NIPPON VALVE CONTROLS, INC.

Instruction manual

Pneumatic Actuated Ball Valve SR SH MS MV MH H HH ST SL SP-1500

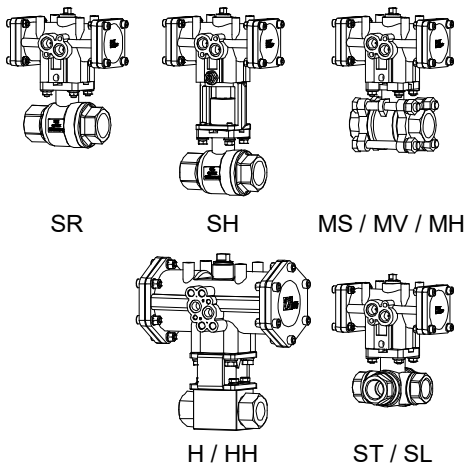
Please read this manual before installation and use.

GENERAL

Threaded-end ball valve with pneumatic actuator.

Actuator
- Double-acting type
  - PND
  - TAD
- Single-acting type
  - PSO (Airless SHUT)
  - TAO (Airless SHUT)
  - PSC (Airless OPEN)
  - TAC (Airless OPEN)

Valve
- SR type For food / Corrosive fluid.
- SH type For high temp. (up to 2 MPa)
- MS type 3 piece / For heavy load.
- MV type 3 piece / For control.
- MH type 3 piece / For high pressure.
- H type For high pressure.
- HH type For ultra-high pressure.
- ST type 4 seats, 3 way. (with flow paths)
- SL type 4 seats, 3 way.



PRODUCT CODE

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
SR type		☐☐☐	S	R	9	☐	5	U	U	T - ☐☐☐	- ☐☐	
SH type		☐☐☐	S	H	9	☐	5	U	U	F - ☐☐☐	- ☐☐	
MS type		☐☐☐	M	S	9	☐	5	U	U	P - ☐☐☐	- ☐☐	
MV type	(V-port) (Standard port)	☐☐☐	M	V	9	☐	5	U	U	P R ☐☐☐	- ☐☐	- ☐
	(V-port)	☐☐☐	M	V	9	☐	5	U	U	P - ☐☐☐	- ☐☐	- ☐
MH type		☐☐☐	M	H	9	☐	5	U	U	☐ - ☐☐☐	- ☐☐	
H type		☐☐☐	H	-	9	☐	5	☐	U	D - ☐☐☐	- ☐☐	
HH type		☐☐☐	H	H	9	☐	5	S	U	☐ - ☐☐☐	- ☐☐	
ST type		☐☐☐	S	T	9	☐	5	U	U	F - ☐☐☐	- ☐☐	- ☐
SL type		☐☐☐	S	L	9	☐	5	U	U	F - ☐☐☐	- ☐☐	

(1) Actuator
- PND TAD
- PSO TAO
- PSC TAC

(2) Valve
- SR SH
- MS MV
- MH
- H HH
- ST SL

(3) Voltage
- 9 : Air

(4) Sizing code
- 0 : Standard
- 1 : Light
- 2 : Heavy

(5) Connection
- 5 : Threaded End Rc

(6) Body material
- U : SCS14A / SUS316Ti
- S : Carbon steel

(7) Ball material
- U : SCS14A / SUS316

(8) Seat material
- T : PTFE
- F : F-PTFE
- P : R-PTFE
- D : POM
- R : R-F-PTFE
- K : PEEK

(9) Size [mm]
- ex. 25 A → 025

(10) Option
- FR : Filter Regulator Unit
- LB : Limit Switch Box
- EP : Positioner
- EX : Smart Positioner
- ES : Smart Positioner
- ER : Smart Positioner

(11) Positioner control pattern (TAD)
- A : SHUT by 4 mA ↔ OPEN by 20 mA
- B : SHUT by 20 mA ↔ OPEN by 4 mA

(11) Positioner control pattern (PSO / TAO)
- C : OPEN by 20 mA ↔ SHUT by 4 mA (Airless SHUT)
- D : OPEN by 4 mA ↔ SHUT by 20 mA (Airless SHUT)

(11) Positioner control pattern (PSC / TAC)
- E : SHUT by 4 mA ↔ OPEN by 20 mA (Airless OPEN)
- T : SHUT by 20 mA ↔ OPEN by 4 mA (Airless OPEN)

(11) Flow paths (ST valve)
- a to d : 3 way valve flow

VALVES SPECIFICATIONS

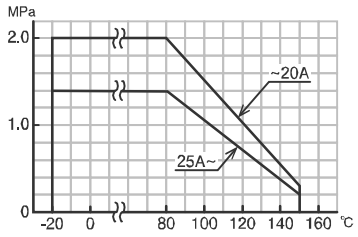
Water Oil Air, Gas Steam Chemicals Sea water Slurry Negative pressure

SR SH type

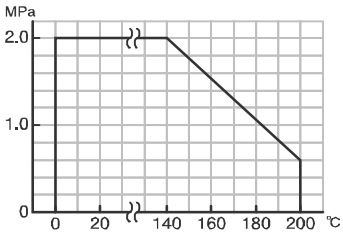
Valve type		SR		SH
Design		2-way, Full port		2-way, Full port
Connection		Threaded End Rc		Threaded End Rc
Fluid				
Max pressure		2 MPa	1.4 MPa	2 MPa
Size [mm]		015 to 020	025 to 040	015 to 032
Material	Body	SCS14A		SCS14A
	Ball	SCS14A		SCS14A
	Seat	PTFE		F-PTFE
Stem seal	Packing	F-PTFE		R-PTFE
	O-ring	-		Steam resistant FKM

PRESSURE & TEMPERATURE RATING

SR



SH



VALVES SPECIFICATIONS

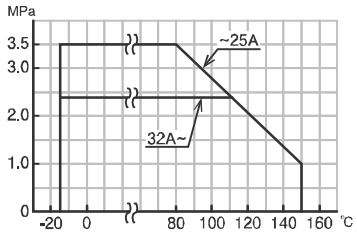
Water Oil Air, Gas Steam Chemicals Sea water Slurry Negative pressure

MS MV type

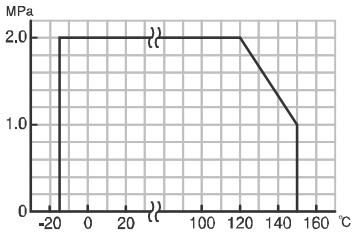
Valve type		MS		MV	
Design		2-way, Full port		2-way, V-port (Standard port)	2-way, V-port
Connection		Threaded End Rc		Threaded End Rc	
Fluid					
Max pressure		3.5 MPa	2.4 MPa	2 MPa	
Size [mm]		010 to 025	032 to 050	010 to 015	015 to 050
Material	Body	SCS14A		SCS14A	
	Ball	SCS14A		SUS316	SUS316 / SCS14A
	Seat	R-PTFE		R-PTFE	
Stem seal	Packing	R-PTFE		R-PTFE	
	O-ring	FKM		FKM	

PRESSURE & TEMPERATURE RATING

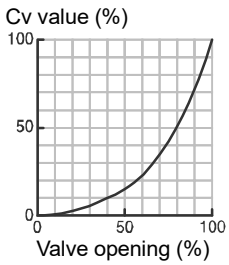
MS



MV



INHERENT FLOW CHARACTERISTIC



Range ability

MV-5UUP R 010 to 015 = 100:1

MV-5UUP - 015 to 050 = 50:1

VALVES SPECIFICATIONS

Water Oil Air, Gas Steam Chemicals Sea water Slurry Negative pressure

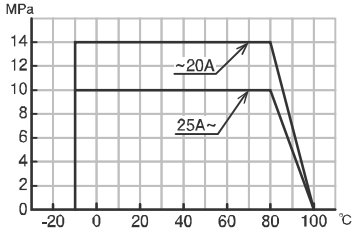
MH type

Valve type		MH			
Design		2-way, Full port			
Connection		Threaded End Rc			
Fluid					
Max pressure		14 MPa	10 MPa	7 MPa	5 MPa
Size [mm]		010 to 020	025 to 040	010 to 020	025 to 040
Material	Body	SCS14A			
	Ball	SCS14A (HCr)			
	Seat	POM		R-F-PTFE	
Stem seal	Packing	-			
	O-ring	FKM			

Note) It cannot be used POM seat for a water solution of more than 85 °C. (MH type)

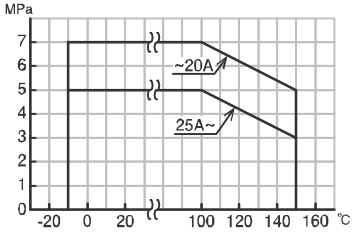
PRESSURE & TEMPERATURE RATING

Seat material: POM



MH-5UUD

Seat material: R-F-PTFE



MH-5UUR

VALVES SPECIFICATIONS

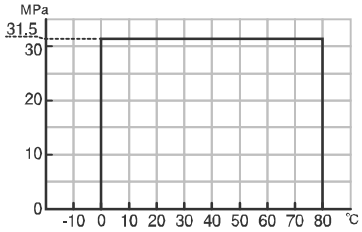
Water Oil Air, Gas Steam Chemicals Sea water Slurry Negative pressure

H type

Valve type		H (Carbon steel)	H (Stainless)		
Design		2-way, Full port	2-way, Full port		
Connection		Threaded End Rc	Threaded End Rc		
Fluid					
Max pressure		31.5 MPa	31.5 MPa	30 MPa	25 MPa
Size [mm]		008 to 025	008 to 015	020	025
Material	Body	Carbon steel (Plated)	SUS316Ti		
	Ball	SUS316Ti (HCr)	SUS316Ti (HCr)		
	Seat	POM	POM		
Stem seal	O-ring	FKM	FKM		

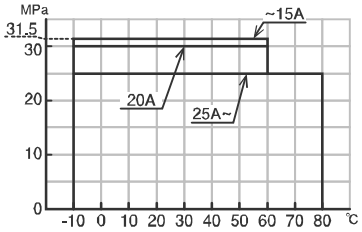
PRESSURE & TEMPERATURE RATING

Body material: Carbon steel



H-5SUD

Body material: Stainless

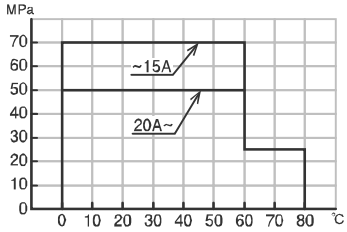


H-5UUD

HH type

Valve type		HH	
Design		2-way, Full port	
Connection		Threaded End Rc	
Fluid			
Max pressure		70 MPa	50 MPa
Size [mm]		010 to 015	020 to 025
Material	Body	Carbon steel (Plated)	
	Ball	SUS316Ti (HCr)	
	Seat	PEEK	POM
Stem seal	O-ring	FKM	

PRESSURE & TEMPERATURE RATING



HH-5SUK
HH-5SUD

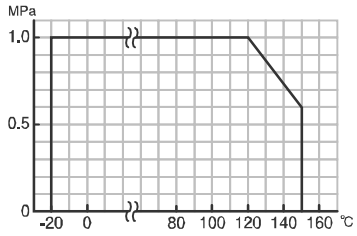
VALVES SPECIFICATIONS

Water Oil Air, Gas Steam Chemicals Sea water Slurry Negative pressure

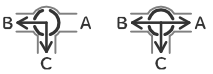
ST SL type

Valve type		ST / SL
Design		3 way, Standard port
Connection		Threaded End Rc
Fluid		
Max pressure		1 MPa
Size [mm]		015 to 032
Material	Body	SCS14A
	Ball	SCS14A
	Seat	F-PTFE
Stem seal	Packing	F-PTFE
	O-ring	-

PRESSURE & TEMPERATURE RATING



FLOW PATHS (Position① / P1) (Position② / P2)

SL		ST							
		Code: a		Code: b		Code: c		Code: d	
P1	P2	P1	P2	P1	P2	P1	P2	P1	P2
									
B-C ⇔ A-C		A-B ⇔ B-C		A-C ⇔ A-B		B-C ⇔ A-B-C		A-B-C ⇔ A-C	

Note) When a closed path is exposed to high pressure, it may leak slightly to an open path.

PNEUMATIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

PND type

Classification	Double-acting type			
Actuator type	PND-03S	PND-03D	PND-04D	PND-05D
Weight [kg]	0.2	0.3	0.5	0.8
Air consumption [ℓ] (round-trip)	0.05	0.08	0.19	0.35
Operation time [s]	Less than 1.			
Operation	SHUT by air to port A. ↔ OPEN by air to port B.			
Air pressure	0.4 to 0.7 MPa			
Piping connection	Rc 1/8			
Method of operation	Scotch yoke			
Housing material	PPS resin			
Ambient temperature	-10 to 50 °C (Please be careful when you use in 5 °C or less, so that there no freeze.)			
Manual operation	Operates the upper shaft of the actuator directly.			

PSO PSC type

Classification	Single-acting type (Spring-return)				
Actuator type	PSO - 03S PSC - 03S	PSO - 03D PSC - 03D	PSO - 04D PSC - 04D	PSO - 05D PSC - 05D	PSO - 05W PSC - 05W
Weight [kg]	0.2	0.4	0.6	1.2	1.8
Air consumption [ℓ] (round-trip)	0.03	0.04	0.1	0.2	0.53
Air exit	One side	Both sides			
Operation time [s]	Less than 1.				
Operation	PSO : OPEN by air to intake port. ↔ SHUT by spring-return. (Airless SHUT) PSC : SHUT by air to intake port. ↔ OPEN by spring-return. (Airless OPEN)				
Air pressure	0.4 to 0.7 MPa				
Piping connection	Rc 1/8				
Method of operation	Scotch yoke				
Housing material	PPS resin				
Ambient temperature	-10 to 50 °C (Please be careful when you use in 5 °C or less, so that there no freeze.)				
Manual operation	No manual operation.				

PNEUMATIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

TAD type

Classification	Double-acting type						
Actuator type	TAD-040	TAD-050	TAD-063	TAD-080	TAD-100	TAD-125	TAD-160
Weight [kg]	0.9	1.3	2.1	3.4	6.1	9.8	18.2
Air consumption [ℓ] (round-trip)	0.11	0.18	0.34	0.66	1.36	2.72	5.56
Operation	SHUT by air to port A. ↔ OPEN by air to port B.						
Air pressure	0.4 to 0.7 MPa						
Piping connection	Rc 1/8	Rc 1/4					
Method of operation	Rack-and-pinion	Scotch yoke					
Housing material	Aluminum alloy						
Ambient temperature	-10 to 50 °C (Please be careful when you use in 5 °C or less, so that there no freeze.)						
Manual operation	Operates the upper shaft of the actuator directly.						

TAO TAC type

Classification	Single-acting type (Spring-return)						
Actuator type	TAO-040 TAC-040	TAO-050 TAC-050	TAO-063 TAC-063	TAO-080 TAC-080	TAO-100 TAC-100	TAO-125 TAC-125	TAO-160 TAC-160
Weight [kg]	2.3	3	4.9	8.5	16.4	27.6	51.2
Air consumption [ℓ] (round-trip)	0.23	0.34	0.67	1.26	2.62	4.44	8.77
Operation	TAO : OPEN by air to intake port. ↔ SHUT by spring-return. (Airless SHUT) TAC : SHUT by air to intake port. ↔ OPEN by spring-return. (Airless OPEN)						
Air pressure	0.4 to 0.7 MPa						
Piping connection	Rc 1/4						
Method of operation	Rack-and-pinion	Scotch yoke					
Housing material	Aluminum alloy						
Ambient temperature	-10 to 50 °C (Please be careful when you use in 5 °C or less, so that there no freeze.)						
Manual operation	No manual operation.	Option: MT (Manual handle unit)					

PNEUMATIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

OPTIONAL PARTS

Classification			Code	PND	PSO	PSC	TAD	TAO	TAC
Speed Controller with bypass valve (Housing material: PPS)			BS				○		
FR Unit (Regulator with Filter) TA2-FR (KONAN)			FR	○	○	○	○	○	○
Limit Switch Box (Standard load signal)			LB	○	○	○	○	○	○
Explosion Proof Limit Switch / VCX7001 (azbil) Ex d e II C T6			LR				○	○	○
Speed Controller (with One-touch Fitting) One set			SE	○	○	○	○	○	○
Speed Controller (with One-touch Fitting) Two sets			SS	○			○		
Speed Controller (with One-touch Fitting) Dual Speed Controller			SF		○	○		○	○
Manual handle unit (for TAO-050 to 160 / TAC-050 to 160)			MT					○	○
Sealing the spring unit. (Oil-free)			92					○	○
Smart positioner for PSO / PSC (Except 03S)			EX		○	○			
Explosion Proof Electro-Pneumatic Positioner Ex dmb II B T5 (TIIS)			EP				○	○	○
Smart positioner			ES				○		
			ER					○	○
Smart positioner (with 4 to 20mA output)			ET				○		
			EU					○	○
Positioner operation	SHUT by 4 mA. ↔ OPEN by 20 mA.		A				○		
	SHUT by 20 mA. ↔ OPEN by 4 mA.		B				○		
	OPEN by 20 mA. ↔ SHUT by 4 mA. (Airless SHUT)		C		○			○	
	OPEN by 4 mA. ↔ SHUT by 20 mA. (Airless SHUT)		D		○			○	
	SHUT by 4 mA. ↔ OPEN by 20 mA. (Airless OPEN)		E			○			○
	SHUT by 20 mA. ↔ OPEN by 4 mA. (Airless OPEN)		T			○			○
Smart positioner SHUT by loss of signal	SHUT by 4 mA. ↔ OPEN by 20 mA.		A				○		
	SHUT by 20 mA. ↔ OPEN by 4 mA.		B				○		
	OPEN by 20 mA. ↔ SHUT by 4 mA. (Airless SHUT)		C					○	
	OPEN by 4 mA. ↔ SHUT by 20 mA. (Airless SHUT)		D					○	
	SHUT by 4 mA. ↔ OPEN by 20 mA. (Airless OPEN)		Y						○
Smart positioner OPEN by loss of signal	SHUT by 20 mA. ↔ OPEN by 4 mA.		W				○		
	OPEN by 4 mA. ↔ SHUT by 20 mA. (Airless SHUT)		X					○	
	SHUT by 4 mA. ↔ OPEN by 20 mA. (Airless OPEN)		E						○
	SHUT by 20 mA. ↔ OPEN by 4 mA. (Airless OPEN)		T						○
5-Port Solenoid Valve (with speed controller, silencer, DIN connector) VZ3190-□D-X213		Voltage: 100 V AC	1S	○	○	○			
		Voltage: 200 V AC	2S	○	○	○			
		Voltage: 110 V AC	3S	○	○	○			
		Voltage: 220 V AC	4S	○	○	○			
		Voltage: 24 V DC	5S	○	○	○			

PNEUMATIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

SOLENOID VALVE (Applicable Pneumatic Actuators: PND-05D, TAD TAO TAC)

Classification (☐: Voltage code)			Code	
5-port Solenoid Valve Return (with bypass valve)	Lead wire	4N3S102K-L☐	N43SL☐	☐: Voltage 1 : 100V AC 3 : 200V AC 5 : 24V DC
	DIN Connector	4N3S102K-D☐	N43SD☐	
	DIN Connector (with lamp)	4N3S102K-N☐	N43SN☐	
	Watertight cover	4N3S102K-W☐	N43SW☐	
5-port Explosion proof solenoid valve Return (with bypass valve)	Conduit	4N4S102K-E01-H☐B0-R	4N4S01-☐B0, NO	
	Flame proof packing (Cable size Φ9.5 to 10.4 mm)	4N4S102K-E10-H☐B0-R	4N4S10-☐B0, NO	

Operate by solenoid valve (Normally Open)

PND / TAD	SHUT by solenoid off.	↔	OPEN by power to solenoid.
PSO / TAO (Airless SHUT)	OPEN by power to solenoid.	↔	SHUT by solenoid off. (Spring-return)
PSC / TAC (Airless OPEN)	SHUT by power to solenoid.	↔	OPEN by solenoid off. (Spring-return)

HANDLING & STORAGE

①HANDLING

Do not drop or throw the product as it may break.

②STORAGE

- Store away from dust, moisture and direct sunlight. If possible, store in the original package.
- Do not remove a dust proof cap until the piping.

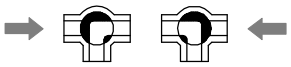
③CHECKING

- Check the product code before installation.
- Make sure that the bolts are not loose.

INSTALLATION

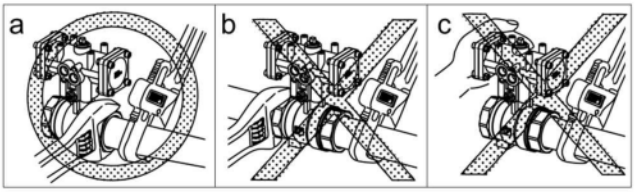
①PRECAUTIONS

- Flush the pipeline carefully before installing the valve. Foreign particles, such as sand or pieces of welding electrode, will damage the ball and seats.
- For valves with specified flow direction (SH / MV) or with ST / SC option, check the arrows on the product before piping.
- When the flow path is subjected to a high pressure from arrow, it may leak slightly to the low pressure port. (ST / SL)



②PIPING

- Using a pipe with too long a thread will damage the valve.
- If sealing tape or sealant gets inside the valve, the valve seat leaks or malfunctions.
- To prevent the valve from being damaged by stress, always hang a wrench on the end of the valve on the side where the pipe is to be connected when screwing in the pipe or when unscrewing it after correcting the angle (Fig a and b) and do not use a pipe wrench on the valve. Do not apply force to the actuator when working on the piping. (Fig. c)



- Refer to the recommended tightening torque table and do not apply excessive torque.

Valve size [mm]	Torque [N·m]
008 to 010	15 to 20
015	25 to 35
020	40 to 50
025	50 to 60
032	60 to 80
040	75 to 85
050	90 to 110

③ENVIRONMENT

- Do not install in place where corrosive gas is present or where vibration is heavy (0.5 G or more).
- When radiant heat causes the surface temperature of the control unit to exceed 50 °C, provide an appropriate shielding plate.
- If there is a possibility that the fluid and drive part freeze, please take measures to prevent freezing.
- For single-acting type, prevent water and dust from coming into air exit.

④POSITIONING

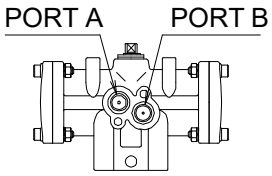
Should be positioned through 90° upward from horizontal. Provide space around the product to allow manual operation, inspection and replacement work.

AIR PIPING

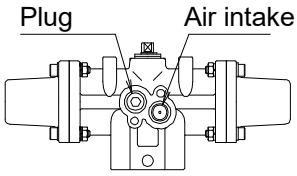
- Pneumatic actuator has an air supply ports to operate piston.

Double-acting type
PND : Rc 1/8
Coupling OD
less than 14.5 Φ

TAD-040 : Rc 1/8
TAD-050 to 160 : Rc 1/4



Single-acting type
PSO / PSC : Rc 1/8
TAO / TAC : Rc 1/4



- Piping of double-acting type is connected by seal tape on PORT A / B. Piping of single-acting type is put seal tape only on the air intake port.
- PND / PSO / PSC: PPS resin air supply port may be damaged if over tighten, please lightly tighten by hand.
- Never put anything on the actuator or make it into a foothold.

OPERATION

①AIR SOURCE

- Use the filtered dry air (less than 40 μ).
- Extra attention is needed where it's cold climate (below 5 °C).
- When air pressure is high, reduce it to standard pressure (0.4 to 0.7 MPa). Air pressure should not exceed 0.7 MPa during operation test.
- Capacity of compressor and air tank are to be calculated by capacity of piping and air consumption. A margin of 30% is required.

②TEST OPERATION

Check the operation of pneumatic actuator before fluid enters the piping.

Double-acting type	Stop the air from the air source. Release the residual pressure in the air cylinder. Open the air equalizer. Move the manual shaft of actuator with a wrench.
Single-acting type	Send the standard pressure air. Confirm the opening / closing operation by slowly moving the actuator.

③TESTING

After piping, check following points.

- Piping is correct.
- Air or fluid leakage from connection. Flow direction of air is correct.
- Air pressure is in the range.
- Nothing interferes with operation when limit switch or solenoid valve is attached.

④ATTENTION

The opening and closing operation of the pneumatic actuator is fast, which may affect the product life. Please adjust the operation time of pneumatic actuator using a speed controller.

Valve size [mm]	Adjustment of operation time.
Less than 040	More than 1 second
050 or more	More than 2 seconds

MANUAL OPERATION

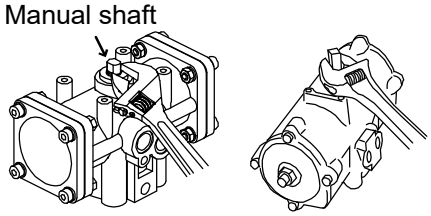
- Double-acting; stop the air supply and do not leave the air inside of cylinder.
- Single-acting; cannot be operated manually.

Optional code with the handle: TAO-MT / TAC-MT.

- Before automatic operation, be sure to remove wrench.

OPERATION (PND / TAD)

After turning air pressure to 0, turn manual shaft slowly with a smooth-jawed wrench to check the direction of OPEN/SHUT position.



PND TAD

MAINTENANCE

- Do the routine maintenance at least once in half a year.
- Do not set or take spring unit parts apart after installing the pneumatic single-acting actuator.

Can be used with no oil supply.

- Confirm the air leakage.
- Confirm the air supply pressure.
- Confirm the dirt or grit inside of cylinder.

Lubrication Procedure (TAD / TAO / TAC)
In case of lubricating, use turbine oil or the equivalent through a lubricator. (ISO VG 32.46).
Once lubricate, do the regularly.

Inspection items

- Confirm operation of opening and closing.
- Confirm whether screws are loose or not.
- Confirm the fluid temperature or pressure.
- Confirm the leak from valve stem.
- Confirm the bolt tightening torque.

TROUBLESHOOTING

Problem	Cause	Solution
Fail to operate.	Air doesn't come out.	Supply air.
	Air pressure is too low.	Adjust to standard pressure level.
Stop in the mid position.	• Biting of valve seat. • The scale has adhered to the valve ball.	Remove a foreign object.
		Clean or replace valve parts. (MS MV MH)
Leakage from valve body	• Valve cap get loose. • Valve body is damaged.	Replace the valve.
Leakage from valve seat	Seat is worn or damaged.	Replace the valve.
		Replace the seat. (MS MV MH)
Leakage from valve stem	Stem packing is worn or distorted.	Replace the valve.
		Replace the packing. (MS MV)
		Replace the O-ring. (MH)

For more information contact
NIPPON VALVE CONTROLS, INC. for consultation.

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