CKD

SM-8163-A

INSTRUCTION MANUAL

PICOSOL

3MA0, 3MB0
M3MA0, M3MB0

- 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.

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 instruction 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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3MA0, 3MB0, M3MA0, M3MB0
PICOSOL
SM 8163-A

1. PRODUCTS

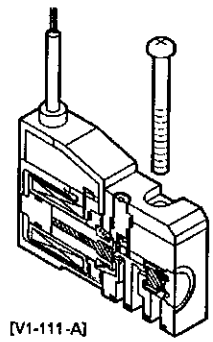
1.1 General description and special features.

1) Compact, width 10mm
It is able to build the total system smaller as this valve is designed compactly.

2) Broad varieties of connecting cable.
It allows to make a choice of lead cord, series of C type connecters or D type connecters and also combination with lamp and surge killer.

3) Low wattage design (1W)
41.7mA (with lamp) at DC24V. It is capable to be connected directly to electronics controls.

4) High response
It is serviceable to broad high technology industries with feasibility of high performance and high accurate control.


[V1-111-A]

1.2 Specifications

1) Common Specifications

(1) Fluid specifications

Item	Specification
Media	Pneumatic pressure
Actuation type	Direct Poppet valve
Withstanding pressure MPa	1.05
Ambient temperature ℃	5 to 50 (Not to be frozen)
Service fluid temperature ℃	5 to 50
Lubrication	Not required (Use Turbine oil, Class 1, ISO VG32 if lubrication is preferred.)
Protective Structure	Dust prevention
Manual operation device	Non lock type

(2) Electrical specification

Item	Specification
Power consumption (W) (w/Lanp & surge killer)	0.9(1.0)
Temperature rising (°C)	50
Voltage fluctuation	±10%
Insulation class	Class B
Connecting wire cord	Grommet lead wire, C type connecter, D type connecter
Option	Surge killer and Indicator lamp

2) Model code and Specifications

(1) 3MA0, 3MB0 series

Model	Diam. of Connecting ports		Effective sectional area mm²	Working pressure MPa	Responding time msec	Mass g
	A port	P · R port				
3MA0	φ4 Barbed fitting	M3	P→A0.1 A→R0.15	0 to 0.7	10	18
3MB0	M3					

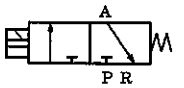
(2) M3MA0, M3MB0 series

Model / Item		M3MA0	M3MB0
Manifold type		Solid w/manifold	
Applicable solenoid		3SA019 series	3MB019
No. of blocks		2 blocks to 20 blocks	
Type of manifold block		Concentration air supply, concentration exhaust	
Connecting wire cord		Grommet lead wire (C type connecter, D type connecter)	
Pipe connection	P port	M5	
	A port	φ4, barbed fitting	M3, M5 , φ4 Snap joint, φ4 barbed fitting, φ6 barbed fitting
	R port	M5	
Manually operating device		Upward Non-lock type	

1.3 External dimensions

1) 3MA0, 3MB0 series

- 3MB019-00 (Grommet lead wire)



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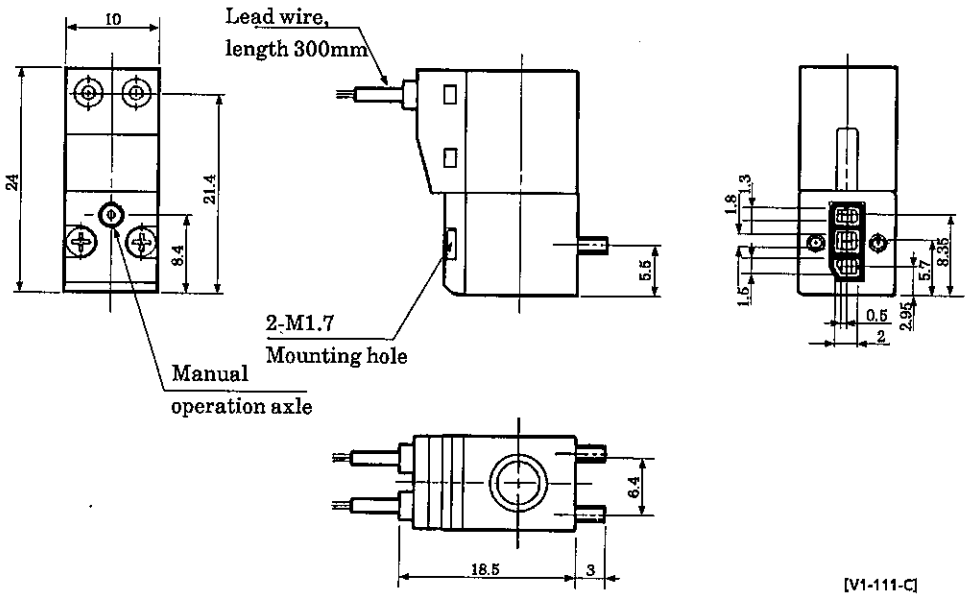
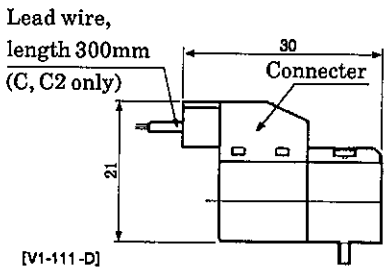


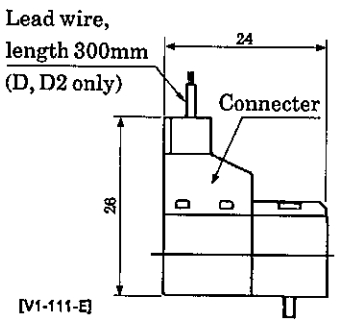
[V1-111-C]

- 3MB019-M3 - C, C1, C2, C3 (C type connecter)



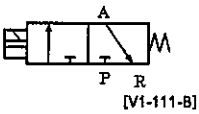
[V1-111-D]

- 3MB019-M3 - D, D1, D2, D3 (D type connecter)



[V1-111-E]

- 3MA010-T4 (Grommet lead wire)



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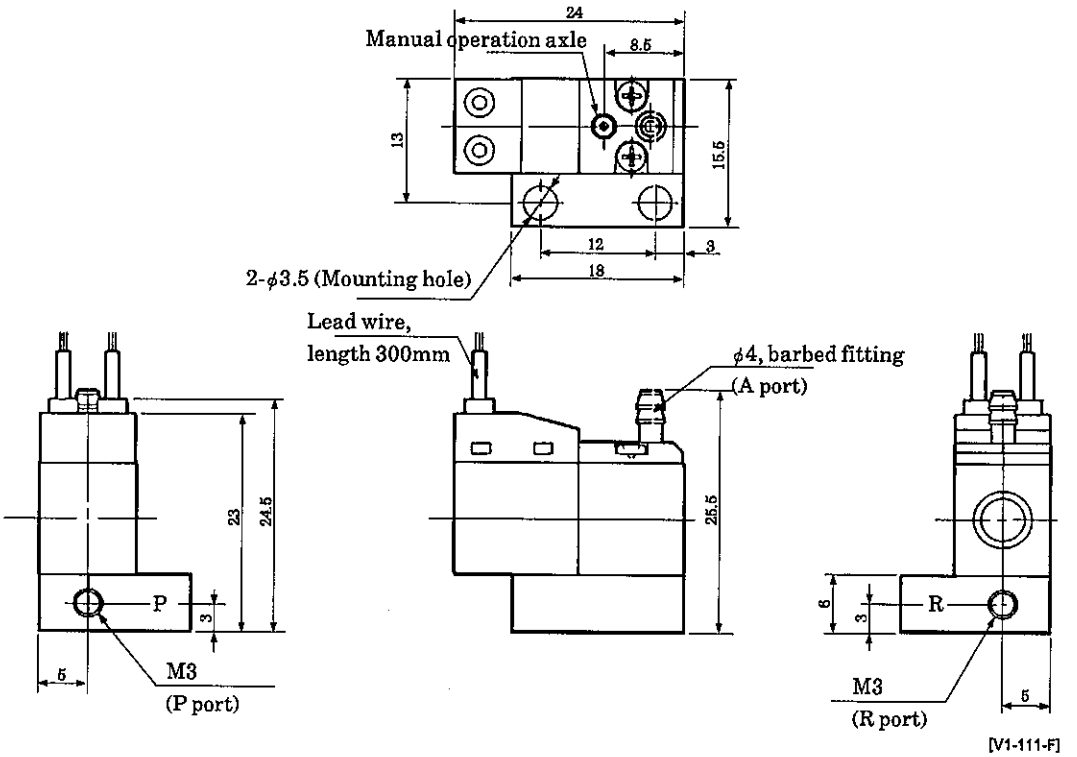
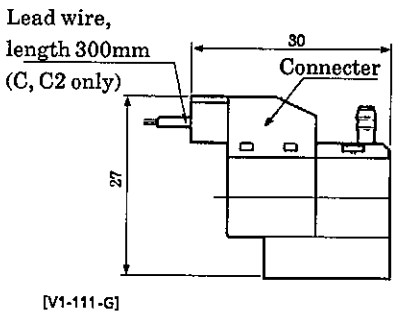


[V1-111-F]

- 3MA010-T4 - C, C1, C2, C3

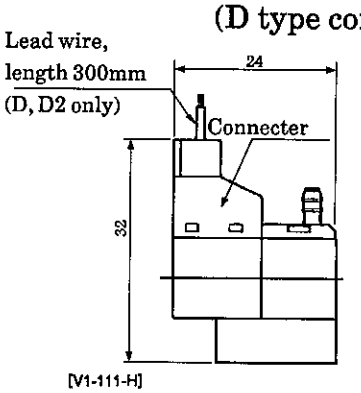
(C type connecter)



[V1-111-G]

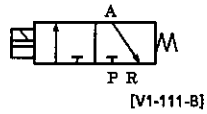
- 3MA010-T4 - D, D1, D2, D3

(D type connecter)



[V1-111-H]

● 3MB010-M3 (Grommet lead wire)



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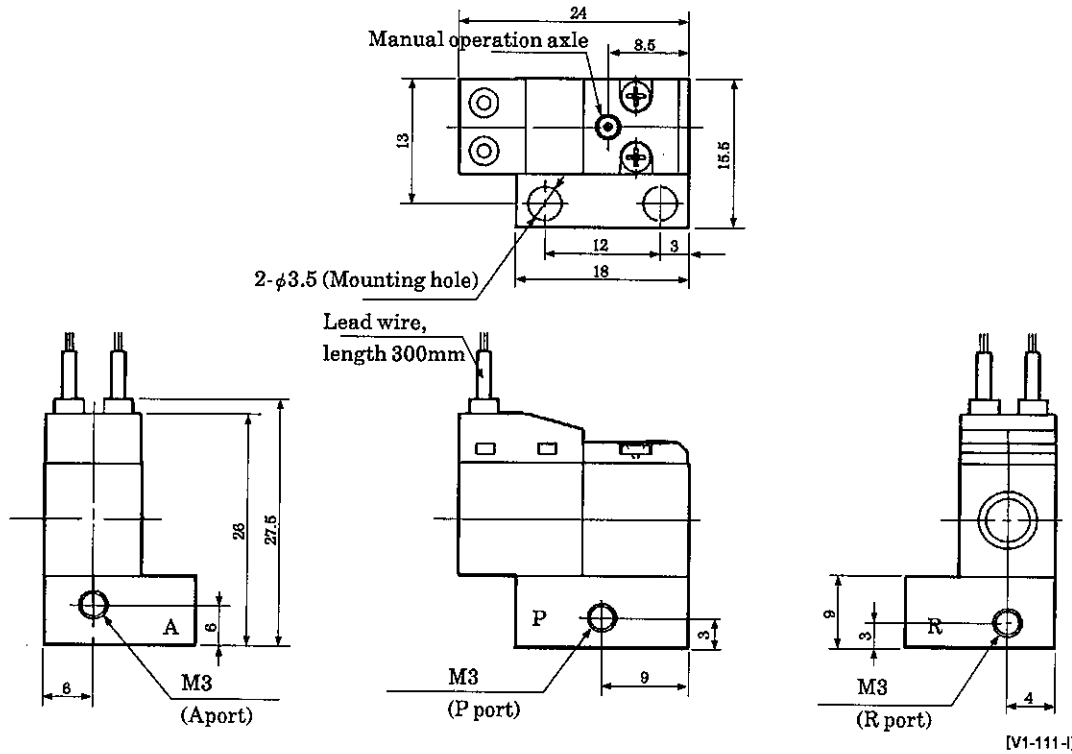

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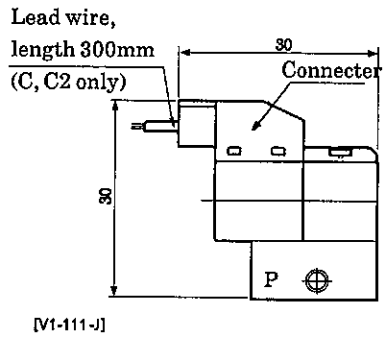
● 3MB010-M3 - C, C1, C2, C3

(C type connecter)



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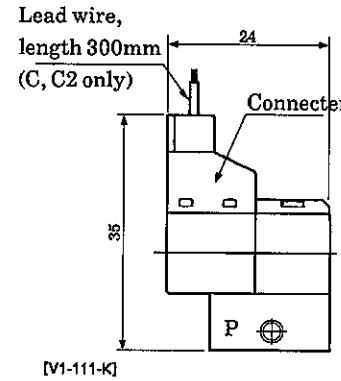
● 3MB010-M3 - D, D1, D2, D3

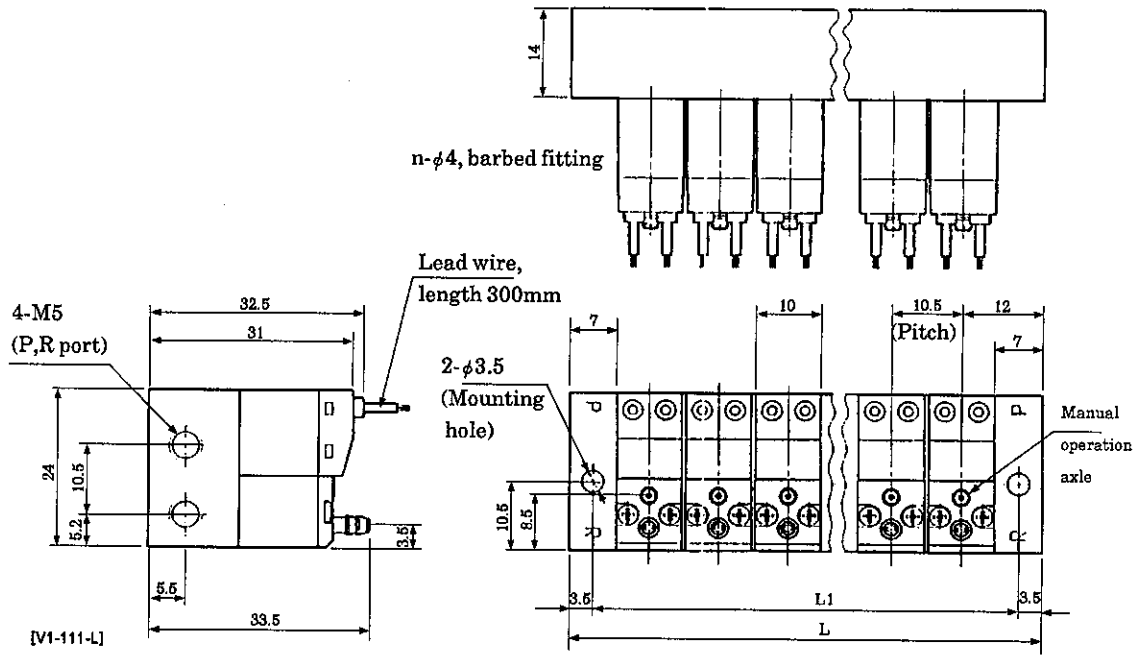
(D type connecter)



[V1-111-K]

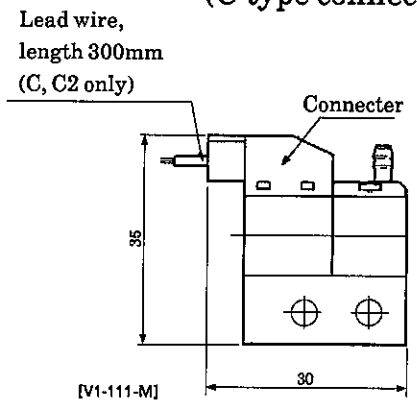
2) M3MA0, M3MB0 series

- M3MA010 (Grommet lead wire)

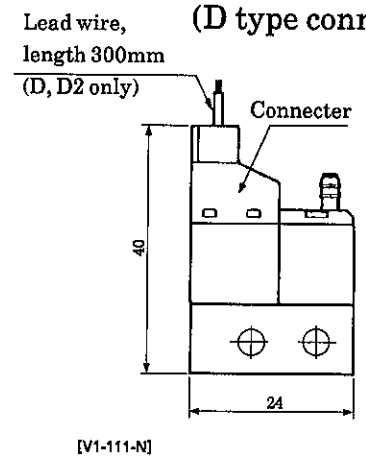


No. of blocks / Symbol	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L1	27.5	38	48.5	59	69.5	80	90.5	101	111.5	122	132.5	143	153.5	164	174.5	185	195.5	206	216.5
L	34.5	45	55.5	66	76.5	87	97.5	108	118.5	129	139.5	150	160.5	171	181.5	192	202.5	213	223.5

- M3MA010- C, C1, C2, C3 (C type connecter)

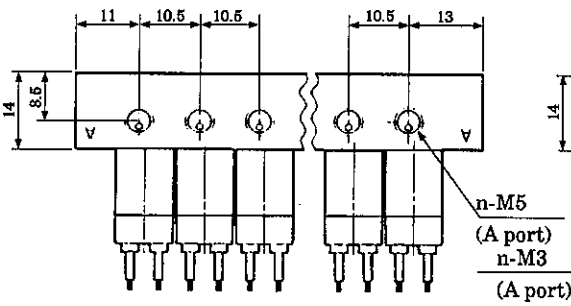


- M3MA010 - D, D1, D2, D3 (D type connecter)

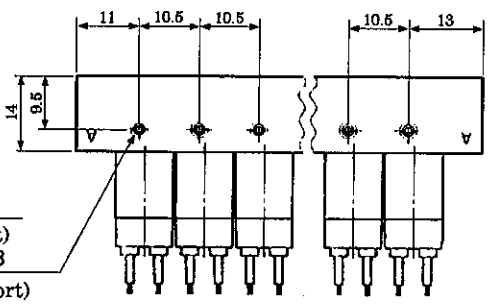


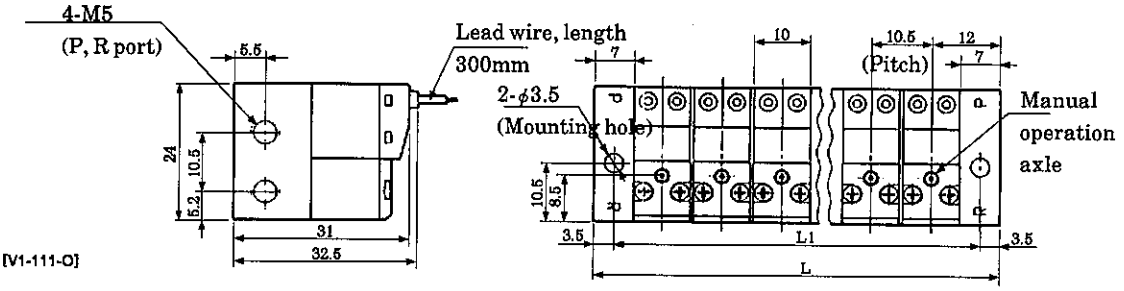
● M3MB010-M3, M5 (Grommet lead wire)

M3MB010-M5



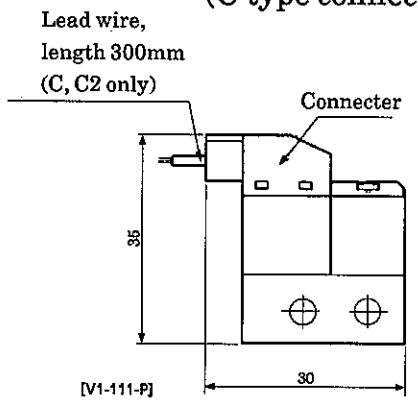
M3MB010-M3



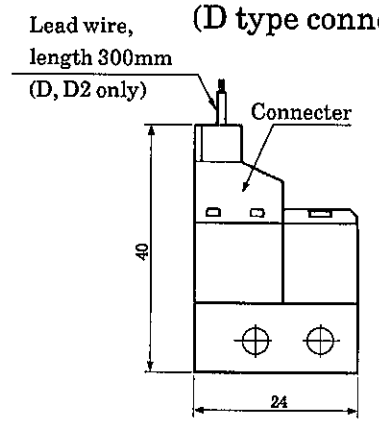


No. of blocks / Symbol	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
L1	27.5	38	48.5	59	69.5	80	90.5	101	111.5	122	132.5	143	153.5	164	174.5	185	195.5	206	216.5
L	34.5	45	55.5	66	76.5	87	97.5	108	118.5	129	139.5	150	160.5	171	181.5	192	202.5	213	223.5

● M3MB010- C, C1, C2, C3 (C type connecter)



● M3MB010 - D, D1, D2, D3 (D type connecter)



2. CAUTION

2.1 Quality of Compressed air

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

Improve the quality of compressed air by dehumidifying using after-cooler dryer.

1) How to purge drain (sludge)
   - Dehumidifying the air by means of after-cooler dryer
   - Removal foreign particles and material by means of filter
   - Removal tarcarbide by means of tar-removing filter

2.2 Cautions to build system with manifold

1) Direction of flow

   Both Compressed air supply (P) ports and Exhaust (R) ports are provided at both end of manifold block. Make use either one of them.

2) Connecting pipe diameter

   Use the pipe of diameter corresponding to P port size of manifold. Insufficient flow or pressure may cause either malfunction of valve or short propelling force of cylinders.

2.3 Cautions to mount subplate onto manifold

Tighten 2ea. of mounting screws uniformly with tightening torque of 0.25 to 0.3 N · m.

2.4 Manual Operation Devices

Non-lock type manual operation device

Press manual operation axis till it hits the bottom. Valve will be shifted to the same position as if solenoid coil is energized and returns when axis is released.

2.5 Responding time

1) Supplying pressure

Responding time posted on a catalog is for the case of energizing with Non-lubricat at the pressure of 0.5 MPa.

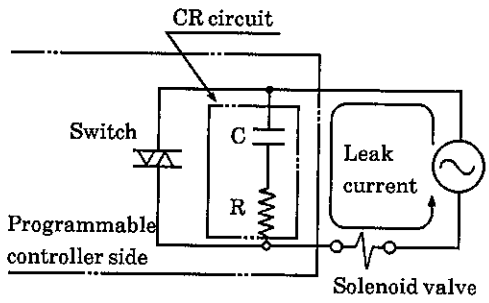
2) Lubrication

There may be a delay of responding time in case of excessive volume of lubrication or low pressure.

2.6 Solenoid valve

1) Limitation of Leak current

Make sure that the leak current of programmable controller output is less than DC24V, 1mA when anticipating to drive solenoid coil valve with programmable controller, etc. Otherwise, it may cause malfunction of coil.



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2) Polarity of solenoid coil

There is a polarity of DC solenoid coil with lamp and surge killer. Confirm the electric circuit.

2.7 Ambient Conditions

1) Dust

Mount either silencer or elbow joint to R port keeping its open end downward within the area of much dust or floating foreign particles, to provide protective measurement of keeping those foreign particles from falling into R port.

2) Water drops and cutting coolant

Instead of leaving water or cutting coolant dripping over the solenoid, either provide a cover or install the solenoid within enclosed panel as it may causes short circuit or coil burning. Prevent allowing cutting coolant drip over cylinder rod because it will result malfunction of solenoid valve due to penetrated coolant to secondary piping of solenoid through cylinder. Contact nearest CKD dealer if the case is as such.

3) Continuous charging

When it is installed within enclosed control box or charging time is long, take some measure of ventilation or radiation. Otherwise it may cause rising temperature excessively.

4) Corrosive gas ambient

Prevent installation the valve within the corrosive gas such as sulfurous acid gas. Contact nearest CKD dealer for installation valve in the ambient of sea breeze or splash of sea water.

5) Ambient temperature

Contact nearest CKD dealer for installation valve in the ambient of high temperature higher than 50°C or such lower temperature as below 5°C.

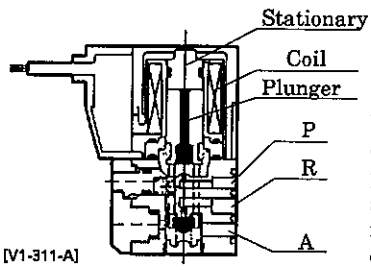
6) Vibration and Shock

Prevent installation of valve within the area of 50m/s^2 or higher vibration and/or 300m/s^2 or higher shock.

3. OPERATION

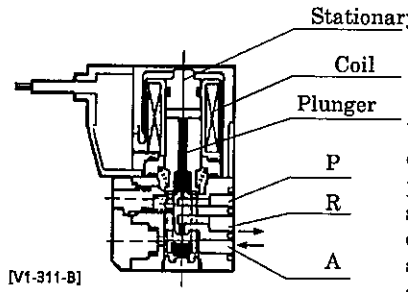
3.1 Actuation explanation

Energized



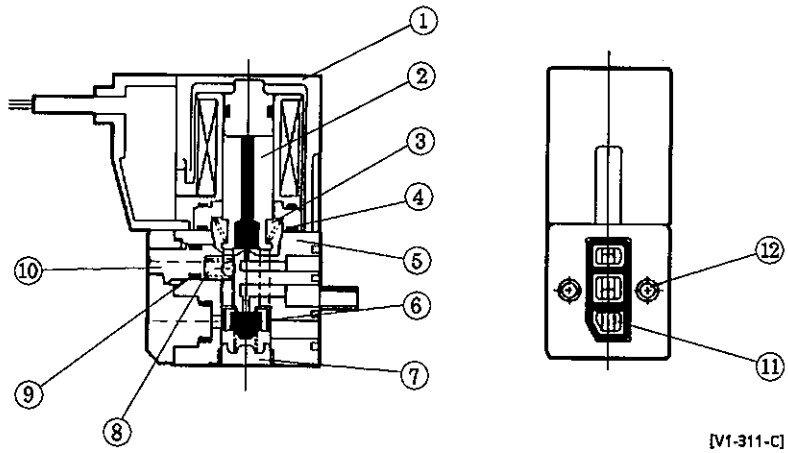
When coil is energized, plunger is attracted to core iron, allowing compressed air to flows from P port

Disengaged



When coil is disengaged, plunger separates from core iron allowing compressed air to

3.2 Internal Structure and Parts list



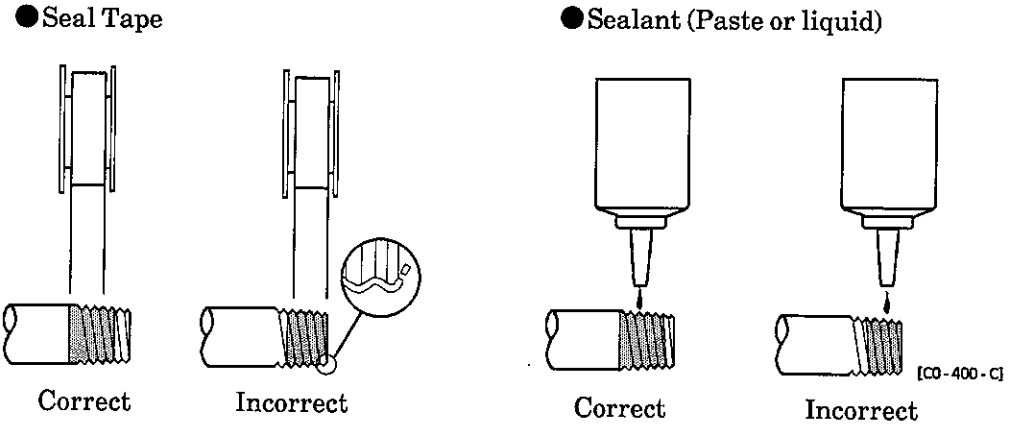
No.	Parts	Material		Remarks
①	Actuator ass'y	—	—	
②	Plunger	SUS405	Stainless steel	
③	Plunger spring	SUS304	Stainless steel	
④	O ring	FKM	Fluorine rubber	
⑤	Body	PPS	Polyphenilene sulfide	
⑥	Valve seat	NBR	Nitril rubber	
⑦	Bottom	PPS	Polyphenilene sulfide	
⑧	Manual op. axle spring	SUS304	Stainless steel	
⑨	O ring	FKM	Fluorine rubber	
⑩	Manual operation axle	POM	Polyacetal	
⑪	Body gasket	NBR	Nitril rubber	
⑫	Mounting screws	SWCH	Steel	Zinc chromate

4. INSTALLATION

4.1 Piping

1) Application of sealant

Carefully apply it so as to prevent it from flowing into pipe but sufficient to prevent air leakage.



When applying the seal tape of Fluorine resin over threaded pipe, apply it 2 to 3 layers leaving blank 1 to 2 pitches of thread off the end of pipe and press it with finger nail to make it stick to thread. Leave the same blank of thread when applying sealant sufficiently but not excessive to prevent it from falling into pipe. Never apply sealant to female threaded part.

2) Rust scale or dust in pipes cause malfunction of valve seat leakage. Install a filter preferably adjacent upper-stream to solenoid valve for eliminating rust, foreign substance and drain from falling into the system.

3) Flush air into the pipes, solenoid valve and peripheral equipment to blow out foreign substances and chips before piping.

4) Mounting posture

There is no restriction as to its mounting posture.

5) Tightening torque

Apply appropriate torque referring to the following table for the purpose of preventing leakage and damage.

Connecting thread	Appropriate torque N · m
M3	0.3 to 0.6
M5	1.0 to 1.5
Rc1/8	3.0 to 5.0

Gasket (Model code: FGS) is used to seal M3 and M5. Avoid additional tightening while pressure is on. Design and build the system to provide ample room around piping for hand tools at later maintenance work.

4.2 Applicable tubes

1) Appropriate tubes

Select tubes specified by CKD for solenoid valves with fittings.

Soft nylon tube (F-1500 series)

Urethane (U-9500 series)

Carefully examine its Outside Diameter accuracy as well as its wall thickness and hardness when selecting commercially available tubes. As for urethane tube hardness, select 93° or over (Rubber hardness gage).

OD tolerance

Soft·hard nylon	±0.1mm
Urethane ϕ4, 6	+0.1mm −0.15mm

Wall thickness of tube

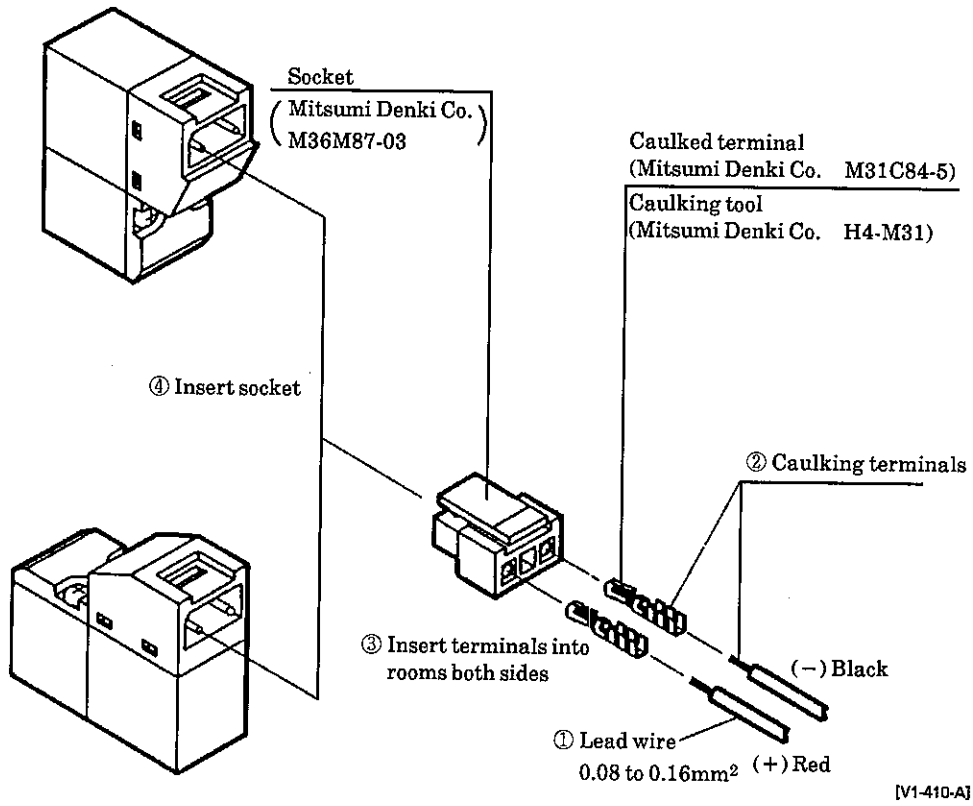
OD mm	ID mm	
	Nylon	Urethane
ϕ4	ϕ2.5	ϕ2
ϕ6	ϕ4	ϕ4

2) Apply tube bending radius more than the least bending radius posted in the table below. Otherwise it may cause slipping off or leakage.

Tube diam.	Least bending radius mm	
	Nylon	Urethane
ϕ4	10	10
ϕ6	20	20

4.3 Wire connection to C type and D type connecters.

Refer to the following illustration and comply with steps ① to ④.



Note : Confirm the polarity when it is the type with lamp and surge killer.
It results no short circuit but valve does not function.

4.4 Installation of Peripheral equipments

1) Air filter

Select the air filter with a filter element of 5μm mesh or smaller.(Refer to CKD's SELEX air filter catalog.) Also, periodically purge drain.

2) Lubricator

Models 3MA, 3MB series are serviceable with no lubrication. It is recommended, if lubrication is preferred due to peripheral equipment, to use Turbine oil, Class 1, ISO VG32 (Additive free) or equivalent, but maintain volume only to the extent of reasonable.

Spindle oil, machine oil are inappropriate because packings will be swollen causing malfunction of equipment.

5. MAINTENANCE

5.1 Trouble Shooting

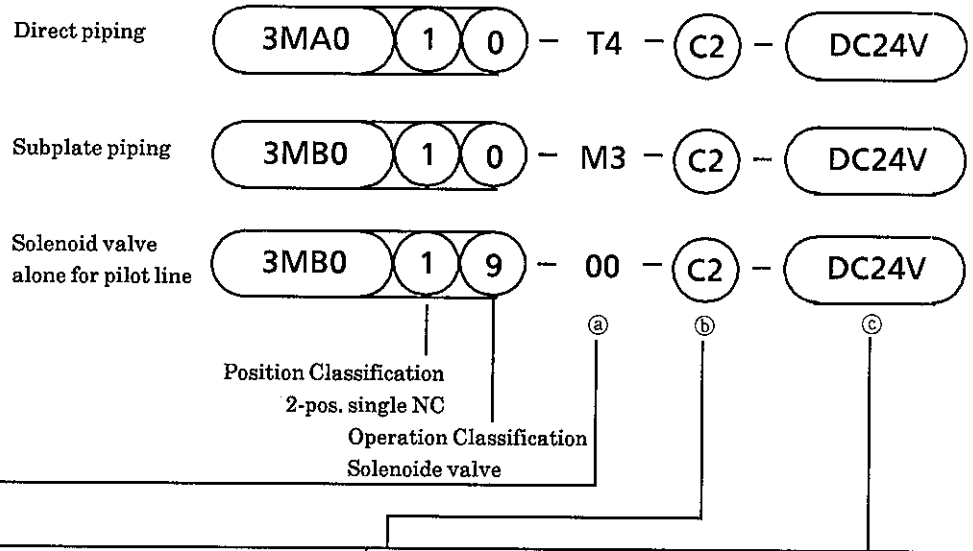
Motion troubles	Suspected cause	Remedies
Does not actuate	No electric signals	Turn on the power
	Damage to signal wiring system	Repair the control circuit
	Excessive fluctuating range of current or voltage	Reaffirm the power capacity. (within ±10% of voltage pressure fluctuation)
Malfunctions	Excessive leaking current	Correct control circuit and/or set a bleed circuit
	Chattering	Inspect switching system and/or tighten each loosen terminal screw
	Voltage deviates than specified on the name plate	Rectify the voltage to meet the specification
	Erroneous shut off pressure source	Turn on the power source
	Insufficient pressure	Reset the pressure reducer valve or install a pressure raising valve
	Insufficient flow of fluid	Rectify the size of pipe or install a surge tank
	Pressure supplied through exhaust port	Change the piping to an external pilot system
	Erroneous piping, erroneous omitting some piping	Rectify the piping system
	Speed control valve completely closed by error	Reset the needle valve
	Valve is frozen	Add remedies of avoiding freezing (Heating system or dehumidifying system etc.)
	Delayed return of a plunger (Excessive oil, existence of tar)	Check the quality of the lubricant. (Turbine oil class 1, ISO VG 32 or equivalent)
	〃	Rectify the quantity of lubricant drip
	〃	Install a tar removing filter
Malfunctions when manifold is used	Delayed response when multiple blocks are used	Install Sup.(P) piping to P ports on both sides of manifold block
	〃	Connect Exh.(R) piping to R ports on both sides of manifold block so as to exhaust to an open air through
	Adjacent cylinder pops out	Rewire to have the solenoid valve in question is actuated prior to others sequentially. Install a locking system to the cylinder

5.2 Disassembly

It is not recommended to disassemble this equipment in field due to it consistency of precision components.

6. HOW TO ORDER

6.1 3MA0, 3MB0 series



ⓐ Connecting port diam.			
Symbol	A port	P・R port	Model
T4	φ4 barbed	M3	3MA0
M3	M3		3MB0

- It is recommended to use either one of such tubes as listed below for connecting A port of 3MA0 series.
  F-1532 F-1504
  U-9532 U-9504

ⓑ Wiring types	
Symbol	Content
No marking	Grommet lead wire (std)
C	C type connecter, lead wire 300mm
C1	C type connecter, without lead wire
C2	C type connecter, lead wire 300mm w/lamp and surge killer
C3	C type connecter, without lead wire w/lamp and surge killer
D	D type connecter, lead wire 300mm
D1	D type connecter, without lead wire
D2	D type connecter, lead wire 300mm w/lamp and surge killer
D3	D type connecter, without lead wire w/lamp and surge killer

ⓒ Voltage		
Symbol	Content	
DC24V	DC24V	Standard
DC12V	DC12V	Option
DC6V	DC6V	
DC5V	DC5V	

6.2 M3MA0, M3MB0 series

Solenoid valve alone for Manifold: 3MA0 1 9 – T4 – C2 ——— DC24V

Manifold: M3MA0 1 0 – T4 – C2 – 2 – DC24V

Solenoid valve alone for Manifold: 3MB0 1 9 – 00 – C2 ——— DC24V

Manifold: M3MB0 1 0 – M3 – C2 – 2 – DC24V

ⓐ ⓑ ⓒ ⓓ ⓔ

Operation Classification
Solenoide valve

ⓐ No. of positions	
Symbol	Content
1	2-pos. single, NC
8	Mixed manifold

ⓑ Connecting port diam.			
Symbol	A port	P·R port	Model
T4	φ4Barbed fitting	M5	M3MA0
M3	M3		M3MB0
M5	M5		
GS4	φ4 Snap joint		
T4	φ4Barbed fitting		
T6	φ6Barbed fitting		

ⓒ Wiring	
Symbol	Content
No marking	Grommet lead wire (std)
C	C type connecter, lead wire 300mm
C1	C type connecter, without lead wire
C2	C type connecter, lead wire 300mm w/lamp and surge killer
C3	C type connecter, without lead wire w/lamp and surge killer
D	D type connecter, lead wire 300mm
D1	D type connecter, without lead wire
D2	D type connecter, lead wire 300mm w/lamp and surge killer
D3	D type connecter, without lead wire w/lamp and surge killer

- To build GS4, Snap joint GMS4-M5-S is screwed into A port.
- To build T4, T6, Barbed fitting FTS4-M5, FTS6-M5 respectively is screwed into A port. However, in case of T4 of M3MA, fitting and body are built solid.

ⓓ Number of blocks	
Symbol	Content
2	2 blocks
⌇	⌇
20	20 blocks

ⓔ Voltage		
Symbol	Content	
DC24V	DC24V	Standar
DC12V	DC12V	Option
DC6V	DC6V	
DC5V	DC5V	

When building a system using one kind of manifold

Example of building a series of manifold blocks with same model : M3MA010-T4-7-DC24V : It denotes to be a 3MA0 Manifold, 2-position single solenoid, A · B port, M5 side piping, 7 blocks, DC 24V.

Mixed Manifold

- Describing procedure of Combination concept

  When ordering mixed combined manifold (marking 8 in column Ⓐ), specify required function markings (refer to the following tables) and sequential block number starting from left end block (No. 1), beside normal specifications.

  When function list is as follows :

Marking	Function
S1	2-positon, Single
MP	Masking plate

1	2-pos. Single, (S1)
2	2-pos. Double, (S1)
3	3-pos. All port block, (S3)
4	3-pos. All port block, (S3)
5	2-pos. double, (S2)
6	2-pos. Single, (MP)
7	3-pos. All port block, (MP)

The model coding is as follows when intending to line up 7 blocks of combined blocks of A · B port connection, M5 side piping, DC 24V line numbered as above example.

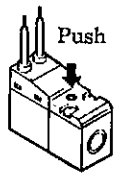
M3MB080-M3-7-DC24V- [5 (S1)] [2 (MP)]

Show 0 for blocks not scheduled to use.
(S1 = 1~5, MP = 6.7)

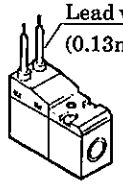
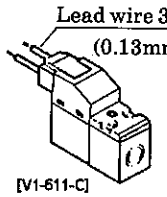
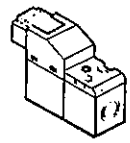
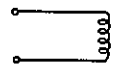
Use alphabetic letters in sequence when anticipating to use more than blocks of same model to build up mix manifolds.

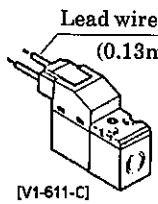
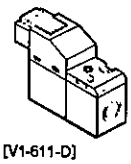
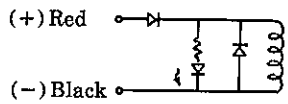
Number of actuators scheduled	10	11	12	13	14	15	16	17	18	19	20
Alphabettic marking	A	B	C	D	E	F	G	H	I	J	K

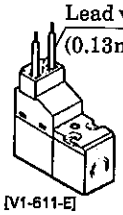
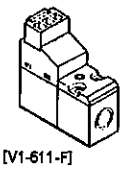
Manual operation device

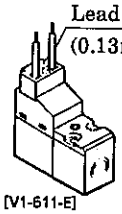
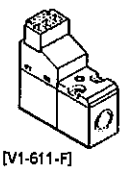
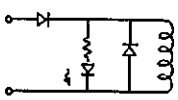
Device name	Non-locking type
Option marking	No marking
Shape	 [V1-611-A]

© Wiring concept

Device name	Grommet lead wire	C type connecter, with lead wire1.	C type connecter, without lead wire
Option marking	No marking	C	C1
Shape	 [V1-611-B]	 [V1-611-C]	 [V1-611-D]
Circuit	 [V6-405-E]		

Device name	C type connecter, with lead wire w/surge killer and lamp	C type connecter, without lead wire w/surge killer and lamp
Option marking	C2	C3
Shape	 [V1-611-C]	 [V1-611-D]
Circuit	 [V1-610-G] Carefully confirm the polarity.	

Device name	D type connecter, with lead wire	D type connecter, without lead wire
Option marking	D	D1
Shape	Lead wire 300mm (0.13mm²)  [V1-611-E]	 [V1-611-F]
Circuit	 [V6-405-E]	

Device name	D type connecter, with lead wire w/surge killer and lamp	D type connecter, without lead wire w/surge killer and lamp
Option marking	D2	D3
Shape	Lead wire 300mm (0.13mm²)  [V1-611-E]	 [V1-611-F]
Circuit	(+) Red (−) Black  [V1-610-G] Carefully confirm the polarity.	