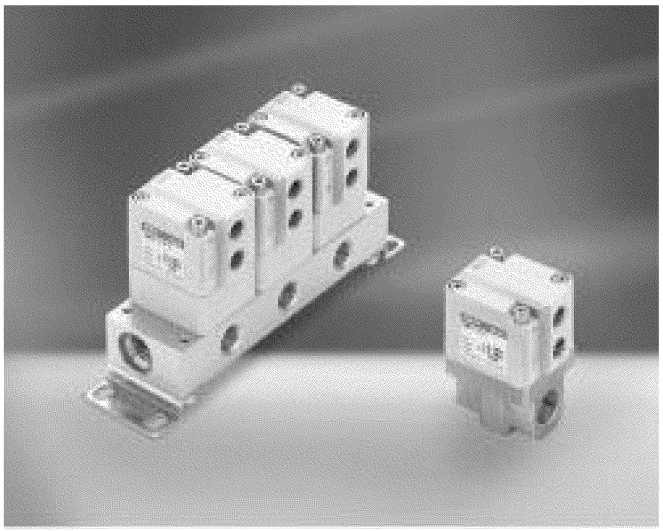
SM－50765－A

CKD

INSTRUCTION MANUAL
CYLINDER VALVE
NAD※ Series
GNAD※ 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.

Ver.3

CKD Corporation

Safety precautions

When designing and manufacturing a device using CKD products, the manufacturer is obligated to manufacture a safe product by confirming safety of the system comprising the following items:

■Device mechanism
■Pneumatic or water control circuit
■Electric control that controls the above

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 someone having sufficient knowledge and experience.

2. **Use this product within of specifications.**
   Consult with CKD for details when using the product beyond the unique specification range, outdoors, or in the following conditions or environment: Additionally, the product must not be modified or machined.
   ① Use for special applications requiring safety including nuclear energy, railroad, aviation, ship, vehicle, medical equipment, equipment or applications coming into contact with beverage or food, amusement equipment, emergency shutoff circuits, press machine, brake circuits, or for safeguard.
   ② Use for applications where life or assets could be adversely affected, and special safety measures are required.

3. **Observe corporate standards and regulations, etc., related to the safety of device design and control, etc.**
   ISO4414, JIS B 8370 (pneumatic system rules)
   JFPS2008(principles for pneumatic cylinder selection and use)
   Including High Pressure Gas Maintenance Law, Occupational Safety and Sanitation Laws, other safety rules, body standards and regulations, etc.

4. **Do not handle, pipe, or remove devices before confirming safety.**
   ① Inspect and service the machine and devices after confirming safety of the entire system related to this product.
   ② Note that there may be hot or charged sections even after operation is stopped.
   ③ When inspecting or servicing the device, turn off the energy source (air supply or water supply), and turn off power to the facility. Discharge any compressed air from the system, and pay enough attention to possible water leakage and leakage of electricity.
   ④ 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 on the pages below to prevent accidents.**

■ **The safety cautions 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, or when there is a high degree of emergency to a warning.

⚠ WARNING : When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries.

⚠ 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. In any case, important information that must be observed is explained.

Precautions with regard to guarantee

● **Guarantee period**

The guarantee period of our product shall be one (1) year after it is delivered to the place specified by the customer.

● **Guarantee** coverage

If any failure for which CKD CORPORATION is recognized to be responsible occurs within the above warranty period, a substitute or necessary replacement parts shall be provided free of charge, or the product shall be repaired free of charge at the plant of CKD CORPORATION.

However, the guarantee excludes following cases:

① Defects resulting from operation under conditions beyond those stated in the catalogue or specifications.
② Failure resulting from malfunction of the equipment and/or machine manufactured by other companies.
③ Failure resulting from wrong use of the product.
④ Failure resulting from modification or repairing that CKD CORPORATION is not involved in.
⑤ Failure resulting from causes that could not be foreseen by the technology available at the time of delivery.
⑥ Failure resulting from disaster that CKD is not responsible of.

Guarantee stated here covers only the delivered products. Any other damage resulting from failure of the delivered products is not covered by this guarantee.

● **Confirmation of product compatibility**

Our customer shall be responsible of confirming compatibility of our product used in our customer's system, machinery or device.

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1. Unpacking

⚠ CAUTION	Do not take off the port protection until just before piping. Otherwise, foreign matter enters the valve and cause malfunction or bad operation.

(1) Check that the model No. shown on the name plate of the product is the same with what you ordered.
(2) Check that the product has no external damages.
(3) When storing the product, keep the product inside the packing box to prevent the intrusion of foreign matter to the valve. Take out the valve when piping.

2. Installation

⚠ WARNING	Contact CKD if the product is to be used beyond specifications, or in special applications.

2. 1 Conditions for installation

⚠ WARNING	a) Do not splash liquid such as water or lubricating oil. Protective measure shall be taken such as covering, or valve installation inside a panel. Protective measure shall be taken against welding spatter. b) The product can not be used in a corrosive or solvent environment. c) Avoid humid environments, since condensation may occur with change in temperature. d) Prevent dust from entering the valve. For use in a dusty atmosphere, prevent dust intruding from the pilot air exhaust port by the following method: ・ Attach a silencer to the exhaust port ・ Attach an elbow connector and face it down. e) Use the product away from radiant heat.

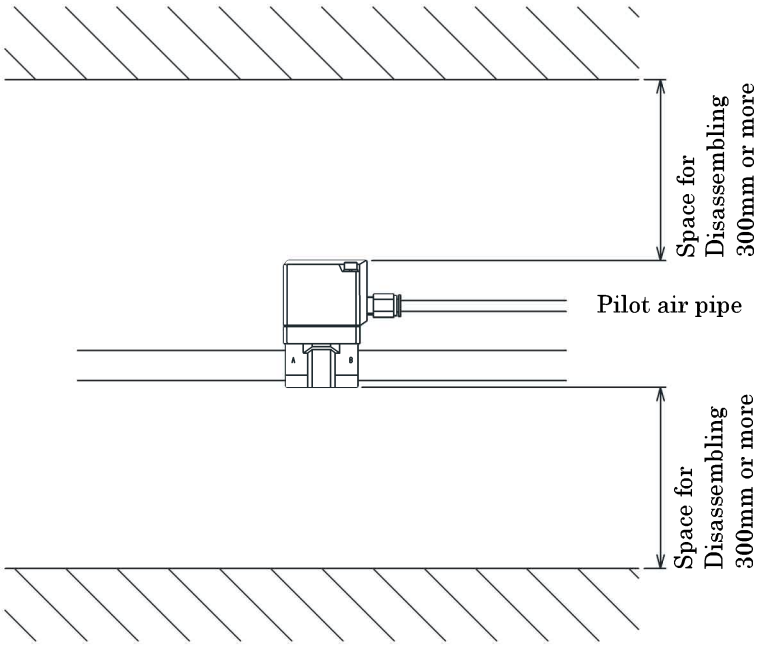
(1) Provide appropriate measures to prevent the product from freezing at cold places.
(2) The product cannot be used outdoors. Protective measure shall be taken such as covering, or valve installation inside a panel.
(3) Do not wash the product with water or solvents. Do not paint the product. Resin material used in the product may break down.
(4) Do not use the product under vibration or inertia.

2. 2 Installation method

⚠ CAUTION	a) Read this instruction manual thoroughly and understand the contents before installing the product. b) Always take hold of the body portion when handling and mounting the product. c) Confirm leakage from the piping after installation.

(1) The mounting posture of the valve is not restricted.

(2) An adequate space shall be provided around the valve to assure the safety during the maintenance/troubleshooting work (figure 1)



(Figure 1) Maintenance space

2. 3 Piping

⚠ CAUTION	a) Precautions when mounting and installing the product. Under your responsibility, worker who understands safety precautions such as system, fluid characteristic, and suitability of this product with related devices shall read this instruction manual carefully and perform work. Incorrect mounting and piping not only fails this product but also causes malfunction to your system. Furthermore, user of your system may be in risk of death or serious injury if mounting and piping is incorrect. b) When piping or re-piping, fix the product. c) Fix and provide appropriate support to the piping, so that the weight and vibration of the piping will not directly be applied to the product. d) When piping is finished and fluid is to be flown, supply pressure gradually. ・If the piping is improper, the piping may disconnect or the fluid may leak.

(1) Cleaning the pipes

・Before piping, flush the piping with compressed air 0.3MPa or more to remove foreign material such as dust, metal powder, rust and sealing material.

(2) Filtration

・Dust or foreign particle in the air may lead to a malfunction and/or leakage.

When the fluid is air, attach a filter 5μm or finer to the primary side of the valve.

(3) Piping

・The piping should be such that the supply ports on the body side and pilot control side are as indicated in the table 1

The cap on the exhaust side of the pilot port is to prevent miss-piping.

The cap can be left attached

Table 1. Supply ports of the body side and the pilot side

Model	Operation Classification	Body side supply port	Pilot air Supply port
NAD※	Normally closed type	A	X
	Normally open type	A	Y
	Double action type	A	X and Y
GNAD※－1 (Centralized supply)	Normally closed type	C	X
	Normally open type	C	Y
	Double action type	C	X and Y
GNAD※－5 (Individual supply)	Normally closed type	A	X
	Normally open type	A	Y
	Double action type	A	X and Y

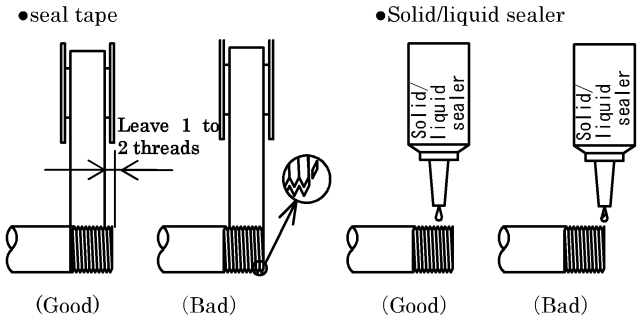
(4) Sealing material

The sealer shall be used with great care to prevent it from entering the pipes or leaking out.

When taping a threaded portion, 1-2 threads at the end of the portion shall be exposed.

When using liquid sealer, take care not to apply too much sealer. Similarly to the case of taping, threads at the end of the threaded portion shall be exposed.

Do not apply sealing material to the female screw of the product. (figure 2)



(Figure 2) Sealing material application method

(5) Tightening

・The valve body should be held by a tool such as an adjustable spanner for piping work.

・The torque required for tightening pipes are shown in Table 2 ,3 for reference.

Table 2 Pilot port recommend torque

Port size	Torque for tightening pipe
Rc1/8	7 - 9 N・m

Table 3 Main port recommended torque

《When body is made of aluminum》

Port size	Recommended torque for tightening pipe
Rc1/4	12-14[N・m]
Rc3/8	22-24[N・m]

《When body is made of material other than aluminum》

Port size	Recommended torque for tightening pipe
Rc1/4	23-25[N・m]
Rc3/8	31-33[N・m]

(6) Lubricated or non-lubricated operation
This valve dose 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).
Once lubricated, do not stop periodical lubrication. Otherwise, disappearance of initial lubrication will result in operation malfunction.

(7) Drain from the pilot air
Compressed air contains large amounts of drain (water, oxidized oil, tar, foreign matter). Drain seriously degrades performance of pneumatic equipments. To remove drain and to improve quality of compressed air, perform the following methods:
a) Dehumidify moisture by an aftercooler and a dryer.
b) Filter out foreign matter by a filter.
c) Remove tar by a tar removal filter.

(8) Draining
Improve the quality of pilot air by dehumidification by after-cooler air dryer, elimination of foreign particles by filter, elimination of tar by a filter for tar.
Dust causes malfunction and leakage.

(9) Always observe the effective thread length for the piping threads. Chamfer the end of the thread section by approx. a half-pitch.

(10) Any dirt or foreign matter in the fluid can prevent the product from functioning correctly. Install an 80 mesh or higher filter when passing water, and a 5 micron or less filter when passing air.

(11) Install a by-pass circuit and pipe using unions to simplify maintenance and repair work.

(12) When controlling the fluid in a tank, pipe at a level slightly above the bottom of the tank.

3. Pre-operation (post-installation) check

3. 1 Appearance check

⚠WARNING : **Shut off the fluid flow.(close the main shut-off valve)**
Exhaust the fluid remaining in the valve.

(1) Push the valve with finger to check that the valve is securely fixed to the pipe or mounting hole.

(2) Check that the fasteners such as hexagonal socket head cap screws and bolts are not loose.

3. 2 Check for leakage

(1) Compress the fluid to check for leakage at pipe joints.

(2) Confirm leakage at the connection part by applying pressure to the fluid.

(3) It is recommended to check for leakage by supplying a pneumatic pressure of 0.3－0.5MPa with soap water applied to the joints. Air bubbles will be generated at the leaking joints.

3. 3 Operation check

(1) Apply pressure to the working fluid. Confirm normal operation of the valve when pilot air pressure is applied and released.

4. Instructions for proper use

4. 1 Handling precautions

⚠WARNING	a) Do not use this product as an emergency shut-off valve. ・ This product is not designed as a safety-securing valve, such as an emergency shut-off valve. For such systems, use this valve after providing another method of securing safety. b) Take measures to prevent harm to operators or objects if this product fails. c) Liquid-filled state ・ When conveying a liquid in a circuit, operation may fail if liquid-filled state occurs. This is because pressure rises in the liquid-filled state when temperature rises. Provide an escape valve in the system so that a liquid-filled state circuit is not created. d) Working fluids ・ Do not use this product for fluids other than the working fluids listed in the catalog specifications. ・ Before use, confirm the compatibility of the product and applicable fluid with the Applicable Fluid Check List.

⚠ CAUTION	a) About particles This product emits particles. Our customer shall be responsible of confirming the suitability of this product in your system before use. b) Always use within the maximum working pressure and maximum working pressure differential range. c) About back pressure (pressure at the secondary side) Back pressure shall be within allowable range. Be careful not to let back pressure exceed allowable range, as in the case of it coming around from other lines, or it caused by water head from vertical piping.

(1) When carrying the product, hold the main body

(2) Do not use the product as footings, or place heavy loads on the product.

(3) If the product is not used for three days or more, startup operation may be delayed for around one second. Perform trial run before work.

(4) Always carry out trial run before work after a halt for more than a month.

(5) Pilot air pressure shall be within the specification.

In particular, do not set pilot air pressure below the specified value for normally open types (Model : NAD2, GNAD2) and double acting types (Model : NAD3,GNAD3). Otherwise, sealing will fail.

If the pilot air pressure cannot be controlled, we recommend you the normally closed type (Model: NAD1, GNAD1)

(6) When a solenoid valve manifold is used for pilot operation, exhaust pressure from other valves may come around into the pilot circuit, and may instantaneously open the Valve unintentionally.

Therefore, when using solenoid valve manifolds, use a product with a built-in check valve.

We recommend our 3, 5 port pneumatic valve 4G series.

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

Table 4 Maximum operating frequency

Max operating frequency
30cycles／min

(8) If the energizing time length of the pilot solenoid valve is too short, operation of the cylinder valve may not follow.

(9) Use the product within the fluid temperature range.

(10) Refer to "6. Troubleshooting" if there are any abnormalities.

4．2 Disassembling work precautions

⚠ CAUTION	a) Do not disassemble this product.

(1) If this product is disassembled, parts contacting with fluid may lose its degreased characteristics.

5. Maintenance

5. 1 Maintenance and checking

⚠ CAUTION	a) Read this Instruction manual thoroughly and understand the contents well before performing maintenance and inspection. b) Shut off the power supply and release the fluid pressure before performing maintenance.

(1) Regularly inspect the product to ensure optimum performance. Although inspection frequency differs based on the working state, the product should be inspected every half year.

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

(3) Beware the clogging of the strainer and filter.

6. Failure and countermeasure

(1) If the valve does not function as intended, check it according to following Table.

Table 5. Cause of malfunction and countermeasures

Symptom			Cause	Action
Valve does not close, or leaks			The pressurizing direction to the body is opposite.	Refer to section 2.3. Correct the pressurizing port.
			Fluid pressure is too high.	Adjust fluid pressure.
			Back pressure is too high.	Adjust back pressure.
			Malfunction of solenoid valve for operation.	Replace solenoid valve for operation.
	Actuation	NC type	Port Y is closed.	Open the port to atmosphere.
			Pressure to operate is not released from port X.	Release pressure to operate. Adjust to atmospheric pressure.
		NO type Double acting type	Port Y is closed.	Open the port to atmosphere.
			Pressure to operate is not supplied to port Y, or supplied pressure is too low.	Supply specified operating pressure to port Y.
Valve does not open, or flow rate is short			Fluid is not supplied.	Confirm circuit, and supply fluid.
			Malfunction of solenoid valve for operation.	Replace solenoid valve for operation.
	Actuation	NC type	Port Y is closed.	Open the port to atmosphere.
			Pressure to operate is not supplied to port Y, or supplied pressure is too low.	Supply specified operating pressure to port X.
		NO type Double acting type	Port X is closed.	Open the port to atmosphere.
			Pressure to operate is not released from port X.	Release pressure to operate. Adjust to atmospheric pressure.
			Product was closed for a long time(for normally open type).	Supply operating air to port X temporarily, and return the valve to initial position.

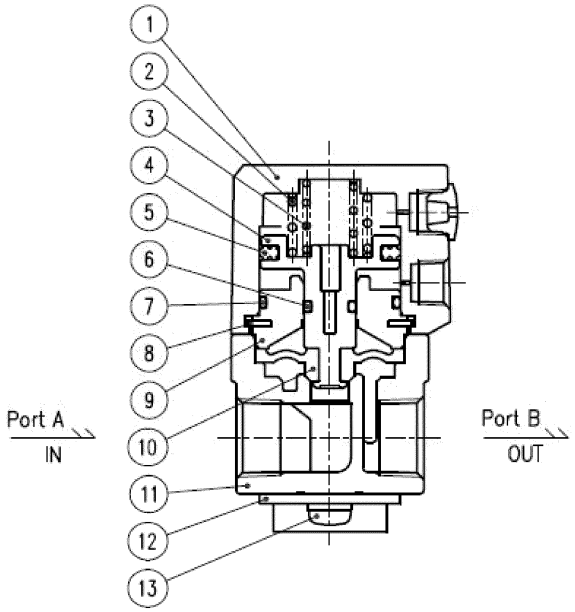
(2) If further information is required, consult us or your nearest agency.

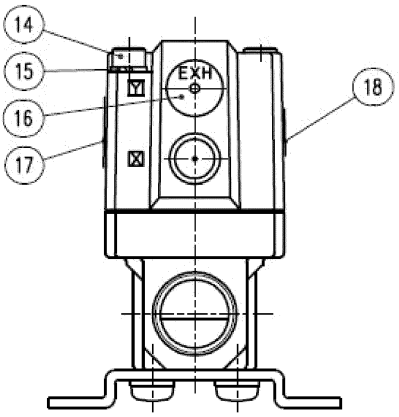
7. Appropriate disposal

(1) When disposing this product, dispose this product as industrial waste.

8. Internal construction drawing

8. 1 Internal construction of discrete valves





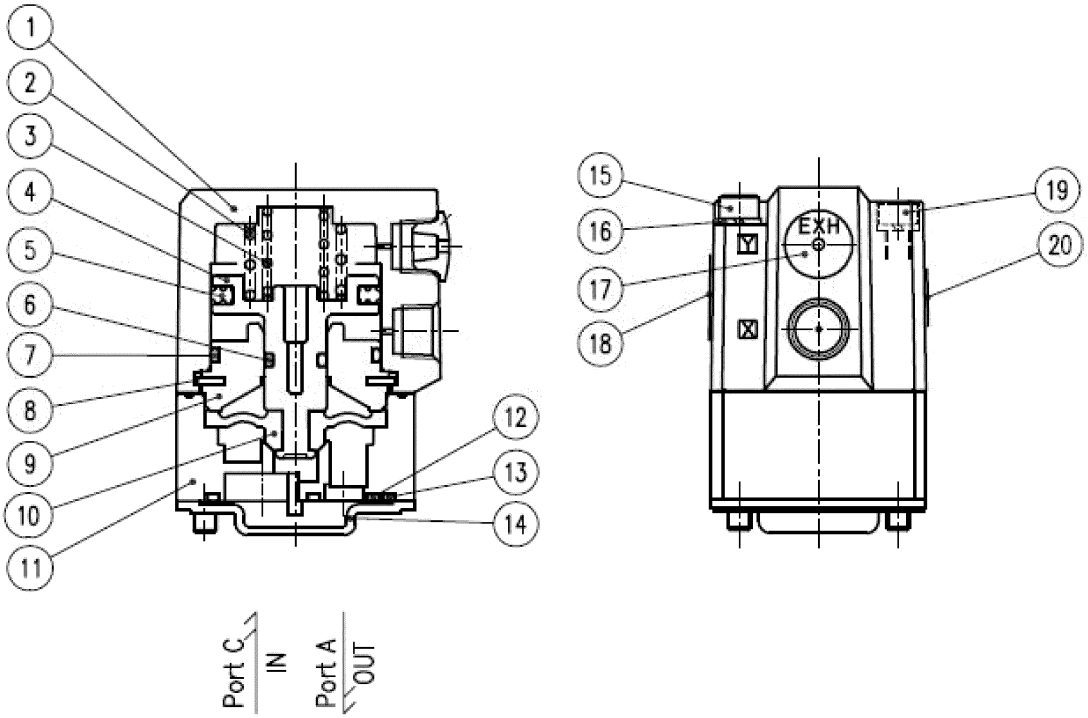
No.	Parts	material	Q'ty
1	Cylinder cover	ADC12	1
2	Spring A	SWP	1
3	Spring B	SWP	1
4	Piston	PPS	1
5	PSD packing	NBR	1
6	O-ring	FKM	1
7	O-ring	NBR	1
8	Parallel pin	SUS304	2
9	Adapter	A5056	1
10	Diaphragm	EPDM	1
11	Body	SCS13	1
12	Mounting plate	SPC	1
13	Cross recessed and slotted pan head machine screw with spring lock washer	SWRM SWRH	2
14	Hexagon socket head cap screw	SUSXM7	4
15	Spring lock washer	SUS304	4
16	Exhaust cap	CR	1
17	Face plate	PET	1
18	JIS symbol plate	PET	1

※1. Figure shows NAD1 type (normally closed) with Mounting Plate. For option without Mounting Plate, ⑫Mounting Plate and ⑬Screw is not included.

※2. For NAD2 type (normally open), a NO (normally open) Spring is included below ④Piston instead of ②③Springs. Also, assembling position of the ⑲ Exhaust Cap is on X port.

※3. For NAD3 type (double acting), ②③Springs, ⑧Parallel Pin, and ⑲Exhaust Cap is not included.

8．2　Internal construction of manifold valves



No.	Parts	material	Q'ty
1	Cylinder cover	ADC12	1
2	Spring A	SWP	1
3	Spring B	SWP	1
4	Piston	PPS	1
5	PSD packing	NBR	1
6	O-ring	FKM	1
7	O-ring	NBR	1
8	Parallel pin	SUS304	2
9	Adapter	A5056	1
10	Diaphragm	EPDM	1
11	Body	SCS13 or PP	1
12	O-ring	EPDM	1
13	O-ring	EPDM	1
14	Plate	SPC	1
15	Hexagon socket head cap screw	SUSXM7	2
16	Spring lock washer	SUS304	4
17	Exhaust cap	CR	1
18	Face plate	PET	1
19	Hexagon socket head cap screw	SUSXM7	2
20	JIS symbol plate	PET	1

※1. Figure shows only the actuator of GNAD1 type (normally closed).
※2. For GNAD2 type (normally open), a NO (normally open) Spring is included below ④ Piston instead of ②③Springs. Also, assembling position of the ⑳Exhaust Cap is on X port
※3. For GNAD3 type (double acting), ②③Springs, ⑧Parallel Pin, and ⑳Exhaust Cap is not included.
※4.Remove protect Plate⑰ placed on the bottom of body before start using.

9. Product specification

9. 1 Model number display

9. 1. 1 Discrete valves

NAD [A] － [B] － [C] [D]

Symbol	Descriptions
A : Actuation	
1	Normally closed(NC type)
2	Normally open(NO type)
3	Double acting type

B : Port size	
10	Rc3/8

C : Material combination		
	Body	Diaphragm
R	SCS13	EPDM

D : Other options	
Blank	No options
B	Moutining plate

9. 1. 2 Manifold valves

GNAD [A] － [B] － [C] － [D]

Symbol	Descriptions
A : Actuation	
1	Normally closed(NC type)
2	Normally open(NO type)
3	Double acting type

B : Air supply code	
1	Common suplly type
5	Individual supply type

C : Station #	
2 to 10	2 station to 10 station
0	Actuator only

D : Material combination			
	Sub-plate	Body	Seal
R	SUS303	SUS303	EPDM
8	SUS303	PP	EPDM
3	A6063	PP	EPDM

9．2　Product specification

9．2．1　Discrete valves

Descriptions		NAD1-10	NAD2-10	NAD3-10
Actuation		Normally close(NC type)	Normally open(NO type)	Double acting type
Working fluid		Air, gas, water and noncorrosive fluid		
Fluid viscosity	mm^2/s	500 or less		
Working pressure range	MPa	0 to 0.5 (Secondary side pressure 0.4 MPa or less)		
Withstanding pressure(water)	MPa	1.0		
Fluid temperature	℃	-10 to 50(not fleezing)		
Ambient temperature	℃	-10 to 50		
Valve seat leakage	cm^3/min	0.12 or less(compressed air)		
Port size		Rc3/8		
Orifice	mm	7		
Cv flow factor		1.1		
C	$dm^3/(s\cdot bar)$	4.4		
b		0.3		
Mass	kg	0.32		
Installation attitude		Free		
Pilot air pressure	MPa	0.4 to 0.5		
Pilot port size		Rc1/8		

Note 1：Following shows conversion of sonic conductance C to effective sectional area S; S≒5.0×C

9．2．2　Manifold valves

Descriptions		GNAD1-1/5	GNAD2-1/5	GNAD3-1/5
Actuation		Normally close(NC type)	Normally open(NO type)	Double acting type
Working fluid		Air, inert gas, water and noncorrosive fluid		
Fluid viscosity	mm^2/s	500 or less		
Working pressure range	MPa	0 to 0.5 (Secondary side pressure 0.4 MPa or less)		
Withstanding pressure(water)	MPa	1.0		
Fluid temperature	℃	-10 to 50(not fleezing)		
Ambient temperature	℃	-10 to 50		
Valve seat leakage	cm^3/min	0.12 or less(compressed air)		
Orifice	mm	7		
Cv flow factor		0.7		
C	$dm^3/(s\cdot bar)$	3.4		
b		0.1		
Installation attitude		Free		
Pilot air pressure	MPa	0.4 to 0.5		
Pilot port size		Rc1/8		

Note 2：Following shows conversion of sonic conductance C to effective sectional area S; S≒5.0×C