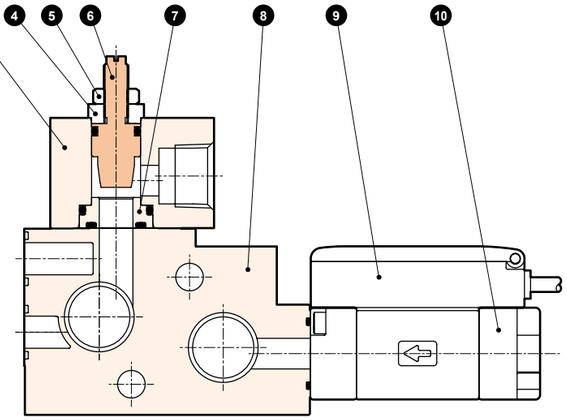
●One-station assembly

・With valve



[Needle is fully opened at shipment.]

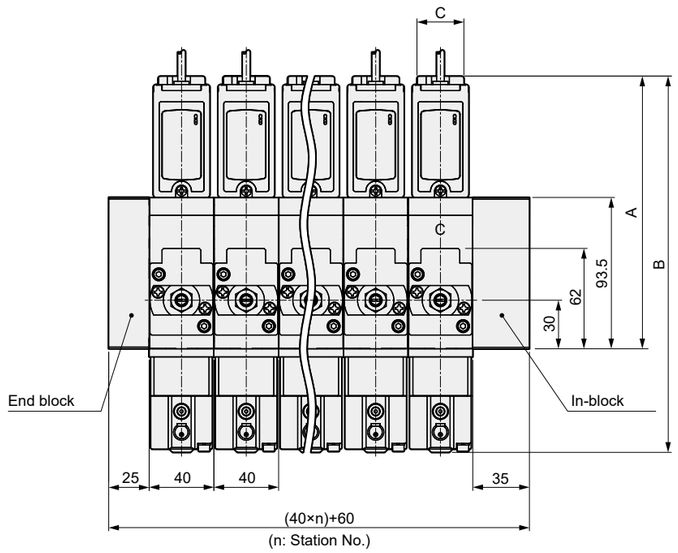
・Without valve

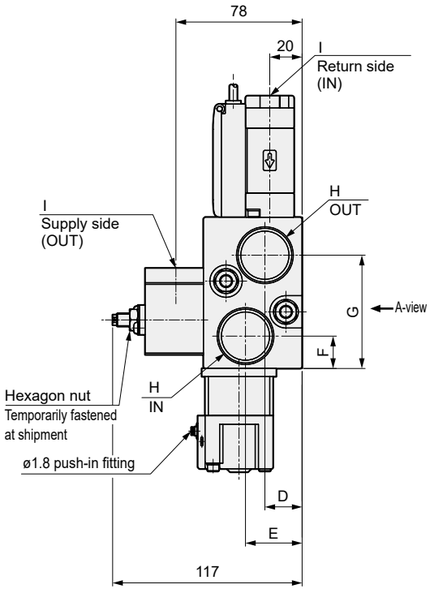


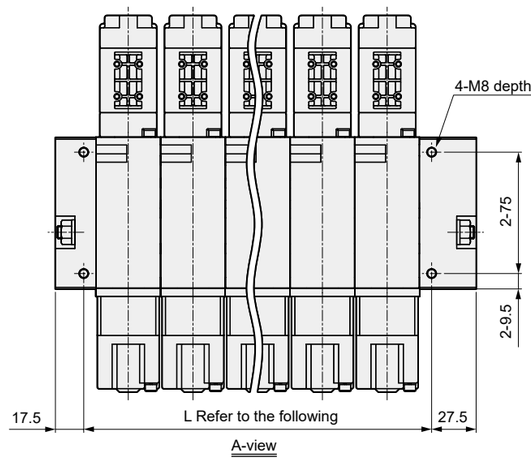
[Needle is fully opened at shipment.]

Part No.	Part name	Material		Part No.	Part name	Material	
1	Cylinder valve [GNAB Series]			6	Needle	SUS304	Stainless steel
2	Plate	SUS304	Stainless steel	7	Valve body	PP	Polypropylene
3	Needle block	SUS304	Stainless steel	8	Base	PPS	Polyphenylene sulfide
4	Needle stopper	SUS304	Stainless steel	9	Flow rate sensor [WFK3000 Series]		
5	Hexagon nut	SWCH	Carbon steel for cold rolling	10	Attachment	SCS13	Stainless steel casting

Dimensions





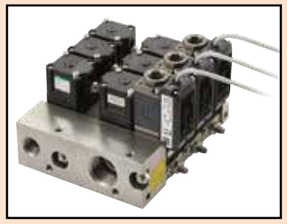


Model No.	A	B	C	D	E	F	G	H	I
WXU-J-□-□-20-□-10-□-□	164	228	24	22	33	24	65	Rc3/4	Rc3/8
WXU-J-□-□-25-□-10-□-□	164	228	24	23	35	20	70	Rc1	Rc3/8
WXU-J-□-□-20-□-15-□-□	169	233	29	22	33	24	65	Rc3/4	Rc1/2
WXU-J-□-□-25-□-15-□-□	169	233	29	23	35	20	70	Rc1	Rc1/2

Pitch (L) for fixing main body

The screw pitch (L) is as follows.
Consider mounting holes by adopting a slotted hole at one side, etc.

Station No.	2	3	4	5	6	7	8	9	10
L: Screw pitch	95±1	135±1.5	175±1.5	215±2	255±2	295±2	335±2.5	375±2.5	415±3



Integrated unit for water control Two-fluid control

WXU-P Series

- Port size: Rc3/8, Rc1/2, Rc1
- Flow rate range: 0.5 to 32 L/min

RoHS

Model No. Notation Method

When the configuration of all one-station assembly machines is identical, the entire unit can be displayed in the model number by selecting the codes. When assembling a unit from different configurations of one-station assembly components, specify the configuration in "Manifold specifications" (Page 512) for configuration.

WXU-P - R - 6 - L - S - 1 - 1 - N - 15 - 12 - A0N0

- Model No.
- ❶ Supply/drain category
- ❷ Station No.
- ❸ In-block position
- ❹ Valve size for fluid 1
- ❺ Valve actuation for fluid 1
- ❻ Valve actuation for fluid 2
- ❼ Flow rate adjustment function
- ❽ Port size (branching port)
- ❾ Flow rate range for flow sensor
- ❿ Flow rate sensor output (1)
- ⓫ Flow rate sensor output (2)

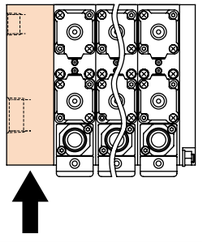
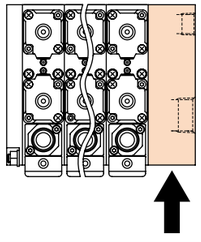
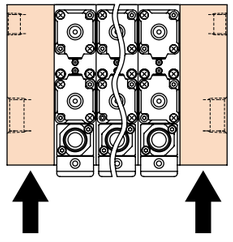
❶Supply/drain category

Code	Description
S	Supply side
R	Return side

❷Station No.

Code	Description
2	2 stations
to	to
6	6 stations

❸In-block position

Code	L	R	W
Description	Left	Right	Both sides
Layout			

❹Valve size for fluid 1

Code	Description
S	Standard specifications
B	Large flow rate specifications

❺Valve actuation for fluid 1

Code	Description
1	NC (normally closed)
2	NO (normally open)

❻Valve actuation for fluid 2

Code	Description
1	NC (normally closed)
2	NO (normally open)

❼Flow rate adjustment function

Code	Description	
N	With flow rate adjustment function	
0	None	

❽Port size (branching port)

Code	Description
10	Rc3/8
15	Rc1/2

❾Flow rate range for flow sensor

Code	Description
04	0.5 to 4.0 L/min
12	1.5 to 12 L/min
32	4.0 to 32 L/min
00	Without flow rate sensor (❶ Supply/Drain category "S")

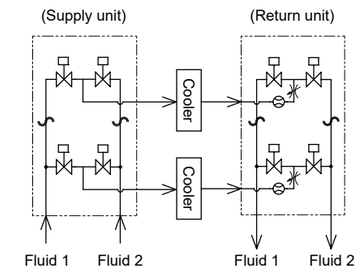
❿Flow rate sensor output (1)

⓫Flow rate sensor output (2)

Code	Description	Not required	Transistor output 1 point: NPN a contact	NPN b contact	PNP a contact	PNP b contact
		Blank	N0	N1	P0	P1
A0	0 to 5 VDC	●	●	●	●	●
A1	4 to 20 mA DC	●	●	●	●	●
A2	1 to 5 VDC	●	●	●	●	●
A3	0 to 10 VDC	●	●	●	●	●
N0	NPN transistor output, 2 points (a contact)	●				
N1	NPN transistor output, 2 points (b contact)	●				
P0	PNP transistor output, 2 points (a contact)	●				
P1	PNP transistor output, 2 points (b contact)	●				
000	Without flow rate sensor (❶Water supply category "S")	●				

Flow rate sensor
Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit
Ending

Application examples



It enables flow of two kinds of fluid (e.g., water and air). Suitable for systems with both coolant and air purge. Each circuit can be controlled separately.
(2 units are used)

Common specifications

Item		WXU-P
Working fluid		Water, hot water, air
Working pressure MPa		0 to 0.4 (Note)
Proof pressure (water pressure) MPa		1.0
Fluid temperature °C		1 to 70
Ambient temperature °C		5 to 50
Atmosphere		Place free of corrosive gas / explosive gas
Flow rate adjusting range %		15 to 100 (water)
Station No.		2 to 6 stations
Mounting orientation		Unrestricted
Sealant		Fluoro rubber
Port size	Port for fluid 1	Rc1
	Port for fluid 2	Rc1/2
	Branching ports	Rc3/8 or Rc1/2

Note: Contact CKD about use at pressures higher than working pressure.

Weight

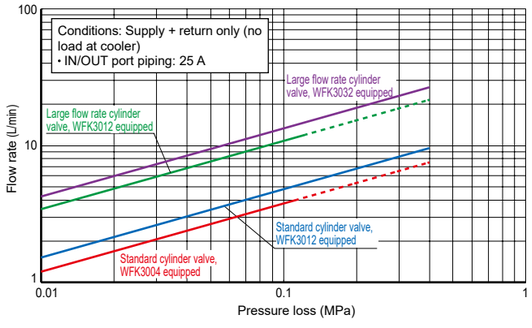
In-block (kg)				2.60
End block (kg)				0.70
One-station assembly (kg)	Supply/drain category	Cylinder valve for fluid 1	Cylinder valve for fluid 2	–
	Supply side	Standard specifications	Standard specifications	0.87
		Large flow rate specifications	Standard specifications	0.90
	Return side	Standard specifications	Standard specifications	1.14
		Large flow rate specifications	Standard specifications	1.17

Flow Characteristics

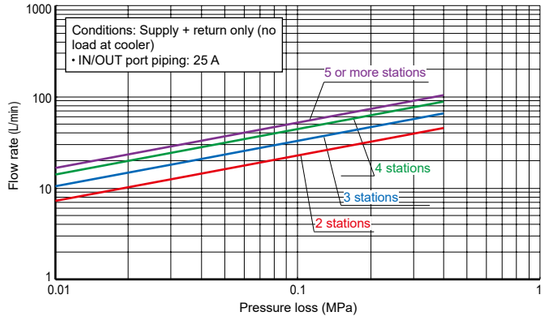
Supply/drain category	Configuration		Fluid 1 side		Fluid 2 side	
	Cylinder valve	Flow rate sensor	Cv	Kv value *1	C[dm3/(s·bar)]	b
Supply side (one station)	Standard specifications	-	0.44	0.38	1.4	0.2
	Large flow rate specifications	-	1.28	1.11	3.0	0.1
Return side (one station)	Standard specifications	WFK3004	0.33	0.29	1.4	0.2
		WFK3012	0.52	0.45		
	Large flow rate specifications	WFK3012	0.94	0.82	3.0	0.1
		WFK3032	1.37	1.19		

*1: Refer to Kv values on Intro Page 11.
*2: Make sure to check the flow rate of one station (each system) and overall unit. (Refer to "Reading the Flow Properties Table" on Page 513.)

●One station

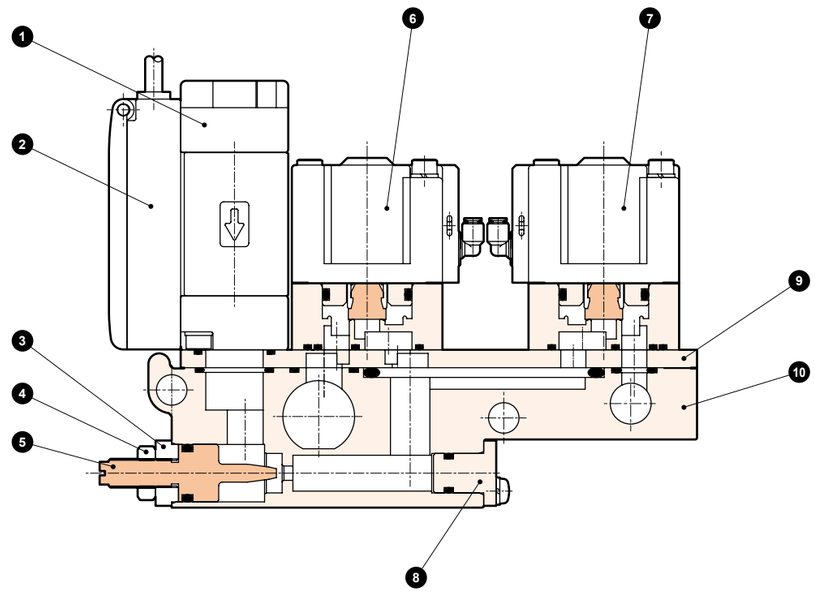


●Overall unit



Internal Structure Diagram / Material

●One-station assembly

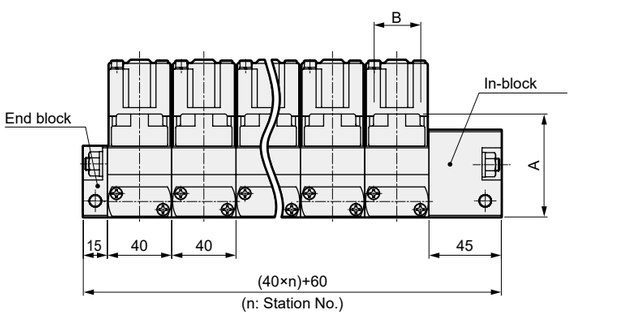


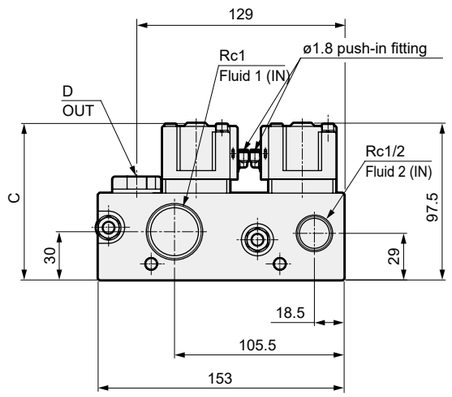
[Needle is fully opened at shipment.]

Part No.	Part name	Material	
1	Attachment	SCS13	Stainless steel casting
2	Flow rate sensor [WFK3000 Series]		
3	Needle stopper	SUS304	Stainless steel
4	Hexagon nut	SWCH	Carbon steel for cold rolling
5	Needle	SUS304	Stainless steel
6	Cylinder valve for fluid 1 [GNAB Series]		
7	Cylinder valve for fluid 2 [GNAB Series]		
8	Plug	SUS304	Stainless steel
9	Plate	SUS304	Stainless steel
10	Base	PPS	Polyphenylene sulfide

Dimensions

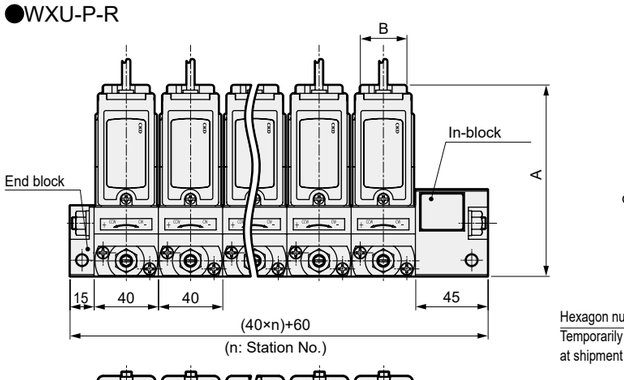
●WXU-P-S

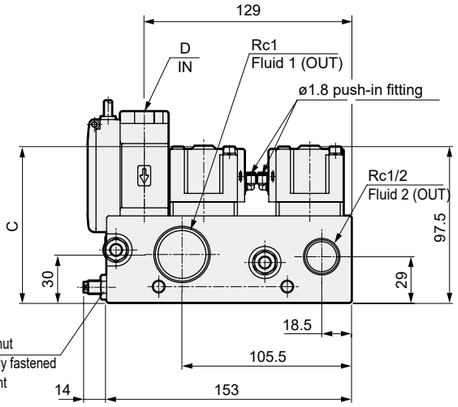




Model No.	A	B	C	D
WXU-P-S-□-□-S□□-□-10-□-□	59	24	97.5	Rc3/8
WXU-P-S-□-□-B□□-□-10-□-□	59	24	103	Rc3/8
WXU-P-S-□-□-S□□-□-15-□-□	64	29	97.5	Rc1/2
WXU-P-S-□-□-B□□-□-15-□-□	64	29	103	Rc1/2

●WXU-P-R





Model No.	A	B	C	D
WXU-P-R-□-□-S□□-□-10-□-□	114	24	97.5	Rc3/8
WXU-P-R-□-□-B□□-□-10-□-□	114	24	103	Rc3/8
WXU-P-R-□-□-S□□-□-15-□-□	119	29	97.5	Rc1/2
WXU-P-R-□-□-B□□-□-15-□-□	119	29	103	Rc1/2

Pitch (L) for fixing main body

The screw pitch (L) is shown on the right.
Consider mounting holes by adopting a slotted hole at one side, etc.

Station No.	2	3	4	5	6
L: Screw pitch	122.5±2	162.5±2	202.5±2.5	242.5±2.5	282.5±2.5

Specifications of mounted devices

Specifications of valve part

Item	GNAB-X□	
	Standard specifications	Large flow rate specifications
Valve seat leakage cm³/min	0.12 or less (pneumatic pressure)	
Orifice size (mm)	7	10
Cv	1.0	1.6
C[dm³/(s·bar)]	3.8 (*1)	–
b	0.3	–
Pilot air pressure MPa	NC (normally closed): 0.25 to 0.7 NO (normally open): (*2)	
Pilot connection	ø1.8 push-in fitting for air fiber (Please inquire separately for other connections.)	

*1: Formula to calculate sonic conductance C from effective cross-sectional area S is S≈5.0×C.
*2: Refer to the graph below for NO pilot air pressure.

●GNAB Series NO-type



Specifications of flow sensor part

■ WFK30□□S Flow sensor part specifications (sensor)
• Flow rate sensor output (1): -A0, -A1, -A2, -A3
• Flow rate sensor output : Blank

Item	04 (WFK3004S)	12 (WFK3012S)	32 (WFK3032S)
Flow rate range L/min	0.5 to 4.0	1.5 to 12	4.0 to 32
Accuracy	±2.5% F.S.		
Analog Output	-A0: 0 to 5 VDC, -A1: 4 to 20 mA DC, -A2: 1 to 5 VDC, -A3: 0 to 10 VDC		
Service voltage	12 to 24 VDC±10% (max. 80 mA) -A3 is 15 to 24 VDC		

■ Specifications of WFK30□□C flow sensor part (sensor/switch)
• Flow rate sensor output (1): -A0, -A1, -A2, -A3
• Flow rate sensor output (2): N0, N1, P0, P1

Item		04 (WFK3004C)	12 (WFK3012C)	32 (WFK3032C)
Flow rate range L/min		0.5 to 4.0	1.5 to 12	4.0 to 32
Accuracy		±2.5% F.S. ±1 digit		
Output	Indicator	Instantaneous flow rate 2-digit LED display		
	Analog Output	-A0: 0 to 5 DC, -A1: 4 to 20 mA DC, -A2: 1 to 5 VDC, -A3: 0 to 10 VDC		
	Switch Output	1-point transistor output (select NPN/PNP) max. 50 mA DC Internal voltage drop: (NPN) 2.0 V or less, (PNP) 2.5 V or less		
Service voltage		12 to 24 VDC±10% (max. 80 mA)		

■ Specifications of WFK30□□M flow sensor part (switch)
• Flow rate sensor output : -N0, -N1, -P0, -P1
• Flow rate sensor output : Blank

Item		04 (WFK3004M)	12 (WFK3012M)	32 (WFK3032M)
Flow rate range L/min		0.5 to 4.0	1.5 to 12	4.0 to 32
Accuracy		±2.5% F.S. ±1 digit		
Output	Indicator	Instantaneous flow rate 2-digit LED display		
	Switch Output	2-point transistor output (select NPN/PNP) max. 50 mA DC Internal voltage drop: (NPN) 2.0 V or less, (PNP) 2.5 V or less		
Service voltage		12 to 24 VDC±10% (max. 80 mA)		

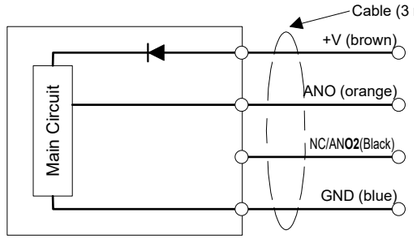
Flow rate sensor wiring method

- Always read the safety precautions before wiring.
- The cable is a 4-conductor cabtyre cable with a core wire of 0.2 m㎡ made by Correns Corporation.
- Option

Sensor (Analog output)	Switch (output)
-A0; (0 to 5 [V])	-N0; (NPN a-contact, 2 points)
-A1; (4 to 20 [mA])	-N1; (NPN b-contact, 2 points)
-A2; (1 to 5 [V])	-P0; (PNP a-contact, 2 points)
-A3; (0 to 10 [V])	-P1; (PNP b-contact, 2 points)

*Sensor/switch alarm output is one point.

●WFK3□□□S (sensor voltage output: -A0/-A2/-A3)

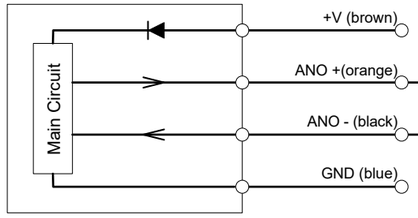


… DC power supply plus, connect to [+]: 12 to 24 VDC ±10%(Option A3: 15 to 24 VDC ±10%)

… Analog output: Output voltage proportional to flow rate

...Standard: NC

...DC power supply: Connect to [-]: 0 VDC



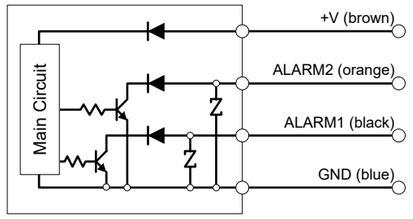
…DC power supply plus, connect to [+]: 12 to 24 VDC±10%

...Connect to 4-20 mA input device

...DC power supply: Connect to [-]: 0 VDC

Note: When connecting two or more flow rate sensors to the upper-level input circuit (receiver), carefully prevent signal interference.

●WFK3□□□M (Switch NPN output: -N0/-N1)



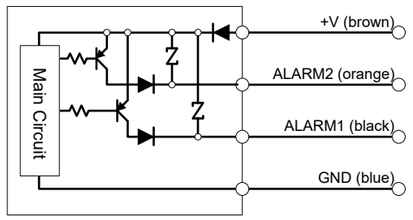
… Connect to [+] of DC power supply: 12 to 24 VDC±10%

...Switch 2 (OUT2) output: max. 30 VDC, 50 mA

...Switch 1 (OUT1) output: max. 30 VDC, 50 mA

...Connect to DC power supply [-]: 0 VDC

●WFK3***M (Switch PNP output: -P0/-P1)



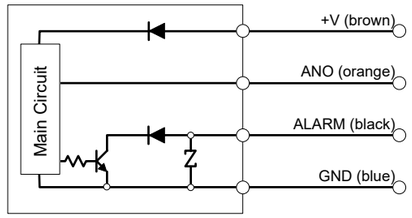
… Connect to [+] of DC power supply: 12 to 24 VDC±10%

… Switch 2 (OUT2) output : max. 50 mA

...Switch 1 (OUT1) output: max. 50 mA

… Connect to [-] of DC power supply: 0 VDC

●WFK3□□□C (sensor voltage output: -A0/-A2/-A3, switch NPN output: N0/N1)



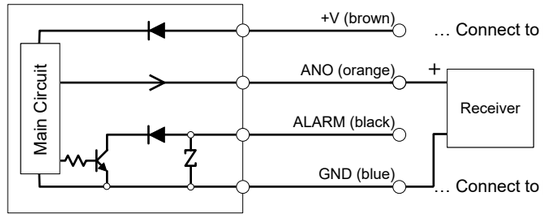
… Connect to DC power supply [+]: 12 to 24 VDC ±10% (Option A3 is 15 to 24 VDC±10%)

… Analog output: Voltage in proportion to flow rate is output.

...Switch (OUT) output: max. 30 VDC, 50 mA

… Connect to [-] of DC power supply: 0 VDC

●WFK3□□□C (sensor current output: -A1, switch NPM output: N0, N1)



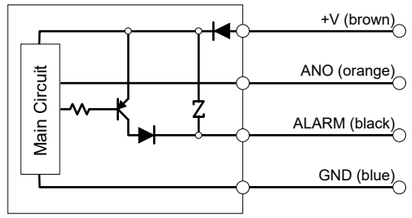
… Connect to [+] of DC power supply: 12 to 24 VDC±10%

...Connect to 4-20 mA input device

...Switch (OUT) output: max. 30 VDC, 50mA

… Connect to [-] of DC power supply: 0 VDC

●WFK3□□□C (sensor voltage output: -A0/-A2/-A3, switch PNP output: P0, P1)



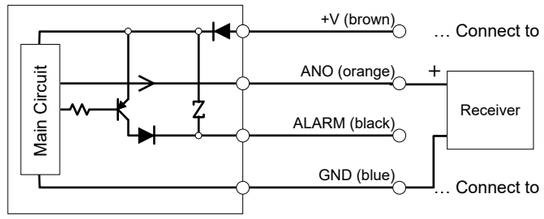
… Connect to DC power supply [+]: 12 to 24 VDC ±10% (Option A3 is 15 to 24 VDC±10%)

… Analog output: Voltage in proportion to flow rate is output.

...Switch (OUT) output: max. 30 VDC, 50 mA

… Connect to [-] of DC power supply: 0 VDC

●WFK3□□□C (sensor current output: -A1, switch PNP output: P0, P1)



… Connect to [+] of DC power supply: 12 to 24 VDC±10%

...Connect to 4-20 mA input device

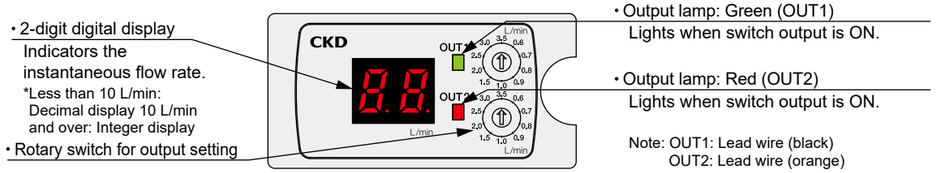
...Switch (OUT) output: max. 30 VDC, 50mA

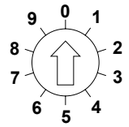
… Connect to [-] of DC power supply: 0 VDC

Flow rate sensor
Compact flow sensor (gas)
Compact flow sensor (air)
Compact flow sensor (liquid)
Water Manifold Unit
Ending

Functions

●Switch (WFK30□□M)

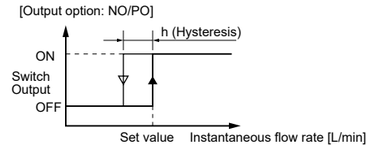


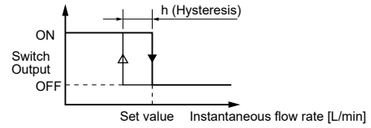


Allows you to set the switch output setting in 10 steps.
- Use a precision screwdriver, etc., to set the rotary switch. Be extremely careful, since applying excessive force to the rotating part may result in contact failure.
- Use the cylinder by making sure that the arrow aligns with the scale.

If it is forcibly set at an intermediate point, the output may become unstable.
- Turn power OFF before setting switch outputs.
- After setting switch output, close the cover to display the set flow rate.

Switch output operation

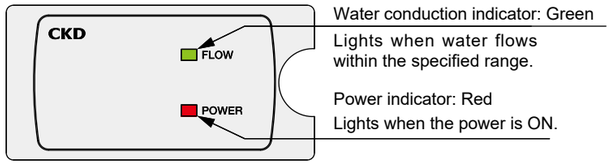




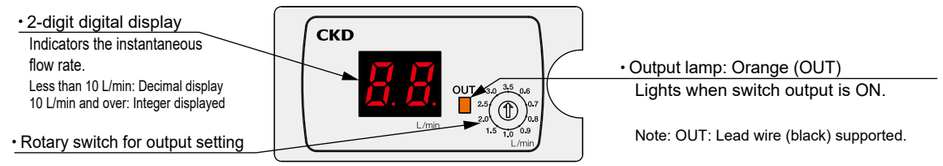
Switch output setting value [L/min]

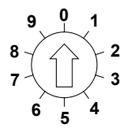
Rotary switch contact number	Model		
	WFK3004M	WFK3012M	WFK3032M
1	0.6	2.0	5.0
2	0.7	3.0	9.0
3	0.8	4.0	12
4	0.9	5.0	14
5	1.0	6.0	16
6	1.5	7.0	18
7	2.0	8.0	21
8	2.5	9.0	24
9	3.0	10	27
0	3.5	11	30
Hysteresis	0.1	0.5	1.0

●Sensor (WFK30□□S)



●Sensor / Switch (WFK30**C)

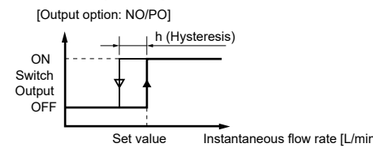


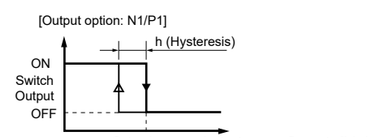


Allows you to set the switch output setting in 10 steps.
- Use a precision screwdriver, etc., to set the rotary switch. Be extremely careful, since applying excessive force to the rotating part may result in contact failure.
- Use the cylinder by making sure that the arrow aligns with the scale.

If it is forcibly set at an intermediate point, the output may become unstable.
- Turn power OFF before setting switch outputs.
- After setting switch output, close the cover to display the set flow rate.

Switch output operation





Switch output set value [L/min]

Rotary switch contact number	Model		
	WFK3004C	WFK3012C	WFK3032C
1	0.6	2.0	5.0
2	0.7	3.0	9.0
3	0.8	4.0	12
4	0.9	5.0	14
5	1.0	6.0	16
6	1.5	7.0	18
7	2.0	8.0	21
8	2.5	9.0	24
9	3.0	10	27
0	3.5	11	30
Hysteresis	0.1	0.5	1.0

■ Specifications of WFC flow sensor part

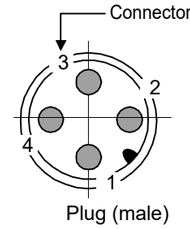
Item			150 (WFC-150)	600 (WFC-600)
Rated flow range			0.5 to 15 L/min	2.0 to 60 L/min
Available fluid conductivity			5 μs/cm or more	
Repeatability *1			±6.0% F.S	
Response time *2			0.25 s, 0.5 s, 1 s, 2 s, 5 s (default 1 s)	
Switch Output			NPN or PNP transistor output	
	Max. load current		50 mA	
	Max. applied voltage		30 VDC	
	Internal voltage drop		NPN: 2.0 V or less PNP: 2.4 V or less	
Analog Output		Output voltage	Voltage output: 1 to 5 V Load impedance: 50 kΩ or more	
		Output current	Current output: 4 to 20 mA, load impedance 500 Ω or less	
Indicator			Dual screen display (top: 4-digit 7 segment green/red, bottom: 6-digit 11 segment white)	
Power supply voltage			24 VDC ±10% (ripple P-P ±10% or less)	
Current consumption			65 mA or less	

*1: Characteristics when the response time is 5 s.
*2: The response time to reach 63% of the value in relation to the step input.
*3: Piping port and body metal part are grounded to DC (-) / blue wire. This product cannot be used in (+) ground power supply.

Wiring method

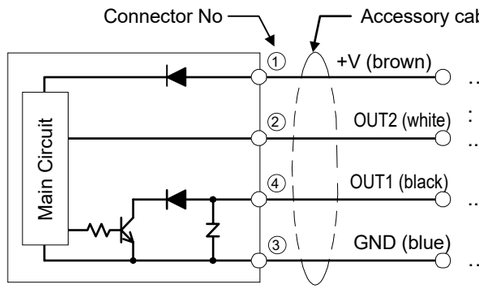
- Always read the safety precautions before wiring.

Connectors used are VA connectors (model No.: TM-4DSX3HG4) made by Correns Corporation. Specifications: For DC, 4 conductor 0.5 mm²
Cable model No.: TM-4DSX3HG4
L-type cable model No.: VA-4DLX3HG4



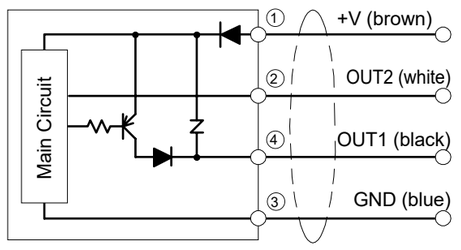
	Switch output	Analog Output
-NV	NPN transistor output	1 to 5 [V]
-NA		4 to 20 [mA]
-PV	PNP transistor output	1 to 5 [V]
-PA		4 to 20 [mA]

1) -NV,-NA



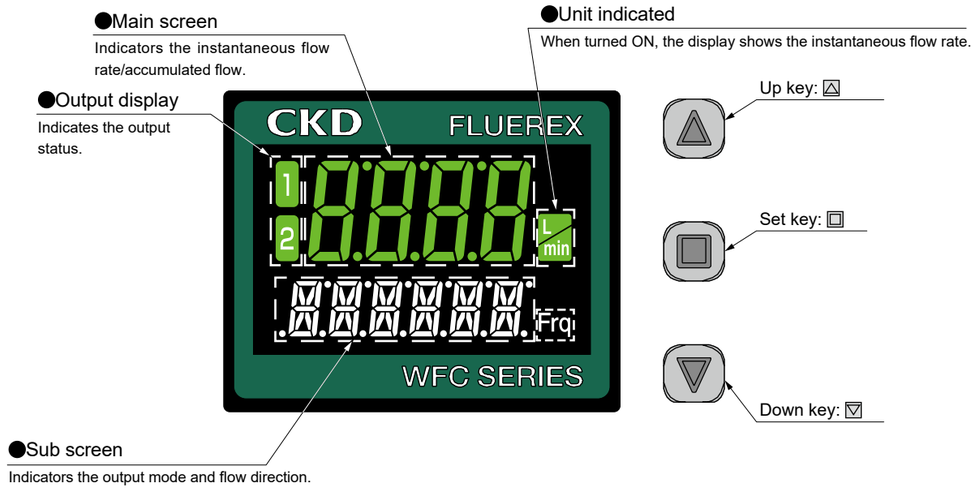
… DC power supply plus [+]: 24 VDC±10%
: Voltage outputs current in proportion to flow rate
...Analog output/switch input/Remote zero adjustment or accumulation reset
...Switch output (NPN): max. 30 VDC 50 mA
… Connect to [-] of DC power supply: 0 VDC

2) -PV, -PA



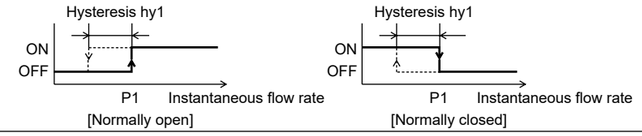
… DC power supply plus [+]: 24 VDC±10%
: Voltage outputs current in proportion to flow rate
...Analog output/switch input/Remote zero adjustment or accumulation reset
...Switch output (PNP): max. 50 mA
… Connect to [-] of DC power supply: 0 VDC

Functions

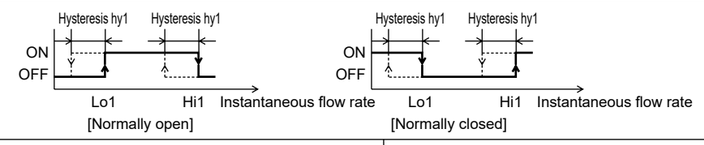


Output mode and output operation

(1) Hysteresis mode

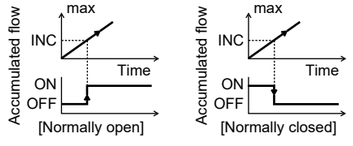


(2) Window comparator mode

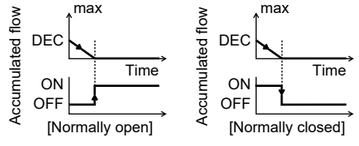


(3) Accumulated output mode

●Increment mode



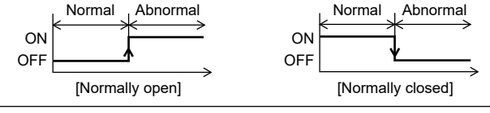
●Decrement mode



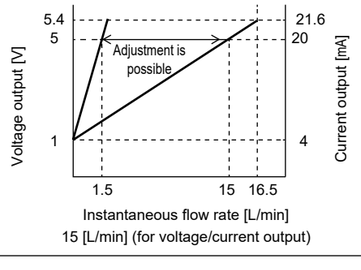
(4) Integrated pulse output



(5) Alarm output mode



(6) Analog output mode



Measurement mode

[Normal screen]

Instantaneous flow rate display	Hysteresis mode	Window comparator mode	Accumulated output mode	Integrated pulse output mode
	Analog Output	Digital input: Remote zero adjustment	Digital input: Accumulation reset	Alarm output mode
	Flow direction		Select any character	No sub-screen display
Total accumulated flow display	Accumulated units can be switched to "L", "kL", "ML" with up key: ▲ and down key: ▼.			

Easy setting (shortcut mode)

By shortcut operation, settings with high frequency of use can be moved from the normal screen to the settable state.

Main screen	Normal screen ⇄ (Current screen blinks) □ ⇄ □ ; △ or ▽ "Instantaneous value display", "total integrated value display" are selected, □ is confirmed.
Hysteresis mode	△ or ▽ ⇄ □ ; △ or ▽ set judgment value, □ and to confirm.
Accumulated output mode	□ + ▽ ⇄ □ ; Integrated value is reset with □.
Analog output mode	△ or ▽ ⇄ □ ; △ or ▽ change F.S. with, and to □ confirm.
Flow direction	△ or ▽ ⇄ □ ; △ or ▽ to change flow direction, and □ to confirm.
Total integrated value reset	□ + ▽ ⇄ ; Reset by □. △ or ▽ can be canceled.
Setting key lock	Normal screen ⇄ △ + ▽ (Hold down for 2 seconds or more) / 1 second after setting ; △ or ▽ to change, and □ to confirm.

How to fill out WXU-P manifold specifications sheet

Supply side/~~Return side~~ — Create manifold specifications for both supply side and return side.

*Layout position is 1, 2... from the left with flow sensor cover facing the front. (Refer to the figure below)

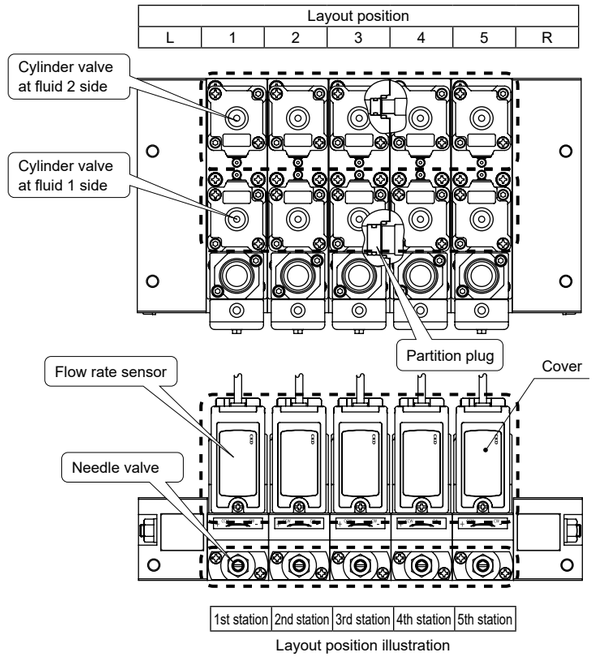
Part name	Specifications	Model No.	Layout position L	1	2	3	4	5	6	R	Quantity
In-block	Rc1, Rc1/2	-	○								1
End block	-	-								○	1
Cylinder valve at fluid 2 side [Dedicated product for integrated unit for water control]	NC	**GNAB-X2144-5**		○	○	○					3
	NO	**GNAB-X2190-5**					○	○			2
	Masking plate	-									
Cylinder valve at fluid 1 side [Dedicated product for integrated unit for water control]	NC (Standard specifications)	**GNAB-X2144-5**			○	○					2
	NO (Standard specifications)	**GNAB-X2190-5**					○				1
	NC (Large flow rate specifications)	**GNAB-X2145-5**		○							1
	NO (Large flow rate specifications)	**GNAB-X2224-5**						○			1
	Masking plate	-									
Branching port size (Supply side only)	Rc3/8	-									
	Rc1/2	-									
Flow rate sensor [Dedicated product for integrated unit for water control] (Return side only)	Select from the following and enter in the table at right. (Refer to the specifications of the on-board components on Page 501)	Flow rate range / Port size / Flow rate sensor output (1) / (2)									
		WFK30 04 15 - A0 Blank		○							1
	Flow rate range: 04/12/32	**WFK30** 32 15 - A3 Blank			○	○					2
	Port size: 10/15	**WFK30** 04 15 - N0 Blank					○				1
	Flow rate sensor output (1)(2): Refer to *1 (table below).	**WFK30** 32 15 - P0 N0						○			1
		WFK30 - - - - -									
	For port only: Rc3/8	-									
	For port only: Rc1/2	-									
Needle valve	For standard specifications / For large flow rate specs. (It depends on the model number of the cylinder valve at fluid 1 side.)	-		○	○	○	○	○			5
Partition plug	Fluid 1 side	-					○				1
	Fluid 2 side	-					○				1
Remarks											

Fill in total quantity.

Specify device to be mounted for each station.

*1: Output variations of water flow rate sensor

Flow rate sensor output (1)		Flow rate sensor output (2): Not required	Transistor output 1 point: NPN a contact	NPN b contact	PNP a contact	PNP b contact
		Blank	N0	N1	P0	P1
A0	0 to 5 VDC	●	●	●	●	●
A1	4 to 20 mA DC	●	●	●	●	●
A2	1 to 5 VDC	●	●	●	●	●
A3	0 to 10 VDC	●	●	●	●	●
N0	NPN transistor output, 2 points (a contact)	●				
N1	NPN transistor output, 2 points (b contact)	●				
P0	PNP transistor output, 2 points (a contact)	●				
P1	PNP transistor output, 2 points (b contact)	●				



Layout position illustration

WXU-H Manifold Specifications

●Contact ● Quantity set(s) ● Delivery date: / /

Receipt No.	Order No.

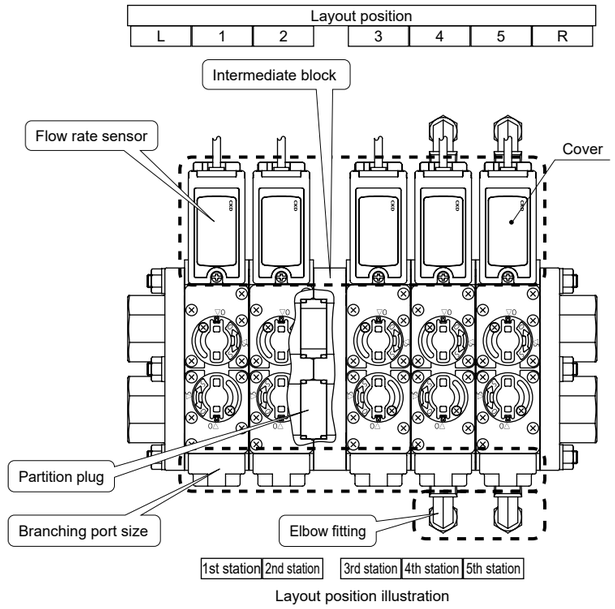
Date issued / /
Company
Contact
Purchase order No.

*Layout position is 1, 2... from the left with flow sensor cover facing the front. (Refer to the figure below)

Part name	Specifications		Model No.	Layout position L	1	2	3	4	5	6	7	8	9	10	R	Quantity
In-block	Rc1		-													
End block	-		-													
Flow rate sensor [Dedicated product for integrated unit for water control] (Return side only)	Select from the following and enter in the table at right. (Refer to the specifications of the on-board components on Page 501)		Flow rate range / Port size / Flow rate sensor output (1) / (2)													
			WFK30 - -													
	Flow rate range: 04/12/32		**WFK30** - -													
	Port size: 10/15		**WFK30** - -													
	Flow rate sensor output (1)(2): Refer to *1 (table below)		**WFK30** - -													
			WFK30 - -													
	Port only For	Rc3/8	-													
		Rc1/2	-													
Branching port size (Supply side OUT port)	Rc3/8		-													
	Rc1/2		-													
Partition plug	With intermediate block (Width 20 mm)	Supply side	-													
		Return side	-													
Elbow fitting (stainless steel) (Supply unit + Return unit Piped on both sides)	Tube, Thread size (inch)	Compatible tube O.D. x I.D. (mm)	Manufactured by NITTA Co., Ltd. Quick seal fittings													
		3/8	9.53 x 6.99	L1N3/8-PT3/8-S												
		1/2	12.70 x 9.56	L1N1/2-PT1/2-S												
Remarks																

*1: Output variations of water flow rate sensor

Flow rate sensor output (1)		Flow rate sensor output (2): Not required	Transistor output 1 point: NPN a contact	NPN b contact	PNP a contact	PNP b contact
		Blank	N0	N1	P0	P1
A0	0 to 5 VDC	●	●	●	●	●
A1	4 to 20 mA DC	●	●	●	●	●
A2	1 to 5 VDC	●	●	●	●	●
A3	0 to 10 VDC	●	●	●	●	●
N0	NPN transistor output, 2 points (a contact)	●				
N1	NPN transistor output, 2 points (b contact)	●				
P0	PNP transistor output, 2 points (a contact)	●				
P1	PNP transistor output, 2 points (b contact)	●				



Layout position illustration

WXU-HC Manifold Specifications

●Contact ● Quantity set(s) ● Delivery date: / /

Receipt No.	Order No.

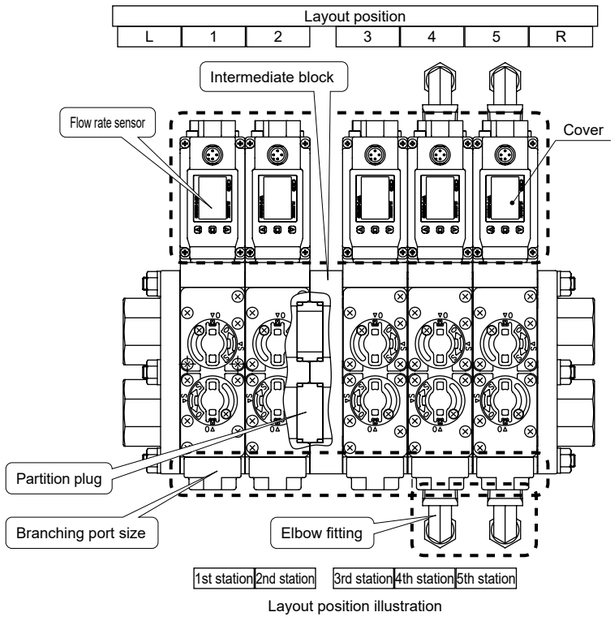
Date issued / /
Company
Contact
Purchase order No.

*Layout position is 1, 2... from the left with the monitor of flow sensor facing the front. (Refer to the figure below)

Part name	Specifications		Model No.				Layout position L	1	2	3	4	5	6	7	8	9	10	R	Quantity
In-block	Rc1		-																
End block	-		-																
Flow rate sensor [Dedicated product for integrated unit for water control]	Select from the following and enter in the table at right.			Flow rate range / Port size		Output													
	●Flow rate range / Port size: 150-10 W, 600-15 W ●Output: Refer to *1 (table below).		WFC-	-	-														
			WFC-	-	-														
			WFC-	-	-														
			WFC-	-	-														
			WFC-	-	-														
	Port only For	Rc3/8	-																
		Rc1/2	-																
	M12 connector cable		-																
	M12L-connector cable		-																
Branching port size (Supply side OUT port)	Rc3/8		-																
	Rc1/2		-																
Partition plug	Intermediate block (width 20 mm)	Supply side	-																
		Return side	-																
Stainless steel fitting (elbow) insert type	Tube, thread size (inch)	Compatible tube O.D. × I.D. (mm)	Quick seal fittings (NITTA)																
	3/8	9.53 x 6.99																	
	1/2	12.70 x 9.56																	
Remarks																			

*1: Output variations of water flow rate sensor

Output	Switch Output	Analog Output
NV	NPN-Tr output	Voltage output (1 to 5 V)
NA	NPN-Tr output	Current output (4 to 20 mA)
PV	PNP-Tr output	Voltage output (1 to 5 V)
PA	PNP-Tr output	Current output (4 to 20 mA)



Layout position illustration

WXU-J Manifold Specifications

●Contact ● Quantity set(s) ● Delivery date: / /

Receipt No.	Order No.

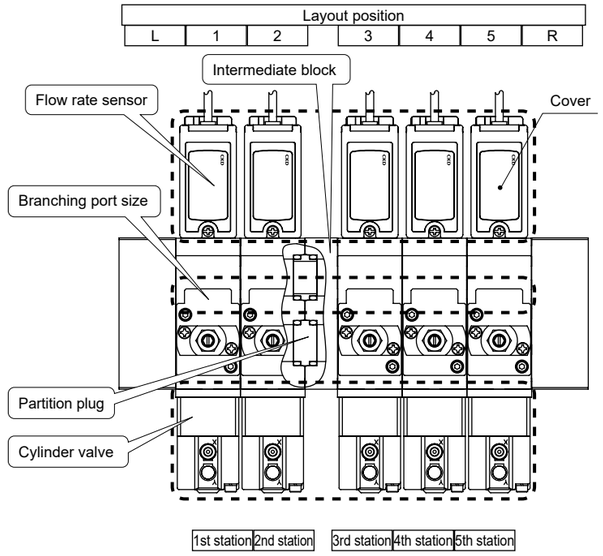
Date issued / /
Company
Contact
Purchase order No.

*Layout position is 1, 2... from the left with flow sensor cover facing the front. (Refer to the figure below)

Part name	Specifications		Model No.						Layout position L	1	2	3	4	5	6	7	8	9	10	R	Quantity
In-block	Rc3/4		-																		
	Rc1		-																		
End block	-		-																		
Cylinder valve [Dedicated product for integrated unit for water control]	NC		GNAB-X2225-1																		
	NO		GNAB-X2226-1																		
	Masking plate		-																		
Flow rate sensor [Dedicated product for integrated unit for water control] (Return side only)	Select from the following and enter in the table at right. (Refer to the specifications of the on-board components on Page 501)			Flow rate range	Port size		Flow rate sensor output (1)	(2)													
			WFK30			-															
	Flow rate range: 04/12/32 Port size: 10/15 Flow rate sensor output (1)(2): Refer to *1 (table below).		WFK30			-															
			WFK30			-															
			WFK30			-															
			WFK30			-															
	Port only For	Rc3/8	-																		
		Rc1/2	-																		
Branching port size (Supply side OUT port)	Rc3/8		-																		
	Rc1/2		-																		
Partition plug	Intermediate block (width 20 mm)	Supply side	-																		
		Return side	-																		
Remarks																					

*1: Output variations of water flow rate sensor

		Flow rate sensor output (2)				
		Not required	Transistor output 1 point			
			NPN a contact	NPN b contact	PNP a contact	PNP b contact
Flow rate sensor output (1)		Blank	N0	N1	P0	P1
A0	0 to 5 VDC	●	●	●	●	●
A1	4 to 20 mA DC	●	●	●	●	●
A2	1 to 5 VDC	●	●	●	●	●
A3	0 to10 VDC	●	●	●	●	●
N0	NPN transistor output, 2 points (a contact)	●				
N1	NPN transistor output, 2 points (b contact)	●				
P0	PNP transistor output, 2 points (a contact)	●				
P1	PNP transistor output, 2 points (b contact)	●				



Layout position illustration

WXU-P Manifold Specifications

●Contact ● Quantity set(s) ● Delivery date: / /

Receipt No.	Order No.

Date issued / /

Company

Contact

Purchase order No.

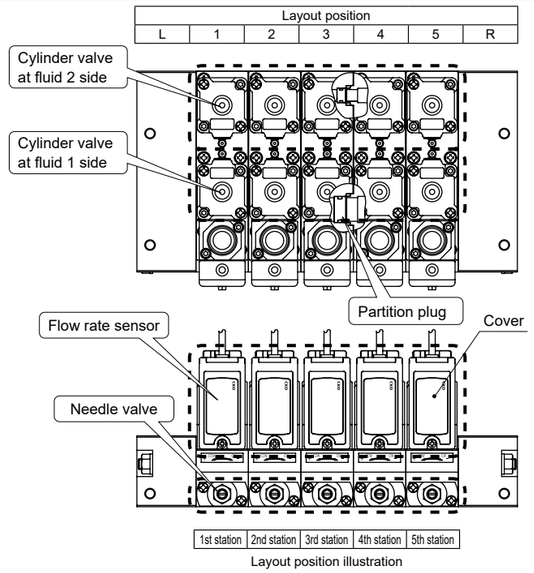
Supply side/Return side

*Layout position is 1, 2... from the left with flow sensor cover facing the front. (Refer to the figure below)

Part name	Specifications	Model No.	Layout position L	1	2	3	4	5	6	R	Quantity
In-block	Rc1, Rc1/2	-		■	■	■	■	■	■		
End block	-	-		■	■	■	■	■	■		
Cylinder valve at fluid 2 side [Dedicated product for integrated unit for water control]	NC	**GNAB-X2144-5**	■							■	
	NO	**GNAB-X2190-5**	■							■	
	Masking plate	-	■							■	
Cylinder valve at fluid 1 side [Dedicated product for integrated unit for water control]	NC (Standard specifications)	**GNAB-X2144-5**	■							■	
	NO (Standard specifications)	**GNAB-X2190-5**	■							■	
	NC (Large flow rate specifications)	**GNAB-X2145-5**	■							■	
	NO (Large flow rate specifications)	**GNAB-X2224-5**	■							■	
	Masking plate	-	■							■	
Branching port size (Supply side only)	Rc3/8	-	■							■	
	Rc1/2	-	■							■	
Flow rate sensor [Dedicated product for integrated unit for water control] (Return side only)	Select from the following and enter in the table at right. (Refer to the specifications of the on-board components on Page 501)	Flow rate range / Port size / Flow rate sensor output (1) / (2)									
		WFK30 -	■							■	
	Flow rate range: 04/12/32	**WFK30** -	■							■	
	Port size: 10/15	**WFK30** -	■							■	
	Flow rate sensor output (1)(2): Refer to *1 (table below).	**WFK30** -	■							■	
		WFK30 -	■							■	
	For port only: Rc3/8	-	■							■	
	For port only: Rc1/2	-	■							■	
Needle valve	For standard specifications / For large flow rate specs.	It depends on the model number of the cylinder valve at fluid 1 side. -	■							■	
Partition plug	Fluid 1 side	-		■	■	■	■	■	■		
	Fluid 2 side	-		■	■	■	■	■	■		
Remarks											

*1: Output variations of water flow rate sensor

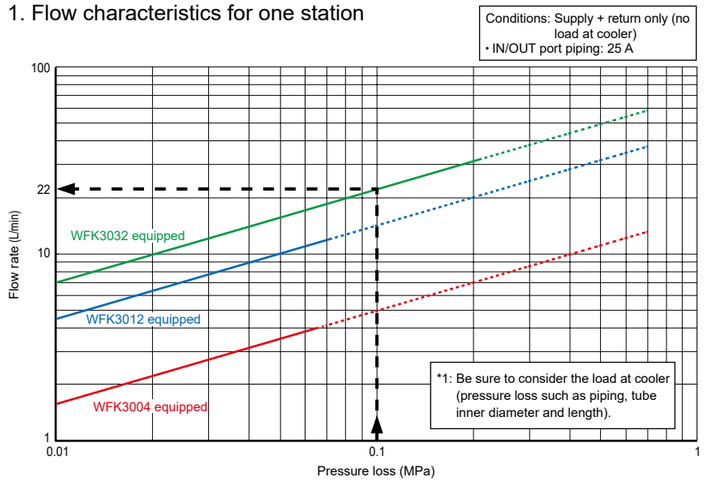
Flow rate sensor output (1)		Flow rate sensor output (2) Not required	Transistor output 1 point NPN a contact	NPN b contact	PNP a contact	PNP b contact
		Blank	N0	N1	P0	P1
A0	0 to 5 VDC	●	●	●	●	●
A1	4 to 20 mA DC	●	●	●	●	●
A2	1 to 5 VDC	●	●	●	●	●
A3	0 to 10 VDC	●	●	●	●	●
N0	NPN transistor output, 2 points (a contact)	●				
N1	NPN transistor output, 2 points (b contact)	●				
P0	PNP transistor output, 2 points (a contact)	●				
P1	PNP transistor output, 2 points (b contact)	●				



Layout position illustration

Reading the Flow Properties Table

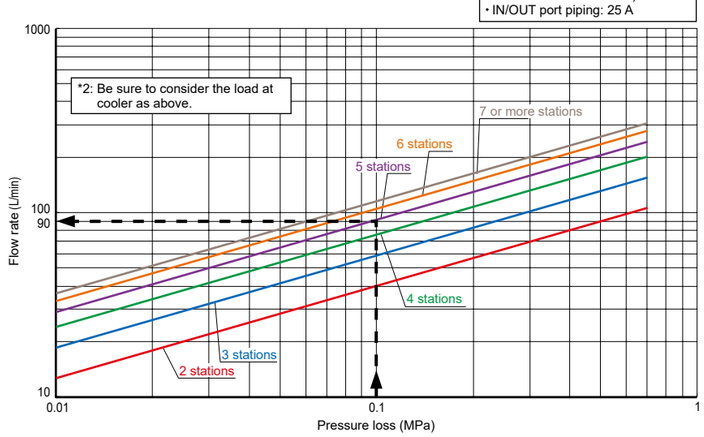
1. Flow characteristics for one station



Example 1:
What is the maximum flow rate when water (specific gravity = 1) flows at △P = 0.15 MPa (P_1-P_2) with WFK3032 mounted on WXU-H type (assume the load on the cooling section is 0.05 MPa)?

Q=22 L/min
(pressure loss: 0.1 MPa (0.15 - 0.05))

2. Flow characteristics of entire unit



Example 2:
With WXU-H type, when using 5 stations, water (specific gravity = 1) will be △P=0.15 MPa (P_1-P_2Max. flow rate when flow is applied with parentheses (load at cooler is 0.05 MPa)

Q=90 L/min
(pressure loss: 0.1 MPa (0.15 - 0.05))

Flow rate calculation method

SI units $\frac{\sqrt{P_1\text{-}P_2}}{\sqrt{G}}$

Q=45.16Cv

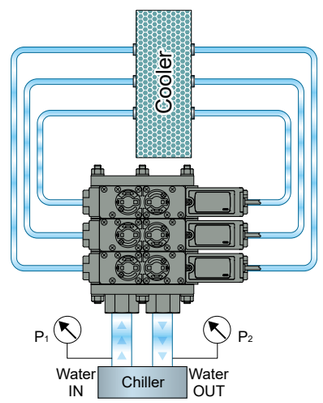
Q: Flow rate L/min

P_1: Primary pressure MPa

P_2: Secondary pressure MPa

G: Specific gravity (water = 1)

Cv: Flow coefficient



Pressure loss
△P
△P=P_1-P_2

Water-use components

Safety Precautions

Be sure to read this section before use.
Refer to Intro 17 for General Precautions.

Product-specific cautions: Integrated unit for water control WXU Series

Design / Selection

1.Safety Design

⚠WARNING

■This product cannot be used as an emergency shut-off valve.
The valves listed in this catalog are not designed as valves to ensure safety such as emergency cutoff valves. When using in such a system, always take separate measures that will ensure safety.

■Take measures to prevent physical harm or property damage in the event of breakdown of this product.

⚠CAUTION

■Liquid Ring
When liquid is to be passed, and a circuit of the liquid seal is formed, the pressure could rise due to changes in the temperature and operation may be disabled or some components may be damaged. Prevent a liquid seal circuit by providing a relief valve in the system.

■Vibration
Install this product in a place not subject to vibration.

2. Working Fluid

⚠WARNING

■Working Fluids
Do not use any fluid other than the working fluids specified in the catalog.

■Fluid quality
Iron rust and debris in the fluid can cause operation faults or leaks and deteriorate product performance. Provide measures to remove foreign matter.

■Fluid Temperature
Cannot be used outside the specified fluid temperature range.

3. Working Environment

⚠WARNING

■Only explosion-proof solenoid valves and air operated valves can be used in an explosive atmosphere.
Select either an explosion-proof solenoid valve or air operated valve for use within an explosive atmosphere.

■Do not use this product in a corrosive gas atmosphere or an atmosphere that could affect the component materials.

■Do not use this product near a heat generating source or in a location where it may be exposed to radiant heat.

■Use this product within the specified ambient temperature range.
Even if the ambient temperature is within the specified range, do not use this product in a location where rapid changes in temperature can occur.

■When you use the products in a cold climate, take necessary measures to prevent freezing.

4. Securing of space

⚠CAUTION

■Securing maintenance space
Secure sufficient space for maintenance and inspection.

■Be sure to secure the product by using the mounting screws for in-block, end block and intermediate block.

■Make sure to secure the metal part of the port so that no force is applied to the resin parts when piping.
The resin parts could be damaged.

Product-specific cautions: Air operated 2-port components (cylinder valve)

Design / Selection

1. Working Fluid

⚠CAUTION

■External pilot air
(1) Draining: Compressed air contains a large amount of drainage (water, oil oxides, tar, foreign matter). This is a factor that significantly reduces the reliability of the pneumatic components. For drainage measures, improve air quality by dehumidifying with an after cooler or dryer, removing foreign matter with a filter, and removing tar with a tar removal filter, etc.
(2) Pre-lubrication: This series is pre-lubricated, so no lubricator is required. However, once lubrication has been started, it must be continued so that the lubricant does not run out. Use turbine oil Class 1 ISO VG32 (#90) or equivalent for lubrication.
(3) Filter: Install a filter with a 5 μm or less filter element.

Product-specific cautions: Karman vortex flow rate components for water WFK3000 Series

Design / Selection

1. Working environment

⚠CAUTION

■Vibration / Impact
For use with Vibration of 20 m/s^2 or more, Shock of 98m/s^2 or more, avoid using the parts above. This may cause malfunction and/or damage, as this product uses the Karman's vortex type detection principle.

× Vibration 20 m/s$_2$ or more × Shock 98 m/s$_2$ or more

■For approximately 2 seconds after power-ON, internal settings such as hardware checks are performed, so the display and output will not operate normally during this time. Particularly, if a transistor output is used in the control of an interlock circuit, an abnormal stop may occur. Mask the output during this period.

Product-specific cautions: Capacitance electromagnetic flow components WFC Series

Design / Selection

⚠CAUTION

■Do not exceed the specified range.
■This product is for fluids that do not corrode water/wetted part materials with conductivity 5 μs/cm (0.5 ms/m). Fluids with low conductivity cannot be detected normally.
■Do not use with a positive ground.
■Do not use for applications in direct contact with beverages, foodstuffs, chemical liquids, etc.
■Do not use in flammable gas atmospheres.
■Observe the working fluid temperature and use. If using at low temperatures, take freeze prevention measures such as adding antifreeze.
■If a fluid with temperature lower than the ambient temperature flows, condensation may form inside the product, which may adversely affect performance. Use the product so that there is no condensation.
■Observe the working pressure range and use.
■Observe the rated flow range and use.
■This product cannot be used as a billing meter. Do not use this product for commercial transactions as it is not compliant with the Measurement Act. It cannot be calibrated, so use it as an industrial sensor.
■After the power supply is turned ON, there is a 10-second warm-up period. Do not use display/output during this time.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No."→ Instruction Manual

Compact flow rate Controller

RAPIFLOW® FCM

■ Flow rate controller



CONTENTS

Product Introduction	518
● FCM analog input/parallel input	524
● FCM IO-Link	540
● FCM RS-485	558
FCM Glossary	572
⚠Safety Precautions	573

FCM Series

Supports the IoT era! Flow rate controller equipped with predictive maintenance

Stainless steel body

[Applicable fluids / Flow rates]

AIR N₂
0.015 to 50 L/min

Ar
0.015 to 50 L/min

O₂ 13A CH₄ C₃H₈
0.015 to 10 L/min

H₂ He
0.06 to 20 L/min

Weight: Approx. 480 g





Resin body

[Applicable fluids / Flow rates]

AIR N₂
0.015 to 100 L/min

Weight: Approx. 200 g

Compatible with various fluids

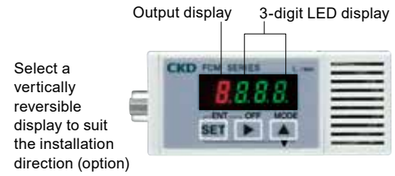
Compatible with various gases. It can be used in various applications.

Applicable fluid

Air Nitrogen Argon Oxygen City gas Methane
Propane Hydrogen Helium etc.

Equipped with a digital display that shows the control status at a glance.

- Digitally displays the flow rate value in 3 digits
- Error and output status (switch output ON-OFF) are displayed

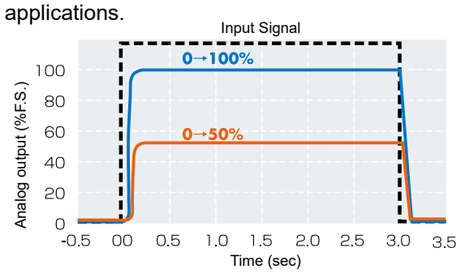


Low differential pressure model

Suitable for controlling burner flame or other combustion gases with low supply pressure.

High-speed control for 0.5 seconds

High speed control of 0.5sec is possible by using a platinum sensor chip based on silicon micromachining Compatible with various applications.



Dedicated power supply not required

24 VDC power supply voltage. It operates with a general purpose single power supply.

Highly reliable flow control

Our proprietary rectifying mechanism enables improved reproducibility, which affects flow controllability.

Reproducibility	±1% F.S.
Accuracy	±3% F.S.

Parallel input is available as standard

Controllable with parallel input (ON/OFF signal such as PLC, 10bit resolution 1024). Analog I/O components such as D/A converters are not required.



Compact and lightweight

70×70×30 (vertical/horizontal/width) size. Installable in narrow spaces or on movable parts, enabling equipment downsizing and weight reduction.

Volume
Compared with conventional models Approx. 30%
Weight
Compared with conventional models Approx. 20%



Multiple functions realized with built-in microcomputer

Error display function
Error display and notification by electric signal.

Zero/span adjustment function
Zero/span adjustment of input signal is possible to suit the user's needs.

Preset input function
Four arbitrary flow rates can be set, and the flow rate can be controlled with an external 2bit signal input (signal from PLC, etc.).

Direct memory function
Control flow rate can be controlled freely by operation key on the product even if there is no external input signal.

Switch output function
Switch output function equipped with flow rate upper/lower limit setting. (Overcurrent protection integrated)

Flow rate integrating function
The flow rate integration display (max. 6 digits) and integration pulse output are possible.

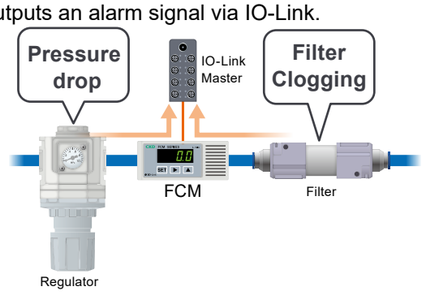
Auto cutoff function
The valve is automatically shut off in the event of an emergency at the time of an error.

IO-Link

System error detection (predictive maintenance)

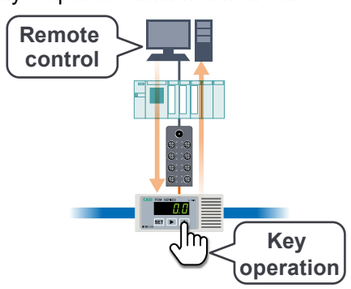
System error warning function

In addition to self-detection functions for detecting the deterioration of sensors and proportional solenoid valves, abnormalities with peripheral systems can also be detected.
Outputs an alarm signal via IO-Link.



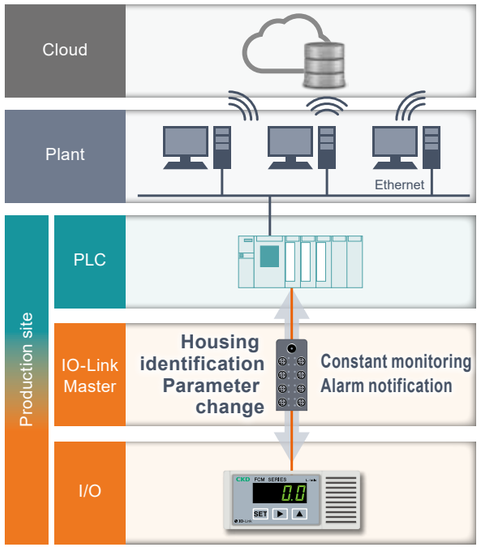
Improved existing communication with IO-Link

- Various settings are possible with key operations and configuration is possible remotely.
  - **Input method switching**
  - **Preset memory value input**
  - **Flow rate control / forced OFF state switching**
- 4 preset memory points (conventional)
  - ➡ Increased to 8 points.
- 4 switch output types can be set and output simultaneously.
- Directly output accumulated flow value.



IO-Link model available

IO-Link is a digital communication standard for sensors/actuators at factory sites. (IEC 61131-9)
Unlike analog communication, it enables the transmission of parameters and event data.



Features of IO-Link



Constant monitoring via digital data is possible.



Parameters can be set and changed via the network, enabling remote equipment operation.



Models, serial numbers, etc., can be confirmed on the network.



The settings can be copied from the master, making parameter reconfiguration after maintenance obsolete.



Device failure and disconnection can be confirmed.



It can also be converted to Ethernet networks and connected, enabling devices to be IoT-ready.

Communication specifications

Item	Details
Communication protocol	IO-Link
Communication protocol version	V1.1
Transmission bit rate	COM3(230.4kbps)
Port type	A
Process data length (input)	10 byte

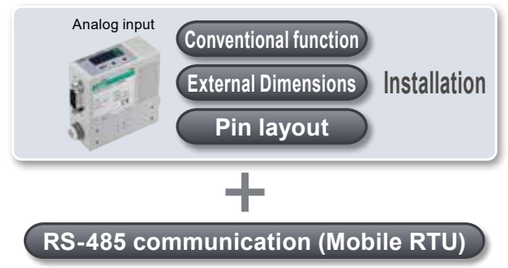
Item	Details
Process data length (output)	4 byte
Min. cycle time	2 ms
Data storage	1 kbyte
SIO mode support	None

RS-485

RS-485 communication supported

Stable noise-resistance and long-distance communication are possible

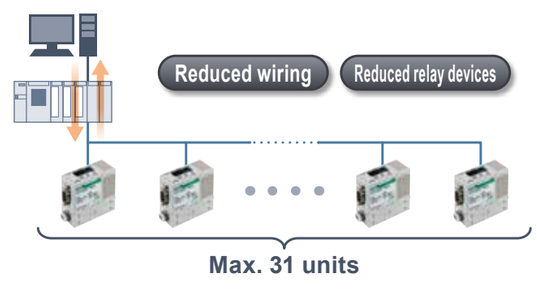
While maintaining the conventional functions and installation size, it supports RS-485, which is highly reliable in industrial network communication.



Reduce wiring and relay equipment costs

Up to 31 units can be connected

One master can connect up to 31 units at a time.
Wiring and analog units can be reduced.



Additional functions (1)

Can be set with both key operation and RS-485

Various settings can be set both with key operation and remote control with RS-485 communication

- **Input method switching**
- **Preset memory value input**
- **Flow rate control / forced OFF state switching**

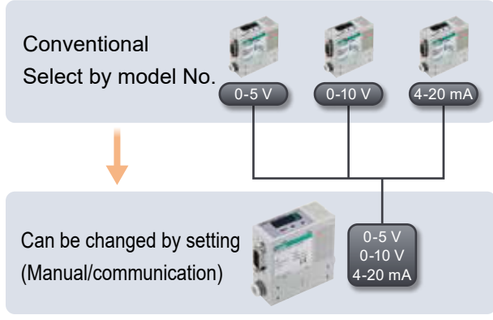
Communication specifications

Item	Details
Communication standards	RS-485 compliant
Communication method	Half-duplex
Communication protocol	Modbus RTU compliant
Communication speed	9.6/19.2/38.4 kbps

Additional functions (2)

Analog input specification can be switched

Switch input specifications to match the device

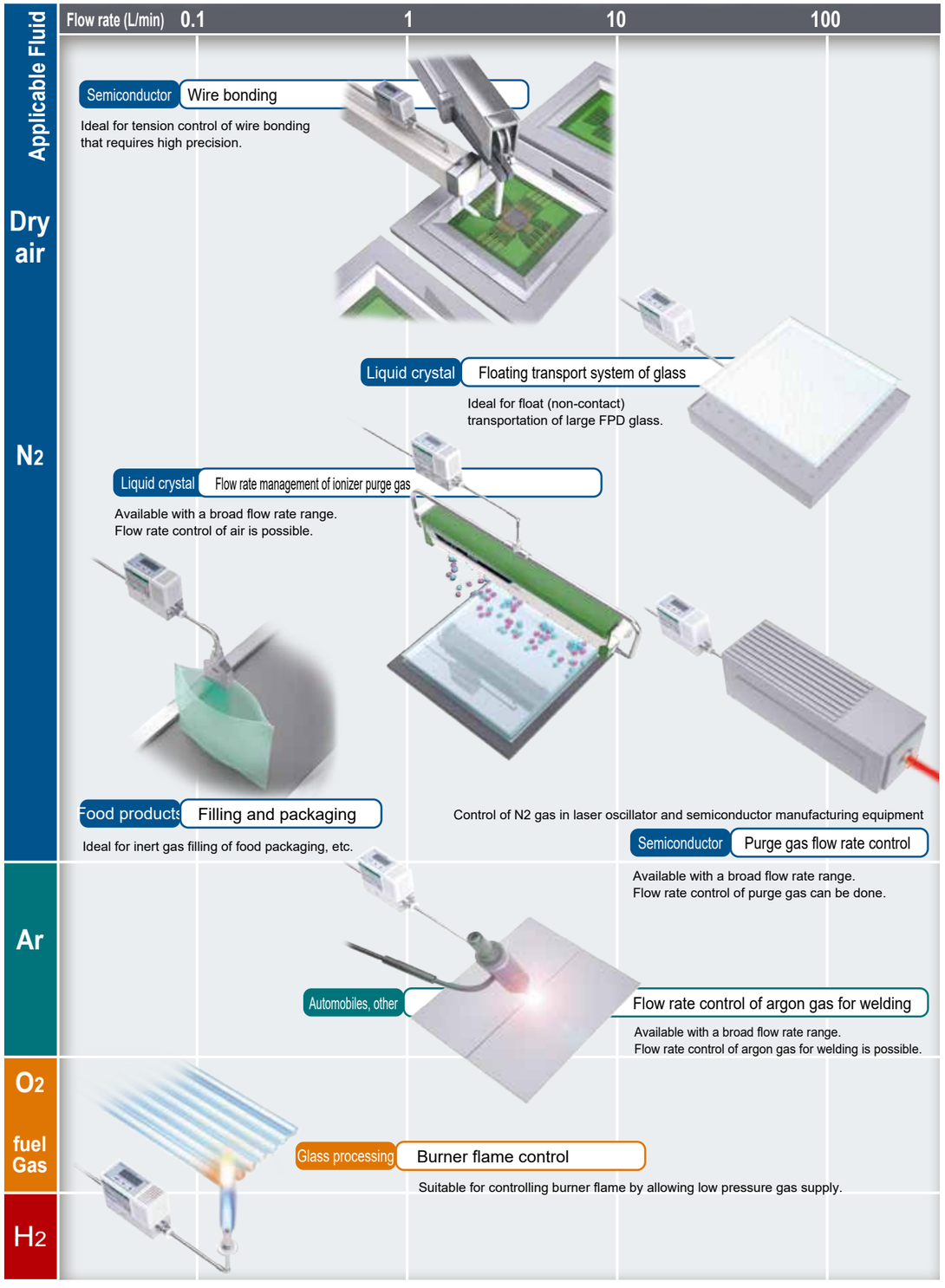


Item	Details
Parity bit	None / Odd / Even
Stop bit	1bit / 2bit
Components address	1 to 247 (broadcast-capable)

Examples of applications

Used in various fields

RAPIFLOW is available for a wide variety of applications in industries such as machinery, automobiles and precision components, cutting-edge fields such as semiconductors and biotechnology, medical care, foodstuffs, and more.



RAPIFLOW® FCM Series variation

Applicable fluids/flow rate control range

Applicable fluid	Model No.	Flow rate control range (L/min)		Body material	Port size
		0.01 0.1 10 100			
AIR Air N2 Nitrogen	FCM-9500 AI		0.015 to 0.5	Resin	Resin ø6 push-in ø8 push-in
	FCM-0001 AI		0.03 to 1		
	FCM-0002 AI		0.06 to 2		
	FCM-0005 AI		0.15 to 5		
	FCM-0010 AI		0 to 0.3	SUS	SUS Rc1/4 9/16-18 UNF
	FCM-0020 AI		0.6 to 20		
	FCM-0050 AI		1.5 to 50		
	FCM-0100 AI (Resin type only)		3 to 100		
Ar Argon	FCM-9500 AR		0.015 to 0.5	SUS	Rc1/4 9/16-18 UNF
	FCM-0001 AR		0.03 to 1		
	FCM-0002 AR		0.06 to 2		
	FCM-0005 AR		0.15 to 5		
	FCM-0010 AR		0 to 0.3		
	FCM-0020 AR		0.6 to 20		
	FCM-0050 AR		1.5 to 50		
O2 Oxygen 13A City gas CH4 Methane C3H8 Propane	FCM-9500 O2/LN/C1/C3		0.015 to 0.5	SUS	Rc1/4 9/16-18 UNF
	FCM-0001 O2/LN/C1/C3		0.03 to 1		
	FCM-0002 O2/LN/C1/C3		0.06 to 2		
	FCM-0005 O2/LN/C1/C3		0.15 to 5		
	FCM-0010 O2/LN/C1/C3		0 to 0.3		
H2 Hydrogen He Helium	FCM-0002 H2/HE		0.06 to 2	SUS	Rc1/4 9/16-18 UNF 1/4" Double barbed fitting 1/4" JXR male fitting
	FCM-0005 H2/HE		0.15 to 5		
	FCM-0010 H2/HE		0 to 0.3		
	FCM-0020 H2/HE		0.6 to 20		

System Table I/O specifications

Input		Model No.	Output		
Input signal: Specifications			Output Method	Specifications	Error output
Analog: 0-10 V		FCM-□-□0AN	Analog	1-5 V	NPN
		FCM-□-□0AP			PNP
bit Preset: 4 points (2 bit) (Note)		FCM-□-□0SN	NPN PNP Switch	NPN	NPN
		FCM-□-□0SP		PNP	PNP
Analog: 0-5 V		FCM-□-□1AN	Analog	1-5 V	NPN
		FCM-□-□1AP			PNP
bit Preset: 4 points (2 bit) (Note)		FCM-□-□1SN	NPN PNP Switch	NPN	NPN
		FCM-□-□1SP		PNP	PNP
Analog: 4-20 mA		FCM-□-□2AN	Analog	1-5 V	NPN
		FCM-□-□2AP			PNP
bit Preset: 4 points (2 bit) (Note)		FCM-□-□2SN	NPN PNP Switch	NPN	NPN
		FCM-□-□2SP		PNP	PNP
bit Parallel: 10bit		FCM-□-□PAN	Analog	1-5 V	NPN
		FCM-□-□PAP			PNP
		FCM-□-□PSN	NPN PNP Switch	NPN	NPN
		FCM-□-□PSP		PNP	PNP
IO-Link Preset: 8 points (3 bit)		FCM-□-□C	IO-Link		
RS-485 Analog: 0-10 V, 0-5 V, 4-20 mA *Can be changed with setting		FCM-□-□RAN	RS-485 Analog	1-5 V	NPN
		FCM-□-□RAP			PNP
RS-485 Preset: 4 points (2 bit)		FCM-□-□RSN	RS-485 Switch	NPN	NPN
		FCM-□-□RSP		PNP	PNP

Note: Preset 8 points (3 bit) input is available custom made. (In this case, the external accumulation reset signal input function cannot be used.) Contact the CKD Sales for details.



Compact flow rate controller RAPIFLOW

FCM Series

Analog input/parallel input

- For air, nitrogen, argon, oxygen, city gas, methane, propane (flow rate range: 0.5 to 100 L/min)
- For hydrogen, helium (flow rate range: 2.0 to 20 L/min)

Refer to the CKD website for detailed compatible model Nos.

■ Air, nitrogen, argon, oxygen, city gas, methane, propane

Model No. Notation Method

FCM - 9500 AI - H6 0 AN R 1 B T

- FCM: Model No.
- 9500: ❶Flow rate range
- AI: ❷Applicable fluid
- H6: ❸Port size, body material
- 0: ❹Input signal
- AN: ❺Output specifications
- R: ❻Indicator direction
- 1: ❼Cable
- B: ❽Bracket
- T: ❾Traceability

❶Flow rate range

	Description	Code	❷Applicable fluid					
			AI	AR	O2	LN	C1	C3
Standard model	0 to 0.5 L/min	9500	●	●	●	●	●	●
	0 to 1 L/min	0001	●	●	●	●	●	●
	0 to 2 L/min	0002	●	●	●	●	●	●
	0 to 5 L/min	0005	●	●	●	●	●	●
	0 to 10 L/min	0010	●	●	●	●	●	●
	0 to 20 L/min	0020	●	●				
	0 to 50 L/min	0050	●	●				
	0 to 100 L/min (resin body only)	0100	●					
Low differential pressure model (stainless steel only)	0 to 0.5 L/min	L9500	●		●	●	●	●
	0 to 1 L/min	L0001	●		●	●	●	●
	0 to 2 L/min	L0002	●		●	●	●	●
	0 to 5 L/min	L0005	●		●	●	●	●
	0 to 10 L/min	L0010	●		●	●	●	●

❷Applicable fluid

Code	Description
AI	Compressed air, nitrogen gas
AR	Argon
O2	Oxygen (oil-prohibited specifications)
LN	City gas (13A)
C1	Methane (CH_4)
C3	Propane (C_3H_8)

❸Port size, body material

	Port size	Body material		Code	❷Applicable fluid					
					AI	AR	O2	LN	C1	C3
Push-in	ø6 (*1)	Resin body		H6	●					
	ø8			H8	●					
Screw-in	Rc1/4	Stainless steel body		8 A	●	●	●	●	●	●
	9/16-18 UNF (*2)			UF	●	●	●	●	●	●

*1: ❶Flow rate range excludes "0050" and "0100".
*2: For 9/16-18UNF screw shape, please refer to the dimensional outline drawing on Page 532.

❹Input signal

Code	Description
0	Analog 0-10 VDC
1	Analog 0-5 VDC
2	Analog 4-20 mADC
P	Parallel 10 bit

❺Output specifications

Code	Description
AN	1-5 V analog error (NPN)
AP	1-5V analog error (PNP)
SN	Switch (NPN), error (NPN)
SP	Switch (PNP), error (PNP)

❻Indicator direction

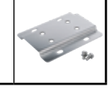
Code	Description
Blank	Forward direction
R	Reverse direction

❼Cable

Code	Description	
Blank	None	
1	1 m	
3	3 m	

Note: Shipped with the product.

❽Bracket

Code	Description	
Blank	None	
B	With bracket	

Note: Shipped with the product.

❾Traceability

Code	Description
Blank	None
T	Traceability certification with series variation diagram and company certification
K	With company certification

Note: Shipped with the product.

Discrete option model No.

FCM - AC1

- AC1: ❶Option

❶Option

Code	Description	
AC1	Analog 9-conductor, cable 1 m	
AC3	Analog 9-conductor, 3 m cable	
PC1	Parallel 15-conductor, cable 1 m	
PC3	Parallel 15-conductor, 3 m cable	
LB1	Bracket	

Specifications for air, nitrogen, argon, oxygen, city gas, methane, propane

Item				FCM-[1] [2]-[3] [4] [5]						
Valve drive method				Proportional solenoid valve When not energized: Closed						
				Full scale flow rate	AI (Air, nitrogen)	AR (Argon)	02 (Oxygen)	LN (City gas)	C1 (Methane)	C3 (Propane)
Flow rate range *1	[1]	Standard model	9500	500 mL/min	●	●	●	●	●	●
			0001	1 L/min	●	●	●	●	●	●
			0002	2 L/min	●	●	●	●	●	●
			0005	5 L/min	●	●	●	●	●	●
			0010	10 L/min	●	●	●	●	●	●
			0020	20 L/min	●	●				
			0050	50 L/min	●	●				
			0100	100 L/min (resin only)	●					
		(stainless steel only) Low differential pressure model	L9500	500 mL/min	●		●	●	●	●
			L0001	1 L/min	●		●	●	●	●
			L0002	2 L/min	●		●	●	●	●
			L0005	5 L/min	●		●	●	●	●
			L0010	10 L/min	●		●	●	●	●
Applicable fluid *2	[2]		AI	Compressed air, nitrogen	●					
			AR	Argon		●				
			O2	Oxygen (oil-prohibited specifications)			●			
			LN	City gas (13A) *3				●		
			C1	Methane (CH4 100%)					●	
			C3	Propane (C3H8 100%)						●
Port size, body material	[3]		H6	ø6 Push-in, resin (excluding 50, 100 L/min)	●					
			H8	ø8 push-in, resin	●					
			8 A	Rc1/4, Stainless steel	●	●	●	●	●	●
			UF	9/16-18UNF, stainless steel	●	●	●	●	●	●
Control	Control range				3 to 100% F.S.					
	Response time	[1]	9500 to 0020, L9500 to L0010		Within 0.5 sec. to setting ±5% F.S. (TYP.)					
			0050 to 0100		Within 1 sec. to setting ±5% F.S. (TYP.)					
	Accuracy				Within ±3% F.S.					
	Repeatability				Within ±1% F.S.					
	Temperature characteristics				Within ±0.2% F.S./°C (base temp. 25°C)					
	Pressure characteristics				Within ±1% F.S. per 98 kPa (standard differential pressure ref.)					
Pressure	Standard differential pressure *4				Refer to the separate table					
	Working pressure differential *5				Refer to the separate table					
	Max. working pressure *5				Refer to the separate table					
	Proof pressure	[3]	H6/H8 (Resin body)		490 kPa					
			8A/UF (SUS body)		980 kPa					
Operating ambient temperature, operating ambient humidity					0 to 50°C, 90% RH or less (no condensation)					
I/O	Input signal/ preset input	[4]	0		0-10 VDC (6.7 kΩ)/4 points (2 bit)					
			1		0-5VDC (10 kΩ)/4 point (2 bit))					
			2		4-20 mADC (250 Ω)/4 points (2 bit))					
			P		Parallel 10 bit/none					
	Output signal	[5]	AN		Analog output: 1-5 V (connecting load impedance 500 kΩ and over) Error output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less					
			AP		Analog output: 1-5 V (connecting load impedance 500 kΩ and over) Error output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less					
			SN		Switch output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less Error output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less					
			SP		Switch output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less Error output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less					
Flow rate display	Indicator method				7-segment LED 3-digit, indicator accuracy: control accuracy ±1digit					
	Indicator range, display resolution				Refer to the separate table					
Integrating functions					Refer to the separate table					
Power Supply	Power supply voltage				24VDC ±10% (stabilized power supply with ripple rate 2% or less)					
	Current consumption *6				250 mA or less					
Mounting orientation					Unrestricted in vertical/horizontal direction					
Wetted section materials		[3]	H6/H8 (Resin body)		Polyamide resin, fluoro rubber, stainless steel, alumina, semiconductor silicon, soldering					
			8A/UF (SUS body)		Stainless steel, fluoro rubber, alumina, semiconductor silicon, soldering					
Weight		[3]	H6/H8 (Resin body)		Approx. 200 g					
			8A/UF (SUS body)		Approx. 480 g					
Degree of Protection					IEC standards IP40 or equivalent					
Protection circuit *7					Power reverse connection protection, switch output reverse connection protection, switch output load short-circuit protection					
EMC Directive					EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8					

Pressure

Standard differential pressure, working pressure differential *4, 5

(Standard model)

Applicable fluid [2]			Flow rate range [1] 9500	0001	0002	0005	0010	0020	0050	0100
	AI	Standard differential pressure (kPa)	50	100	100	100	100	150	200	300
		Working pressure differential (kPa)	20 to 150	50 to 200	50 to 250	50 to 250	50 to 250	100 to 300	150 to 300	250 to 350
		Max. working pressure (kPa)	150	200	250	250	250	300	300	350
	AR	Standard differential pressure (kPa)	50	100	100	100	100	150	200	
		Working pressure differential (kPa)	20 to 150	50 to 200	50 to 250	50 to 250	50 to 250	100 to 300	150 to 300	
		Max. working pressure (kPa)	150	200	250	250	250	300	300	
	O2	Standard differential pressure (kPa)	50	100	100	100	100			
		Working pressure differential (kPa)	20 to 150	50 to 200	50 to 250	50 to 250	50 to 250			
		Max. working pressure (kPa)	150	200	250	250	250			
	LN/C1	Standard differential pressure (kPa)	50	50	50	50	50			
		Working pressure differential (kPa)	20 to 150	20 to 150	20 to 150	20 to 150	30 to 150			
		Max. working pressure (kPa)	150	150	150	150	150			
	C3	Standard differential pressure (kPa)	50	50	50	50	50			
		Working pressure differential (kPa)	20 to 150	20 to 150	20 to 150	20 to 150	30 to 150			
		Max. working pressure (kPa)	150	150	150	150	150			

(Low differential pressure model)

Applicable fluid [2]		Flow rate range [1] L9500	L0001	L0002	L0005	L0010
AI/**O2** LN/C1 C3 *8	Standard differential pressure (kPa)	20	20	20	20	20
	Working pressure differential (kPa)	5 to 50	5 to 50	5 to 50	5 to 50	10 to 50
	Max. working pressure (kPa)	50	50	50	50	50

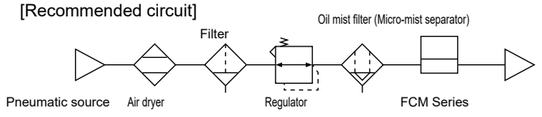
Indicator, integrating functions

		Flow rate range [1] 9500 L9500	0001 L0001	0002 L0002	0005 L0005	0010 L0010	0020	0050	0100
Flow rate display *9	Indicator range	0 to 500 mL/min	0.00 to 1.00 L/min	0.00 to 2.00 L/min	0.00 to 5.00 L/min	0.0 to 10.0 L/min	0.0 to 20.0 L/min	0.0 to 50.0 L/min	0 to 100 L/min
	Indicator resolution	1 mL/min	0.01 L/min	0.01 L/min	0.01 L/min	0.1 L/min	0.1 L/min	0.1 L/min	1 L/min
Integrating functions *10	Indicator range	999999 mL	9999.99 L	9999.99 L	9999.99 L	99999.9 L	99999.9 L	99999.9 L	999999 L
	Indicator resolution	1 mL	0.01 L	0.01 L	0.01 L	0.1 L	0.1 L	0.1 L	1 L
	Pulse output rate	5 mL	0.01 L	0.02 L	0.05 L	0.1 L	0.2 L	0.5 L	1 L

*1: The value converted to volumetric flow rate at standard condition (20°C 1 barometric pressure (101 kPa) relative humidity 65%). Full scale stands for max. scale flow rate in the flow rate range.

*2: Use dry gas which does not contain corrosive elements such as chlorine, sulfur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air compliant with ISO 8573-1: 2010 [1:1:1 to 1:6:2]. Compressed air from the compressor contains drainage-water, oil oxide, foreign substances, etc. To maintain the functionality of this product, install a filter, air dryer (minimum pressure dew point 10°C or less) and oil mist filter (maximum oil concentration 0.1 mg/m^3) on the primary side (upstream) of this product.

[Recommended circuit]



[Recommended device]
Air filter: F Series
Oil mist filter: M Series

*3: City gas 13A is for 88% methane (CH_4) gas produced from LNG.

*4: Standard differential pressure is the differential pressure when this product is calibrated. (Secondary side released to atmosphere)

*5: Working pressure differential is the differential pressure required for normal operation of this product. Note that the values depend on the flow rate range and applicable fluids. The min. value of the working pressure differential is the differential pressure required for the full scale flow rate to flow when secondary side is released to atmosphere. The max. working pressure (max. value of working pressure differential) is the max. value of primary side pressure. If more pressure is applied, control may become unstable, or the max. flow rate may not be controllable.

*6: Current at 24 VDC, no load connected, and full-scale flow rate. Note that current consumption may vary depending on load conditions.

*7: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.

*8: When using a low pressure city gas line (1 to 2.5 kPa), the working pressure differential range is exceeded.

*9: The flow rate display is rounded off at approx. 1%F.S. or less (forced zero).

*10: The integrating flow is a reference value. It is reset when the power is turned OFF.

*11: The valve inside this product cannot be used as a stop valve requiring zero leakage. Slight leakage is allowed for in the specifications.

*12: The output impedance of the analog output voltage section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.

■ For hydrogen, helium

Model No. Notation Method

FCM - 0002 H2 - 8A 0 AN R 1 B T

Model No. / ❶Flow rate range / ❷Applicable fluid / ❸Port size / ❹Input signal / ❺Output specifications / ❻Indicator direction / ❼Cable / ❽Bracket / ❾Traceability

❶Flow rate range

Code	Description	❷Applicable fluid	
		H2	HE
0002	0 to 2 L/min	●	●
0005	0 to 5 L/min	●	●
0010	0 to 10 L/min	●	●
0020	0 to 20 L/min	●	●

❷Applicable fluid

Code	Description
H2	Hydrogen
HE	Helium

❸Port size

Port size			Code	❷Applicable fluid	
				H2	HE
Screw-in	Rc1/4		8 A	●	●
	9/16-18UNF (Note)		UF	●	●
1/4" double barbed fitting			4S	●	●
1/4" JXR male fitting			4RM	●	●

Note: Refer to dimensions diagram on Page 532 for shape of 9/16-18UNF thread.

❹Input signal

Code	Description
0	Analog 0-10 VDC
1	Analog 0-5 VDC
2	Analog 4-20 mADC
P	Parallel 10 bit

❺Output specifications

Code	Description
AN	1-5 V analog error (NPN)
AP	1-5V analog error (PNP)
SN	Switch (NPN), error (NPN)
SP	Switch (PNP), error (PNP)

❻Indicator direction

Code	Description
Blank	Forward direction
R	Reverse direction

❼Cable

Code	Description	
Blank	None	
1	1 m	
3	3 m	

Note: Shipped with the product.

❽Bracket

Code	Description	
Blank	None	
B	With bracket	

Note: Shipped with the product.

❾Traceability

Code	Description
Blank	None
T	Traceability certification with series variation diagram and company certification
K	With company certification

Note: Shipped with the product.

Discrete option model No.

FCM - AC1

❶Option

❶Option

Code	Description	
AC1	Analog 9-conductor, cable 1 m	
AC3	Analog 9-conductor, 3 m cable	
PC1	Parallel 15-conductor, cable 1 m	
PC3	Parallel 15-conductor, 3 m cable	
LB1	Bracket	

■ Specifications for hydrogen, helium

Item				FCM-[❶] [❷]-[❸] [❹] [❺]		
Valve drive method				Proportional solenoid valve When not energized: Closed		
				Full scale flow rate	H2 (Hydrogen)	HE (Helium)
Flow rate range *1	[❶]		0002	2 L/min	●	●
			0005	5 L/min	●	●
			0010	10 L/min	●	●
			0020	20 L/min	●	●
Applicable fluids *2	[❷]		H2	Hydrogen	●	
			HE	Helium		●
Port size	[❸]		8 A	Rc1/4	●	●
			UF	9/16-18UNF	●	●
			4S	1/4" double barbed fitting	●	●
			4RM	1/4" JXR male fitting	●	●
Control	Control range				3 to 100% F.S.	
	Response time				Within 0.5 sec. to setting ±5% F.S. (TYP.)	
	Accuracy				Within ±3% F.S.	
	Repeatability				Within ±1% F.S.	
	Temperature characteristics				Within ±0.2% F.S./°C (base temp. 25°C)	
	Pressure characteristics				Within ±1% F.S. per 98 kPa (standard differential pressure ref.)	
Pressure	Standard differential pressure *3				Refer to the separate table	
	Working pressure differential *4				Refer to the separate table	
	Max. working pressure *4				Refer to the separate table	
	Proof pressure				980 kPa	
Operating ambient temperature, Operating ambient humidity					0 to 50°C, 90% RH or less (no condensation)	
External leakage					1 x 10^{-6} PA·m³/s or less (helium leakage rate)	
I/O	Input signal/ preset input	[❹]	0		0 to 10 VDC (6.7 kΩ)/4 point (2 bit)	
			1		0 to 5 VDC (10 kΩ)/4 point (2 bit)	
			2		4 to 20 mADC (250 Ω)/4 points (2 bit))	
			P		Parallel 10 bit/none	
	Output signal	[❺]	AN		Analog output: 1-5 V (connecting load impedance 500 kΩ and over) Error output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less	
			AP		Analog output: 1-5 V (connecting load impedance 500 kΩ and over) Error output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less	
			SN		Switch output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less Error output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less	
			SP		Switch output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less Error output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less	
Flow rate display	Indicator method				7-segment LED 3-digit, indicator accuracy: control accuracy ±1digit	
	Indicator range, display resolution				Refer to the separate table	
Integrating functions					Refer to the separate table	
Power Supply	Power supply voltage				24 VDC ±10% (stabilized power supply with ripple rate 1% or less)	
	Current consumption *5				270 mA or less	
MountingOrientation					Unrestricted in vertical/horizontal direction	
Wetted section materials					Stainless steel, fluoro rubber, alumina, semiconductor silicon, soldering	
Weight		[❸]	8A/UF		Approx. 480 g	
			4S/4RM		Approx. 560 g	
Degree of Protection					IEC standards IP40 or equivalent	
Protection circuit *6					Power reverse connection protection, switch output reverse connection protection, switch output load short-circuit protection	
EMC Directive					EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8	

Pressure

Standard differential pressure, working pressure differential

			Flow rate range [❶]			
			0002	0005	0010	0020
Applicable fluid[❷]	H2	Standard differential pressure (kPa)	20	50	50	50
		Working pressure differential (kPa)	10 to 50	30 to 80	30 to 80	30 to 80
		Max. working pressure (kPa)	50	80	80	80
	HE	Standard differential pressure (kPa)	50	100	100	100
		Working pressure differential (kPa)	20 to 100	50 to 150	50 to 150	50 to 150
		Max. working pressure (kPa)	100	150	150	150

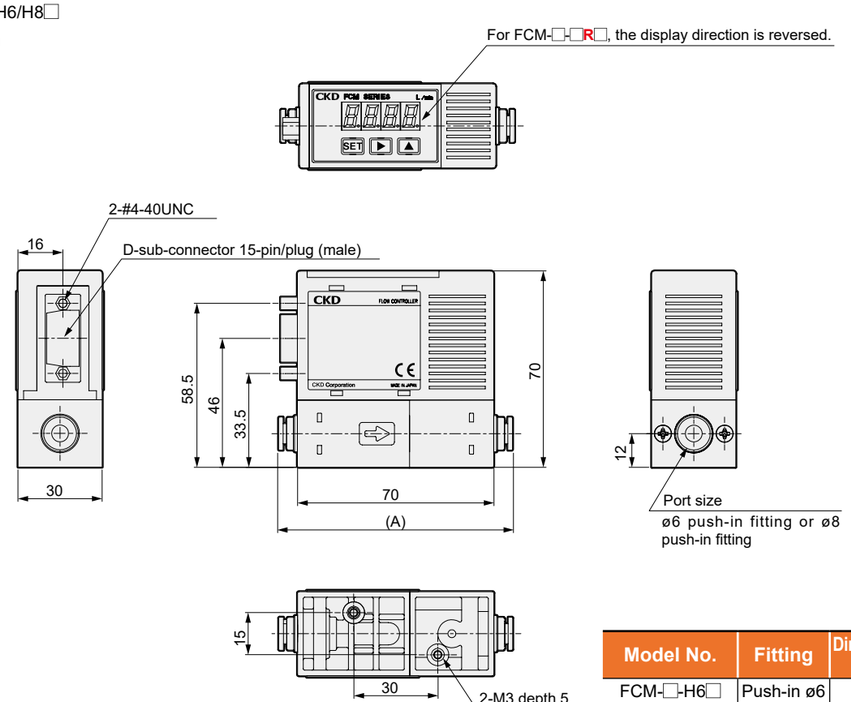
Indicator, integrating functions

		Flow rate range [❶]			
		0002	0005	0010	0020
Flow rate display *7	Indicator range	0.00 to 2.00 L/min	0.00 to 5.00 L/min	0.0 to 10.0 L/min	0.0 to 20.0 L/min
	Indicator resolution	0.01 L/min	0.01 L/min	0.1 L/min	0.1 L/min
Integrating functions *8	Indicator range	9999.99 L	9999.99 L	99999.9 L	99999.9 L
	Indicator resolution	0.01 L	0.01 L	0.1 L	0.1 L
	Pulse output rate	0.02 L	0.05 L	0.1 L	0.2 L

*1: Flow rate converted to volumetric flow rate at 20°C, 1 barometric pressure (101 kPa). Full scale stands for max. scale flow rate in the flow rate range.
*2: Use dry gas which does not contain corrosive elements such as chlorine, sulfur or acids, and which is clean and does not contain dust or oil mist.
*3: Standard differential pressure is the differential pressure when this product is calibrated. (Secondary side released to atmosphere)
*4: Working pressure differential is the differential pressure required for normal operation of this product. Note that the values depend on the flow rate range and applicable fluids. The min. value of the working pressure differential is the differential pressure required for the full scale flow rate to flow when secondary side is released to atmosphere. The max. working pressure (max. value of working pressure differential) is the max. value of primary side pressure. If more pressure is applied, control may become unstable, or the max. flow rate may not be controllable.
*5: Flow rate for 24 VDC, when no load is connected, and when the flow rate is full scale. The current consumption will vary depending on the load.
*6: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.
*7: The flow rate display is rounded off at approx. 1%F.S. or less (forced zero).
*8: The accumulated flow is a calculated (reference) value. It is reset when the power is turned OFF.
*9: The valve inside this product cannot be used as a stop valve requiring zero leakage. Slight leakage is allowed for in the specifications.
*10: The output impedance of the analog output voltage section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.

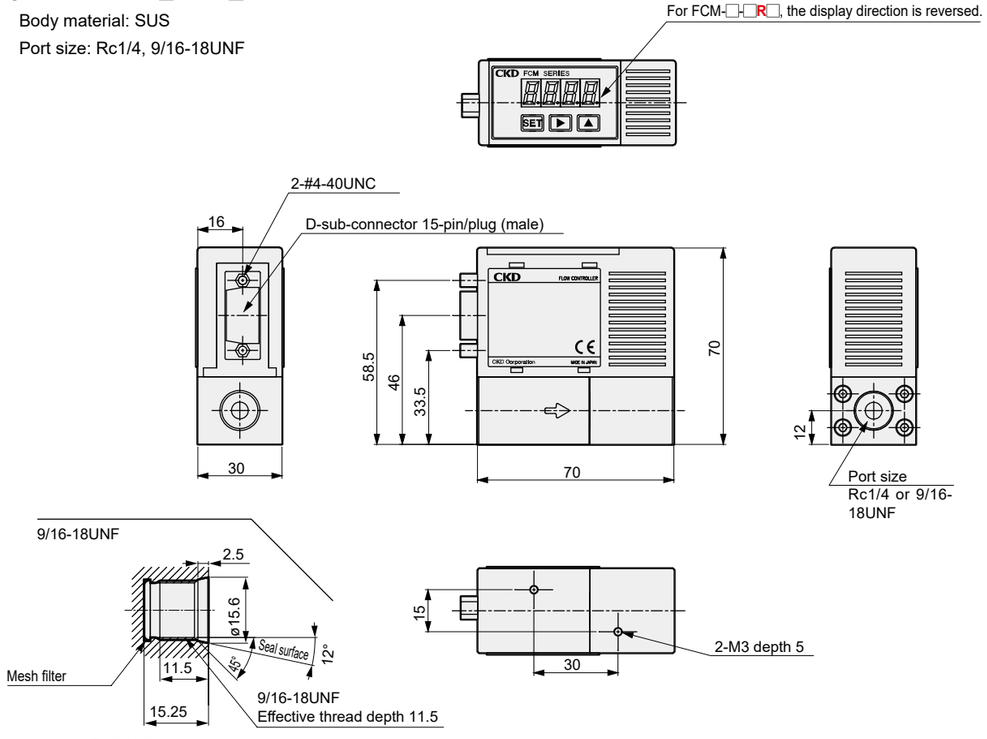
Dimensions

●Model No.: FCM-□-H6/H8□
Body material: Resin
Port size: ø6, ø8



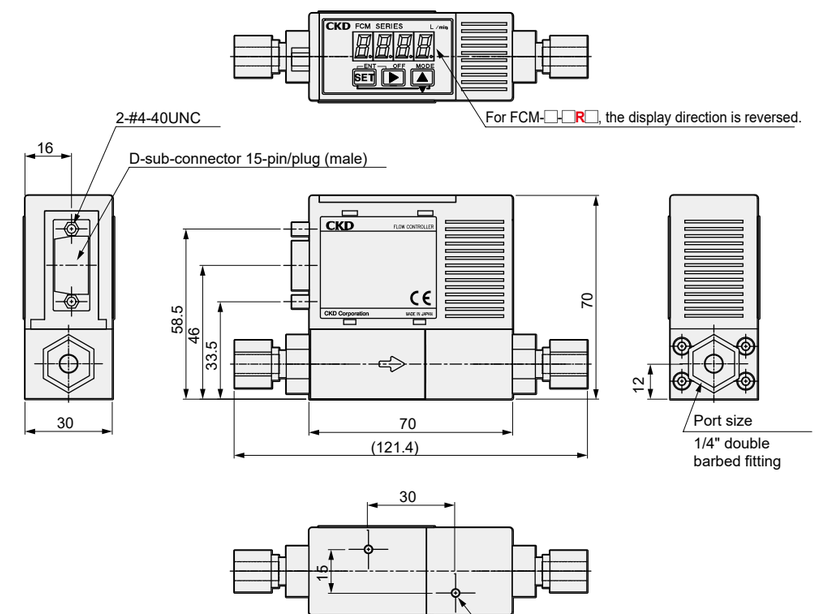
Model No.	Fitting	Dimension (A)
FCM-□-H6□	Push-in ø6	84
FCM-□-H8□	Push-in ø8	85

● Model No.: FCM-□-8A/UF□
Body material: SUS
Port size: Rc1/4, 9/16-18UNF

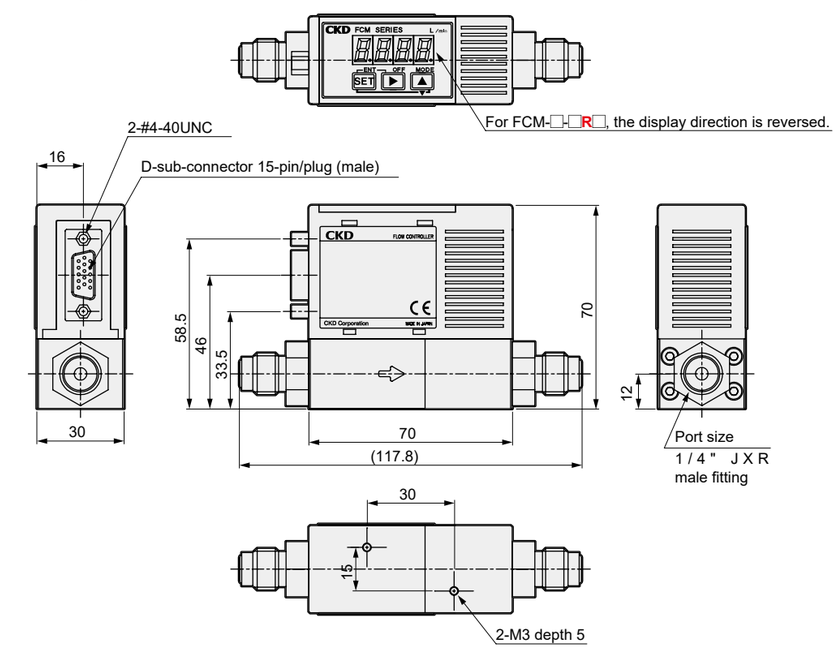


Dimensions

●Model No.: FCM-□-4S□
Body material: SUS
Port size: 1/4" double barbed fitting

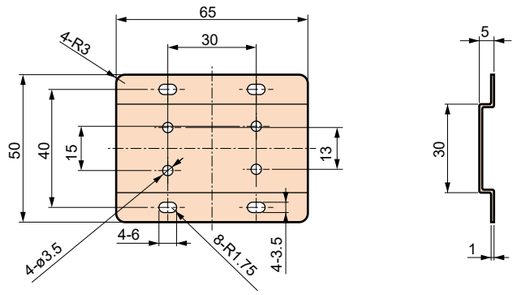


●Model No.: FCM-□-4RM□
Body material: SUS
Port size: 1/4" JXR male fitting

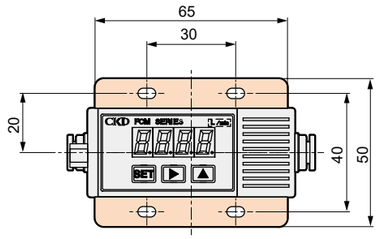


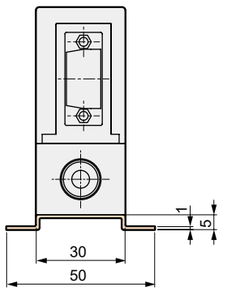
Dedicated bracket (floor mounted)

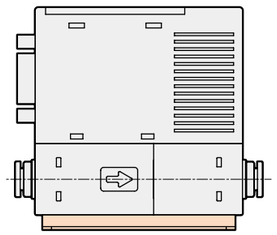
Discrete model No.:FCM-LB1

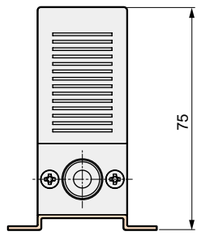


Material: Steel
Weight: 28 g



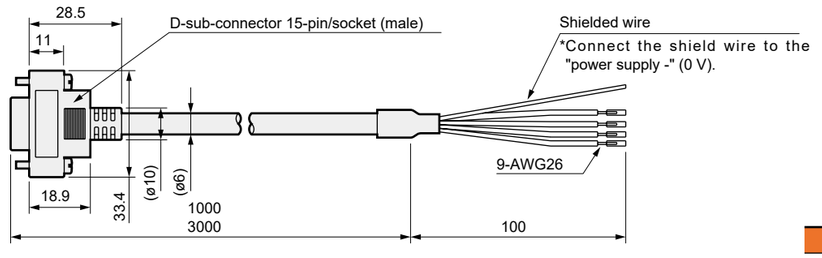






Cable optional dimensions

●9-conductor cable for analog input
Discrete option model No.:FCM-AC1, AC3

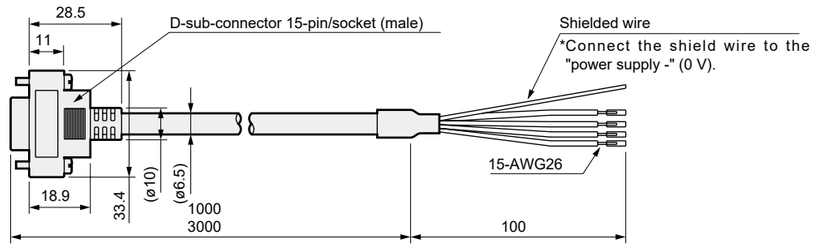


Cable	Weight g
FCM-AC1	68
FCM-AC3	166

D sub-socket pin No.	1	2	3	4	5	6	7	8	9	10	11			12	13		14	15
Insulator color	Brown	Orange	Yellow	–	Red	–	–	–	–	Gray	White			–	Green		Blue	Black
Name	Preset input signal		Integrating Reset Signal	Vacant	Power supply +	Vacant	Vacant	Vacant	Vacant	Common	Input signal			Vacant	Analog Output	Switch Output	Error output	Power supply -(0 V)
Input	Bit 1	Bit 2			+24 VDC						0-10 VDC	0-5 VDC	4-20 mADC	Vacant	1-5 VDC	NPN or PNP output	NPN or PNP output	

Note: The No. 10 pin common is the common for the preset input and accumulation reset signal (pin No. 1 to 6).

●15-conductor cable for parallel input
Discrete option model No.:FCM-PC1, PC3



Cable	Weight g
FCM-PC1	82
FCM-PC3	205

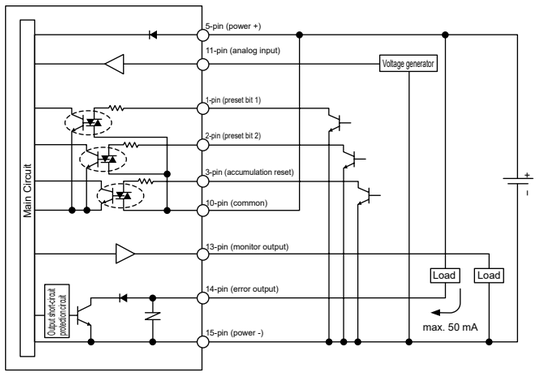
D sub-socket pin No.	1	2	3	4	5	6	7	8	9	10	11	12	13		14	15
Insulator color	Brown	Orange	Yellow	Purple	Red	Light blue	Pink	White (black lineON)	Red (black lineON)	Gray	White	Green (black lineON)	Green		Blue	Black
Name	Parallel input signal				Power supply +	Parallel input signal				Common	Parallel input signal		Analog Output	Switch Output	Error output	Power supply -(0 V)
Input	Bit 1	Bit 2	Bit 3	Bit 4	+24 VDC	Bit 5	Bit 6	Bit 7	Bit 8		Bit 9	Bit 10	1-5 VDC	NPN or PNP output	NPN or PNP output	

Note: The No. 10 pin common is the common for the parallel input signal (pin No. 1 to 4, 6 to 9, 11, 12).

Example of internal circuit and load connection Analog input

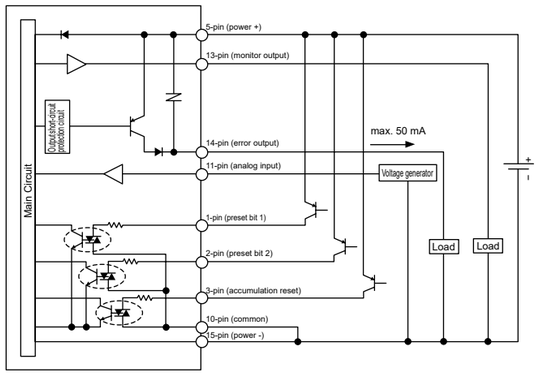
⚠ CAUTION Take care to prevent incorrect wiring.

FCM-□-□0/1/2 AN□
(Analog input, analog output + error output type NPN output)



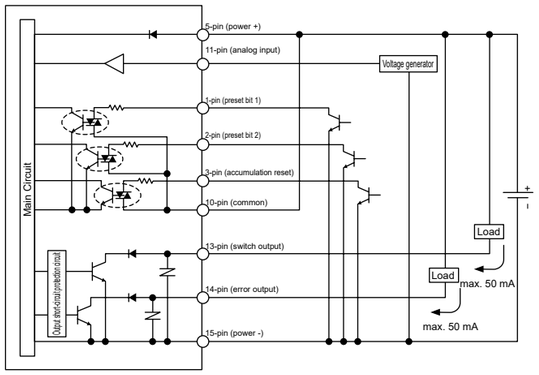
*Current consumption of pins 1 to 3 is approx. 6 mA.

FCM-□-□0/1/2 AP□
(Analog input, analog output + error output type PNP output)



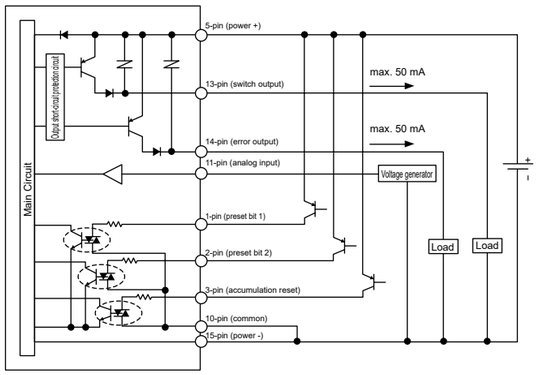
*Current consumption of pins 1 to 3 is approx. 6 mA.

FCM-□-□0/1/2 SN□
(Analog input, switch output + error output type NPN output)



*Current consumption of pins 1 to 3 is approx. 6 mA.

FCM-□-□0/1/2 SP□
(Analog input, switch output + error output type PNP output)



*Current consumption of pins 1 to 3 is approx. 6 mA.

■ Connector pin array (product side)
[Analog input]

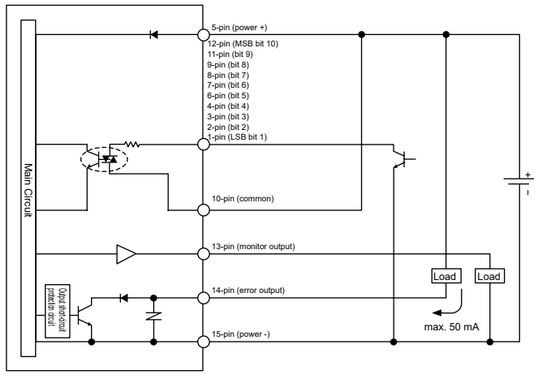
(1) (2) (3) (4) (5)
(6) (7) (8) (9) (10)
(11) (12) (13) (14) (15)

The analog input type
(4), (6), (7), (8), (9), (12) does not have a pin.

Example of internal circuit and load connection Parallel input

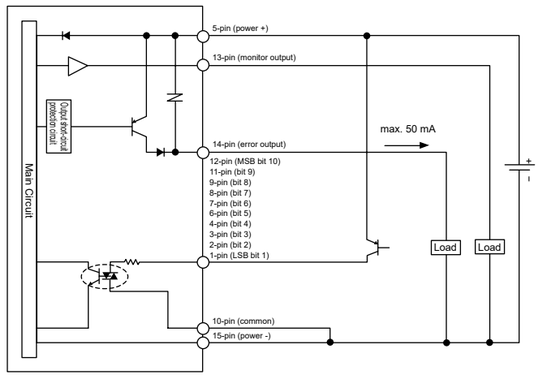
⚠ CAUTION Take care to prevent incorrect wiring.

FCM-□-□ PAN□
(Parallel input, analog output + error output type NPN output)



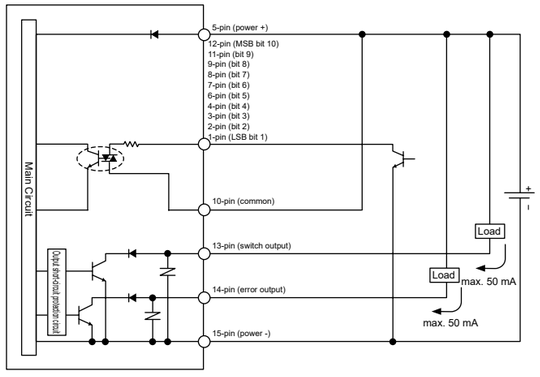
*The current consumption for pins 1 to 4, 6 to 9, 11, and 12 is approximately 6 mA.

FCM-□-□ PAP□
(Parallel input, analog output + error output type PNP output)



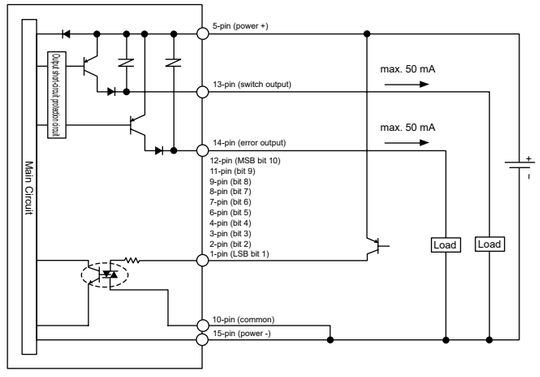
*The current consumption for pins 1 to 4, 6 to 9, 11, and 12 is approximately 6 mA.

FCM-□-□ PSN□
(Parallel input, switch output + error output type NPN output)



*The current consumption for pins 1 to 4, 6 to 9, 11, and 12 is approximately 6 mA.

FCM-□-□ PSP□
(Parallel input, switch output + error output type PNP output)



*The current consumption for pins 1 to 4, 6 to 9, 11, and 12 is approximately 6 mA.

■ Connector pin array (product side)
[Parallel input]

(1) (2) (3) (4) (5)
(6) (7) (8) (9) (10)
(11) (12) (13) (14) (15)

Names and functions of display / operation section

Output display (Red)



●F is displayed when confirming the function setting

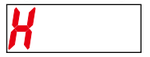


●When the switch output is ON, "-" lights up.(switch output only)
* Blinks when overcurrent is detected.
* Does not blink at integrated pulse output.

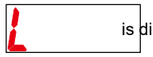


●E lights up when error output is ON.
* Blinks when overcurrent is detected.

*When there are upper/lower limits for function setting or when the higher digits or lower digits of accumulated flow display are indicated



or



is displayed.

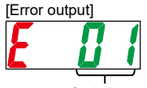
3-digit number LED display (green)

●Indicators instantaneous flow rate display and function setting details during RUN mode (instantaneous flow rate display).
* The setting mode No. and setting details are displayed when displaying details of function settings.
●When setting each data, the values, etc., are displayed.
●Error code No. is displayed at the time of error display.

[At instantaneous flow rate display]



[Error output]



Code No.

[Setting details display]



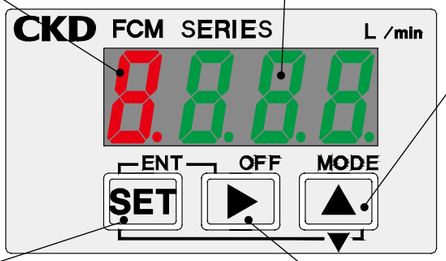
Setting details
Setting mode No.

[Disabled display]



Setting details
Setting mode No.

Flow rate 110% or more: Hi



UP key (MODE key)

●Used to count up values, etc.
●Used to change the setting mode.
●Used to change the settings item.

SET Key

●Used to confirm the setting mode.
●Used to confirm the setting item.
●Used to change to the integration display.

Shift key (OFF key)

●It is used to select the digits to the values, etc.
●Used to reset from forced OFF when performing forced OFF (control stop).

SET + Key (ENT key)

●Used to confirm the value.
●Used to release the key lock.
●Used to reset accumulation.

SET + Key (DOWN key)

●Used to count down values, etc.
●Used to set the key lock.

Key

●Used for resetting settings (initialization).

Compact flow rate controller Functions of FCM Series (analog/parallel)

No.	Function	Description	Function compatible model			
			Analog input		Parallel input	
			Analog Output	Switch Output	Analog Output	Switch Output
F1.- -	Direct memory function	Target value can be entered by key. Control flow rate can be controlled freely by operation key on the product even if there is no external input signal.	○	○	○	○
	Preset input function	By specifying 4 arbitrary flow rates, the flow rate can be controlled with an external 2-bit input signal (signal from PLC, etc.).	○	○	-	-
	Analog input function	Flow rate can be controlled with an analog input signal.	○	○	-	-
	Parallel input function	Flow rate can be controlled with a parallel 10-bit (signal from PLC, etc.). Expensive input-output devices such as D/A converters are not required.	-	-	○	○
F2.- -	Input signal zero/span adjustment function	Zero point or span point of input signal can be changed. [When disabled] 100% Control flow rate 0% 100% Input signal [When enabled] 100% Zero point (L) setting range 0 to 50% Span point (H) setting range 10 to 100% 0% 100% Input signal	○	○	-	-
F3.- -	Auto-power OFF	Turns the flow rate display OFF if not operated for approx. 1 minute (control does not stop with auto-power OFF function). Turns off unneeded displays to enable energy-saving operation.	○	○	○	○
F4.- -	Switch output function	The switch functions below can be selected. • ①Tolerance mode: Turns the switch ON when the value is within tolerance against the control target value (arbitrary setting) • ②Designated range mode: Turns the switch ON when the value is outside the designated flow rate range • ③Integrated pulse: Outputs the integrated pulse when performing integration • ④ON at set integration or higher: Turns the switch ON when the value reaches the set accumulated flow [Mode 1: Tolerance mode] H (+ tolerance side) Input signal set value L (- tolerance side) Output ON OFF [Mode 2: Designated range mode] H (upper limit side) L (lower limit side) Output ON OFF [Mode 3: Integrated pulse] Approximately 50 msec ON OFF [Mode 4: ON at set integration or higher] ON OFF Refer to the specifications for details on the pulse output rate. Set integrated value	-	○	-	○
F5.- -	Integrating functions	Integrates the flow rate. As well as accumulated flow display, it has the following functions. • Closes the solenoid valve when the value reaches the set accumulated flow • Integrated pulse function (switch output only) *1 • Turns the switch ON when the value reaches the set accumulated flow (switch output only) *1 How to reset the integrated value • Analog input: External input, button operation • Parallel input: Button operation only	○ (*1)	○	○ (*1)	○
F6.- -	Error auto shut-off	Stops control when an error occurs, fully opens or closes valves, and turns error output ON.	○	○	○	○
F7.- -	Zero point adjustment	Adjusts the zero point of flow rate output.	○	○	○	○
	Error display function	Capable of displaying error state. As well as error display, it has the following functions. • Turns ON error output when an error occurs(Applicable only for E01, E02, E05) • Stops control automatically when an error occurs	○	○	○	○
	Key lock	Disables setting change to avoid incorrect operation.	○	○	○	○
	Reset setting	Returns the settings to default. (Input signal selection, switch output, input signal zero/span adjustment, auto-power OFF, zero adjustment only)	○	○	○	○

For details on operation and setting method, refer to CKD components product website (https://www.ckd.co.jp/kiki/en/) → "Model No."→ Instruction manual



Compact flow rate controller RAPIFLOW

FCM Series

IO-Link

- For air, nitrogen, argon, oxygen, city gas, methane, propane (flow rate range: 0.5 to 100 L/min)
- For hydrogen, helium (flow rate range: 2.0 to 20 L/min)

CE UKCA RoHS

Refer to the CKD website for detailed compatible model Nos.

Air, nitrogen, argon, oxygen, city gas, methane, propane

Model No. Notation Method

FCM - 9500 AI - H6 C R S B T

- Model No.
- ❶ Flow rate range
- ❷ Applicable fluid
- ❸ Port size, body material
- Input signal: IO-Link
- ❹ Indicator direction
- ❺ Cable
- ❻ Bracket
- ❼ Traceability

❶ Flow rate range

	Description	Code	❷ Applicable fluid					
			AI	AR	O2	LN	C1	C3
Standard model	0 to 0.5 L/min	9500	●	●	●	●	●	●
	0 to 1 L/min	0001	●	●	●	●	●	●
	0 to 2 L/min	0002	●	●	●	●	●	●
	0 to 5 L/min	0005	●	●	●	●	●	●
	0 to 10 L/min	0010	●	●	●	●	●	●
	0 to 20 L/min	0020	●	●				
	0 to 50 L/min	0050	●	●				
	0 to 100 L/min (resin body only)	0100	●					
Low differential pressure model (stainless steel only)	0 to 0.5 L/min	L9500	●		●	●	●	●
	0 to 1 L/min	L0001	●		●	●	●	●
	0 to 2 L/min	L0002	●		●	●	●	●
	0 to 5 L/min	L0005	●		●	●	●	●
	0 to 10 L/min	L0010	●		●	●	●	●

❷ Applicable fluid

Code	Description
AI	Compressed air, nitrogen gas
AR	Argon
O2	Oxygen (oil-prohibited specifications)
LN	City gas (13A)
C1	Methane (CH_4)
C3	Propane (C_3H_8)

❸ Port size, body material

	Port size	Body material		Code	❷ Applicable fluid					
					AI	AR	O2	LN	C1	C3
Push-in	ø6 (*1)	Resin body		H6	●					
	ø8			H8	●					
Screw-in	Rc1/4	Stainless steel body		8A	●	●	●	●	●	●
	9/16-18 UNF (*2)			UF	●	●	●	●	●	●

*1: Flow rate range excludes "0050" and "0100".
*2: For 9/16-18UNF screw shape, please refer to the dimensions diagram on Page 548

❹ Indicator direction

Code	Description
Blank	Forward direction
R	Reverse direction

❺ Cable

Code	Description	
Blank	None	
S	Straight (female), straight (male) 3 m	
L	L-type (female) / straight (male) 3 m	
M	One side straight (female) 3 m	

Note: Shipped with the product.

❻ Bracket

Code	Description	
Blank	None	
B	With bracket	

Note: Shipped with the product.

❼ Traceability

Code	Description
Blank	None
T	Traceability certification with series variation diagram and company certification
K	With company certification

Note: Shipped with the product.

Discrete option model No.

FCM - MS3

- ❶ Option

❶ Option

Code	Description	
MS3	Straight (female), straight (male) 3 m	
ML3	L-type (female) / straight (male) 3 m	
MM3	One side straight (female) 3 m	
LB1	Bracket	

■ Specifications for air, nitrogen, argon, oxygen, city gas, methane, propane

Item \ Model No.				FCM-[❶] [❷]-[❸]C						
Valve drive method				Proportional solenoid valve When not energized: Closed						
				Full scale flow rate	AI (Air, nitrogen)	AR (Argon)	O2 (Oxygen)	LN (City gas)	C1 (Methane)	C3 (Propane)
Flow rate range *1	[❶]	Standard	9500	500 mL/min	●	●	●	●	●	●
			0001	1 L/min	●	●	●	●	●	●
			0002	2 L/min	●	●	●	●	●	●
			0005	5 L/min	●	●	●	●	●	●
			0010	10 L/min	●	●	●	●	●	●
			0020	20 L/min	●	●				
			0050	50 L/min	●	●				
			0100	100 L/min (resin only)	●					
		(stainless steel only) Low differential pressure	L9500	500 mL/min	●		●	●	●	●
			L0001	1 L/min	●		●	●	●	●
			L0002	2 L/min	●		●	●	●	●
			L0005	5 L/min	●		●	●	●	●
			L0010	10 L/min	●		●	●	●	●
Applicable fluid *2	[❷]		AI	Compressed air, nitrogen	●					
			AR	Argon		●				
			O2	Oxygen (oil-prohibited specifications)			●			
			LN	City gas (13A) *3				●		
			C1	Methane (CH4 100%)					●	
			C3	Propane (C3H8 100%)						●
Port size, body material	[❸]		H6	ø6 Push-in, resin (excluding 50 and 100 L/min)	●					
			H8	ø8 Push-in, resin	●					
			8A	RC1/4, stainless steel	●	●	●	●	●	●
			UF	9/16-18UNF, stainless steel	●	●	●	●	●	●

Control	Control range		3 to 100% F.S.
	Response time	[❶] 9500 to 0020, L9500 to L0010	Within 0.5 sec. to setting ±5% F.S. (TYP.)
		[❶] 0050 to 0100	Within 1 sec. to setting ±5% F.S. (TYP.)
	Accuracy		Within ±3% F.S.
	Repeatability		Within ±1% F.S.
	Temperature characteristics		Within ±0.2% F.S./°C (base temperature 25°C)
	Pressure characteristics		Within ±1% F.S. per 98 kPa (standard differential pressure reference)
Pressure	Standard differential pressure *4		Refer to the separate table
	Working pressure differential *5		Refer to the separate table
	Max. working pressure *5		Refer to the separate table
	Proof pressure	[❷] H6/H8 (Resin body)	490 kPa
		[❷] 8A/UF (SUS body)	980 kPa
Operating ambient temperature, operating ambient humidity			0 to 50°C, 90% RH or less (no condensation)
I/O	Input signal	C	IO-Link
Flow rate display	Indicator method		7-segment LED 3-digit, indicator accuracy: control accuracy ±1digit
	Indicator range, display resolution		Refer to the separate table
Integrating functions			Refer to the separate table
Power Supply	Power supply voltage		24 VDC ±10% (stabilized power supply with ripple rate 1% or less)
	Current consumption *6		200 mA or less (Port type A)
Mounting orientation			Unrestricted in vertical/horizontal direction
Wetted section materials	[❸]	H6/H8 (Resin body)	Polyamide resin, fluoro rubber, stainless steel, alumina, semiconductor silicon, soldering
		8A/UF (SUS body)	Stainless steel, fluoro rubber, alumina, semiconductor silicon, soldering
Weight	[❸]	H6/H8 (Resin body)	Approx. 200 g
		8A/UF (SUS body)	Approx. 480 g
Degree of Protection			IEC standards IP40 or equivalent
Protection circuit *7			Power supply reverse connection protection
EMC Directive			EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8

Pressure

Standard differential pressure, working pressure differential *4, 5

(Standard model)

			Flow rate range [❶] 9500	0001	0002	0005	0010	0020	0050	0100
Applicable fluid	AI	Standard differential pressure (kPa)	50	100	100	100	100	150	200	300
		Working pressure differential (kPa)	20 to 150	50 to 200	50 to 250	50 to 250	50 to 250	100to 300	150to 300	140 to 250
		Max. working pressure(kPa)	150	200	250	250	250	300	300	350
	AR	Standard differential pressure (kPa)	50	100	100	100	100	150	200	
		Working pressure differential (kPa)	20 to 150	50 to 200	50 to 250	50 to 250	50 to 250	100to 300	150to 300	
		Max. working pressure(kPa)	150	200	250	250	250	300	300	
	O2	Standard differential pressure (kPa)	50	100	100	100	100			
		Working pressure differential (kPa)	20 to 150	50 to 200	50 to 250	50 to 250	50 to 250			
		Max. working pressure(kPa)	150	200	250	250	250			
	LN/C1	Standard differential pressure (kPa)	50	50	50	50	50			
		Working pressure differential (kPa)	20 to 150	20 to 150	20 to 150	20 to 150	30 to 150			
		Max. working pressure(kPa)	150	150	150	150	150			
	C3	Standard differential pressure (kPa)	50	50	50	50	50			
		Working pressure differential (kPa)	20 to 150	20 to 150	20 to 150	20 to 150	30 to 150			
		Max. working pressure(kPa)	150	150	150	150	150			

(Low differential pressure model)

			Flow rate range [❶] L9500	L0001	L0002	L0005	L0010
Applicable fluid	AI/O2 LN/C1 C3 *8	Standard differential pressure (kPa)	20	20	20	20	20
		Working pressure differential (kPa)	5 to 50	5 to 50	5 to 50	5 to 50	10 to 50
		Max. working pressure(kPa)	50	50	50	50	50

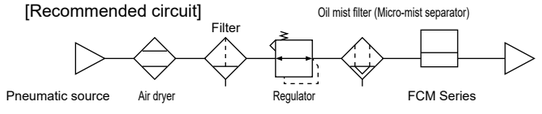
Indicator, integrating functions

		Flow rate range [❶] 9500 L9500	0001 L0001	0002 L0002	0005 L0005	0010 L0010	0020	0050	0100
Flow rate display	Indicator range	0 to 500 mL/min	0.00 to 1.00 L/min	0.00 to 2.00 L/min	0.00 to 5.00 L/min	0.0 to 10.0 L/min	0.0 to 20.0 L/min	0.0 to 50.0 L/min	0 to 100 L/min
	Indicator resolution	1 mL/min	0.01 L/min	0.01 L/min	0.01 L/min	0.1 L/min	0.1 L/min	0.1 L/min	1 L/min
Integrating functions *9	Indicator range	999999 mL	9999.99 L	9999.99 L	9999.99 L	99999.9 L	99999.9 L	99999.9 L	999999 L
	Indicator resolution	1mL	0.01 L	0.01 L	0.01 L	0.1 L	0.1 L	0.1 L	1L
	Pulse output rate	5 mL	0.01 L	0.02 L	0.05 L	0.1 L	0.2 L	0.5 L	1L

*1: The value converted to volumetric flow rate at standard condition (20°C 1 barometric pressure (101 kPa) relative humidity 65%). Full scale stands for max. scale flow rate in the flow rate range.

*2: Use dry gas which does not contain corrosive elements such as chlorine, sulfur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air compliant with ISO 8573-1: 2010 [1:1:1 to 1:6:2]. Compressed air from the compressor contains drainage-water, oil oxide, foreign substances, etc. To maintain the functionality of this product, a filter, air dryer (minimum pressure dew point 10°C or less) and oil mist filter (maximum oil concentration 0.1 mg/m^3) must be installed on the primary side (upstream) of this product.

[Recommended circuit]



[Recommended device]
Air filter: F Series
Oil mist filter: M Series

*3: City gas 13A is for 88% methane (CH_4) gas produced from LNG.

*4: Standard differential pressure is the differential pressure when this product is calibrated. (Secondary side released to atmosphere)

*5: Working pressure differential is the differential pressure required for normal operation of this product. Note that the values depend on the flow rate range and applicable fluids. The min. value of the working pressure differential is the differential pressure required for the full scale flow rate to flow when secondary side is released to atmosphere. The max. working pressure (max. value of working pressure differential) is the max. value of primary side pressure. If more pressure is applied, control may become unstable, or the max. flow rate may not be controllable.

*6: Use an IO-Link master that has sufficient current supply per port.

*7: The product's protection circuitry is effective only against certain misconnections and does not protect against all misconnections.

*8: The low pressure line (1 to 2.5 kPa) of city gas is outside the working pressure differential range.

*9: The accumulated flow is a reference value. It is reset when the power is turned OFF.

*10: The valve inside this product cannot be used as a stop valve requiring zero leakage. Slight leakage is allowed for in the specifications.

■ For hydrogen, helium

Model No. Notation Method

FCM - 0002 H2 - 8A C R S B T

- FCM: Model No.
- 0002: ❶ Flow rate range
- H2: ❷ Applicable fluid
- 8A: ❸ Port size
- C: Input signal: IO-Link
- R: ❹ Indicator direction
- S: ❺ Cable
- B: ❻ Bracket
- T: ❼ Traceability

❶ Flow rate range

Code	Description	❷ Applicable fluid	
		H2	HE
0002	0 to 2 L/min	●	●
0005	0 to 5 L/min	●	●
0010	0 to 10 L/min	●	●
0020	0 to 20 L/min	●	●

❷ Applicable fluid

Code	Description
H2	Hydrogen
HE	Helium

❸ Port size

Port size			Code	❷ Applicable fluid	
				H2	HE
Screw-in	Rc1/4		8A	●	●
	9/16-18UNF (Note)		UF	●	●
1/4" double barbed fitting			4S	●	●
1/4" JXR male fitting			4RM	●	●

Note: For 9/16-18UNF screw shape, please refer to the dimensions diagram on P. 548

❹ Indicator direction

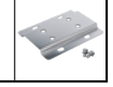
Code	Description
Blank	Forward direction
R	Reverse direction

❺ Cable

Code	Description	
Blank	None	
S	Straight (female), straight (male) 3 m	
L	L-type (female) / straight (male) 3 m	
M	One side straight (female) 3 m	

Note: Shipped with the product.

❻ Bracket

Code	Description	
Blank	None	
B	With bracket	

Note: Shipped with the product.

❼ Traceability

Code	Description
Blank	None
T	Traceability certification with series variation diagram and company certification
K	With company certification

Note: Shipped with the product.

Discrete option model No.

FCM - MS3

- MS3: ❶ Option

❶ Option

Code	Description	
MS3	Straight (female), straight (male) 3 m	
ML3	L-type (female) / straight (male) 3 m	
MM3	One side straight (female) 3 m	
LB1	Bracket	

■ Specifications for hydrogen, helium

Item \ Model No.			FCM-[❶] [❷]-[❸]C		
Valve drive method			Proportional solenoid valve When not energized: Closed		
			Full scale flow rate	H2 (Hydrogen)	HE (Helium)
Flow rate range *1	[❶]	0002	2 L/min	●	●
		0005	5 L/min	●	●
		0010	10 L/min	●	●
		0020	20 L/min	●	●
Applicable fluid *2	[❷]	H2	Hydrogen	●	
		HE	Helium		●
Port size	[❸]	8A	Rc1/4	●	●
		UF	9/16-18UNF	●	●
		4S	1/4" Double barbed fitting	●	●
		4RM	1/4" JXR male fitting	●	●
Control	Control range			3 to 100% F.S.	
	Response time			Within 0.5 sec. to setting ±5% F.S. (TYP.)	
	Accuracy			Within ±3% F.S.	
	Repeatability			Within ±1% F.S.	
	Temperature characteristics			Within ±0.2% F.S./°C (base temperature 25°C)	
	Pressure characteristics			Within ±1% F.S. per 98 kPa (standard differential pressure reference)	
Pressure	Standard differential pressure *3			Refer to the separate table	
	Working pressure differential *4			Refer to the separate table	
	Max. working pressure *4			Refer to the separate table	
	Proof pressure			980 kPa	
Operating ambient temperature, operating ambient humidity				0 to 50°C, 90% RH or less (no condensation)	
External leakage				1 x 10^{-6}Pa·m³/s or less (helium leakage rate)	
I/O	Input signal	C		IO-Link	
Flow rate display	Indicator method			7-segment LED 3-digit, indicator accuracy: control accuracy ±1digit	
	Indicator range, display resolution			Refer to the separate table	
Integrating functions				Refer to the separate table	
Power Supply	Power supply voltage			24 VDC ±10% (stabilized power supply with ripple rate 1% or less)	
	Current consumption *5			220 mA or less (Port type A)	
Mounting orientation				Unrestricted in vertical/horizontal direction	
Wetted section materials				Stainless steel, fluoro rubber, alumina, semiconductor silicon, soldering	
Weight		[❸]	8A/UF	Approx. 480 g	
			4S/4RM	Approx. 560 g	
Degree of Protection				IEC standards IP40 or equivalent	
Protection circuit *6				Power supply reverse connection protection	
EMC Directive				EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8	

Pressure

Standard differential pressure, working pressure differential

			Flow rate range [❶]			
			0002	0005	0010	0020
Applicable fluid	H2	Standard differential pressure (kPa)	20	50	50	50
		Working pressure differential (kPa)	10 to 50	30 to 80	30 to 80	30 to 80
		Max. working pressure(kPa)	50	80	80	80
	HE	Standard differential pressure (kPa)	50	100	100	100
		Working pressure differential (kPa)	20 to 100	50 to 150	50 to 150	50 to 150
		Max. working pressure(kPa)	100	150	150	150

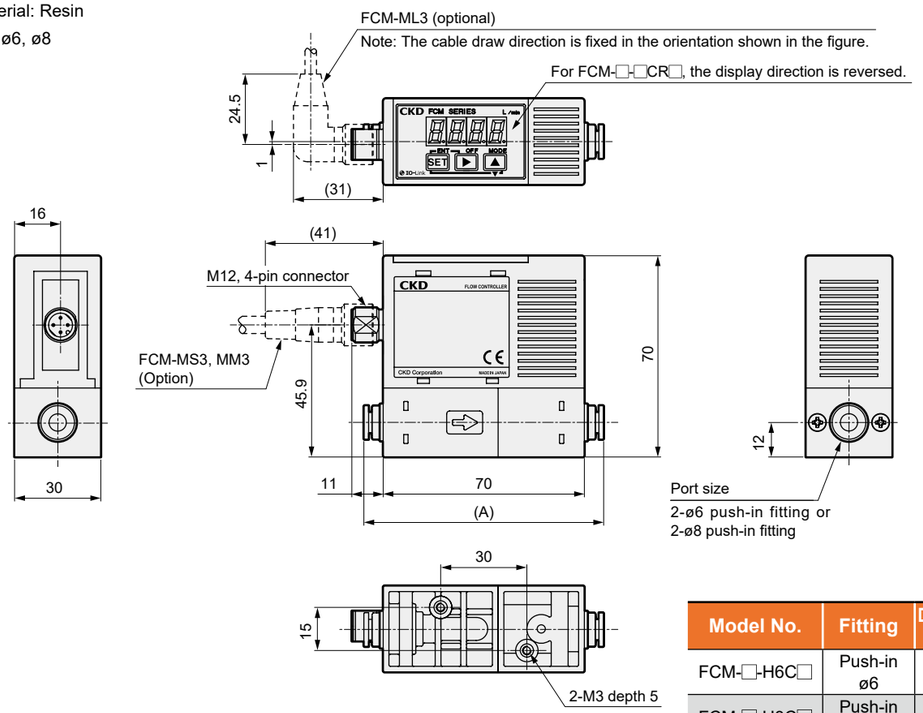
Indicator, integrating functions

		Flow rate range [❶]			
		0002	0005	0010	0020
Flow rate display	Indicator range	0.00 to 2.00 L/min	0.00 to 5.00 L/min	0.0 to 10.0 L/min	0.0 to 20.0 L/min
	Indicator resolution	0.01 L/min	0.01 L/min	0.1 L/min	0.1 L/min
Integrating functions *7	Indicator range	9999.99 L	9999.99 L	99999.9 L	99999.9 L
	Indicator resolution	0.01 L	0.01 L	0.1 L	0.1 L
	Pulse output rate	0.02 L	0.05 L	0.1 L	0.2 L

*1: Flow rate converted to volumetric flow rate at 20°C, 1 barometric pressure (101 kPa). Full scale stands for max. scale flow rate in the flow rate range.
*2: Use dry gas which does not contain corrosive elements such as chlorine, sulfur or acids, and which is clean and does not contain dust or oil mist.
*3: Standard differential pressure is the differential pressure when this product is calibrated. (Secondary side released to atmosphere)
*4: Working pressure differential is the differential pressure required for normal operation of this product. Note that the values depend on the flow rate range and applicable fluids. The min. value of the working pressure differential is the differential pressure required for the full scale flow rate to flow when secondary side is released to atmosphere. The max. working pressure (max. value of working pressure differential) is the max. value of primary side pressure. If more pressure is applied, control may become unstable, or the max. flow rate may not be controllable.
*5: Use an IO-Link master that has sufficient current supply per port.
*6: This product's protection circuit is effective only for specific misconnections. It does not provide protection for all misconnections.
*7: The accumulated flow is a reference value. It is reset when the power is turned OFF.
*8: The valve inside this product cannot be used as a stop valve requiring zero leakage. Slight leakage is allowed for in the specifications.

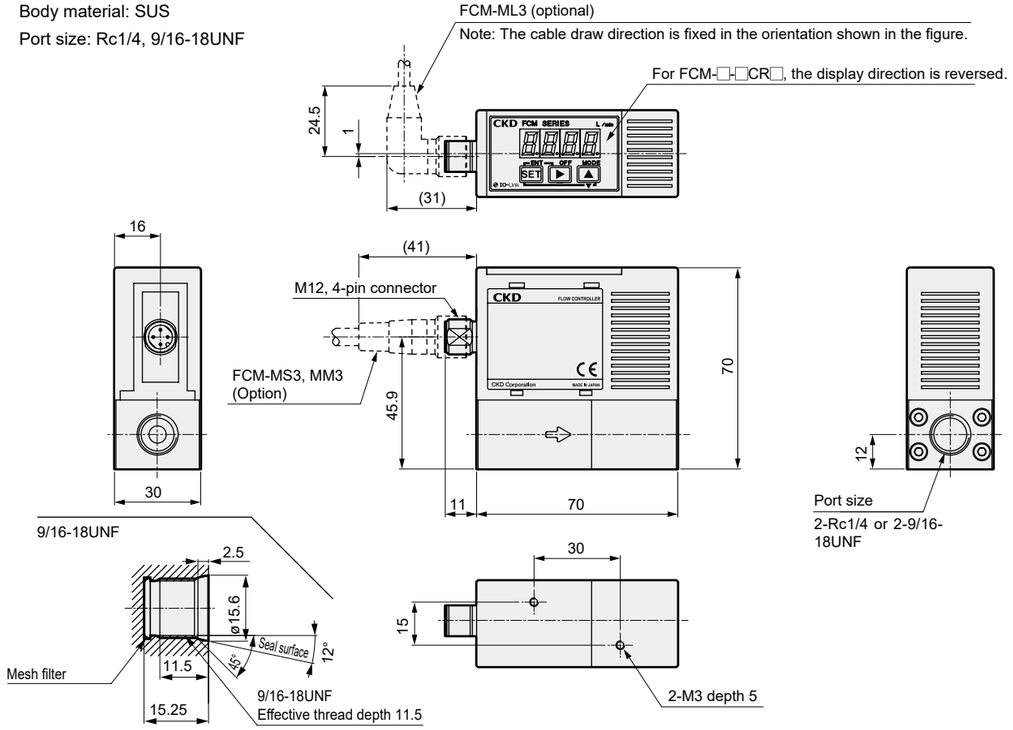
Dimensions

●Model No.: FCM-□-H6C/H8C□
Body material: Resin
Port size: ø6, ø8



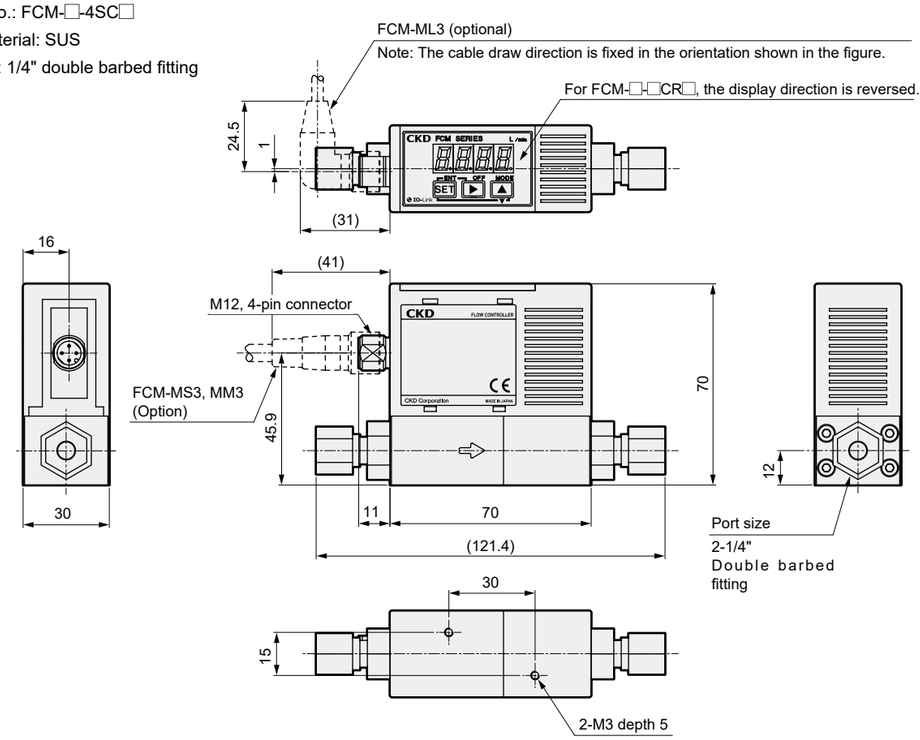
Model No.	Fitting	Dimension (A)
FCM-□-H6C□	Push-in ø6	84
FCM-□-H8C□	Push-in ø8	85

●Model No.: FCM-□-8AC/UFC□
Body material: SUS
Port size: Rc1/4, 9/16-18UNF

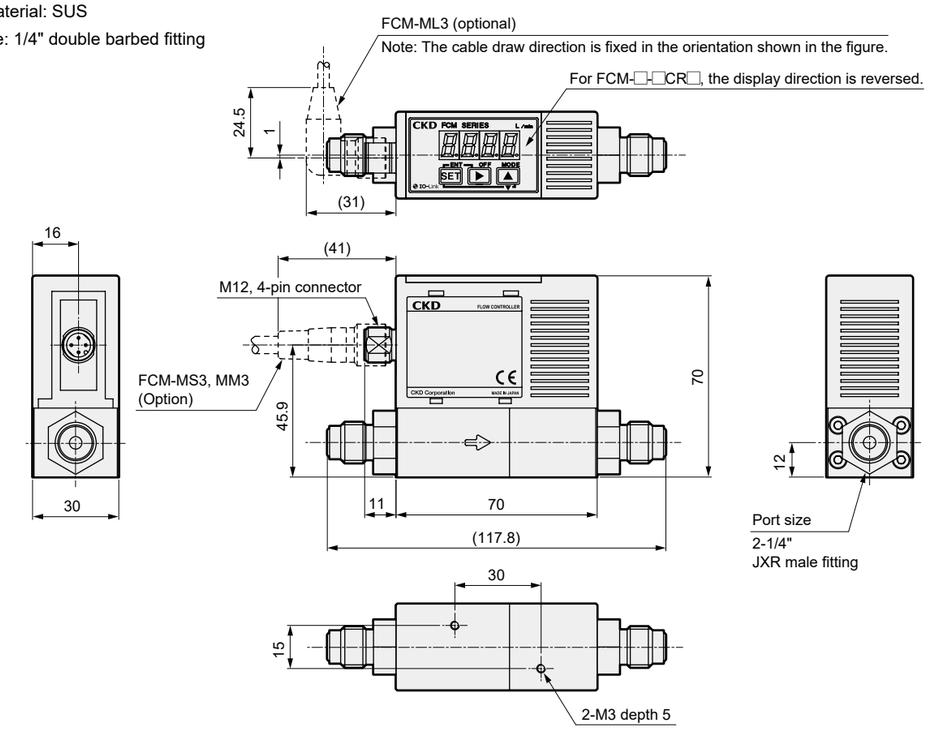


Dimensions

●Model No.: FCM-□-4SC□
Body material: SUS
Port size: 1/4" double barbed fitting

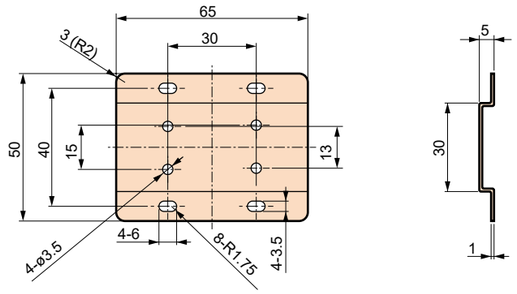


●Model No.: FCM-□-4RMC□
Body material: SUS
Port size: 1/4" double barbed fitting

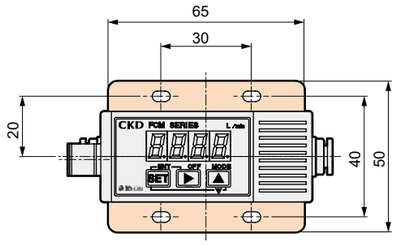


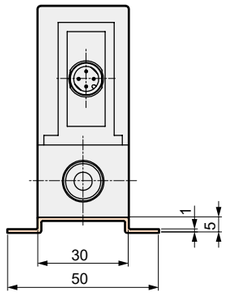
Dedicated bracket (floor mounted)

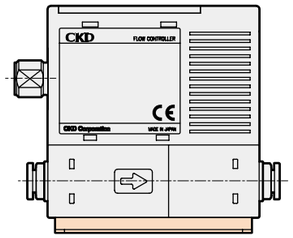
Discrete model No.:FCM-LB1

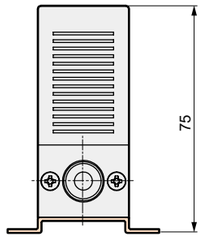


Material: Steel
Weight: 28 g



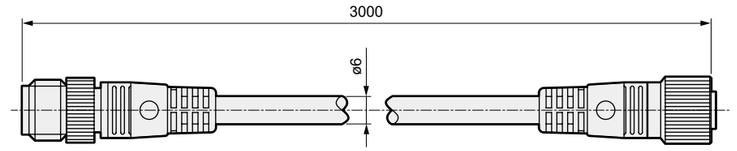




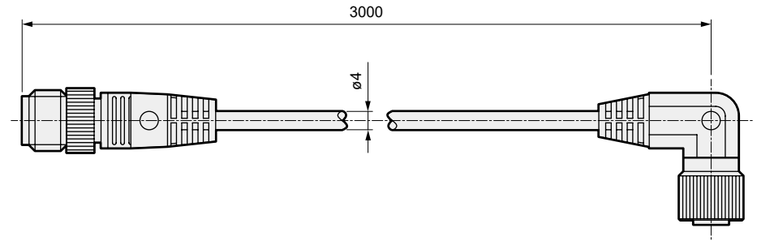


Cable optional dimensions

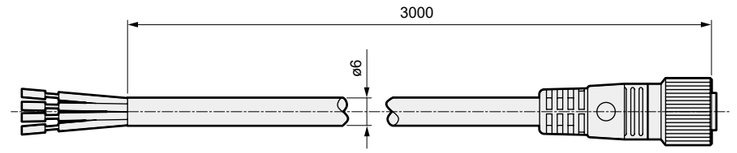
●Cable option (M12 straight (female), M12 straight (male))
Discrete model No.: FCM-MS3



●Cable option (M12 L-type (female), M12 straight (male))
Discrete model No.: FCM-ML3



●Cable option (M12 one side straight (female))
Discrete model No.: FCM-MM3



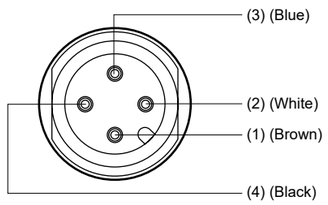
Cable color	Applications
Brown	L+ (24 DC)
White	NC Note
Blue	L- (GND)
Black	C (IO-Link)

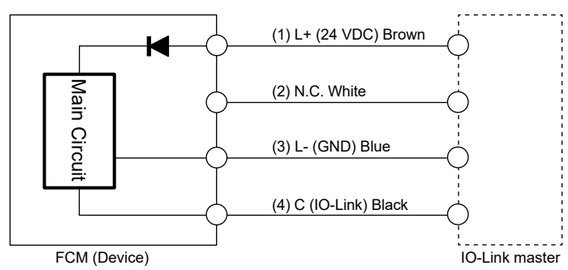
Note: Insulate so that there is no contact with other wires.

Wiring method

Wiring method

CAUTION Take care to prevent incorrect wiring.





Terminal No.	Option cable color	Name
(1)	Brown	L+ (24 VDC)
(2)	White	N.C.
(3)	Blue	L- (GND)
(4)	Black	C (IO-Link)

Names and functions of display / operation section

Output display (Red)



●"F" is displayed when confirming the function setting.



●When the switch output is ON, "-" lights up.
*Does not blink at integrated pulse output.

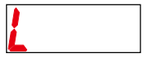


●E lights up when error output is ON.

*When there are upper/lower limits in the function setting, or when the higher digits or lower digits of the accumulated flow display are indicated,



or

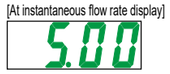


is displayed.

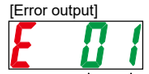
3-digit number LED display (green)

●Indicators instantaneous flow rate display and function setting details during RUN mode (instantaneous flow rate display).
*When displaying the function setting, the setting mode number and setting details are displayed.
●The values are displayed when setting each piece of data.
●Error code No. is displayed at the time of error display.

[At instantaneous flow rate display]

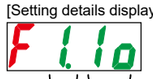


[Error output]



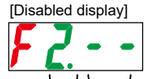
Code No.

[Setting details display]



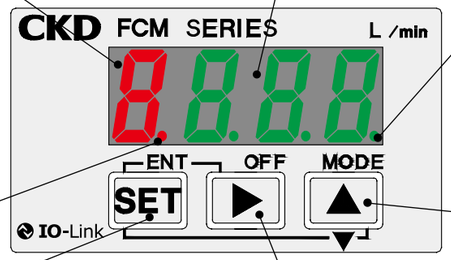
Setting details
Setting mode No.

[Disabled display]



Setting details
Setting mode No.

Flow rate 110%F.S. or more: Hi



Power lamp (red dot)

●Blinks during IO-Link communication.
●Lights when a communication error occurs.

Process Data OUT ineffective lamp (display right end green dot)

●Blinks when Process Data OUT is disabled.

UP key (MODE key)

●Used to count up values.
●Used to change the setting mode.
●Used to change the settings item.

SET Key

●Used to confirm the setting mode.
●Used to confirm the setting item.
●Used to change to the integration display.

Shift key (OFF key)

●Used to select the digit of the values.
●Used to reset from forced OFF when performing forced OFF (control stop).

SET + Key (ENT key)

●Used to confirm the value.
●Used to release the key lock.
●Used to reset accumulation. (Accumulated flow display)

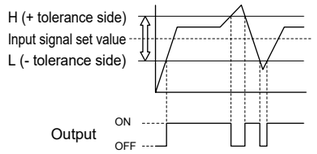
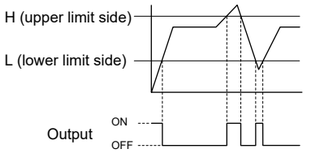
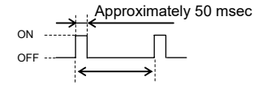
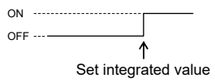
SET + Key (DOWN key)

●Used to count down values.
●Used to set the key lock.

+ Key

●Used for resetting settings (initialization).

Compact flow rate controller Functions of FCM Series (IO-Link type)

No.	Function	Description
F1.- -	Normal mode input function	Process Data OUT can be used to set an arbitrary flow rate.
	Direct memory function	Target value can be entered by key.
	Preset input function	By specifying 8 arbitrary flow rates (IO-Link parameter, key input), the flow rate can be controlled with the 3 bit of Process Data OUT.
F3.- -	Auto-power OFF	Turns the flow rate display OFF if a key is not operated for approx. 1 minute (control does not stop with auto-power OFF function). Enables energy-saving operation.
F4.- -	Switch output function	The following switch functions can be set individually. · Switch output 1 (tolerance mode): Turns the switch ON when the value is within tolerance against the control target value (arbitrary setting) · Switch output 2 (designated range mode): Turns the switch ON when the value is outside the designated flow rate range · Switch output 3 (integrated pulse): Outputs the integrated pulse when performing integration · Switch output 4 (ON at set integration or higher): Turns the switch ON when the value reaches the set accumulated flow Normally open (NO) and normally closed (NC) can be set for each switch output. [Switch output 1: Tolerance mode]  [Switch output 2: Designated range mode]  [Switch output 3: Integrated pulse]  Refer to the specification display, integrating functions for details on pulse output rates. [Switch output 4: ON above set integrated value] 
F5.- -	· Integrating functions · Accumulated flow auto cutoff function	Integrates the flow rate. As well as accumulated flow display, it has the following functions. · Process Data OUT can be used to control the start/stop/reset of integrating functions · Integrated flow rate value output to Process Data IN · Closes the solenoid valve when the value reaches the set accumulated flow · Integrated pulse output (switch output 3) · Turns the switch ON when the value reaches the set accumulated flow (switch output 4) How to reset the integrated value · Process Data OUT, key input
F6.- -	Error auto shut-off	Stops control when an error occurs, fully closes valves, and turns error output ON.
F7.- -	Zero point adjustment	Adjusts the zero point of flow rate output.
F8.- -	Operation setting at communication error	The operation of the product when a communication error occurs can be set from HOLD (holds the set value before the error occurs) / CLEAR (valve fully closed) / VALVE OPEN (valve fully open).
	Instantaneous flow rate display	Indicators the instantaneous flow rate. Instantaneous flow rate values are output to Process Data IN.
	Set flow rate output	Process Data IN outputs the current flow rate setting.
	Error display function	Capable of displaying error state. As well as error display, it has the following functions. · Process Data IN error signal output during an error · Process Data IN error code output during an error · Stops control automatically when an error occurs
	Normal operation output	Outputs a signal to Process Data IN when operating normally (without an Error).
	Key lock	Disables setting changes by key operation to avoid incorrect operation.
	Reset setting	Returns the settings to default.
	Control error threshold setting	The control error judgment threshold can be set with the IO-Link parameter. (Default: ±20%F.S.)
	Output when starting	Displays the total startup time from the start of use. This time is not reset even if the power turns OFF. (Also not reset when using the reset setting.)
	Data storage function	Uploading set values to the master and downloading set values from the master are possible. (Can be copied by the same model No.)

* input signal zero/span adjustment function (F2) cannot be used with IO-Link.

Communication specifications

Communication specifications

General

Item	Details
Communication protocol	IO-Link
Communication protocol version	V1.1
Transmission bit rate	COM3(230.4kbps)
Port type	A
Process data length (input)	10 byte
Process data length (output)	4 byte

Item	Details
Min. cycle time	2 ms
Data storage	1 kbyte
SIO mode support	None
Device ID	Refer to table below
Vendor ID	855 (decimal)/357 (hexadecimal)

Parameters

Device ID

Device ID	Product ID	Remarks
0 x 216001	FCM-9500-C	500 mL/min Range
0 x 216002	FCM-0001-C	1 L/min range
0 x 216003	FCM-0002-C	2 L/min range
0 x 216004	FCM-0005-C	5 L/min range
0 x 216005	FCM-0010-C	10 L/min range
0 x 216006	FCM-0020-C	20 L/min range
0 x 216007	FCM-0050-C	50 L/min range
0 x 216008	FCM-0100-C	100 L/min Range

Table 1 Flow rate range for each model

Model No.	Instantaneous flow rate			Accumulated flow	
	Indicator range	Displayed value	ProcessData output value	Integration display range	Displayed value
FCM-(L)9500□-□C	0 to 500.0 mL/min	0 to 500	0 to 5000	0 to 999999 mL	0 to 999999
FCM-(L)0001□-□C	0.00 to 1.000 L/min	0 to 1.00	0 to 1000	0 to 9999.99 L	
FCM-(L)0002□-□C	0.00 to 2.000 L/min	0 to 2.00	0 to 2000		
FCM-(L)0005□-□C	0.00 to 5.000 L/min	0 to 5.00	0 to 5000		
FCM-(L)0010□-□C	0.0 to 10.00 L/min	0 to 10.0	0 to 1000	0 to 99999.9 L	
FCM-0020□-□C	0.0 to 20.00 L/min	0 to 20.0	0 to 2000		
FCM-0050□-□C	0.0 to 50.00 L/min	0 to 50.0	0 to 5000		
FCM-0100□-□C	0 to 100.0 L/min	0 to 100	0 to 1000	0 to 999999 L	

*Refer to the instruction manual SM-A19060 for setting parameters.
*Download the IO-Link setting file (IODD) from the CKD website (https://www.ckd.co.jp/en/).

Process data IN

PD	PD0								PD1							
Bit	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
	MSB															LSB
Data name	Integrating flow unit upper byte															
Data range	2 byte															
Format	UInteger16															

PD	PD2								PD3							
Bit	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
	MSB															LSB
Data name	Integrating flow unit lower byte															
Data range	2 byte															
Format	UInteger16															

PD	PD4								PD5							
Bit	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
	MSB															LSB
Data name	Set flow rate *1															
Data range	2 byte															
Format	UInteger16															

PD	PD6								PD7							
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
	MSB															LSB
Data name	Instantaneous flow rate *2															
Data range	2 byte															
Format	Integer16															

PD	PD8								PD9							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Data name	Error	WARNING	Normal operation	–	Switch output *3				MSB			LSB	Input setting *4		Integration auto shutoff occurring	Start/stop
					4	3	2	1	Error code							
Data range	True/False								0 to 15				0 to 2		True/False	
Format	Boolean								UInteger4				UInteger2		Boolean	

*1: Displays the set flow rate for the current input setting. “9999” means "valve fully open". (Refer to Process data OUT Items.)
*2: For instantaneous flow rates, the negative value is used to check the shift from the zero point and does not indicate a reverse flow.

*3

Switch Output	Switch function
1	Tolerance mode
2	Designated range mode
3	Integrated pulse
4	ON at set integration or higher

*4

Input setting	Input mode
0	Normal mode (flow rate value)
1	Preset mode (3 bit)
2	Direct memory mode (key operation)

Process data OUT

PD	PD0								PD1							
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
	MSB															LSB
Data name	Set flow rate *1															
Data range	2 byte (depends on model. Refer to page 554 Table 1 ProcessData output values)															
Format	UInteger16															

PD	PD2								PD3							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Data name	Vacant					Preset *2			Vacant		Integrating		Vacant		Reset	Start/ stop *3
						3	2	1			Reset	Stop				
Data range						0 to 7					True/False				True/False	
Format						UInteger3					Boolean				Boolean	

*1: Set to "9999" for "valve fully open".

*2: Preset memory number and bit combination

Process Data OUT preset			Preset memory number
Bit 3	Bit 2	Bit 1	
0	0	0	P1
0	0	1	P2
0	1	0	P3
0	1	1	P4
1	0	0	P5
1	0	1	P6
1	1	0	P7
1	1	1	P8

Use device-side key operations or IO-Link communication Parameter to set preset memory contents.

*3: IO-Link communication used for control should be set to 1(True). Control will not occur if set to 0 (False). Note the following when using flow rate control/forced OFF via device key input.
Note: The "start/stop" bit of Process Data OUT has the same role as "Flow control/Forced OFF" status switching by key operation.
When the "start/stop" bit is "1 (start)", however, the flow rate control ⇒ forced OFF by key input on the device side
The “Start/Stop” bit of Process Data IN is set to “0 (stop)” and the product is forced off, but the “Start/Stop” bit of Process Data OUT remains set to “1 (start)”.
The “Start/Stop” bit of Process Data IN is set to “0” (stop) and the product is forced to turn off. Therefore, be sure to check the “start/stop” status of the device with the “start/stop” bit of the Process Data IN. Also, when switching the "start (flow control)" state from the master in this state, set it to "0 (stop)" and then set it to "1 (start)" again.

[Reference]

Accumulated flow calculation example

Bit	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
hex	000F															
Data name	Integrating flow unit upper byte															

Bit	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
	0	1	0	0	0	0	1	0	0	0	1	1	1	1	1	1
hex	423F															
Data name	Integrating flow unit lower byte															

000F 423F(hex) → 999999(dec)

For FCM-0005□-□C, Table 1 on page 554 shows the accumulated flow as 99999.9 L.

For details on operation and setting method, refer to CKD components product website (https://www.ckd.co.jp/kiki/en/) → "Model No."→ Instruction manual

MEMO



Compact flow rate controller RAPIFLOW

FCM Series

RS-485

- For air, nitrogen, argon, oxygen, city gas, methane, propane (flow rate range: 0.5 to 100 L/min)
- For hydrogen, helium (flow rate range: 2.0 to 20 L/min)

Refer to the CKD website for detailed compatible model Nos.

■ Air, nitrogen, argon, oxygen, city gas, methane, propane

Model No. Notation Method

FCM - 9500 AI - H6 R AN R 1 B T

- FCM: Model No.
- 9500: ❶Flow rate range
- AI: ❷Applicable fluid
- H6: ❸Port size, body material
- R: Input signal: RS-485 + analog
- AN: ❹Output specifications
- R: ❺Indicator direction
- 1: ❻Cable
- B: ❼Bracket
- T: ❽Traceability

❶Flow rate range

	Description	Code	❷Applicable fluid AI	AR	O2	LN	C1	C3
Standard model	0 to 0.5 L/min	9500	●	●	●	●	●	●
	0 to 1 L/min	0001	●	●	●	●	●	●
	0 to 2 L/min	0002	●	●	●	●	●	●
	0 to 5 L/min	0005	●	●	●	●	●	●
	0 to 10 L/min	0010	●	●	●	●	●	●
	0 to 20 L/min	0020	●	●				
	0 to 50 L/min	0050	●	●				
	0 to 100 L/min (resin body only)	0100	●					
Low differential pressure model (stainless steel only)	0 to 0.5 L/min	L9500	●		●	●	●	●
	0 to 1 L/min	L0001	●		●	●	●	●
	0 to 2 L/min	L0002	●		●	●	●	●
	0 to 5 L/min	L0005	●		●	●	●	●
	0 to 10 L/min	L0010	●		●	●	●	●

❷Applicable fluid

Code	Description
AI	Compressed air, nitrogen gas
AR	Argon
O2	Oxygen (oil-prohibited specifications)
LN	City gas (13A)
C1	Methane (CH_4)
C3	Propane (C_3H_8)

❸Port size, body material

	Port size	Body material		Code	❷Applicable fluid AI	AR	O2	LN	C1	C3
Push-in	ø6 (*1)	Resin body		H6	●					
	ø8			H8	●					
Screw-in	Rc1/4	Stainless steel body		8 A	●	●	●	●	●	●
	9/16-18 UNF (*2)			UF	●	●	●	●	●	●

*1: ❶Flow rate range excludes "0050" and "0100".
*2: For the shape of the 9/16-18UNF thread, refer to the dimensions diagram on Page 566.

❹Output specifications

Code	Description
AN	1-5 V analog error (NPN)
AP	1-5 V analog error (PNP)
SN	Switch (NPN), error (NPN)
SP	Switch (PNP), error (PNP)

❺Indicator direction

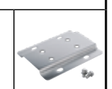
Code	Description
Blank	Forward direction
R	Reverse direction

❻Cable

Code	Description	
Blank	None	
1	Parallel 15-conductor, cable 1 m	
3	Parallel 15-conductor, 3m cable	

Note: Shipped with the product.

❼Bracket

Code	Description	
Blank	None	
B	With bracket	

Note: Shipped with the product.

❽Traceability

Code	Description
Blank	None
T	Traceability certification with series variation diagram and company certification
K	With company certification

Note: Shipped with the product.

Discrete option model No.

FCM - RC1

- RC1: ❶Option

❶Option

Code	Description	
RC1	Parallel 15-conductor, cable 1 m	
RC3	Parallel 15-conductor, 3m cable	
LB1	Bracket	

Note: The cable body is the same as FCM-PC1, PC3.

■Specifications for air, nitrogen, argon, oxygen, city gas, methane, propane

Item				FCM-[1] [2]-[3]R[4]						
Valve drive method				Proportional solenoid valve When not energized: Closed						
				Full scale flow rate	AI (Air, nitrogen)	AR (Argon)	02 (Oxygen)	LN (City gas)	C1 (Methane)	C3 (Propane)
Flow rate range *1	[1]	Standard model	9500	500 mL/min	●	●	●	●	●	●
			0001	1 L/min	●	●	●	●	●	●
			0002	2 L/min	●	●	●	●	●	●
			0005	5 L/min	●	●	●	●	●	●
			0010	10 L/min	●	●	●	●	●	●
			0020	20 L/min	●	●				
			0050	50 L/min	●	●				
			0100	100 L/min (resin only)	●					
		(stainless steel only)Low differential pressure model	L9500	500 mL/min	●		●	●	●	●
			L0001	1 L/min	●		●	●	●	●
			L0002	2 L/min	●		●	●	●	●
			L0005	5 L/min	●		●	●	●	●
			L0010	10 L/min	●		●	●	●	●
Applicable fluid *2	[2]		AI	Compressed air, nitrogen	●					
			AR	Argon		●				
			O2	Oxygen (oil-prohibited specifications)			●			
			LN	City gas (13A) *3				●		
			C1	Methane (CH4 100%)					●	
			C3	Propane (C3H8 100%)						●
Port size, body material	[3]		H6	ø6 Push-in, resin (excluding 50, 100 L/min)	●					
			H8	ø8 push-in, resin	●					
			8 A	Rc1/4, Stainless steel	●	●	●	●	●	●
			UF	9/16-18UNF, stainless steel	●	●	●	●	●	●
Control	Control range			3 to 100% F.S.						
	Response time	[1]	9500 to 0020, L9500 to L0010	Within 0.5 sec. to setting ±5% F.S. (TYP.)						
			0050 to 0100	Within 1 sec. to setting ±5% F.S. (TYP.)						
	Accuracy			Within ±3% F.S.						
	Repeatability			Within ±1% F.S.						
	Temperature characteristics			Within ±0.2% F.S./°C (base temperature 25°C)						
	Pressure characteristics			Within ±1% F.S. per 98 kPa (standard differential pressure reference)						
Pressure	Standard differential pressure *4			Refer to the separate table						
	Working pressure differential *5			Refer to the separate table						
	Max. working pressure *5			Refer to the separate table						
	Proof pressure	[3]	H6/H8 (Resin body)	490 kPa						
			8A/UF (SUS body)	980 kPa						
Operating ambient temperature, operating ambient humidity				0 to 50°C, 90% RH or less (no condensation)						
I/O	Input signal/ preset input *6	-	R	RS-485 communication (Modbus RTU) / 0-10 VDC (6.7 kΩ) / 0-5 VDC (10 kΩ) / 4-20 mADC (250 Ω) *7 / preset input 4 points (2 bit) (switching with setting)						
	Output signal *8	[4]	AN	Analog output: 1-5V (connecting load impedance 500 kΩ and over) Error output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less						
			AP	Analog output: 1-5V (connecting load impedance 500 kΩ and over) Error output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less						
			SN	Switch output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less Error output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less						
			SP	Switch output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less Error output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less						
Flow rate display	Indicator method			7-segment LED 3-digit, indicator accuracy: control accuracy ±1digit						
	Indicator range, display resolution			Refer to the separate table						
Integrating functions				Refer to the separate table						
Power Supply	Power supply voltage			24 VDC ±10% (stabilized power supply with ripple rate 2% or less)						
	Current consumption *9			250 mA or less						
Mounting orientation				Unrestricted in vertical/horizontal direction						
Wetted section materials		[3]	H6/H8 (Resin body)	Polyamide resin, fluoro rubber, stainless steel, alumina, semiconductor silicon, soldering						
			8A/UF (SUS body)	Stainless steel, fluoro rubber, alumina, semiconductor silicon, soldering						
Weight		[3]	H6/H8 (Resin body)	Approx. 200 g						
			8A/UF (SUS body)	Approx. 480 g						
Degree of Protection				IEC standards IP40 or equivalent						
Protection circuit *10				Power reverse connection protection, switch output reverse connection protection, switch output load short-circuit protection						
EMC Directive				EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8						

Pressure

Standard differential pressure, working pressure differential *4, 5

(Standard model)

Applicable fluid [2]		Flow rate range [1]	9500	0001	0002	0005	0010	0020	0050	0100
	AI	Standard differential pressure (kPa)	50	100	100	100	100	150	200	300
		Working pressure differential (kPa)	20 to 150	50 to 200	50 to 250	50 to 250	50 to 250	100to 300	150to 300	140 to 250
		Max. working pressure(kPa)	150	200	250	250	250	300	300	350
	AR	Standard differential pressure (kPa)	50	100	100	100	100	150	200	
		Working pressure differential (kPa)	20 to 150	50 to 200	50 to 250	50 to 250	50 to 250	100to 300	150to 300	
		Max. working pressure(kPa)	150	200	250	250	250	300	300	
	O2	Standard differential pressure (kPa)	50	100	100	100	100			
		Working pressure differential (kPa)	20 to 150	50 to 200	50 to 250	50 to 250	50 to 250			
		Max. working pressure(kPa)	150	200	250	250	250			
	LN/C1	Standard differential pressure (kPa)	50	50	50	50	50			
		Working pressure differential (kPa)	20 to 150	20 to 150	20 to 150	20 to 150	30 to 150			
		Max. working pressure(kPa)	150	150	150	150	150			
	C3	Standard differential pressure (kPa)	50	50	50	50	50			
		Working pressure differential (kPa)	20 to 150	20 to 150	20 to 150	20 to 150	30 to 150			
		Max. working pressure(kPa)	150	150	150	150	150			

(Low differential pressure model)

Applicable fluid [2]		Flow rate range [1]	L9500	L0001	L0002	L0005	L0010
	AI/**O2**	Standard differential pressure (kPa)	20	20	20	20	20
	LN/C1	Working pressure differential (kPa)	5 to 50	5 to 50	5 to 50	5 to 50	10 to 50
	C3 *11	Max. working pressure(kPa)	50	50	50	50	50

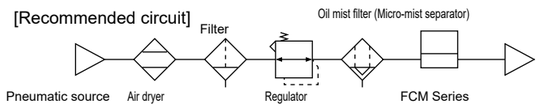
Indicator, integrating functions

		Flow rate range [1]	9500 L9500	0001 L0001	0002 L0002	0005 L0005	0010 L0010	0020	0050	0100
Flow rate display	Indicator range		0 to 500 mL/min	0.00 to 1.00 L/min	0.00 to 2.00 L/min	0.00 to 5.00 L/min	0.0 to 10.0 L/min	0.0 to 20.0 L/min	0.0 to 50.0 L/min	0 to 100 L/min
	Indicator resolution		1 mL/min	0.01 L/min	0.01 L/min	0.01 L/min	0.1 L/min	0.1 L/min	0.1 L/min	1 L/min
Integrating functions *12	Indicator range		999999 mL	9999.99 L	9999.99 L	9999.99 L	99999.9 L	99999.9 L	99999.9 L	999999 L
	Indicator resolution		1mL	0.01 L	0.01 L	0.01 L	0.1 L	0.1 L	0.1 L	1L
	Pulse output rate		5 mL	0.01 L	0.02 L	0.05 L	0.1 L	0.2 L	0.5 L	1L

*1: The value is converted to volumetric flow rate at standard condition (20°C 1 barometric pressure (101 kPa) relative humidity 65%). Full scale stands for max. scale flow rate in the flow rate range.

*2: Use dry gas which does not contain corrosive elements such as chlorine, sulfur or acids, and which is clean and does not contain dust or oil mist. When using compressed air, use clean air compliant with ISO 8573-1: 2010 [1:1:1 to 1:6:2]. Compressed air from the compressor contains drainage-water, oil oxide, foreign substances, etc. To maintain the function of this product, install a filter, air dryer (min. pressure dew point 10°C or less), and oil mist filter (max. oil content 0.1 mg/m^3) on the primary side (upstream side) of this product.

[Recommended circuit]



[Recommended device]
Air filter: F Series
Oil mist filter: M Series

*3: The value for city gas 13A is a value for methane (CH4) 88% gas generated from LNG.

*4: Standard differential pressure is the differential pressure when this product is calibrated. (Secondary side released to atmosphere)

*5: Working pressure differential is the differential pressure required for normal operation of this product. This value differs with the flow rate range and applicable fluid. The min. value of the working pressure differential is the differential pressure required for the full scale flow rate to flow when secondary side is released to atmosphere. The max. working pressure (max. value of working pressure differential) is the max. value of primary side pressure. If more pressure is applied, control may become unstable, or the max. flow rate may not be controllable.

*6: The default is RS-485. Analog input or preset input can be used as needed. (It cannot be used together with RS-485.) Do not apply analog signals that differ from the set analog input specifications. Do not apply excessive voltage that exceeds the analog input specifications. Do not turn ON/OFF the power supply with an input signal applied. Excessive voltage could be applied, causing malfunction or damage to the product. Take special care when the current input is 4-20 mA.

*7: Use a current input signal that does not apply overvoltage of 10 V or more.

*8: The output impedance of the analog output voltage section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.

*9: Current for when 24 VDC, no load is connected, and flow rate is full scale. The current consumption will vary depending on the load.

*10: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.

*11: When using a low pressure city gas line (1 to 2.5 kPa), the working pressure differential range is exceeded.

*12: The integrating flow is a reference value. It is reset when the power is turned OFF.

*13: The valve inside this product cannot be used as a stop valve requiring zero leakage. Slight leakage is allowed for in the specifications.

Model No. Notation Method hydrogen, helium

FCM - 0002 H2 - 8A R AN R 1 B T

- FCM: Model No.
- 0002: ❶Flow rate range
- H2: ❷Applicable fluid
- 8A: ❸Port size
- R: Input signal: RS-485 + analog
- AN: ❹Output specifications
- R: ❺Indicator direction
- 1: ❻Cable
- B: ❼Bracket
- T: ❽Traceability

❶Flow rate range

Code	Description	❷Applicable fluid	
		H2	HE
0002	0 to 2 L/min	●	●
0005	0 to 5 L/min	●	●
0010	0 to 10 L/min	●	●
0020	0 to 20 L/min	●	●

❷Applicable fluid

Code	Description
H2	Hydrogen
HE	Helium

❸Port size

Port size			Code	❷Applicable fluid	
				H2	HE
Screw-in	Rc1/4		8A	●	●
	9/16-18UNF (Note)		UF	●	●
1/4" double barbed fitting			4S	●	●
1/4" JXR male fitting			4RM	●	●

Note: Refer to Dimensions diagram on page 566 for shape of 9/16-18UNF thread.

❹Output specifications

Code	Description
AN	1-5V analog error (NPN)
AP	1-5V analog error (PNP)
SN	Switch (NPN), error (NPN)
SP	Switch (PNP), error (PNP)

❺Indicator direction

Code	Description
Blank	Forward direction
R	Reverse direction

❻Cable

Code	Description	
Blank	None	
1	Parallel 15-conductor, cable 1 m	
3	Parallel 15-conductor, 3m cable	

Note: Shipped with the product.

❼Bracket

Code	Description	
Blank	None	
B	With bracket	

Note: Shipped with the product.

❽Traceability

Code	Description
Blank	None
T	Traceability certification with series variation diagram and company certification
K	With company certification

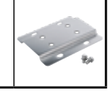
Note: Shipped with the product.

Discrete option model No.

FCM- RC1

- RC1: ❶Option

❶Option

Code	Description	
RC1	Parallel 15-conductor, cable 1 m	
RC3	Parallel 15-conductor, 3m cable	
LB1	Bracket	

Note: The cable body is the same as FCM-PC1, PC3.

■ Specifications for hydrogen, helium

Item			FCM-[❶] [❷]-[❸]R[❹]		
Valve drive method			Proportional solenoid valve When not energized: Closed		
			Full scale flow rate	H2 (Hydrogen)	HE (Helium)
Flow rate range *1	[❶]	0002	2 L/min	●	●
		0005	5 L/min	●	●
		0010	10 L/min	●	●
		0020	20 L/min	●	●
Applicable fluids *2	[❷]	H2	Hydrogen	●	
		HE	Helium		●
Port size	[❸]	8 A	Rc1/4	●	●
		UF	9/16-18UNF	●	●
		4S	1/4" Double barbed fitting	●	●
		4RM	1/4" JXR male fitting	●	●
Control	Control range			3 to 100% F.S.	
	Response time			Within 0.5 sec. to setting ±5% F.S. (TYP.)	
	Accuracy			Within ±3% F.S.	
	Repeatability			Within ±1% F.S.	
	Temperature characteristics			Within ±0.2% F.S./°C (base temperature 25°C)	
	Pressure characteristics			Within ±1% F.S. per 98 kPa (standard differential pressure reference)	
Pressure	Standard differential pressure *3			Refer to the separate table	
	Working pressure differential *4			Refer to the separate table	
	Max. working pressure *4			Refer to the separate table	
	Proof pressure			980 kPa	
Operating ambient temperature, operating ambient humidity				0 to 50°C, 90% RH or less (no condensation)	
External leakage				1 x 10^{-6} Pa·m³/s or less (helium leakage rate)	
I/O	Input signal/ preset input *5	-	R	RS-485 communication (Modbus RTU)/0-10 VDC (6.7 kΩ)/0-5 VDC (10 kΩ)/4-20 mADC (250 Ω) *6/preset input 4 points (2 bit) (switching with setting)	
	Output signal *7	[❹]	AN	Analog output: 1-5 V (connecting load impedance 500 kΩ and over) Error output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less	
			AP	Analog output: 1-5 V (connecting load impedance 500 kΩ and over) Error output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less	
			SN	Switch output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less Error output: NPN open collector output, 50 mA or less, voltage drop 2.4 V or less	
			SP	Switch output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less Error output: PNP open collector output, 50 mA or less, voltage drop 2.4 V or less	
Flow rate display	Indicator method			7-segment LED 3-digit, indicator accuracy: control accuracy ±1digit	
	Indicator range, display resolution			Refer to the separate table	
Integrating functions				Refer to the separate table	
Power Supply	Power supply voltage			24 VDC ±10% (stabilized power supply with ripple rate 1% or less)	
	Current consumption *8			270 mA or less	
Mounting orientation				Unrestricted in vertical/horizontal direction	
Wetted section materials				Stainless steel, fluoro rubber, alumina, semiconductor silicon, soldering	
Weight		[❸]	8A/UF	Approx. 480 g	
			4S/4RM	Approx. 560 g	
Degree of Protection				IEC standards IP40 or equivalent	
Protection circuit *9				Power reverse connection protection, switch output reverse connection protection, switch output load short-circuit protection	
EMC Directive				EN55011, EN61000-6-2, EN61000-4-2/3/4/6/8	

Pressure

Standard differential pressure, working pressure differential

			Flow rate range [❶]			
			0002	0005	0010	0020
Applicable fluid [❷]	H2	Standard differential pressure (kPa)	20	50	50	50
		Working pressure differential (kPa)	10 to 50	30 to 80	30 to 80	30 to 80
		Max. working pressure(kPa)	50	80	80	80
	HE	Standard differential pressure (kPa)	50	100	100	100
		Working pressure differential (kPa)	20 to 100	50 to 150	50 to 150	50 to 150
		Max. working pressure(kPa)	100	150	150	150

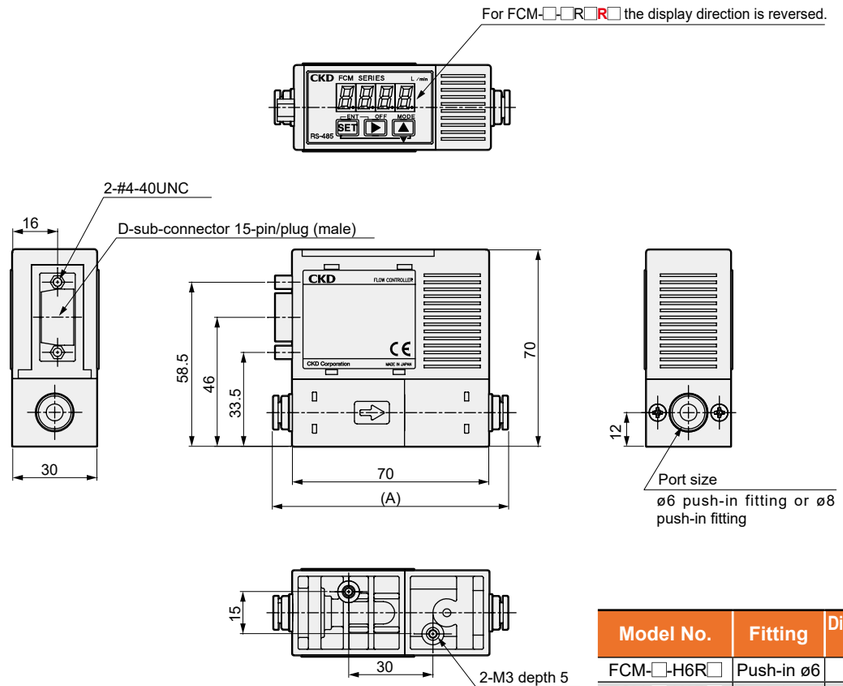
Indicator, integrating functions

		Flow rate range [❶]			
		0002	0005	0010	0020
Flow rate display	Indicator range	0.00 to 2.00 L/min	0.00 to 5.00 L/min	0.0 to 10.0 L/min	0.0 to 20.0 L/min
	Indicator resolution	0.01 L/min	0.01 L/min	0.1 L/min	0.1 L/min
Integrating functions *10	Indicator range	9999.99 L	9999.99 L	99999.9 L	99999.9 L
	Indicator resolution	0.01 L	0.01 L	0.1 L	0.1 L
	Pulse output rate	0.02 L	0.05 L	0.1 L	0.2 L

*1: 20°C flow rate converted to volumetric flow rate at 1 barometric pressure (101 kPa). Full scale stands for max. scale flow rate in the flow rate range.
*2: Use dry gas which does not contain corrosive elements such as chlorine, sulfur or acids, and which is clean and does not contain dust or oil mist.
*3: Standard differential pressure is the differential pressure when this product is calibrated. (Secondary side released to atmosphere)
*4: Working pressure differential is the differential pressure required for normal operation of this product. This value differs with the flow rate range and applicable fluid. The min. value of the working pressure differential is the differential pressure required for the full scale flow rate to flow when secondary side is released to atmosphere. The max. working pressure (max. value of operating differential pressure) is the max. value of primary side pressure. If more pressure is applied, control may become unstable, or the max. flow rate may not be controllable.
*5: The default is RS-485. Analog input or preset input can be used as needed. (It cannot be used together with RS-485.) Do not apply analog signals that differ from the set analog input specifications. Do not apply excessive voltage that exceeds the analog input specifications. Do not turn ON/OFF the power supply with an input signal applied. Excessive voltage could be applied, causing malfunction or damage to the product. Take special care when the current input is 4-20 mA.
*6: Use a current input signal that does not apply overvoltage of 10 V or more.
*7: The output impedance of the analog output voltage section is approx. 1 kΩ. If the impedance of the connecting load is small, output and error increase. Check error with the impedance of the connecting load before using.
*8: Current for 24 VDC, when no load is connected, and when flow rate is full scale. The current consumption will vary depending on the load.
*9: This product's protection circuit is effective only for specific misconnections and load short-circuits. It does not provide protection for all misconnections.
*10: The accumulated flow is a calculated (reference) value. It is reset when the power is turned OFF.
*11: The valve inside this product cannot be used as a stop valve requiring zero leakage. Slight leakage is allowed for in the specifications.

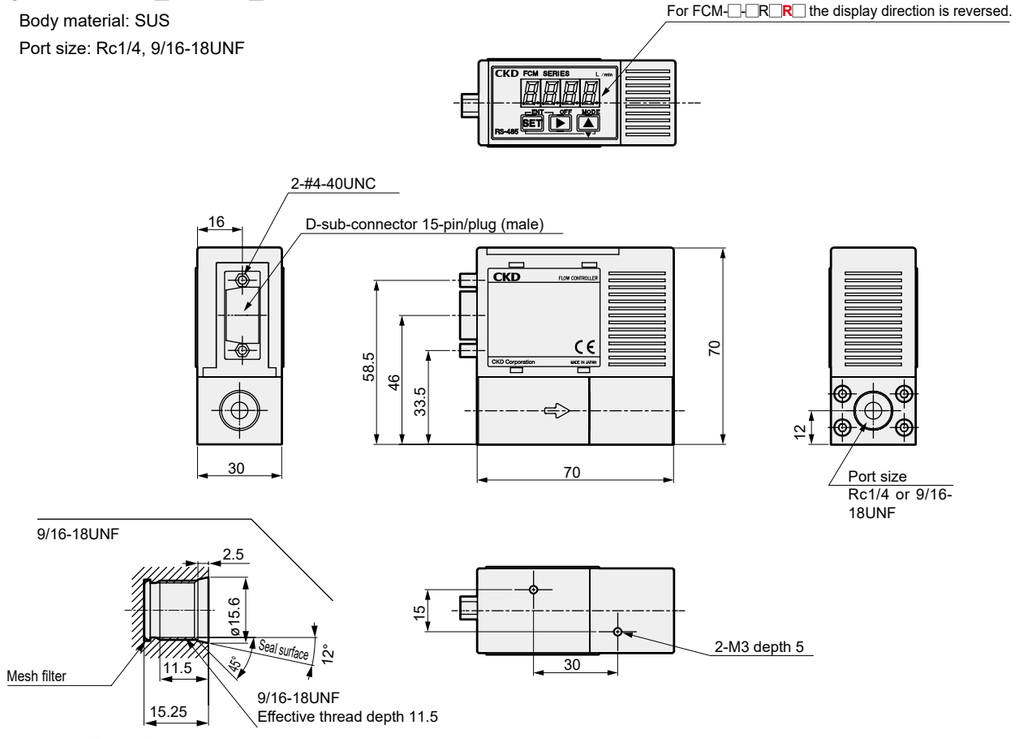
Dimensions

●Model No.: FCM-□-H6R/H8R□
Body material: Resin
Port size: ø6, ø8



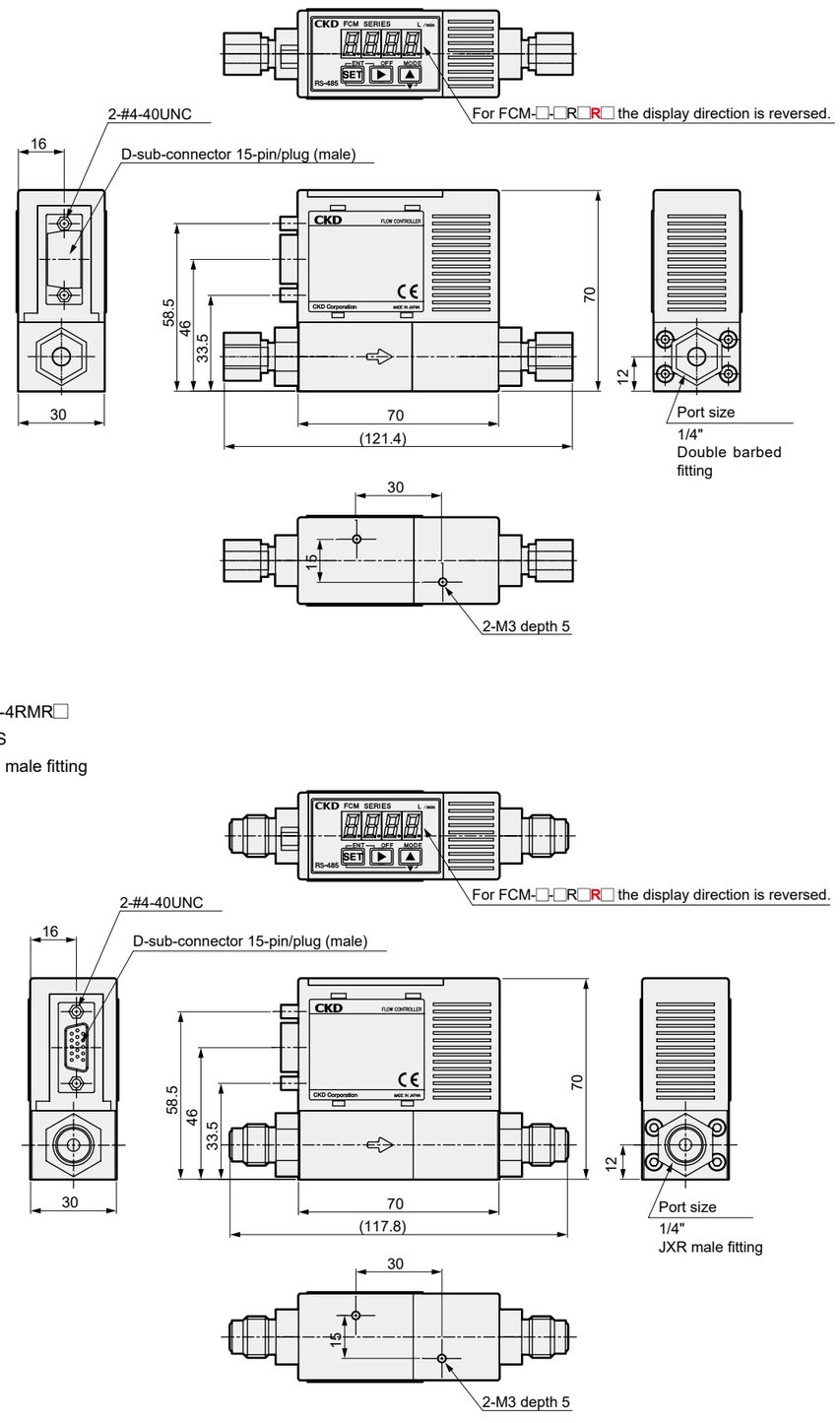
Model No.	Fitting	Dimension (A)
FCM-□-H6R□	Push-in ø6	84
FCM-□-H8R□	Push-in ø8	85

●Model No.: FCM-□-8AR/UFR□
Body material: SUS
Port size: Rc1/4, 9/16-18UNF



Dimensions

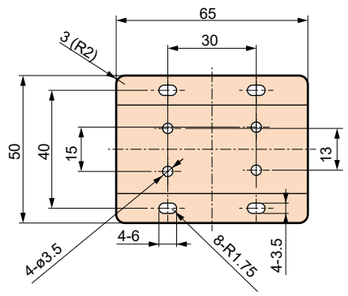
●Model No.: FCM-□-4SR□
Body material: SUS
Port size: 1/4" double barbed fitting

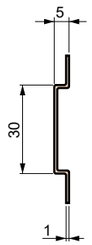


●Model No.: FCM-□-4RMR□
Body material: SUS
Port size: 1/4" JXR male fitting

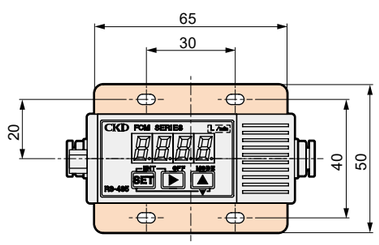
Dedicated bracket (floor mounted)

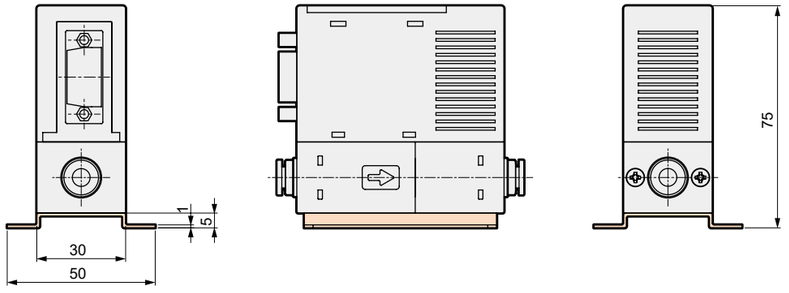
Discrete model No.:FCM-LB1



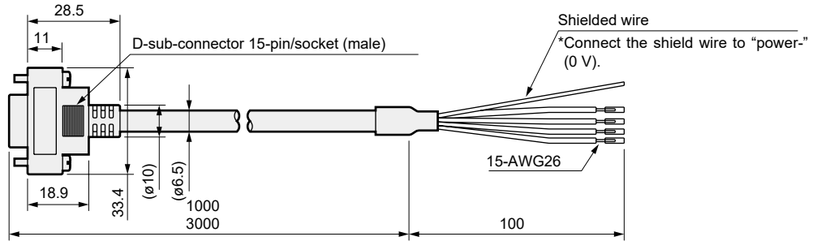


Material: Steel
Weight: 28 g



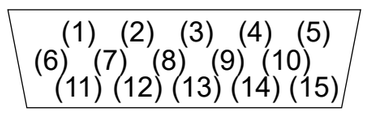


Cable optional dimensions



Cable	Weight g
FCM-RC1	82
FCM-RC3	205

■Connector pin array (product side)



D sub Socket Pin №	1	2	3	4	5	6	7	8	9	10	11	12	13		14	15
Insulator color	Brown	Orange	Yellow	Purple	Red	Light blue	Pink	White (with black line)	Red (with black line)	Gray	White	Green (with black line)	Green		Blue	Black
Name	Preset input signal		Integration reset signal	Digital signal ground	Power supply +	RS-485 communication line				Common	Analog input	Terminating resistor	Analog Output	Switch Output	Error output	Power supply - (0V)
Input	Bit 1	Bit 2			+24 VDC	A-IN (+)	B-IN (−)	A-OUT (+)	B-OUT (−)				1-5 VDC	NPN or PNP output	NPN or PNP output	

*1: Pin No. 4 is the signal ground for RS-485 communication.
*2: The No. 8 pin (A-OUT) and No. 9 pin (B-OUT) are for crossover wiring. Use when connecting multiple units.
*3: The No. 10 pin common is the common for the preset input and accumulation reset signal (pin No. 1 to 3).

Communication specifications

Item	Details
Communication standards	RS-485 compliant
Communication method	Half-duplex
Synchronization method	Step synchronization
Communication protocol	Modbus RTU compliant
Transmission bit rate	9.6/19.2/38.4 kbps
Data bit	8 bit

Item	Details
Parity bit	None / Odd / Even
Stop bit	1 bit/2 bit
Transmission distance	Max. 20 m
Components address	1 to 247
Connection	1: N (max. 31 units)

Names and functions of display / operation section

Output display (Red)



●"F" is displayed when confirming the function setting.



●When the switch output is ON, "-" lights up.
* Does not blink at integrated pulse output.
* Blinks when overcurrent is detected.

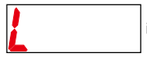


●E lights up when error output is ON.
* Blinks when overcurrent is detected.

*When there are upper/lower limits in the function setting, or when the higher digits or lower digits of the accumulated flow display are indicated,



or

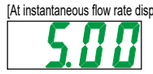


is displayed.

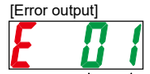
3-digit number LED display (green)

●Indicators instantaneous flow rate display and function setting details during RUN mode (instantaneous flow rate display).
*When displaying the function setting, the setting mode number and setting details are displayed.
●The values are displayed when setting each piece of data.
●Error code No. is displayed at the time of error display.

[At instantaneous flow rate display]

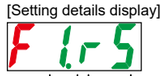


[Error output]



Code No.

[Setting details display]



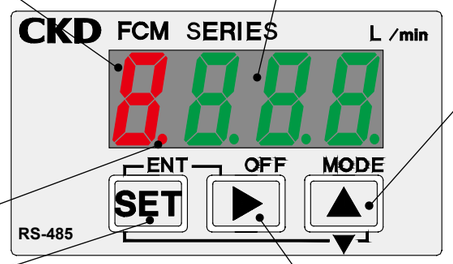
Setting details
Setting mode No.

[Disabled display]



Disabled display
Setting mode No.

Flow rate 110%F.S. or more: Hi



Power lamp (red dot)

●Blinks during RS-485 communication.

UP key (MODE key)

●Used to count up values.
●Used to change the setting mode.
●Used to change the settings item.

SET Key

●Used to confirm the setting mode.
●Used to confirm the setting item.
●Used to change to the integration display.

Shift key (OFF key)

●Used to select the digit of the values.
●Used to reset from forced OFF when performing forced OFF (control stop).

SET + Key (ENT key)

●Used to confirm the value.
●Used to release the key lock.
●Used to reset accumulation. (Accumulated flow display)

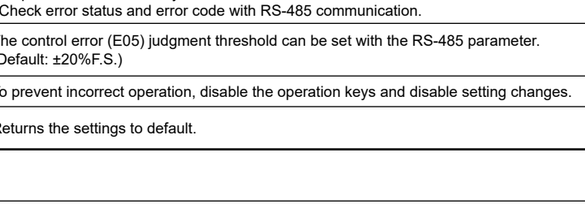
SET + Key (DOWN key)

●Used to count down values.
●Used to set the key lock.

+ Key

●Used for resetting settings (initialization).

Compact flow rate controller Functions of FCM Series (RS-485 type)

No.	Function	Description	Function compatible model: Analog Output	Function compatible model: Switch Output
F0.- -	RS-485 setting function	Device address, communication speed, parity, and stop bit can be set.	○	○
F1.- -	RS-485 input function	An arbitrary flow rate can be set to the target value with RS-485 communication.	○	○
	Direct memory function	Target value can be entered by key. Control flow rate can be controlled freely by operation key on the product even if there is no external input signal.	○	○
	Preset input function	By specifying 4 arbitrary flow rates, the flow rate can be controlled with an external 2bit signal input (signal from PLC, etc.) or "Address: 0x0038 preset number selection" of RS-485 communication.	○	○
	Analog input function	Flow rate can be controlled with an analog input signal. Input signal can be selected from 0-10 V, 0-5 V or 4-20 mA.	○	○
F2.- -	Analog input signal zero/span adjustment function	Zero point or span point of analog input signal can be changed. [When disabled] [When enabled] 	○	○
F3.- -	Auto-power OFF	Turns the flow rate display OFF if not operated for approx. 1 minute. (Control does not stop with auto-power OFF function). Turns off unneeded displays to enable energy-saving operation.	○	○
F4.- -	Switch output function	The switch functions below can be selected. • ①Tolerance mode: Turns the switch ON when the value is within tolerance against the control target value (arbitrary setting). • ②Designated range mode: Turns the switch ON when the value is outside the designated flow rate range. • ③Integrated pulse: Outputs the integrated pulse when performing integration. • ④ON at set integration or higher: Turns the switch ON when the value reaches the set accumulated flow. [Mode 1: Tolerance mode] [Mode 2: Designated range mode] [Mode 3: Integrated pulse] [Mode 4: ON at set integration or higher] Refer to the specifications for pulse output rate. Set integrated value	-	○
F5.- -	Integrating functions	Integrates the flow rate. As well as accumulated flow display, it has the following functions. • Control of start/stop/reset of integrating functions with RS-485 communication. • Closes the solenoid valve when the value reaches the set accumulated flow. • Reads accumulated flow value via RS-485 communication. • Turns the switch ON when the value reaches the set accumulated flow. How to reset the integrated value • External input, key operation, RS-485 communication	○	○
F6.- -	Error auto shut-off	Stops control when an error occurs, fully opens or closes valves, and turns error output ON.	○	○
F7.- -	Zero point adjustment	Adjusts the zero point of flow rate output.	○	○
	Error display function	Capable of displaying error state. As well as error display, it has the following functions. • Turns ON error output when an error occurs. • Stops control automatically when an error occurs. • Check error status and error code with RS-485 communication.	○	○
	Control error threshold setting	The control error (E05) judgment threshold can be set with the RS-485 parameter. (Default: ±20%F.S.)	○	○
	Key lock	To prevent incorrect operation, disable the operation keys and disable setting changes.	○	○
	Reset setting	Returns the settings to default.	○	○

For details on operation and setting method, refer to CKD components product website (https://www.ckd.co.jp/kiki/en/) → "Model No."→ Instruction manual

FCM Glossary

Applicable to compact flow rate controller FCM.

Term	Explanation
Control range	Calibration range of this product.
Accuracy	Calibration error from CKD reference device. (Conditions: Temperature 25±3°C, power supply voltage 24 VDC ±0.01 V, standard differential pressure, secondary side released to atmosphere)
Repeatability	Calculated from the variation (D=Max-Min) after 20 consecutive cycles of 0% F.S. and 50% F.S. flow control at a cycle in which the control is sufficiently stabilized. (Reproducibility) = ±D/2/FS control flow rate x 100[%]
Temperature characteristics	Indicates the fluctuation of the flow rate value according to changes in the ambient temperature and fluid temperature (reference temperature 25°C) converted per 1°C. Calibration is performed at a temperature of 25°C.
Pressure characteristics	Indicates the fluctuation of the flow rate value according to changes in the working pressure. Calibration is performed at standard differential pressure.
Standard differential pressure	Differential pressure when this product is calibrated. (Secondary side released to atmosphere)
Working pressure differential	Differential pressure required for normal operation of this product.
Proof pressure	Pressure at which the product will not be damaged.
Indicator resolution	Min. step at which the display changes.
(Integrated) pulse output rate	Accumulated flow per pulse when the integrated pulse is output.
LSB	Shows the lowest order bit of the data. (Abbreviation for Least Significant Bit)
MSB	Shows the highest order bit of the data. (Abbreviation for Most Significant Bit)
UInteger	Unsigned integer. Indicates the data type. Ex. If the data format is UInteger16 (Process data OUT setting flow rate, etc.) Expressed as 16 (digits) bits (0/1) The variable range on the data is 0 to 65535, but the variable range that can be taken by each data name is limited.
Integer	Signed integer. Indicates the data type. Ex. If the data format is Integer16 (Process data IN instantaneous flow rate, etc.) Expressed as 16 (digits) bits (0/1) with the most significant bit representing the sign. Data value can range from -32768 to +32767, but for instantaneous flow rates a negative value is used to check the shift from the zero point to check and does not indicate a reverse flow.
Digit	Digit. Min. value of digital display when decimal points are ignored.
AWG	Abbreviation of American Wire Gauge. Standard for cables.

Flow rate controller

Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

Product-specific cautions: Compact flow rate controller FCM Series

Design / Selection

1. Working fluids

DANGER

■Do not feed gas at the explosion limit. There is a risk of explosive accidents.

■When using this product for hydrogen, be sure to purge with inert gas such as nitrogen or argon before use. Usage without purging with inert gas could result in explosive accidents.

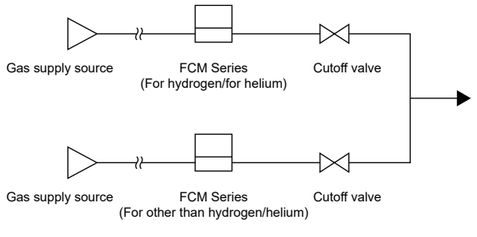
■For products without oil-free processing in gas-contacting parts, do not feed oxygen gas. Doing so could result in fire. Even for products with oil-free processing, do not use for oxygen gas if the product has been used even once for any other gas.

WARNING

■This product cannot be used as a billing meter. Do not use this product for commercial transactions as it is not compliant with the Measurement Act.

■This product is only for use with the gases indicated in the model No. Do not use products other than the applicable fluids, as specifications such as accuracy and control properties cannot be met. In particular, note that if hydrogen gas or helium gas flows into products in this series that is not in each dedicated model, the sensor safety circuit will activate and the product may not operate. (When the safety circuit is activated, flow rate measurement/control cannot be performed until the power has been turned OFF.)

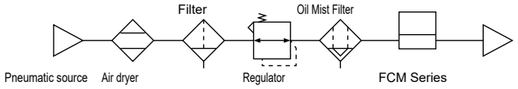
■When mixing hydrogen gas or helium gas with a gas other than hydrogen or helium, use caution regarding gas reverse flow. If hydrogen gas or helium gas flows into products in this series that is not in each dedicated model, the sensor safety circuit will activate and the product may not operate. (When the safety circuit is activated, flow rate measurement/control cannot be performed until the power has been turned OFF.) When cutting off the gas, provide individual cutoff valves as in the reference drawing below in order to prevent gas back-flow.



■Avoid the entry of foreign matter into the product. If foreign matter (foreign materials, water drops, or oil mist inside the piping, etc.) enters the product, accuracy or control properties may be adversely affected, leading to breakdown in some cases. If the entry of foreign matter is possible, install a filter, air dryer, and oil mist filter on the primary side (upstream side) of the product.

- The mesh inside the product rectifies flow in the pipe. Note that it does not filter out foreign matter.
- As compressed air from the compressor contains drainage (water, oil oxides, foreign matter, etc.), install a filter, air dryer, and oil mist filter (Micro-mist separator) on the primary side (upstream side) of the product.
- When using compressed air, use clean air compliant with ISO 8573-1: 2010 [1.1.1 to 1.6.2].

[Recommended circuit]



- When using a valve on the primary side of the product, use only valves with oil-prohibited specifications. The product could malfunction or breakdown if exposed to splattering grease, oil, etc.
- Use dry gas which does not contain corrosive elements such as chlorine, sulfur or acids, and which is clean and does not contain dust or oil mist.
- Depending on the fluid, retaining the fluid for long periods could adversely affect the performance. Do not seal the fluid in the pipe for long periods of time.

■When using the valve with liquefied gases such as propane gas, always vaporize the gas. Failure may result if liquefied gas enters the product.

■When using this product to control the burner air-fuel ratio, take design measures to prevent backfire and to avoid the effect of backfire on the product. Internal pressure increase in the piping or fire due to burner backfire may lead to failure.

■Check that the pressure inside the fluid supply line is within the working differential pressure range before using. If the source pressure is low or the pressure at the secondary side is high, the differential pressure becomes insufficient and the fluid does not flow.

■Due to the flow characteristics of the primary side regulator, the pressure is unstable when the flow rate flows, and FCM output may fluctuate.

2. Working environment

⚠ WARNING

■ Corrosive environment
Do not use this product in an atmosphere containing corrosive gases such as sulfur dioxide.

■ Ambient/fluid temperatures
Use at ambient/fluid temperatures within the specified range of 0 to 50°C. Even if the temperature is within the specified range, do not use this product if the ambient temperature and fluid temperature could suddenly change and cause dew to condense.

■ Guaranteed proof pressure/working pressure differential range
Usage in applications exceeding the proof pressure or outside the working pressure differential could result in breakdown. Use only within the specified range. If the source pressure is low or the pressure at the secondary side is high, the differential pressure decreases and the fluid does not flow.

■ Drip-proof environment
The degree of protection of this product is equivalent to IP40. Do not install this product where water, salt, dust, or swarf is present or in a pressurized or depressurized environment. The product cannot be used with large temperature variations or high temperature/humidity since condensation may occur inside the body.

■ The solenoid proportional valve inside this product does not have a fully closed function. When a fully closed state is required, separately provide a cutoff valve outside the product. When the external cutoff valve is closed, keep the product valve in standby at a fully closed state (setting flow rate zero). If the product is left in the normal control state with the external cutoff valve closed, excessive flow is produced for a moment when the external cutoff valve is opened. When using with frequent ON/OFF operations, its service life as a proportional valve may be reduced depending on the working conditions.

■ Do not install this product in movable sections or where it may be subject to vibration. Vibration or impact may lead to malfunction.

⚠ CAUTION

■ Check leakage current to prevent malfunction caused by leakage current from other fluid control components. When using a PLC, etc., leakage current could cause the product to malfunction.

■ When the current input type is wired, the power ground and signal common are shared. When operating this product in multiples with one PLC and D/A unit, depending on the D/A unit circuit, wiring trouble could prevent the correct signal from being input. Consult with the PLC manufacturer for use.

■ The current input type can be used with input signal 1-5 V, but as opposed to other voltage input types, input impedance is small (250 Ω). Use an appropriate voltage generator.

■ Be alert for pressure loss in the piping. When piping to this product, keep the differential pressure between upstream and downstream sides within the working pressure differential range (refer to the specification table for each type). Using the product outside the working pressure differential range could cause incorrect operation. In particular, an orifice or restriction in the secondary side (downstream side) of the product could cause incorrect operation. Please be careful. In addition, the product's primary or secondary pressure may fluctuate repeatedly, or the product's control may not be track, leading to unstable flow rate control.

■ CE-compliance working conditions
This product is CE-marked, indicating conformity with the EMC Directives. The standard for the immunity for industrial environments applied to this product is EN61000-6-2; the following requirements must be satisfied in order to conform to this standard:
Conditions
- The evaluation of this product is performed by using a cable that has a power supply line and a signal line paired to assess the product's performance.
- This product is not equipped with surge protection. Implement surge protection measures on the system side.

3. Wiring and piping

⚠ WARNING

■ Use a DC stabilized power supply within the specified rating, insulated from the AC power supply. A non-isolated power supply could result in electrical shock. If power is not stabilized, the peak value in hot summer could exceed the rating and damage the product or reduce precision.

⚠ CAUTION

■ When using oxygen gas, take special care with the points below.
- The piping work should be performed by an expert in the handling of oxygen gas.
- Use piping with oil-free processing.
- Make sure to remove foreign materials, burrs, etc., in the piping before installing the product.
- Install a filter on the primary side of the product.

■ Do not install regulator/solenoid valve, etc., immediately before this product. Deflected currents may occur and cause errors. Provide a straight piping section if required.

■ Although the mounting is "unrestricted in vertical/horizontal direction", the flow rate may vary depending on difference in the mounting orientation or piping conditions.

■ Do not install multiple bodies in close contact. The mutual generation of heat could cause the product body's temperature to rise, hastening changes in characteristics or in the resin material. When using the products in a row, set intervals of distance of 10 mm or more.

Analog input/parallel input/RS-485

■ Cable extension
When extending the cable beyond 3 m, the analog output and analog input error may increase or the control may become unstable due to wiring resistance. Use of a cable within 3 m is recommended.

■ Extension of cable for RS-485 communication
- Make sure that the total extension distance of the RS-485 communication cable is within 20 m.
- Use a shielded twisted-pair cable for the communication cable to be extended.

■ When using RS-485 communication
- Install terminating resistors on both ends of the communication path. A terminating resistor (120Ω) is built into the product. Can be used as a terminating resistor by connecting the terminating resistor pin of pin No. 12 and pin No. 7 or pin No. 9.
- Be sure to connect the digital signal ground. Stable communication may not be possible if not connected.

IO-Link

■ IO-Link power supply
- Make sure that the length of the cable is within 20 m. If extending the cable, use wiring length of 20 m or less between the master and device (this product).
- Insulate wires not being used so that they do not contact other wires. Unintended connection of unused wires to the ground, etc., could cause malfunction or damage to the product.
- Use a power supply with sufficient current supply capacity. Use a IO-Link master that has sufficient current supply per port. If these specifications are not met, the product performance may not be achieved. In this case, connect a DC stabilized power supply with sufficient current supply capacity, not the IO-Link master, to L+ (2VDC) or L- (GND).

4. Flow rate unit

⚠ CAUTION

■ This product's flow rate is measured at a mass flow rate unaffected by temperature or pressure. The unit is L/min, but this is the display when the mass flow rate is converted to volumetric flow rate at 20°C 1 barometric pressure (101 kPa) relative humidity 65%.

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual

Multi-monitors

MD



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● MD 580
Display description, internal circuit and connection method 583
⚠Safety Precautions 584

There is one way to manage both flow rate and pressure



Miniature flow rate sensor for gas
FSM-V

Compact electronic pressure switch
PPE-□A

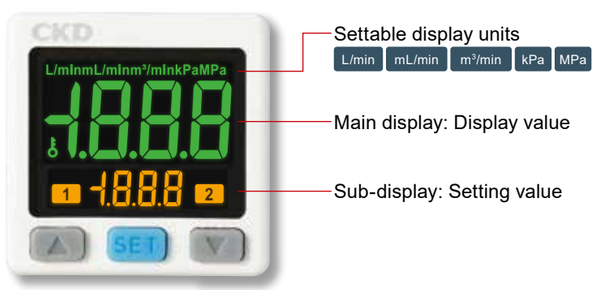
Karman vortex flow rate sensor for water
WFK3000

Capacitance electromagnetic flow sensor
WFC

Compatible with any flow rate and pressure regardless of the sensor

Multi-monitors

Simultaneous confirmation of the display value and the set value is possible. Output of flow rate and pressure can be displayed regardless of the sensor.



Analog output proportional to display value is possible

Switch output 2 points, analog output 1 point equipped

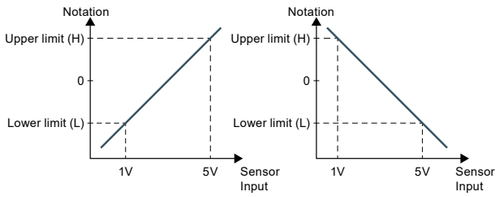
Transmits analog output signal proportional to input signal of the sensor to PLC, etc.



Set display value freely within range

Scaling function

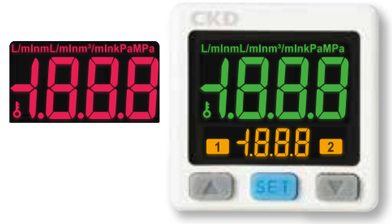
Enables conversion display of sensor input to arbitrary values. The decimal point position can also be switched.



Easy-to-read display

3-color display

The display value and set value are displayed in three colors.



Prevents misoperation

Lock function

Prevents misoperation such as touching the wrong key.

Saves power with display OFF when not setting

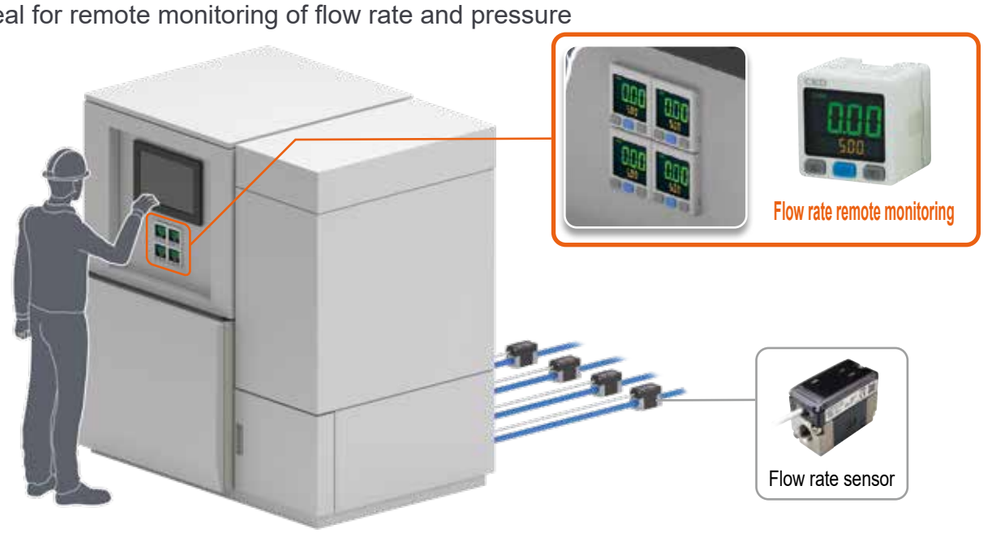
Energy saving mode function

In energy saving mode, the display will turn OFF after 30 seconds unless a button is pressed.

*Environment inspection is only available for "RoHS certificate" and "REACH certificate". Parts level detailed data is not supported.

Examples of applications

Ideal for remote monitoring of flow rate and pressure





Multi-monitors

MD Series

Refer to the CKD website for detailed compatible model Nos.

Model No. Notation Method

MD - N V A

- MD: Model No.
- N: ❷ Analog output
- V: ❶ Output
- A: ❸ Compatible sensor

❶ Output

Code	Description
N	Switch output (NPN) 2 points
P	Switch output (PNP) 2 points

❷ Analog output

Code	Description
V	Voltage output (1 to 5 V)
A	Current output (4 to 20 mA)

❸ Compatible sensor

Code	Description	Sensor connection (CN1) connector *Accessories			
		Sumitomo 3M model No.	Cover color	Applicable wire	
				AWG	O.D.
A	FSM-V, PPE, PPD3-A	37104-3122-000 FL	Yellow	24-26	ø1.0 - 1.2
B	WFK3000	37104-3163-000 FL	Orange		ø1.2 - 1.6
C	WFC	37104-2206-000 FL	Gray	20-22	ø1.6 to 2.0

Note: The corresponding sensor is voltage output (1 to 5 V).

(Standard attachment)
· 5-conductor connector cable 2 m: 1
· Sensor connection connector (e-CON): 1

●Discrete option model No.

MD - KD

- KD: ❶ Option

❶ Option

Code	Description	
KD	Parallel mounting bracket (mounting screws included)	
KL	L-shaped mounting bracket (mounting screws attached)	
KHS	Panel adapter	
KHSCB	Panel adapter + Front protective cover	
C2	5-conductor connector cable 2 m	

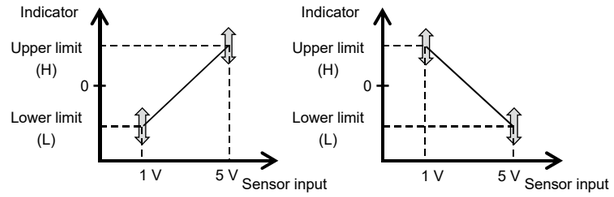
Specifications

Item			MD									
Indicator	Flow rate/ pressure range *1	Upper limit (H) / Lower limit (L)	-100.0 to 0	1.000 to 0	1.50 to 0	2.00 to 0	4.00 to 0	5.00 to 0	10.00 to 0	12.0 to 0	20.0 to 0	25.0 to 0
		Resolution	0.1	0.001	0.01	0.01	0.01	0.01	0.01	0.1	0.1	0.1
		Upper limit (H) / Lower limit (L)	32.0 to 0	50.0 to 0	60.0 to 0	100.0 to 0	1 to 200	300 to 0	500 to 0	1000 to 0	1.000 to -1.000	2.00 to -2.00
		Resolution	0.1	0.1	0.1	0.1	1	1	1	1	0.001	0.01
		Upper limit (H) / Lower limit (L)	5.00 to -5.00	10.00 to -10.00	20.0 to -20.0	50.0 to -50.0	100.0 to -100.0	200 to -200	500 to -500	1000 to -1000	300 to -100	980 to -100
		Resolution	0.01	0.01	0.1	0.1	0.1	1	1	1	1	1
		With scaling function										
	Unit *2	MPa, kPa, mL/min, L/min, m³/min										
Power supply voltage		12 to 24 VDC ±10% ripple (P-P) 10% or less										
Current consumption		40 mA or less (no load)										
Sensor input		1 to 5 V										
Sensor supply power current		max. 100 mA										
Switch output (NPN)		NPN: transistor, open collector 2 points Max. load current: 125 mA Max. power supply voltage: 30 VDC Internal voltage drop: 1.5 V or less										
Switch output (PNP)		PNP: transistor, open collector 2 points Max. load current: 125 mA Max. power supply voltage: 24 VDC Internal voltage drop: 1.5 V or less										
Repeatability (switch output)		±0.1% F.S. ±1 digit or less										
Hysteresis	One-point mode / Hysteresis mode / Window comparator mode	Adjustable *3										
Response time		2.5 ms or less (chattering prevention: 25 ms, 100 ms, 250 ms, 500 ms, 1000 ms, and 1500 ms can be selected)										
Switch output load short-circuit protection		Yes										
Indicator		Main/unit display: 2 colors (red, green) Sub-display: Orange (sampling rate: 5 times/sec)										
Indicator accuracy		±1%F.S.±1digit or less (reference temperature: 25±3°C)										
Indicator lamp		Orange (OUT1, OUT2)										
Analog output (voltage output)		Output voltage: 1 to 5 V±2%F.S. or less (rated pressure range) Linearity: ±1%F.S. Output impedance: 1 kΩ										
Analog output (current output)		Output current: 4 to 20 mA±2%F.S. or less (rated pressure range) Linearity: ±1%F.S. Max. load impedance: 250 Ω (12 V), 600 Ω (24 V) Min. load impedance: 50 Ω										
Environment conditions	Degree of Protection	IP40										
	Ambient temperature	Usage: 0 to 50°C, Storage: -10 to 60°C (no condensation or freezing)										
	Ambient humidity	Usage/Storage: 35 to 85% RH (no condensation)										
	Withstand voltage	1000 VAC, 1 minute (between the case and lead wire)										
	Insulation resistance	50 MΩ or less (500 VDC, between the case and lead wire)										
	Vibration resistance	Compound amplitude 1.5 mm, 10 Hz - 55 Hz - 10 Hz per minute, 2 hours each in X, Y, Z directions										
	Shock resistance	100 m/s² (10 G), 3 times each in X, Y, Z directions										
Temperature characteristics		±0.5F.S. or less (25°C reference) temperature range 0 to 50°C										
Lead wire		Oil resistant cable (0.15 mm²)										
Weight		Approx. 67 g (Lead wire 2 m)										

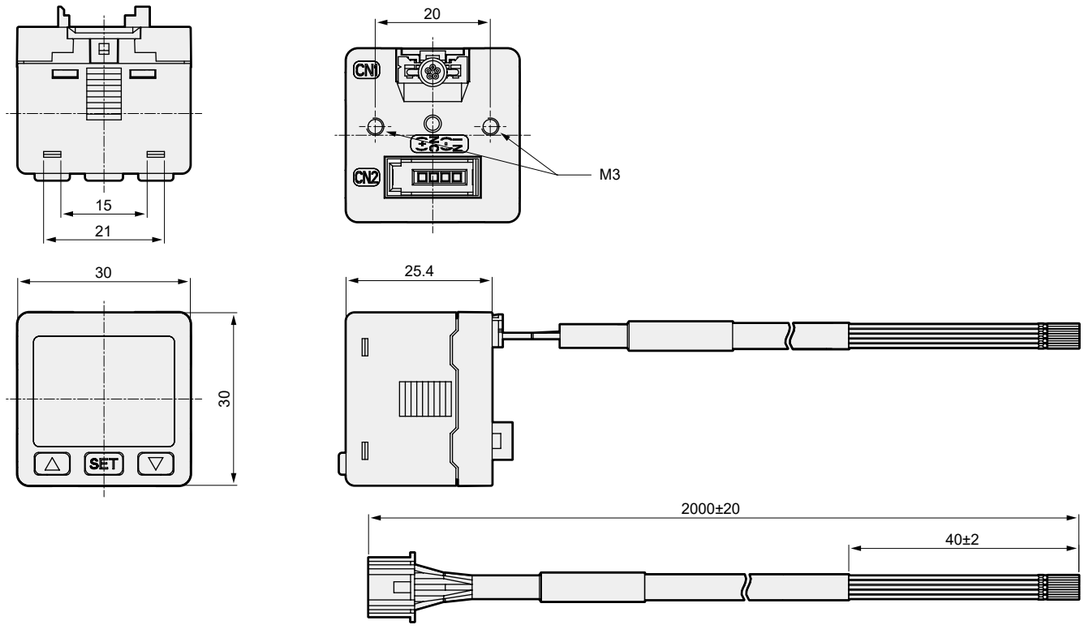
*1: The flow rate/pressure range can be selected from 30 patterns. Arbitrary values can also be set with the scaling function.
*2: Units are "MPa" "kPa" "mL/min" "L/min" "m³/min" can be selected from five types.
*3: Hysteresis of 1 to 8digit can be adjusted in one-point mode and window comparator mode.

Scaling function

Arbitrary figures can also be set for the flow rate/pressure range with the scaling function.
The number of digits after the decimal point can also be changed.
Note: The upper (H) and lower (L) limits can be set within a range of ±1999. However, the upper (H) and lower (L) limits cannot be set with the same polarity (both positive or both negative).

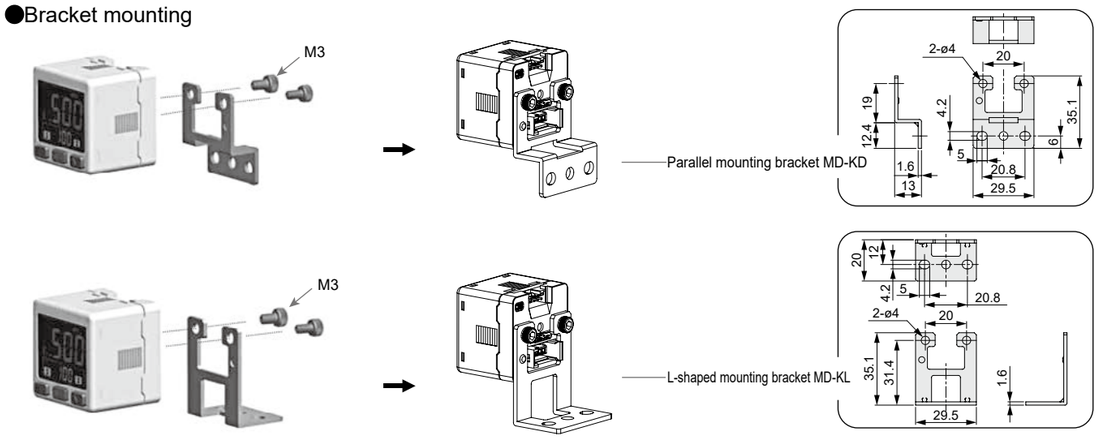


Dimensions

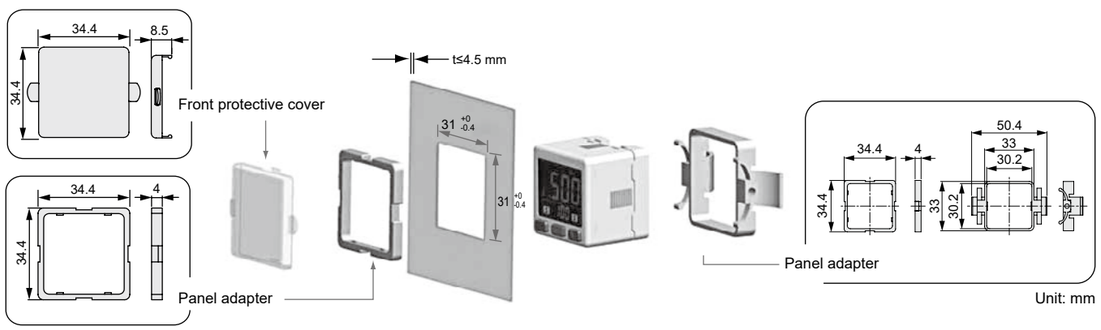


Optional dimensions

●Bracket mounting



●Panel mount

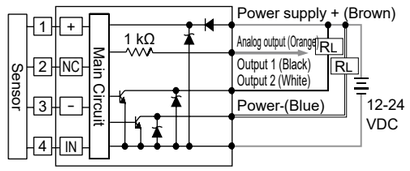


Indicator description

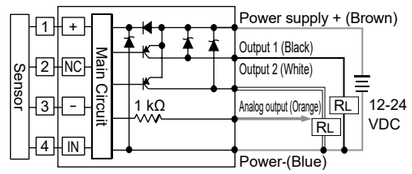


Internal circuit / connection method

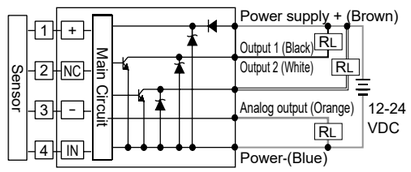
●MD-NV
2NPN + Analog output (1 to 5 V)



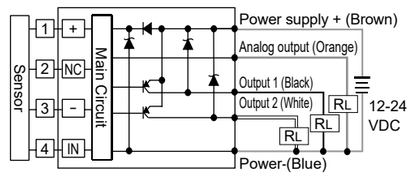
●MD-PV
2PNP + Analog output (1 to 5 V)



●MD-NA
2NPN + Analog output (4 to 20 mA)

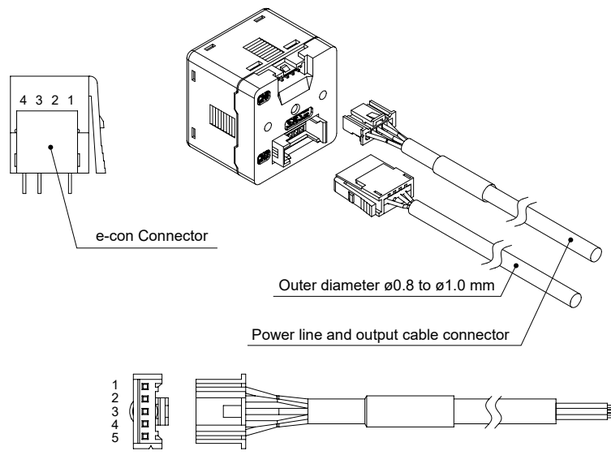


●MD-PA
2PNP + Analog output (4 to 20 mA)



PIN No.	Sensor wiring
1	Power supply +
2	N.C.
3	Power supply -
4	Sensor input (1 to 5 V)

PIN No.	Cable color
1	Brown (Power supply +)
2	Orange (analog output)
3	White (OUT2)
4	Black (OUT1)
5	Blue (Power supply -)



Safety Precautions

Be sure to read this section before use.
For general pneumatic components precautions, refer to Intro 17 for details.

Product-specific cautions: Multi-monitor MD Series

Design / Selection

⚠ WARNING

■ Use this product in accordance with specifications.
Use for applications, or at load currents, voltages, temperatures, impacts or sites excluded from the specifications could result in damage or malfunctions.

■ Power supply voltage
Do not use this product at levels exceeding the power supply voltage. If voltage exceeding this range or AC power supply (100 VAC) is applied, the controller could rupture or burn.

■ Load short-circuit
Do not short-circuit the load. Failure to observe this could result in rupture or burning.

⚠ CAUTION

■ Working environment
- Do not use the product in a location subject to vibration or shock of 100 m/s^2.
- Do not use this product in areas containing water droplets, oil droplets, or dust.

■ Determine the setting taking error caused by accuracy and temperature characteristics into consideration.

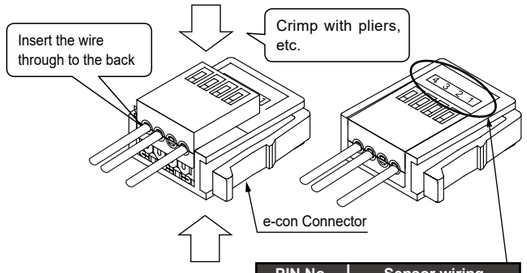
■ Take care when using this product for an interlock circuit.
When using this product for an interlock signal requiring high reliability, provide a double interlock by installing a mechanical protection function or a switch (sensor) other than this product as a safeguard against breakdown.

■ Corresponding sensor
- The corresponding sensor is the voltage output (1-5 V) type. If the current output-type or other voltage output-type is connected, it will not operate properly.
- The maximum supply current to the sensor is 100 mA. Check the specifications of the connected sensor before use.
- As the compatible e-CON type varies depending on the sensor, select upon confirmation with Model No. Notation Method on page 580.
- The FSM2 separated display sensor cannot be used as is, because the e-CON wiring pin array is different.

■ CE-compliance working conditions
The standard for the immunity for industrial environments used for CE conforming products is EN61000-6-2, but the following requirements must be satisfied in order to conform to this standard.
Conditions
- The evaluation of this product is performed by using a cable that has a power supply line and a signal line paired to assess the product's performance.
- This product is not equipped with surge protection. Implement surge protection measures on the system side.

■ Range setting
When using this product, be sure to set the range and units.

■ Care must be taken for protection of body and lead wire.
- Check that stress is not directly applied to cable leadouts or connectors.
- Connect and wire bend-resistant material, such as robot wire material, for movable sections.
- For e-CON connector wiring, cut the tip of the sensor lead wire for use. Insert the wire through to the back of the connector, and securely crimp with pliers, etc. The wire sheath does not need to be removed.
- As the analog voltage output lead wire sheath color varies depending on the sensor, check the sensor specifications before e-CON wiring. Check that the pin No. and sensor wiring are correct before crimping. Incorrect wiring can result in malfunction, breakdown, or damage to the sensor or to this product.



PIN No.	Sensor wiring
1	Power supply +
2	N.C.
3	Power Supply
4	Sensor input (1 to 5 V)

For precautions during mounting, installation, adjustment, use and maintenance, refer to the CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manual

MEMO

Standards compliant products/ISO

Listed page

CE Marking Ending 2

RoHS Compliance Ending 4

ISO9001 / ISO14001 Certification Ending 6

CE Marking

CKD offers a variety of European standard compliant equipment to support customers in achieving CE Marking for their machinery products.



CE : Displayed on European standard compliant products

CE What is Marking?

- CE Marking is a mark that proves a product conforms to the essential requirements of all applicable EC directives.
- CE marking is a product passport within the EU, and products displaying the CE marking can be freely circulated within the EU.
- Machinery exported to the EU is required to comply with the Machinery Directive, EMC Directive, Low Voltage Directive, etc., but since CE marking is, in principle, mandatory for final products that flow directly to the market, marking on built-in components is not originally required. However, if built-in components (CKD equipment products) are certified for European standards, it makes CE Marking easier for the final product (your machinery product).

Content of Each EC Directive

CKD's main products, such as solenoid valves, sensors, and ABSODEX, are required to conform to the following directives, and many models are European standard compliant.

Directive	Requirements	Applicable
Machinery Directive (2006/42/EC)	Essential safety requirements for machinery	■ Machinery with drive parts Equipment such as solenoid valves are not subject to this, but ensuring compliance with standards makes CE Marking easier for customers.
EMC Directive (2014/30/EU)	Measures for both the generation of electromagnetic disturbance (EMI/emission) and the ability to eliminate electromagnetic disturbance (EMS/immunity)	■ Equipment that generates electromagnetic disturbance or equipment that is affected by electromagnetic disturbance Solenoid valves composed of simple solenoids do not generate electromagnetic disturbance, but ensuring compliance with standards makes CE Marking easier for customers.
Low Voltage Directive (2014/35/EU)	Electrical safety regarding electric shock, etc.	■ Components operating at 50 VAC to 1000 VAC and 75 VDC to 1500 VDC
Pressure Equipment Directive (2014/68/EU)	Safety regarding the hazards of fluid energy possessed by pressure equipment	■ When certain conditions are exceeded within pressure equipment
Simple Pressure Vessels Directive (2014/29/EU)	Safety regarding leakage and explosion of containers	■ Welded containers where the product of maximum operating pressure and volume (PV·S) exceeds 50 bar-liters Our air tanks (AT type) do not conform, so they cannot be exported to the EU.
RoHS Directive (2011/65/EU)	Restriction of 6 environmentally hazardous substances	■ Electrical/Electronic Equipment
2011/65/EU and (EU) 2015/863	Restriction of 10 environmentally hazardous substances	■ Electrical/Electronic Equipment

The countries to which CE marking applies are EU (European Union) member states, EFTA (European Free Trade Association) member states, and Turkey.

CKD's Compliance with European Standard Compliant Products

⚠Compliant products may not be available depending on the specification and detailed model number combination; for details, please contact our sales representative. For the latest information, please visit our website.
Home Page Address https://www.ckd.co.jp/en/productinfo/eu/

CKD RoHS Compliance

At CKD, our theme is the development of environmentally friendly products.

RoHS

RoHS is the abbreviation for Restriction Of the use of certain Hazardous Substances in electrical and electronic equipment. This is the directive prohibiting use of certain hazardous substances issued by the EU.



- CKD products are approved as in conformity to RoHS directive in order of priority from July 1, 2006.
- RoHS-compliant products are designed to reduce environmental load and can be distributed in the EU countries.

Based on the CKD Environmental Policy established in 2001, our company is engaged in environmental management system activities company-wide to protect the global environment.

CKD's Environmental Policy

1. Promote development and sales of low environmental load
2. Clarify and comply with the requirements of environmental laws and regulations, and promote the realization of carbon neutrality and the prevention of environmental pollution.
   a) Reduce CO_2 emissions b) Promote resource conservation
   c) Reduce waste d) Reduce environmental pollutants

Response to RoHS of CKD

For our main equipment products, we have been progressively implementing RoHS compliance since July 2006. This catalog indicates RoHS-compliant products with the "RoHS-compliant" mark.

(Note) For the latest compliance status, please check our website.

Technical Data

RoHSDirective

(Directive 2011/65/EU of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment)

This directive assimilates laws related to limiting the use of hazardous substances in electrical and electronics components set forth by each EU member state, contributes to the protection of human health, and provides sufficient means for processing and recycling waste electrical and electric products.

1 Scope of Application

1. Large household electrical appliances
2. Small appliances
3. IT Components and Telecommunications Components
4. Civilian Components
5. Lighting Components
6. Electric tools
7. Toys, leisure goods and sports components
8. Medical components, in-vitro diagnostics components
9. Monitoring and control components, industrial monitoring and control equipment
10. Vending machines
11. Other electrical and electronic equipment not falling into the above categories

Our components products mainly correspond to category 9, industrial monitoring and control equipment. (Some medical devices in Category 8 and non-applicable products also exist)

2 Directive Contents

Regulated substances (2011/65/EU)
- Lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBBs)
- Polybrominated diphenyl ethers (PBDE)

Additional regulated substances ((EU) 2015/863)
- Specific phthalates (DEHP, DBP, BBP, DIBP)

Electrical and electronic equipment containing the above substances, products in Categories 8 and 9, will not be able to be brought into the EU from July 22, 2021, and other categories from July 22, 2019, in principle.

Regarding ISO9001/ISO14001 Certification Acquisition

We deliver reliable quality that is gentle to people, machines, and the environment.

CKD has obtained ISO 9001 and ISO 14001 certification and established a quality and environmental management system. With safety, the environment, and energy saving as our primary themes, our entire company is dedicated to creating safe, reliable products and quality that pose no harm to people, machinery, society, or the global environment.




ISO 9001
マネジメントシステム登録証

登録証番号：JQA-0535

登録事業者：
CKD株式会社
愛知県小牧市応時二丁目２５０番地

当機関は、上記事業者の品質マネジメントシステムを審査した結果、付属書に記載する範囲において、下記規格の要求事項に適合していることを証します。

ISO 9001 :2015 ／ JIS Q 9001 :2015

登録日　：1994年 6月 24日
登録更新日：2021年 6月 24日

有効期限　：2024年 6月 23日

一般財団法人 日本品質保証機構
東京都千代田区九段北１－１３－５
理事長 小林 憲明

JQA


ISO 14001
マネジメントシステム登録証

登録証番号：JQA-EM1149

登録事業者：
CKD株式会社
愛知県小牧市応時二丁目２５０番地

当機関は、上記事業者の環境マネジメントシステムを審査した結果、付属書に記載する範囲において、下記規格の要求事項に適合していることを証します。

ISO 14001 :2015 ／ JIS Q 14001 :2015

登録日　：2008年 12月 8日
登録更新日：2023年 6月 24日

有効期限　：2026年 6月 23日

一般財団法人 日本品質保証機構
東京都千代田区九段北１－１３－５
理事長 小林 憲明

JQA

MEMO

MEMO

MEMO

MEMO

MEMO

Model No. [Alphabetical Index]

Model No.	Model Name	Catalog No./Page
HS	Fluid Actuated Valve for Gas Combustion System	1024
HSV	(SV) Manual Valve/Standard	RJ-012AA

■Listed Page
This is the specification/model number page for models listed in this catalog.

■Listed Catalog No.

RJ-002AA ... Pneumatic Cylinder ①
RJ-003AA ... Pneumatic Cylinder ②
RJ-004AA ... Pneumatic Cylinder ③
RJ-005AA ... Pneumatic Cylinder ④
RJ-006AA ... Pneumatic Cylinder ⑤
RJ-007AA ... Air Preparation, Pressure Control, and Auxiliary Components
RJ-008AA ... Sensors/Controllers
RJ-009AA ... Main Line Equipment/Gas Generators
RJ-010AA ... Precision Components/Vacuum Components
RJ-011AA ... Directional Control Valve ①
RJ-012AA ... Directional Control Valve ②
RJ-013AA ... Fluid Control Valve
RJ-014AA ... Electric Actuator ROBODEX Pluse
RJ-015AA ... Electric Actuator ROBODEX Std.
RJ-016AA ... Dry Fine Equipment
CB-019SAA ... Indexman General
CB-031AA ... Wet Fine Equipment General
CB-054AA ... ABSODEX General
CB-055AA ... Electric Actuator Motorless General
CC-1055AA ... Life Science Equipment
CC-1276AA ... Outdoor Products WP Series
CC-1590AA ... Gas Combustion System
CC-1637AA ... Pharmaceutical Manufacturing Process Equipment
CC-297AA ... Automatic Watering Control Equipment

Others list the single item catalog No. for each series.

■Codes

(SV)...Single Valve (WR)…Wiring Reduced Manifolds (IM) …Individual Manifold
(MX)...Mixed Manifold (BM)…Block Manifolds (MN)…Manifold

Model No.	Model Name	Catalog No./Page
1		
1219	Micro-mist Separator/Micro Naught Type (For Oil Mist Removal)	RJ-007AA
1238	Micro-mist Separator/Micro Naught Type (For Oil Mist Removal)	RJ-007AA
1326	Heavy Duty Air Filter	RJ-007AA
1126-□-□Y	Submicron Air Filter (For Tar Removal)	RJ-007AA
1126-□-E	Air Filter	RJ-007AA
1138-□-□Y	Submicron Air Filter (For Tar Removal)	RJ-007AA
1138-□-E	Air Filter	RJ-007AA
1226(J)	Micro-mist Separator/Micro Naught Type (For Oil Mist Removal)	RJ-007AA
1226(J)-□-X	Micro-mist Separator/Odor Naught Type (For Odor Removal)	RJ-007AA
1238-□-X	Micro-mist Separator/Odor Naught Type (For Odor Removal)	RJ-007AA
1326-□-□Y	Submicron Air Filter (For Tar Removal)	RJ-007AA
2		
2215	Regulator	RJ-007AA
2216	Regulator	RJ-007AA
2302 to **2304-□C**	Dial Air Regulator	RJ-007AA
2302 to **2304-□C-R**	Remote Control Dial Air Regulator	RJ-007AA
2415	Reverse Regulator (Built-in Check Valve)	RJ-007AA
2415-P11	Reverse Regulator (Built-in Check Valve)/Ozone Resistant	RJ-007AA
2419	Reverse Regulator (Built-in Check Valve)	RJ-007AA
2619	Regulator	RJ-007AA
2QV	Quick Valve with One-touch Fitting	RJ-007AA
3		
3003E to **3005E**	Lubricator/Economist Type	RJ-007AA
3003E-□C-V	Lubricator/Auto Fill Type	RJ-007AA
3GA1/2/3	(SV)Pilot Operated 3-Port Valve/Direct Piping	RJ-012AA
3GA1/2/3	Air Operated 3-Port Valve (Master Valve)/Direct Piping	RJ-012AA
3GB1/2	(SV)Pilot Operated 3-Port Valve Dual Unit/Base Piping	RJ-012AA
3GD1/2/3	(SV)Pilot Operated 3-Port Valve/Direct Piping	RJ-012AA
3GD1/2□ 0EJ	(SV)Intrinsically Safe Explosion-proof Pilot Operated 3-Port Valve/Direct Piping	RJ-012AA
3GD1/2□ 0EX	(SV)Intrinsically Safe Explosion-proof Pilot Operated 3-Port Valve/Direct Piping	RJ-012AA
3GE1/2	(SV)Pilot Operated 3-Port Valve Dual Unit/Base Piping	RJ-012AA
3GE1/2□ 0EJ	(SV)Intrinsically Safe Explosion-proof Pilot Operated 3-Port Valve/Base Piping	RJ-012AA
3GE1/2□ 0EX	(SV)Intrinsically Safe Explosion-proof Pilot Operated 3-Port Valve/Base Piping	RJ-012AA
3KA1	(SV)Pilot Operated 3-Port Valve/Direct Piping	RJ-012AA
3KA1	(SV)Air Operated 3-Port Valve (Master Valve)/Direct Piping	RJ-012AA
3MA0	(SV)Direct Acting 3-Port Valve/Direct Piping	RJ-012AA
3MB0	(SV)Direct Acting 3-Port Valve/Sub-plate Piping	RJ-012AA
3PA1/2	(SV)Direct Acting 3-Port Valve/Direct Piping	RJ-012AA
3PB1/2	(SV)Direct Acting 3-Port Valve/Sub-plate Piping	RJ-012AA
3QB1	(SV)Direct Acting 3-Port Valve/Sub-plate Piping	RJ-012AA
3QE1	(SV)Direct Acting 3-Port Valve/Sub-plate Piping	RJ-012AA
3QRA1	(SV)Direct Acting 3-Port Valve/Direct Piping	RJ-012AA
3QRB1	(SV)Direct Acting 3-Port Valve/Sub-plate Piping	RJ-012AA
3QV	Quick Valve with One-touch Fitting	RJ-007AA
4		
4001, 4002	Desiccant Air Dryer/Manual Air Dryer	RJ-009AA
4F0/1/2/3	(SV)Pilot Operated 5-Port Valve/Direct Piping	RJ-012AA
4F0/1/2/3	Air Operated 5-Port Valve (Master Valve)/Direct Piping	RJ-012AA
4F2/3	(SV)Pilot Operated 5-Port Valve Outdoor Specification	CC-1276AA
4F3□□0EX	(SV)Explosion-proof Pilot Operated 5-Port Valve/Direct Piping	RJ-012AA
4F3□□0E	(SV)Explosion-proof Pilot Operated 5-Port Valve/Direct Piping	RJ-012AA
4F4/5/6/7	(SV)Pilot Operated 5-Port Valve/Sub-plate Piping	RJ-012AA
4F4/5/6/7	Air Operated 5-Port Valve (Master Valve)/Sub-plate Piping	RJ-012AA
4F4/5/6/7□□ 0EX	Explosion-proof Pilot Operated 5-Port Valve/Direct Piping	RJ-012AA
4F4/5/6/7□□ 0E	Explosion-proof Pilot Operated 5-Port Valve/Sub-plate Piping	RJ-012AA
4GA1/2/3	(SV)Pilot Operated 5-Port Valve/Direct Piping	RJ-011AA
4GA1/2/3	Air Operated 5-Port Valve (Master Valve)/Direct Piping	RJ-012AA
4GA4	(SV)Pilot Operated 5-Port Valve/Direct Piping	RJ-011AA
4GB1/2/3	(SV)Pilot Operated 5-Port Valve/Base Piping	RJ-011AA
4GB1/2/3	Air Operated 5-Port Valve (Master Valve)/Base Piping	RJ-012AA
4GB4	(SV)Pilot Operated 5-Port Valve/Base Piping	RJ-011AA
4GD1/2/3	(SV)Pilot Operated 5-Port Valve/Direct Piping	RJ-011AA
4GD1/2/3/4□ 0EJ	(SV)Intrinsically Safe Explosion-proof Pilot Operated 5-Port Valve/Direct Piping	RJ-012AA
4GD1/2/3/4□ 0EX	(SV)Intrinsically Safe Explosion-proof Pilot Operated 5-Port Valve/Direct Piping	RJ-012AA
4GE1/2/3	(SV)Pilot Operated 5-Port Valve/Base Piping	RJ-011AA
4GE1/2/3/4□ 0EJ	(SV)Intrinsically Safe Explosion-proof Pilot Operated 5-Port Valve/Base Piping	RJ-012AA
4GE1/2/3/4□ 0EX	(SV)Intrinsically Safe Explosion-proof Pilot Operated 5-Port Valve/Base Piping	RJ-012AA
4KA1/2/3/4	(SV)Pilot Operated 5-Port Valve Direct Piping	RJ-012AA
4KA1/2/3/4	Air Operated 5-Port Valve (Master Valve)/Direct Piping	RJ-012AA
4KB1/2/3/4	(SV)Pilot Operated 5-Port Valve/Sub-plate Piping	RJ-012AA
4KB1/2/3/4	(SV)Air Operated 4, 5-Port Valve (Master Valve)/Sub-plate Piping	RJ-012AA
4SA0	(SV)Pilot Operated 5-Port Valve/Direct Piping	RJ-011AA
4SB0	(SV)Pilot Operated 5-Port Valve/Sub-plate Piping	RJ-011AA
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5100-4C	Heavy Duty Drain	RJ-009AA
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6119-2C	Moisture Indicator	RJ-009AA
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A101 to **801-W**	L-type Piping Adapter/Standard White Series	RJ-007AA
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A1338	Heavy Duty Air Filter	RJ-007AA
A1338-□Y	Submicron Air Filter (For Tar Removal)	RJ-007AA
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A2-5201	Direct Acting 2-Port Solenoid Valve (For High Frequency Operation)	RJ-013AA
A2-5202	Pilot Operated 2-Port Solenoid Valve (For High Frequency Operation)	RJ-013AA
A2-5800	Cryogenic 2-Port Solenoid Valve	RJ-013AA
A3019	Lubricator/Economist Type	RJ-007AA
AB21	Direct Acting 2-Port Solenoid Valve (Multilex)	RJ-013AA
AB31	Direct Acting 2-Port Solenoid Valve Single Unit (Multilex)	RJ-013AA
AB31-ZAA	Direct Acting 2-Port Solenoid Valve for Dry Air (Multilex)	RJ-013AA
AB41	Direct Acting 2-Port Solenoid Valve Single Unit (Multilex)	RJ-013AA
AB41E2	Explosion-proof Direct Acting 2-Port Solenoid Valve (Multilex)/d2G2	RJ-013AA
AB41E4	Explosion-proof Direct Acting 2-Port Solenoid Valve (Multilex)/d2G4	RJ-013AA

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AB41EX2	Explosion-proof Direct Acting 2-Port Solenoid Valve (Multilex)/Exd II BT2	RJ-013AA
AB41EX4	Explosion-proof Direct Acting 2-Port Solenoid Valve (Multilex)/Exd II BT4	RJ-013AA
AB41-ZAA	Direct Acting 2-Port Solenoid Valve for Dry Air (Multilex)	RJ-013AA
AB42	Direct Acting 2-Port Solenoid Valve Single Unit (Multilex)	RJ-013AA
AB42E4	Explosion-proof Direct Acting 2-Port Solenoid Valve (Multilex)/d2G4	RJ-013AA
AB71	Direct Acting 2-Port Solenoid Valve (Multilex)/Large Bore	RJ-013AA
ABP	Air Booster	RJ-007AA
AD11	Pilot Operated 2-Port Solenoid Valve (Multilex)/ Diaphragm Driven	RJ-013AA
AD11E4	Explosion-proof Pilot Operated 2-Port Solenoid Valve (Multilex)/Diaphragm Driven, d2G4	RJ-013AA
AD11EX4	Explosion-proof Pilot Operated 2-Port Solenoid Valve (Multilex)/Diaphragm Driven, Exd II BT4	RJ-013AA
AD12	Pilot Operated 2-Port Solenoid Valve (Multilex)/ Diaphragm Driven	RJ-013AA
AD12E4	Explosion-proof Pilot Operated 2-Port Solenoid Valve (Multilex)/Diaphragm Driven, d2G4	RJ-013AA
AD21	Pilot Operated 2-Port Solenoid Valve (Multilex)/ Diaphragm Driven	RJ-013AA
AD21E4	Explosion-proof Pilot Operated 2-Port Solenoid Valve (Multilex)/Diaphragm Driven, d2G4	RJ-013AA
AD21EX4	Explosion-proof Pilot Operated 2-Port Solenoid Valve (Multilex)/Diaphragm Driven, Exd II BT4	RJ-013AA
AD22	Pilot Operated 2-Port Solenoid Valve (Multilex)/ Diaphragm Driven	RJ-013AA
AD22E4	Explosion-proof Pilot Operated 2-Port Solenoid Valve (Multilex)/Diaphragm Driven, d2G4	RJ-013AA
ADK11	Pilot Kick Operated 2-Port Solenoid Valve (Multilex)/ Diaphragm Driven	RJ-013AA
ADK11E4	Explosion-proof Pilot Kick Operated 2-Port Solenoid Valve (Multilex)/Diaphragm Driven, d2G4	RJ-013AA
ADK11EX4	Explosion-proof Pilot Operated 2-Port Solenoid Valve (Multilex)/Diaphragm Driven, Exd II BT4	RJ-013AA
ADK11-ZAA	Pilot Kick Operated 2-Port Solenoid Valve for Dry Air (Multilex)	RJ-013AA
ADK12	Pilot Kick Operated 2-Port Solenoid Valve (Multilex)/ Diaphragm Driven	RJ-013AA
ADK12E4	Explosion-proof Pilot Kick Operated 2-Port Solenoid Valve (Multilex)/Diaphragm Driven, d2G4	RJ-013AA
ADK21	Pilot Kick Operated 2-Port Solenoid Valve (Multilex)/ Diaphragm Driven	RJ-013AA
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AES (Facilea AI)	Image Processing AI Tool	CC-1623AA
AESM (ExiaStudio)	Device Visual Programming Tool	CC-1579AA
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AF30□□	Large Size Main Line Filter (Standard Type)	RJ-009AA
AF40□□	Medium Size Main Line Filter (For Oil-Free)	RJ-009AA
AF50□□	Large Size Main Line Filter (For Oil-Free)	RJ-009AA
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AG4□E4-Z	Explosion-proof Direct Acting 3-Port Solenoid Valve for Dry Air (Multilex)/d2G4	RJ-013AA
AG4□-Z	Direct Acting 3-Port Solenoid Valve for Dry Air (Multilex)	RJ-013AA
AG41	Direct Acting 3-Port Solenoid Valve Single Unit (Multilex)	RJ-013AA
AG41E4	Explosion-proof Direct Acting 3-Port Solenoid Valve (Multilex)/d2G4	RJ-013AA
AG41EX4	Explosion-proof Direct Acting 3-Port Solenoid Valve (Multilex)/Exd II BT4	RJ-013AA
AG43	Direct Acting 3-Port Solenoid Valve Single Unit (Multilex)	RJ-013AA
AG43E4	Explosion-proof Direct Acting 3-Port Solenoid Valve (Multilex)/d2G4	RJ-013AA
AG43EX4	Explosion-proof Direct Acting 3-Port Solenoid Valve (Multilex)/Exd II BT4	RJ-013AA
AG44	Direct Acting 3-Port Solenoid Valve Single Unit (Multilex)	RJ-013AA
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AMD	Air Operated Valve for Chemicals (2-Port)	CB-031AA
AMDS	Air Operated Valve for Chemicals/Integrated Suck-back Type	CB-031AA
AMG	Air Operated Valve for Chemicals (3-Port)	CB-031AA
AMS	Suck-back Valve for Chemicals	CB-031AA
AP11	Pilot Operated 2-Port Solenoid Valve (Multilex)/ Piston Driven	RJ-013AA
AP11E2	Explosion-proof Pilot Operated 2-Port Solenoid Valve (Multilex)/Piston Driven, d2G2	RJ-013AA
AP11E4	Explosion-proof Pilot Operated 2-Port Solenoid Valve (Multilex)/Piston Driven, d2G4	RJ-013AA
AP11EX2	Explosion-proof Pilot Operated 2-Port Solenoid Valve (Multilex)/Piston Driven, Exd II BT2	RJ-013AA
AP11EX4	Explosion-proof Pilot Operated 2-Port Solenoid Valve (Multilex)/Piston Driven, Exd II BT4	RJ-013AA
AP12	Pilot Operated 2-Port Solenoid Valve (Multilex)/ Piston Driven	RJ-013AA
AP12E2	Explosion-proof Pilot Operated 2-Port Solenoid Valve (Multilex)/Piston Driven, d2G2	RJ-013AA
AP12E4	Explosion-proof Pilot Operated 2-Port Solenoid Valve (Multilex)/Piston Driven, d2G4	RJ-013AA
AP21	Pilot Operated 2-Port Solenoid Valve (Multilex)/ Piston Driven	RJ-013AA
AP21E2	Explosion-proof Pilot Operated 2-Port Solenoid Valve (Multilex)/Piston Driven, d2G2	RJ-013AA
AP21EX2	Explosion-proof Pilot Operated 2-Port Solenoid Valve (Multilex)/Piston Driven/ Exd II BT2	RJ-013AA
AP21E4	Explosion-proof Pilot Operated 2-Port Solenoid Valve (Multilex)/Piston Driven, d2G4	RJ-013AA
AP21EX4	Explosion-proof Pilot Operated 2-Port Solenoid Valve (Multilex)/Piston Driven, Exd II BT4	RJ-013AA
AP22	Pilot Operated 2-Port Solenoid Valve (Multilex)/ Piston Driven	RJ-013AA
AP22E2	Explosion-proof Pilot Operated 2-Port Solenoid Valve (Multilex)/Piston Driven, d2G2	RJ-013AA
AP22E4	Explosion-proof Pilot Operated 2-Port Solenoid Valve (Multilex)/Piston Driven, d2G4	RJ-013AA
APE	Mechanical Pressure Switch	RJ-007AA
APK11	Pilot Kick Operated 2-Port Solenoid Valve (Multilex)/ Piston Driven	RJ-013AA
APK21	Pilot Kick Operated 2-Port Solenoid Valve (Multilex)/ Piston Driven	RJ-013AA
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ASU	Portable Air Supply Unit	CC-1363AA
AT	Air Tank	RJ-007AA
AVB	Air Operated Valve for High Vacuum	CB-035AA
AX1000T, 2000T, 4000T	Direct Drive Actuator ABSODEX	CB-054AA
AX1R, 2R, 4R	Direct Drive Actuator ABSODEX	CC-1614AA
AX6000M	Direct Drive Actuator ABSODEX	CB-054AA
AX9000TS, TH, MU	Driver for ABSODEX	CB-054AA
AXD	Driver for ABSODEX	CC-1614AA
AZ	Tube Cutter	RJ-007AA
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B2019	Regulator	RJ-007AA
B2019-P11	Regulator/Ozone Resistant	RJ-007AA
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B5142	Ⓢⓥ Pilot Operated 5-Port Valve/Sub-base Type	RJ-012AA
B6061	Relief Valve	RJ-007AA
B7019	F.R. Unit	RJ-007AA
BBS-A	Balancer Unit Automatic Pressure Adjustment Type	RJ-005AA
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BHA	Compact Cross Roller Parallel Gripper	RJ-006AA
BHA-FC	Mechanical Gripper	RJ-006AA

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B		
BHA-LN	Gripper with Linear Norm Sensor/Cross Roller Parallel Gripper with Sensor	RJ-005AA
BHE	Centering Gripper	RJ-006AA
BHE-LN	Gripper with Linear Norm Sensor/Centering Gripper with Sensor	RJ-005AA
BHG	Compact Cross Roller Parallel Gripper with Rubber Cover	RJ-006AA
BHG-LN	Gripper with Linear Norm Sensor/Cross Roller Parallel Gripper with Rubber Cover and Sensor	RJ-005AA
BN	Air Blow Nozzle General Type	RJ-007AA
BNB	Air Blow Nozzle Blower Specification	RJ-007AA
BNE-F	Air Blow Nozzle Flat Type	RJ-007AA
BNE-R	Air Blow Nozzle Round Type	RJ-007AA
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C		
C1000 to **8000-P6**	F.R.L. Combination/Copper Ion Restricted (No copper/ PTFE Specification)	RJ-007AA
C1000 to **8000-W**	F.R.L. Combination/Standard White Series	RJ-007AA
C1010 to **8010-W**	W.L. Combination/Standard White Series	RJ-007AA
C1020 to **8020-W**	F.R. Combination/Standard White Series	RJ-007AA
C1030 to **8030-W**	F.M.R. Combination/Standard White Series	RJ-007AA
C1040 to **8040-W**	W.M. Combination/Standard White Series	RJ-007AA
C1050 to **8050-W**	R.M. Combination/Standard White Series	RJ-007AA
C1060 to **8060-W**	F.M. Combination/Standard White Series	RJ-007AA
C25N-B	Governor for Medium Pressure Gas	CC-1590AA
C3070 to **8070-W**	F.F.M. Combination/Standard White Series	RJ-007AA
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CAC-N32/40	Lightweight Clamp Cylinder/ Double Acting, Single Rod Type	RJ-005AA
CAT	Cartridge Cylinder/Single Acting, Push Type	RJ-003AA
CAU30	Clean Air Unit	RJ-007AA
CAV2	Cell Cylinder/With Valve, Double Acting, Lubricated Type	RJ-005AA
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CCH	Check Valve for Liquids	RJ-013AA
CCN	Check Valve for Liquids (Nozzle Type)	RJ-013AA
CG	Air Fiber One-touch Fitting (Clean Type)	RJ-007AA
CHB	Air Operated Ball Valve 2-Port (Compact Rotary Valve)	RJ-013AA
CHBF	Air Operated Ball Valve 2-Port (Compact Rotary Valve)/Full Bore	RJ-013AA
CHC	Auto Gripper Changer	RJ-006AA
CHG	Air Operated Ball Valve 3-Port (Compact Rotary Valve)	RJ-013AA
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CK	3-Jaw Long Stroke Chuck	RJ-006AA
CKA	3-Jaw Low Profile Chuck	RJ-006AA
CKF	Hollow Chuck	RJ-006AA
CKG	3-Jaw Bearing Chuck	RJ-006AA
CKH2	High Gripping Force Powerful Chuck	RJ-006AA
CKJ	Ultra Long Stroke Chuck	RJ-006AA
CKL2	Powerful Chuck	RJ-006AA
CKL2-FC	Mechanical Chuck	RJ-006AA
CKLB2	Bidirectional Powerful Chuck	RJ-006AA
CKS	Low Profile Chuck	RJ-006AA
CKV2	Compact cylinder with valve/ With Valve, Double Acting, Single Rod Type	RJ-005AA
CKW-HP1	3-Jaw Chuck	RJ-006AA
CKWL-HP1	3-Jaw Chuck	RJ-006AA
CMA2	Small Bore Size Cylinder/ Double Acting, Single Rod Type	RJ-002AA
CMK2	Small Bore Size Cylinder/ Double Acting, Single Rod Type	RJ-002AA
COV□2	Cell Cylinder/With Valve, Double Acting, Lubricated Type	RJ-005AA
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CSBF	Air Operated Ball Valve 2-Port for Steam (Compact Rotary Valve)	RJ-013AA
CV3E	Low Pressure Air Operated 3-Port Valve (Coolant Valve)	RJ-013AA
CVE2, CVE22	Air Operated 2-Port Valve (Coolant Valve)	RJ-013AA
CVE3	Air Operated 3-Port Valve (Coolant Valve)	RJ-013AA
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CVSE2, CVSE22	Air Operated 2-Port Valve (Coolant Valve)/Solenoid Valve Mounted Type	RJ-013AA
CVSE3	Air Operated 3-Port Valve (Coolant Valve)/Solenoid Valve Mounted Type	RJ-013AA
CXU	Air Unit	RJ-007AA
D		
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DBS1006	Drain Sensor	RJ-009AA
DCKW	Electric Actuator with Motor D Series 3-Finger Gripper Type	RJ-014AA
DLSH	Electric Actuator with Motor D Series 2-Finger Gripper Type	RJ-014AA
DMSDG	Electric Actuator with Motor D Series Compact Guided Type	RJ-014AA
DSC	Speed Controller with Dial	RJ-007AA
DSG	Solenoid Valve for Gas Combustion System	CC-1590AA
DSG-W	Solenoid Valve for Gas Combustion System	CC-1590AA
DSSD2	Electric Actuator with Motor D Series Rod Type	RJ-014AA
DSTG	Electric Actuator with Motor D Series Guided Type	RJ-014AA
DSTK	Electric Actuator with Motor D Series Stopper Type	RJ-014AA
DSTL	Electric Actuator with Motor D Series Guided Type	RJ-014AA
DSTS	Electric Actuator with Motor D Series Guided Type	RJ-014AA
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DT4000, 4010-W	Snap Drain	RJ-009AA
DVL	Needle Valve with Dial	RJ-007AA
E		
E0, ET0	Cylinder Switch/Heat Resistant, Reed 2-wire	RJ-002,003, 004,005,006
ECS	Electric Actuator Motorless Specification Slider	CB-055AA
ETS	Electric Actuator Motorless Specification Slider	CB-055AA
EBS-L	Electric Actuator Motorless Specification Slider	CB-055AA
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EBR-L	Electric Actuator Motorless Specification Rod	CB-055AA
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ECG	Single Axis Controller for Electric Actuator	RJ-014AA
ECMG	Multi Axis Controllers for Electric Actuators	RJ-014AA
ECR	Single Axis Controller for Electric Actuator	RJ-014AA
ECV	Electric Actuator Motorless Specification Slider type (belt drive/low dust specifications)	CB-055AA
EH	Fiber Tube Clean-room Type (For push-in fitting)	RJ-007AA
EKS-L	Electric Actuator Motorless Specification Slider Type (Ball Screw Driven)	CB-055AA
EKS-M	Electric Actuator with Motor Specification Slider Type	CC-1457AA
EMB21, 41, 51	Metal-free 2-Port Solenoid Valve	RJ-013AA
EJSG	Electric Actuator with Motor Specification Slider Type	RJ-014AA
ESC4	Single Axis Controller for Electric Actuator	RJ-014AA
ESM	Electric Shuttle Mover (Belt Driven)	[CC-1259AA]
ETS	Electric Actuator Motorless Specification Slider Type (Ball Screw Driven)	CB-055AA
ETV	Electric Actuator Motorless Specification Slider Type (Belt Driven)	CB-055AA
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EVR	Electro-Pneumatic Regulator/ Solenoid Valve Type Medium Flow	RJ-007AA
EVB□17	Electric Vacuum Valves	CB-035AA
EVD	Digital Electro-Pneumatic Regulator	RJ-007AA
EVL	Low Pressure Electro-Pneumatic Regulator	RJ-007AA
EVS2	Electro-Pneumatic Regulator/ Solenoid Valve Type Compact	RJ-007AA
EVT	Low Profile Electro-Pneumatic Regulator/Single Unit	RJ-007AA
EXA	Pilot Operated 2-Port Solenoid Valve for Compressed Air	RJ-013AA
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F□	Soft nylon tube	RJ-007AA

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F1000 to **8000-W**	Air Filter/Standard White Series	RJ-007AA
F2S, F3S	Cylinder Switch/1-Color Indicator, Solid State 2/3-wire	RJ-002,003, 004,005,006
F2, 3V/H	Cylinder Switch/1-Color Indicator, Solid State 2/3-wire	RJ-002,003, 004,005,006
F3PH/V	Cylinder Switch/PNP Output Type Solid State 3-wire	RJ-002,003, 004,005,006
F2, 3Y V/H	Cylinder Switch/2-Color Indicator, Solid State 2/3-wire	RJ-002,003, 004,005,006
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FA□	Ultra Compact Joint/ Adjustable Socket	RJ-007AA
FA331 to **831**	Exhaust Cleaner	RJ-007AA
FAC	Clean Exhaust Filter	RJ-007AA
Facilea (AES)	Image Processing Visual Programming Tool	CC-1548AA
Facilea AI (AES)	Image Processing AI Tool	CC-1623AA
FAW	Flex Arm	CC-1615AA
FBS	Ultra Compact Joint/Bushing	RJ-007AA
FBU2	Fine Buffer	RJ-010AA
FC□	Ultra Compact Joint/Clamp Fitting	RJ-007AA
FCD	Flat Cylinder Compact Demi/ Double Acting, Single Rod Type	RJ-003AA
FCH	Flat Cylinder Compact Demi/ Single Acting, Retracting Type	RJ-003AA
FCK	Shock Absorber, Adjustable Type	RJ-005AA
FCM	Compact Flow Controller Rapiflow	517
FCS	Flat Cylinder Compact Demi/ Single Acting, Push Type	RJ-003AA
FCS1000	Inline Clean Filter	RJ-007AA
FCS500	Inline Clean Filter	RJ-007AA
FFB	Direct Acting 2-Port Solenoid Valve Multi-fit	RJ-013AA
FFBM	Direct Acting 2-Port Solenoid Valve Multi-fit	RJ-013AA
FFG	Direct Acting 3-Port Solenoid Valve Multi-fit	RJ-013AA
FFGM	Direct Acting 3-Port Solenoid Valve Multi-fit	RJ-013AA
FFLD	Electric Actuator with Motor F Series 2-Finger Gripper Type (Built-in Controller)	RJ-014AA
FGRC	Electric Actuator with Motor F Series Rotary Type	RJ-014AA
FGS	Ultra Compact Joint/Gasket	RJ-007AA
FH100	Feather Gripper (Mini Parallel Gripper)	RJ-006AA
FH500	Feather Gripper (Mini Pivot Gripper)	RJ-006AA
FJ	Free Joint	RJ-005AA
FK	Simple Flow Controller	RJ-005AA
FLCR	Electric Actuator with Motor F Series Table Type	RJ-014AA
FLS	Ultra Compact Joint/ Extension	RJ-007AA
FLSH	Electric Actuator with Motor F Series 2-Finger Gripper Type	RJ-014AA
FM□	Ultra Compact Joint/Manifold	RJ-007AA
FM3000 to **8000**	Air Filter/Medium Pressure Series	RJ-007AA
FMD	Flow Control Valve	CB-031AA
FMS	Metering Valve with Silencer	RJ-007AA
FNS	Ultra Compact Joint/Double Nipple	RJ-007AA
FPL	Ultra Compact Joint/Plug	RJ-007AA
FPV	Block Valve	RJ-007AA
FS□	Ultra Compact Joint/Socket	RJ-007AA
FSL100	Inline Filter	RJ-007AA
FSL200	Inline Filter	RJ-007AA
FSL500	Inline Filter	RJ-007AA
FSM2-D	Compact Flow Sensor Rapiflow	355
FSM3	Compact Flow Sensor Rapiflow	229
FSM-V	Ultra Compact Flow Sensor Rapiflow	378
FSM-V-D	Separate Display Unit Rapiflow	388
FSM-VFM	Compact Flow Sensor/Inline Filter	394
FSM-X	Ultra Compact Flow Switch Rapiflow	372
FT□	Ultra Compact Joint/Barb Fitting	RJ-007AA
FWD	Compact Pilot Operated Solenoid Valve for Water	RJ-013AA
FWS	Ultra Compact Joint/Partition Wall	RJ-007AA
FW4000, 8000	Air Filter/Outdoor Series	CC-1276AA
FX	Drain Separator	RJ-007AA
G		
G29D	Ultra Compact Pressure Gauge	RJ-007AA
G39D	Round Pressure Gauge	RJ-007AA
G401-W	Thin Pressure Gauge	RJ-007AA
G40D	Pressure Gauge with Safety Mark	RJ-007AA
G45D	Pressure Gauge with Limit Mark	RJ-007AA
G49D, 59D	General Purpose Pressure Gauge	RJ-007AA
G49D, 59D-P6	Pressure Gauge/Copper Ion Restricted (No copper/PTFE Specification)	RJ-007AA
G52D	Pressure Gauge with Switch	RJ-007AA
G53D	Pressure Gauge for Panel Mount	RJ-007AA
GA400	Differential Pressure Gauge	RJ-007AA
GAB312/352	Direct Acting 2-Port Solenoid Valve Manifold/Actuator (Multilex)	RJ-013AA
GAB312/352-Z	Direct Acting 2-Port Solenoid Valve for Dry Air Manifold/ Actuator (Multilex)	RJ-013AA
GAB412	Direct Acting 2-Port Solenoid Valve Manifold/Actuator (Multilex)	RJ-013AA
GAB412-Z	Direct Acting 2-Port Solenoid Valve for Dry Air Manifold/ Actuator (Multilex)	RJ-013AA
GAB422	Direct Acting 2-Port Solenoid Valve Manifold/Actuator (Multilex)	RJ-013AA
GAB452	Direct Acting 2-Port Solenoid Valve Manifold/Actuator (Multilex)	RJ-013AA
GAB452-Z	Direct Acting 2-Port Solenoid Valve for Dry Air Manifold/ Actuator (Multilex)	RJ-013AA
GAG31□	Direct Acting 3-Port Solenoid Valve Manifold/Actuator (Multilex)	RJ-013AA
GAG31□-Z	Direct Acting 3-Port Solenoid Valve for Dry Air Manifold/ Actuator (Multilex)	RJ-013AA
GAG33□	Direct Acting 3-Port Solenoid Valve Manifold/Actuator (Multilex)	RJ-013AA
GAG33□-Z	Direct Acting 3-Port Solenoid Valve for Dry Air Manifold/ Actuator (Multilex)	RJ-013AA
GAG34□	Direct Acting 3-Port Solenoid Valve Actuator (Multilex)	RJ-013AA
GAG34□-Z	Direct Acting 3-Port Solenoid Valve for Dry Air Actuator (Multilex)	RJ-013AA
GAG35□	Direct Acting 3-Port Solenoid Valve Manifold/Actuator (Multilex)	RJ-013AA
GAG35□-Z	Direct Acting 3-Port Solenoid Valve for Dry Air Manifold/ Actuator (Multilex)	RJ-013AA
GAG41□	Direct Acting 3-Port Solenoid Valve Manifold/Actuator (Multilex)	RJ-013AA
GAG41□-Z	Direct Acting 3-Port Solenoid Valve for Dry Air Manifold/ Actuator (Multilex)	RJ-013AA
GAG43□	Direct Acting 3-Port Solenoid Valve Manifold/Actuator (Multilex)	RJ-013AA
GAG43□-Z	Direct Acting 3-Port Solenoid Valve for Dry Air Manifold/ Actuator (Multilex)	RJ-013AA
GAG44□	Direct Acting 3-Port Solenoid Valve Actuator (Multilex)	RJ-013AA
GAG44□-Z	Direct Acting 3-Port Solenoid Valve for Dry Air Actuator (Multilex)	RJ-013AA
GAG45□	Direct Acting 3-Port Solenoid Valve Manifold/Actuator (Multilex)	RJ-013AA
GAG45□-Z	Direct Acting 3-Port Solenoid Valve for Dry Air Manifold/ Actuator (Multilex)	RJ-013AA
GAMD	Air Operated Valve for Chemicals (Manifold/Branch Valve)	CB-031AA
GCKW	Electric Actuator with Motor G Series 3-Finger Gripper Type	RJ-014AA
GCVE2	Modular Coolant Valve Air Operated Type	RJ-013AA
GCVSE2	Modular Coolant Valve Solenoid Valve Mounted Type	RJ-013AA
GEXA	Pilot Operated 2-Port Solenoid Valve Manifold with One-touch Fittings for Compressed Air	RJ-013AA
GFM	Float Star	RJ-010AA
GHV	Gas Combination Valve	CC-1590AA
GLC	Guideless Cylinder/Double Acting Type	RJ-005AA
GMF1	Ⓜ Pilot Operated 5-Port ISO Compliant Valve/DIN Terminal Box Type/ISO Size ①	RJ-012AA
GMF1	Ⓜ Pilot Operated 5-Port ISO Compliant Valve/I/O Connector Type/ISO Size ①	RJ-012AA
GMF2	Ⓜ Pilot Operated 5-Port ISO Compliant Valve/DIN Terminal Box Type/ISO Size ②	RJ-012AA
GMF2	Ⓜ Pilot Operated 5-Port ISO Compliant Valve/I/O Connector Type/ISO Size ②	RJ-012AA
GMFZ	Ⓜ Pilot Operated 5-Port ISO Compliant Valve/DIN Terminal Box Type/ISO Size ① & ②	RJ-012AA
GMFZ	Ⓜ Pilot Operated 5-Port ISO Compliant Valve/I/O Connector Type/ISO Size ① & ②	RJ-012AA
GMMD	Manual Valve Manifold for Chemicals	CB-031AA
GNAB□	Air Operated 2-Port Valve Manifold (Compact Cylinder Valve)	RJ-013AA
GNAD□	Diaphragm Cylinder Valve Manifold	RJ-013AA
GPS2	Seating Confirmation Switch/ Single Unit	126
GPS3	Digital Gap Switch/Single Unit	100

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Model No.	Model Name	Catalog No./Page
G		
GRC	Table Type Rotary Actuator/ Basic Type	RJ-005AA
GRV	Medium Pressure Gas Combination Valve	CC-1590AA
GSSD2	Electric Actuator with Motor G Series Rod Type	RJ-014AA
GSTG	Electric Actuator with Motor G Series Guided Type	RJ-014AA
GSTK	Electric Actuator with Motor G Series Stopper Type	RJ-014AA
GSTL	Electric Actuator with Motor G Series Guided Type	RJ-014AA
GSTS	Electric Actuator with Motor G Series Guided Type	RJ-014AA
GSV	Solenoid Valve for Automatic Watering Control	CC-297AA
GSV2	Solenoid Valve for Automatic Watering Control	CC-297AA
GT9000	Refrigerated Air Dryer/	RJ-009AA
GW49D	Outdoor Pressure Gauge	CC-1276AA
GW	New Joint	RJ-007AA
GX3200D	Refrigerated Air Dryer/ Compact For Equipment Installation, Standard Inlet Air (35°C) Type	RJ-009AA
GX5200D	Refrigerated Air Dryer/ Compact For Direct Compressor Connection, High Inlet Air (55°C) Type	RJ-009AA
H		
H0	Cylinder Switch/1-Color Indicator, Reed	RJ-002,003, 004,005,006
H0Y	Cylinder Switch/2-Color Indicator, Reed	RJ-002,003, 004,005,006
HAP-1C	Parallel Gripper	RJ-006AA
HAP-2 to **4CS**	Parallel Gripper	RJ-006AA
HB	High Corrosion Resistance Direct Acting 2-Port Solenoid Valve	RJ-013AA
HBL	Pivot Gripper	RJ-006AA
HCA	High Speed Cylinder/Double Acting, Single Rod Type	RJ-005AA
HCM	High Energy Absorption Cylinder/Double Acting, Single Rod Type	RJ-005AA
HCP	Horizontal Parallel Gripper	RJ-006AA
HD-0.5 to **9**	Desiccant Air Dryer/Compact Heatless Dryer	RJ-009AA
HDL	Wide Angle Gripper	RJ-006AA
HFP	Wide Parallel Gripper	RJ-006AA
HGP	Long Stroke Parallel Gripper	RJ-006AA
HJL	Toggle Gripper	RJ-006AA
HK1	Fluid Actuated Valve for Gas Combustion System	CC-1590AA
HKP	Cross Roller Parallel Gripper	RJ-006AA
HLA	Low Profile Parallel Gripper	RJ-006AA
HLB	Low Profile Parallel Gripper	RJ-006AA
HLC	Low Profile Long Stroke Parallel Gripper	RJ-006AA
HLD	Ultra Low Profile Parallel Gripper	RJ-006AA
HLF2	Low Profile Long Stroke Gripper	RJ-006AA
HMD	Low Profile Wide Angle Gripper	RJ-006AA
HMC-HP1	Wide Parallel Gripper	RJ-006AA
HMF	Compact Wide Parallel Gripper	RJ-006AA
HMFB	Guided Large Size Wide Parallel Gripper	RJ-006AA
HMTB1	Metal-free Compact Lever Type 2-Port Solenoid Valve for Medical Equipment	CC-1055AA
HMTG1	Metal-free Compact Lever Type 3-Port Solenoid Valve for Medical Equipment	CC-1055AA
HMV	(SV)Manual Valve/Miniature	RJ-012AA
HMVE	(SV)Manual Valve/Miniature	RJ-012AA
HNB1	Compact Direct Acting 2-Port Solenoid Valve	RJ-013AA
HNG1	Compact Direct Acting 3-Port Solenoid Valve	RJ-013AA
HO	Worm Reducer	CC-1601AA
HPS	Adhesion Confirmation Switch/Single Unit	154
HRL-1	Hybrid Robot/Single Axis Unit Element for Pneumatic Robot	RJ-005AA
HS	Fluid Actuated Valve for Gas Combustion System	CC-1590AA
HSV	(SV)Manual Valve/Standard	RJ-012AA
HSVE	(SV)Manual Valve/Standard	RJ-012AA
HVB□12	High Vacuum Solenoid Valve	RJ-013AA
HVL12	Delayed Vacuum Solenoid Valve	RJ-013AA
HYA	Fine Pinch Valve	CC-1055AA
HYN	Direct Acting 2, 3-Port Valve (Fine Pinch Valve)	CC-1055AA
I		
IAGD□	Integrated Gas Supply System	CB-035AA
IAVB	Vacuum Pressure Control System	CB-035AA
J		
J100 to **800-W**	Joiner/For Selex F.R.L/ Standard White Series	RJ-007AA
JL	Fitting (Elbow Joint)	RJ-007AA
JSB3	Brake Unit	RJ-005AA
JSC3(-N) JSC4(-N)	Brake Cylinder (Medium/ Large Bore)/Double Acting, Single Rod Type	RJ-005AA
JSG	Tie Rod Cylinder with Brake/ Double Acting, Single Rod Type	RJ-005AA
JSK2	Brake Cylinder (Small Bore ø20 to 40, Crimped Type)/ Double Acting Type	RJ-005AA
JSM2	Brake Cylinder (Small Bore ø20 to 40, Serviceable Type)/ Double Acting Type	RJ-005AA
K		
K0V/H	Cylinder Switch/1-Color Indicator, Reed 2-wire	RJ-002,003, 004,005,006
K2, 3 V/H	Cylinder Switch/1-Color Indicator, Solid State 2/3-wire	RJ-002,003, 004,005,006
K2, 3Y V/H	Cylinder Switch/2-Color Indicator, Solid State 2/3-wire	RJ-002,003, 004,005,006
K3P V/H	Cylinder Switch/PNP Output Type, Solid State 3-wire	RJ-002,003, 004,005,006
K5V/H	Cylinder Switch/No Indication, Reed 2-wire	RJ-002,003, 004,005,006
K60570	F.R.L. Kit	RJ-007AA
KBX	Electric Actuator with Motor Specification Slider Type Rod Type R-Axis Type	CC-1275AA
KCA	Controller	CC-1275AA
KHE	SCARA Robot	CC-1436AA
KHL	SCARA Robot	CC-1436AA
KML	Fine Level Switch	CB-031AA
KX	Coiling Tube	RJ-007AA
KZV3	Pilot Operated 2-Port Solenoid Valve	RJ-013AA
L		
L1000 to **8000-W**	Lubricator/Copper Ion Restricted (No copper/PTFE Specification)	RJ-007AA
L1000 to **8000-W**	Lubricator/Standard White Series	RJ-007AA
LAD	Diaphragm Cylinder Valve	RJ-013AA
LBC	Air Bearing Actuator	RJ-010AA
LCG	Linear Slide Cylinder/Double Acting, Single Rod Type	RJ-004AA
LCM	Linear Slide Cylinder/Double Acting, Single Rod Type	RJ-004AA
LCR	Linear Slide Cylinder/Double Acting, Single Rod Type	RJ-004AA
LCW	Linear Slide Cylinder/Double Acting, Single Rod Type	RJ-004AA
LCX	Linear Slide Cylinder/Double Acting, Single Rod Type	RJ-004AA
LFC-KL	Lifter Cylinder	CC-902AA
LGD	Air Operated Valve for Process Gas	CB-035AA
LHA	Linear Guide Gripper	RJ-006AA
LHAG	Linear Guide Gripper with Rubber Cover	RJ-006AA
LMB	Linear Guide Lock	RJ-005AA
LML	Linear Guide Lock	RJ-005AA
LN	Cylinder with Linear Norm Sensor/Sensor, Amplifier, Indicator	RJ-005AA
LSH	Linear Slide Gripper	RJ-006AA
LSH-HP1	Linear Slide Gripper	RJ-006AA
LSHL-HP1	Linear Slide Gripper	RJ-006AA
LSHM-HP2	Linear Slide Gripper with Length Measurement Function	RJ-006AA
LST-HP1	Low Profile Long Stroke Gripper	RJ-006AA
LSTM-HP2	Low Profile Long Stroke Gripper with Length Measurement Function	RJ-006AA
LW4000/ LW8000	Lubricator Outdoor Series	CC-1276AA
LYX	Air Operated Valve for Chemicals	CB-031AA
M		
M0V/H	Cylinder Switch/1-Color Indicator, Reed 2-wire	RJ-002,003, 004,005,006
M1000 to **8000-P6**	Oil Mist Filter/Copper Ion Restricted (No copper/PTFE Specification)	RJ-007AA
M1000 to **8000-W**	Oil Mist Filter/Standard White Series	RJ-007AA
M2, 3V/H	Cylinder Switch/1-Color Indicator, Solid State 2/3-wire	RJ-002,003, 004,005,006
M2, 3WV	Cylinder Switch/2-Color Indicator, Solid State 2/3-wire	RJ-002,003, 004,005,006
M3GA1/2/3	(IM)Pilot Operated 3-Port Valve/Direct Piping	RJ-011AA
M3GA1/2/3	(VR)Pilot Operated 3-Port Valve/Direct Piping	RJ-011AA
M3GA1/2/3	Air Operated 3-Port Valve (Master Valve)/Direct Piping	RJ-012AA
M3GB1/2	(IM)Pilot Operated 3-Port Valve Dual Unit/Base Piping	RJ-011AA
M3GB1/2	(VR)Pilot Operated 3-Port Valve Dual Unit/Base Piping	RJ-011AA
M3GD1/2/3	(IM)Pilot Operated 3-Port Valve/Direct Piping	RJ-011AA
M3GD1/2/3	(VR)Pilot Operated 3-Port Valve/Direct Piping	RJ-011AA
M3GD1/2□ 0EJ	(IM)Intrinsically Safe Explosion-proof Pilot Operated 3-Port Valve/Direct Piping	RJ-012AA
M3GD1/2□ 0EX	(IM)Intrinsically Safe Explosion-proof Pilot Operated 3-Port Valve/Direct Piping	RJ-012AA
M3GE1/2	(IM)Pilot Operated 3-Port Valve Dual Unit/Base Piping	RJ-011AA
M3GE1/2	(VR)Pilot Operated 3-Port Valve Dual Unit/Base Piping	RJ-011AA

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Model No.	Model Name	Catalog No./Page
M		
M3GE1/20EJ	Ⓜ Intrinsically Safe Explosion-proof Pilot Operated 3-Port Valve/Base Piping	RJ-012AA
M3GE1/20EX	Ⓜ Intrinsically Safe Explosion-proof Pilot Operated 3-Port Valve/Base Piping	RJ-012AA
M3KA1	Ⓜ Pilot Operated 3-Port Valve/Direct Piping	RJ-012AA
M3KA1	Ⓜ Air Operated 3-Port Valve (Master Valve)/Direct Piping	RJ-012AA
M3MA0	Ⓜ Direct Acting 3-Port Valve/Direct Piping	RJ-012AA
M3MB0	Ⓜ Direct Acting 3-Port Valve/Sub-plate Piping	RJ-012AA
M3P V/H	Cylinder Switch/1-Color Indicator, PNP Output Type, Solid State 3-wire	RJ-002,003, 004,005,006
M3PA1/2	Ⓜ Direct Acting 3-Port Valve/Direct Piping	RJ-012AA
M3PB1/2	Ⓜ Direct Acting 3-Port Valve/Sub-plate Piping	RJ-012AA
M3QB1	Ⓜ Direct Acting 3-Port Valve/Sub-plate Piping	RJ-012AA
M3QE1	Ⓜ Direct Acting 3-Port Valve/Sub-plate Piping	RJ-012AA
M3QZ1	Ⓜ Direct Acting 3-Port Valve/Sub-plate Piping	RJ-012AA
M3QRA	Ⓜ Direct Acting 3-Port Valve/Direct Piping	RJ-012AA
M3QRB	Ⓜ Direct Acting 3-Port Valve/Sub-plate Piping	RJ-012AA
M4F0/1/2/3	Ⓜ Pilot Operated 5-Port Valve/Direct Piping	RJ-012AA
M4F0/1/2/3	Ⓜ Air Operated 5-Port Valve (Master Valve)/Direct Piping	RJ-012AA
M4F3□□0EX	Ⓜ Explosion-proof Pilot Operated 5-Port Valve/Direct Piping	RJ-012AA
M4F3□0E	Ⓜ Explosion-proof Pilot Operated 5-Port Valve/Direct Piping	RJ-012AA
M4F4/5/6/7	Ⓜ Pilot Operated 5-Port Valve/Sub-plate Piping	RJ-012AA
M4F4/5/6/7	Air Operated 5-Port Valve (Master Valve)/Sub-plate Piping	RJ-012AA
M4F4/5/6/7□0EX	Ⓜ Explosion-proof Pilot Operated 5-Port Valve/Sub-plate Piping	RJ-012AA
M4F4/5/6/7□0E	Ⓜ Explosion-proof Pilot Operated 5-Port Valve/Sub-plate Piping	RJ-012AA
M4GA1/2/3	Ⓜ Pilot Operated 5-Port Valve/Direct Piping	RJ-011AA
M4GA1/2/3	Ⓦ Pilot Operated 5-Port Valve/Direct Piping	RJ-011AA
M4GA1/2/3	Air Operated 5-Port Valve (Master Valve)/Direct Piping	RJ-012AA
M4GA4	Ⓜ Pilot Operated 5-Port Valve/Direct Piping	RJ-011AA
M4GA4	Ⓦ Pilot Operated 5-Port Valve/Direct Piping	RJ-011AA
M4GB1/2/3	Ⓜ Pilot Operated 5-Port Valve/Base Piping	RJ-011AA
M4GB1/2/3	Ⓦ Pilot Operated 5-Port Valve/Base Piping	RJ-011AA
M4GB1/2/3	Ⓝ Air Operated 5-Port Valve (Master Valve)/Base Piping	RJ-012AA
M4GB4	Ⓜ Pilot Operated 5-Port Valve/Base Piping	RJ-011AA
M4GB4	Ⓦ Pilot Operated 5-Port Valve/Base Piping	RJ-011AA
M4GD1/2/3	Ⓜ Pilot Operated 5-Port Valve/Direct Piping	RJ-011AA
M4GD1/2/3	Ⓦ Pilot Operated 5-Port Valve/Direct Piping	RJ-011AA
M4GD1/2/3/40EJ	Ⓜ Intrinsically Safe Explosion-proof Pilot Operated 5-Port Valve/Direct Piping	RJ-012AA
M4GD1/2/3/40EX	Ⓜ Intrinsically Safe Explosion-proof Pilot Operated 5-Port Valve/Direct Piping	RJ-012AA
M4GE1/2/3	Ⓜ Pilot Operated 5-Port Valve/Base Piping	RJ-011AA
M4GE1/2/3	Ⓦ Pilot Operated 5-Port Valve/Base Piping	RJ-011AA
M4GE1/2/3/40EJ	Ⓜ Intrinsically Safe Explosion-proof Pilot Operated 5-Port Valve/Base Piping	RJ-012AA
M4GE1/2/3/40EX	Ⓜ Intrinsically Safe Explosion-proof Pilot Operated 5-Port Valve/Base Piping	RJ-012AA
M4KA1/2/3/4	Ⓜ Pilot Operated 5-Port Valve/Direct Piping	RJ-012AA
M4KA1/2/3/4	Ⓝ Air Operated 5-Port Valve (Master Valve)/Direct Piping	RJ-012AA
M4KB1/2/3/4	Ⓜ Pilot Operated 4, 5-Port Valve/Sub-plate Piping	RJ-012AA
M4KB1/2/3/4	Ⓝ Air Operated 4, 5-Port Valve (Master Valve)/Sub-plate Piping	RJ-012AA
M4SA0	Ⓜ Pilot Operated 5-Port Valve/Direct Piping	RJ-011AA
M4SB0	Ⓜ Pilot Operated 5-Port Valve/Sub-plate Piping	RJ-011AA
M4SB0	Ⓦ Pilot Operated 5-Port Valve/Sub-plate Piping	RJ-011AA
M512□	Ⓢ Pilot Operated 2-Port Valve/Direct Type	RJ-012AA
M513□	Ⓢ Pilot Operated 3-Port Valve/Direct Type	RJ-012AA
M5V/H	Cylinder Switch/No Indication, Reed 2-wire	RJ-002,003, 004,005,006
MAB1/MAG1	Metal-free 2-Port Solenoid Valve	CC-1055AA
MAVL	Large Mechanical Valve/Detector	RJ-007AA
MCP	Mechanical Power Cylinder	RJ-005AA
MD	Multi Monitor	577
MDC2	Compact Direct Cylinder/Double Acting, Single Rod Type	RJ-003AA
MDV	Compact Direct Cylinder	CC-905AA
MEB2/MEG2	Metal-free 2-Port Solenoid Valve	CC-1055AA
MEVT	Thin Electro-Pneumatic Regulator/Wiring-saving Manifold Type	RJ-007AA
MGD	Manual Valve for Process Gas	CB-035AA
MGPS2	Seating Confirmation Switch/Manifold	132
MGPS3	Digital Gap Switch/Manifold	108
MHB4	Miniature Electric Ball Valve 2-Port (Motor Valve)	RJ-013AA
MHG4	Miniature Electric Ball Valve 3-Port (Motor Valve)	RJ-013AA
MHPS	Adhesion Confirmation Switch/Manifold	160
MJB3	Metal-free Direct Acting 2-Port Solenoid Valve	CC-1055AA
MJL□	Compression Joint/Elbow Type	RJ-007AA
MJN□	Compression Joint/Sleeve	RJ-007AA
MJS□	Compression Joint/Straight Type	RJ-007AA
MJT□	Compression Joint/Tee Type	RJ-007AA
MJU□	Compression Joint/Insert Ring	RJ-007AA
MKB3	Metal-free 2-Port Solenoid Valve	CC-1055AA
MKML	Fine Level Switch Manifold	CB-031AA
MM	Medium Mechanical Valve/Detector	RJ-007AA
MM3000 to 8000	Oil Mist Filter/Medium Pressure Series	RJ-007AA
MMD	Manual Valve for Chemicals	CB-031AA
MN3E0	Ⓦ Pilot Operated 3, 4-Port Valve	RJ-011AA
MN3E00	Ⓦ Pilot Operated 3, 4-Port Valve	RJ-011AA
MN3GA1/2	Ⓜ, Ⓑ Pilot Operated 3-Port Valve/Direct Piping	RJ-011AA
MN3GA1/2	Ⓦ, Ⓑ Pilot Operated 3-Port Valve/Direct Piping	RJ-011AA
MN3GAX12	Ⓦ, Ⓧ Pilot Operated 3-Port Valve/Direct Piping	RJ-011AA
MN3GB1/2	Ⓜ, Ⓑ Pilot Operated 3-Port Valve Dual Unit/Base Piping	RJ-011AA
MN3GB1/2	Ⓦ, Ⓑ Pilot Operated 3-Port Valve Dual Unit/Base Piping	RJ-011AA
MN3GD1/2	Ⓜ, Ⓑ Pilot Operated 3-Port Valve/Direct Piping	RJ-011AA
MN3GD1/2	Ⓦ, Ⓑ Pilot Operated 3-Port Valve/Direct Piping	RJ-011AA
MN3GDX12	Ⓦ, Ⓧ Pilot Operated 3-Port Valve/Direct Piping	RJ-011AA
MN3GE1/2	Ⓜ, Ⓑ Pilot Operated 3-Port Valve Dual Unit/Base Piping	RJ-011AA
MN3GE1/2	Ⓦ, Ⓑ Pilot Operated 3-Port Valve Dual Unit/Base Piping	RJ-011AA
MN3Q	Ⓦ Direct Acting 3-Port Valve	RJ-012AA
MN4E0	Ⓦ Pilot Operated 3, 4-Port Valve	RJ-011AA
MN4E00	Ⓦ Pilot Operated 3, 4-Port Valve	RJ-011AA
MN4EX0	Ⓦ/Ⓧ Pilot Operated 4-Port Valve	RJ-011AA
MN4GA1/2	Ⓜ/Ⓑ Pilot Operated 5-Port Valve/Direct Piping	RJ-011AA
MN4GA1/2	Ⓦ/Ⓑ Pilot Operated 5-Port Valve/Direct Piping	RJ-011AA
MN4GAX12	Ⓦ/Ⓧ Pilot Operated 5-Port Valve/Direct Piping	RJ-011AA
MN4GB1/2	Ⓜ/Ⓑ Pilot Operated 5-Port Valve/Base Piping	RJ-011AA
MN4GB1/2	Ⓦ/Ⓑ Pilot Operated 5-Port Valve/Base Piping	RJ-011AA
MN4GBX12	Ⓦ/Ⓧ Pilot Operated 5-Port Valve/Base Piping	RJ-011AA
MN4GD1/2	Ⓜ/Ⓑ Pilot Operated 5-Port Valve/Direct Piping	RJ-011AA
MN4GD1/2	Ⓦ/Ⓑ Pilot Operated 5-Port Valve/Direct Piping	RJ-011AA
MN4GDX12	Ⓦ/Ⓧ Pilot Operated 5-Port Valve/Direct Piping	RJ-011AA
MN4GE1/2	Ⓜ/Ⓑ Pilot Operated 5-Port Valve/Base Piping	RJ-011AA
MN4GE1/2	Ⓦ/Ⓑ Pilot Operated 5-Port Valve/Base Piping	RJ-011AA
MN4GEX12	Ⓦ/Ⓧ Pilot Operated 5-Port Valve/Base Piping	RJ-011AA
MN4KB1/2	Ⓑ Pilot Operated 5-Port Valve/Sub-plate Piping	RJ-012AA
MNRB500	Block Manifold Regulator	RJ-007AA
MNRB500-P11	Block Manifold Regulator/Ozone Resistant	RJ-007AA
MNRJB500	Block Manifold Compact Direct Acting Precision Regulator	RJ-007AA
MNV	Flow Control Valve	CB-031AA
MR10R	Metal-free Compact 2, 3-Port Solenoid Valve	CC-1055AA
MR16	Metal-free Compact 2, 3-Port Solenoid Valve	CC-1055AA
MRG2	Magnet Type Rodless Cylinder/Double Acting Type	RJ-005AA
MRL2	Magnet Type Rodless Cylinder/Basic Type	RJ-005AA
MS	Compact Mechanical Valve/Detector	RJ-007AA
MSB1□	Electric Ball Valve 2-Port for Steam (Motor Valve)	RJ-013AA
MSD	Compact Cylinder/Double Acting, Single Rod Type	RJ-003AA
MSDG-L	Compact Cylinder/Double Acting, Guided Type, with Switch	RJ-004AA
MTLPS	Tool Breakage Detection Switch/Manifold	188
MV3QRA	3QR Negative Pressure Switching Unit Direct Piping	RJ-012AA
MV3QRB	3QR Negative Pressure Switching Unit Sub-plate Piping	RJ-012AA
MXKML	Fine Level Switch Manifold	CB-031AA
MVB	Manual Valve for High Vacuum	CB-035AA

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Model No.	Model Name	Catalog No./Page
M		
MVC	Compact Cylinder with Vacuum Pad/Double Acting, Single Rod Type	RJ-005AA
MW3GA2	Ⓜ Pilot Operated 3-Port Valve/Direct Piping	RJ-011AA
MW3GA2	ⓌⓇ Pilot Operated 3-Port Valve/Direct Piping	RJ-011AA
MW4GA2	Ⓜ Pilot Operated 5-Port Valve/Direct Piping	RJ-011AA
MW4GA2	ⓌⓇ Pilot Operated 5-Port Valve/Direct Piping	RJ-011AA
MW4GB2	Ⓜ Pilot Operated 5-Port Valve/Base Side Piping	RJ-011AA
MW4GB2	ⓌⓇ Pilot Operated 5-Port Valve/Base Side Piping	RJ-011AA
MW4GB4	Ⓜ Pilot Operated 5-Port Valve/Base Side Piping	RJ-011AA
MW4GB4	ⓌⓇ Pilot Operated 5-Port Valve/Base Side Piping	RJ-011AA
MW4GZ2	Ⓜ Pilot Operated 5-Port Valve/Base Bottom Piping	RJ-011AA
MW4GZ2	ⓌⓇ Pilot Operated 5-Port Valve/Base Bottom Piping	RJ-011AA
MW4GZ4	Ⓜ Pilot Operated 5-Port Valve/Base Bottom Piping	RJ-011AA
MW4GZ4	ⓌⓇ Pilot Operated 5-Port Valve/Base Bottom Piping	RJ-011AA
MW4000, 8000	Oil Mist Filter/Outdoor Series	CC-1276AA
MWD	Wear Type Diaphragm Valve	CC-1637AA
MX1000 to **8000-W**	High Performance Oil Mist Filter/Standard White Series	RJ-007AA
MXB1□	Electric Ball Valve 2-Port (Motor Valve)	RJ-013AA
MXB1D-N	Electric Oil-free Ball Valve 2-Port (Motor Valve)	RJ-013AA
MXB1F	Electric Ball Valve 2-Port (Motor Valve)/Full Bore	RJ-013AA
MXB1-N	Electric Oil-free Ball Valve 2-Port (Motor Valve)	RJ-013AA
MXBC2	Proportional Control Electric Ball Valve 2-Port (Motor Valve)	RJ-013AA
MXG1□	Electric Ball Valve 3-Port (Motor Valve)	RJ-013AA
MXG1D-N	Electric Oil-free Ball Valve 3-Port (Motor Valve)	RJ-013AA
MXG1-N	Electric Oil-free Ball Valve 3-Port (Motor Valve)	RJ-013AA
MXGC2	Proportional Control Electric Ball Valve 3-Port (Motor Valve)	RJ-013AA
MYB□	Metal-free 2-Port Solenoid Valve	CC-1055AA
MYG□	Metal-free 3-Port Solenoid Valve	CC-1055AA
N		
N□P51□	ⒷⓂ Pilot Operated 2, 3, 5-Port Valve/Block Manifold	RJ-012AA
NAB□	Air Operated 2-Port Valve Single Unit (Compact Cylinder Valve)	RJ-013AA
NAD□	Diaphragm Cylinder Valve	RJ-013AA
NAP11	Air Operated 3-Port Valve	RJ-012AA
NCK	Shock Absorber, Fixed Type	RJ-005AA
NHS-H	New Handling System/Z-axis Module HRL	RJ-005AA
NHS-S	New Handling System/Z-axis Module STL-B	RJ-005AA
NP13R/14R	Internal Pilot Operated 3-Port Valve Solenoid Valve Mounted Type	RJ-012AA
NPV2	Direct Air Pressure Automatic Pinch Valve	RJ-013AA
NS	Nitrogen Extraction Unit/Unit Type	RJ-009AA
NSU	Nitrogen Extraction Unit/System Type	RJ-009AA
NSR	New Handling System/X-axis Module	RJ-005AA
NU	New Urethane Tubing	RJ-007AA
NVP11R	Air Operated 3-Port Valve/Solenoid Valve Mounted Type	RJ-012AA
NX4	ABSODEX	CC-1456AA
NXD	Driver	CC-1456AA
O		
OGD	Manual Valve for Process Gas	CB-035AA
OMC2	Sequential Controller for Pulse Jet Valve (Pulse Jet Controller)	RJ-013AA
P		
P1100-W	Reed Switch Type Mechanical Compact Pressure Switch	RJ-007AA
P4000-W	Mechanical Pressure Switch/Standard White Series	RJ-007AA
P4100-W	Reed Switch Type Mechanical Compact Pressure Switch	RJ-007AA
P512□	ⓈⓋ Pilot Operated 2-Port Valve/Pilot Type	RJ-012AA
P513□	ⓈⓋ Pilot Operated 3-Port Valve/Pilot Type	RJ-012AA
P5142	ⓈⓋ Pilot Operated 5-Port Valve/Pilot Type	RJ-012AA
P8100-W	Reed Switch Type Mechanical Compact Pressure Switch	RJ-007AA
PAW	PowerArm	CC-1418AA
PCC	Pin Clamp Cylinder Double Acting, Single Rod Type	RJ-005AA
PCIS/PCOS	Parallel cam unit	CB-019SAA
PD2	For dust collector Pilot Operated 2-Port Air Operated Valve	RJ-013AA
PD3	For dust collector Pilot Operated 2-Port Air Operated Valve	RJ-013AA
PDV2	Pilot Operated 2-Port Valve with Solenoid for Dust Collector	RJ-013AA
PDV3	Pilot Operated 2-Port Valve with Solenoid for Dust Collector	RJ-013AA
PDVE4	Explosion-proof 2-Port Solenoid Valve for Dust Collector (Explosion-proof Pulse Jet Valve)	RJ-013AA
PE	Pressure Switch/Logic Valve	RJ-007AA
PFD	Flow Sensor for Compressed Air/Separate Display Type Flurex	403
PG	Air Fiber One-touch Fitting (Standard Type)	RJ-007AA
PGM	Regulator for Process Gas	CB-035AA
PG-P2-B	Blank Plug	RJ-007AA
PJVB	Box Type Manifold Solenoid Valve for Operation (2-Port Solenoid Valve for Pulse Jet Control)	RJ-013AA
PKA	Pilot Kick Operated 2-Port Solenoid Valve for Air	RJ-013AA
PKS	Pilot Kick Operated 2-Port Solenoid Valve for Steam	RJ-013AA
PKW	Pilot Kick Operated 2-Port Solenoid Valve for Water	RJ-013AA
PLE-B12	Side Block/Integrated Type	RJ-007AA
PLJ-C12	YES Element/Relay Type	RJ-007AA
PLK-A11	OR Element/Line Type	RJ-007AA
PLK-B12	OR Element/Integrated Type	RJ-007AA
PLK-C12	OR Element/Relay Type	RJ-007AA
PLL-A11	AND Element/Line Type	RJ-007AA
PLL-B12	AND Element/Integrated Type	RJ-007AA
PLL-C12	AND Element/Relay Type	RJ-007AA
PLM	Memory Element/Relay Type	RJ-007AA
PLN-B12	NOT Element/Integrated Type	RJ-007AA
PLN-C12	NOT Element/Relay Type	RJ-007AA
PLN-D12	Threshold Element/Relay Type	RJ-007AA
PMM	Fine Regulator	CB-031AA
PMP	Fine Regulator	CB-031AA
PNA	Oxygen Concentration Meter	RJ-009AA
PPD3	Electronic Pressure Switch/Sensor/Amplifier Integrated Type with Display	40
PPD3-S	Electronic Pressure Switch, Stainless Steel Diaphragm Sensor Type/Sensor/Amplifier Integrated Type with Display	40
PPE	Electronic Compact Pressure Switch/Sensor/Amplifier Integrated Type without Display	72
PPE-□A	Electronic Compact Pressure Switch/Sensor/Amplifier Integrated Type without Display, Analog Output Type	80
PPEV-□A	Electronic Compact Pressure Switch/Sensor/Amplifier Integrated Type without Display, Analog Output Type	86
PPG-D	Electronic Pressure Sensor with Digital Display	60
PPLX	Linear Pick & Place Unit	CB-019SAA
PPR	Electronic Pressure Sensor with Digital Display	92
PPX	Digital Pressure Sensor	8
PRD	Amplifier/Elements and Sensors	RJ-007AA
PRE-A12	Pressure Switch/Relay Type	RJ-007AA
PRF-A2	Booster/Elements and Sensors	RJ-007AA
PRS-A12	Solenoid Valve/Relay Type	RJ-007AA
PRT	Timer/Relay Type	RJ-007AA
PSD	Sequencer Branch Block	RJ-007AA
PSE	Sequencer Input/Output Block	RJ-007AA
PSL	Sequencer AND Element	RJ-007AA
PSM	Sequencer Element	RJ-007AA
PSV	Sequencer Sub-base V-Type	RJ-007AA
PTN2	Dedicated Fitting for Air Fiber	RJ-007AA
PV5	ⓈⓋ Pilot Operated 5-Port ISO Compliant Valve/I/O Connector Type/ISO Size ①	RJ-012AA
PV5G	ⓈⓋ Pilot Operated 5-Port ISO Compliant Valve/DIN Terminal Box Type/ISO Size ①	RJ-012AA
PV5S-0	ISO Compliant Master Valve	RJ-012AA
PVP	Precision Suction Plate	RJ-010AA
PVS	Pilot Operated 2-Port Solenoid Valve	RJ-013AA
PWS	Threshold Sensor	RJ-007AA
PXB-B3	Push Button Switch/Switch Body/Separate Type	RJ-007AA
PXC-K	Limit Switch	RJ-007AA
PXC-M	Miniature Limit Switch	RJ-007AA
PXC-M	Compact Limit Switch	RJ-007AA
PXD	Proximity Sensor/Elements and Sensors	RJ-007AA
PXF	Limit Sensor/Elements and Sensors	RJ-007AA
PXV	Air Lamp	RJ-007AA
PYM	Fine Regulator	CB-031AA
PZM	Mounting Bracket/Line Type	RJ-007AA
PZU	Sub-base/Input Block/Relay Type Sub-base	RJ-007AA
Q		
QEL	Quick Exhaust Valve	RJ-007AA

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Model No.	Model Name	Catalog No./Page
Q		
QEV2	Quick Exhaust Valve	RJ-007AA
R		
R0, 3, 4, 6	Cylinder Switch/1-Color Indicator, Reed 2-wire	RJ-002,003, 004,005,006
R1, 2	Cylinder Switch/1-Color Indicator, Solid State 2-wire	RJ-002,003, 004,005,006
R1000 to **8000-P11**	Regulator/Ozone Resistant	RJ-007AA
R1000 to **8000-P6**	Regulator/Copper Ion Restricted (No copper/PTFE Specification)	RJ-007AA
R1000 to **8000-W**	Regulator/Standard White Series	RJ-007AA
R1100 to **8100-P11**	Reverse Regulator/Ozone Resistant	RJ-007AA
R1100 to **8100-P6**	Reverse Regulator/Copper Ion Restricted (No copper/ PTFE Specification)	RJ-007AA
R1100 to **R8100-W**	Reverse Regulator/Standard White Series	RJ-007AA
R2, 3Y	Cylinder Switch/2-Color Indicator, Solid State 2/3-wire	RJ-002,003, 004,005,006
R3000 to **8000-G4**	Regulator/Flame Resistant Series	RJ-007AA
R3100 to **8100-G4**	Reverse Regulator/Flame Resistant Series	RJ-007AA
R5	Cylinder Switch/No Indication, Reed 2-wire	RJ-002,003, 004,005,006
RA800	Compact Regulator/Compact Piston Type	RJ-007AA
RB500	Compact Regulator	RJ-007AA
RB500-P11	Compact Regulator/Ozone Resistant	RJ-007AA
RC2000	Clean Regulator	RJ-007AA
RCC2	Rotary Clamp Cylinder Double Acting, Single Rod Type	RJ-005AA
RCKL	Gripper for Collaborative Robot 3-Jaw Type	RJ-006AA
RCS2	Rotary Clamp Cylinder (Single Guide Type) Double Acting, Single Rod Type	RJ-005AA
RG	One-touch Fitting for Air Fiber (Flame Resistant Type)	RJ-007AA
RHLF	Gripper for Collaborative Robot Long Stroke Type	RJ-006AA
RJB500	Compact Direct Acting Precision Regulator	RJ-007AA
RJF	Rotary Joint	RJ-007AA
RLSH	Gripper for Collaborative Robot Compact Type	RJ-006AA
RM3000, 4000	Regulator/Medium Pressure Series	RJ-007AA
RN3000 to **8000**	Oil-free Regulator	RJ-007AA
RP1000	Precision Regulator	RJ-007AA
RPE1000	Precision Regulator	RJ-007AA
RP2000	Precision Regulator	RJ-007AA
RRC	Selex Rotary/Rack & Pinion Type	RJ-005AA
RS-6	Rain Sensor for Automatic Watering Control	CC-297AA
RSC	Automatic Watering Controller	CC-297AA
RSV	Solenoid Valve for Automatic Watering Control	CC-297AA
RT	Remote I/O	RJ-011AA
RTD-3A	Air Timer/Logic Valve	RJ-007AA
RW4000, 8000	Regulator/Outdoor Series Outdoor Series	CC-1276AA
RV3□	Selex Rotary/Vane Type	RJ-005AA
RVC	Shock Absorber	RJ-005AA
S		
SAB□□	Air Operated 2-Port Valve (Cylinder Valve)	RJ-013AA
SAL	Compact Air Lamp/Logic Valve	RJ-007AA
SC1	Speed Controller/Medium Bore Type	RJ-007AA
SC-20A to **50A**	Speed Controller/Large Bore Type	RJ-007AA
SC3P	Speed Controller/Stainless Steel Corrosion Resistant Type	RJ-007AA
SC3R	Speed Controller/Direct Port Connection, Elbow Type	RJ-007AA
SC3U	Speed Controller/Universal Type with One-touch Fitting	RJ-007AA
SC3W	Speed Controller/Elbow Type with One-touch Fitting	RJ-007AA
SCA2	Medium Bore Size Cylinder (ø40 to 100)/Double Acting, Single Rod Type	RJ-002,003, 004,005,006
SCD	Speed Controller/Ultra Compact In-Out Type	RJ-007AA
SCD2	Speed Controller/In-Out Line Type with One-touch Fitting	RJ-007AA
SCG	Tie Rod Cylinder/Double Acting, Single Rod Type	RJ-002,003, 004,005,006
SCK	Shock Absorber, Adjustable Type	RJ-005AA
SCL2	Speed Controller/Line Type with One-touch Fitting	RJ-007AA
SCL2-N	Needle Valve/Line Type with One-touch Fitting	RJ-007AA
SCM	Round shaped cylinder/ Double Acting, Single Rod Type	RJ-002,003, 004,005,006
SC-M3/ M5(-F)	Speed Controller/Ultra Compact	RJ-007AA
SCPD3	Pencil Shaped Cylinder/ Double Acting, Single Rod Type	RJ-002,003, 004,005,006
SCPH3	Pencil Shaped Cylinder/ Single Acting, Retracting Type	RJ-002,003, 004,005,006
SCPS	Pencil Shaped Cylinder/ Single Acting, Push Type	RJ-002,003, 004,005,006
SCPS3	Pencil Shaped Cylinder/ Single Acting, Push Type	RJ-002,003, 004,005,006
SCS2	Large Bore Size Cylinder (ø125 to 250)/Double Acting, Single Rod Type, Lubricated Type	RJ-002,003, 004,005,006
SD301, 302D	Membrane Air Dryer/Single Unit	RJ-009AA
SD301, 302E	Membrane Air Dryer/Single Unit	RJ-009AA
SD3015 to **3075**	Membrane Air Dryer/Single Unit	RJ-009AA
SD401, 402D	Membrane Air Dryer/Single Unit	RJ-009AA
SD401, 402E	Membrane Air Dryer/Single Unit	RJ-009AA
SD4050 to **4100**	Membrane Air Dryer/Single Unit	RJ-009AA
SDM4050 to **4100**	Membrane Air Dryer/Super Dryer Modular Series (Large Size)	RJ-009AA
SFC□	Antibacterial/Bacteria-removing Filter	RJ-007AA
SFS10	Bacteria-removing Filter/ Inline Type	RJ-007AA
SFR/SFRT	Super Fan Rotary	CC-984AA
SFX	Siloxane/Ozone Remover	RJ-007AA
SHD	Desiccant Air Dryer/Medium/ Large Heatless Dryer	RJ-009AA
SHV2	Shuttle Valve	RJ-007AA
SKAC	Contact Protection Circuit Box (For AC Circuit)	RJ-002,003, 004,005,006
SKDC	Contact Protection Circuit Box (For DC Circuit)	RJ-002,003, 004,005,006
SKH	Shockless Valve	RJ-012AA
SKL	Shock Absorber	RJ-005AA
SL	Silencer/Metal Body Type	RJ-007AA
SLM	Silencer/Ultra Compact Type	RJ-007AA
SLW	Silencer/Small Bore, Resin Body Type	RJ-007AA
SM-25	Shuttle Mover Standard Type/ High Load Type	RJ-005AA
SMG	Compact Cylinder/Double Acting, Single Rod Type	RJ-003AA
SMW	Metering Valve with Silencer	RJ-007AA
SMW2	Metering Valve with Silencer	RJ-007AA
SNP	3-Port Solenoid Valve with Spool Position Detection Function	RJ-007AA
SNS	Residual Pressure Exhaust Valve with Spool Position Detection Function	RJ-007AA
SP	Thin Pilot Operated 2-Port Solenoid Valve for Compressed Air	RJ-013AA
SPD	Poppet Type Diaphragm Valve	CC-1637AA
SPK	Pilot Kick Operated 2-Port Solenoid Valve for Steam	RJ-013AA
SR	Flame Resistant Tubing	RJ-007AA
SRG3	High Precision Guided Rodless Cylinder (Single Guide)/Double Acting Type	RJ-005AA
SRL3	Rodless Cylinder/Double Acting Type	RJ-005AA
SRM3	High Precision Guided Rodless Cylinder (Double Guide)/Double Acting Type	RJ-005AA
SRT3	Rodless Cylinder with Brake/ Double Acting Type	RJ-005AA
SSD	Compact Cylinder/Double Acting, Single Rod Type	RJ-003AA
SSD2	Compact Cylinder/Double Acting, Single Rod Type	RJ-003AA
SSD-LN	With Linear Norm Sensor	RJ-005AA
SSG	Guided Compact Cylinder/ Double Acting, Single Rod Type	RJ-003AA
STG	Guided Cylinder/Double Acting, Single Rod Type	RJ-004AA
STK	Stopper Cylinder/Double Acting, Round Rod End Type	RJ-005AA
STL-□	Guided Cylinder (Long Stroke Type)/Double Acting, Single Rod Type	RJ-004AA
STM-M/B	Guided Cylinder, Double Acting/Single Rod Type	RJ-004AA
STR2-□	Twin Rod Cylinder Double Acting/Single Rod Type	RJ-004AA
STS-□	Guided Cylinder (Short Stroke) Double Acting/Single Rod Type	RJ-004AA
SU301, 302D	Membrane Air Dryer/Unit	RJ-009AA
SU301, 302E	Membrane Air Dryer/Unit	RJ-009AA
SU3015 to **3075**	Membrane Air Dryer/Unit	RJ-009AA
SU401, 402D	Membrane Air Dryer/Unit	RJ-009AA
SU401, 402E	Membrane Air Dryer/Unit	RJ-009AA
SU4050, 4100	Membrane Air Dryer/Unit	RJ-009AA
SVB□□	Air Operated 2-Port Valve Solenoid Valve Mounted Type (Cylinder Valve)	RJ-013AA
SWD	Wear Type Diaphragm Valve	CC-1637AA
T		
T0V/H/C	Cylinder Switch/1-Color Indicator, Reed 2-wire	RJ-002,003, 004,005,006
T0Y	Magnetic Field Resistant Cylinder Switch Reed 2-wire type	RJ-002,003, 004,005,006

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T		
T1 V/H	Cylinder Switch/1-Color Indicator, Solid State 2-wire	RJ-002,003, 004,005,006
T2 V/H R	Cylinder Switch/Flexible Shielded Cable Type, Solid State 2-wire	RJ-002,003, 004,005,006
T2, 3 V/H/C	Cylinder Switch/1-Color Indicator, Solid State 2/3-wire	RJ-002,003, 004,005,006
T2, 3YL V/H	Cylinder Switch/Solid State 2/3-wire for Cutting Oil	RJ-002,003, 004,005,006
T2J V/H	Cylinder Switch/Off-delay Type, Solid State 2-wire	RJ-002,003, 004,005,006
T2YD(T)	Cylinder Switch/Solid State 2-wire for Strong Magnetic Fields	RJ-002,003, 004,005,006
T2WL V/H	Cylinder Switch/Improved Water Resistance, Solid State 2-wire	RJ-002,003, 004,005,006
T3P V/H	Cylinder Switch/PNP Output Type, Solid State 3-wire	RJ-002,003, 004,005,006
T5V/H/C	Cylinder Switch/No Indication, Reed 2-wire	RJ-002,003, 004,005,006
T8 V/H	Cylinder Switch/1-Color Indicator, Reed 2-wire	RJ-002,003, 004,005,006
TAC-25	Medium Pressure Gas Safety Shutoff Control System	CC-1590AA
TGX	Torque Guard	CC-1601AA
TLPS	Tool Breakage Detection Switch/Single Unit	182
TSF	Torque Saver	CC-1601AA
TVG	Plug-in Block Manifold	RJ-011AA
U		
U	Urethane Tubing	RJ-007AA
UB	Lock Unit	RJ-005AA
UCA2	Unit Cylinder/Double Acting, Single Rod, Plain Bearing Type	RJ-004AA
UCAC2	Clamp Cylinder with Fall Prevention Double Acting/Single Rod Type	RJ-005AA
UCAC-N32/40	Lightweight Clamp Cylinder/ With Fall Prevention, Double Acting, Single Rod Type	RJ-005AA
UFCD	Flat Cylinder with Free Position Drop Prevention Double Acting/Single Rod Type	RJ-005AA
UGPS2	Seating Confirmation Switch/Unit	136
UGPS3	Digital Gap Switch/Unit	110
UHPS	Adhesion Confirmation Switch/Unit	164
ULK	Brake Cylinder/Double Acting, Single Rod Type	RJ-005AA
UMB1	For medical components High Corrosion Resistance Ultra Compact Direct Acting 2-Port Solenoid Valve for Medical Equipment	CC-1055AA
UMG1	For medical components High Corrosion Resistance Ultra Compact Direct Acting 3-Port Solenoid Valve	CC-1055AA
UP	Air Fiber Antistatic Type (For One-touch Fittings)	RJ-007AA
UP-□□-F1/ F2	Antistatic Tubing	RJ-007AA
UP-9102-20-□-F1	Air Fiber Antistatic Type	RJ-007AA
UP-9102-SR	Flame Resistant Air Fiber (For One-touch Fittings)	RJ-007AA
US	Compact Direct Acting 2, 3-Port Solenoid Valve (Resin Body Type)	RJ-013AA
USB□	Compact Direct Acting 2-Port Solenoid Valve	RJ-013AA
USC	Medium Bore Size Cylinder with Free Position Fall Prevention/Double Acting, Single Rod Type	RJ-005AA
USG□	Compact Direct Acting 3-Port Solenoid Valve	RJ-013AA
USSD	Compact Cylinder with Drop Prevention/Double Acting, Single Rod Type	RJ-005AA
UTLPS	Tool Breakage Detection Switch/Unit	192
V		
V0	Cylinder Switch, Cylinder Switch/Compact Reed 2-wire for Strong Magnetic Fields	RJ-002,003, 004,005,006
V1000, 3000-W	Residual Pressure Exhaust Valve/Standard White Series	RJ-007AA
V3010, 6010-W	Residual Pressure Release Valve with key hole with Keyhole, OSA Compliant	RJ-007AA
V3301, 3321-W	Slow Start Valve	RJ-007AA
VFA1000 to 4000	Vacuum Filter	RJ-010AA
VG	Vacuum Generator	CB-035AA
VG41D	Vacuum Pressure Gauge with Limit Mark	RJ-007AA
VLA	Solenoid Valve for Gas Combustion System	CC-1590AA
VLM	Shutoff Valve for Medium Pressure Gas Safety Shutoff Control	CC-1590AA
VNA	Solenoid Valve for Gas Combustion System	CC-1590AA
VNA-R/RH	Solenoid Valve for Gas Combustion System	CC-1590AA
VNM	Shutoff Valve for Medium Pressure Gas Safety Shutoff Control	CC-1590AA
VNM-25-K	Safety Shutoff Valve (Fire Safety Enhanced Specification)	CC-1590AA
VNR	Solenoid Valve for Gas Combustion System (Normally Closed when energized)	CC-1590AA
VRA2000	Vacuum Regulator	RJ-010AA
VSB	Ejector System/Square Type	RJ-010AA
VSC	Ejector System/Pad Direct Mount Type	RJ-010AA
VSECV	Vacuum Related Equipment/ Fall Prevention Valve	RJ-010AA
VSFB	Vacuum Related Equipment/ Large Capacity Union Type Vacuum Filter	RJ-010AA
VSFJ	Vacuum Related Equipment/ Compact Socket Type Vacuum Filter	RJ-010AA
VSFU	Vacuum Related Equipment/ Compact Union Type Vacuum Filter	RJ-010AA
VSG	Ejector System/20 mm Width Single Unit Dedicated Type	RJ-010AA
VSH	Ejector System/Solenoid Valve Direct Mount Type	RJ-010AA
VSJ/VSJM	Ejector System/20 mm Width General Type	RJ-010AA
VSJP/ VSJPM	Vacuum Pump System/20 mm Width General Type	RJ-010AA
VSK/VSKM	Ejector System/16 mm Width General Type	RJ-010AA
VSLF	Vacuum Related Equipment/ Vacuum Break Unit	RJ-010AA
VSN/VSNM	Ejector System/10.3 mm Width General Type	RJ-010AA
VSNP/ VSNPM	Vacuum Pump System/10.3 mm Width General Type	RJ-010AA
VSP	Suction Pad	RJ-010AA
VSQ	Ejector System/31.5 mm Width Single Unit Dedicated Type	RJ-010AA
VSQP	Vacuum Pump System/31.5 mm Width General Type	RJ-010AA
VSRVV	Vacuum Related Equipment/ Compact Vacuum Regulator	RJ-010AA
VST	Vacuum Related Equipment/ Air Tweezers	RJ-010AA
VSU	Ejector System/Pipe Type	RJ-010AA
VSUS	Vacuum Related Equipment/ Vacuum Pressure Switch	RJ-010AA
VSX/VSXM	Ejector System/10.5 mm Width General Type	RJ-010AA
VSXP/ VSXPM	Vacuum Pump System/10.5 mm Width General Type	RJ-010AA
VSY	Ejector System/Vacuum Break Function Type	RJ-010AA
VSZM	Ejector System/11 mm Pitch Manifold Dedicated Type	RJ-010AA
VSZPM	Vacuum Pump System/11 mm Pitch Manifold Dedicated Type	RJ-010AA
W		
W1000 to 8100-P11	Filter Regulator/Ozone Resistant	RJ-007AA
W1000 to 8000-P6	Filter Regulator/Copper Ion Restricted (No copper/PTFE Specification)	RJ-007AA
W1000 to 8000-W	Filter Regulator/Standard White Series	RJ-007AA
W1100 to 8100-P11	Reverse Filter Regulator/ Ozone Resistant	RJ-007AA
W1100 to 8100-P6	Reverse Filter Regulator/ Copper Ion Restricted (No copper/PTFE Specification)	RJ-007AA
W1100 to 8100-W	Reverse Filter Regulator/ Standard White Series	RJ-007AA
W2P513□	ⓈⓋPilot Operated 5-Port Valve/Double Type	RJ-012AA
W3000 to 8000-G4	Filter Regulator/Flame Resistant Series	RJ-007AA
W3100 to 8100-G4	Reverse Filter Regulator/ Flame Resistant Series	RJ-007AA
W4GB2	ⓈⓋPilot Operated 3, 5-Port Valve/Base Piping	RJ-011AA
W4GB4	ⓈⓋPilot Operated 5-Port Valve/Base Side Piping	RJ-011AA
W4GZ4	ⓈⓋPilot Operated 5-Port Valve/Base Bottom Piping	RJ-011AA
WB500	Compact Filter Regulator	RJ-007AA
WFC	Capacitance Electromagnetic Flow Sensor	447
WFK2	Karman Vortex Type Liquid Flow Sensor Flurex	421
WFK3000	Karman Vortex Type Water Flow Sensor Flurex	465
WR1 / 2	Regulator for Water	RJ-007AA
WW4000, 8000	Filter Regulator/Outdoor Series Outdoor series	CC-1276AA
WXU	Water Manifold Unit	483
Y		
YS	Y-type Strainer	RJ-013AA
Z		
ZB4-B	Switch Head	RJ-007AA
ZCK	Rotary Type Head Lever Actuator	RJ-007AA
ZRS	Roller Gear Cam Unit	CC-1601AA
ZSP	New Joint Stainless Steel Type	RJ-007AA
ZW	New Joint Stainless Steel Type	RJ-007AA

Products by Application

-FP□	For Food Manufacturing Process	CC-1271AA
-HP□	High Durability Equipment	CC-1421AA
-P4□	For Rechargeable Battery Manufacturing Process	CC-1226AA
-P5□	For Clean Components	CB-033SAA
-P6	Copper Ion Restricted (No copper/PTFE Specification)	RJ-001AA
-P7□	For Clean Components	CB-033SAA
-P8□	For Clean Components, Oil-free Treatment	CB-033SAA
-P9□	For Clean Components, Oil-free Treatment	CB-033SAA
-P11	Ozone Resistant	RJ-001AA
-P12	Oil-free Compatible	RJ-001AA
-W□	For Outdoor Use	CC-1276AA

Sensors / Controllers

Catalog No. RJ-008AA

Sensors & Controllers

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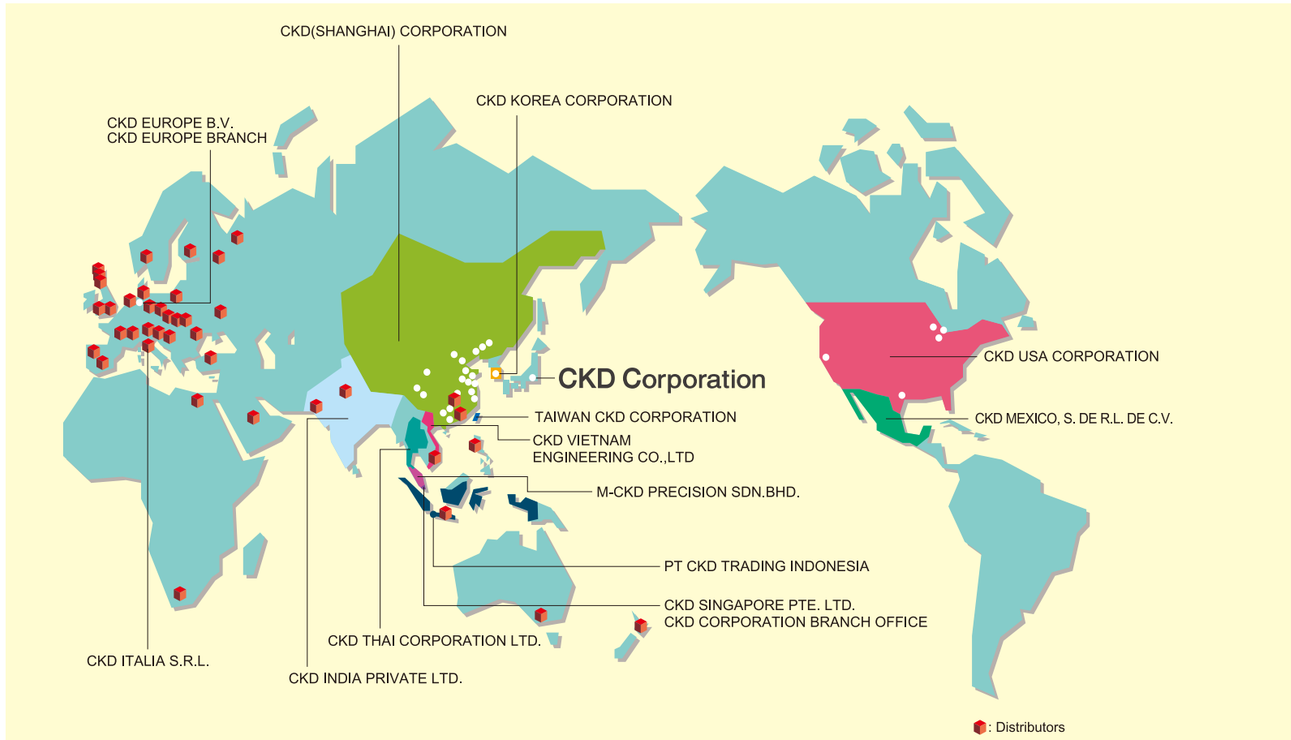
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