
Operating Instruction

2/3-way Piston Valves Series DC

2-way NC DN8~DN40
TPC2211・2212

3-way DN8~DN40
TPC2311・2312・2313



Introduction

This manual includes the instruction regarding 2/3-way Piston valves/ Series TPC.

Make sure to read important notice and cautions before conducting any work with a full understanding of the content.

Please refer to each specified delivered drawing because the sketch, drawing, and photos in this instruction are only basic referential purpose.

This manual does not contain the procedures for special type of specification. Please contact us for further details of procedures for the special specification product.

※ Please be advised that the content of this manual may change without any advanced notice.

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Safety Instruction

Inappropriate handling of the products may lead to the unreliable performance or serious accidents. In order to prevent any accident, be sure to read carefully this catalogue, and fully understand the contents for safe handling.

Remember that your special attention must be paid to the messages with the words “DANGER”, “WARNING” and “CAUTION”. Non-observance of these messages may pose dangers to operators or machines. These are important safety messages and require your strict observance, adding to International Standards (JIS/ISO/IEC), and other safety regulations.

Safety advisories in this catalogue are classified into “DANGER”, “WARNING” and “CAUTION”, according to the degree of risk and hindrance.



Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.



Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.



Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

Important instructions are categorized and depicted in this manual as follows.



This symbol indicates an action that should be observed.



This symbol indicates an action that should not be taken.



This symbol indicates mandatory actions that must be adhered to.

Product feature

These piston valves use a single spring-return air cylinder to drive pneumatic pressure, and are offered as 2-way valves for open-close functions and 3-way valves for path switching functions.

2-way valves can be provided in two types: Normal Open (NO) where the port 1-2 path is open when the air supply is off, and Normal Closed (NC) where the port 1-2 path is closed when the air supply is off. For 3-way valves, the port 1-2 path is closed and the port 2-3 path open when the air supply is off, and the port 1-2 path is open and the port 2-3 path closed when the air supply is on. A long-term high-quality seal is maintained under the high temperature, high pressure environment of a tire curing press by specifying the use of a specialized fiber (carbon fiber PTFE) for the stem which connects to the valve set of the valve body.

They are also designed to allow easy maintenance, such as disassembly and assembly for parts replacement. The valves are for use in the internal or external pressure systems, hydraulic systems and air systems of tire curing presses.

Main specification

Fluid	Steam, gas, hot water, cold water	
Maximum Working Pressure	3.2MPa* ¹	
Maximum Working Temp.	205°C (specialized option 240°C)	
Operation Air Pressure	0.25~0.35MPa	
End Connection	Pilot port	Rc1/4、NPT1/4、G1/4
	Threaded End (Rc、NPT)	
	Ports 1, 2 & 3	Flanged End (JIS 20K, ASME Class 30, DIN PN40)
Material of main parts * ²	Body : SCS13	
	Flange : SUS304 or S25C	
	Lower Seat Flange : SCS13 or S25C with SUS304 build-up welded valve seat	
	Stem : SUS403 with hard chrome plating	

*1. The maximum usage pressure is limited for each port. See page 17 for details.

*2. See valve assembly diagram for details.

Appearance

	3-way Valves (DN8~DN40)		
Appearance			
Model	TPC2311 - □□	TPC2312 - □□	TPC2313 - □□
Ports 1 & 2	Threaded	Flanged	Flanged
Port 3	Threaded	Threaded	Flanged

	2-way Valves Normally Closed (NC) (DN8~DN40)			
Appearance				
Model	TPC2211 - □□C	TPC2211 - □□T	TPC2212 - □□C	TPC2212 - □□T
Ports 1 & 2	Threaded	Threaded	Flanged	Flanged
Port 3*1	Lower Cover	Plugged Lower Seat Flange	Lower Cover	Plugged Lower Seat Flange

* 1 : There are two types of 2-way valve, due to the 3-port specification.

① With a cover with no connection to port 3 (Lower Cover).

This design has no screw hole, helping to prevent gas leaks.

② With a plug in the connection to port 3 (Lower Seat Flange)

Removing the plug allows access to port 3.

Product Coding

Code

	N1	N2	N3	N4	-	N5	N6	N7	N8	N9	N10	N11
TPC	2	2	1	2	-	25	J	P	X	Y	T	Z10

	Meaning of symbol	Code	Meaning of code	Remarks
N1	Model	1	1 st Model	
		2	2 nd Model	
N2	Number of Ports	2	2-way type	
		3	3-way type	
N3	Function	1	2-way Normally Closed (NC) or 3-way	
		2	2-way Normally Open (NO)	
N4	End Connection	1	Ports 1 & 2: Threaded	For 3-way valved, port 3 is threaded
		2	Ports 1 & 2: Flanged	
		3	Ports 1, 2 & 3: Flanged	* 1
N5	Nominal Size	08	DN8	
		10	DN10	
		15	DN15	
		20	DN20	
		25	DN25	
		32	DN32	
		40	DN40	
		50	DN50	
		65	DN65	
		80	DN80	
N6	End connection Flange Type	Nil	— (if N4 is "1")	
		J	JIS 20K	
		A	ASME Class 300	
		D	DIN PN40	
N7	End connection/ Body Port/Pilot Port Thread Type	P	Rc / Rc	Thread size on pilot port is 1/4"
		N	NPT / NPT	
		B	Rc / G	
N8	Lower Seat Flange/ Lower Cover Material (Port 3)	Nil	Lower Seat Flange Steel (S25C)	Valve seat build-up welded with SUS 304 * 2
			Lower Cover Steel (S25C)	* 3
		X	Lower Seat Flange SUS304	
			Lower Cover SUS304	

	Meaning of symbol	Code	Meaning of code	Remarks
N9	End connection Flange Material (Ports 1 & 2)	Nil	Steel (S25C)	
		Y	SUS304	
N10	2-way type Port 3 Specification	Nil	— (When 3-way type)	
		C	Lower Cover	
		T	Plugged Lower Seat Flange	The plug material is the same as the lower seat flange material.
N11	Specialized Code	Z□□	Specialized Specification	

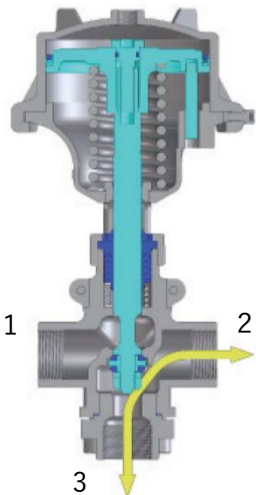
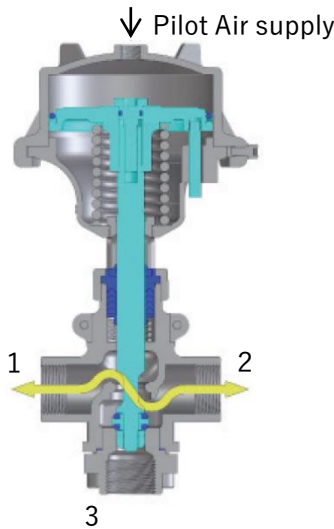
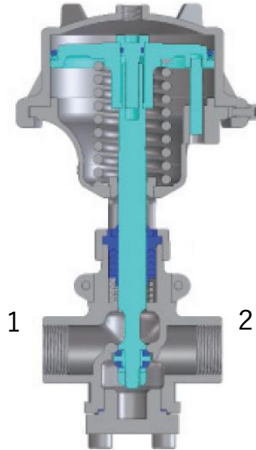
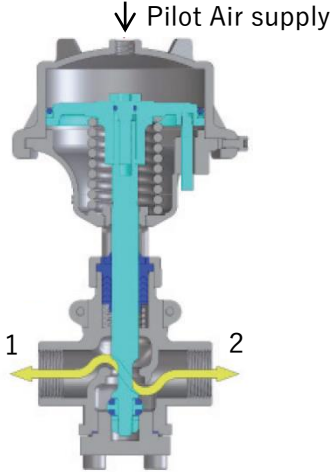
* 1 : Only 3-way type of Nominal size DN15~50 can be selected.

* 2 : Only 3 port flange and nominal size DN 50~80 can be selected.

* 3 : Only nominal size DN50~80 can be selected.

The table above corresponds to the entire TPC series, so symbols for specification items not covered by this instruction manual are also included.

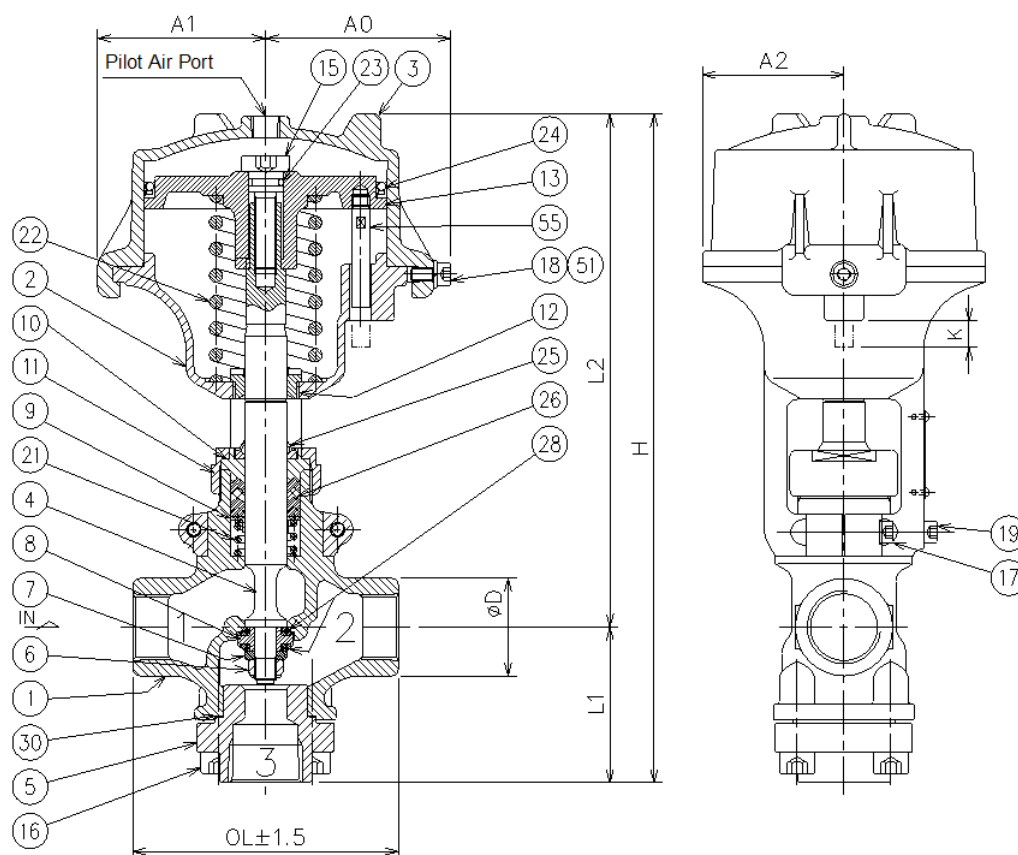
Explanation of movement

	Pilot Air supply OFF	↔	Pilot Air supply ON
3-way valve	 The stem which is coupled to the piston is pushed upwards by the power of the spring so that a barrier forms between port 1 and 2. In this state, port 2 and 3 connect.		 The stem which is coupled to the piston is pushed downwards by air pressure resisting against the power of the spring so that a barrier forms between port 2 and 3. In this state, port 1 and 2 connect.
2-way valve	 The stem which is coupled to the piston is pushed upwards by the power of the spring so that a barrier forms between port 1 and 2.		 The stem which is coupled to the piston is pushed downwards by air pressure resisting against the power of the spring so that port 1 and 2 connect.

Structure

3-way valves

TPC2311-□□	Ports 1, 2 & 3	Threaded
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11	Gland Nut
10	Gland
9	Ring Washer
8	Disc Adapter
7	Guide Washer
6	Lock Nut
5	Lower Seat Flange
4	Stem
3	Cylinder
2	Yoke Stand
1	Body

☆ 24	Piston Ring
☆ 23	O-Ring
22	Spring
21	Packing Spring
19	Socket Cap Screw
18	Socket Cap Screw
17	Socket Cap Screw
16	Socket Cap Screw
15	Tension Bolt
13	Piston
12	Guide Bush

☆ Recommended spare part

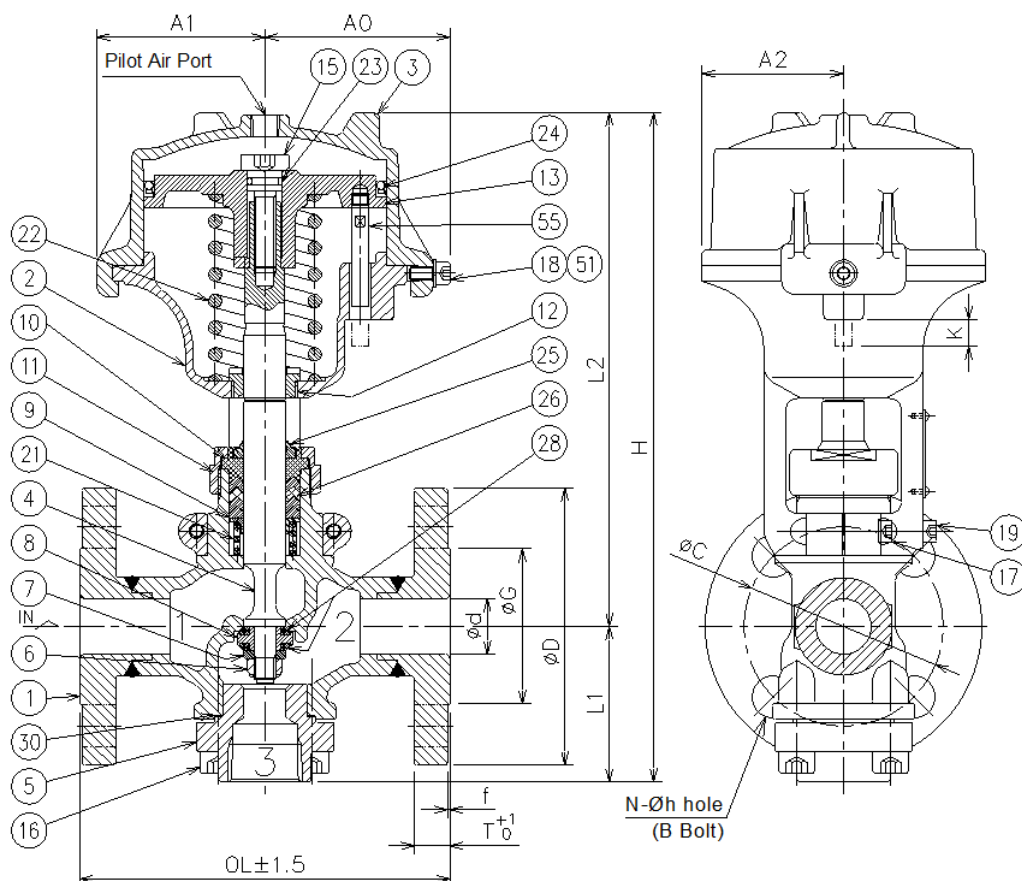
55	Pin Gauge
51	Spring Lock Washer
☆ 30	Lower Seat Gasket
☆ 28	Disc Ring
☆ 26	Gland Packing
☆ 25	Dust Seal

Weight	DN8	DN10	DN15	DN20	DN25	DN32	DN40
kg	2.7	2.7	2.7	4.2	7.0	9.6	15.3

※ See valve assembly drawings for details.

3-way valves

TPC2312-□□	Ports 1 & 2	Flanged	Port 3	Threaded
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☆ Recommended spare part

11	Gland Nut
10	Gland
9	Ring Washer
8	Disc Adapter
7	Guide Washer
6	Lock Nut
5	Lower Seat Flange
4	Stem
3	Cylinder
2	Yoke Stand
1	Body & Flange

☆ 24	Piston Ring
☆ 23	O-Ring
22	Spring
21	Packing Spring
19	Socket Cap Screw
18	Socket Cap Screw
17	Socket Cap Screw
16	Socket Cap Screw
15	Tension Bolt
13	Piston
12	Guide Bush

55	Pin Gauge
51	Spring Lock Washer
☆ 30	Lower Seat Gasket
☆ 28	Disc Ring
☆ 26	Gland Packing
☆ 25	Dust Seal

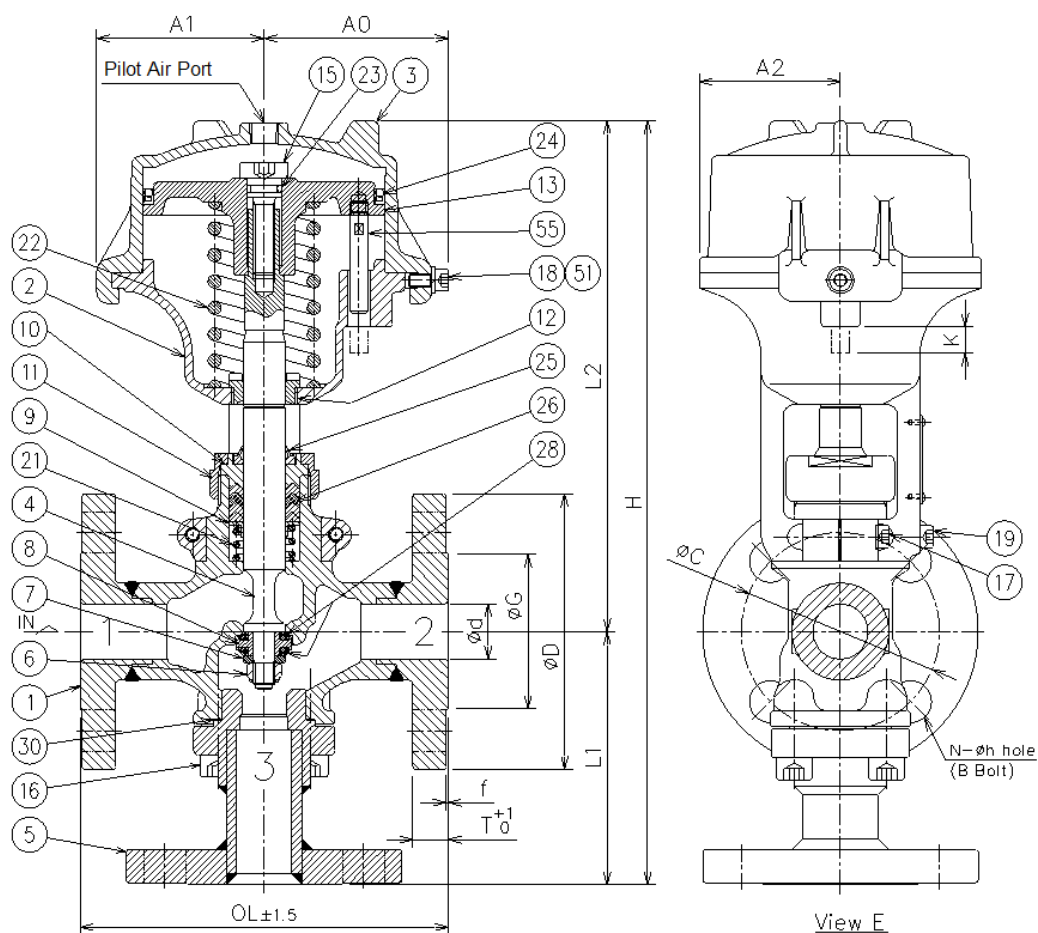
Weight *1	DN15	DN20	DN25	DN32	DN40
kg	4.1~4.3	6.0~6.8	9.5~9.9	13.7~13.9	18.8~20.6

*1 : The weigh changes up to flange specification.

※ See valve assembly drawings for details.

3-way valves

TPC2313-□□	Port 1, 2 & 3	Flanged
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☆ Recommended spare part

11	Gland Nut
10	Gland
9	Ring Washer
8	Disc Adapter
7	Guide Washer
6	Lock Nut
5	Lower Seat Flange
4	Stem
3	Cylinder
2	Yoke Stand
1	Body & Flange

☆ 24	Piston Ring
☆ 23	O-Ring
22	Spring
21	Packing Spring
19	Socket Cap Screw
18	Socket Cap Screw
17	Socket Cap Screw
16	Socket Cap Screw
15	Tension Bolt
13	Piston
12	Guide Bush

☆ 55	Pin Gauge
51	Spring Lock Washer
☆ 30	Lower Seat Gasket
☆ 28	Disc Ring
☆ 26	Gland Packing
☆ 25	Dust Seal

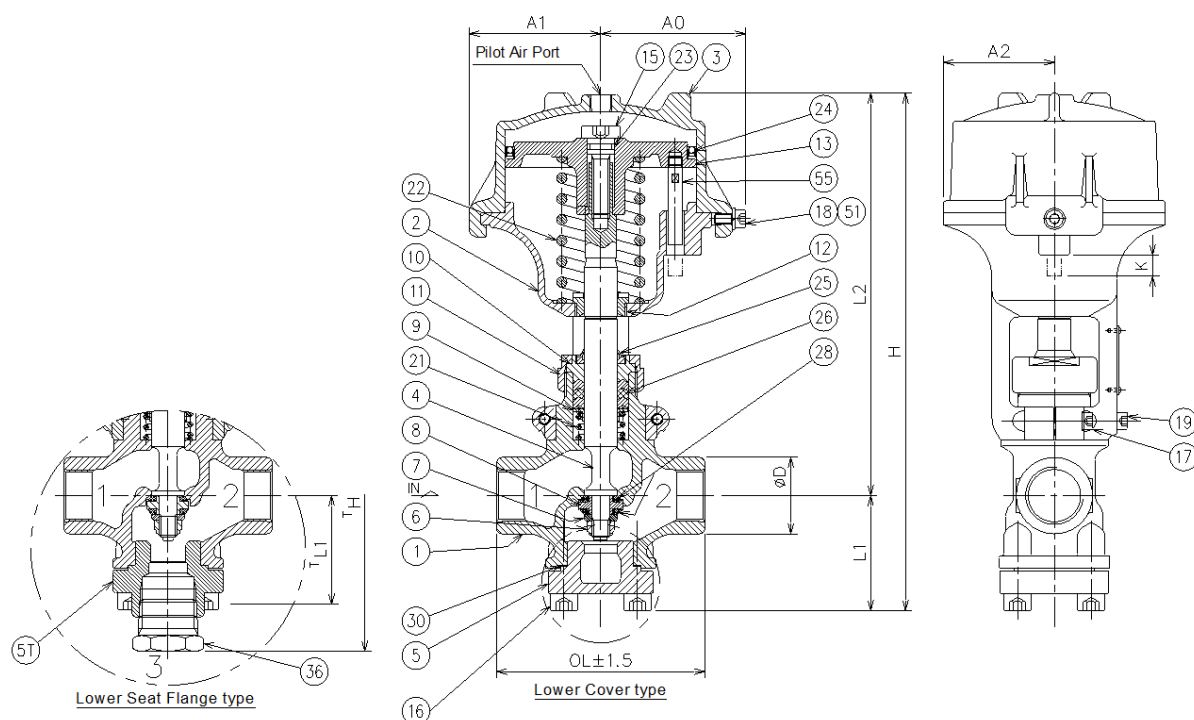
Weight *1	DN15	DN20	DN25	DN32	DN40
kg	5.1~5.3	7.3~8.1	11.1~11.5	15.8~16.0	21.7~23.5

*1 : The weigh changes up to flange specification.

※ See valve assembly drawings for details.

2-way valves Normally Closed

TPC2211-□□C	Ports 1 & 2	Threaded	Port 3	Lower Cover
TPC2211-□□T	Ports 1 & 2	Threaded	Port 3	Plugged Lower Seat Flange



☆ Recommended spare part

10	Gland
9	Ring Washer
8	Disc Adapter
7	Guide Washer
6	Lock Nut
5T	Lower Seat Flange
5	Lower Cover
4	Stem
3	Cylinder
2	Yoke Stand
1	Body

☆ 23	O-Ring
22	Spring
21	Packing Spring
19	Socket Cap Screw
18	Socket Cap Screw
17	Socket Cap Screw
16	Socket Cap Screw
15	Tension Bolt
13	Piston
12	Guide Bush
11	Gland Nut

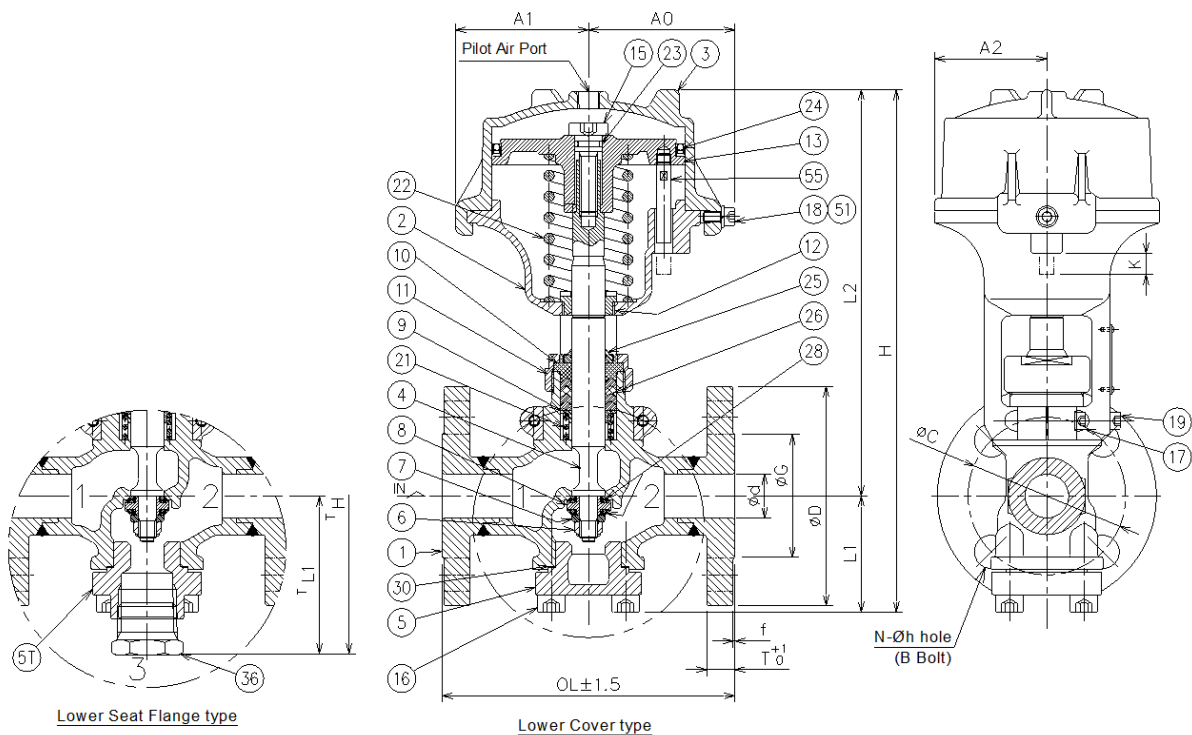
☆ 55	Pin Gauge
51	Spring Lock Washer
36	Plug
☆ 30	Lower Seat Gasket
☆ 28	Disc Ring
☆ 26	Gland Packing
☆ 25	Dust Seal
☆ 24	Piston Ring

Weight	DN8	DN10	DN15	DN20	DN25	DN32	DN40
kg	2.7	2.7	2.7	4.2	7.0	9.6	15.3

※ See valve assembly drawings for details.

2-way valves Normally Closed

TPC2212-□□C	Ports 1 & 2	Flanged	Port 3	Lower Cover
TPC2212-□□T	Ports 1 & 2	Flanged	Port 3	Plugged Lower Seat Flange



☆ Recommended spare part

10	Gland
9	Ring Washer
8	Disc Adapter
7	Guide Washer
6	Lock Nut
5T	Lower Seat Flange
5	Lower Cover
4	Stem
3	Cylinder
2	Yoke Stand
1	Body & Flange

☆ 23	O-Ring
22	Spring
21	Packing Spring
19	Socket Cap Screw
18	Socket Cap Screw
17	Socket Cap Screw
16	Socket Cap Screw
15	Tension Bolt
13	Piston
12	Guide Bush
11	Gland Nut

55	Pin Gauge
51	Spring Lock Washer
36	Plug
☆ 30	Lower Seat Gasket
☆ 28	Disc Ring
☆ 26	Gland Packing
☆ 25	Dust Seal
☆ 24	Piston Ring

Weight *1	DN15	DN20	DN25	DN32	DN40
kg	4.1~4.3	6.0~6.8	9.5~9.9	13.7~13.9	18.8~20.6

*1 : The weight changes up to flange specification.

※ See valve assembly drawings for details.

Operation condition



WARNING

Use valve according to scope of specification. If not, it may lead to serious accident.

○ Operating Fluids

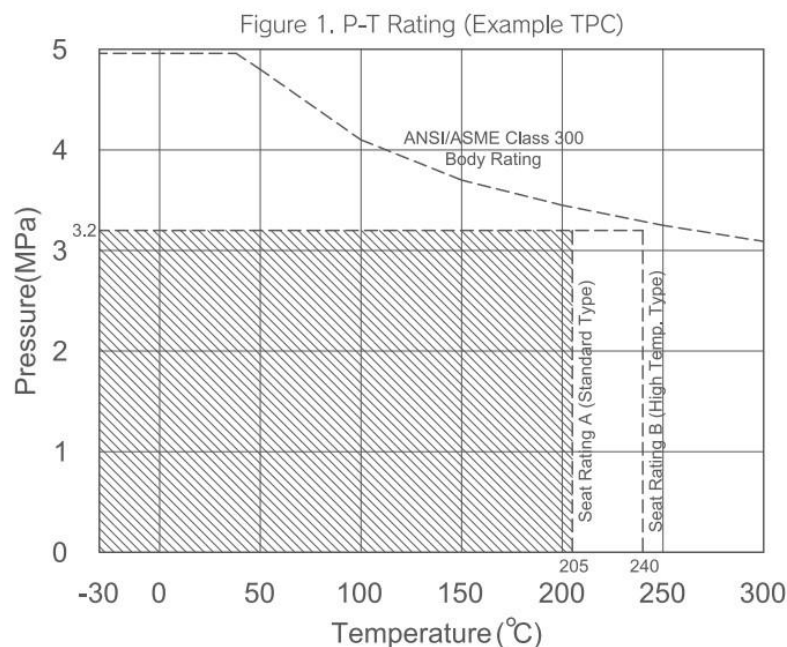
The fluids that can be used are Steam, Gas, Air, and Hot & Cold water. Gases are inert gases such as nitrogen gas (N₂ gas) and air. Flammable, corrosive or toxic gases cannot be used.

○ Operating Pressure/ Temperature

Maximum Operating Pressure of fluids is 3.2MPa, and Maximum Operating Temperature is maximum 205°C (Specialized option : 240°C) .

The range of operating pressure and operating temperature of the valve is called P-T Rating (Pressure-Temperature Rating). It is essentially the range within which the body rating defined by the pressure rating (class) and body material and the seat rating defined by the seat material are both satisfied.

Please note that the nominal pressure (class) is different from the maximum working pressure due to construction of valve. (See diagram below)



○ Maximum Working Pressure for 3-way Valve Port 3

The maximum usage pressure for port 3 on a TPC 3-way valve when the air supply is on (no flow between ports 2 & 3) is dependent on the operating air pressure. Set the operating air pressure with reference to the table below.

Maximum Working Pressure for TPC 3-way Valve when Port 3 with Operating Air Supply ON TPC

Units: MPa

Nominal Size	Operating Air Pressure (MPa)		
	0.25	0.30	0.35
DN8-15	0.3	1.7	3.1
DN20	1.1	2.7	3.2
DN25	1.8	3.2	3.2
DN32	0.6	1.8	2.9
DN40	0.8	1.8	2.7

* 1 : The maximum working pressure for ports 1 & 2 is 3.2 MPa.

○ Power source

Use clean, moisture-free compressed air (0.25~0.35MPa*⁴) as the operating fluid. If lubricant is used, use one that will not affect the lubricant*² which has been already applied inside Cylinder. The use of a quick exhaust valve, which contributes to the exhaust speed of operating air, may affect seal life due to the increased impact of the soft seat of the valve plug on the valve seat.

* 2 : Lithium-based grease (Daphne Eponex SR No.2/Idemitsu Kosan)

* 4 : Adjustment to 0.3MPa is required to maintain high sealing performance.

○ Maximum allowable leak rate

This valve is a soft seat type, and the amount of seat leakage when closed complies with the classification rate A*³ of the General Rules for Valve Inspection (JIS B 2003:2018).

* 3 : No leakage. (Test fluid: air)

○ Mounting position

The mounting position of this product should be used within the range of actuator upright (upward) to horizontal (sideways). Although the actuator can be operated from horizontal to downward, avoid doing so as it may cause trouble.

○ Water Hammer

Design piping to account for water hammer when using hot and cold water. Consider setting up a speed controller to control the supply and exhaust speed of the operating air as an avoidance mitigation measure. This will reduce the operating speed of the stem and is expected to reduce water hammer.

The quick exhaust valves that contribute to the exhaust velocity of the operating air should not be used.

○ Usage Environment

This product should be installed indoors and used at an ambient temperature of 80° C or less and an ambient humidity of 80%RH or less. If the product is exposed to radiant heat from the surrounding area, take measures such as installing a heat shield. In addition, make sure that the product is not affected by corrosive or explosive gases, dust, sand, or vibrations. In addition, when the product is used in cold climates, consideration should be given to the prevention of freezing.

○ Plug Mounting Section

If the Loser seat flange with plug is use in a high-temperature, high-pressure environment, leakage may occur from plug mounting area. In this case, please retighten the plug or rewrap the sealing tape. To avoid leakage, please select Lower Cover type which does not have plug monting area.

○ Flange Material

If a flanged valve is installed on the exhaust side of the internal line of the tire curing press, stainless steel is recommended as the flange material. If a flange made of steel is selected, water droplets from condensate are carried at high speed and erode the inside of the steel flange, causing “droplet impact erosion”, which may lead to leakage from the flange.

○ Location

When installing this product, ensure that a workspace is available for safe and easy operation and maintenance. Also, consider supporting the valve itself or the piping in front of and behind it so that the piping in front of and behind it is not overloaded by the valve's own weight.

Installation

 WARNING	Do not stand under the lift when the goods are lifted during transportation. If not avoided, it could lead to serious injury.
 WARNING	Wear safety gear such as Helmet, protective glasses, protective gloves, safety shoes, and other necessary gear for protection.
 CAUTION	Use machine (such as crane or lift) when handling overweight product.
 CAUTION	Do not step on valve nor actuator during work. If not avoided, It could lead to serious injury by slipping feet and so on.

Remove all packing materials from the valve.

Prior to the installation the pipeline should be checked for contamination and foreign particles and cleaned if necessary.

The proper function of the completely mounted valve has to be checked prior to putting the installation into service.

○ Installation/ General information

- The valve body is embossed with markings of Port numbers 「1」「2」「3」. Check the piping diagram and install the piping in the correct direction.
- The mounting posture should be within the range of actuator upright (upward) to horizontal (sideways). Although it can be operated from horizontal to downward, avoid doing so as it may cause trouble.



○ Installation/ Threaded connection

- Tapered pipe threads on the pipe side should be free from scratches and retain the default effective thread length.
- After cleaning the taper threads with a brush or cloth, wrap the taper threads with sealing tape or apply sealant. At this time, please follow the specified installation method (winding method, application method, appropriate amount, etc.).
- For parallel threads, use a sealing material (gasket, O-ring, etc.) suitable for the seat surface.
- Use the appropriate torque for the pipe size when tightening. Excessive torque will result in damage such as cracking of the connection.

- When piping to the lower seat flange, be careful not to apply excessive tension or lateral load. This may cause seal failure of the gasket seal.
- When tightening, hang the tool on the connection end of the valve on the side where the piping is screwed in.
- When tightening the valve to pipes, hang the tool on the connecting end of the valve closer to the pipe connection side.

○ Installation/ Flanged connection

- Make sure that the flange surface and the gasket surface to be used are free from harmful scratches and adherence of foreign matter.
- When tightening bolts, make sure that the flange surfaces are properly parallel. Do not adjust the flange center misalignment by tightening the bolts, nor adjust the distance between the faces.
- When tightening the bolts, first tighten the bolts lightly by hand so that the gasket is evenly tightened, then use a wrench or torque wrench to gradually tighten the bolts at diagonal positions alternately and with even force to avoid one-sided tightening. Final tightening should be torque-controlled to prevent excessive tightening.

○ After installation

- Make sure that the valve and both end pipes are correctly centered.
- Flush inside of the valve and piping with air blowers, etc. During flushing, keep the valve fully open and do not open or close it. Foreign matter (dust, sand, scale, welding spatters, etc.) may enter the piping due to piping work. If the seat or any parts are damaged by such foreign matter, it may cause leakage.

Installation

○ Power source

- Use clean, moisture-free compressed air (0.25~0.35MPa*⁴) as the operating fluid. If lubricant is used, use one that will not affect the lubricant* which has been already applied inside Cylinder.

* : Lithium-based grease (Daphne Eponex SR No.2/Idemitsu Kosan)

○ Trial run

- First, visually or audibly check that the stem operates smoothly and that there is no abnormality in any part while repeatedly supplying and exhausting air to the operating air port with no fluid flowing through the valve.
- Next, pass fluid through the valve and check in the same manner. At this time, increase the pressure and temperature of the fluid step by step, and finally check under the operating conditions.

○ Operation

- Start using the products only after confirming that the it is in good working order. Watch for any abnormalities in the valve and its surroundings at the initial stage of use.
- If any abnormality is found, discontinue to use immediately.
- Inspect the valve periodically.

Disassembly

 WARNING	When disassembling the valve, avoid working at high temperatures immediately after use, and allow the valve to cool down sufficiently before starting work.
 CAUTION	Wear protective equipment such as a helmet, safety glasses, protective gloves, and safety shoes when working.
 CAUTION	Disassembly and inspection should be performed by skilled workers who understand the structure.
 CAUTION	Products with large mass should be operated using a machine (e.g. crane).
 CAUTION	When working on the product, use a vise firmly fixed to a stable workbench to ensure safe and proper disassembly.
 CAUTION	When working, be very careful not to pinch hands or fingers.
	When disposing of fluoroplastic products, do not incinerate them. Incineration will generate toxic fumes.
	Do not damage the sealing surface where the packing or gasket contacts.

Follow the instructions below while referring to the structural drawings listed in the "Structure (p. 9-13)" section. For the materials and quantities of each part, refer to the delivery specification drawing (assembly drawing). For special specifications (Z product), please contact us.

[] = Part number on assembly drawing

○ Disassembly Procedure

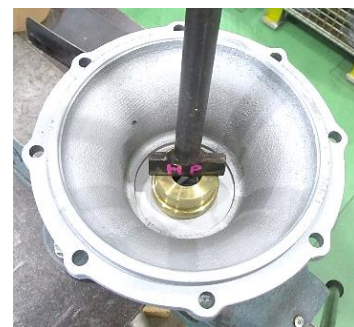
1. TPC2211-□□C / TPC2212-□□C (When port 3 with Lower Cover)

< Overall Disassembly >

1. Loosen the Socket Cap Screw [18] to the extent that it will not come off, rotate the Cylinder [3] about 90 degrees, and then tighten the Socket Cap Screw [17].
Make sure that the lock is released, and pull out the Cylinder [3] to remove it.
At this time, pull it straight out so that it does not get caught on the Piston [13].
2. Remove Tension Bolt assembly [15 / 23] and remove Piston assembly [13 / 24 / 55].
At this time, pay attention to the reaction force of Spring [22].
3. Remove Spring [22].
4. Remove Socket Cap Screw [19] and loosen Socket Cap Screw [17].
5. Remove Yoke Stand Assembly [2 / 12 / 17] from Body [1].
6. Remove Socket Cap Screw [16] and remove Lower Cover [5].
7. Remove the Lower Seat Gasket [30].
8. Remove Stem Assembly [4 / 6 / 7 / 8 / 28].
9. Remove the Gland Nut [11].
10. Remove Gland Assembly [10 / 25] and Gland Packing [26] (4 layers).
11. Remove the Ring Washer [9] and Packing Spring [21].

< Disassembly of each sub-assembly >

12. Tension Bolt Assembly [15 / 23] to Remove the O-Ring [23].
13. From Piston Assembly [13 / 24 / 55], remove Piston Ring [24] and remove Pin Gauge [55].
14. Remove Guide Bush [12] from Yoke Stand Assembly [2 / 12 / 17]. At this time, use a tool that matches the groove shape of the Guide Bush. (See figure on the right).
15. Remove Lock Nut [6] from Stem Assembly [4 / 6 / 7 / 8 / 28] and remove Guide Washer [7], Disc Adapter [8] and Disc Ring [28].
16. Remove Dust Seal [25] from Gland assembly [10 / 25].
Be careful not to damage the Gland [10] at this time.



< After disassembly >

- Carefully clean each parts and wipe off the cleaning solution.
In particular, clean off any dirt on the sealing surfaces where packing and gaskets come in contact.
- Prepare new consumable parts (parts marked with☆)
O-Ring [23] / Piston Ring [24] / Dust Seal [25] / Gland Packing [26]

Disc Ring [28] / Lower Seat Gasket [30]

- If any abnormality (wear, damage, corrosion, etc.) is found even in other parts, prepare new parts.

Body [1] / Cylinder [3] / Stem [4] / Lower Cover [5]

Guide Washer [7] / Disc Adapter [8] / Piston [13]

Parts related to guide performance

Gland [10] / Guide Bush [12]

Etc...

2. TPC2211-□□T / TPC2212-□□T (When port 3 with Plugged Lower Seat Flange)

Follow the same procedures as 「 1. TPC2211-□□C / TPC2212-□□C 」 .

The only difference is at the 3-port section; Just replace "Lower Cover [5]" in 1. with "Lower Seat Flange [5T]" and "Plug [36]".

3. TPC2311-□□ / TPC2312-□□ / TPC2313-□□

Follow the same procedures as 「 1. TPC2211-□□C / TPC2212-□□C 」 .

The only difference is at the 3-port section; Just replace "Lower Cover [5]" in 1. with "Lower Seat Flange [5]".

Assembly

 WARNING	Wear protective equipment such as a helmet, safety glasses, protective gloves, and safety shoes when working.
 CAUTION	Assembly should be performed by skilled workers who understand the structure.
 CAUTION	Products with large mass should be worked with a machine (e.g. crane).
 CAUTION	When working, use a vise firmly fixed to a stable workbench to ensure safe and proper assembly.
 CAUTION	When working, be very careful not to pinch hands or fingers.
	Do not damage the sealing surface that the packing or gasket contacts.
	Always use new packings and gaskets. Reusing them may cause leakage.

Follow the instructions below while referring to the structural drawings listed in the "Structure (p. 9-13)" section. For the materials and quantities of each part, refer to the delivery specification drawing (assembly drawing). For special specifications (Z product), please contact us.

Assembly work should basically be performed in the reverse order of "Disassembly".
The following points should be noted.

[] = Part number on assembly drawing

○ Assembly procedures

1. TPC2211-□□C / TPC2212-□□C (When port 3 with Plugged Lower Seat Flange)

- Select grease and anti-seizing agent according to the temperature environment in which they will be used.

Reference (products used when shipped from our company)

Grease: Lithium type / Daphne Eponex SR No.2 / Idemitsu Kosan

Anti-seize agent: SMOCON/Supero Machine Industry

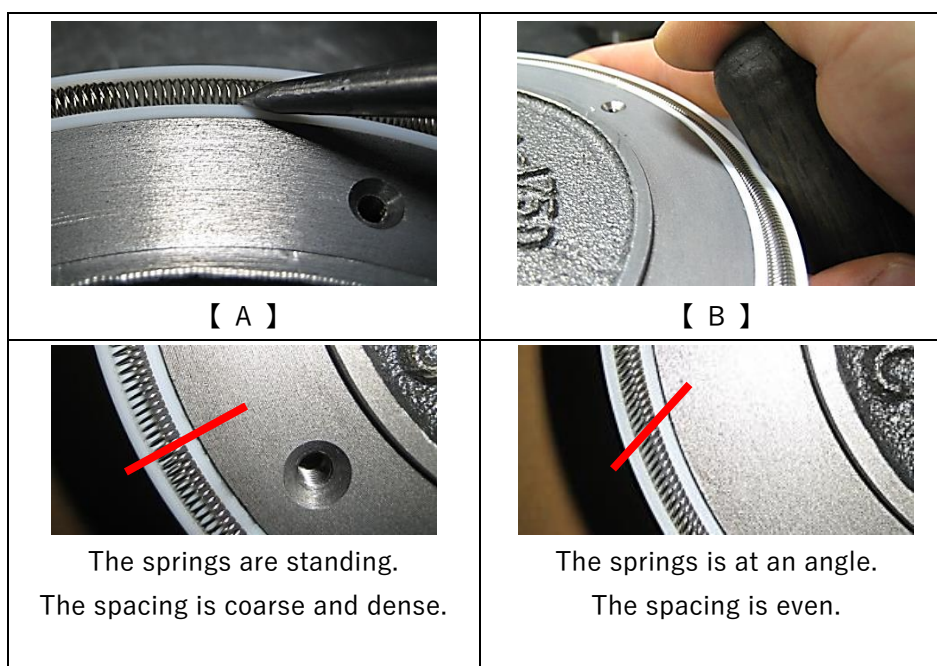
< Assembly of each sub-assembly >

- Piston Assembly[13 / 24 / 55]

After applying an appropriate amount of grease to the outer circumference of the Piston [13] and after assembling the Piston Ring [24], install it against the Piston Ring [24] as follows.

To ensure that the springs in the Piston Ring fall in the same direction and are evenly coarse or dense, turn the inside diameter of the spring clockwise with the tip of an ice picker (or equivalent) 【A】. Then, while holding the Teflon part on the outer diameter side of the Piston Ring with a cylindrical part such as the handle of a tool, turn it several times 【B】 so that the spring is slightly slanted.

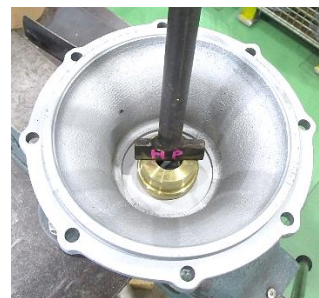
If this work is not performed, it will be difficult to insert the Piston Assembly into the Cylinder [3], and if it is forced, the lip of the Piston Ring may be damaged or premature wear may cause air leaks. On the other hands, if Piston Ring spring is crushed too hard, the lip will not stand up, causing the initial air leakage.



When assembling Pin Gauge [55], apply medium-strength Loctite to the threads.

- Yoke Stand Assembly 2 / 12 / 17]

When assembling Guide Bush [12] on Yoke Stand [2], apply medium-strength Loctite to the threads of the Guide Bush. Tighten the Guide Bush [12] securely using a tool that matches the groove shape of the Guide Bush. (See figure on the right).



- Stem Assembly [4 / 6 / 7 / 8 / 28]

Fix the two-sided part of the Stem [4] with vise or equivalent to work on it.

Be careful not to assemble each component in the wrong order.

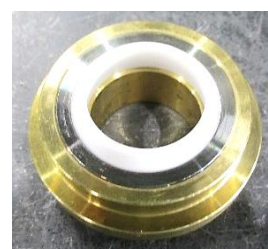
Apply anti-seize agent to the tip threads of the Stem [4] and tighten the Lock Nut [6] to the torque value shown in the table below.



Valve Nominal Size	Thread size	Torque value (Nm)
DN8~15	M 7	15.0
DN20	M 8	29.0
DN25	M10	33.0
DN32	M12	59.7
DN40	M16	144.3

- Gland Assembly [10 / 25]

When assembling Dust Seal [25] to Gland [10], since it is a light press-fit, use a jig suitable for the shape of the Dust Seal and press it in until the top surfaces are identical. (See figure on the right).



< Overall Assembly >

- When assembling Gland Packing [26] (4-layer structure) into Body [1], grease the casing side of the Body beforehand to make insertion easier. If insertion is difficult, lightly tap with a urethane hammer.
- When assembling the Gland Nut [11], apply anti-seizing agent to thread. When tightening the screws, tighten lightly at first, and then tighten firmly after inserting the Stem assembly [4 / 6 / 7 / 8 / 28] (before assembling the Yoke Stand assembly [2 / 12 / 17]).



- When assembling Stem Assembly [4 / 6 / 7 / 8 / 28], apply grease to the taper area of Stem [4] and insert it straight into Gland Packing [26] to avoid applying excessive force.



- When tightening Socket Cap Screw [16], tighten bolts in diagonal positions alternately in order to evenly tighten Lower Seat Gasket [30]. Also, gradually tighten the bolts one round at a time, using the torque values in the table below as the final values, in three different tightening intensities.



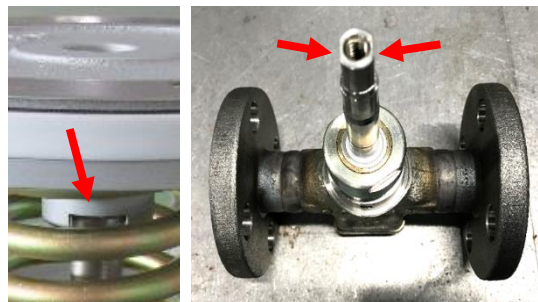
Valve Nominal Size	Thread size	Torque value (Nm)
DN8~15	M 6	9.0
DN20	M 8	19.0
DN25	M10	30.0
DN32	M12	42.0
DN40	M14	50.0

- When assembling the Yoke Stand assembly [2 / 12 / 17] to the Body [1], first lightly tighten Socket Cap Screw [17], then temporarily assemble the Spring [22], Piston assembly [13 / 24 / 55], and Tension Bolt assembly [15 / 23], then tighten firmly so that the two split gaps are evenly distributed on both sides.



- When assembling Piston assembly [13 / 24 / 55] to Stem assembly [4 / 6 / 7 / 8 / 28], assemble them so that the two sides of both parts match. (See Right figure)

At this time, it is recommended to phase the Stem [4] in advance (aligning the two-sided face with the 1-2 port) so that the Pin Gauge [55] fits into the corresponding hole in the Yoke Stand [2].



- When tightening the Tension Bolt [15], tighten it with the tool until the seating surfaces are in contact, then tighten to the torque values in the table below.

Valve Nominal size	Thread size	Torque value (Nm)
DN8~15	M 6	13.0
DN20	M 8	13.0
DN25	M10	18.0
DN32	M12	18.0
DN40	M16	32.0



- When assembling Cylinder [3] to Yoke Stand [2], insert it straight so as not to put load on Piston Ring [24].

< After assembly >

- Supply compressed air to pilot air port and check that there is no air leakage from around Cylinder and that Stem operates smoothly.

2. TPC2211-□□T / TPC2212-□□T (When port 3 with Plugged Lower Seat Flange)

Follow the same procedures as 「 1. TPC2211-□□C / TPC2212-□□C 」 .

The only difference is at the 3-port section; Just replace "Lower Cover [5]" in 1. with "Lower Seat Flange [5T]" and "Plug [36]".

3. TPC2311-□□ / TPC2312-□□ / TPC2313-□□

Follow the same procedures as 「 1. TPC2211-□□C / TPC2212-□□C 」 .

The only difference is at the 3-port section; Just replace "Lower Cover [5]" in 1. with "Lower Seat Flange [5]".

Trouble Shooting

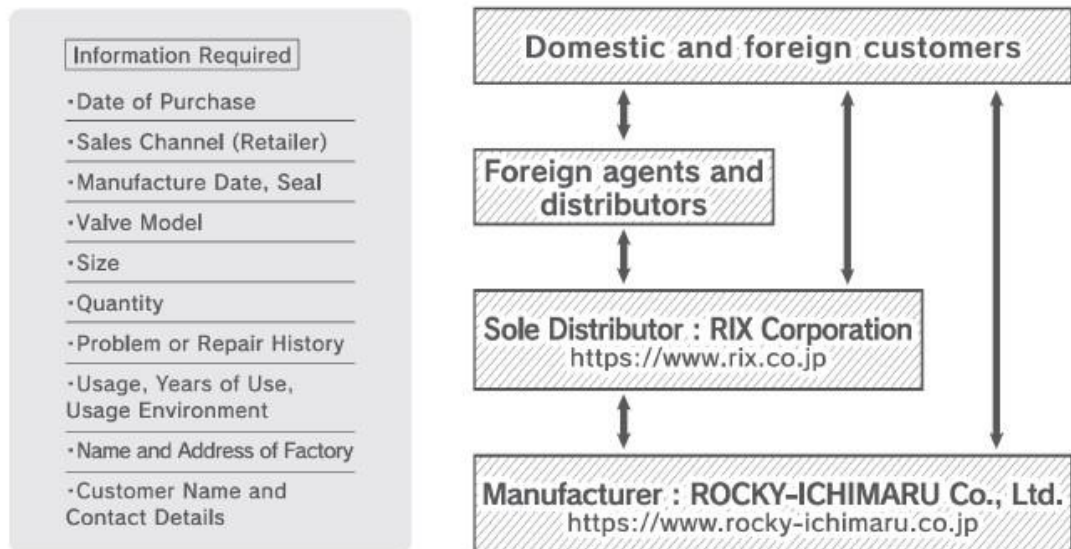
Phenomenon	Cause	Countermeasures
Fluid does not flow	The valve is installed without removing protective poly plug at the connection port.	Remove protective poly plug
Insufficient flow rate	Valve size is too small.	Increase valve size
Inoperative (Valve rod)	Insufficient operating air pressure	Set proper pressure
	Worn sealing parts in the actuator	Seal parts replacement (Piston Ring and O-Rings)
	Damage to inner surface of Cylinder	Cylinder replacement
	Damaged spring in actuator	Spring replacement
	Contamination of foreign matter in actuator.	Foreign material removal
	Contamination of foreign matter in Body.	Foreign material removal
	High fluid pressure	Bring to proper pressure
Seat leakage (Valve seat, Valve)	Insufficient operating air pressure	Bring to proper pressure
	Damaged spring in actuator	Spring replacement
	High fluid pressure	Set proper pressure Check 「Usage condition」
	Foreign matter caught at seat	Foreign material removal
	Foreign matter in actuator	Foreign material removal
	Damage to seat	Replace valve seat and plug
Leakage at screwed connections	Insufficient screw-in	Screw in firmly
	Poor sealing performance	Correctly apply sealing tape and sealant
	Damaged, Worn threads	Parts replacement
Leakage at flange connection	Insufficient bolt/nut fastening force	Fasten firmly
	Gasket failure	Gasket replacement
	One-sided tightening of flange	Gradually tighten diagonally alternately with even force
	Insufficient parallelism of flange	Support installation for front and rear piping Reinstallation of flange piping
	Seat surface damage	Repair/ Replacement
	Worn flange due to erosion	Change flange material to stainless steel

Phenomenon	Cause	Countermeasures
Leakage at Gland	Worn Gland Packing	Gland packing replacement
	Damage to valve Rod	Valve Rod Replacement (Stem)
Leakage at Body	Crack in Body	Body repair/ Replacement
Water Hammer	Rapid closing of Seat	Control operating air supply and exhaust speed by speed controller.

※ If you are unable to determine whether or not the damaged part needs to be replaced, please contact us.

Product service system

When contacting us about problems or repairs, check the diagram below to ensure you contact the most appropriate office.



<Contact>

ROCKY-ICHIMARU Co., Ltd.
601 Oaza Tsunemochi, Chikugo City,
Fukuoka 833-0016 JAPAN
Tel 0942-53-7510 / Fax 0942-52-8799
<https://www.rocky-ichimaru.co.jp/en/>
Email info@ml.rocky-ichimaru.co.jp



Company website



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