CKD

New Products

Direct Acting 2, 3-port Solenoid Valve (MULTI-FIT™ Valves) FFB/FFG Series

Inherited Trust

NEW STANDARD for Fluid Control Valves

CKD Corporation

CC-1544 AA 2

Direct acting 2, 3-port solenoid valve
MULTI-FIT™

FFB/FFG Series

Multi-fit for various fluids.
Functions required for Fluid Control Valves are integrated into a single body

Compressed Air — Compressed Air
Dry air — Dry Air
Inert gas — Inert gas
Hot water (New) — Hot water
Water — Water
Medium Vacuum — Vacuum
Oil — Oil
Steam (New) — Steam

High reliability
- 20 million cycle high durability
- Pressure resistant container structure
- High corrosion resistance
- Prevents coil scorching

MULTI-FIT Valves

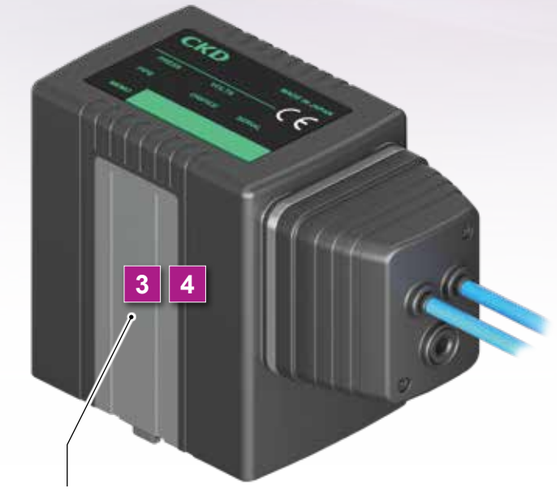
Easy to select
- Supports multiple fluids
- Wide variation

Easy to use
- Increased flexible installation
- Improved maintainability
- Silent structure

CKD's solenoid valve control technology has been developed for half a century with fluid control track records. The Multi-fit valve is equipped with the required function as a solenoid valve as standard for each application, further enhancing reliability to support a variety of fluids with a single series. We are also working to make a sustainable society that is carbon neutral.

- **Fiscal 2022 Cho Monodzukuri Innovative Parts and Components Award** (sponsored by: Monodzukuri Nippon Conference (Nikkan Kogyo Shimbun, Ltd.) **Winner of the "Machine/Robot Parts Award"**
- **Good Design Award** 2023 (sponsored by: Japan Institute of Design Promotion)

High functionality as standard



Coil with full-wave rectifier (AC) used

1 Compatible with dry air (inert gas)

High durability of 20 million cycles realized (Under CKD test conditions)

The integrated plunger and wear ring achieves durability equivalent to that of general air, even with dry air.

2 Improved corrosion resistance of wetted parts

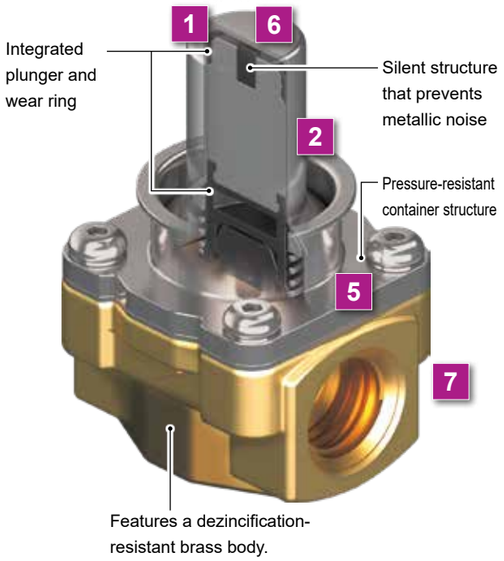
High corrosion resistant material is used for the plunger and flare pipe. In addition, the flare pipe is integrally molded so there is no welding.

3 Full-wave rectifier equipped as standard (AC type)

Prevents the noise specific to AC solenoids and coil burnout due to overcurrent generation.

4 Energy saving

Achieved a low wattage of 11 W → 4.5 W.
(60% less than our previous model) Valve size: 3)



5 Pressure resistant container structure adopted

Reduces risk of external leakage

The flow path is not exposed when the coil is replaced, and there is no fluid leakage.

6 Silent structure

Reduces metallic noise

It can be used safely in quiet environments such as medical facilities and laboratories.

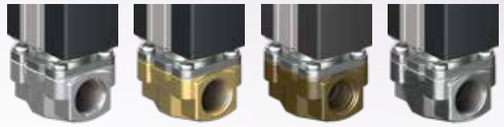
7 Compliant with Global Standards

CE UKCA RoHS

Abundant variations

Body material

Four materials compatible with various fluids are available as standard.



Aluminum | Brass | Bronze (Now) | Stainless Steel

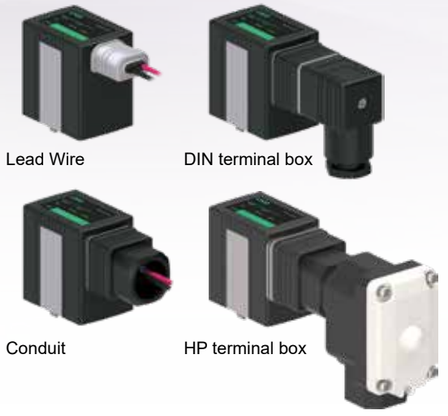
Port thread standards Rc/G/NPT

Sealant

Nitrile rubber, fluoro rubber and ethylene propylene rubber can be selected to support various fluids.

Coil housing

Select the type ideal for your electrical wiring.

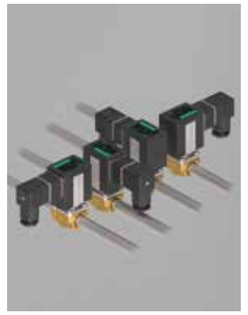


Lead Wire | DIN terminal box | Conduit | HP terminal box

Increased flexible installation

Coil rotates 360°

It enables effective use of narrow spaces, such as installations near walls.

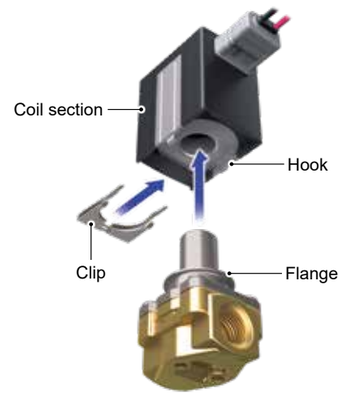


Flexible for line expansion.

Improved maintainability

Attach/detach the coil with a push-in clip

The coil and core are not screwed up, enabling easy coil attachment/removal.



Series variation

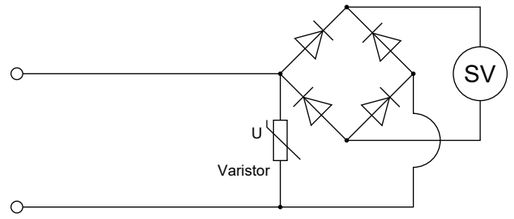
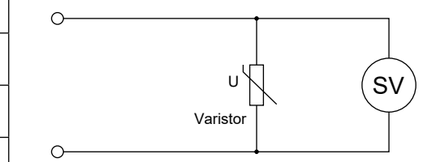
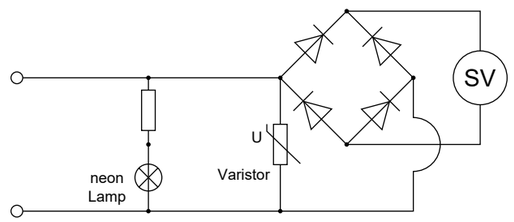
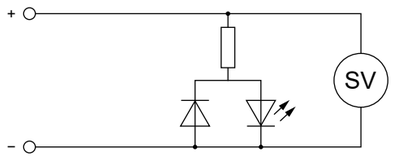
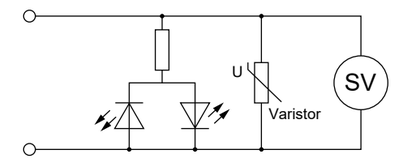
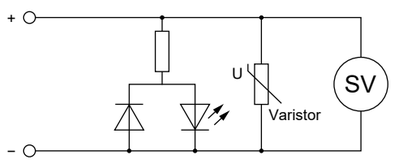
Port	Configuration	Actuation Method	4 coil sizes (width 24/30/35/40) Connection Port Size 1/8	1/4	3/8	1/2
2WAY	Discrete valve	NC (normally closed)	●	●	●	●
		NO (closed when energized)	●	●	●	
	Manifold	NC (open when energized) common/individual supply	●	●		
3WAY	Discrete valve	Universal	●	●	●	
		NC pressurization	●	●	●	
	Manifold	Universal common supply/common exhaust		●		

System Table

Direct acting 2, 3-port solenoid valve
MULTI-FIT

No. of Ports	Model Name		Configuration	Actuation Method		Operating Fluid							Connection Port Size Rc, G, NPT				Page
						Compressed Air	Dry air Inert gas	Water	Oil	Medium Vacuum	Hot water	Steam	1/8	1/4	3/8	1/2	
2-port		FFB-21	Discrete valve	NC (Normally Closed) type		●	●	●	●	●			●				1
		FFB-31				●	●	●	●	●	●	●	●	●			
		FFB-41				●	●	●	●	●	●	●		●	●		
		FFB-51				●	●	●	●	●	●	●		●	●	●	
		FFB-32		NO (Closed when energized)		●	●	●	●				●	●			
		FFB-42				●	●	●	●					●	●		
		FFB-52				●	●	●	●					●	●		
		FFBM-21	Manifold	NC (Normally Closed) type Common supply		●	●	●	●				●				19
		FFBM-31				●	●	●	●					●			
		FFBM-41				●	●	●	●					●			
		FFBM-51				●	●	●	●					●			
		FFBM-25		NC (Normally Closed) type Individual supply		●	●	●	●	●			●				
		FFBM-35				●	●	●	●	●				●			
		FFBM-45				●	●	●	●	●				●			
		FFBM-55				●	●	●	●	●				●			
3-port		FFG-21	Discrete valve	Universal		●	●	●	●				●				31
		FFG-31				●	●	●	●				●	●			
		FFG-41				●	●	●	●					●	●		
		FFG-51				●	●	●	●					●	●		
		FFG-33		NC Pressurization		●	●	●	●				●	●			
		FFG-43				●	●	●	●					●	●		
		FFGM-31	Manifold	Universal Common supply Centralized Exhaust		●	●	●	●					●			39
		FFGM-41				●	●	●	●					●			
		FFGM-51				●	●	●	●					●			

Electrical connection circuit diagram

Coil option		Voltage				
		DC			AC	
A	Lead wire (300 mm)	●			●	
B	With DIN terminal box (G1/2)	●			●	
C	With DIN terminal box (Pg9, Pg11)	●			●	
E	Conduit (G1/2)	●			●	
F	Conduit (CTC19)	●			●	
G	With HP terminal box	●			●	
S	DIN coil without terminal box	●			●	
J	Lead wire (300 mm) with surge suppressor	●*1	Product included		*2	
M	Conduit (G1/2) with surge suppressor	●				
P	Conduit (CTC19) with surge suppressor	●				
Q	HP terminal box with surge suppressor	●				
K	DIN terminal box with surge suppressor	●				
D	DIN terminal box with lamp (Pg11)	*3			● *4	
H	HP terminal box with lamp	●			●	
L	DIN terminal box with lamp/surge suppressor	●				
R	HP terminal box with lamp/surge suppressor	●				

*1: DC voltage coil option "J" surge suppressor is included.
*2: All AC voltages have a full-wave rectifier circuit. Significant surges generated in the coil by the action of this diode are almost eliminated.
For this reason, a surge suppressor is not available.
*3: Use "L" DIN terminal box with lamp/surge suppressor.
*4: 230 VAC setting is not available.

Coil option code

	**A(DC)**	Grommet lead wire 300 mm
	J	Grommet lead wire 300 mm□ With surge suppressor
	**A(AC)**	Grommet lead wire 300 mm
	**B C**	DIN terminal box
	K	DIN terminal box with surge suppressor
	**D**	DIN terminal box with lamp
	L	DIN terminal box/lamp/ With surge suppressor
	**G**	HP terminal box
	Q	HP terminal box with surge suppressor
	**H**	HP terminal box with lamp
	R	HP terminal box/lamp/ With surge suppressor
	**E**	Conduit (G1/2)
	F	Conduit (CTC19)
	M	Conduit (G1/2) with surge suppressor
	P	Conduit (CTC19) with surge suppressor
	**S**	DIN coil without terminal box

Direct Acting 2-Port Solenoid Valve

FFB Series

- NC, NO
- Connection Port Size: Rc/G/NPT 1/8 to 1/2

CE UKCA RoHS

For compatible detailed model Nos., please visit the CKD website.

Model No. Notation Method NC FFB-□1 Series

FFB - 4 1 08 A 4 C 3 C 3 - B

- FFB: Model No.
- 4: ❶ Valve Size
- 1: Actuation Method: NC (normally closed)
- 08: ❷ Connection Port Size
- A: ❸ Thread and Pressure indicated on nameplate unit
- 4: ❹ Orifice size
- C: ❺ Body/sealant combination
- 3: ❻ Coil thermal class
- C: ❼ Coil option
- 3: ❽ Rated voltage
- B: ❾ Option

❶ Valve size

Code	Content
2	Width 24 mm
3	Width 30 mm
4	Width 35 mm
5	Width 40 mm

❷ Connection Port Size

Code	Content	❶ Valve size 2	3	4	5
06	1/8	●	●		
08	1/4		●	●	●
10	3/8			●	●
15	1/2				●

❸ Thread and pressure unit indicated on nameplate

Code	Content		
	Thread	Pressure display unit	
A	Rc thread	MPa	
B	G thread	bar	
C	NPT Thread	psi	*1
D	G thread	MPa	*2
E	NPT Thread	MPa	*2

*1: In compliance with the Measurement Act, the psi display cannot be used in Japan.
*2: "D" and "E" are selections primarily for indicating the pressure display unit as MPa in Japan even for G and NPT threads.

❹ Orifice size

Code	Content	❶ Valve size 2	3	4	5
S	ø1.5	●			
2	ø2	●	●		
3	ø3		●		
4	ø4			●	
5	ø5		●		● *1
7	ø7			●	●
X	ø10				● *2

*1: Not available for ❷port size "15".
*2: Not available for ❷port size "08".

❺ Body/sealant combination

Body	Seal	Treatment	Code	Compressed Air	Dry air Inert gas	Water (up to 60°C)	Oil	Low vacuum (*1)	Medium Vacuum
Aluminum	NBR	-	A	●	●				
Brass	NBR	-	C	●	●	●	●	●	
	FKM	-	D	●	●	●	●	●	
	FKM	Vacuum inspection (*2)	G	●	●				●
Stainless Steel	NBR	-	H	●	●	●	●	●	
	FKM	-	J	●	●	●	●	●	
	FKM	Vacuum inspection (*2)	M	●	●				●
Brass	NBR	Oil-prohibited	N	●	●	●	●	●	
	FKM	Oil-prohibited	P	●	●	●	●	●	
	EPDM	Oil-prohibited	Q			●			
Stainless Steel	NBR	Oil-prohibited	S	●	●	●	●	●	
	FKM	Oil-prohibited	T	●	●	●	●	●	
	EPDM	Oil-prohibited	U			●			

*1: This can be used with aow vacuum of [1.33 × 10^2 Pa (abs)], but valve seat leakage is 0.2 cm^3/min (ANR) or less. (Valve seat leakage at positive pressure)
When used in a low vacuum, the lower limit of operating pressure is 1.33 x 102 Pa (abs), so the upper limit is 0.1 MPa lower.
*2: Cannot be selected for ❹ orifice size "X".

❻ Coil thermal class

Code	Content
3	Class 130 (B)

❼ Coil option

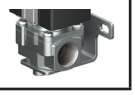
Code	Content		❶ Valve size 2	3	4	5	Voltage DC	AC
A	Lead wire (300 mm)		●	●	●	●	●	●
B	With DIN terminal box (G1/2)		*1	●	●	●	●	●
C	With DIN terminal box (Pg11)		●*2	●	●	●	●	●
D	DIN terminal box with lamp (Pg11)		●*2	●	●	●	*3	●
E	Conduit (G1/2)			●	●	●	●	●
F	Conduit (CTC19)			●	●	●	●	●
G	HP terminal box (G1/2)			●	●	●	●	●
H	HP terminal box with lamp (G1/2)			●	●	●	●	●*5
J	Lead wire (300 mm)	Surge With absorber	●	●	●	●	●*4	
K	With DIN terminal box (Pg11)	Surge With absorber	●*2	●	●	●	●	
L	DIN terminal box with lamp (Pg11)	Surge With absorber	●*2	●	●	●	●	
M	Conduit (G1/2)	Surge With absorber		●	●	●	●	*6
P	Conduit (CTC19)	Surge With absorber		●	●	●	●	
Q	HP terminal box (G1/2)	Surge With absorber		●	●	●	●	
R	HP terminal box with lamp (G1/2)	Surge With absorber		●	●	●	●	
S	DIN coil without terminal box		●	●	●	●	●*7	●*6

*1: When the ❶valve size is "2", the coil option "B" cannot be selected.
*2: When the ❶valve size is "2", the DIN terminal box thread size is Pg9.
*3: Use "L" DIN terminal box with lamp/surge suppressor.
*4: DC voltage coil option "J" surge suppressor is attached.
*5: When the coil option "H" is selected, the ❽rated voltage "K" (230 VAC) cannot be selected.
*6: All AC voltages have a full-wave rectifier circuit. Significant surges generated in the coil by the action of this diode are almost eliminated. For this reason, a surge suppressor is not available.
*7: Surge suppressor is not available. Use the terminal box with surge suppressor.

❽ Rated voltage

Code	Content
1	100 VAC 50/60 Hz
2	200 VAC 50/60 Hz
3	24 VDC
4	12 VDC
5	110 VAC 50/60 Hz
6	220 VAC 50/60 Hz
K	230 VAC 50/60 Hz

❾ Option *1

Code	Content	
Blank	None	
B	① Mounting plate *2	
M	② Mounting plate *3, *4	
P	Panel mounting plate	

*1: Mounting plate and panel mounting plate are included with the product.
Tightening torque isCKD components Product Website
(*https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manuals for details.
*2: ①The mounting plate is compatible with CKD product FAB, FGB, FVB, FWB, or FLB Series.
*3: Cannot be selected when the ❶valve size is "2".
*4: ②The mounting plate is compatible with CKD product AB Series.

Coil option code

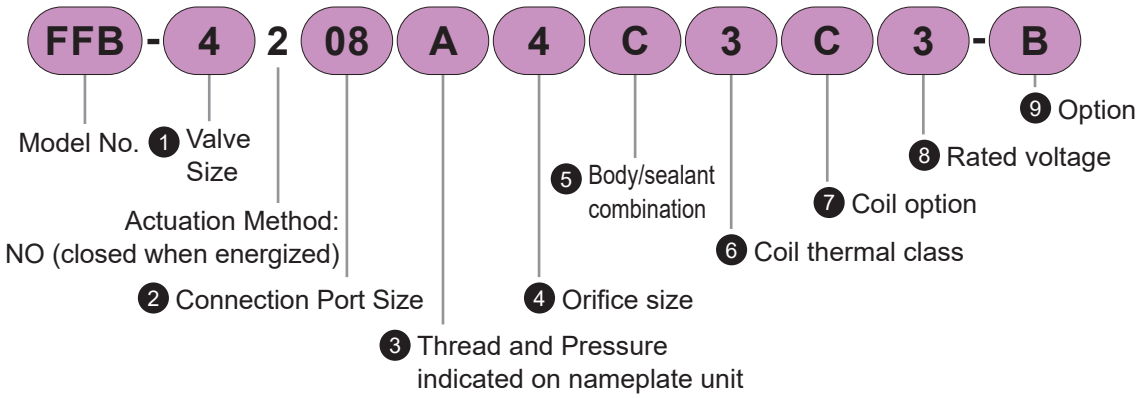
	A(DC)	Grommet lead wire 300 mm
	J	Grommet lead wire 300 mm/ With surge suppressor
	A(AC)	Grommet lead wire 300 mm
	B C	DIN terminal box
	K	DIN terminal box with surge suppressor
	D	DIN terminal box with lamp
	L	DIN terminal box/lamp/ With surge suppressor
	G	HP terminal box
	Q	HP terminal box with surge suppressor
	H	HP terminal box with lamp
	R	HP terminal box/lamp/ With surge suppressor
	E	Conduit (G1/2)
	F	Conduit (CTC19)
	M	Conduit (G1/2) with surge suppressor
	P	Conduit (CTC19) with surge suppressor
	S	DIN coil without terminal box

Model No. Notion Method mounting plate

With body mounting screw

Model No.	Mounting plate code: B	Mounting plate code: M	Mounting plate code: P
FFB-21	FFB-21-B-MOUNT-PLATE-KIT	No setting	FFB-21-P-MOUNT-PLATE-KIT
FFB-31	FFB-31-B-MOUNT-PLATE-KIT	FFB-31-M-MOUNT-PLATE-KIT	FFB-31-P-MOUNT-PLATE-KIT
FFB-41	FFB-41-B-MOUNT-PLATE-KIT	FFB-31-M-MOUNT-PLATE-KIT	FFB-31-P-MOUNT-PLATE-KIT
FFB-51	FFB-51-B-MOUNT-PLATE-KIT (Aluminum body) FFB-41-B-MOUNT-PLATE-KIT (brass, stainless steel body)	FFB-51-M-MOUNT-PLATE-KIT	FFB-51-P-MOUNT-PLATE-KIT

Model No. Notation Method NO FFB-□2 Series



1 Valve size

Code	Content
3	Width 30 mm
4	Width 35 mm
5	Width 40 mm

2 Connection Port Size

Code	Content	1 Valve size 3	4	5
06	1/8	●		
08	1/4	●	●	●
10	3/8		●	●

3 Thread and pressure unit indicated on nameplate

Code	Content		
	Thread	Pressure display unit	
A	Rc thread	MPa	
B	G thread	bar	
C	NPT Thread	psi	*1
D	G thread	MPa	*2
E	NPT Thread	MPa	*2

*1: In compliance with the Measurement Act, the psi display cannot be used in Japan.
*2: "D" and "E" are selections primarily for indicating the pressure display unit as MPa in Japan even for G and NPT threads.

4 Orifice size

Code	Content	1 Valve size 3	4	5
2	ø2	●		
3	ø3	●	●	
4	ø4		●	●
5	ø5	●		●
7	ø7		●	●

5 Body/sealant combination

Body	Seal	Treatment	Code	Operating Fluid: Compressed Air	Dry air Inert gas	Water (up to 60°C)	Oil	Low vacuum (*1)
Aluminum	NBR	-	A	●	●			
Brass	NBR		C	●	●	●	●	●
	FKM		D	●	●	●	●	●
Stainless Steel	NBR		H	●	●	●	●	●
	FKM		J	●	●	●	●	●
Brass	NBR	Oil-prohibited	N	●	●	●	●	●
	FKM		P	●	●	●	●	●
	EPDM		Q			●		
Stainless Steel	NBR		S	●	●	●	●	●
	FKM		T	●	●	●	●	●
	EPDM		U			●		

*1: This can be used with alow vacuum of [1.33 × 10^2 Pa (abs)], but valve seat leakage is 0.2cm^3/min (ANR) or less. (Valve seat leakage at positive pressure)
When used in a low vacuum, the lower limit of operating pressure is 1.33 x 102 Pa (abs), so the upper limit is 0.1 MPa lower.

6 Coil thermal class

Code	Content
3	Class 130 (B)

❼ Coil option

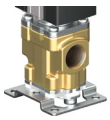
Code	Content		❶ Valve size 3	4	5	Voltage DC	AC
A	Lead wire (300 mm)		●	●	●	●	●
B	With DIN terminal box (G1/2)		●	●	●	●	●
C	With DIN terminal box (Pg11)		●	●	●	●	●
D	DIN terminal box with lamp (Pg11)		●	●	●	*1	●
E	Conduit (G1/2)		●	●	●	●	●
F	Conduit (CTC19)		●	●	●	●	●
G	HP terminal box (G1/2)		●	●	●	●	●
H	HP terminal box with lamp (G1/2)		●	●	●	●	●*3
J	Lead wire (300 mm)	With Surge absorber	●	●	●	●*2	*4
K	With DIN terminal box (Pg11)		●	●	●	●	
L	DIN terminal box with lamp (Pg11)		●	●	●	●	
M	Conduit (G1/2)		●	●	●	●	
P	Conduit (CTC19)		●	●	●	●	
Q	HP terminal box (G1/2)		●	●	●	●	
R	HP terminal box with lamp (G1/2)		●	●	●	●	
S	DIN coil without terminal box		●	●	●	●*5	●*4

*1: Use "L" DIN terminal box with lamp/surge suppressor.
*2: DC voltage coil option "J" surge suppressor is attached.
*3: When the coil option "H" is selected, the ❽ rated voltage "K" (230 VAC) cannot be selected.
*4: All AC voltages have a full-wave rectifier circuit. Significant surges generated in the coil by the action of this diode are almost eliminated. For this reason, a surge suppressor is not available.
*5: Surge suppressor is not available. Use the terminal box with surge suppressor.

❽ Rated voltage

Code	Content
1	100 VAC 50/60 Hz
2	200 VAC 50/60 Hz
3	24 VDC
4	12 VDC
5	110 VAC 50/60 Hz
6	220 VAC 50/60 Hz
K	230 VAC 50/60 Hz

❾ Option *1

Code	Content		
Blank	None		
B	Mounting plate①	Aluminum body	Brass/Stainless steel body
			

*1: Mounting plate is included with the product. Tightening torque isCKD components Product Website (*https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manuals for details.
*2: ①The mounting plate is compatible with CKD product FAB or FWB Series.

Coil option code

	A(DC)	Grommet lead wire 300 mm
	J	Grommet lead wire 300 mm/ With surge suppressor
	A(AC)	Grommet lead wire 300 mm
	B C	DIN terminal box
	K	DIN terminal box with surge suppressor
	D	DIN terminal box with lamp
	L	DIN terminal box/lamp/ With surge suppressor
	G	HP terminal box
	Q	HP terminal box with surge suppressor
	H	HP terminal box with lamp
	R	HP terminal box/lamp/ With surge suppressor
	E	Conduit (G1/2)
	F	Conduit (CTC19)
	M	Conduit (G1/2) with surge suppressor
	P	Conduit (CTC19) with surge suppressor
	S	DIN coil without terminal box

Model No. Notion Method mounting plate

With body mounting screw

Model No.	Mounting plate code: B	
	Aluminum body	Brass, stainless steel body
FFB-32	FFB-31-B-MOUNT-PLATE-KIT	FFG-31-B-MOUNT-PLATE-KIT
FFB-42	FFB-41-B-MOUNT-PLATE-KIT	FFG-41-B-MOUNT-PLATE-KIT
FFB-52	FFB-51-B-MOUNT-PLATE-KIT	

Common Specifications

Item		FFB
Operating Fluid		Compressed air/dry air/inert gas/water/oil (50mm^2/s or less)/medium vacuum *1, *2
Maximum Operating Pressure	MPa	1.4 (refer to working pressure in individual specifications.)
Proof pressure (water pressure)	MPa	2.1 (NC), 1.5 (NO)
Fluid Temperature	°C	−10 to 60 (no freezing)
Ambient Temperature	°C	−10 to 60 (DC), −10 to 55 (AC)
Thermal class		Class 130 (B)
Atmosphere		Place free of corrosive gas and explosive gas
Valve Structure		Direct acting poppet structure
Valve seat leakage cm^3/min (ANR)		0.2 or less (air)
Valve seat leakage *3	Pa·m^3/sHe	1.33 × 10^{-6} or less
Mounting Orientation		Unrestricted
Protection Structure		IP65

*1: When using in vacuum, vacuum the OUT port side.
*2: When using at medium vacuum, select the "G" and "M" material options.
*3: Amount of leakage at medium vacuum. (FFB Series NC only)

Circuit Diagram Symbol

● FFB-□1:NC (open when energized) type ● FFB-□2:NO (closed when energized) type

Electrical specifications

Item		FFB-2							FFB-3						
Rated voltage	V	24 VDC	12 VDC	100 VAC 50/60Hz	110 VAC 50/60Hz	200 VAC 50/60Hz	220 VAC 50/60Hz	230 VAC 50/60Hz	24 VDC	12 VDC	100 VAC 50/60Hz	110 VAC 50/60Hz	200 VAC 50/60Hz	220 VAC 50/60Hz	230 VAC 50/60Hz
Voltage Fluctuation Range		±10%							±10%						
Power Consumption	W	3.5	3.5	–	–	–	–	–	4.5	4.5	–	–	–	–	–
Apparent power	VA	–	–	5.1	5.7	6.0	5.3	5.7	–	–	6.2	6.1	6.2	6.2	6.5

Item		FFB-4							FFB-5						
Rated voltage	V	24 VDC	12 VDC	100 VAC 50/60Hz	110 VAC 50/60Hz	200 VAC 50/60Hz	220 VAC 50/60Hz	230 VAC 50/60Hz	24 VDC	12 VDC	100 VAC 50/60Hz	110 VAC 50/60Hz	200 VAC 50/60Hz	220 VAC 50/60Hz	230 VAC 50/60Hz
Voltage Fluctuation Range		±10%							±10%						
Power Consumption	W	7	7	–	–	–	–	–	10.5	10.5	–	–	–	–	–
Apparent power	VA	–	–	8.6	10	9.6	9.5	9.4	–	–	13	13	14	14	13

The leakage current must be less than or equal to the values shown below.

Voltage	AC					DC	
	100 V	110 V	200 V	220 V	230 V	12 V	24 V
Leakage current	2 mA or less		1 mA or less			5 mA or less	

Individual specifications

Item / Model No.				Connection Port Size Rc/G/NPT	Orifice size (mm)	Operating Pressure (MPa) *1	Operating Pressure Pa (abs) *2, *3	Flow Characteristics				Weight (kg) *5
								C [dm3/(s·bar)]	b	Cv	Kv value *4	
NC (normally closed)												
FFB-21	06	*	S	1/8	1.5	0 to 1.0	1.3×10^{-2} to 1×10^{6}	0.31	0.42	0.085	0.074	0.21
			2		2	0 to 0.6	1.3×10^{-2} to 0.6×10^{6}	0.53	0.34	0.13	0.11	
FFB-31	06 08	*	2	1/8 1/4	2	0 to 1.4	1.3×10^{-2} to 1.4×10^{6}	0.56	0.50	0.15	0.13	0.36
			3		3	0 to 0.6	1.3×10^{-2} to 0.6×10^{6}	1.2	0.45	0.31	0.27	
			5		5	0 to 0.2	1.3×10^{-2} to 0.2×10^{6}	2.4	0.43	0.63	0.55	
FFB-41	08 10	*	4	1/4 3/8	4	0 to 1.0	1.3×10^{-2} to 1×10^{6}	1.8	0.52	0.43	0.37	0.55
			7		7	0 to 0.15	1.3×10^{-2} to 0.15×10^{6}	4.7	0.43	1.15	1.00	
FFB-51	08 10 15	*	5	1/4 3/8 1/2	5	0 to 0.8	1.3×10^{-2} to 0.8×10^{6}	2.7	0.45	0.72	0.62	0.85
			7		7	0 to 0.3	1.3×10^{-2} to 0.3×10^{6}	4.7	0.38	1.2	1.04	
			X		10	0 to 0.1	1.3×10^{-2} to 0.1×10^{6}	6.9	0.41	2.0	1.74	
NO (closed when energized)												
FFB-32	06 08	*	2	1/8 1/4	2	0 to 0.9		0.53	0.46	0.13	0.11	0.46
			3		3	0 to 0.5		0.77	0.54	0.19	0.16	
			5		5	0 to 0.15		1.4	0.56	0.37	0.32	
FFB-42	08 10	*	3	1/4 3/8	3	0 to 0.8		1.2	0.45	0.31	0.27	0.71
			4		4	0 to 0.4		1.8	0.38	0.56	0.49	
			7		7	0 to 0.12		3.5	0.36	0.95	0.82	
FFB-52	08 10	*	4	1/4 3/8	4	0 to 0.8		1.8	0.38	0.56	0.49	0.9
			5		5	0 to 0.5		2.8	0.31	0.72	0.62	
			7		7	0 to 0.25		3.5	0.36	0.95	0.82	

*1: This can be used with alow vacuum of [1.33×10^{2} Pa (abs)], but valve seat leakage is 0.2 cm^3/min (ANR) or less. (Valve seat leakage at positive pressure)
When using at low vacuum, the lower limit of the working pressure is 1.33×10^{2} Pa (abs), so the upper limit is 0.1 MPa lower.
*2: Working pressure at medium vacuum.
*3: When using in vacuum, vacuum the OUT port side.
*4: Kv value refer to page 53.
*5: Weight of brass body with DC lead wire.

Direct Acting 2-Port Solenoid Valve

FFB Series

For high temperature fluids

- NC (normally closed)
- Connection Port Size: Rc/G/NPT 1/8 to 1/2

For compatible detailed model Nos., please visit the CKD website.

Model No. Notation Method NC FFB-* 1 Series For high temperature fluid

FFB - 4 1 08 A 4 C 4 A 3 - B

- FFB: Model No.
- 4: ❶ Valve Size
- 1: Actuation Method: NC (normally closed)
- 08: ❷ Connection Port Size
- A: ❸ Thread and Pressure indicated on nameplate unit
- 4: ❹ Orifice size
- C: ❺ Body/sealant combination
- 4: ❻ Coil thermal class
- A: ❼ Coil option
- 3: ❽ Rated voltage
- B: ❾ Option

❶ Valve size

Code	Content
3	Width 30 mm
4	Width 35 mm
5	Width 40 mm

❷ Connection Port Size

Code	Content	❶ Valve size 3	4	5
06	1/8	●		
08	1/4	●	●	●
10	3/8		●	●
15	1/2			●

❸ Thread and pressure unit indicated on nameplate

Code	Content: Thread	Content: Pressure display unit
A	Rc thread	MPa
B	G thread	bar
C	NPT Thread	psi *1
D	G thread	MPa *2
E	NPT Thread	MPa *2

*1: In compliance with the Measurement Act, the psi display cannot be used in Japan.
*2: "D" and "E" are selections primarily for indicating the pressure display unit as MPa in Japan even for G and NPT threads.

❹ Orifice size

Code	Content	❶ Valve size 3	4	5
3	ø3	●		
4	ø4		●	
5	ø5	●		● *1
7	ø7		●	●
X	ø10			● *2

*1: Not available for ❷ port size "15".
*2: Not available for ❷ port size "08".

❺ Body/sealant combination

Body	Seal	Treatment	Code	Compressed Air	Dry air Inert gas	Water/hot water (up to 90°C)	Oil	Low vacuum (*1)	Steam (up to 143°C)
Brass	FKM	-	D	●	●	●	●	●	●
Bronze	FKM	-	E	●	●	●	●	●	●
Stainless Steel	FKM	-	J	●	●	●	●	●	●
Brass	FKM	Oil-prohibited	P	●	●	●	●	●	●
Brass	EPDM	Oil-prohibited	Q			●			
Bronze	FKM	Oil-prohibited	F	●	●	●	●	●	●
Bronze	EPDM	Oil-prohibited	K			●			
Stainless Steel	FKM	Oil-prohibited	T	●	●	●	●	●	●
Stainless Steel	EPDM	Oil-prohibited	U			●			

*1: This can be used with alow vacuum of [1.33 × 10^2 Pa (abs)], but valve seat leakage is 0.2 cm^3/min (ANR) or less. (Valve seat leakage at positive pressure) When used in a low vacuum, the lower limit of operating pressure is 1.33 x 102 Pa (abs), so the upper limit is 0.1 MPa lower.

❻ Coil thermal class

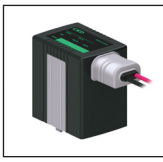
Code	Content
4	Class 180 (H)

❼ Coil option

Code	Content		❶ Valve size 3	4	5	Voltage DC	AC
A	Lead wire (300 mm)		●	●	●	●	●
J	Lead wire (300 mm)	With surge suppressor	●	●	●	●*1	*2

*1: DC voltage coil option "J" surge suppressor is attached.
*2: All AC voltages have a full-wave rectifier circuit. Significant surges generated in the coil by the action of this diode are almost eliminated. For this reason, a surge suppressor is not available.

Coil option code



A	Grommet lead wire 300 mm
J	Grommet lead wire 300 mm/ With surge suppressor

❽ Rated voltage

Code	Content
1	100 VAC 50/60 Hz
2	200 VAC 50/60 Hz
3	24 VDC
4	12 VDC
5	110 VAC 50/60 Hz
6	220 VAC 50/60 Hz
K	230 VAC 50/60 Hz

❾ Option *1

Code	Content		
Blank	None		
B	①Mounting plate	*2	
M	②Mounting plate	*3	
P	Panel mounting plate		

*1: Mounting plate and panel mounting plate are included with the product. Tightening torque isCKD components Product Website (*https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manuals details.
*2: ①The mounting plate is compatible with our product FAB, FGB, FVB, FWB, FHB, FLB Series.
*3: ②The mounting plate is compatible with CKD product AB Series.

Model No. Notion Method mounting plate

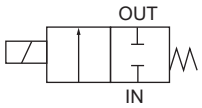
With body mounting screw

Model No.	Mounting plate code: B	Mounting plate code: M	Mounting plate code: P
FFB-31	FFB-31-B-MOUNT-PLATE-KIT	FFB-31-M-MOUNT-PLATE-KIT	FFB-31-P-MOUNT-PLATE-KIT
FFB-41	FFB-41-B-MOUNT-PLATE-KIT	FFB-31-M-MOUNT-PLATE-KIT	FFB-31-P-MOUNT-PLATE-KIT
FFB-51	FFB-51-B-MOUNT-PLATE-KIT (Aluminum body) FFB-41-B-MOUNT-PLATE-KIT (brass, stainless steel, bronze body)	FFB-51-M-MOUNT-PLATE-KIT	FFB-51-P-MOUNT-PLATE-KIT

Common Specifications

Item	FFB
Operating Fluid	Compressed air/dry air/inert gas/steam/water/hot water/oil (50mm^2/s or less)
Maximum Operating Pressure MPa	0.8 (refer to working pressure in individual specifications.)
Proof pressure (water pressure) MPa	1.2
Fluid Temperature °C	Other than steam: −10 to 90 Steam: −10 to 143
Ambient Temperature °C	−10 to 60
Thermal class	Class 180 (H)
Atmosphere	Place free of corrosive gas and explosive gas
Valve Structure	Direct acting poppet structure
Valve seat leakage cm^3/min (ANR)	0.2 or less (air)
Mounting Orientation	Unrestricted
Protection Structure	IP65

Circuit Diagram Symbol



Electrical specifications

Item	FFB-3							FFB-4						
Rated voltage V	24 VDC	12 VDC	100 VAC 50/60Hz	110 VAC 50/60Hz	200 VAC 50/60Hz	220 VAC 50/60Hz	230 VAC 50/60Hz	24 VDC	12 VDC	100 VAC 50/60Hz	110 VAC 50/60Hz	200 VAC 50/60Hz	220 VAC 50/60Hz	230 VAC 50/60Hz
Voltage Fluctuation Range	±10%							±10%						
Power Consumption W	9	9	–	–	–	–	–	7	7	–	–	–	–	–
Apparent power VA	–	–	10.2	10.2	10.7	10.3	11.2	–	–	8.6	10	9.6	9.5	9.4

Item	FFB-5						
Rated voltage V	24 VDC	12 VDC	100 VAC 50/60Hz	110 VAC 50/60Hz	200 VAC 50/60Hz	220 VAC 50/60Hz	230 VAC 50/60Hz
Voltage Fluctuation Range	±10%						
Power Consumption W	10.5	10.5	–	–	–	–	–
Apparent power VA	–	–	13	13	14	14	13

The leakage current must be less than or equal to the values shown below.

Voltage	AC					DC	
	100V	110V	200V	220V	230V	12V	24V
Leakage current	2 mA or less		1 mA or less			5 mA or less	

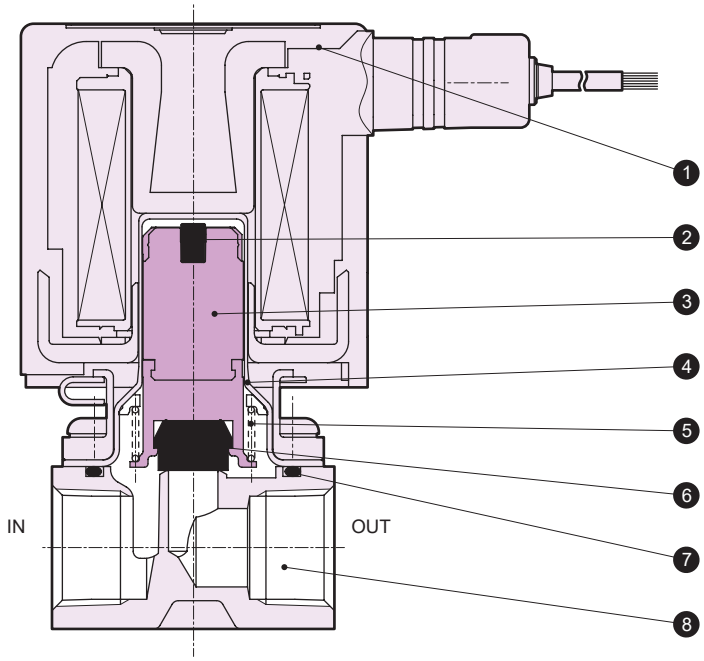
Individual specifications

Item / Model No.				Connection Port Size Rc/G/NPT	Orifice size (mm)	Working pressure (MPa) *1		Flow Characteristics				Weight (kg) *3
						Fluid: Except steam	Fluid: Steam	C [dm3/(s·bar)]	b	Cv	Kv value *2	
NC (normally closed)												
FFB-31	06 08	*	3	1/8 1/4	3	0 to 0.45	0 to 0.3	1.2	0.45	0.31	0.27	0.36
			5		5	0 to 0.3	0 to 0.3	2.4	0.43	0.63	0.55	
FFB-41	08 10	*	4	1/4 3/8	4	0 to 0.8	0 to 0.3	1.8	0.52	0.43	0.37	0.55
			7		7	0 to 0.1		4.7	0.43	1.15	1.00	
FFB-51	08 10 15	*	5	1/4 3/8 1/2	5	0 to 0.65	0 to 0.3	2.7	0.45	0.72	0.62	0.85
			7		7	0 to 0.25	0 to 0.15	4.7	0.38	1.2	1.04	
			X		10	0 to 0.07		6.9	0.41	2.0	1.74	

*1: This can be used with alow vacuum of [1.33 × 10^2 Pa (abs)], but valve seat leakage is 0.2cm^3/min (ANR) or less. (Valve seat leakage at positive pressure) When using at low vacuum, the lower limit of the working pressure is 1.33 × 10^2 Pa (abs), so the upper limit is 0.1 MPa lower.
*2: Kv value refer to page 53.
*3: Weight of brass body with DC lead wire.

Internal Structure Diagram/Materials

● FFB-* 1 Series: NC (normally closed)

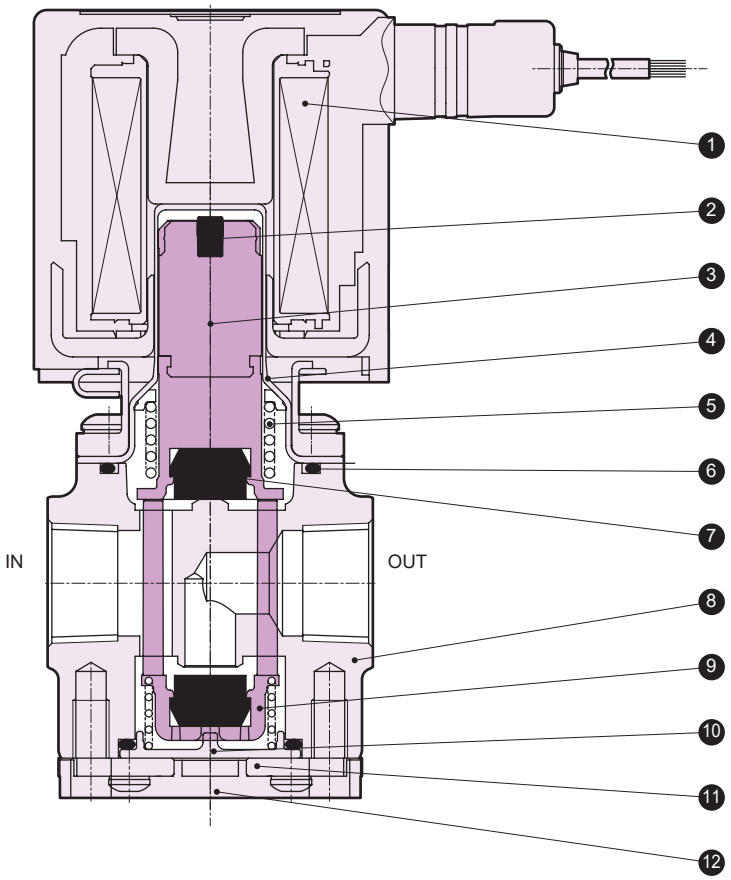


Part No.	Name	Material	
1	Coil assembly	–	
2	Noise dampening rubber	HNBR(FKM,EPDM)	Hydrogenated nitrile rubber (fluoro rubber, ethylene propylene rubber)
3	Plunger	SUS,PPS	Stainless steel, polyphenylene sulfide
4	Flare pipe assembly	SUS,PPS	Stainless steel, polyphenylene sulfide
5	Plunger spring	SUS304	Stainless Steel
6	Seal	NBR(FKM,EPDM)	Nitrile rubber (fluoro rubber, ethylene propylene rubber)
7	O-ring	NBR(FKM,EPDM)	Nitrile rubber (fluoro rubber, ethylene propylene rubber)
8	Body	Brass (ADC, SCS13, CAC408)	Brass (aluminum die-casting, stainless steel, bronze)

( ) shows options.

Internal Structure Diagram/Materials

● FFB-* 2 Series: NO (closed when energized)



Part No.	Name	Material	
1	Coil assembly	–	
2	Noise dampening rubber	HNBR(FKM,EPDM)	Hydrogenated nitrile rubber (fluoro rubber, ethylene propylene rubber)
3	Plunger	SUS,PPS	Stainless steel, polyphenylene sulfide
4	Flare pipe assembly	SUS,PPS	Stainless steel, polyphenylene sulfide
5	Plunger spring	SUS304	Stainless Steel
6	O-ring	NBR(FKM,EPDM)	Nitrile rubber (fluoro rubber, ethylene propylene rubber)
7	Seal	NBR(FKM,EPDM)	Nitrile rubber (fluoro rubber, ethylene propylene rubber)
8	Body	Brass (ADC, SCS13)	Brass (aluminum die-casting, stainless steel)
9	Valve Body Guide	PPS	Polyphenylene sulfide
10	NO cover	PPS	Polyphenylene sulfide
11	Covers A, B *1	SUS304	Stainless Steel
12	Cover A lid *2	POM	Polyacetal

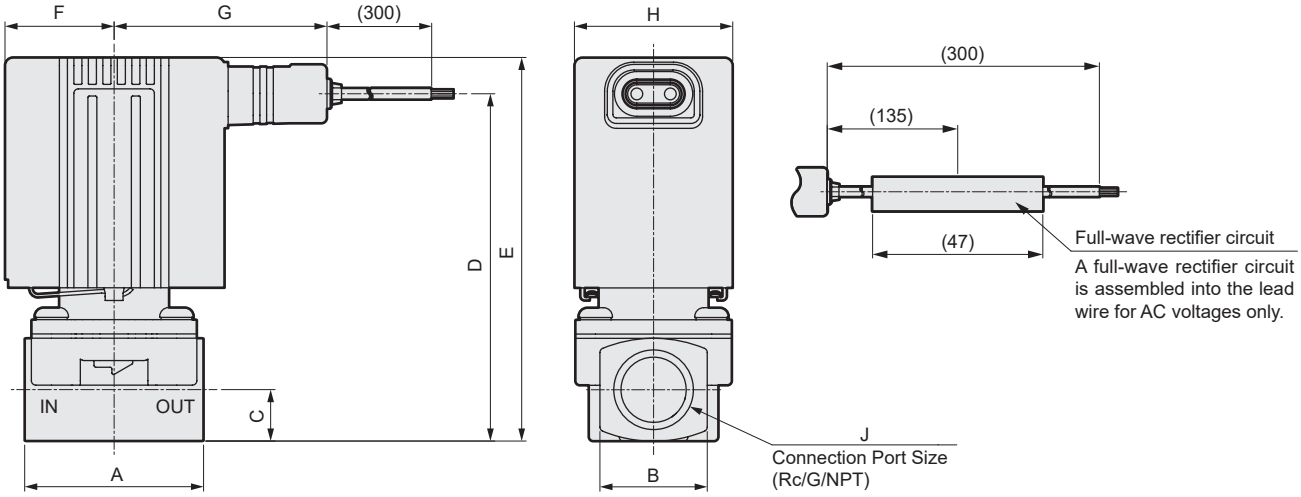
( ) shows options.
*1: brass body, stainless steel cover A, aluminum cover B
*2: Only for body material of brass/stainless steel

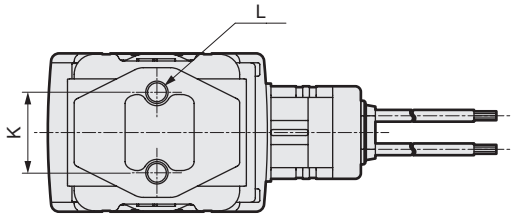
For maintenance parts, refer to the CKD component product site (*https://www.ckd.co.jp/kiki/en/) → Refer to "Model No." → Maintenance parts .

Dimensions diagram FFB-* 1 Series: NC (normally closed)

● Lead wire/DC voltage Coil option code: A / J

● Lead wire/AC voltage + class 180(H) Coil option code: A/J, coil thermal class code: 4

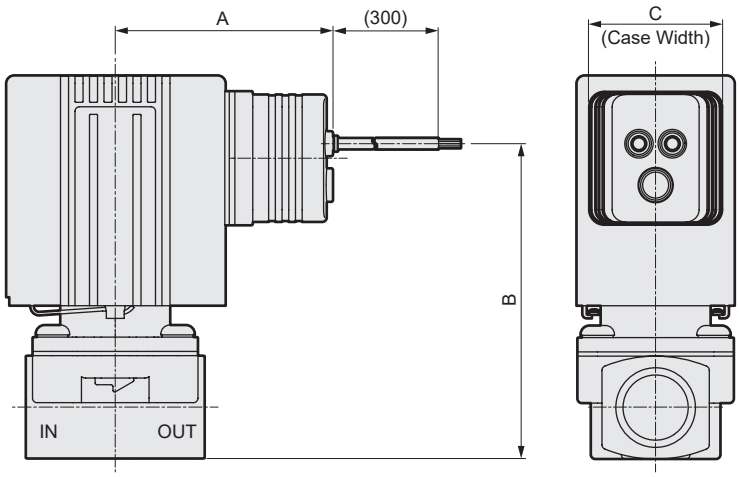




Model No.	Connection Port Size	Thread depth
FFB-21	G1/8	7.4
FFB-31	G1/8	8.5
	G1/4	10.5
FFB-41	G1/4	12.5
FFB-51	G 3/8	11.4
FFB-5110 * X (ø 10)	G 3/8	12.5
FFB-5115	G 1/2	15

Model No.	A	B	C	D	E	F	G	H	J	K	L
FFB-21	32	17	7.5	54.5	62.5	18.5	42	24	1/8	15	M4 depth 6
FFB-31	36	19	9.5	66.5	74	22	45	30	1/8, 1/4	18	M5 depth 6
FFB-41	40	24	11.5	77.5	86	24.5	47.5	35	1/4, 3/8	18	M5 depth 8
FFB-51	40	24	11.5	86.5	95	27.5	50	40	1/4, 3/8	18	M5 depth 8
FFB-5110 * X (ø 10) FFB-5115(15A)	50	27	13.5	94.5	102.5	27.5	50	40	3/8, 1/2	18	M5 depth 8

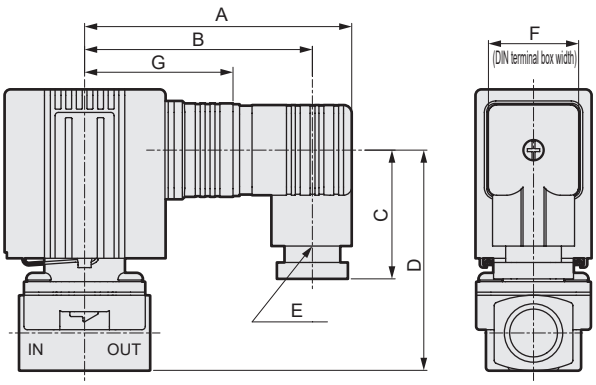
● Lead wire/AC voltage + class 130 (B) Coil option code: A/J, coil thermal class code: 3



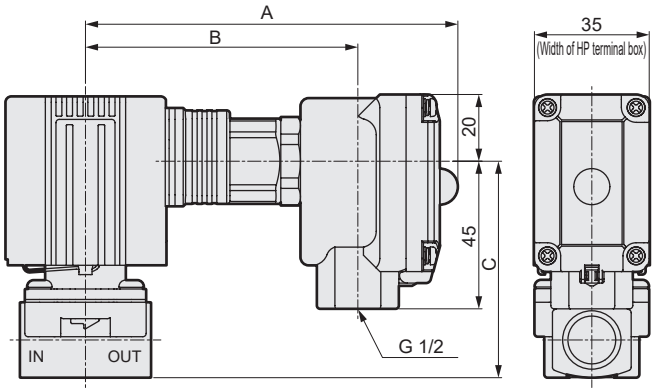
Model No.	A	B	C
FFB-21	43	50.5	24
FFB-31	46	59.5	30
FFB-41	48.5	70.5	30
FFB-51	51	79.5	30
FFB-5110 * X (ø 10) FFB-5115(15A)	51	87.5	30

Optional Dimensions diagram FFB-□1 Series: NC (normally closed)

● Coil option codewith DIN terminal box: B/C/D/K/L/S
● DIN coil without terminal box



● With HP terminal boxCoil option code: G/H/Q/R

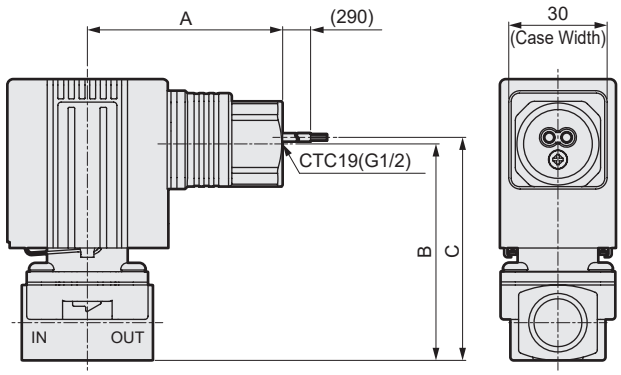


Dimensions shown in ( ) are for G1/2.

Model No.	A	B	C	D	E	F	G
FFB-21	73	64	36	47.5	Pg9	21	39
FFB-31	78.5	66.5 (65)	39.5 (41.5)	56	Pg11 (G 1/2)	27.5	42
FFB-41	81	69 (67.5)	39.5 (41.5)	67.5	Pg11 (G 1/2)	27.5	44.5
FFB-51	83.5	71.5 (70)	39.5 (41.5)	76.5	Pg11 (G 1/2)	27.5	47
FFB-5110 * X (ø 10) FFB-5115(15A)	83.5	71.5 (70)	39.5 (41.5)	84	Pg11 (G 1/2)	27.5	47

Model No.	A	B	C
FFB-21	–	–	–
FFB-31	113	82	55
FFB-41	115	85	66
FFB-51	118	87	75
FFB-5110 * X (ø 10) FFB-5115(15A)	118	87	83

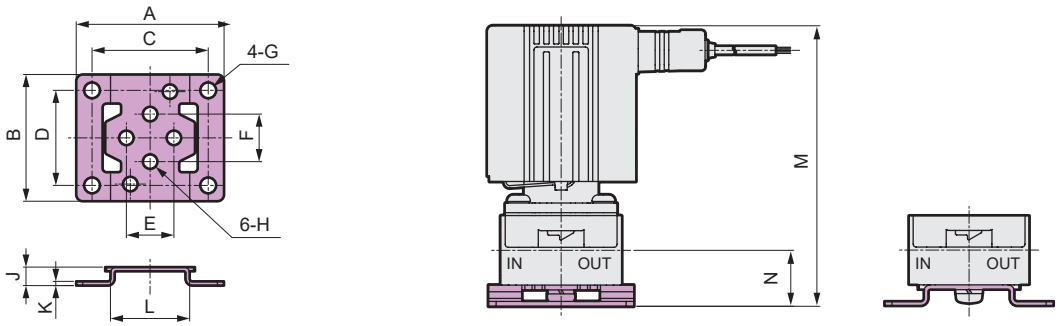
● Conduit Coil option code: E/F/M/P



Model No.	A	B	C
FFB-21	–	–	–
FFB-31	56.5	55	57
FFB-41	59	66	68
FFB-51	61.5	75	77
FFB-5110 * X (ø 10) FFB-5115(15A)	61.5	83	85

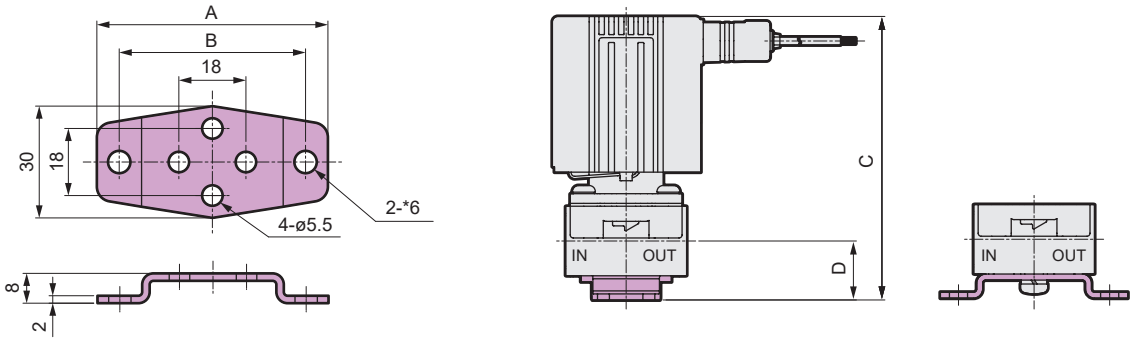
Optional Dimensions diagram FFB-□1 Series: NC (normally closed)

● Mounting plate①Option code: B



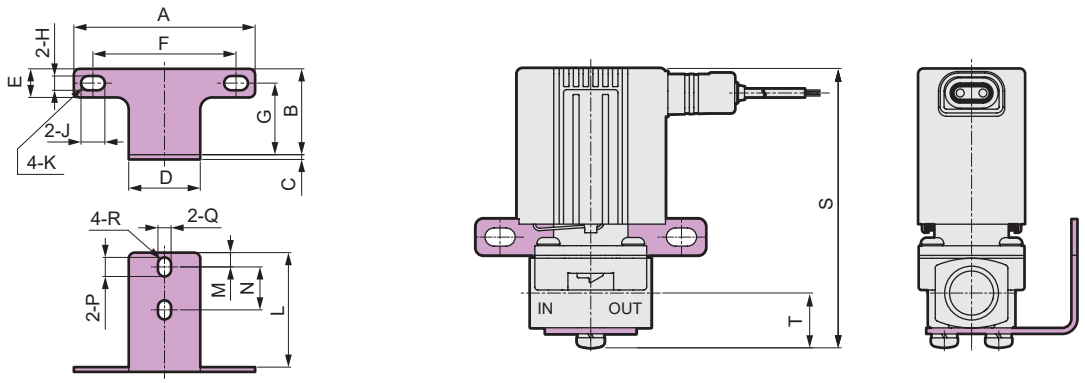
Model No.		A	B	C	D	E	F	G	H	J	K	L	M	N
FFB-21		40	34	30	25	15	15	ø5	ø4.5	6	1.2	20	68.5	13.5
FFB-31		52	42	40	30	18	18	ø6	ø5.5	7	1.6	25	81	16.5
FFB-41		56	48	44	36	18	18	ø6	ø5.5	7	1.6	30	93	18.5
FFB-51	Aluminum body	62	50	50	38	18	18	ø6	ø5.5	7	1.6	36	102	18.5
FFB-5110 * X (ø 10) FFB-5115(15A)	Aluminum body	62	50	50	38	18	18	ø6	ø5.5	7	1.6	36	109.5	20.5
FFB-51	Brass/SUS/ bronze body	56	48	44	36	18	18	ø6	ø5.5	7	1.6	30	102	18.5
FFB-5110 * X (ø 10) FFB-5115(15A)	Brass/SUS/ bronze body	56	48	44	36	18	18	ø6	ø5.5	7	1.6	30	109.5	20.5

● Mounting plate② Option code: M



Model No.	A	B	C	D
FFB-31	62	50	82	17.5
FFB-41	62	50	94	19.5
FFB-51	70	58	103	19.5
FFB-5110 * X (ø 10) FFB-5115(15A)	70	58	110.5	21.5

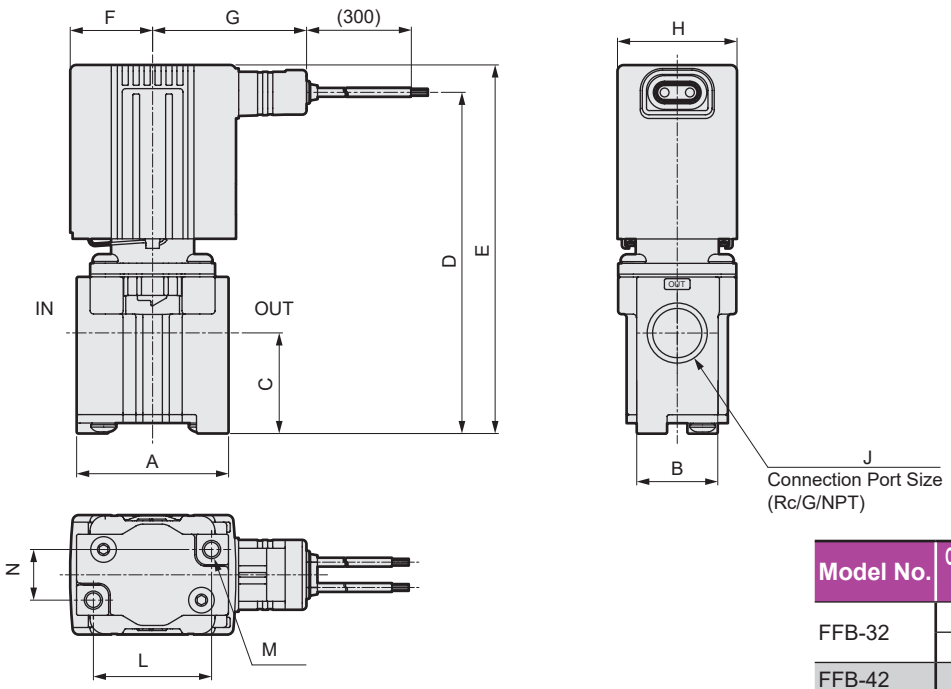
● Panel mounting plate Option code: P



Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T
FFB-21	57	25	1.6	25	10	45	20	5	8	R 2.5	35.4	4.5	15	6	4.5	R 2.25	67.5	12.5
FFB-31	66	31	2	30	12	50	25	6	10	R3	43	6	18	8	5.5	R 2.75	80.5	16
FFB-41	66	31	2	30	12	50	25	6	10	R3	43	6	18	8	5.5	R 2.75	92.5	18
FFB-51	76	36	2	30	12	60	30	6	10	R3	48	6	18	8	5.5	R 2.75	101.5	18
FFB-5110 * X (ø 10) FFB-5115(15A)	76	36	2	30	12	60	30	6	10	R3	48	6	18	8	5.5	R 2.75	109	20

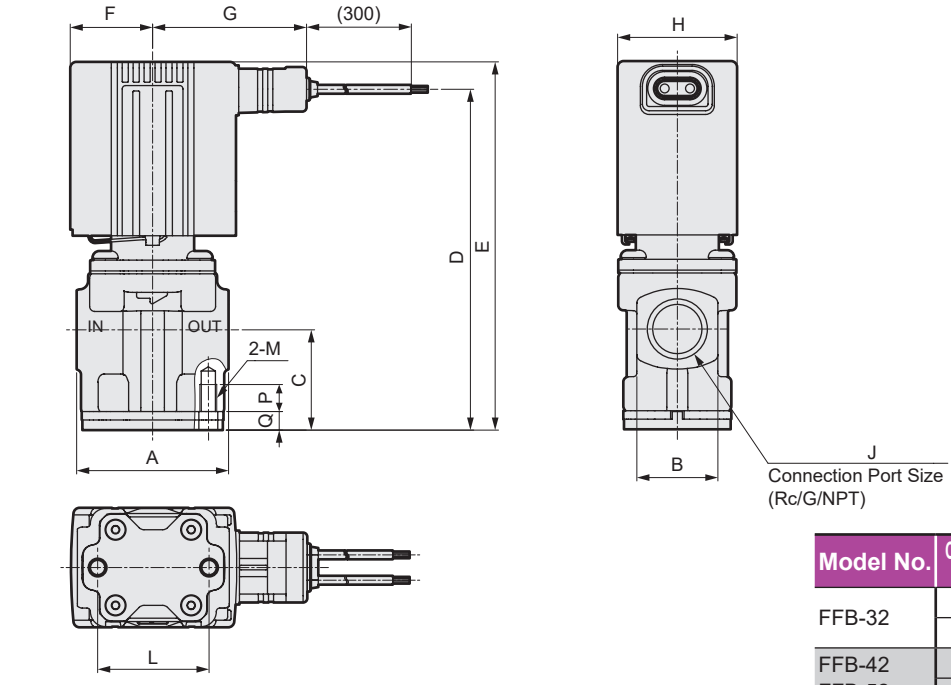
Dimensions diagram FFB-□2 Series: NO (closed when energized)

● Lead wire/DC voltage (aluminum body) Coil option code: A/J



Model No.	Connection Port Size	Thread depth
FFB-32	G1/8	8.5
	G1/4	12.5
FFB-42	G1/4	12.5
FFB-52	G 3/8	12.5

● Lead wire/DC voltage (brass body/stainless steel body) Coil option code: A/J

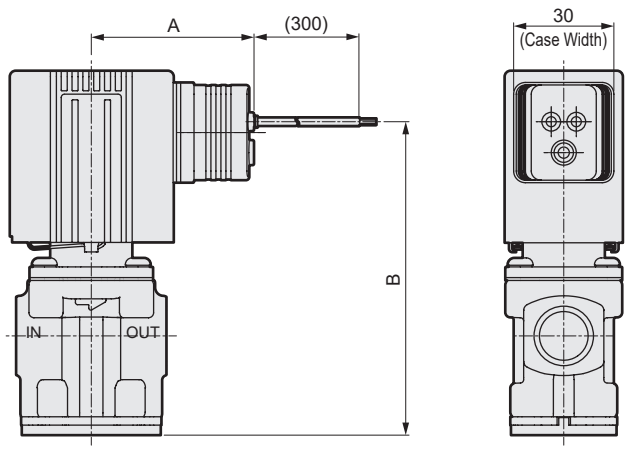


Model No.	Connection Port Size	Thread depth
FFB-32	G1/8	8.5
	G1/4	12.5
FFB-42	G1/4	12.5
FFB-52	G 3/8	12.5

Model No.		A	B	C	D	E	F	G	H	J	L	M	N	P	Q
FFB-32	Aluminum body	40	19	26.5	86.5	94	22	45	30	1/8 1/4	32	M5 depth 8	11	–	–
	Brass/SUS body			26	86	93.5					29	M5	–	6	4.5
FFB-42	Aluminum body	45	24	30	101	109	24.5	47.5	35	1/4 3/8	35	M5 depth 8	15	–	–
	Brass/SUS body										33	M5	–	8	5.5
FFB-52	Aluminum body	45	24	30	110	118	27.5	50	40	1/4 3/8	35	M5 depth 8	15	–	–
	Brass/SUS body										33	M5	–	8	5.5

Dimensions diagram FFB-□2 Series: NO (closed when energized)

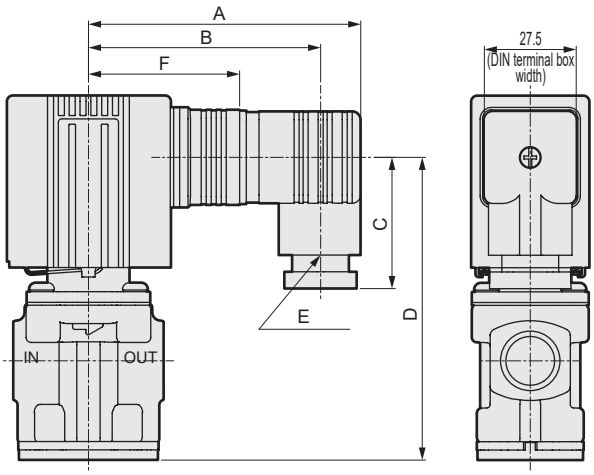
● Lead wire/AC voltage Coil option code: A/J



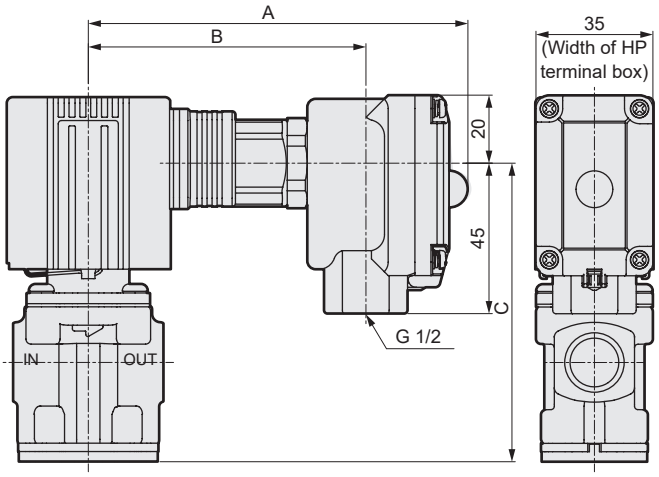
Model No.		A	B
FFB-32	Aluminum body	46	79
	Brass/SUS body		78.5
FFB-42	Aluminum body	48.5	94
	Brass/SUS body		
FFB-52	Aluminum body	51	103
	Brass/SUS body		

Optional Dimensions diagram FFB-□2 Series: NO (closed when energized)

● With DIN terminal box Coil option code: B/C/D/K/L/S
● DIN coil without terminal box



● With HP terminal box Coil option code: G/H/Q/R



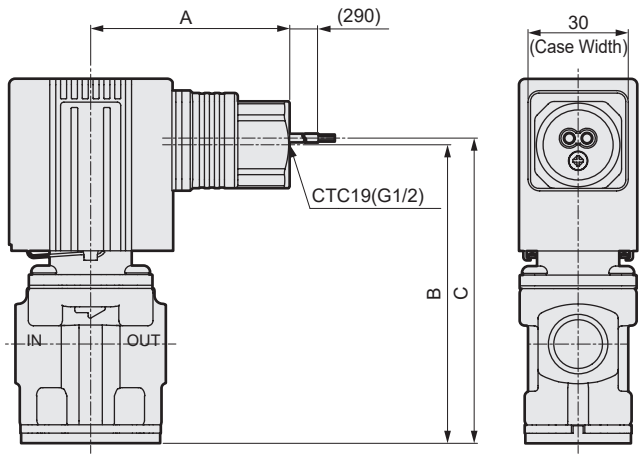
Dimensions shown in ( ) are for G1/2.

Model No.		A	B	C	D	E	F
FFB-32	Aluminum body	78.5	66.5 (65)	39.5 (41.5)	76	Pg11 (G 1/2)	42
	Brass/SUS body				75.5		
FFB-42	Aluminum body	81	69 (67.5)	39.5 (41.5)	90.5	Pg11 (G 1/2)	44.5
	Brass/SUS body						
FFB-52	Aluminum body	83.5	71.5 (70)	39.5 (41.5)	99.5	Pg11 (G 1/2)	47
	Brass/SUS body						

Model No.		A	B	C
FFB-32	Aluminum body	113	82	74.5
	Brass/SUS body			74
FFB-42	Aluminum body	115	85	89.5
	Brass/SUS body			
FFB-52	Aluminum body	118	87	98.5
	Brass/SUS body			

Optional Dimensions diagram FFB-□2 Series: NO (closed when energized)

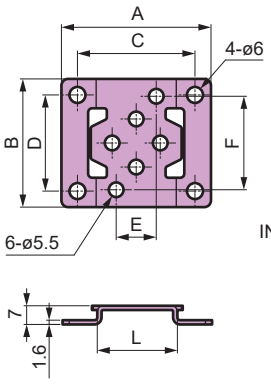
● Conduit Coil option code: E/F/M/P

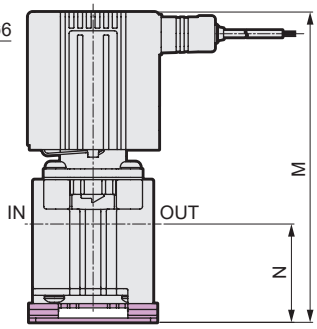


Model No.		A	B	C
FFB-32	Aluminum body	56.5	74.5	76.5
	Brass/SUS body		74	76
FFB-42	Aluminum body	59	89.5	91.5
	Brass/SUS body			
FFB-52	Aluminum body	61.5	98.5	100.5
	Brass/SUS body			

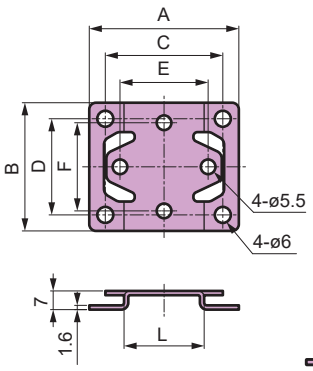
● Mounting plate① Option code: B

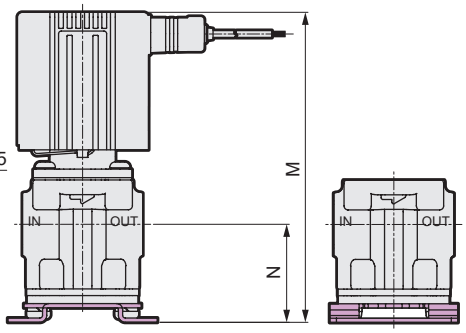
Aluminum body





Brass/SUS body





Model No.		A	B	C	D	E	F	L	M	N
FFB-32	Aluminum body	52	42	40	30	11	32	25	101	33.5
	Brass/SUS body					29	29	26	100.5	33
FFB-42	Aluminum body	56	48	44	36	15	35	30	116	37
	Brass/SUS body					33	33			
FFB-52	Aluminum body	62	50	50	38	15	35	36	125	37
	Brass/SUS body	56	48	44	36	33	33	30		

Port 2-Port Solenoid Valves Manifold

FFBM Series

- NC (normally closed)
- Connection Port Size: Rc/G/NPT 1/8, 1/4

CE UKCA RoHS

For compatible detailed model Nos., please visit the CKD website.

Model No. Notation Method

FFBM - 4 1 08 A 4 05 C 3 C 3

- Model No.
- 1 Valve Size
- 2 Actuation Method
- 3 Connection Port Size (port A)
- 4 Thread and pressure unit indicated on nameplate
- 5 Orifice size
- 6 Number of Manifold Stations
- 7 Body/sealant combination
- 8 Coil thermal class
- 9 Coil option
- 10 Rated voltage

1 Valve size

Code	Content
2	Width 24 mm
3	Width 30 mm
4	Width 35 mm
5	Width 40 mm

2 Actuation Method

Code	Content
1	NC common supply *1
5	NC (open when energized) individual supply

*1: When using in avacuum, this will be "5".
"1" cannot be selected.

3 Port size (port A)

Code	Content	1 Valve size 2	3	4	5
06	1/8	●			
08	1/4		●	●	●
00	Actuator only	●	●	●	●

4 Thread and pressure unit indicated on nameplate

Code	Content	
	Thread	Pressure display unit
A	Rc thread	MPa
B	G thread	bar
C	NPT Thread	psi *2
D	G thread	MPa *3
E	NPT Thread	MPa *3

*1: If the 3 port size is only for "00" actuator, there is no thread, so select either "A" (MPa), "B" (bar), or "C" (psi) pressure display unit.
*2: In compliance with the Measurement Act, the psi display cannot be used in Japan.
*3: "D" and "E" are selections primarily for indicating MPa as the pressure display unit in Japan even for G and NPT threads.

5 Orifice size

Code	Content	1 Valve size 2	3	4	5
S	ø1.5	●			
2	ø2	●	●		
3	ø3		●		
4	ø4			●	
5	ø5		●		●
7	ø7			●	●

6 Number of Manifold Stations

Code	Content
02 to 09	2 stations to 9 stations
10	10 stations
00	Actuator only

7 Body/sealant combination

Body	Seal	Treatment	Code	Compressed Air	Dry air Inert gas	Water	Oil	Low vacuum (*1)	Medium Vacuum
Aluminum	NBR	-	A	●	●				
Brass	NBR	-	C	●	●	●	●	●	
	FKM	-	D	●	●	●	●	●	
	FKM	Vacuum inspection	G	●	●				●
Stainless Steel	NBR	-	H	●	●	●	●	●	
	FKM	-	J	●	●	●	●	●	
	FKM	Vacuum inspection	M	●	●				●
Brass	NBR	Oil-prohibited	N	●	●	●	●	●	
	FKM	Oil-prohibited	P	●	●	●	●	●	
	EPDM	Oil-prohibited	Q			●			
Stainless Steel	NBR	Oil-prohibited	S	●	●	●	●	●	
	FKM	Oil-prohibited	T	●	●	●	●	●	
	EPDM	Oil-prohibited	U			●			

*1: This can be used with alow vacuum of [1.33 × 10^2 Pa (abs)], but valve seat leakage is 0.2 cm^3/min (ANR) or less. (Valve seat leakage at positive pressure)
When used in a low vacuum, the lower limit of operating pressure is 1.33 x 102 Pa (abs), so the upper limit is 0.1 MPa lower.

❽ Coil thermal class

Code	Content
3	Class 130 (B)

❾ Coil option

Code	Content		❶ Valve size 2	3	4	5	Voltage DC	AC
A	Lead wire (300 mm)		●	●	●	●	●	●
B	With DIN terminal box (G1/2)		*1	●	●	●	●	●
C	With DIN terminal box (Pg11)		● *2	●	●	●	●	●
D	DIN terminal box with lamp (Pg11)		● *2	●	●	●	*4	●
E	Conduit (G1/2)			●	●	●	●	●
F	Conduit (CTC19)			●	●	●	●	●
G	HP terminal box (G1/2)			● *3	●	●	●	●
H	HP terminal box with lamp (G1/2)			● *3	●	●	●	● *6
J	Lead wire (300 mm)	Surge With absorber	●	●	●	●	● *5	*7
K	With DIN terminal box (Pg11)		● *2	●	●	●	●	
L	DIN terminal box with lamp (Pg11)		● *2	●	●	●	●	
M	Conduit (G1/2)			●	●	●	●	
P	Conduit (CTC19)			●	●	●	●	
Q	HP terminal box (G1/2)			● *3	●	●	●	
R	HP terminal box with lamp (G1/2)			● *3	●	●	●	
S	DIN coil without terminal box		●	●	●	●	● *8	● *7

*1: When the ❶valve size is "2", the coil option "B" cannot be selected.
*2: When the ❶valve size is "2", the DIN terminal box thread size is Pg9.
*3: When the ❼body/sealant combination is "A" aluminum body, the HP terminal box cannot be selected.
*4: Use "L" DIN terminal box with lamp/surge suppressor.
*5: DC voltage coil option "J" surge suppressor is attached.
*6: When the coil option "H" is selected, the❿rated voltage "K" (230 VAC) cannot be selected.
*7: All AC voltages have a full-wave rectifier circuit. Significant surges generated in the coil by the action of this diode are almost eliminated. For this reason, a surge suppressor is not available.
*8: Surge suppressor is not available. Use the terminal box with surge suppressor.

❿ Rated voltage

Code	Content
1	100 VAC 50/60 Hz
2	200 VAC 50/60 Hz
3	24 VDC
4	12 VDC
5	110 VAC 50/60 Hz
6	220 VAC 50/60 Hz
K	230 VAC 50/60 Hz

⚠ Model No. Notion Method

Masking plate orders are also available. Refer to Model No. Notion Method on pages 25 and 29.

Coil option code

	A(DC)	Grommet lead wire 300 mm
	J	Grommet lead wire 300 mm/ With surge suppressor
	A(AC)	Grommet lead wire 300 mm
	B C	DIN terminal box
	K	DIN terminal box with surge suppressor
	D	DIN terminal box with lamp
	L	DIN terminal box/lamp/ With surge suppressor
	G	HP terminal box
	Q	HP terminal box with surge suppressor
	H	HP terminal box with lamp
	R	HP terminal box/lamp/ With surge suppressor
	E	Conduit (G1/2)
	F	Conduit (CTC19)
	M	Conduit (G1/2) with surge suppressor
	P	Conduit (CTC19) with surge suppressor
	S	DIN coil without terminal box

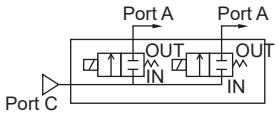
Common Specifications

Item	FFBM
Operating Fluid	Compressed air/dry air/inert gas/water/oil (50 mm^2/s or less)/medium vacuum *1, *2
Maximum Operating Pressure MPa	1.4 (refer to working pressure in individual specifications.)
Proof pressure (water pressure) MPa	2.1(NC)
Fluid Temperature °C	−10 to 40 (no freezing)
Ambient Temperature °C	−10 to 40
Thermal class	Class 130 (B)
Atmosphere	Place free of corrosive gas and explosive gas
Valve Structure	Direct acting poppet structure
Valve seat leakage cm^3/min (ANR)	0.2 or less (air)
Valve seat leakage *3 $Pa \cdot m^3/sHe$	1.33×10^{-6} or less
Mounting Orientation	Unrestricted
Protection Structure	IP65

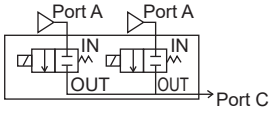
*1: When using in vacuum, vacuum the OUT port side.
*2: When using at medium vacuum, select the "G" and "M" material options.
*3: Amount of leakage at medium vacuum.

Circuit Diagram Symbol

● FFBM-□1
(Common supply/port C pressurization)



● FFBM-□5
(Individual supply/port A pressurization)



Electrical specifications

Item	FFBM-2							FFBM-3						
Rated voltage V	24 VDC	12 VDC	100 VAC 50/60Hz	110 VAC 50/60Hz	200 VAC 50/60Hz	220 VAC 50/60Hz	230 VAC 50/60Hz	24 VDC	12 VDC	100 VAC 50/60Hz	110 VAC 50/60Hz	200 VAC 50/60Hz	220 VAC 50/60Hz	230 VAC 50/60Hz
Voltage Fluctuation Range	±10%							±10%						
Power Consumption W	3.5	3.5	–	–	–	–	–	4.5	4.5	–	–	–	–	–
Apparent power VA	–	–	5.1	5.7	6.0	5.3	5.7	–	–	6.2	6.1	6.2	6.2	6.5

Item	FFBM-4							FFBM-5						
Rated voltage V	24 VDC	12 VDC	100 VAC 50/60Hz	110 VAC 50/60Hz	200 VAC 50/60Hz	220 VAC 50/60Hz	230 VAC 50/60Hz	24 VDC	12 VDC	100 VAC 50/60Hz	110 VAC 50/60Hz	200 VAC 50/60Hz	220 VAC 50/60Hz	230 VAC 50/60Hz
Voltage Fluctuation Range	±10%							±10%						
Power Consumption W	7	7	–	–	–	–	–	10.5	10.5	–	–	–	–	–
Apparent power VA	–	–	8.6	10	9.6	9.5	9.4	–	–	13	13	14	14	13

The leakage current must be less than or equal to the values shown below.

Voltage	AC					DC	
	100V	110V	200V	220V	230V	12V	24V
Leakage current	2 mA or less		1 mA or less			5 mA or less	

Individual specifications

Item / Model No.					Connection Port Size Rc/G/NPT		Orifice size (mm)	Operating Pressure (MPa) *1	Operating Pressure Pa (abs) *2	Flow Characteristics			
					Port A	Port C				C [dm3/(s·bar)]	b	Cv	Kv value *4
NC (normally closed)													
FFBM-2$^{1}_{5}$	06	*	S		1/8	1/4 (1/8) *3	1.5	0 to 1.0	1.3×10^{-2} to 1×10^{6}	0.30	0.48	0.085	0.074
			2				2	0 to 0.6	1.3×10^{-2} to 0.6×10^{6}	0.52	0.39	0.12	0.10
FFBM-3$^{1}_{5}$	08	*	2		1/4	3/8	2	0 to 1.4	1.3×10^{-2} to 1.4×10^{6}	0.55	0.42	0.12	0.10
			3				3	0 to 0.6	1.3×10^{-2} to 0.6×10^{6}	1.1	0.25	0.23	0.20
			5				5	0 to 0.2	1.3×10^{-2} to 0.2×10^{6}	1.8	0.11	0.45	0.39
FFBM-4$^{1}_{5}$	08	*	4		1/4	3/8	4	0 to 1.0	1.3×10^{-2} to 1×10^{6}	1.7	0.11	0.42	0.36
			7				7	0 to 0.15	1.3×10^{-2} to 0.15×10^{6}	3.3	0.11	0.73	0.63
FFBM-5$^{1}_{5}$	08	*	5		1/4	3/8	5	0 to 0.8	1.3×10^{-2} to 0.8×10^{6}	2.3	0.10	0.55	0.48
			7				7	0 to 0.3	1.3×10^{-2} to 0.3×10^{6}	3.3	0.11	0.73	0.63

*1: This can be used with alow vacuum of [1.33×10^{2} Pa (abs)], but valve seat leakage is 0.2cm^3/min (ANR) or less. (Valve seat leakage at positive pressure)
When using at low vacuum, the lower limit of the working pressure is 1.33×10^{2} Pa (abs), so the upper limit is 0.1 MPa lower.
*2: Working pressure at medium vacuum.
*3: 1/8 for aluminum body.
*Refer to page 53 for 4:Kv value.

Weight

●Body material: Aluminum

Model No.	Mass (kg)									
	Actuator only	2 stations	3 stations	4 stations	5 stations	6 stations	7 stations	8 stations	9 stations	10 stations
FFBM-2	0.16	0.4	0.6	0.7	0.9	1.1	1.3	1.5	1.7	1.8
FFBM-3	0.27	0.7	1.0	1.3	1.7	2.0	2.3	2.6	3.0	3.3
FFBM-4	0.41	1.0	1.5	2.0	2.5	3.0	3.5	3.9	4.4	4.9
FFBM-5	0.60	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7.0

*: Weight of aluminum sub-plate with 24 VDC lead wire.

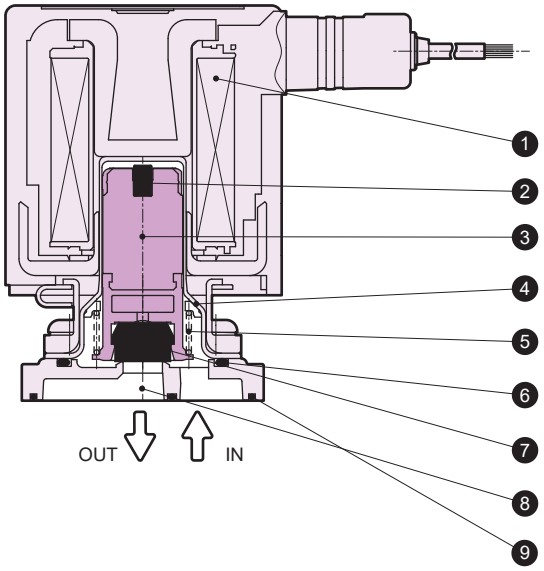
●Body material: Brass/stainless steel

Model No.	Mass (kg)									
	Actuator only	2 stations	3 stations	4 stations	5 stations	6 stations	7 stations	8 stations	9 stations	10 stations
FFBM-2	0.2	0.9	1.3	1.8	2.0	2.5	2.9	3.3	3.8	4.0
FFBM-3	0.35	1.4	2.0	2.9	3.2	4.1	4.7	5.3	6.2	6.5
FFBM-4	0.5	2.0	2.8	4.0	4.5	5.7	6.5	7.4	8.6	9.1
FFBM-5	0.7	2.5	3.5	5.0	5.7	7.1	8.2	9.3	10.7	11.5

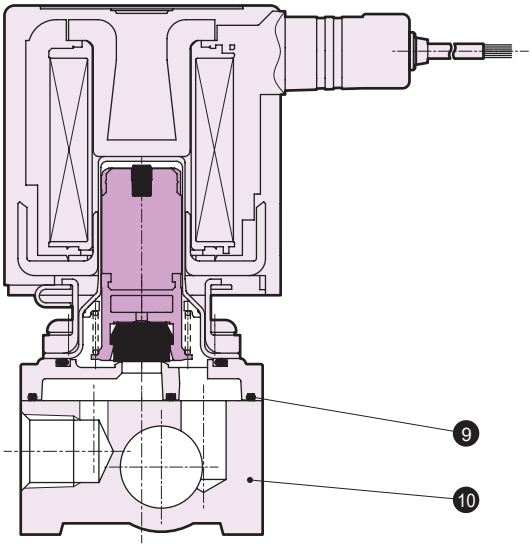
*: Weight of brass sub-plate with 24 VDC lead wire.

Internal structure/material Aluminum body

● FFBM actuator



● FFBM manifold

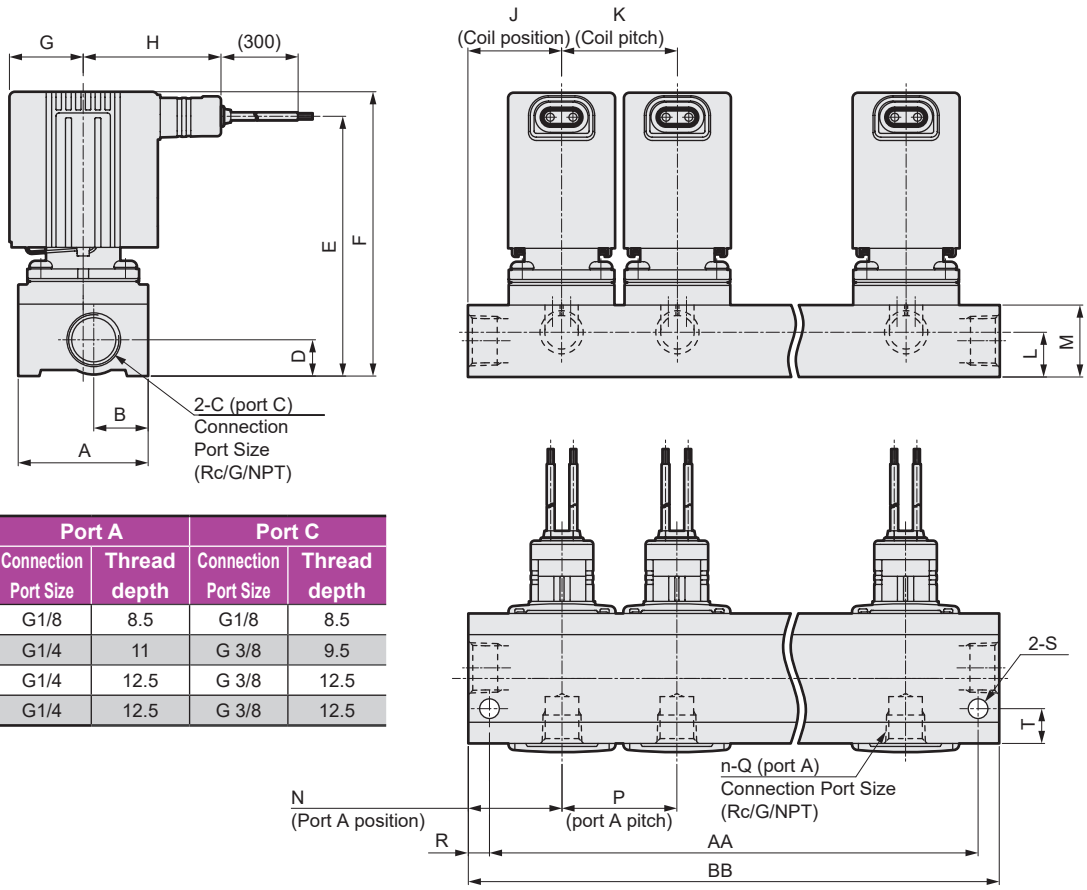


Part No.	Name	Material	
1	Coil assembly	–	
2	Noise dampening rubber	HNBR	Hydrogenated nitrile rubber
3	Plunger	SUS,PPS	Stainless steel, polyphenylene sulfide
4	Flare pipe assembly	SUS,PPS	Stainless steel, polyphenylene sulfide
5	Plunger spring	SUS304	Stainless Steel
6	O-ring	NBR	Nitrile rubber
7	Seal	NBR	Nitrile rubber
8	Body	ADC	Aluminum die-casting
9	Gasket	NBR	Nitrile rubber
10	Sub-plate	A6063	Aluminum

For maintenance parts, refer to the CKD component product site (https://www.ckd.co.jp/kiki/en/) → Refer to "Model No." → Maintenance parts .

Dimensions diagram aluminum body

● Manifold lead wire/DC voltage Coil option code: A/J



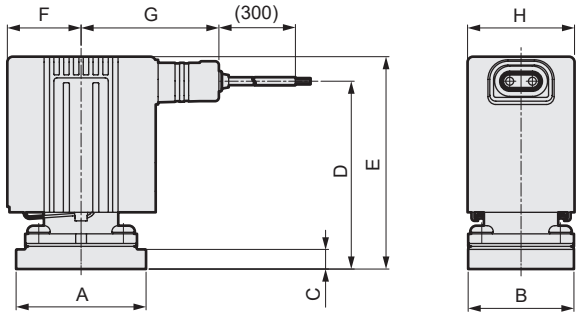
Model No.	Port A		Port C	
	Connection Port Size	Thread depth	Connection Port Size	Thread depth
FFBM-2	G1/8	8.5	G1/8	8.5
FFBM-3	G1/4	11	G 3/8	9.5
FFBM-4	G1/4	12.5	G 3/8	12.5
FFBM-5	G1/4	12.5	G 3/8	12.5

Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T
FFBM-2	30	12	1/8	8	64.5	72.5	18.5	42	21	26	8	16	25	26	1/8	5	ø4.5	9
FFBM-3	36	13	3/8	12	79	87	22	45	28	32	15	24	34.5	32	1/4	7	ø6.5	10
FFBM-4	43	18	3/8	12	86	94	24.5	47.5	31	38	15	24	31	38	1/4	7	ø6.5	11.5
FFBM-5	43	18	3/8	12	95	103	27.5	50	34	46	15	24	34	46	1/4	7	ø6.5	11.5

Model No.	Station No. / Code	2	3	4	5	6	7	8	9	10
FFBM-2	AA	58	84	110	136	162	188	214	240	266
	BB	68	94	120	146	172	198	224	250	276
FFBM-3	AA	74	106	138	170	202	234	266	298	330
	BB	88	120	152	184	216	248	280	312	344
FFBM-4	AA	86	124	162	200	238	276	314	352	390
	BB	100	138	176	214	252	290	328	366	404
FFBM-5	AA	100	146	192	238	284	330	376	422	468
	BB	114	160	206	252	298	344	390	436	482

Dimensions diagram aluminum body

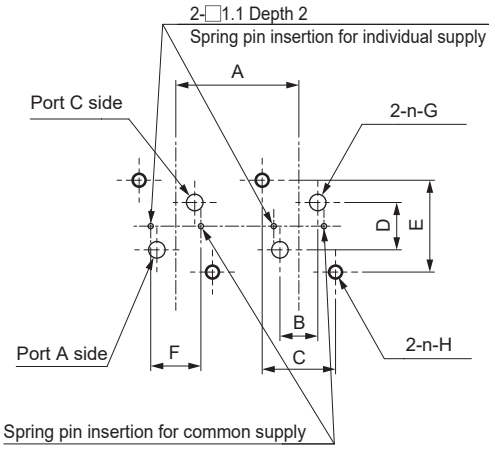
● Actuator lead wire/DC voltage Coil option code: A/J



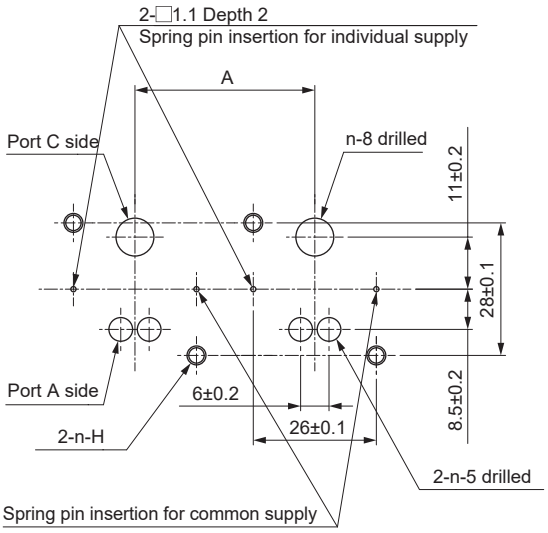
Model No.	A	B	C	D	E	F	G	H
FFBM-2	28	22.5	2.5	48.5	57	18.5	42	24
FFBM-3	32.5	29.5	2.5	55.5	63	22	45	30
FFBM-4	43	35	6.5	62	70.5	24.5	47.5	35
FFBM-5	43	35	6.5	71	79.5	27.5	50	40

● Actuator installation dimensions

FFBM-2□/3-□



FFBM-4□/5-□



*: Machining diagram when using 2 actuators.

Model No.	A	B	C	D	E	F	G	H
FFBM-2	26 or more	8±0.15	15.5±0.1	10±0.15	19.4±0.1	10.6±0.1	ø3.5	M3 depth 6 or more
FFBM-3	32 or more	13±0.1	22.4±0.1	11.4±0.1	22.4±0.1	17±0.1	ø5.5	M3 depth 7 or more
FFBM-4	38 or more	–	–	–	–	–	–	M4 depth 7 or more
FFBM-5	46 or more	–	–	–	–	–	–	M4 depth 7 or more

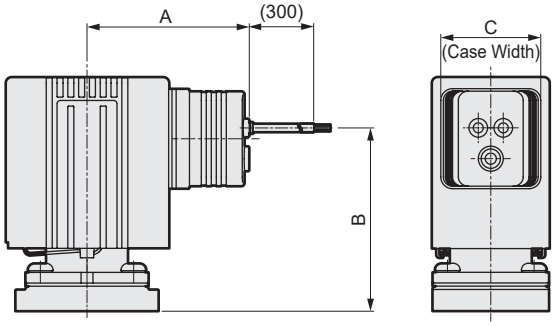
Model No. Notion Method discrete masking plate

O-ring, with mounting screw

Model No.	Aluminum body
FFBM-2	FFBM-21A-MP-KIT
FFBM-3	FFBM-31A-MP-KIT
FFBM-4	FFBM-41A-MP-KIT
FFBM-5	FFBM-41A-MP-KIT

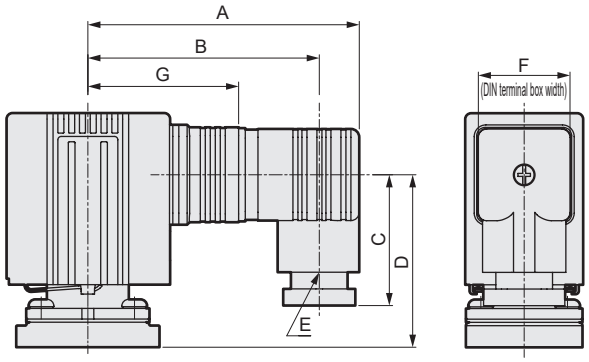
Dimensions diagram aluminum body

● Actuator lead wire/AC voltage Coil option code: A/J



Model No.	A	B	C
FFBM-2	43	45	24
FFBM-3	46	48.5	30
FFBM-4	48.5	55	30
FFBM-5	51	64	30

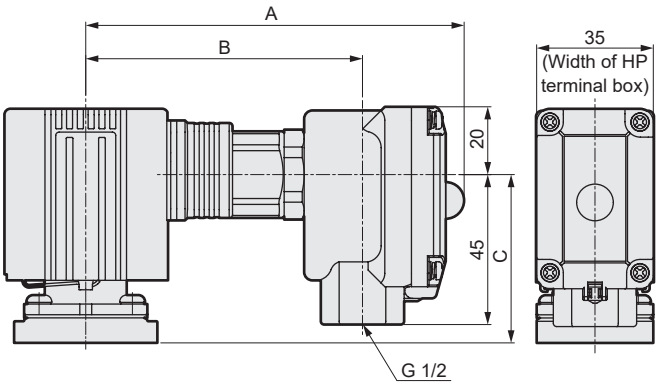
● Actuator with DIN terminal box Coil option code: B/C/D/K/L/S
● Actuator without DIN coil/terminal box



Dimensions shown in ( ) are for G1/2.

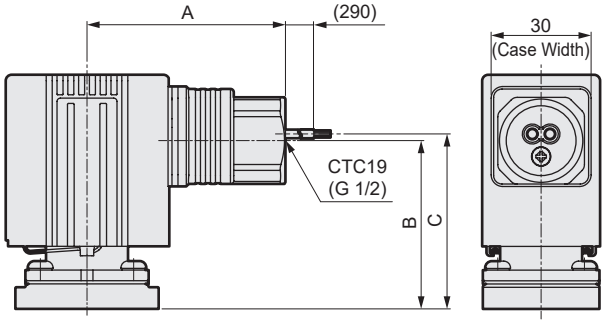
Model No.	A	B	C	D	E	F	G
FFBM-2	73	64	36	41.5	Pg9	21	39
FFBM-3	78.5	66.5 (65)	39.5 (41.5)	45	Pg11 (G 1/2)	27.5	42
FFBM-4	81	69 (67.5)	39.5 (41.5)	52	Pg11 (G 1/2)	27.5	44.5
FFBM-5	83.5	71.5 (70)	39.5 (41.5)	61	Pg11 (G 1/2)	27.5	47

● Actuator HP terminal box Coil option code: G/H/Q/R



Model No.	A	B	C
FFBM-2	–	–	–
FFBM-3	113	82	44
FFBM-4	115	85	50.5
FFBM-5	118	87	59.5

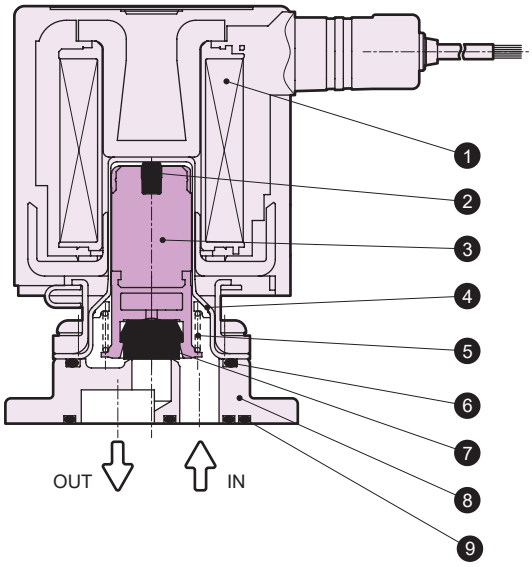
● Conduit Coil option code: E/F/M/P



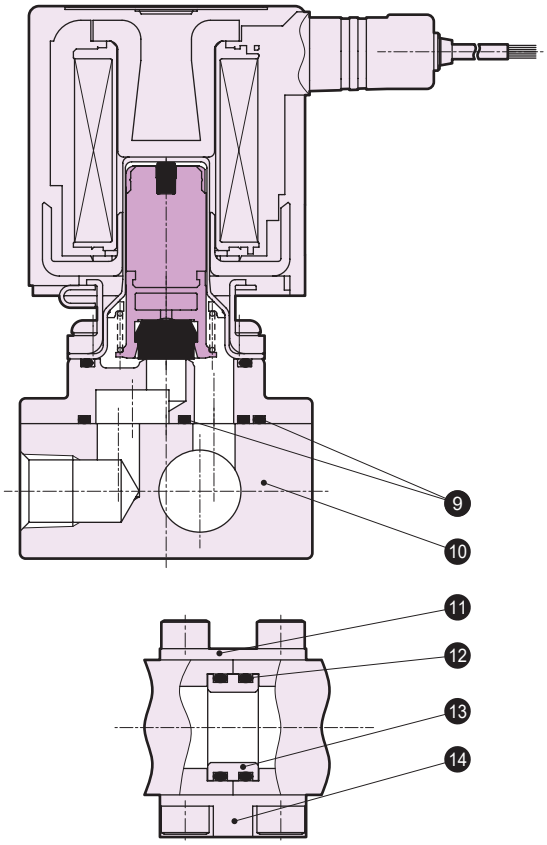
Model No.	A	B	C
FFBM-2	–	–	–
FFBM-3	56.5	44	46
FFBM-4	59	50.5	52.5
FFBM-5	61.5	59.5	61.5

Internal structure/Material brass body/Stainless steel body

● FFBM actuator



● FFBM manifold



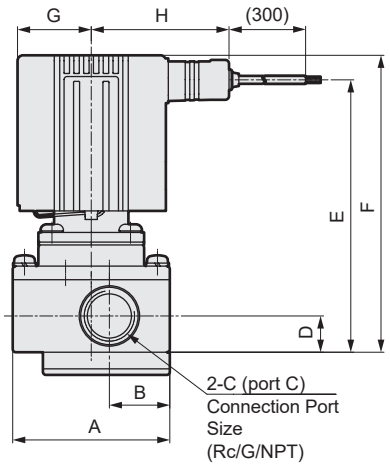
Part No.	Name	Material	
1	Coil assembly	–	
2	Noise dampening rubber	HNBR(FKM,EPDM)	Hydrogenated nitrile rubber (fluoro rubber, ethylene propylene rubber)
3	Plunger	SUS,PPS	Stainless steel, polyphenylene sulfide
4	Flare pipe assembly	SUS,PPS	Stainless steel, polyphenylene sulfide
5	Plunger spring	SUS304	Stainless Steel
6	O-ring	NBR(FKM,EPDM)	Nitrile rubber (fluoro rubber, ethylene propylene rubber)
7	Seal	NBR(FKM,EPDM)	Nitrile rubber (fluoro rubber, ethylene propylene rubber)
8	Body	Brass (SCS13)	Brass (stainless steel)
9	O-ring	NBR(FKM,EPDM)	Nitrile rubber (fluoro rubber, ethylene propylene rubber)
10	Sub-plate	C3604(SUS304)	Brass (stainless steel) Same material as * body
11	Connecting plate	SPCC	Steel
12	O-ring	NBR(FKM,EPDM)	Nitrile rubber (fluoro rubber, ethylene propylene rubber)
13	Connector	C3604(SUS)	Brass (stainless steel)
14	Connecting plate (bottom)	SS400	Steel

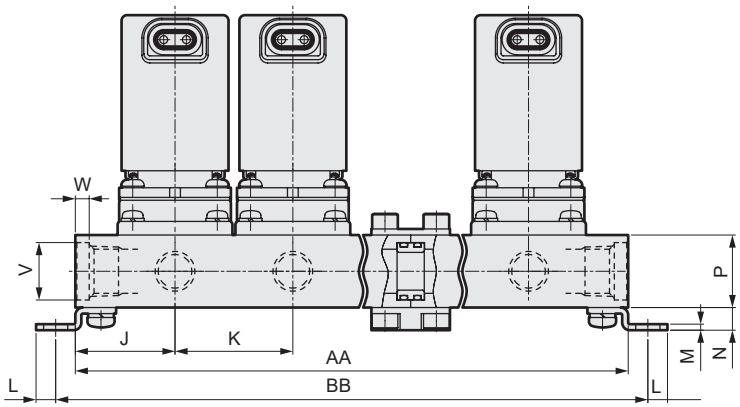
( ) shows options.

Refer to CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No." → Maintenance parts

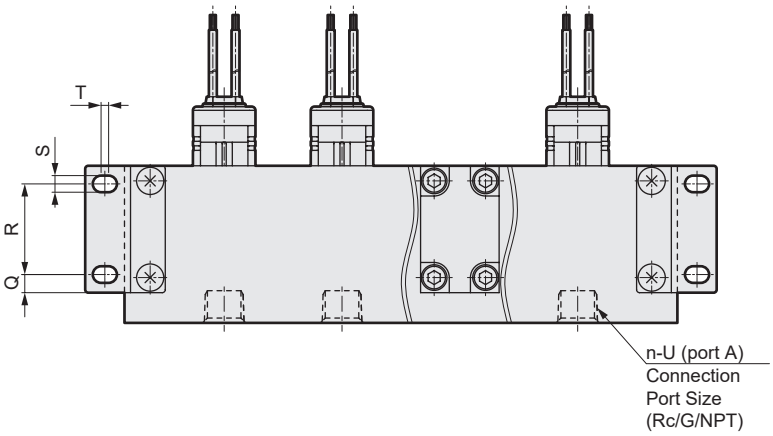
Dimensions diagram brass body/stainless steel body

● Manifold lead wire/DC voltage Coil option code: A/J





Model No.	Port A		Port C	
	Connection Port Size	Thread depth	Connection Port Size	Thread depth
FFBM-2	G1/8	8.5	G1/4	12.5
FFBM-3	G1/4	12.5	G 3/8	12.5
FFBM-4	G1/4	12.5	G 3/8	12.5
FFBM-5	G1/4	12.5	G 3/8	12.5



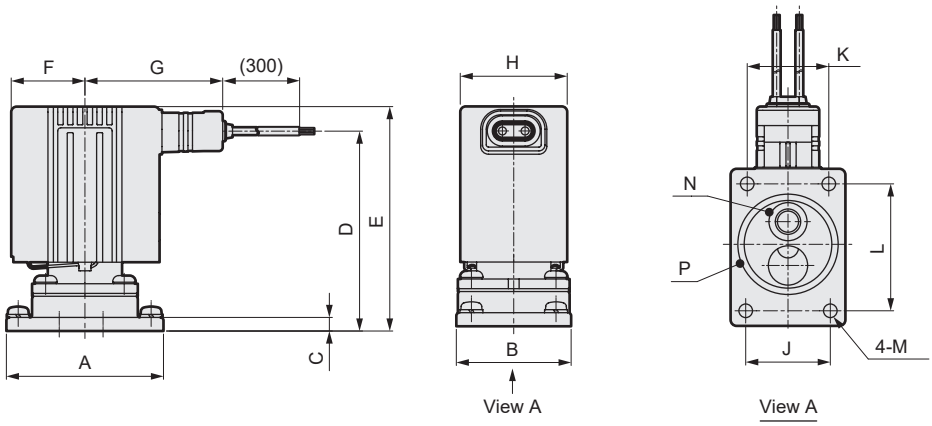
Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W
FFBM-2	38	14	1/4	11	71	79.5	18.5	42	26	28	6	1.6	6.5	21	5	22	4.5	2.5	1/8	ø17.3	4
FFBM-3	46	17.5	3/8	12	81	88.5	22	45	30	36	6	2	6.5	24	5	28	4.5	2.5	1/4	ø19	4.6
FFBM-4	52	20	3/8	12	90	98.5	24.5	47.5	33	39	6.5	2	7.5	24	6	30	5.5	2.5	1/4	ø19	4.6
FFBM-5	52	20	3/8	12	99	107.5	27.5	50	36	45	6.5	2	7.5	24	6	30	5.5	2.5	1/4	ø19	4.6

Model No.	Station No. / Code	2	3	4	5	6	7	8	9	10
FFBM-2	AA	81	109	161	165	218	246	274	327	330
	BB	93	121	173	177	230	258	286	339	342
FFBM-3	AA	97	133	193	205	266	302	338	399	410
	BB	109	145	205	217	278	314	350	411	422
FFBM-4	AA	106	145	211	223	290	329	368	435	446
	BB	119	158	224	236	303	342	381	448	459
FFBM-5	AA	118	163	235	253	326	371	416	489	506
	BB	131	176	247	266	339	384	429	502	519
Manifold configuration		2 stations x 1	3 stations x 1	4 stations x 1	5 stations x 1	3 stations x 2	5 stations + 2 stations	5 stations + 3 stations	3 stations x 3	5 stations x 2

*: Manifold configuration combines 2-station, 3-station, 4-station and 5-station units.

Dimensions diagram brass body/stainless steel body

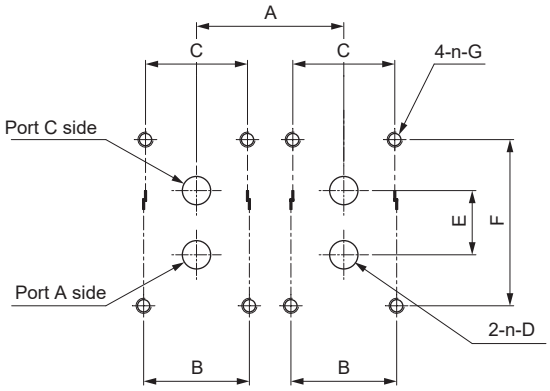
● Actuator lead wire/DC voltage Coil option code: A/J



Model No.	A	B	C	D	E	F	G	H	J	K	L	M	Applicable O-ring	
													N	P
FFBM-2	38	27	4.5	50	58.5	18.5	42	24	19(18)	18 (19)	30	ø3.5	AS568-009	AS568-018
FFBM-3	46	34	4.5	57	64.5	22	45	30	24(23)	23 (24)	38	ø4.5	AS568-011	AS568-022
FFBM-4	52	38	4.5	66	74.5	24.5	47.5	35	28(27)	27 (28)	44	ø4.5	AS568-012	AS568-025
FFBM-5	52	38	4.5	75	83.5	27.5	50	40	28(27)	27 (28)	44	ø4.5	AS568-012	AS568-025

Dimensions shown in ( ) are for individual supply (FFBM-*5).

● Actuator installation dimensions



*: Machining diagram when using 2 actuators.

Model No.	A	B	C	D	E	F	G
FFBM-2	28 or more	19±0.1	18±0.1	ø3.5	10.6±0.1	30±0.1	M3 depth 6 or more
FFBM-3	36 or more	24±0.1	23±0.1	ø5.5	13.8±0.1	38±0.1	M4 depth 6 or more
FFBM-4	39 or more	28±0.1	27±0.1	ø7.5	17±0.1	44±0.1	M4 depth 6 or more
FFBM-5	45 or more	28±0.1	27±0.1	ø7.5	17±0.1	44±0.1	M4 depth 6 or more

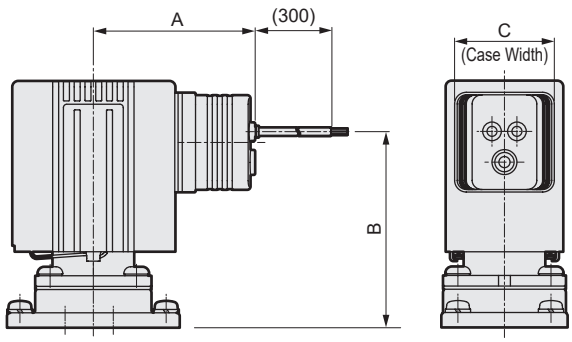
Model No. Notion Method discrete masking plate

O-ring, with mounting screw

Model No.	Brass body			Stainless steel body		
Seal	NBR	FKM	EPDM	NBR	FKM	EPDM
FFBM-2	FFBM-21C-MP-KIT	FFBM-21D-MP-KIT	FFBM-21Q-MP-KIT	FFBM-21H-MP-KIT	FFBM-21J-MP-KIT	FFBM-21U-MP-KIT
FFBM-3	FFBM-31C-MP-KIT	FFBM-31D-MP-KIT	FFBM-31Q-MP-KIT	FFBM-31H-MP-KIT	FFBM-31J-MP-KIT	FFBM-31U-MP-KIT
FFBM-4	FFBM-41C-MP-KIT	FFBM-41D-MP-KIT	FFBM-41Q-MP-KIT	FFBM-41H-MP-KIT	FFBM-41J-MP-KIT	FFBM-41U-MP-KIT
FFBM-5	FFBM-41C-MP-KIT	FFBM-41D-MP-KIT	FFBM-41Q-MP-KIT	FFBM-41H-MP-KIT	FFBM-41J-MP-KIT	FFBM-41U-MP-KIT

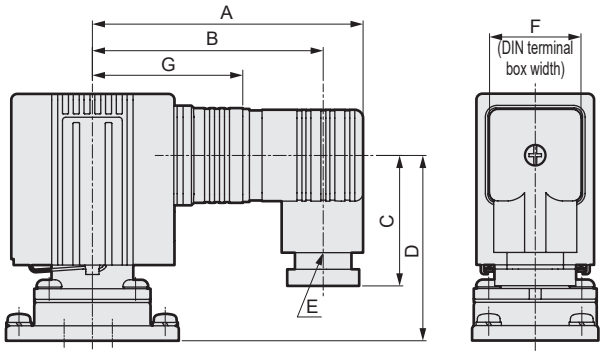
Dimensions diagram brass body/stainless steel body

● Actuator lead wire/AC voltage Coil option code: A/J



Model No.	A	B	C
FFBM-2	43	46.5	24
FFBM-3	46	50	30
FFBM-4	48.5	59	30
FFBM-5	51	68	30

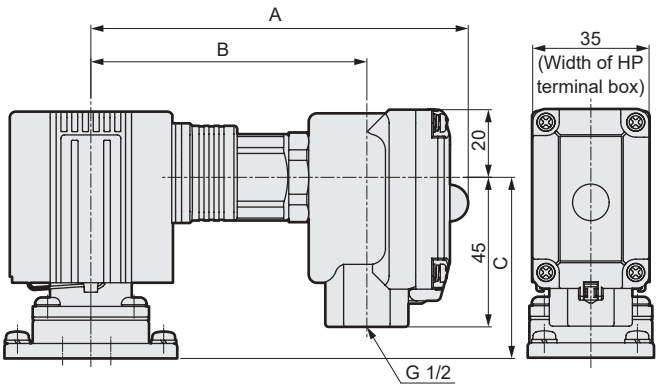
● Actuator with DIN terminal box Coil option code: B/C/D/K/L/S
● Actuator without DIN coil/terminal box



Dimensions shown in ( ) are for G1/2.

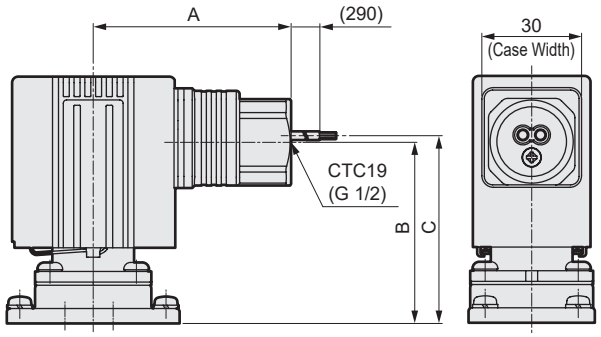
Model No.	A	B	C	D	E	F	G
FFBM-2	73	64	36	43	Pg9	21	39
FFBM-3	78.5	66.5 (65)	39.5 (41.5)	46.5	Pg11 (G 1/2)	27.5	42
FFBM-4	81	69 (67.5)	39.5 (41.5)	56	Pg11 (G 1/2)	27.5	44.5
FFBM-5	83.5	71.5 (70)	39.5 (41.5)	65	Pg11 (G 1/2)	27.5	47

● Actuator HP terminal box Coil option code: G/H/Q/R



Model No.	A	B	C
FFBM-2	–	–	–
FFBM-3	113	82	45.5
FFBM-4	115	85	54.5
FFBM-5	118	87	63.5

● Conduit Coil option code: E/F/M/P



Model No.	A	B	C
FFBM-2	–	–	–
FFBM-3	56.5	45.5	47.5
FFBM-4	59	54.5	56.5
FFBM-5	61.5	63.5	65.5

Direct Acting 3-Port Solenoid Valve

FFG Series

- Universal, NC pressurization
- Connection Port Size: Rc/G/NPT 1/8 to 3/8

For compatible detailed model Nos., please visit the CKD website.

Model No. Notation Method

FFG - 4 1 08 A 4 C 3 C 3 - B

- Model No.
- 1 Valve Size
- 2 Actuation Method
- 3 Connection Port Size
- 4 Thread and Pressure indicated on nameplate unit
- 5 Orifice size
- 6 Body/sealant combination
- 7 Coil thermal class
- 8 Coil option
- 9 Rated voltage
- 10 Option

1 Valve size

Code	Content
2	Width 24 mm
3	Width 30 mm
4	Width 35 mm
5	Width 40 mm

2 Actuation Method

Code	Content	1 Valve size 2	3	4	5
1	Universal	●	●	●	●
3	NC pressurization		●	●	

3 Connection Port Size

Code	Content	1 Valve size 2	3	4	5
06	1/8	●	●		
08	1/4		●	●	●
10	3/8			●	●

4 Thread and pressure unit indicated on nameplate

Code	Content		
	Thread	Pressure display unit	
A	Rc thread	MPa	
B	G thread	bar	
C	NPT Thread	psi	*1
D	G thread	MPa	*2
E	NPT Thread	MPa	*2

*1: In compliance with the Measurement Act, the psi display cannot be used in Japan.
*2: "D" and "E" are selections primarily for indicating the pressure display unit as MPa in Japan even forG and NPT threads.

5 Orifice size

Code	Content	1 Valve size 2	3	4	5
1	ø1	●			
S	ø1.5		●		
2	ø2	●	●	●	●
3	ø3		●	●	●
4	ø4			●	●

6 Body/sealant combination

Body	Seal	Treatment	Code	Operating Fluid: Compressed Air	Dry air Inert gas	Water	Oil	Low vacuum *1
Aluminum	NBR	-	A	●	●			
Brass	NBR		C	●	●	●	●	●
	FKM		D	●	●	●	●	●
Stainless Steel	NBR		H	●	●	●	●	●
	FKM		J	●	●	●	●	●
Brass	NBR	Oil-prohibited	N	●	●	●	●	●
	FKM		P	●	●	●	●	●
	EPDM		Q			●		
Stainless Steel	NBR		S	●	●	●	●	●
	FKM		T	●	●	●	●	●
	EPDM		U			●		

*1: This can be used with alow vacuum of [1.33 × 10^2 Pa (abs)], but valve seat leakage is 0.2 cm^3/min (ANR) or less. (Valve seat leakage at positive pressure)
When used in a low vacuum, the lower limit of operating pressure is 1.33 x 102 Pa (abs), so the upper limit is 0.1 MPa lower.

❼ Coil thermal class

Code	Content
3	Class 130 (B)

❽ Coil option

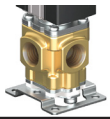
Code	Content		❶ Valve size 2	3	4	5	Voltage DC	AC
A	Lead wire (300 mm)		●	●	●	●	●	●
B	With DIN terminal box (G1/2)		*1	●	●	●	●	●
C	With DIN terminal box (Pg11)		●*2	●	●	●	●	●
D	DIN terminal box with lamp (Pg11)		●*2	●	●	●	*3	●
E	Conduit (G1/2)			●	●	●	●	●
F	Conduit (CTC19)			●	●	●	●	●
G	HP terminal box (G1/2)			●	●	●	●	●
H	HP terminal box with lamp (G1/2)			●	●	●	●	●*5
J	Lead wire (300 mm)	Surge With absorber	●	●	●	●	●*4	
K	With DIN terminal box (Pg11)		●*2	●	●	●	●	
L	DIN terminal box with lamp (Pg11)		●*2	●	●	●	●	
M	Conduit (G1/2)			●	●	●	●	*6
P	Conduit (CTC19)			●	●	●	●	
Q	HP terminal box (G1/2)			●	●	●	●	
R	HP terminal box with lamp (G1/2)			●	●	●	●	
S	DIN coil without terminal box		●	●	●	●	●*7	●*6

*1: When the ❶valve size is "2", the coil option "B" cannot be selected.
*2: When the ❶valve size is "2", the DIN terminal box thread size is Pg9.
*3: Use "L" DIN terminal box with lamp/surge suppressor.
*4: DC voltage coil option "J" surge suppressor is attached.
*5: When the coil option "H" is selected, the ❾ rated voltage "K" (230 VAC) cannot be selected.
*6: All AC voltages have a full-wave rectifier circuit. Significant surges generated in the coil by the action of this diode are almost eliminated. For this reason, a surge suppressor is not available.
*7: Surge suppressor is not available. Use the terminal box with surge suppressor.

❾ Rated voltage

Code	Content
1	100 VAC 50/60 Hz
2	200 VAC 50/60 Hz
3	24 VDC
4	12 VDC
5	110 VAC 50/60 Hz
6	220 VAC 50/60 Hz
K	230 VAC 50/60 Hz

❿ Option *1

Code	Content		
Blank	None		
B	Mounting plate①	Aluminum body	Brass/ Stainless steel body
			

*1: Mounting plate is included with the product. For tightening torque see CKD Components Product Website (https://www.ckd.co.jp/kiki/en/) → "Model No.→ Instruction Manuals
*2: ①The mounting plate is compatible with CKD product FAG, FGG, or FWG Series.

Coil option code

	A(DC)	Grommet lead wire 300 mm
	J	Grommet lead wire 300 mm/ With surge suppressor
	A(AC)	Grommet lead wire 300 mm
	B C	DIN terminal box
	K	DIN terminal box with surge suppressor
	D	DIN terminal box with lamp
	L	DIN terminal box/lamp/ With surge suppressor
	G	HP terminal box
	Q	HP terminal box with surge suppressor
	H	HP terminal box with lamp
	R	HP terminal box/lamp/ With surge suppressor
	E	Conduit (G1/2)
	F	Conduit (CTC19)
	M	Conduit (G1/2) with surge suppressor
	P	Conduit (CTC19) with surge suppressor
	S	DIN coil without terminal box

Model No. Notion Method mounting plate

With body mounting screw

Model No.	Mounting plate code: B	
	Aluminum body	Brass, stainless steel body
FFG-2	FFB-21-B-MOUNT-PLATE-KIT	FFG-21-B-MOUNT-PLATE-KIT
FFG-3	FFB-31-B-MOUNT-PLATE-KIT	FFG-31-B-MOUNT-PLATE-KIT
FFG-4	FFB-41-B-MOUNT-PLATE-KIT	FFG-41-B-MOUNT-PLATE-KIT
FFG-5	FFB-51-B-MOUNT-PLATE-KIT	

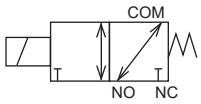
Common Specifications

Item	FFG
Operating Fluid	Compressed air/dry air/inert gas/water/oil (50mm^2/s or less)/low vacuum [1.33 × 10^2 Pa (abs)] *1
Max. working pressure MPa	1.2 (refer to working pressure in individual specifications.)
Proof pressure (water pressure) MPa	1.8
Fluid temperature °C	−10 to 60 (no freezing)
Ambient Temperature °C	−10 to 60(DC), −10 to 55(AC)
Thermal class	Class 130 (B)
Atmosphere	Place free of corrosive gas and explosive gas
Valve Structure	Direct acting poppet structure
Valve seat leakage cm^3/min (ANR)	0.2 or less (air)
Mounting Orientation	Unrestricted
Protection Structure	IP65

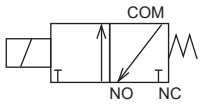
*1: When using at low vacuum, vacuum the NC/NO port side for the universal, and the NO port for the NC pressurization.

Circuit Diagram Symbol

● FFG-□1: Universal



● FFG-□3:NC pressurization



Electrical specifications

Item		FFG-2							FFG-3						
Rated voltage	V	24 VDC	12 VDC	100 VAC 50/60Hz	110 VAC 50/60Hz	200 VAC 50/60Hz	220 VAC 50/60Hz	230 VAC 50/60Hz	24 VDC	12 VDC	100 VAC 50/60Hz	110 VAC 50/60Hz	200 VAC 50/60Hz	220 VAC 50/60Hz	230 VAC 50/60Hz
Voltage Fluctuation Range		±10%							±10%						
Power Consumption	W	3.5	3.5	–	–	–	–	–	4.5	4.5	–	–	–	–	–
Apparent power	VA	–	–	5.1	5.7	6.0	5.3	5.7	–	–	6.2	6.1	6.2	6.2	6.5

Item		FFG-4							FFG-5						
Rated voltage	V	24 VDC	12 VDC	100 VAC 50/60Hz	110 VAC 50/60Hz	200 VAC 50/60Hz	220 VAC 50/60Hz	230 VAC 50/60Hz	24 VDC	12 VDC	100 VAC 50/60Hz	110 VAC 50/60Hz	200 VAC 50/60Hz	220 VAC 50/60Hz	230 VAC 50/60Hz
Voltage Fluctuation Range		±10%							±10%						
Power Consumption	W	7	7	–	–	–	–	–	10.5	10.5	–	–	–	–	–
Apparent power	VA	–	–	8.6	10	9.6	9.5	9.4	–	–	13	13	14	14	13

The leakage current must be less than or equal to the values shown below.

Voltage	AC					DC	
	100 V	110 V	200 V	220 V	230 V	12 V	24 V
Leakage current	2 mA or less		1 mA or less			5 mA or less	

Individual specifications

Item / Model No.			Connection Port Size Rc/G/NPT	Orifice size (mm)	Use Pressure (MPa) *1*2	Flow Characteristics															
						COM→NC				COM→NO				NC→COM				NO→COM			
						C[dm³/(s·bar)]	b	Cv	Kv value *3	C[dm³/(s·bar)]	b	Cv	Kv value *3	C[dm³/(s·bar)]	b	Cv	Kv value *3	C[dm³/(s·bar)]	b	Cv	Kv value *3
Universal																					
FFG-21	06 *	1	1/8	1	0 to 0.7	0.12	0.47	0.036	0.031	0.11	0.54	0.030	0.026	0.12	0.50	0.032	0.028	0.11	0.37	0.028	0.024
		2		2	0 to 0.15	0.53	0.49	0.13	0.11	0.35	0.64	0.10	0.087	0.48	0.27	0.10	0.087	0.32	0.24	0.085	0.074
FFG-31	06 08 *	S	1/8 1/4	1.5	0 to 0.7	0.30	0.49	0.080	0.069	0.30	0.48	0.080	0.069	0.27	0.46	0.080	0.069	0.27	0.42	0.075	0.065
		2		2	0 to 0.4	0.55	0.46	0.15	0.13	0.49	0.47	0.13	0.11	0.49	0.38	0.13	0.11	0.49	0.30	0.10	0.087
		3		3	0 to 0.15	1.1	0.37	0.27	0.23	0.95	0.46	0.20	0.17	1.1	0.14	0.24	0.21	0.9	0.17	0.17	0.15
FFG-41	08 10 *	2	1/4 3/8	2	0 to 0.7 (0.6)	0.55	0.49	0.16	0.14	0.55	0.49	0.15	0.13	0.49	0.44	0.14	0.12	0.49	0.45	0.13	0.11
		3		3	0 to 0.3	1.2	0.40	0.32	0.28	1.2	0.39	0.30	0.26	1.1	0.29	0.30	0.26	1.1	0.22	0.25	0.22
		4		4	0 to 0.15	1.9	0.40	0.47	0.41	1.8	0.37	0.41	0.36	1.9	0.21	0.41	0.36	1.8	0.19	0.32	0.28
FFG-51	08 10 *	2	1/4 3/8	2	0 to 1.2 (0.6)	0.55	0.49	0.16	0.14	0.55	0.49	0.15	0.13	0.49	0.44	0.14	0.12	0.49	0.45	0.13	0.11
		3		3	0 to 0.6 (0.3)	1.2	0.40	0.32	0.28	1.2	0.39	0.30	0.26	1.1	0.29	0.30	0.26	1.1	0.22	0.25	0.22
		4		4	0 to 0.3 (0.15)	1.9	0.40	0.47	0.41	1.8	0.37	0.41	0.36	1.9	0.21	0.41	0.36	1.8	0.19	0.32	0.28
NC pressurization																					
FFG-33	06 08 *	S	1/8 1/4	1.5	0 to 1.0					0.30	0.48	0.080	0.069	0.27	0.46	0.080	0.069				
		2		2	0 to 0.7					0.49	0.47	0.13	0.11	0.49	0.38	0.13	0.11				
		3		3	0 to 0.3					0.95	0.46	0.20	0.17	1.1	0.14	0.24	0.21				
FFG-43	08 10 *	2	1/4 3/8	2	0 to 1.2					0.55	0.49	0.15	0.13	0.49	0.44	0.14	0.12				
		3		3	0 to 0.6					1.2	0.39	0.30	0.26	1.1	0.29	0.30	0.26				
		4		4	0 to 0.3					1.8	0.37	0.41	0.36	1.9	0.21	0.41	0.35				

*1: Values in ( ) are for NO pressurization.
*2: When using at low vacuum, the lower limit of the working pressure is 1.33×10^2 Pa (abs), so the upper limit is 0.1 MPa lower.
*Refer to page 53 for 3:Kv value.

Weight

●Universal

Model No.	Mass (kg)
FFG-21	0.27
FFG-31	0.48
FFG-41	0.74
FFG-51	0.93

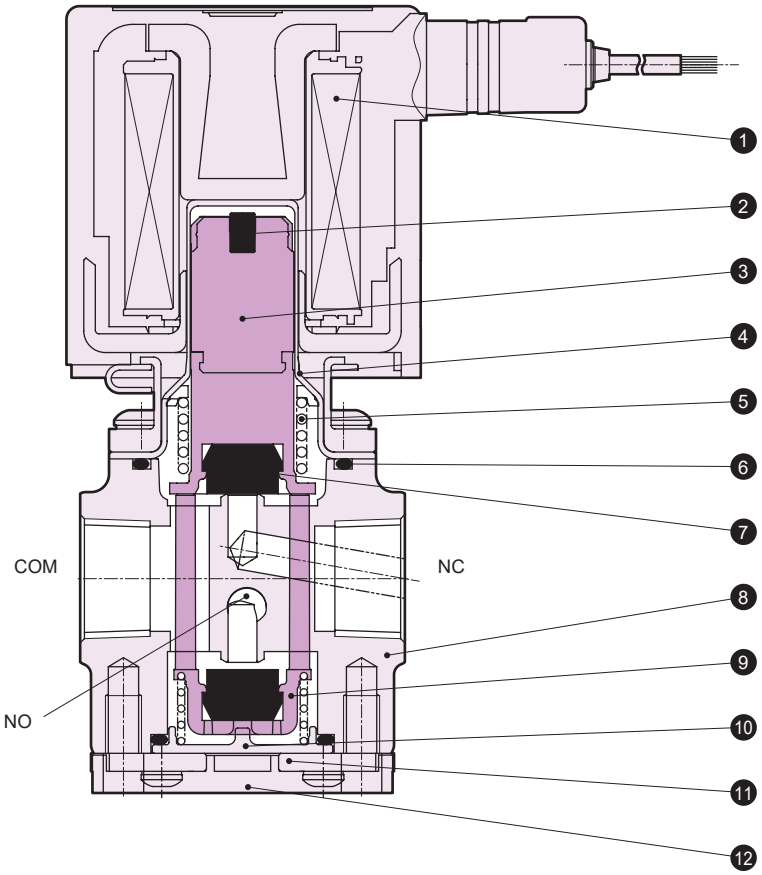
*: Weight of brass body with DC lead wire.

●NC pressurization

Model No.	Mass (kg)
FFG-33	0.48
FFG-43	0.74

*: Weight of brass body with DC lead wire.

Internal Structure Diagram/Materials



Part No.	Name	Material	
1	Coil assembly	–	
2	Noise dampening rubber	HNBR(FKM,EPDM)	Hydrogenated nitrile rubber (fluoro rubber, ethylene propylene rubber)
3	Plunger	SUS,PPS	Stainless steel, polyphenylene sulfide
4	Flare pipe assembly	SUS,PPS	Stainless steel, polyphenylene sulfide
5	Plunger spring	SUS304	Stainless Steel
6	O-ring	NBR(FKM,EPDM)	Nitrile rubber (fluoro rubber, ethylene propylene rubber)
7	Seal	NBR(FKM,EPDM)	Nitrile rubber (fluoro rubber, ethylene propylene rubber)
8	Body	Brass (ADC, SCS13)	Brass (aluminum die-casting, stainless steel)
9	Valve Body Guide	PPS	Polyphenylene sulfide
10	NO cover	PPS	Polyphenylene sulfide
11	Covers A, B *1	SUS304	Stainless Steel
12	Cover cover *2	POM	Polyacetal

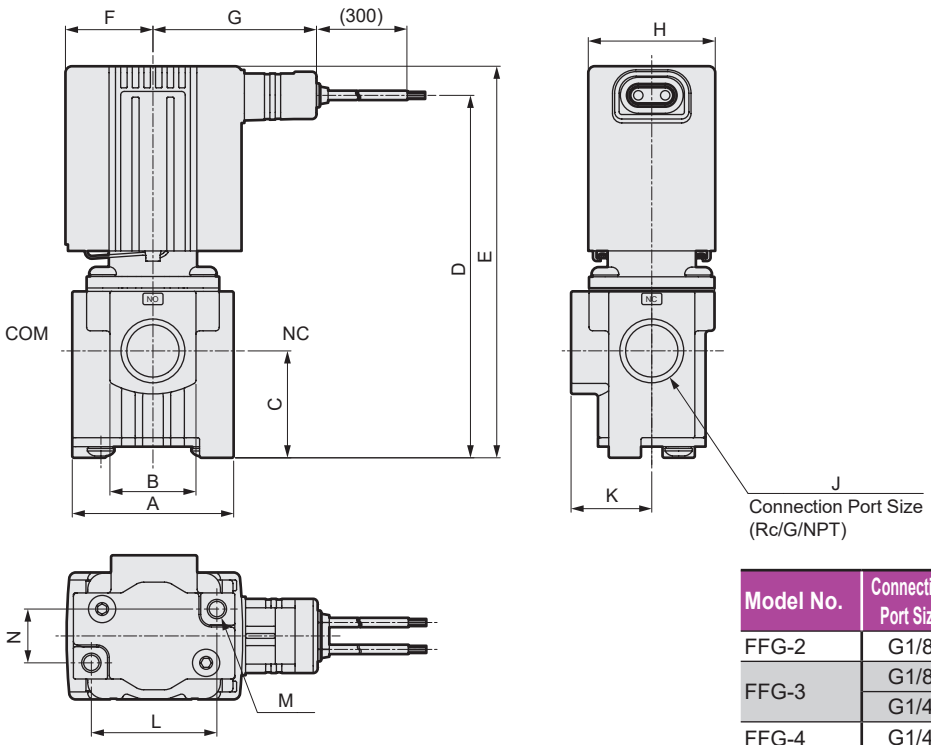
( ) shows options.
*1: brass body, stainless steel cover A, aluminum cover B
*2: Only for body material of brass/stainless steel

For maintenance parts refer to CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No." → Maintenance parts

External Dimension Drawings

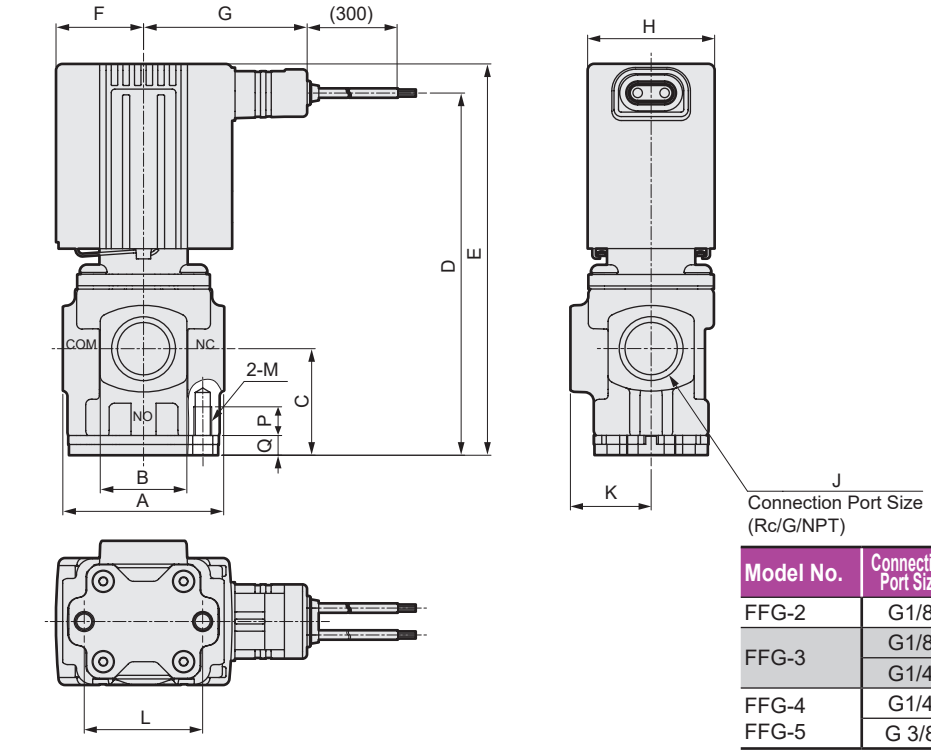
● Lead wire/DC voltage Coil option code: A/J

Aluminum body



Model No.	Connection Port Size	Thread depth
FFG-2	G1/8	7.4
FFG-3	G1/8	8.5
	G1/4	10.5
FFG-4	G1/4	12.5
FFG-5	G 3/8	11.4

Brass body/stainless steel body

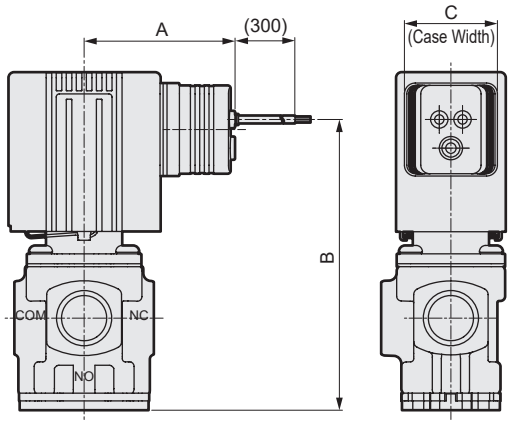


Model No.	Connection Port Size	Thread depth
FFG-2	G1/8	7.4
FFG-3	G1/8	8.5
	G1/4	10.5
FFG-4	G1/4	12.5
FFG-5	G 3/8	11.4

Model No.		A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
FFG-2	Aluminum body	32	17	21	69.5	78	18.5	42	24	1/8	16	25	M4 depth 6	8	–	–
	Brass/SUS body											23.8	M4	–	6	4.5
FFG-3	Aluminum body	40	19	26.5	86.5	94	22	45	30	1/8	20	32	M5 depth 8	11	–	–
	Brass/SUS body			26	86	93.5				1/4		29	M5	–	6	4.5
FFG-4	Aluminum body	45	24	30	101	109	24.5	47.5	35	1/4	22.5	35	M5 depth 8	15	–	–
	Brass/SUS body									3/8		33	M5	–	8	5.5
FFG-5	Aluminum body	45	24	30	110	118	27.5	50	40	1/4	22.5	35	M5 depth 8	15	–	–
	Brass/SUS body									3/8		33	M5	–	8	5.5

External Dimension Drawings

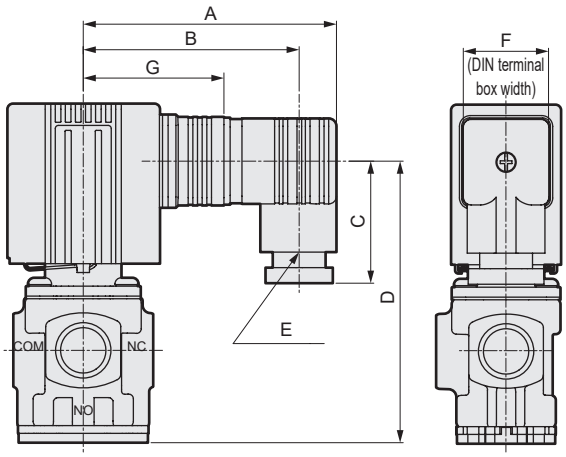
● Lead wire/AC voltage Coil option code: A



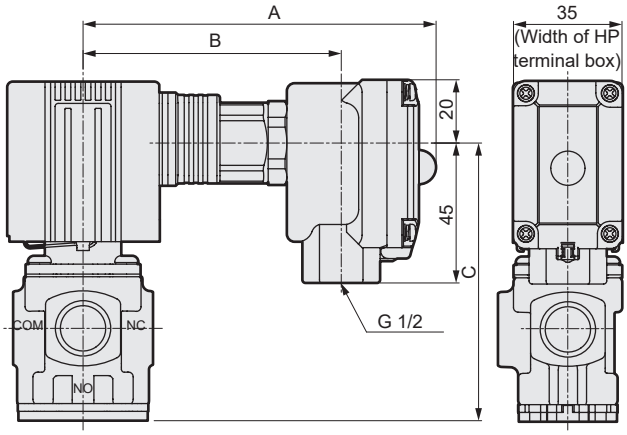
Model No.		A	B	C
FFG-2	Aluminum body	43	66	24
	Brass/SUS body			
FFG-3	Aluminum body	46	79	30
	Brass/SUS body		78.5	
FFG-4	Aluminum body	48.5	94	30
	Brass/SUS body			
FFG-5	Aluminum body	51	103	30
	Brass/SUS body			

Optional dimensions

● WIth DIN terminal box Coil option code: B/C/D/K/L/S
● DIN coil without terminal box



● With HP terminal box Coil option code: G/H/Q/R



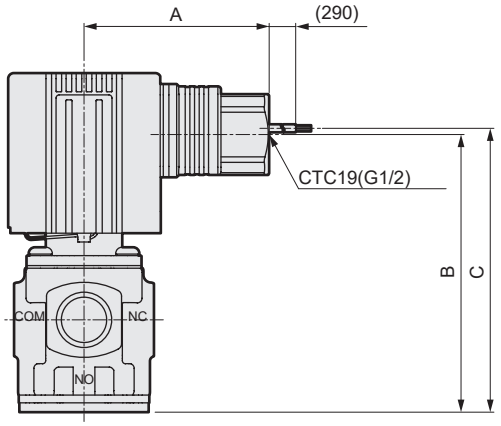
Dimensions shown in ( ) are for G1/2.

Model No.		A	B	C	D	E	F	G
FFG-2	Aluminum body	73	64	36	62.5	Pg9	21	39
	Brass/SUS body							
FFG-3	Aluminum body	78.5	66.5 (65.5)	39.5 (41.5)	76	Pg11 (G 1/2)	27.5	42
	Brass/SUS body				75.5			
FFG-4	Aluminum body	81	69 (67.5)	39.5 (41.5)	90.5	Pg11 (G 1/2)	27.5	44.5
	Brass/SUS body							
FFG-5	Aluminum body	83.5	71.5 (70)	39.5 (41.5)	99.5	Pg11 (G 1/2)	27.5	47
	Brass/SUS body							

Model No.		A	B	C
FFG-2	Aluminum body	–	–	–
	Brass/SUS body	–	–	–
FFG-3	Aluminum body	113	82	74.5
	Brass/SUS body			74
FFG-4	Aluminum body	115	85	89.5
	Brass/SUS body			
FFG-5	Aluminum body	118	87	98.5
	Brass/SUS body			

Optional dimensions

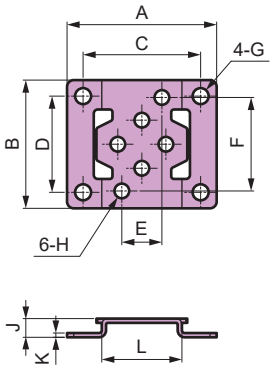
● Conduit Coil option code: E/F/M/P

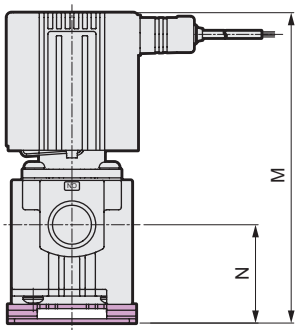


Model No.		A	B	C
FFG-2	Aluminum body	–	–	–
	Brass/SUS body	–	–	–
FFG-3	Aluminum body	56.5	74.5	76.5
	Brass/SUS body		74	76
FFG-4	Aluminum body	59	89.5	91.5
	Brass/SUS body			
FFG-5	Aluminum body	61.5	98.5	100.5
	Brass/SUS body			

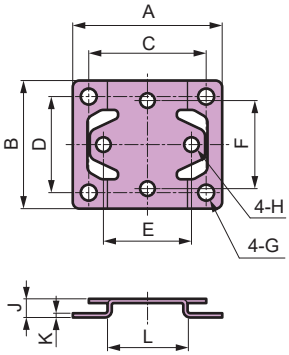
● Mounting plate① Option code: B

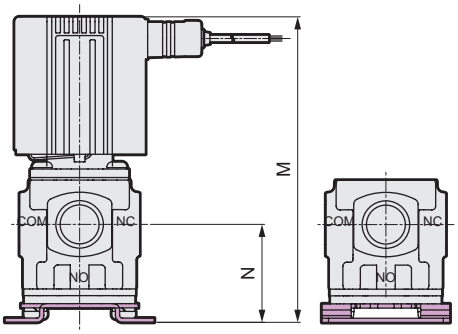
Aluminum body





Brass/stainless steel body





Model No.		A	B	C	D	E	F	G	H	J	K	L	M	N
FFG-2	Aluminum body	40	34	30	25	8	25	ø5	ø4.5	6	1.2	20	84	27
	Brass/SUS body					23.8	23.8					19		
FFG-3	Aluminum body	52	42	40	30	11	32	ø6	ø5.5	7	1.6	25	101	33.5
	Brass/SUS body					29	29					26	100.5	33
FFG-4	Aluminum body	56	48	44	36	15	35	ø6	ø5.5	7	1.6	30	116	37
	Brass/SUS body					33	33							
FFG-5	Aluminum body	62	50	50	38	15	35	ø6	ø5.5	7	1.6	36	125	37
	Brass/SUS body	56	48	44	36	33	33					30		

Direct acting 3-port solenoid valve, manifold

FFGM Series

- Universal
- Connection Port Size: Rc/G/NPT 1/8, 1/4

CE UKCA RoHS

For compatible detailed model Nos., please visit the CKD website.

Model No. Notation Method

FFGM - 4 1 08 A 4 05 C 3 C 3

- FFGM: Model No.
- 4: ❶ Valve size
- 1: Actuation Method: Common supply, Centralized Exhaust
- 08: ❷ Connection Port Size
- A: ❸ Thread and pressure unit indicated on nameplate
- 4: ❹ Orifice size
- 05: ❺ Number of Manifold Stations
- C: ❻ Body/sealant combination
- 3: ❼ Coil thermal class
- C: ❽ Coil option
- 3: ❾ Rated voltage

❶ Valve size

Code	Content
3	Width 30 mm
4	Width 35 mm
5	Width 40 mm

❷ Connection Port Size

Code	Content
08	1/4
00	Actuator only

❸ Thread and pressure unit indicated on nameplate

Code	Content		
	Thread	Pressure display unit	
A	Rc thread	MPa	
B	G thread	bar	
C	NPT Thread	psi	*2
D	G thread	MPa	*3
E	NPT Thread	MPa	*3

*1: If the ❷port size is only for "00" actuator, there is no thread, so select either "A" (MPa), "B" (bar), or "C" (psi) pressure display unit.
*2: In compliance with the Measurement Act, the psi display cannot be used in Japan.
*3: "D" and "E" are selections primarily for indicating MPa as the pressure display unit in Japan even for G and NPT threads.

❹ Orifice size

Code	Content	❶ Valve size 3	4	5
S	ø1.5	●		
2	ø2	●	●	●
3	ø3	●	●	●
4	ø4		●	●

❺ Number of Manifold Stations

Code	Content
02 to 09	2 stations to 9 stations
10	10 stations
00	Actuator only

*: For brass or stainless steel body, the manifold station No. is from 2 to 5 stations.

❻ Body/sealant combination

Body	Seal	Treatment	Code	Operating Fluid: Compressed Air	Dry air Inert gas	Water	Oil	Low vacuum (*1)
Aluminum	NBR	-	A	●	●			
Brass	NBR	-	C	●	●	●	●	●
	FKM	-	D	●	●	●	●	●
Stainless Steel	NBR	-	H	●	●	●	●	●
	FKM	-	J	●	●	●	●	●
Brass	NBR	Oil-prohibited	N	●	●	●	●	●
	FKM	Oil-prohibited	P	●	●	●	●	●
Stainless Steel	NBR	Oil-prohibited	S	●	●	●	●	●
	FKM	Oil-prohibited	T	●	●	●	●	●

*1: This can be used with alow vacuum of [1.33 × 10^2 Pa (abs)], but valve seat leakage is 0.2cm^3/min (ANR) or less. (Valve seat leakage at positive pressure)
When using at low vacuum, the lower limit of the working pressure is 1.33 × 10^2 Pa (abs), so the upper limit is 0.1 MPa lower.

❼ Coil thermal class

Code	Content
3	Class 130 (B)

❽ Coil option

Code	Content		❶ Valve size 3	4	5	Voltage DC	AC
A	Lead wire (300 mm)		●	●	●	●	●
B	With DIN terminal box (G1/2)		●	●	●	●	●
C	With DIN terminal box (Pg11)		●	●	●	●	●
D	DIN terminal box with lamp (Pg11)		●	●	●	*1	●
E	Conduit (G1/2)		●	●	●	●	●
F	Conduit (CTC19)		●	●	●	●	●
G	HP terminal box (G1/2)		●	●	●	●	●
H	HP terminal box with lamp (G1/2)		●	●	●	●	●*3
J	Lead wire (300 mm)	With surge absorber	●	●	●	●*2	*4
K	With DIN terminal box (Pg11)	With surge absorber	●	●	●	●	
L	DIN terminal box with lamp (Pg11)	With surge absorber	●	●	●	●	
M	Conduit (G1/2)	With surge absorber	●	●	●	●	
P	Conduit (CTC19)	With surge absorber	●	●	●	●	
Q	HP terminal box (G1/2)	With surge absorber	●	●	●	●	
R	HP terminal box with lamp (G1/2)	With surge absorber	●	●	●	●	
S	DIN coil without terminal box		●	●	●	●*5	●*4

*1: Use "L" DIN terminal box with lamp/surge suppressor.
*2: DC voltage coil option "J" surge suppressor is attached.
*3: When the coil option "H" is selected, the ❾rated voltage "K" (230 VAC) cannot be selected.
*4: All AC voltages have a full-wave rectifier circuit. Significant surges generated in the coil by the action of this diode are almost eliminated. For this reason, a surge suppressor is not available.
*5: Surge suppressor is not available. Use the terminal box with surge suppressor.

❾ Rated voltage

Code	Content
1	100 VAC 50/60 Hz
2	200 VAC 50/60 Hz
3	24 VDC
4	12 VDC
5	110 VAC 50/60 Hz
6	220 VAC 50/60 Hz
K	230 VAC 50/60 Hz

⚠ Model No. Notion Method

Masking plate orders are also available. Refer to Model No. Notion Method on page 45.

Coil option code

	A(DC)	Grommet lead wire 300 mm
	J	Grommet lead wire 300mm with surge suppressor
	A(AC)	Grommet lead wire 300 mm
	B C	DIN terminal box
	K	DIN terminal box with surge suppressor
	D	DIN terminal box with lamp
	L	DIN terminal box/lamp/ With surge suppressor
	G	HP terminal box
	Q	HP terminal box with surge suppressor
	H	HP terminal box with lamp
	R	HP terminal box with lamp/ surge suppressor
	E	Conduit (G1/2)
	F	Conduit (CTC19)
	M	Conduit (G1/2) with surge suppressor
	P	Conduit (CTC19) with surge suppressor
	S	DIN coil without terminal box

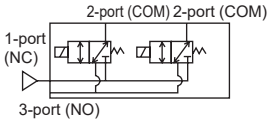
Common Specifications

Item	FFGM
Operating Fluid	Compressed air/dry air/inert gas/water/oil (50mm^2/s or less)/low vacuum [1.33 × 10^2 Pa (abs)] *1
Max. working pressure MPa	1.2 (refer to working pressure in individual specifications.)
Proof pressure (water pressure) MPa	1.8
Fluid temperature °C	−10 to 40 (no freezing)
Ambient Temperature °C	−10 to 40
Thermal class	Class 130 (B)
Atmosphere	Place free of corrosive gas and explosive gas
Valve Structure	Direct acting poppet structure
Valve seat leakagecm^3/min (ANR)	0.2 or less (air)
Mounting Orientation	Unrestricted
Protection Structure	IP65

*1: When using at low vacuum, vacuum the NC/NO port sides.

Circuit Diagram Symbol

● Common supply/common exhaust



Electrical specifications

Item		FFGM-3						
Rated voltage	V	24 VDC	12 VDC	100 VAC 50/60Hz	110 VAC 50/60Hz	200 VAC 50/60Hz	220 VAC 50/60Hz	230 VAC 50/60Hz
Voltage Fluctuation Range		±10%						
Power Consumption	W	4.5	4.5	–	–	–	–	–
Apparent power	VA	–	–	6.2	6.1	6.2	6.2	6.5

Item		FFGM-4							FFGM-5						
Rated voltage	V	24 VDC	12 VDC	100 VAC 50/60Hz	110 VAC 50/60Hz	200 VAC 50/60Hz	220 VAC 50/60Hz	230 VAC 50/60Hz	24 VDC	12 VDC	100 VAC 50/60Hz	110 VAC 50/60Hz	200 VAC 50/60Hz	220 VAC 50/60Hz	230 VAC 50/60Hz
Voltage Fluctuation Range		±10%							±10%						
Power Consumption	W	7	7	–	–	–	–	–	10.5	10.5	–	–	–	–	–
Apparent power	VA	–	–	8.6	10	9.6	9.5	9.4	–	–	13	13	14	14	13

The leakage current must be less than or equal to the values shown below.

Voltage	AC					DC	
	100 V	110 V	200 V	220 V	230 V	12 V	24 V
Leakage current	2 mA or less		1 mA or less			5 mA or less	

Individual specifications

Item / Model No.			Connection Port Size Rc/G/NPT 2-port	Connection Port Size Rc/G/NPT 1-port 3-port	Orifice size (mm)	Working pressure (MPa)*1*2	Flow Characteristics														
							COM→NC				COM→NO				NC→COM				NO→COM			
							C [dm³/(s·bar)]	b	Cv	Kv value *3	C [dm³/(s·bar)]	b	Cv	Kv value *3	C [dm³/(s·bar)]	b	Cv	Kv value *3	C [dm³/(s·bar)]	b	Cv	Kv value *3
Universal																						
FFGM-31	08 *	S	1/4	1/4	1.5	0 to 0.7	0.31	0.41	0.089	0.077	0.31	0.26	0.079	0.069	0.28	0.33	0.070	0.061	0.27	0.32	0.073	0.063
		2			2	0 to 0.4	0.54	0.42	0.15	0.13	0.52	0.10	0.12	0.10	0.49	0.19	0.12	0.10	0.48	0.25	0.12	0.10
		3			3	0 to 0.15	0.92	0.26	0.22	0.19	0.85	0.090	0.19	0.16	0.86	0.11	0.20	0.17	0.88	0.15	0.20	0.17
FFGM-41	08 *	2	1/4	1/4	2	0 to 0.7 (0.6)	0.56	0.46	0.16	0.14	0.56	0.29	0.15	0.13	0.52	0.32	0.14	0.12	0.50	0.31	0.12	0.10
		3			3	0 to 0.3	1.2	0.40	0.33	0.29	1.1	0.060	0.26	0.23	1.1	0.16	0.27	0.23	1.1	0.17	0.26	0.23
		4			4	0 to 0.15	1.8	0.27	0.42	0.36	1.3	0.15	0.36	0.31	1.6	0.090	0.36	0.31	1.5	0.13	0.37	0.32
FFGM-51	08 *	2	1/4	1/4	2	0 to 1.2 (0.6)	0.56	0.46	0.16	0.14	0.56	0.29	0.15	0.13	0.52	0.32	0.14	0.12	0.50	0.31	0.12	0.10
		3			3	0 to 0.6 (0.3)	1.2	0.40	0.33	0.29	1.1	0.060	0.26	0.23	1.1	0.16	0.27	0.23	1.1	0.17	0.26	0.23
		4			4	0 to 0.3 (0.15)	1.8	0.27	0.42	0.36	1.3	0.15	0.36	0.31	1.6	0.09	0.36	0.31	1.5	0.13	0.37	0.32

*1: Values in ( ) are for NO pressurization.
*2: When using at low vacuum, the lower limit of the working pressure is 1.33×10^2 Pa (abs), so the upper limit is 0.1 MPa lower.
*Refer to page 53 for 3:Kv value.

Weight

●Body material: Aluminum

Model No.	Mass (kg)									
	Actuator only	2 stations	3 stations	4 stations	5 stations	6 stations	7 stations	8 stations	9 stations	10 stations
FFGM-3	0.34	1.0	1.5	2.0	2.5	2.9	3.4	3.9	4.4	4.8
FFGM-4	0.53	1.4	2.1	2.8	3.5	4.2	4.8	5.5	6.2	6.9
FFGM-5	0.72	1.8	2.7	3.6	4.6	5.5	6.4	7.3	8.2	9.1

*: Weight of aluminum sub-plate with 24 VDC lead wire.

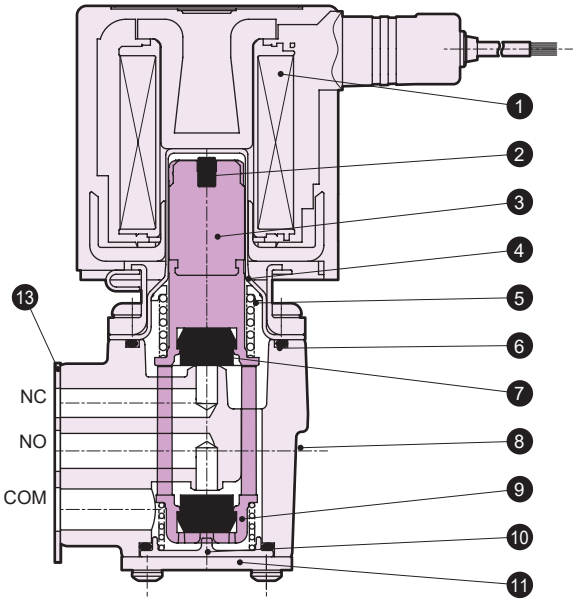
●Body material: Brass/stainless steel

Model No.	Mass (kg)				
	Actuator only	2 stations	3 stations	4 stations	5 stations
FFGM-3	0.49	2.2	3.1	4.1	5.0
FFGM-4	0.78	2.8	4.1	5.4	6.6
FFGM-5	0.97	3.3	4.8	6.4	7.9

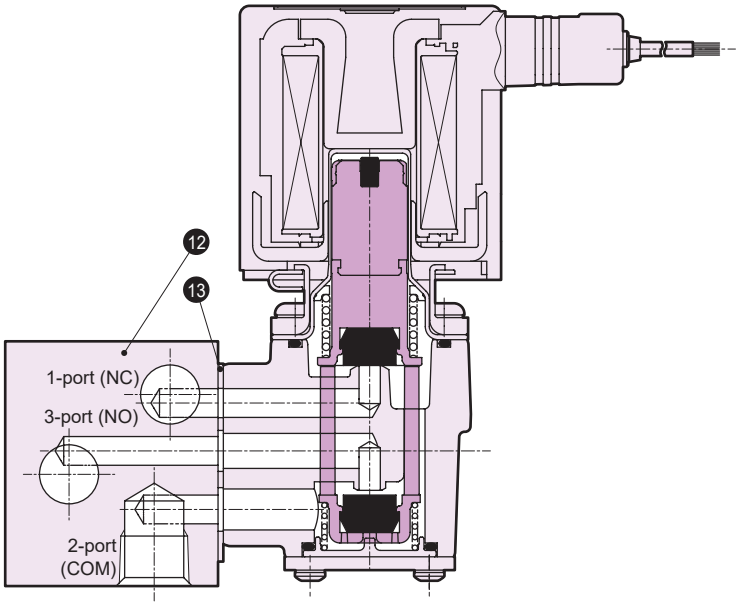
*: Weight of brass body, stainless steel sub-plate 24 VDC lead wire.

Internal Structure Diagram/Materials

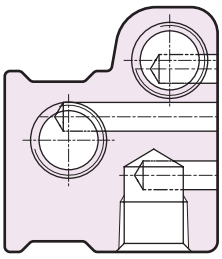
● FFGM actuator



● FFGM manifold



Body material: For brass and SUS



Body material: For aluminum

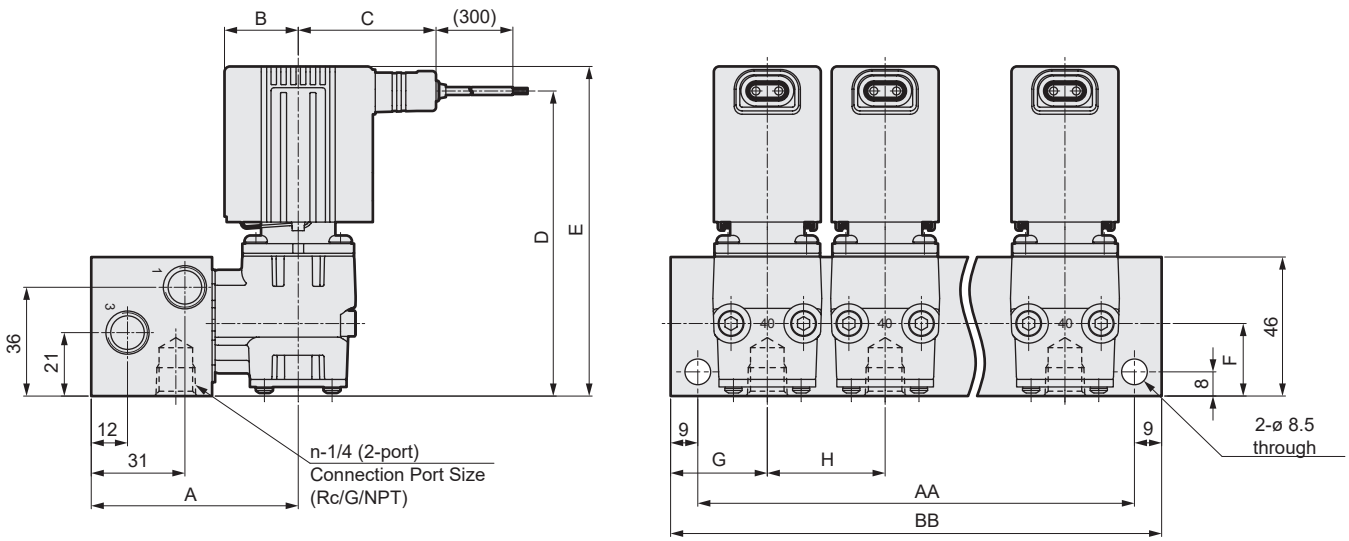
Part No.	Name	Material	
1	Coil assembly	–	
2	Noise dampening rubber	HNBR(FKM,EPDM)	Hydrogenated nitrile rubber (fluoro rubber, ethylene propylene rubber)
3	Plunger	SUS,PPS	Stainless steel, polyphenylene sulfide
4	Flare pipe assembly	SUS,PPS	Stainless steel, polyphenylene sulfide
5	Plunger spring	SUS304	Stainless Steel
6	O-ring	NBR(FKM,EPDM)	Nitrile rubber (fluoro rubber, ethylene propylene rubber)
7	Seal	NBR(FKM,EPDM)	Nitrile rubber (fluoro rubber, ethylene propylene rubber)
8	Body	Brass (aluminum, SCS13)	Brass (aluminum, stainless steel)
9	Valve Body Guide	PPS	Polyphenylene sulfide
10	NO cover	PPS	Polyphenylene sulfide
11	Cover M	SUS304	Stainless Steel
12	Sub-plate	SUS304 (aluminum)	Stainless steel (aluminum) *1
13	Gasket	NBR (FKM)	Nitrile rubber (fluoro rubber)

( ) shows options.
*1: Body material: For brass, the sub-plate material is stainless steel.

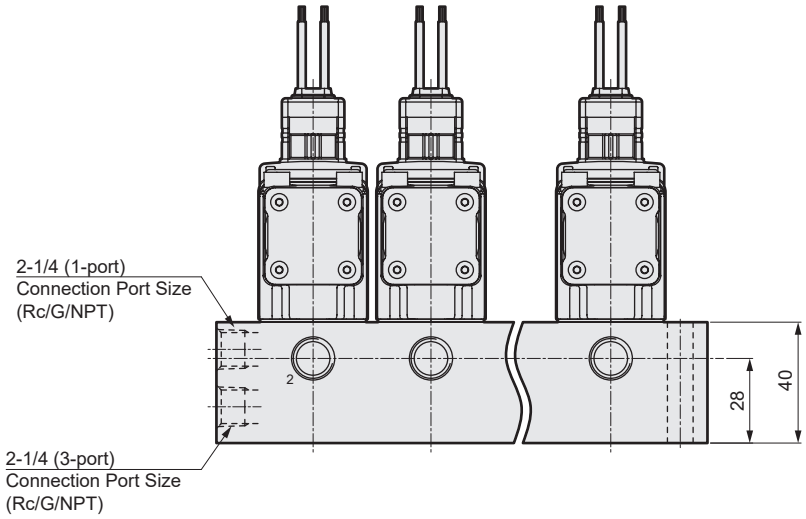
For maintenance parts refer to CKD Components Product Site (https://www.ckd.co.jp/kiki/en/) → "Model No." → Maintenance parts

External Dimension Drawings

● Manifold lead wire/DC voltage Coil option code: A/J



Model No.	Connection Port Size	Thread depth
FFGM-3	G1/4	12.5
FFGM-4	G1/4	12.5
FFGM-5	G1/4	12.5

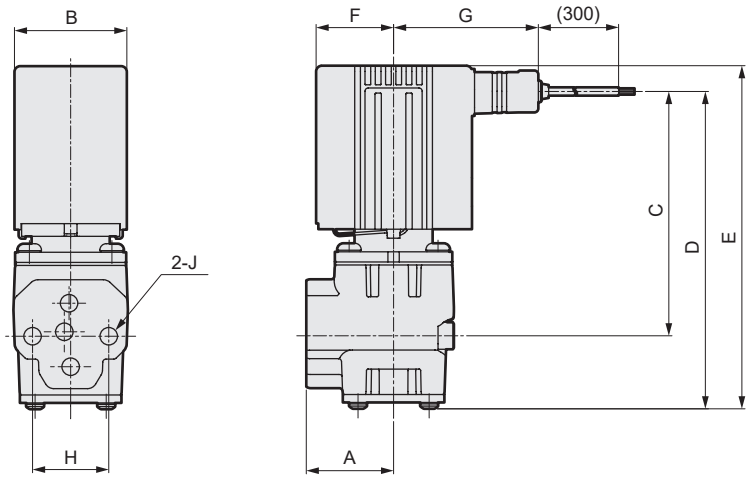


Model No.		A	B	C	D	E	F	G	H
FFGM-3	Aluminum body	63.5	22	45	88	95.5	25	32	36
	Brass/SUS body								36
FFGM-4	Aluminum body	68.5	24.5	47.5	101	109	24	32	38
	Brass/SUS body								39
FFGM-5	Aluminum body	68.5	27.5	50	110	118.5	24	32	46
	Brass/SUS body								45

Model No.		Station No. / Code	2	3	4	5	6	7	8	9	10
FFGM-3	Aluminum body	AA	82	118	154	190	226	262	298	334	370
		BB	100	136	172	208	244	280	316	352	388
	Brass/SUS body	AA	82	118	154	190	–	–	–	–	–
		BB	100	136	172	208	–	–	–	–	–
FFGM-4	Aluminum body	AA	84	122	160	198	236	274	312	350	388
		BB	102	140	178	216	254	292	330	368	406
	Brass/SUS body	AA	85	124	163	202	–	–	–	–	–
		BB	103	142	181	220	–	–	–	–	–
FFGM-5	Aluminum body	AA	92	138	184	230	276	322	368	414	460
		BB	110	156	202	248	294	340	386	432	478
	Brass/SUS body	AA	91	136	181	226	–	–	–	–	–
		BB	109	154	199	244	–	–	–	–	–

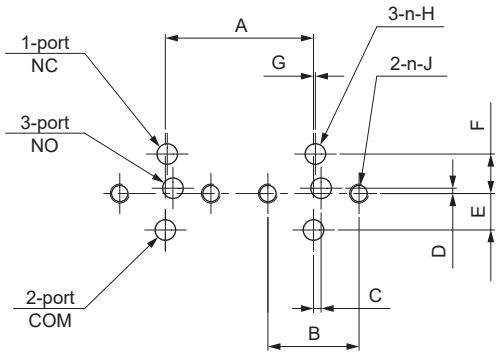
External Dimension Drawings

● Actuator lead wire/DC voltage Coil option code: A/J



Model No.	A	B	C	D	E	F	G	H	J
FFGM-3	23	30	63	85.5	93	22	45	20	ø4.5
FFGM-4	27.5	35	77	100	108	24.5	47.5	24	ø5.5
FFGM-5	27.5	40	86	109	117	27.5	50	24	ø5.5

● Actuator installation dimensions



* Machining diagram when using 2 actuators.

Model No.		A	B	C	D	E	F	G	H	J
FFGM-3	Aluminum body	36 or more	20±0.1	1.5±0.1	±0	9±0.2	7.5±0.2	0.5	ø4	M4 depth of 10 or more
	Brass/SUS body	36 or more								
FFGM-4	Aluminum body	38 or more	24±0.1	2±0.1	1.4±0.1	9.6±0.2	10.4±0.2	0.5	*5.4	M5 depth of 10 or more
	Brass/SUS body	39 or more								
FFGM-5	Aluminum body	46 or more	24±0.1	2±0.1	1.4±0.1	9.6±0.2	10.4±0.2	0.5	*5.4	M5 depth of 10 or more
	Brass/SUS body	45 or more								

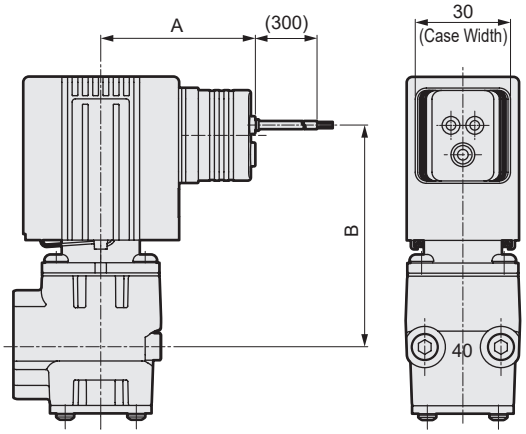
Model No. Notion Method discrete masking plate

With gasket and mounting screws

	Aluminum body	Brass, stainless steel body	
Seal	NBR	NBR	FKM
FFGM-3	FFGM-31A-MP-KIT	FFGM-31H-MP-KIT	FFGM-31J-MP-KIT
FFGM-4	FFGM-41A-MP-KIT	FFGM-41H-MP-KIT	FFGM-41J-MP-KIT
FFGM-5	FFGM-41A-MP-KIT	FFGM-41H-MP-KIT	FFGM-41J-MP-KIT

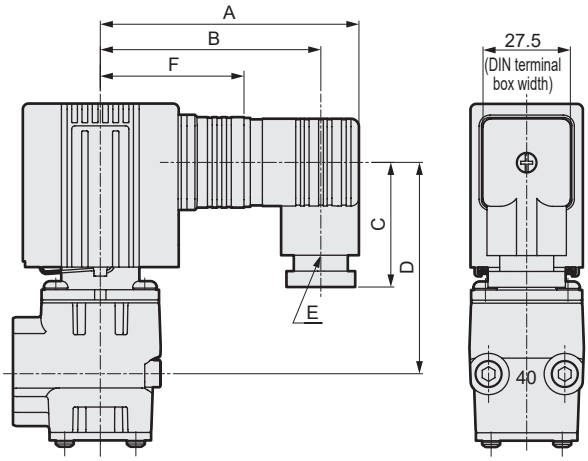
External Dimension Drawings

● Actuator lead wire/AC voltage Coil option code: A/J



Model No.	A	B
FFGM-3	46	55.5
FFGM-4	48.5	70
FFGM-5	51	79

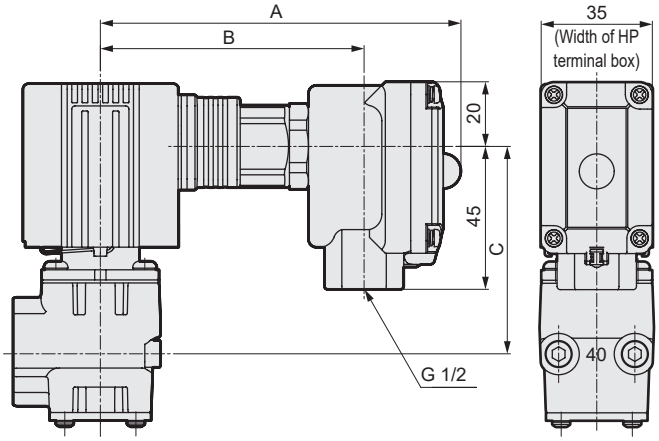
● Actuator with DIN terminal box Coil option code: B/C/D/K/L/S
● Actuator without DIN coil/terminal box



Dimensions shown in ( ) are for G1/2.

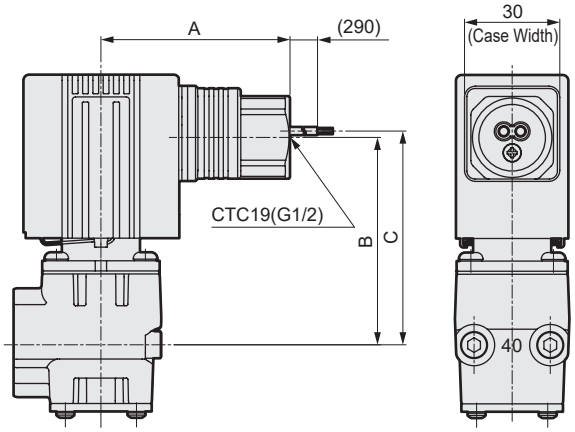
Model No.	A	B	C	D	E	F
FFGM-3	78.5	66.5 (65.5)	39.5 (41.5)	52.5	Pg11 (G 1/2)	42
FFGM-4	81	69 (67.5)	39.5 (41.5)	66.5	Pg11 (G 1/2)	44.5
FFGM-5	83.5	71.5 (70)	39.5 (41.5)	75.5	Pg11 (G 1/2)	47

● Actuator HP terminal box Coil option code: G/H/Q/R



Model No.	A	B	C
FFGM-3	113	82	51
FFGM-4	115	85	65.5
FFGM-5	118	87	74.5

● Actuator conduit Coil option code: E/F/M/P



Model No.	A	B	C
FFGM-3	56.5	51	53
FFGM-4	59	65.5	67.5
FFGM-5	61.5	74.5	76.5

Working fluid check list

For multi-fluid control 2, 3-port solenoid valves

⚠ Caution

This check list displays guidelines for typical corrosion resistance, and does not guarantee the solenoid valve performance. During actual use, there are unpredictable elements. Thus, there may be cases when general specifications do not apply. Therefore, before use, check the compatibility as needed and take the necessary safety measures on the equipment side.

[Indicates the compatibility of sealant material, body material and working fluid.]

Acrylic/nitriles to　# Ethyl ether

●: Usable ▲: Usable with conditions ×: Not Usable

	Fluid name	Fluid properties (Indicators the state of the raw material even if the fluid indicates water solubility)	Material combination [Body material] Brass/Bronze [Sealant material] Nitrile rubber	Fluororubber	Ethylene propylene	Tetrafluoroethylene resin	[Body material] Stainless Steel [Sealant material] Nitrile rubber	Fluororubber	Ethylene propylene	Tetrafluoroethylene resin	Selection Precautions
#	Acrylic/nitriles	Liquid	×	×	×	×	×	×	●	●	Highly flammable liquid. Toxic substance.
	Acetylene	Gas	×	×	×	×	▲	▲	×	▲	Highly explosive gas. Contact CKD during model selection. If explosion proof (d3G2) is specified, CKD solenoid valves cannot be used. Instead use an air operated type.
	Acetaldehyde	Liquid	×	×	×	●	×	×	×	●	Flammable liquid. If explosion-proof types are specified by the surrounding environment, select explosion-proof (d2G4).
	Acetone	Liquid	×	×	●	●	×	×	●	●	Flammable liquid. If explosion-proof types are specified by the surrounding environment, select explosion-proof (d2G4).
	Aniline	Liquid	×	×	×	×	×	●	●	●	Organic solvents used in paints or dyes.
	Linseed oil		×	×	×	×	●	●	×	●	Take note of viscosity. For direct acting 2-port valves, the fluid viscosity must be 50 mm²/s or less. Pilot operated solenoid valves cannot be used.
	Amyl alcohols	Liquid	×	●	●	●	×	●	●	●	Ethylene propylene rubber is more suitable than fluoro rubber.
	Argon	Gas	●	●	●	●	●	●	●	●	This is an inert gas so there is no corrosion. Specify oil-prohibited specifications. Select Multi-fit valve FFB.
	Ammonia	Gas	×	×	×	×	×	×	▲	▲	Specify a coil with a diode or the DC voltage model. (*1)
	Aqueous ammonia	Liquid	×	×	×	×	×	×	▲	▲	Same as above. AKA: Ammonium hydroxide.
#	Isopropyl alcohol	Liquid	●	●	●	●	●	●	●	●	AKA: IPA. Used in semiconductor washers.
#	Ethyl alcohol (pure)	Liquid	×	●	●	●	×	●	●	●	AKA: Ethanol. If explosion-proof types are specified by the surrounding environment, select explosion-proof (d2G2) or (d2G4).
	Ethyl alcohol (industrial)	Liquid	×	×	●	●	×	×	●	●	
	Ethyl ether	Liquid	×	×	×	●	×	×	×	●	In general, these are known as ethers.

*1: AG, AB42, AP12, AP22, AD12, AD22, explosion-proof types (excluding ADK) and PVS cannot be used even with a coil with diode or DC voltage.

[Indicates the compatibility of sealant material, body material and working fluid.]

Ethylene oxide gas to # Gasoline

●: Usable ▲: Usable with conditions ×: Not Usable

	Fluid name	Fluid properties (Indicators the state of the raw material even if the fluid indicates water solubility)	Material combination [Body material] Brass/Bronze [Sealant material] Nitrile rubber	Fluororubber	Ethylene propylene	Tetrafluoroethylene resin	[Body material] Stainless Steel [Sealant material] Nitrile rubber	Fluororubber	Ethylene propylene	Tetrafluoroethylene resin	Selection Precautions
#	Ethylene oxide gas	Gas	×	×	×	×	×	×	×	×	AKA: Also called E.O.G or ethylene oxide. Boils into gas at 10.4°C. Explosive gas.
	Ethylene glycol	Liquid	●	●	●	●	●	●	●	●	Used as anti-freeze.
	Aqueous ammonium chloride	(Crystal)	×	×	×	×	×	×	×	×	Solenoid valves not suitable. Select a completely resin air operated valve.
	Ethylene chloride	Gas	×	×	×	×	×	×	×	●	AKA: Ethyl chloride. Requires dry conditions. Air Operated Valves for Chemicals Select CKD's oil mist if moisture is present. Flammable gas.
	Methyl chloride	Gas	×	×	×	×	×	×	×	●	AKA: also called methyl chloride or chloromethane. Boils into gas at -23°C. Requires dry conditions. Air Operated Valves for Chemicals Select CKD's oil mist if moisture is present.
	Methylene chloride	Liquid	×	×	×	×	×	×	×	●	AKA: Dichloromethane.
	Aqueous potassium chloride	(Crystal)	×	×	×	×	×	×	×	×	Cannot be used with metal.
	Aqueous magnesium chloride	(Crystal)	×	×	×	×	×	×	×	×	Cannot be used with metal.
	AE solvent	Liquid (powder)	×	×	×	×	×	×	×	×	Cement hardener.
#	Ozone (several ppm or less)	Gas	×	×	×	×	×	▲	▲	▲	Specify a coil with a diode or the DC voltage model. (*1)
#	Sodium perchlorate	Liquid	×	×	×	×	×	×	×	●	AKA: Perchlorate soda. Cannot be used with rubber.
	Hydrogen peroxide solution	Liquid	×	×	×	×	×	×	×	▲	Oxidant. Used in disinfectants and sterilization agents. Usually 30 to 50% water soluble. Specify a coil with a diode or the DC voltage model. (*1)
	Caustic soda	(Solid)	×	×	×	×	●	×	●	●	Take care when using as crystals may form when fluid dries out. (Crystals may adhere to the OUT side of the valve, causing it to lock)
	Aqueous potassium permanganate	(Crystal)	×	×	×	×	×	×	×	●	Used for analysis. Strong oxidant. Take care when using as crystals may form as it dries out.
	Gasoline	Liquid	×	▲	×	●	×	▲	×	●	Fluoro rubber may not always be usable.

*1: AG, AB42, AP12, AP22, AD12, AD22, explosion-proof types (excluding ADK) and PVS cannot be used even with a coil withdiode or DC voltage.

Working fluid check list

For multi-fluid control 2, 3-port solenoid valves

⚠ Caution

This check list displays guidelines for typical corrosion resistance, and does not guarantee the solenoid valve performance. During actual use, there are unpredictable elements. Thus, there may be cases when general specifications do not apply. Therefore, before use, check the compatibility as needed and take the necessary safety measures on the equipment side.

[Indicates the compatibility of sealant material, body material and working fluid.]

Glycerin to # Heavy oil A

●: Usable ▲: Usable with conditions ×: Not Usable

Fluid name	Fluid properties (Indicators the state of the raw material even if the fluid indicates water solubility)	Material combination [Body material] Brass/Bronze [Sealant material] Nitrile rubber	Fluororubber	Ethylene propylene	Tetrafluoroethylene resin	[Body material] Stainless Steel [Sealant material] Nitrile rubber	Fluororubber	Ethylene propylene	Tetrafluoroethylene resin	Selection Precautions
# Glycerin	Liquid	●	●	●	●	●	●	●	●	Take note of viscosity. For direct acting 2-port valves, the fluid viscosity must be 50mm²/s or less. Pilot operated solenoid valves cannot be used.
Cresol	Solid (liquid)	×	×	×	×	×	●	×	●	Disinfectant. AKA: Methyl phenol.
Chloroform	Liquid	×	×	×	●	×	×	×	●	AKA: Trichloromethane. Acute toxic substance.
# Light oil	Liquid	●	●	×	●	●	●	×	●	–
Aqueous sodium silicate	(Crystal)	●	●	●	●	●	●	●	●	AKA: Water glass. Used in phosphate-free detergents. Take note of viscosity and concentration. Select stainless steel for high concentrations, as it is classified as an alkaline aqueous solution.
# Isopropyl acetate	Liquid	×	×	×	●	×	×	×	●	Flammable liquid. Acute toxic substance. Paint solvent.
Ethyl acetate	Liquid	×	×	×	●	×	×	×	●	A solvent for paint. If explosion proof types are specified by the surrounding environment, select explosion-proof (d2G2) or (d2G4).
Sodium acetate	(Solid)	●	●	×	●	●	●	×	●	Dye.
Butyl acetate	Liquid	×	×	×	●	×	×	×	●	Flammable liquid. Acute toxic substance.
Methyl acetate	Liquid	×	×	×	●	×	×	×	●	Flammable liquid. Acute toxic substance.
Oxygen	Gas	×	●	●	●	×	●	●	●	Oil-prohibited treatment is required as it may spontaneously ignite when exposed to oil.
# Aqueous potassium cyanide		×	×	×	×	●	●	●	●	AKA: Cyanide potash. A poisonous chemical used in plating solutions.
Carbon tetrachloride	Liquid	×	×	×	●	×	×	×	●	Flame retardant. A solvent for dry cleaning. Acute toxic substance.
Aqueous potassium dichromate	(Solid)	×	×	×	×	×	●	●	●	–
Aqueous sodium bicarbonate	(Solid)	×	×	×	×	●	●	●	●	AKA: a baking soda Used as a food additive.
Heavy oil A	Liquid	▲	●	×	●	▲	●	×	●	Take care when selecting the sealant if an additive is present. *2

*2 : High calorie "heavy oil A" is increasingly used for small boilers, etc. Nitrile rubber cannot be used with "high-calorie heavy oil A".

[Indicates the compatibility of sealant material, body material and working fluid.]

Heavy oil B to # Toluene

●: Usable ▲: Usable with conditions ×: Not Usable

	Fluid name	Fluid properties (Indicators the state of the raw material even if the fluid indicates water solubility)	Material combination [Body material] Brass/Bronze [Sealant material] Nitrile rubber	Fluororubber	Ethylene propylene	Tetrafluoroethylene resin	[Body material] Stainless Steel [Sealant material] Nitrile rubber	Fluororubber	Ethylene propylene	Tetrafluoroethylene resin	Selection Precautions
#	Heavy oil B	Liquid	●	●	×	●	●	●	×	●	–
	Heavy oil C	Liquid	×	●	×	●	×	●	×	●	Take note of viscosity. We recommend the LLO solenoid for heavy oil.
	Nitric acid 30%	Liquid	×	×	×	×	×	×	×	×	Solenoid valves cannot be used. CKD recommends Air operated valve for chemical liquids.
	Table vinegar	Liquid	×	×	×	×	×	×	×	×	AKA: vinegar. This falls under the same conditions as "acetic acid".
	Dimethyl silicone oil	Liquid	●	●	●	●	●	●	●	●	In general, this is known as silicone oil.
	Vacuum (medium vacuum)	–	●	●	×	×	●	●	×	×	We recommend the medium Multi-fit valve option (FFB).
	Vacuum (high vacuum)	–	×	×	×	×	×	×	×	×	We recommend a valve for high vacuum (HVB).
	Aqueous silver nitrate	(Solid)	×	×	×	×	▲	▲	▲	▲	Used for analysis or as a photosensitive developing agent. Specify a coil with a diode or the DC voltage model. (*1)
#	Aqueous calcium hydroxide	(Solid)	×	×	×	×	●	●	●	●	AKA: slaked lime Used as a neutralizing agent for wastewater treatment. Take note of viscosity. Strong alkali. This resists dissolving in water, so may not be appropriate for solenoid use if it leaves grains behind.
	Sodium hydroxide (below 30%) (AKA: Caustic soda)	(Solid)	×	×	×	×	●	×	●	●	Take care when using as crystals may form when fluid dries out. (Crystals may adhere to the OUT side of the valve, causing it to lock)
	Sodium hydroxide (30% or more)	(Solid)	×	×	×	×	×	×	●	●	Same as above. Same conditions.
	Hydrogen	Gas	●	●	●	●	●	●	●	●	This forms an explosive gas combination when mixed with air. Explosion proof (d3G1) specifications are not available.
#	Carbon dioxide	Gas	●	●	●	●	●	●	●	●	–
	Carbonated water	Liquid	●	●	●	●	●	●	●	●	–
	Tannic acid	(powder)	×	×	×	×	●	●	●	●	–
#	Nitrogen	Gas	●	●	●	●	●	●	●	●	Inert gas. Non-corrosive. Oil-prohibited specifications. Multi-fit valve is recommended.
#	Turpentine	Liquid	●	●	×	●	●	●	×	●	Rosin oil. Used in solvents and pharmaceutical products. Ignition point: 35°C.
	Natural gas	Gas	●	●	×	●	●	●	×	●	AKA: LNG. Specific gravity: 0.65. Direct acting valve for gas We recommend Catalog No. [CC-1590]. Refer to "Using ⚠ general purpose valves with fuel gas" on page 52.
#	Kerosene	Liquid	●	●	×	●	●	●	×	●	AKA: Kerosene. Jet fuel is known as kerosene.
	City gas	Gas	●	●	×	●	●	●	×	●	We recommend a gas combustion system. Refer to "Using ⚠ general purpose valves with fuel gas" on page 52.
	Dry air	Gas	●	●	●	●	●	●	●	●	Multi-fit valve is recommended.
	Trichloroethane	Liquid	×	×	×	▲	×	×	×	●	The corrosiveness increases when mixed with water.
	Trichloroethylene	Liquid	×	×	×	▲	×	×	×	●	AKA: Trichlene. Acute toxic substance.
	Toluene	Liquid	×	×	×	●	×	×	×	●	If explosion-proof types are specified by the surrounding environment, select explosion-proof (d2G2) or (d2G4). Note that it is volatile and take care with temperatures. Flammable liquid. Acute toxic substance.

*1: AG, AB42, AP12, AP22, AD12, AD22, explosion-proof types (excluding ADK) and PVS have a shading coil and cannot be used even with a coil with diode or DC voltage.

Working fluid check list

For multi-fluid control 2, 3-port solenoid valves

⚠ Caution

This check list displays guidelines for typical corrosion resistance, and does not guarantee the solenoid valve performance. During actual use, there are unpredictable elements. Thus, there may be cases when general specifications do not apply. Therefore, before use, check the compatibility as needed and take the necessary safety measures on the equipment side.

[Indicates the compatibility of sealant material, body material and working fluid.]

Naphtha to # Freon gas

●: Usable ▲: Usable with conditions ×: Not Usable

Fluid name		Fluid properties (Indicators the state of the raw material even if the fluid indicates water solubility)	Material combination [Body material] Brass/Bronze [Sealant material] Nitrile rubber	Fluororubber	Ethylene propylene	Tetrafluoroethylene resin	[Body material] Stainless Steel [Sealant material] Nitrile rubber	Fluororubber	Ethylene propylene	Tetrafluoroethylene resin	Selection Precautions
#	Naphtha	Liquid	×	×	×	●	×	×	×	●	–
#	Dichloride benzene	Liquid (solid)	×	×	×	●	×	×	×	●	AKA: Dichlorobenzene.
	Lactic acid	Liquid	×	×	×	×	×	●	●	●	Used for brewing or drinking.
#	Perchloroethylene	Liquid	×	×	×	×	×	●	×	●	AKA: Ethylene tetrachloride, acute toxic substances, limited to use in environments with well-equipped exhaust equipment. A volatile solvent for dry cleaning. Contact CKD during model selection.
#	Castor oil	Non-drying	×	×	×	×	●	●	×	●	Used as a laxative. Vegetable oils.
#	Phenols	(Crystal)	×	×	×	×	×	●	×	●	Used as a disinfectant and local anesthetic.
	Butane gas	Gas	●	●	×	●	●	●	×	●	If explosion-proof types are specified by the surrounding environment, select explosion-proof (d2G2) or (d2G4). This is a custom-made product as it generates sticky material. Refer to "Using ⚠ general purpose valves with fuel gas" on page 52.
	Butyl alcohol	Liquid	×	●	●	●	×	●	●	●	AKA: Butanol. If explosion proof types are specified by the surrounding environment, select explosion-proof (d2G2) or (d2G4). Flammable liquid. Contact CKD during model selection.
	Brake fluid	Liquid	×	×	●	●	×	×	●	●	–
	Propyl alcohol	Liquid	×	●	●	●	×	●	●	●	–
	Propane gas	Gas	●	●	×	●	●	●	×	●	This is a custom-made product as it generates sticky material. We recommend a gas combustion system. Refer to "Using ⚠ general purpose valves with fuel gas" on page 52.
	Freon gas R23	Liquid and gas	×	×	×	●	×	×	×	●	AKA: HFC23
	Freon gas R32		×	×	●	●	×	×	●	●	AKA: HFC32
	Freon gas R125		●	×	●	●	●	×	●	●	AKA: HFC125
	Freon gas R134a		×	×	×	●	×	×	×	●	AKA: HFC134a
	Freon gas R143a		●	×	●	●	●	×	●	●	AKA: HFC143a
	Freon gas R404A		×	×	×	●	×	×	×	●	For HFC125/143a/134a mixtures
	Freon gas R407C		×	×	×	●	×	×	×	●	For HFC32/125/134a mixtures
	Freon gas R407E		×	×	×	●	×	×	×	●	For HFC32/125/134a mixtures
	Freon gas R410A		×	×	●	●	×	×	●	●	For HFC32/125 mixtures
	Freon gas R507A		●	×	●	●	●	×	●	●	For HFC125/143a mixtures

[Indicates the compatibility of sealant material, body material and working fluid.]

●: Usable ▲: Usable with conditions ×: Not Usable

Hexanol to # Phosphoric acid

Fluid name	Fluid properties (Indicators the state of the raw material even if the fluid indicates water solubility)	Material combination								Selection Precautions
		[Body material] Brass/Bronze				[Body material] Stainless Steel				
		[Sealant material]				[Sealant material]				
		Nitrile rubber	Fluororubber	Ethylene propylene	Tetrafluoroethylene resin	Nitrile rubber	Fluororubber	Ethylene propylene	Tetrafluoroethylene resin	
# Hexanol	Liquid	×	●	●	●	×	●	●	●	AKA: Hexyl alcohol.
Heptane	Liquid	●	●	×	●	●	●	×	●	Flammable liquid.
Helium	Gas	●	●	●	●	●	●	●	●	Inert gas. Non-corrosive.
Benzine	Liquid	×	×	×	●	×	×	×	●	Solvent. Volatile. Flammable liquid. This forms an explosive gas when mixed with air.
Benzol	Liquid	×	×	×	●	×	×	×	●	AKA: Benzene. Flammable liquid. Harmful substance. Limited to use in environments with well-equipped exhaust equipment.
# Sodium borate	(Crystal)	×	×	×	×	●	●	●	●	AKA: Borax.
Formalin	(Gas)	×	×	×	×	×	×	●	●	AKA: Formaldehyde.
# Methane gas	Gas	●	●	×	●	●	●	×	●	Refer to "Using ⚠ general purpose valves with fuel gas" below.
Methyl alcohol	Liquid	×	×	●	●	×	×	●	●	AKA: Methanol. Flammable liquid. Acute toxic substance.
Methyl ether	Gas	×	×	×	●	×	×	×	●	–
Methyl ethyl ketone	Liquid	×	×	●	●	×	×	●	●	AKA: MEK. Highly flammable liquid. Limited to use in environments with well-equipped exhaust equipment.
Cottonseed oil	Semi-drying	×	●	×	●	×	●	×	●	For food products.
# Lacquer	Liquid	×	×	×	●	×	×	×	●	If explosion-proof types are specified by the surrounding environment, select explosion-proof (d2G2) or (d2G4).
# Hydrogen sulfide solution	Water + gas	×	×	×	×	×	×	×	×	Select a completely resin air operated valve.
Aqueous ammonium sulfate	(Solid)	×	×	×	×	×	×	×	×	AKA: Ammonium sulfate. Nitrogen fertilizer.
Aqueous sodium sulfate	(Solid)	×	×	×	×	×	×	×	×	AKA: Aqueous sodium sulfide.
Aqueous nickel sulfate	(Solid)	×	×	×	×	×	×	×	×	Used as a nickel plating solution.
Aqueous copper sulfate	(Solid)	×	×	×	×	×	×	×	×	Used in agricultural chemicals, pigments, and copper plating.
Phosphoric acid	Liquid	×	×	×	×	×	×	×	×	–

⚠ Using general purpose valves with fuel gas

When using with fuel gas, install an evaporator or provide drainage measures (raise the piping, install a trap, etc.) so that the liquefied gas does not enter the solenoid valve. Observe the laws and periodic inspections set forth for each gas device. When using city gas or LPG (butane gas, propane gas), Standard Product may not be available depending on the gas properties. Contact CKD to select the optimum model.

Regarding Flow Rate Characteristics Display Method

1. Flow characteristics display

The flow rate display in the catalog specifications column is shown as follows.

Applicable Equipment	Display	Unit	Standard
Pneumatic Equipment	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 silencers'
		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 Procedures 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 description

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

● Sonic conductance C : Value obtained by dividing the mass flow rate through the device in a choked flow state by the product of the upstream absolute pressure and the density at standard conditions. (sonic conductance) S ≈ 5.0 C (Conventional sizing is possible with C.)

• Critical Pressure Ratio b: Pressure at which choked flow results if smaller than this value(Downstream pressure Force/upstream pressure)(critical pressure ratio)

● Effective cross-sectional area S (mm^2): When the choked flow is released from the components mounted on the air tank,The value of the ideal restricted cross-sectional area without friction or compressed flow, calculated from the pressure changes inside the air tank.

*Choked flow: Flow where upstream pressure is higher than downstream pressure and velocity reaches sonic speed at a certain point in the equipment. The mass flow rate of gas is proportional to the upstream pressure and does not depend on the downstream pressure. (Choked flow)

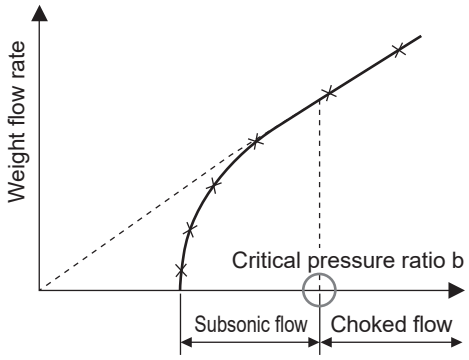


Fig. 1 Weight flow rate characteristics versus upstream pressure

Flow rate calculation formula

Expressed as follows using practical units.

- $\frac{P2}{P1}$ When ≤ b, Choked flow

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

- $\frac{P2}{P1}$ When > b, subsonic flow

$$Q=600\times C\times P_1\times \sqrt{1-\left[\frac{\frac{P2}{P1}-b}{1-b}\right]^2}\sqrt{\frac{293}{273+T}} \quad \text{.....(2)}$$

Q : Flow rate L/min (ANR) in standard condition
C : Sonic conductance [$dm^3/(s\cdot bar)$]
b : Critical pressure ratio
S : Effective cross-sectional area mm^2
P1 : Primary side absolute pressure MPa (abs)
P2 : Secondary 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 description

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, and there are two types o f Kv and C v. 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.

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

Cv : Flow coefficient
Q : Flow rate [U.S.gal/min] (1U.S.gal/min=6,309 ×10^{-5} m^3 /s)
ρ : Fluid density [1b/ft^3] (1b/ft^3=16,018 kg/m^3)
ρw : 40°F to 100°F (4°C to 38°C) water density [1b/ft^3]
△P : Pressure difference [psi] (1 psi= 6.8948 kPa)

● Flow coefficient Kv: Value which indicates 5 to 40°C city water flow rate passing through the valve in m^3/h unit at pressure difference of 1bar. The flow rate (in m^3/h) of fresh water at a temperature of 5 to 40°C that flows through the valve with a pressure differential of 1 bar.

$$Kv=Q\sqrt{\frac{1\times10^5}{\triangle P}\cdot\frac{\rho}{1{,}000}} \quad \cdots \quad (4)$$

Kv : Flow coefficient
Q : Flow rate [m^3/h]
△P :Pressure difference [Pa]
ρ : Fluid density [kg/m^3]

Flow rate calculation formula

Expressed as follows using practical units.

● Flow coefficient Cv

For liquids:

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

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

For steam:

For $P2 \leq \frac{P1}{2}$ $\quad W=\frac{99\,Cv\,P_1}{K}$ ..... (6)

For $P_2 > \frac{P1}{2}$ $\quad W=\frac{198\,Cv\sqrt{(P_1-P_2)\,P_2}}{K}$ ..... (7)

Cv: Flow coefficient
W: Flow rate [kg/h]
P_1 : Primary side absolute pressure [MPa]
P_2 : Secondary side absolute pressure [MPa]
K: (1+0.0013ts) ts: Degree of superheat (Saturation steam K = 1)

Regarding Flow Rate Characteristics Display Method

Flow rate calculation formula

Expressed as follows using practical units.

● Flow coefficient Kv

For liquids:

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

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

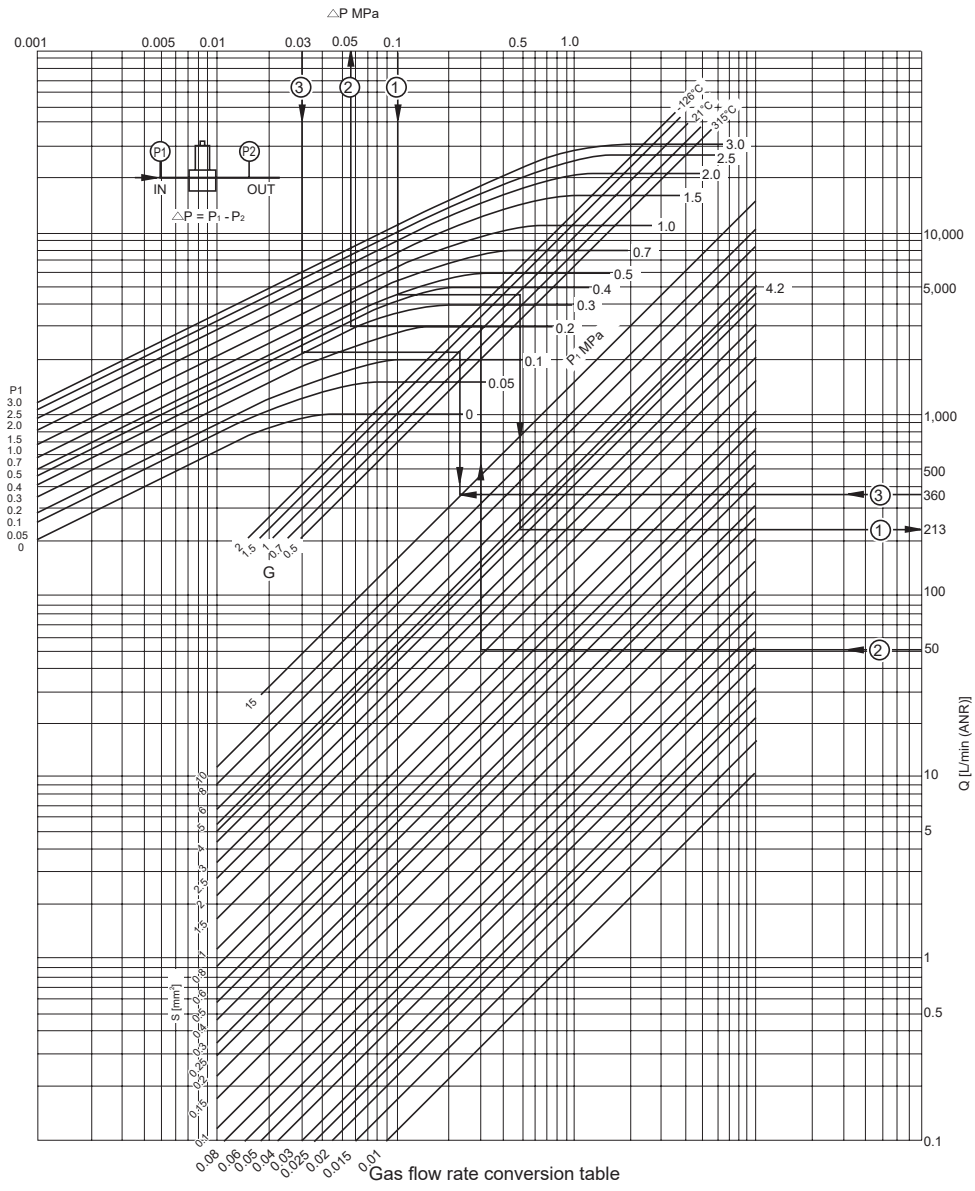
Flow coefficient conversion

Kv≈0.87 Cv

Kv: Value which indicates 5 to 40°C city water flow rate passing through the valve in m^3/h unit at pressure difference 1 bar.
Cv: Value which indicates 60°F city water flow rate passing through the valve in US gal/min. unit at pressure difference 1 lbf/in^2 (psi).
The Kv and Cv for air use different test methods, so the values do not match.

Flow rate conversion table

Air



Gas flow rate conversion table

● Example 1:
The flow rate when air is passed through with (S=4.2 mm²) P1 = 0.5 MPa, P_2 = 0.4 MPa (△P = P_1 - P_2 = 0.1 MPa) is

Q=226 L/min (ANR)

● Example 2:
The pressure loss when air is passed through a S=1.5 mm² valve at 50 L/min (ANR) at P1 = 0.3 MPa is

△P=0.057 MPa

● Example 3:
What should the valve's effective cross-sectional area be to attain a 360 L/min (ANR) flow rate at P1 = 0.3 MPa and △P=0.03 MPa?

S=16.7

*1: The table shows the effective cross-sectional area (S) up to 15. If this value is exceeded, multiply the effective cross-sectional area (S) and flow rate proportionally.
Example:
If the effective cross-sectional area(S) is 20, refer to 2 and calculate the flow rate by 10 times.

*2: Nitrogen Assume that the raw temperature is 20°C.

Flow rate calculation method

When calculating from effective sectional area
SI units

● When $P_2/P_1 \leq 0.5$ (choke flow)

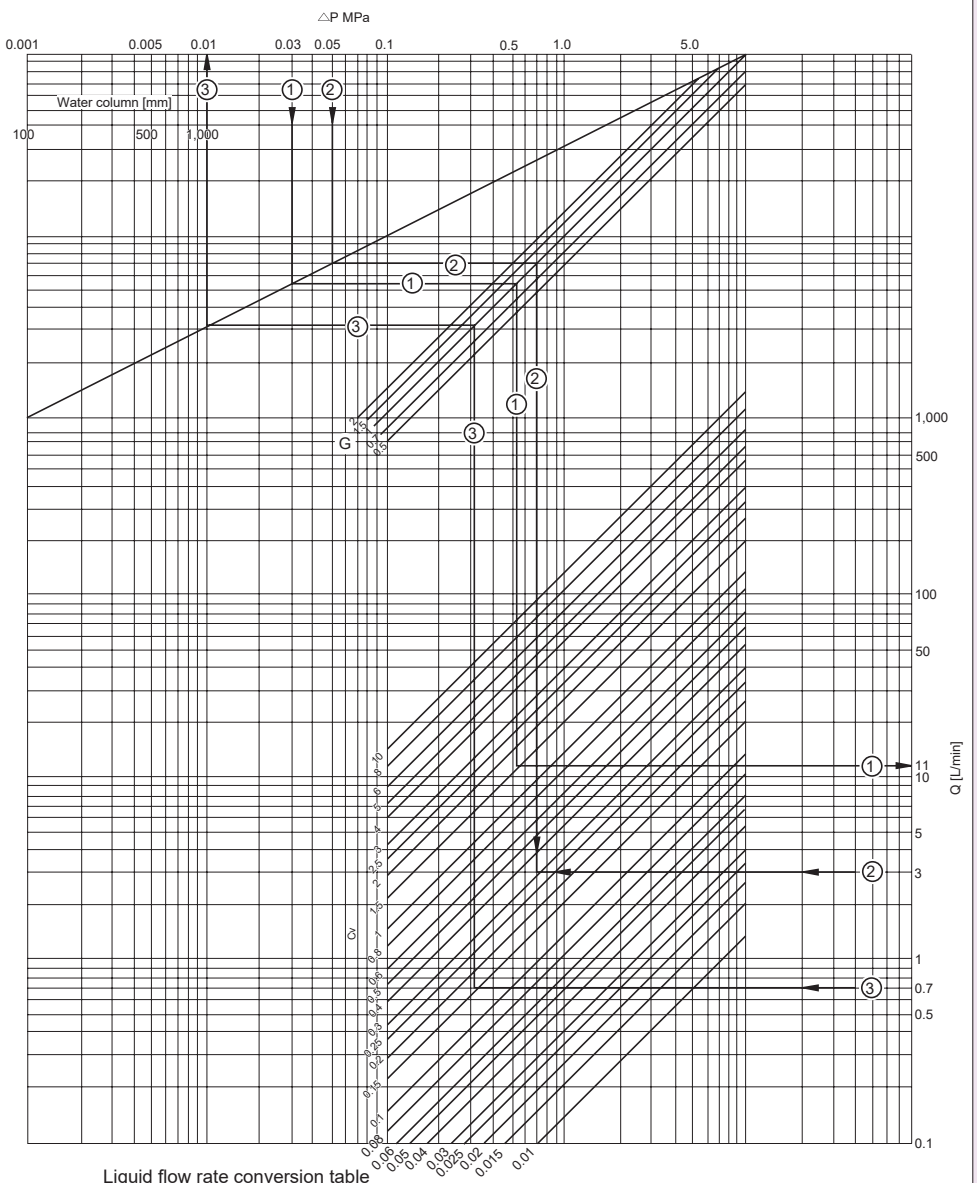
$$Q=120\times S\times P_1\times\sqrt{\frac{293}{273+T}}$$

● P_2/P_1>When 0.5 (subsonic flow)

$$Q=240\times S\times\sqrt{P_2\times(P_1-P_2)}\times\sqrt{\frac{293}{273+T}}$$

Q: Flow rate L/min (ANR)
P_1: Primary side absolute pressure MPa (abs)
P_2: Secondary side absolute pressure MPa (abs)
S: Effective Area (mm^2)

Water



Liquid flow rate conversion table

● Example 1:
What is the flow rate when water (specific gravity = 1) is passed through a Cv1.5 valve at △P=0.03 MPa (P_1-P_2)?

Q = 11 .8L/min

● Example 2:
Cv required for water (specific gravity = 1) to flow 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:
If Cv is 15, refer to 1.5 and multiply the flow rate by 10.

Flow rate calculation method

Flow coefficient Kv $\sqrt{\frac{\triangle P}{G}}$

Q = 52.63Kv

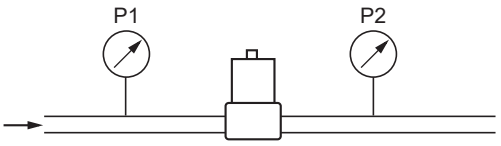
Kv: Flow coefficient
Q: Flow rate [ℓ/min]
△P: Pressure difference [MPa]
G: Specific gravity [water G = 1]

Flow coefficient conversion
Kv≈0.87Cv

Flow coefficient Cv

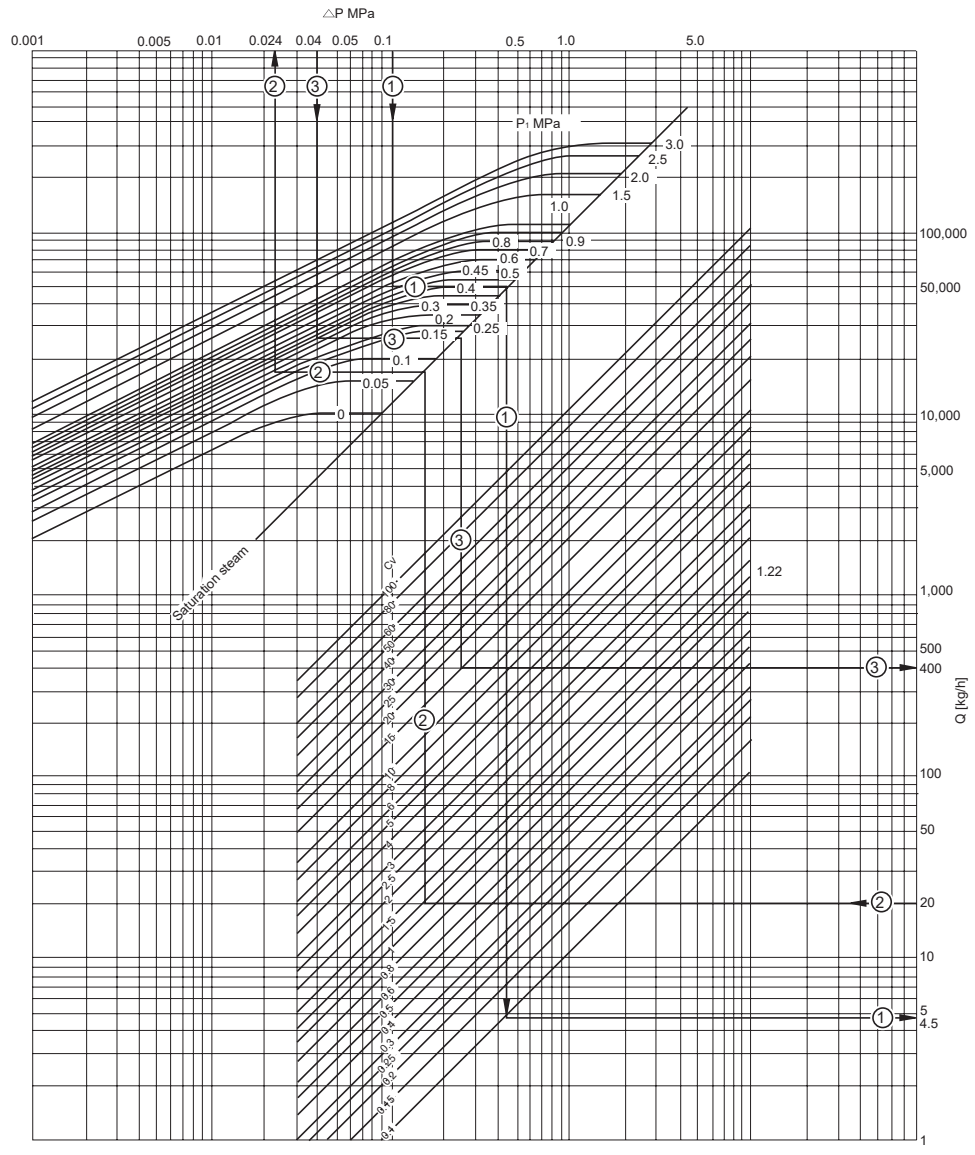
Q = 45.58Cv $\sqrt{\frac{\triangle P}{G}}$

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



Pressure Loss
△P
$\triangle P = P_1 - P_2$
P1: Upstream pressure [MPa]
P2: Downstream pressure [MPa]

Steam



Steam flow rate conversion table

● Example 1:
For solenoid valves with dissolution coefficient Cv=0.1
P_1 = 0.5 MPa,
P_2 = 0.4 MPa
What is the flow rate when saturated water vapor is passed through a valve ($\triangle P = P_1 - P_2$ = 0.1 MPa)?

Q=4.0 kg/h

● Example 2:
What is the pressure loss when 20 kg/h is passed at P_1 = 0.2 MPa (Cv=1.22)?

P = 0.024 MPa

● Example 3:
P_1= Indicates that a Cv=150 valve is used at 0.3 MPa and P=0.04 MPa What flow rate can be attained?

Q=3618 kg/h

Note: The table shows Cv up to 100. If this value is exceeded, multiply the Cv and flow rate Q proportionally.
Example:
If Cv is 150, refer to 15 and multiply the flow rate by 10.

Flow rate calculation method

$$W = \frac{100CvP_1}{K} \qquad \text{For } P_2 \leq \frac{P1}{2}$$

$$W = \frac{201Cv\sqrt{(P_1-P_2)\,P_2}}{K} \qquad P_2\text{For} > \frac{P1}{2}$$

W : Flow rate kg/h
P_1: Primary side absolute pressure MPa (abs)
P_2: Secondary side absolute pressure MPa (abs)
K: (1+0.0013ts) ts: Degree of superheat
(Saturation steam: K=1)

Safety Precautions

Be sure to read this section before use.

When designing and manufacturing a device using CKD products, the manufacturer is obligated to check that device safety mechanism, pneumatic control circuit, or water control circuit and the system operated by electrical control that controls the devices is secured.
It is important to select, use, handle and maintain the product appropriately to ensure that the CKD product is used safely.
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 device design and control, etc.

ISO4414, JIS B 8370 (Pneumatics 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 all systems 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 attention to possible water leakage and leakage of electricity.
❹ When starting or restarting a machine or device that incorporates pneumatic components, make sure that the system safety, such as pop-out prevention measures, is secured.

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

■ The precautions are ranked as "DANGER", "WARNING" and "CAUTION" in this section.

DANGER: When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries, and when there is a high degree of emergency to a warning.

WARNING: If handled incorrectly, a dangerous situation may occur, resulting in death or serious injury.

CAUTION: When a dangerous situation may occur if handling is mistaken leading to minor injuries or physical damage.

Note that some items described as "CAUTION" may lead to serious results depending on the situation.
Every item provides 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.

Fluid Control Valve

To Use This Product Safely

Be sure to read before use.
Refer to "Fluid Control Valves (RJ-013)" for general precautions on valves.

Individual Precautions: Direct acting 2, 3-port solenoid valve Multi-fit TM FFB/FFG Series

Design / Selection

1. Working fluid

Warning

■Working fluids

- Do not use any fluid other than the working fluids specified in the catalog.
- Before starting use, check the compatibility between the product and working fluid with the working fluid check list.
- Contact CKD before using this valve for active gas (combustion gas, acetylene gas, etc.). Sales
- When using the brass body in water or hot water, dezincification or erosion/corrosion may cause malfunction or internal leakage. Stainless steel body is also available. Stainless steel body is recommended for use with water or hot water.
- The fluid viscosity must be 50 mm^2/s or less. Malfunctions could occur if the viscosity is higher than 50 mm^2/s.
- Depending on the model, internal parts may wear when the valve operates. Caution is required because wear chips could enter the valve secondary side.
- If rust must be avoided, select a component whose metal sections are not wetted.
- When using tap water with the EPDM sealant for long periods, it could deteriorate due to residual chlorine.

2. Operating Environment

Warning

■The degree of protection has passed IEC standard compliant test, but performance greatly differs based on weather resistance and time, so these values are not guaranteed. Take measures to ensure that water, dust, etc., do not come in direct contact.

■This product is CE-marked, indicating conformity with the EMC Directives. As a condition for compliance with standard EN61000-6-2 for the immunity for industrial environments applied to this product, take surge immunity measures on the equipment side in the case of DC voltage. For AC voltage, noise is generated because the product is equipped with a full-wave rectifier circuit. If noise protection is required, install a capacitor. Refer to the instruction manual for details.

3. Securing Space

Caution

■Securing maintenance space

Secure sufficient space for maintenance and inspection. Ensure sufficient space for maintenance and troubleshooting safety work. To remove the coil, the clip must be removed from the product side. Provide both space on the top of the coil and space on the side where the clip will be removed.

4. Surge suppressor

Caution

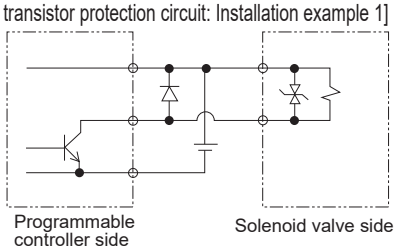
■The surge suppressor included with the solenoid valve aims to protect the output contact for driving the solenoid valve. There is no protection for other peripheral devices, and those devices may be damaged or malfunction by a surge. The suppressor absorbs a surge voltage generated by other devices, and burns itself out protecting the output contact. The following points must be taken into consideration.

- The surge suppressor functions to limit solenoid valve surge voltage, which can reach several hundred volts, to a low voltage level that the output contact can withstand. Depending on the output circuit used, this may be insufficient and could result in damage or malfunction. Confirm in advance whether the surge suppressor is suitable for the withstand voltage of both the solenoid valve in use and the output device, circuit structure and the degree of return delay time. When necessary, provide other surge countermeasures. CKD's solenoid valve with surge suppressor can counter inverse voltage surge which occurs when the valve is turned OFF to the level shown in the table below.

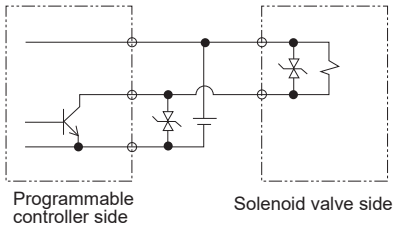
Specification voltage	Inverse voltage when OFF
12 VDC	Approx. 39 V
24 VDC	

- If the output unit is an NPN type, a surge voltage equaling the voltage shown in the table above plus the power supply voltage may be applied to the output transistor. Make sure to implement a contact protection circuit to avoid the risk.

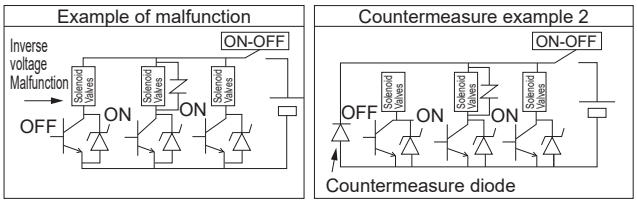
[Output transistor protection circuit: Installation example 1]



[Output transistor protection circuit: Installation example 2]



- If another device or solenoid valve is connected in parallel to the solenoid valve, the inverse voltage surge generated when the valve is OFF would apply to those devices. Even in the case of a solenoid valve with 24 VDC surge suppressor, a surge voltage may reach negative tens of volts for some models. This inverse voltage may cause damage or malfunction to other components connected in parallel. A components that is susceptible to inverse polarity voltages (example: Avoid parallel connection with the LED indicator lamp. When driving several solenoid valves in parallel, the surge from other solenoid valves could enter the surge suppressor of one solenoid valve and cause it to burn. When driving several solenoid valves with surge suppressors in parallel, surge current could concentrate at the surge suppressor with the lowest voltage limit and cause similar burning. Even if the solenoid valve is the same, the surge suppressor's voltage limit can be inconsistent, and in the worst case, could result in burning. Avoid driving multiple solenoid valves in parallel.



- The surge suppressor incorporated in the solenoid valve will often be short-circuited if it is damaged by an overvoltage or overcurrent from other solenoid valves. Where there is a failed surge suppressor, if a large current flows when the output is ON, in the worst case scenario, the output circuit or solenoid valve could be damaged or ignited. Do not continue energizing the solenoid valve if the surge suppressor becomes faulty. Additionally, to prevent large currents from continuing to flow, connect an overcurrent protection circuit to the power supply and drive circuit, or use a power supply with overcurrent protection.

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

Catalog introduction

Components digest

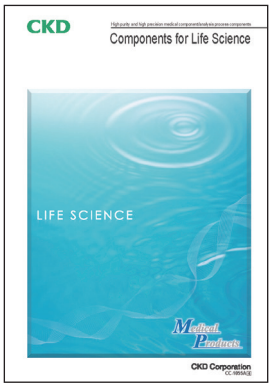
Catalog No.RJ-001

■ CKD offers a wide variety of products to meet your various needs. Select the ideal product according to your application. In the "Components digest," you can search for the equipment you are looking for by overview.

Life Science Equipment

Catalog No.CC-1055A

■ Our Fluid control components respond to the requirements of medical care devices. Controlling every type of fluid with high purity and high precision for extracting, dispensing, cleaning and disposing.



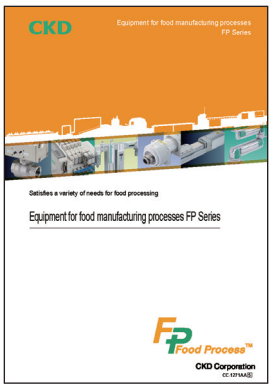
Products for Food Manufacturing Processes FP Series

Catalog No. CC-1271AA

■ Providing total support for food manufacturing based on advanced engineering technologies in packaging machines, air pressure/fluid control, and motors that support a variety of needs in food manufacturing processes. An extensive lineup of everything from Air Filters to actuators allows for secure and safe use in food processing.

FP Food Process™

This logo mark expresses our stance that CKD's safe components support food manufacturing processes.



For details, refer to CKD components product website (https://www.ckd.co.jp/en/).

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Revision details ・Additional models listed

2025.7