CKD

SM-9047-A/1

INSTRUCTION MANUAL

MASTERVALVE

4F0~3 SERIES

- Please read this instruction manual carefully before using this product, particularly the section describing safety.
- Retain this instruction manual with the product for further consultation whenever necessary.

Revision2

CKD Corporation

For Safety Use

To use this product safely, basic knowledge of pneumatic equipment, including materials, piping, electrical system and mechanism, is required (to the level pursuant to JIS B 8370 Pneumatic System Rules).

We do not bear any responsibility for accidents caused by any person without such knowledge or arising from improper operation.

Our customers use this product for a very wide range of applications, and we cannot keep track of all of them. Depending on operating conditions, the product may fail to operate to maximum performance, or cause an accident. Thus, before placing an order, examine whether the product meets your application, requirements, and how to use it.

This product incorporates many functions and mechanisms to ensure safety. However, improper operation could result in an accident. To prevent such accidents, read this operation manual carefully for proper operation.

Observe the cautions on handling described in this manual, as well as the following instructions:

⚠ Precautions

- Do not touch electric wiring connections (exposed live parts) : this will cause an electric shock. During wiring, keep the power off. Also, do not touch these live parts with wet hands.

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4F0~4F3 Series
Master Valve
SM 9047-A

1. PRODUCTS

1-1. Specifications

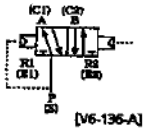
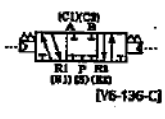
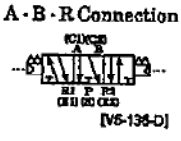
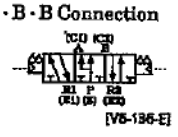
1) Common Specifications

Item	Specifications
Working fluid	Compressed air
Max. working pressure	1MPa
Ambient temperature	−10~60°C
Lubrication	Not required
Valve type and operation	Pilot (soft spool)

2) Model code and specifications

Series・Model code		Specifications						
		Connecting port diam.				Effective sectional area (mm^2)	Main pressure MPa	Pilot signal MPa
		Supply air port S	C	Ex. port E Pilot, Ex. port PE	Pilot port			
4F0	A4F011	M5	M5	M5	Rc1/8	2 (M5)	0.15~1	P≧0.06×(Main pressure)+0.06
	4F021	Rp1/8	Rp1/8			3 (Rp1/8)	0~1	P≧0.15
4F1	4F111	Rp1/8	Rp1/8	Rp1/8	Rc1/8	11	0.15~1	P≧0.06×(Main pressure)+0.06
	4F121						0~1	P≧0.15
	4F131	Rp1/4	Rp1/4			7		P≧0.2
	4F141					9		
4F2	4F211	Rp1/4	Rp1/4	E:Rp1/4 PE:Rp1/8	Rc1/8	18	0.15~1	P≧0.06×(Main pressure)+0.06
	4F221						0~1	P≧0.15
	4F231					11		P≧0.2
	4F241							
4F3	4F311	Rp1/4	Rp1/4	E:Rp1/4 Rp3/8 PE:Rp1/8	Rc1/8	25(Rp1/4) 32(Rp3/8)	0.15~1	P≧0.06×(Main pressure)+0.06
	4F321						0~1	P≧0.15
	4F331	Rp3/8	Rp3/8			17(Rp1/4) 21(Rp3/8) 19(Rp1/4) 22(Rp3/8)		P≧0.2
	4F341							
	4F351							

JIS Symbols

2-pos. single	2-pos. double	3-pos. All ports blocked	3-pos. A・B・R Connection	3-pos.・(4F3・4・5・6・7) P・B・B Connection
 [V6-136-A]	 [V6-135-B]	 [V6-136-C]	 [V6-136-D]	 [V6-136-E]

Regarding Rp (PS) thread

Rp thread is adopted to Models 4F0 ~ 4F3 so as to enable being build with manifolds. Rp thread as for parallel female thread is commonly adopted to meet with tapered male thread. It is also clearly torerated within JIS standard.

2
WARNING

2. CAUTIONS

2-1. Operational Cautions

1) Environmental conditions

(1) Within the area of much dust or floating foreign particles, mount either silencer or elbow joint to R (Exh.) port keeping its open end downward to provide protective measurement of keeping those foreign particles from falling into R port.

(2) Instead of leaving water dripping over the solenoid, either provide a cover or install the solenoid within a panel box.

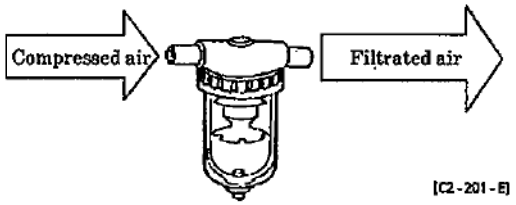
2) Installation auxiliary equipment

(1) Filter

Select a filter element of 5μm or smaller.

(2) Lubricator

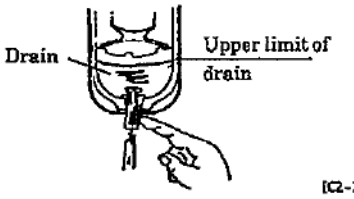
4F Master valve series does not particularly require lubrication. (Use Turbine oil, Class 1, ISO VG32 (#90) or equivalent, if and when lubrication is preferred.)



[C2-201-E]

3) Drain the sludge

Much sludge (such as condensed humidity, oxide oil, tarry material and foreign particles) apt to be contained within the compressed air which destructs the reliability of pneumatic equipment remarkably. Consider the following remedies of removing such sludge.



[C2-201-F]

- Improving the quality of compressed air

Dehumidifying by use of after-cooler dryer, removing foreign particles by use of air filter, removing tarry accumulation by use of tar removal filter, etc.

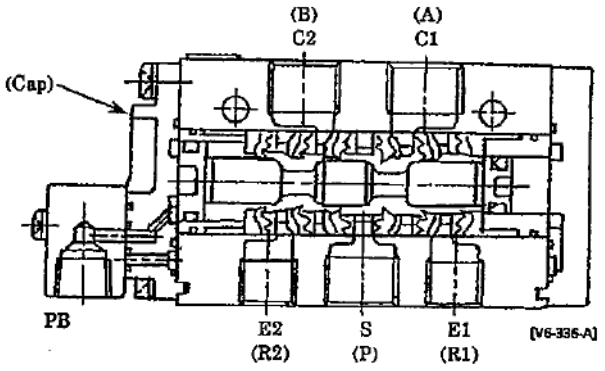
3. OPERATION

3-1. Function

Model 4F1※※ is illustrated. 4F0 is of similar appearance. Ports PA and PB of models 4F2※※ as well as 4F3※※ are mounted on cap directly.

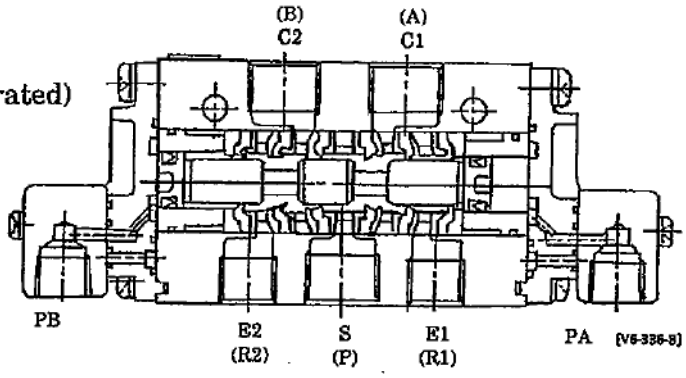
0
● 4F111
2
3

· No pressure to PB (Illustrated)
S → C1
C2 → E2 (E1 port is closed.)
· PB is pressurized
S → C2
C1 → E1 (E2 port is closed.)



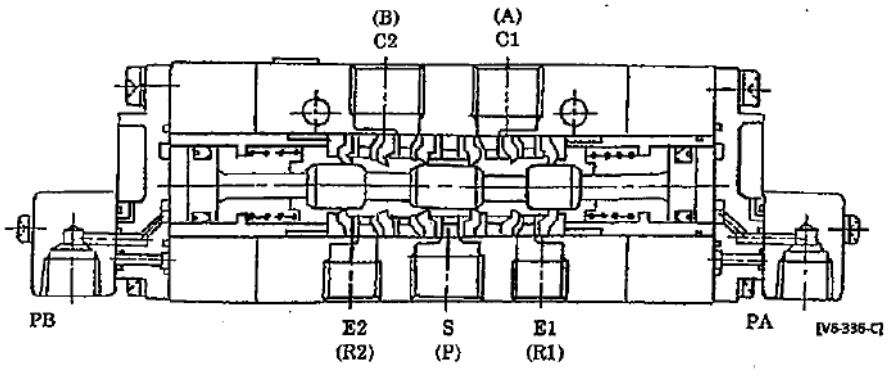
0
● 4F121
2
3

· PA is pressurized (Illustrated)
S → C1
C2 → E2
(E1 port is closed.)
· PB is pressurized
S → C2
C1 → E1
(E2 port is closed.)
· Self-holds new position of the spool once either PA or PB is pressurized, even after the pilot line is exhausted.



1
● 4F231, 4F351
34
· PA is pressurized
S → C1
C2 → E2
(E1 port is closed.)
· PB is pressurized
S → C2
C1 → E1
(E2 port is closed.)

· No pressure to neither PA nor PB
1
4F231 : S, C1, C2, E1 & E2 are all closed.
3
1
4F241 : C1 → E1, C2 → E2, S is closed.
3
4F351 : S → C1 & C2, E1 & E2 are closed.

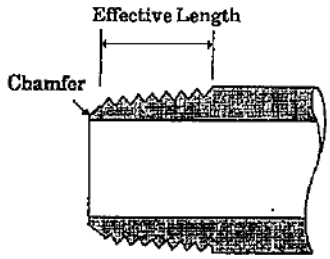


4. INSTALLATION

4-1. Piping

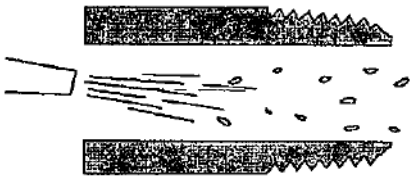
1) For piping beyond the filter, use pipes that hardly get corroded such as galvanized pipes, nylon tubes, rubber tubes, etc.

2) Strictly observe the effective thread length of gas pipe and give a chamfer of approx. 1/2 pitch from the threaded end.

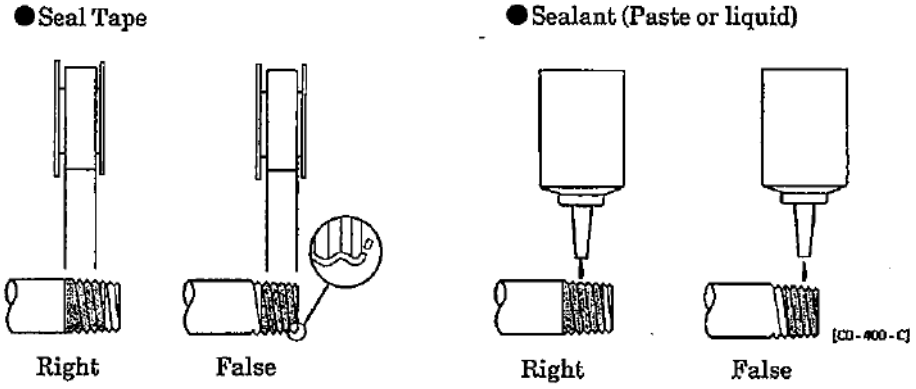


[C0-400-A]

3) Flush air into the pipe to blow out foreign substances and chips before piping.


[C0-400-B]

4) Refrain applying sealant or sealing tape approx. two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system.



[C0-400-C]

5) Avoid such layout of piping to release C1 port or C2 port to an open air by squeezing Supply port (S port).

Carefully joint pipings to eliminate the leakage between master valve and cylinder particularly when laying such 3-position, all port block type valve as 4F※31.

Make sure to use the cylinder with no leakage at packing or piston packing.

6) Although there is no restriction as to the mounting posture of master valve, it is recommendable to mount it on a flat surface and horizontally.

Eliminate of using it in the area of vibration 5G or more or the area of shock 30G or more.

4-2. Environmental Conditions

Within the area of much dust or floating foreign particles, mount either silencer or elbow joint to R port keeping its open end downward to prevent those foreign particles from falling into R port.

5. MAINTENANCE

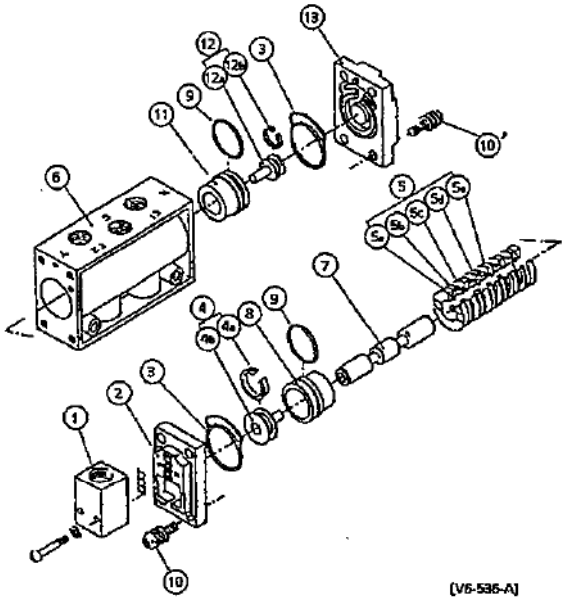
5-1. Periodic Inspection

1) Conduct periodic inspection (s) once or twice per annum for the best service condition of solenoid valves.
2) Items to inspect
   Inspect for dust or foreign particle and high viscosity substitute within valve. Disassemble valve and remove them if their existence is realized.

5-2. Disassembling

1) 4F011 · 4F111

Procedure



Carefully place each components during disassembling work because the positions and direction of piston ass'y ④ ⑫, cylinders ⑧ ⑪ and seal ass'y ⑤ are fixed.

a) Shut off air to valve.
b) Unscrew four mounting screws ⑩ for socket ① and pilot valve ②.
c) Remove the mounting screws ⑩ for cap ⑬.
d) Pull out cylinder ⑪.
e) Push out piston ass'y ⑫ toward X end, then take internal components such as seal ass'y ⑤, spool ⑦, piston ass'y ④ and cylinder ⑧ out of the body ⑥.

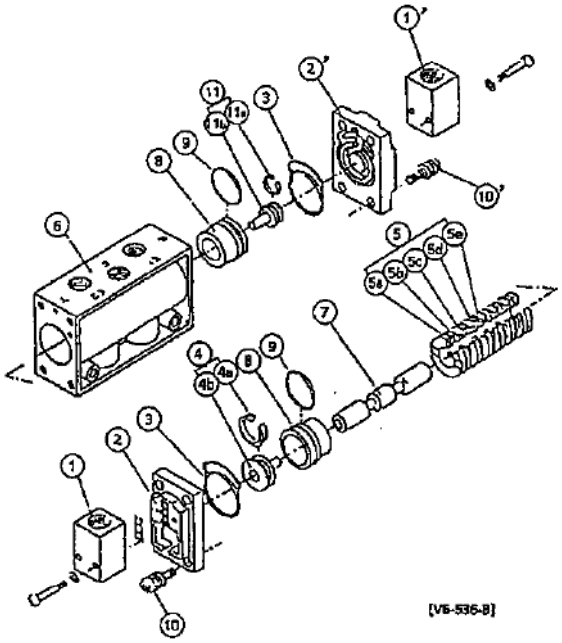
※ Apply either litium list, saponaceous grease or silicon grease as for lubricant.

Expendable parts list

No. parts / Model code	4 Piston ass'y	5 Seal ass'y	12 Piston B ass'y
A4F011	4F9-124	4F9-126	4F9-125
4F111	4F9-110	4F9-112	4F9-111

2) 4F021 · 4F121

Procedure



a) Shut off air to valve.
b) Unscrew four mounting screws ⑩ for socket ① and pilot valve ②.
c) Unscrew four mounting screws ⑩' for socket ①' and pilot valve ②.
d) Pull out cylinder ⑧.
e) Push out piston ass'y ④ toward X end, then take internal components such as seal ass'y ⑤, spool ⑦, piston ass'y ④ and cylinder ⑧ out of the body ⑥.

※ Apply either litium list, saponaceous grease or silicon grease as for lubricant.

Expendable parts list

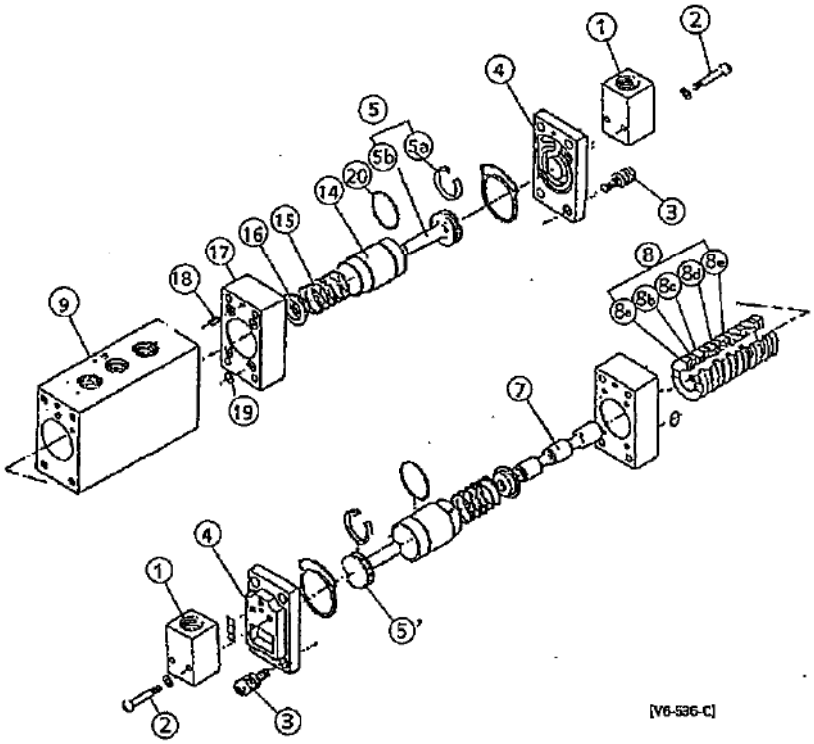
No. parts / Model code	4 Piston ass'y	5 Seal ass'y	11 Piston B ass'y
4F021	4F9-124	4F9-126	4F9-125
4F121	4F9-110	4F9-112	——

3) 4F131 · 4F141

Procedure

a) Take out socket ① by removing two mounting screws ②.
b) Remove mounting screws ③ to take out cap ④ as well as body lock ⑰ at both ends of body, spring ⑮, spring seat ⑯ and cylinder ⑭.
c) Push out piston ass'y ⑤ from Y end to take internal component, such as seal ass'y ⑧, out of the body ⑨.

※ Apply either litium list, saponaceous grease or silicon grease as for lubricant.

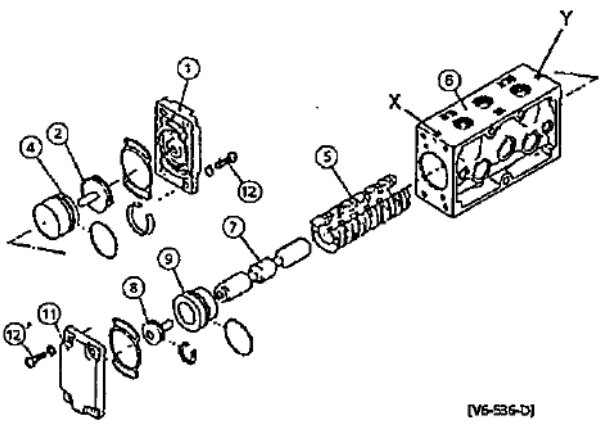


Expendable parts list

No. parts / Model code	5, 5'	8
	Seal ass'y	Piston A ass'y
4F131	4F9-159	4F9-112
4F141		

4) 4F211 · 4F311

Procedure



Carefully place each components during disassembling work because the positions and direction of piston ass'y ②,⑧, cylinders ④, ⑨and seal ass'y ⑤ are fixed.

a) Shut off air to valve.
b) Take out cap ① by removing mounting screws ⑫.
c) Take out cap ⑪ by removing mounting screws ⑫'.
d) Pull out cylinder ④.
e) Push out piston ass'y ② toward X end, then take internal components such as seal ass'y ⑤, spool ⑦, piston ass'y ⑧ and cylinder ⑨ out of the body ⑥.

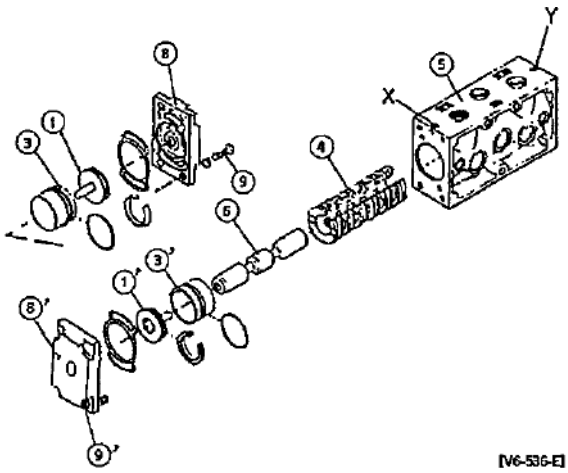
※ Apply either litium list, saponaceous grease or silicon grease as for lubricant.

Expendable parts list

No. parts / Model code	2 Piston A ass'y	5 Seal ass'y	8 Piston B ass'y
4F211	4F9-101	4F9-105	4F9-102
4F311	4F9-104	4F9-106	4F9-103

5) 4F221 · 4F321

Procedure



[V6-536-E]

a) Shut off air to valve.
b) Take out cap ⑧ by removing mounting screws ⑨.
c) Take out cap ⑧' by removing mounting screws ⑨'.
d) Pull out cylinder ③.
e) Push out piston ass'y ① toward X end of the body, then take internal components such as seal ass'y ④, spool ⑥, piston ass'y ①' and cylinder ③' out of the body ⑤.

※ Apply either litium list, saponaceous grease or silicon grease as for lubricant.

Expendable parts list

No. parts / Model code	1, 1' Piston ass'y	4 Seal ass'y
4F221	4F9-101	4F9-105
4F321	4F9-104	4F9-106

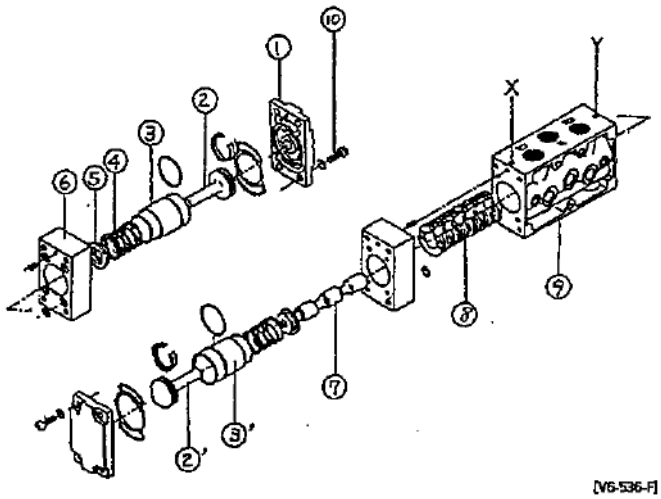
6) 4F231 · 4F331
4F241 · 4F341
4F351

Procedure

Carefully place each components during disassembling work because the positions and direction of piston ass'y ②, ②', cylinders ③, ③', and seal ass'y ⑧ are fixed.

a) Shut off air to valve.
b) Remove mounting screws ⑩ to take out cap ① as well as body block ⑥ at both ends of body, spring ④, spring seat ⑤ and cylinder ③.
c) Push out piston ass'y ② toward X end of body, then take internal components such as seal ass'y ⑧, spool ⑦ and piston ass'y ②' out of the body ⑨.

※ Apply either litium list, saponaceous grease or silicon grease as for lubricant.

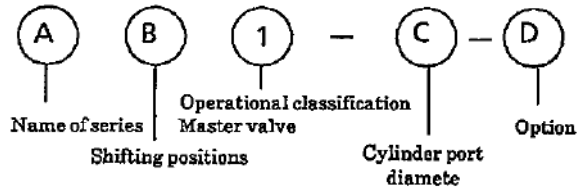


[V6-536-F]

Expendable parts list

No. parts / Model code	2, 2'	8
	Piston ass'y	Seal ass'y
4F231 4F241	4F9-113	4F9-105
4F331 4F341 4F351	4F9-114	4F9-106

6. MODEL CODING



Ⓐ Name of Series Ⓑ Shifting positions Ⓒ Cylinder port diameter Ⓓ Option

Symbol	Effective sectional area (mm^2)	Symbol	Content	Symbol	Content
A4F	2~3	1	2-pos. single	M5	M5×0.8
4F0		2	2-pos. double	06	Rp1/8
4F1	7~11	1	2-pos. single	06	Rp1/8
		2	2-pos. double	08	Rp1/4
4F2	11~18	3	3-pos. all ports block	08	Rp1/4
		4	3-pos. ABR connection		
4F3	17~32	1	2-pos. single	08	Rp1/4
				10	Rp3/8
4F4	21~32	2	2-pos. double	08	Rc1/4
				10	Rc3/8
4F5	41~47	3	3-pos. all ports block	10	Rc3/8
				15	Rc1/2
4F6	80~90	4	3-pos. ABR connection	15	Rc1/2
				20	Rc3/4
4F7	160	5	3-pos. PAB connection	20	Rc3/4
				25	Rc1

Symbol	Content
P	Mounting legs attached
P1	
N	w/plug (for use as 3-pos. valve.)
H	w/check valve (attached for 3-pos., all port block, only.)

Note 1 : P type mounting legs are available for 4F0~4F3, single only.
P1 type mounting legs are unavailable for 4F4~4F7.

Note 2 : Refer to page of each series respectively concerning to P type and P1 type mounting legs.

Note 3 : Manifold for master valve is available on order.
Example of model coding: M4F411-08-3-C
The model code of Actuator for manifold is 4F418-00.

Note4 : Tightening torque for mounting bracket assembly screws : M4F0,1 : 3.0~3.5 N・m
M4F2,3 : 5.0~5.5 N・m

● Example of model code
4F111-06-P

It denotes to be 4F1, 2-position single, Master valve, connecting port Rp 1/8 w/P type mounting legs.