SM-50521-A

INSTRUCTION MANUAL

FOR

3 – PORT, CYLINDER VALVE

NAP11 SERIES

Prior to using the Product, it is essential to read this INSTRUCTION MANUAL, especially the description of safety-use issue.

For quick reference whenever necessary, keep this INSTRUCTION MANUAL in a good manner.

CKD Corporation

Introduction

Thank you for choosing the CKD's cylinder valve NAP11.

To avoid the abuse of the valves, thoroughly read this instruction manual before using them.

1. Purpose and use of the valves

This valve is an external-pilot, 3-port, selector valve specially designed for pneumatic or low vacuum systems of general industrial machines and instruments.

It is intended for switching a pneumatic circuit or absorbing and transfering goods using vacuum supplied through a low vacuum circuit.

2. General precautions

(1) This instruction manual describes the basic matters regarding the handling of the product from the unpackaging, installation, use, maintenance through withdrawal.

(2) The instructions for installation given by this manual assume that they will be read by specialist engineers, i.e. mechanics and electricians.

Thoroughly read this manual before the design and installation in order to assure the safety of the machine or instrument and properly handle the product.

3. Safety precautions

(1) To avoid injury, fire and damages to the facilities, the warnings shown on the product shall be strictly observed.

(2) Each warning has a heading "Danger," "Warning" or "Caution" depending on the rating of the possible risk.
As these valves are used as components of a machine or instrument, all the warnings are shown with the heading "Caution."

Example:

⚠ Caution	A warning

[CONTENTS]

1. Unpackaging

(1) Check that the model No. shown on the face plate of the product agrees with that you ordered.
(2) Check that the product has no external damages.
(3) When keep the product, install a seal plug to prevent the intrusion of foreign matter to the valve. Remove the seal plug when piping the valve.

2. Installation

2.1 Conditions for installation

2.1.1 Protection of the product

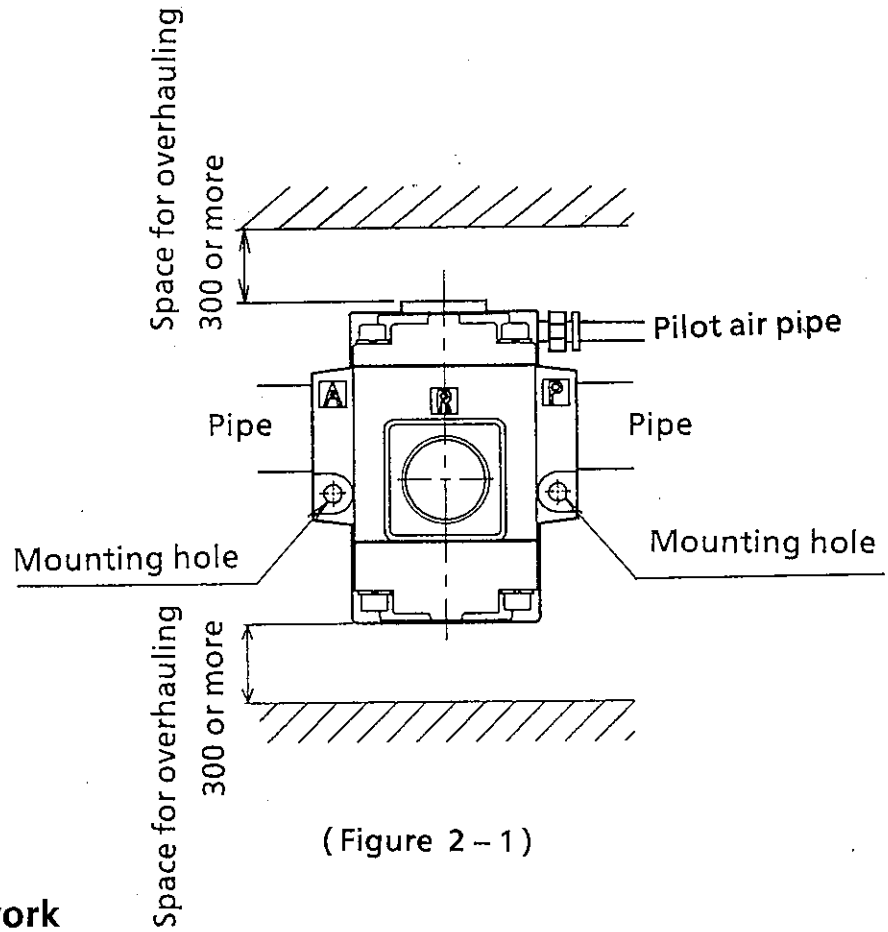
(1) Use in a cold district
When using the valve in a cold district, an adequate provision is required to prevent the freezing of the valve.

2.1.2 Orientation

(1) The mounting posture of the valve is not specified.
(2) Fix the valve using the mounting hole on the valve except when using a metallic pipe.
(3) The valve cannot be used in a place where it will be submitted to the vibration larger than 5G.

2.1.3 Space for maintenance

- An adequate space shall be provided around the valve to assure the safety during the maintenace/troubleshooting work (see Figure 2-1).



(Figure 2 – 1)

2.2 Piping work

(1) Cleaning the pipes

Before piping, check that the pipes are free from foreign matter, cutting chips and burrs.

If necessary, remove the foreign matter, cutting chips and/or burrs inside the pipes using compressed air at a pressure of 0.3 MPa or more.

(2) Air filter

Install an air filter with 5 micrometer or finer mesh before the valve. The rusting of the inside of the pipes may lead to a malfunction and/or leakage.

(3) Dust

If the valve is used in the atmosphere containing much dust, it will be likely to malfunction or cause a leakage. In this case, a silencer or filter shall be installed at the exhaust or air intake port to prevent the intrusion of dust.

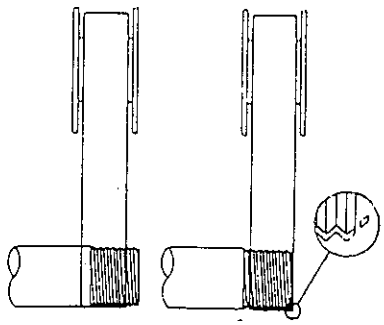
(4) Flowing direction of the fluid

The valve shall be piped in such a manner that the flowing direction of the fluid will match the direction of the arrow indicated on the JIS symbol of the product.

(5) Sealer

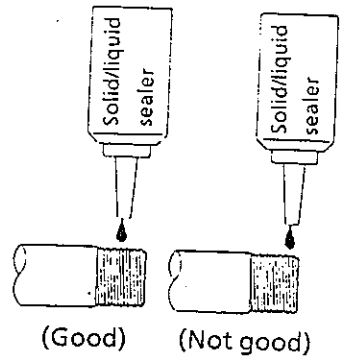
The sealer shall be used with great care to prevent it from entering the pipes or leaking out.
When taping a threaded portion, one point five or two threads at the end of the portion shall be exposed (see Figure 2-2).
When using liquid sealer, take care not to apply too much sealer. Similarly to the case of taping, one point five or two threads at the end of the threaded portion shall be exposed (see Figure 2-3).
Do not apply to the female screw of the apparatus.

● Seal tape



(Figure 2 – 2)

● Solid / liquid sealer



(Figure 2 – 3)

(6) Torques required for tightening pipes
The torques required for tightening pipes are shown in Table 2-1 for reference.

Table 2-1. Recommended values of the torques for tightening pipes

Nominal size of pipe		Torque for tightening (recommended)
Rc	1/8	7 - 9 [N · m]
Rc	1/4	12 - 14 [N · m]
Rc	3/8	22 - 24 [N · m]
Rc	1/2	28 - 30 [N · m]
Rc	3/4	31 - 33 [N · m]
Rc	1	36 - 38 [N · m]
Rc	$1\ 1/4$	40 - 42 [N · m]
Rc	$1\ 1/2$	48 - 50 [N · m]
Rc	2	54 - 56 [N · m]

(7) Lubricated or unlubricated operation
This valve does not require lubrication. Therefore, no lubricator is needed.
If the valve is to be lubricated, use type 1 turbine oil, ISO VG 32 (no additives).

3. Pre-operation (post-installation) check

3.1 Appearance check

⚠ Caution	• Shut off the fluid flow. • Exhaust the fluid remaining in the valve.

(1) Push the valve with finger to check that the valve has been fixed to the pipe or mounting hole.
(2) Check that the fasteners including hexagonal socket head cap screws and bolts have not been loosened.

3.2 Check for leakage

(1) Supply compressed pilot air to the pilot connector port (port X).
(2) Supply compressed fluid to the main line.
(3) Compress the fluid to check for leakage at pipe joints.
It is recommended to check for leakage by supplying a pneumatic pressure of 0.3 - 0.5 MPa with soapy water applied to the joints. Air bubbles will be generated at the leaking joints.

4. Instructions for proper use

⚠ Caution	• Install a silencer at the exhaust port of the main piping to the valve to reduce the noise to be given to the personnel working around the machine.

(1) The operating frequency specified below shall be satisfied.

Table 4-1. Operating frequency

Connection port size of valve	Operating frequency
10A · 15A	360 cycles/min or less
20A · 25A	180 cycles/min or less
32A - 50A	90 cycles/min or less

※ The values shown in Table 4-1 represent the operating frequencies measured with a solenoid valve 3PB2 and 300mm or shorte pipe installed.

If the time for which the valve is energized is too short, the valve may not follow the operation of the entire system.

(2) If the valve has been out of use for seven days or longer, the first cycle after the restart of the valve may take approximately a second longer than usual.
In this case, a commissioning shall be performed before operating the valve.

(3) Periodically remove the drain accumulated in the air filter.

(4) If the filter element of the air filter turns black, it means that it has been contaminated with tar. Periodically clean the filter element.

(5) When supplying oil using a lubricator, periodically replenish oil to keep the oil level in the lubricator.
For lubrication, use type 1 turbine oil, ISO VG 32 (no additives).

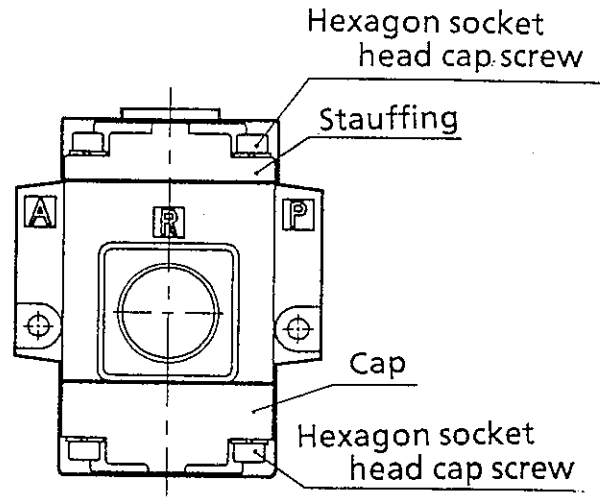
(6) If any abnormal condition is found, see section 7 "Troubleshooting."

5. Disassembly and assembly

5.1 Disassembly procedure

⚠ Caution	• Close the main valve. • Exhaust the fluid remaining in the valve.

(1) Loosen the hexagon socket head cap screw on the stauffing.
(2) Raise the stauffing.
(3) Loosen the hexagon socket head cap screw on the cap. At this time, take care not to lose the spring located inside the cap.



(Figure 5 – 5)

5.2 Assembly procedure

(1) The assembly shall be performed with reference to section 8 "Internal construction drawings."
(2) Apply grease to the packing and O ring.
For grease, use silicone grease G-40H, Shinetsu Kagaku Kogyo.
(3) Apply grease to the surface on which the piston slides.
(4) Apply grease to the surfaces of the body and valve seat on which the packing slides.
(5) Insert the valve stem from the bottom of the body.
(6) Insert the valve seat from the bottom of the body.
(7) Install the gasket, spring and cap and tighten the hexagon socket head cap screw.
(8) Install the stauffing and tighten the hexagon socket head cap screw.
(9) Compress the pilot air to check that the air is not leaking out.
(10) Compress the fluid to check that the fluid is not leaking out.

6. Maintenance

6.1 Maintenance and inspection

(1) To keep the product in the good condition, inspect it twice a year unless otherwise specified.

(2) For the content of the inspection, see section 3 "Pre-operation check."

6.2 Service parts

(1) Valve stem, valve seat and spring
Replace them with new ones if fluid leaks or the valve seat does not move or delays to move during the operation.
As a guideline, replace them every 10 million cycles.

(2) Packing, O ring and gasket
Replace them with new ones if fluid leaks or another abnormal condition is observed.
As a guideline, replace them every 10 million cycles.

7. Troubleshooting

- If the valve does not function as specified, check it according to Table 7-1.

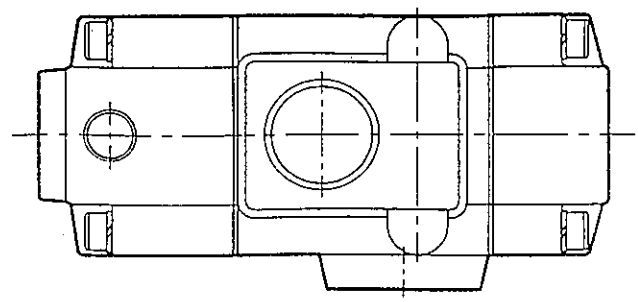
Table 7-1

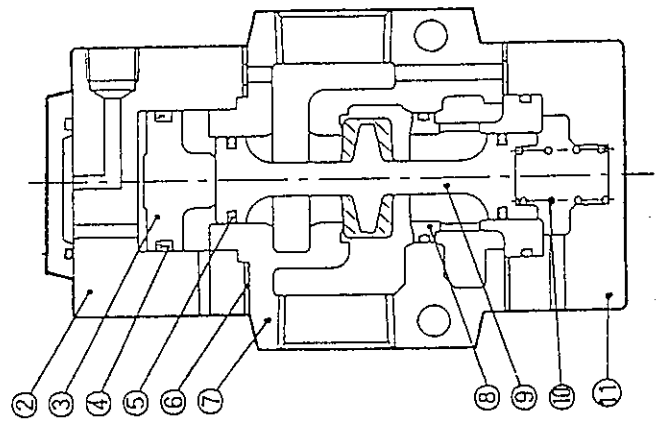
Symptom	Cause	Action
The valve does not move.	The fluid pressure is too high.	Adjust the fluid pressure.
	The pilot air pressure is too low.	Adjust the pilot air pressure.
	The pilot solenoid valve does not move.	Replace the pilot solenoid valve with a new one.
	Foreign matter is entangled by the valve stem.	Overhaul the valve and clean the inside of it.
The valve does not return.	The pilot solenoid valve does not return.	Replace the pilot solenoid valve with a new one.
	Foreign matter is entangled by the valve stem.	Overhaul the valve and clean the inside of it.
	Packing is running short of grease.	Overhaul and reassemble the valve.
External leakage	The fluid pressure is too high.	Adjust the pressure.
	The packing is damaged or worn.	Overhaul the valve and replace the packing with a new one.
	O ring is damaged.	Overhaul the valve and replace the O ring with a new one.
Leakage from the valve seat	The valve seat on the body is damaged.	Replace the body with a new one.
	The sealing surface of the valve seat is damaged.	Replace the valve seat with a new one.
	The rubber or sealing surface of the valve stem is damaged or worn.	Replace the valve stem with a new one.
	Foreign matter is entangled by the valve stem.	Overhaul and clean the valve.

* If further information is required, consult us or the nearest agency.

8. Internal construction drawings

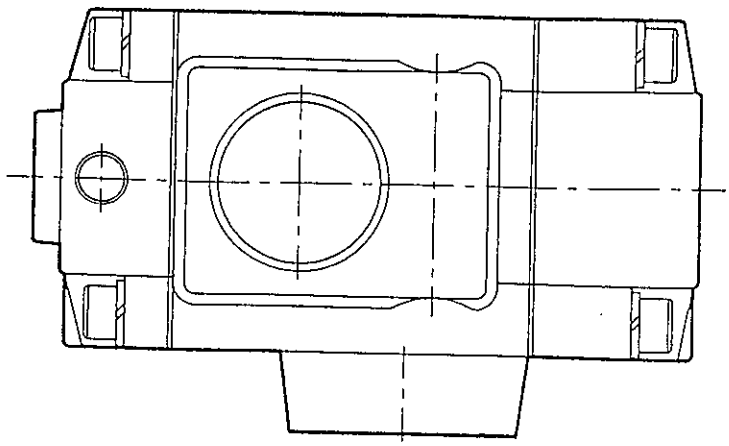
8.1 Connection port size : 10A to 15A

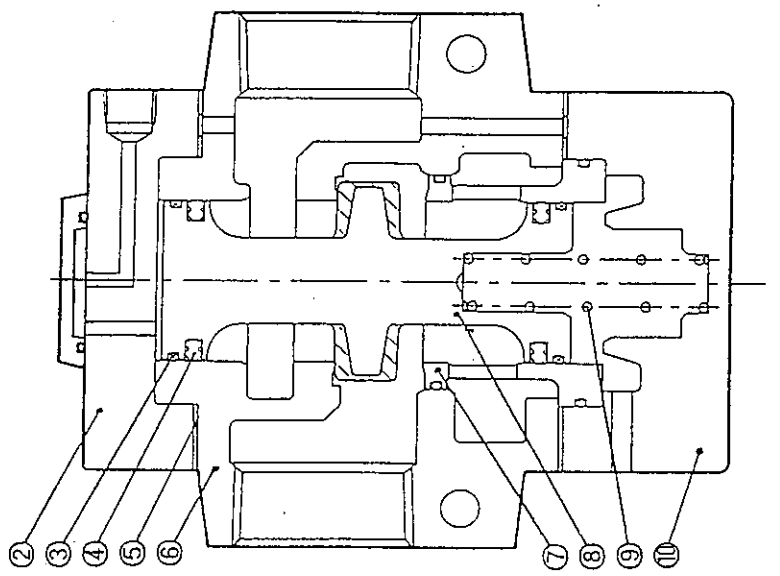




No.	Part name	Qty
1		1
2	Staffing	1
3	Piston	1
4	MY packing	1
5	Packing	2
6	Gasket	2
7	Body	1
8	Valve seat	1
9	Valve stem	1
10	Spring	1
11	Cap	1

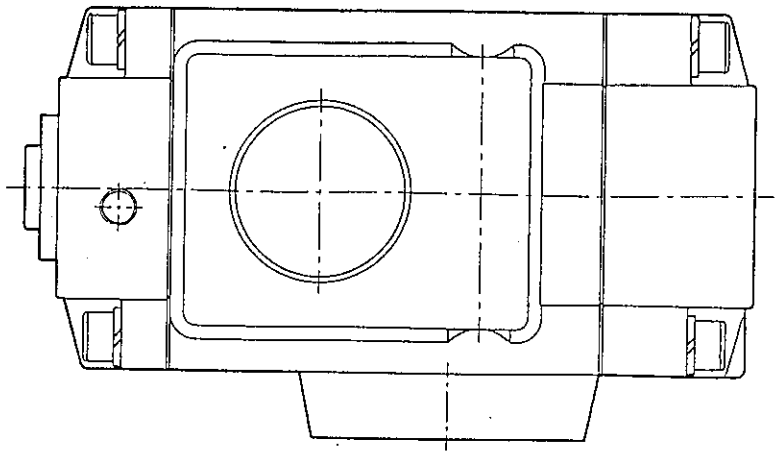
8.2 Connection port size : 20A to 25A

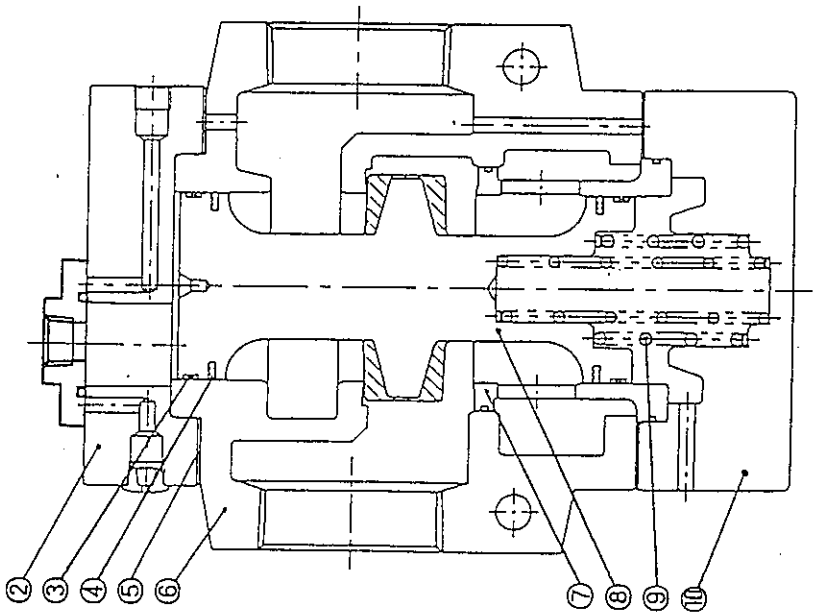




No.	Part name	Qty
1		1
2	Staffing	2
3	Wear ring	2
4	Packing	2
5	Gasket	2
6	Body	1
7	Valve seat	1
8	Valve stem	1
9	Spring	1
10	Cap	1

8. 3 Connection port size : 32A to 50A





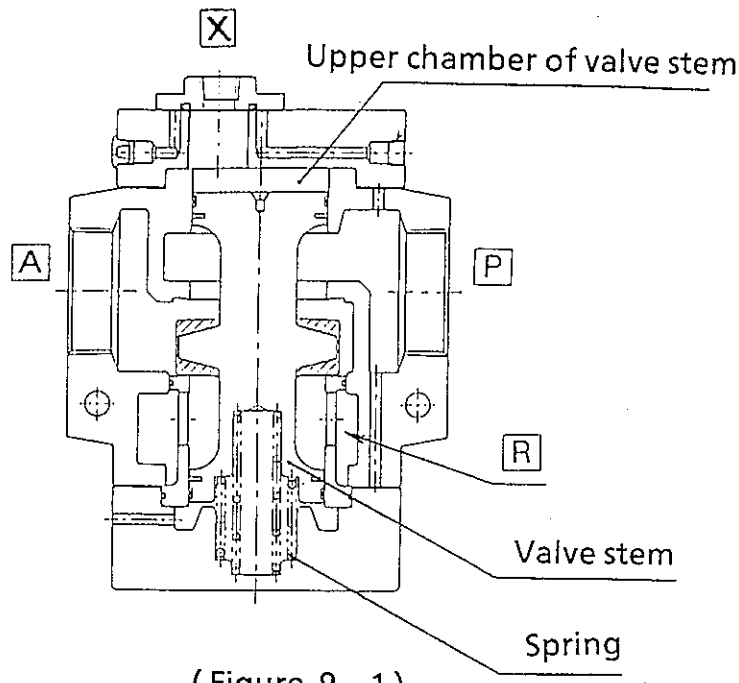
No.	Part name	Qty
1		1
2	Staffing	2
3	Wear ring	2
4	Packing	2
5	Gasket	1
6	Body	1
7	Valve seat	1
8	Valve stem	1
9	Spring	1
10	Cap	1

9. Operating mechanism

● Opening operation

(1) As the pilot air supplied to port X , the valve stem will lower to close the valve seat and open the valve seat on the body.

(2) The fluid in the main line will connect ports P and A and close port R.

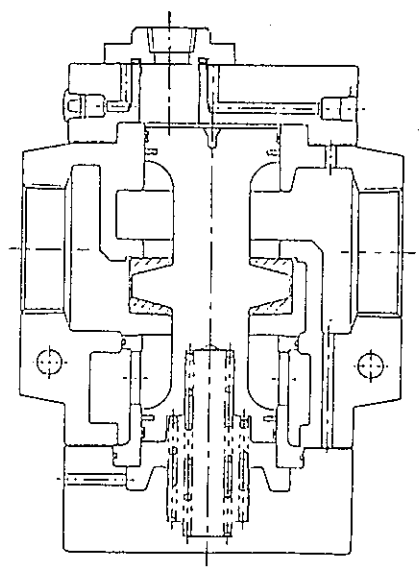


(Figure 9 – 1)

● Closing operation

(1) As the pilot air is discharged , the valve stem will rise by means of the spring force to close the valve seat on the body.

(2) The fluid in the main line will connect ports A and R and close port P.



(Figure 9 – 2)

10. Specifications for the product

10.1 Meaning of the model No.

N A P 1 1 – 1 5 A – 1

① ②

① Body end connection port size	
Symbol	Content
10A	Rc 3/8
15A	Rc 1/2
20A	Rc 3/4
25A	Rc 1
32A	Rc 1 1/4
40A	Rc 1 1/2
50A	Rc 2

② Materials of body and seal		
Symbol	Body	Seal
1	Aluminum	NBR

10.2 Specifications for the product

Connection port size	10A	15A	20A	25A	32A	40A	50A
Proof pressure	1.2 MPa						
Operating fluid	Compressed air , Vacuum						
Fluid pressure	Compressed air 0 - 0.8 MPa Vacuum 1.3×10^2 - 8×10^5 Pa (abs)						
Fluid temperature	5 - 60°C						
Ambient temperature	- 5 - 60°C						
Ambient humidity	95% or less						
Pilot fluid	Compressed air						
Pilot control pressure	0.35- 0.7 MPa						
Pilot fluid temp.	5 - 60°C						
Response time [in milliseconds]	30 or less		60 or less		120 or less		
Operating frequency [in clcyes/min]	360 or less		180 or less		90 or less		

- The response time is measured during the unlubricated operation with a supply pressure of 0.5 MPa. It varies depending on the pressure and the nature of the oil to be supplied.
  All the above values are measured with a pilot solenoid valve 3PB2 and a 300mm long pilot air pipe with an inside diameter of 6mm installed.