ISO 9001
ISO14001

Manufacturer
TLV CO., LTD.
Kakogawa, Japan
is approved by LRQA Ltd. to ISO 9001/14001

Instruction Manual

Remote Adjustable Type Direct-Acting Pressure Reducing Valve for Air
(PTFE-Inlaid Valve Seat)

Featured Models: A-PN-DR-2TS/A-PN-DR-6TS

172-65812M-01
Publication date 24 October 2023

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Introduction

Thank you for purchasing the TLV A-PN-DR remote adjustable type direct-acting pressure reducing valve for air.

This product has been thoroughly inspected before being shipped from the factory. When the product is delivered, before doing anything else, check the specifications and external appearance to make sure nothing is out of the ordinary. Also be sure to read this manual carefully before use and follow the instructions to be sure of using the product properly.

The TLV A-PN-DR remote adjustable type direct-acting pressure reducing valve for air/ nitrogen provides a more stable secondary pressure than conventional direct-acting reducing valves. The A-PN-DR is designed for a long service life, and is made of stainless steel for superior durability.

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If detailed instructions for special order specifications or options not contained in this manual are required, please contact TLV for full details.

This instruction manual is intended for use with the model(s) listed on the front cover.
It is needed not only for installation, but also for subsequent maintenance, disassembly/ reassembly and troubleshooting. Please keep it in a safe place for future reference.

Safety Considerations

- Read this section carefully before use and be sure to follow the instructions.
- Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.
- The precautions listed in this manual are designed to ensure safety and prevent equipment damage and personal injury. For situations that may occur as a result of erroneous handling, three different types of cautionary items are used to indicate the degree of urgency and the scale of potential damage and danger: DANGER, WARNING and CAUTION.
- The three types of cautionary items above are very important for safety: be sure to observe all of them as they relate to installation, use, maintenance and repair. Furthermore, TLV accepts no responsibility for any accidents or damage occurring as a result of failure to observe these precautions.

Cautionary items and definitions

Danger
Indicates an urgent situation which poses a threat of death or serious injury

Warning
Indicates that there is a potential threat of death or serious injury

Caution
Indicates that there is a possibility of injury or equipment/product damage

Safety considerations for the product

Caution
Install properly and DO NOT use this product outside the recommended operating pressure, temperature and other specification ranges. Improper use may result in such hazards as damage to the product or malfunctions that may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted.

Caution
Take measures to prevent people from coming into direct contact with product outlets. Failure to do so may result in burns or other injury from the discharge of fluids.

Caution
When disassembling or removing the product, wait until the internal pressure equals atmospheric pressure and the surface of the product has cooled to room temperature. Disassembling or removing the product when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries or damage.

Caution
Be sure to use only the recommended components when repairing the product, and NEVER attempt to modify the product in any way. Failure to observe these precautions may result in damage to the product and burns or other injury due to malfunction or the discharge of fluids.

Caution
Do not use excessive force when connecting threaded pipes to the product. Over-tightening may cause breakage leading to fluid discharge, which may cause burns or other injury.

Caution
Use only under conditions in which no freeze-up will occur. Freezing may damage the product, leading to fluid discharge, which may cause burns or other injury.

Caution
Use only under conditions in which no water hammer will occur. The impact of water hammer may damage the product, leading to fluid discharge, which may cause burns or other injury.

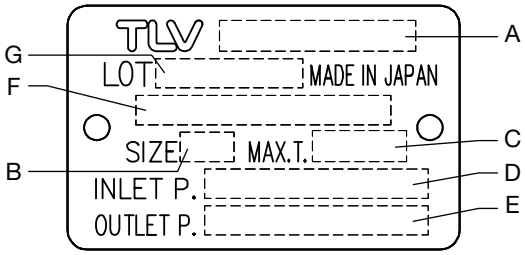
Specifications

Caution

Install properly and DO NOT use this product outside the recommended operating pressure, temperature and other specification ranges. Improper use may result in such hazards as damage to the product or malfunctions that may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted.

Use only under conditions in which no freeze-up will occur. Freezing may damage the product, leading to fluid discharge, which may cause burns or other injury.

Refer to the product nameplate for detailed specifications.



A	Model	E	Secondary Pressure Range
B	Nominal Diameter	F	Valve No. [01]
C	Maximum Operating Temperature (TMO)	G	Production Lot No.
D	Primary Pressure Range		

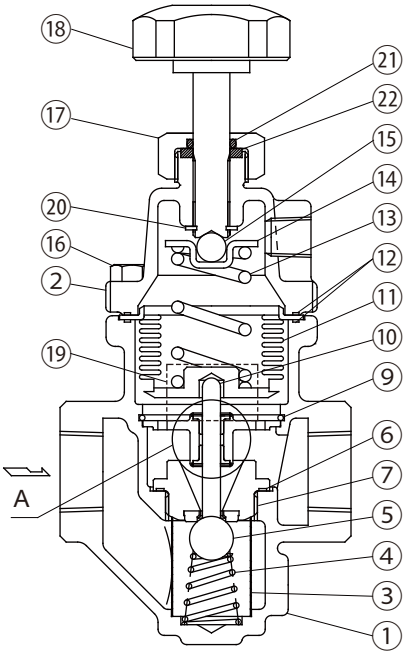
[01]Valve No. is displayed for products with options. This item is omitted from the nameplate when there are no options.

Acceptable Operating Range

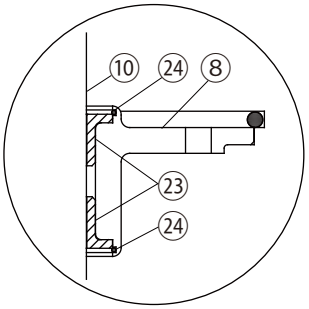
Model	A-PN-DR-2TS	A-PN-DR-6TS
Primary Pressure Range	0.2 to 0.7 MPaG	
Adjustable Pressure Range	0.014 to 0.2 MPaG (but limited to $^{1}/_{30}$ of primary pressure)	0.18 to 0.6 MPaG
	Secondary pressure must not exceed 90% of primary pressure	
Minimum Adjustable Flow Rate	2 m^3/h	

Configuration

Note
The face-to-face length for the sizes 15 and 20 mm (optional) is 18 mm longer than the standard size.



Enlarged view: A



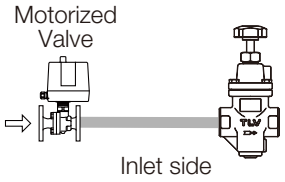
No.	Part Name	A[01]	B[02]	C[03]	D[04]	E[05]
1	Body					
2	Cover					
3	Screen			✔		
4	Coil Spring			✔		
5	Steel Ball			✔		
6	Valve Seat Gasket	✔		✔		
7	Valve Seat [06]			✔		
8	Spacer [07]		✔			
9	Snap Ring					
10	Valve Stem		✔			
11	Bellows				✔	
12	Cover Gasket	✔	✔	✔	✔	✔
13	Coil Spring					
14	Spring Guide					
15	Steel Ball					
16	Cover Bolt					
17	Holder Nut					
18	Adjustment Handle					✔
19	Nameplate					
20	Retaining Ring					✔
21	Seal Ring	✔				✔
22	Gland Retainer	✔				✔
23	Slide Bearing [07,08]		✔			
24	Snap Ring [07 08]		✔			

[01]Maintenance kit
[02]Repair kit for spacer
[03]Repair kit for main valve
[04]Repair kit for bellows
[05]Repair kit for adjustment handle
[06]PTFE is in the seating surface of the valve seat
[07]Shipped as a unit
[08]Number of parts: 2 pieces

Correct usage of the product

Caution
Install properly and DO NOT use this product outside the recommended operating pressure, temperature and other specification ranges. Improper use may result in such hazards as damage to the product or malfunctions that may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted.

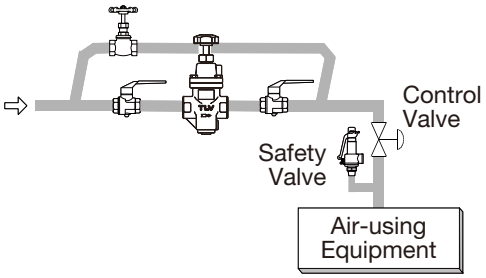
1. The product should be operated only within its specifications.
2. Installing an ON/OFF valve (solenoid valve or motorized valve)



If an on-off valve is required to stop supply of air to the equipment, install it at the inlet side of the product.If a solenoid valve is installed at the outlet of the product, it will cause heavy chattering and may lead to damage of the product. (When the on-off valve opens, the secondary pressure of the reducing valve changes from zero to the set pressure. Passing through an area of the reducing ratio of less than 30:1 where adjustment is impossible, chattering occurs momentarily.)

Note
It is recommended that a slow-acting motorized on-off valve be used. If a fast-acting solenoid valve is used, it may damage the air-using equipment and the product.

3. Installing a control valve and a safety valve



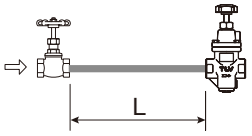
A control valve (i.e. for temperature control) installed between the product and the equipment (downstream of the product) may raise the pressure between the product and the control valve when the control valve is closed, depending on their proximity. Therefore, this valve should be installed close to the air-using equipment, as illustrated. Also, a safety valve should be installed downstream of the control valve.

Note
When installing a safety valve to protect the air-using equipment, be sure to install it on the air-using equipment, or directly before the inlet of the equipment. If the safety valve is installed between the product and a control valve, an eventual pressure rise could activate the safety valve.

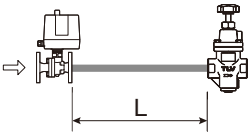
Recommended straight pipe runs

If the product is installed either directly before or after an elbow or control valve, unevenness in flow may result in chattering and unstable pressure. To ensure a stable flow, it is recommended that the product be installed on straight runs of piping, as illustrated below. (d = pipe diameter)

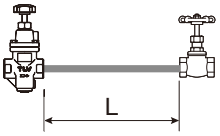
1. Inlet (primary) side
   - Maintain a straight piping run of **10d or more** (L) when a manual valve, a strainer or an elbow, etc. is installed. (Example: if nominal size is 25 mm, have 250 mm or more)



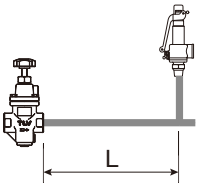
   - Maintain a straight piping run of **30d or more** (L) when an automated valve (on-off valve) is installed. (Example: if nominal size is 25 mm, have 750 mm or more)



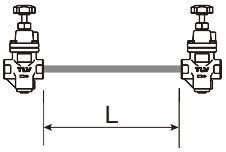
2. Outlet (secondary) side
   - Maintain a straight piping run of **15d or more** (L) when a manual valve, a strainer or an elbow, etc. is installed. (Example: if nominal size is 25 mm, have 375 mm or more)



   - Maintain a straight piping run of **30d or more** (L) when a safety valve is installed. (Example: if nominal size is 25 mm, have 750 mm or more)



   - Maintain a straight piping run of **30d or more** (L) when another pressure reducing valve is installed. (Two-stage pressure reduction) (Example: if nominal size is 25 mm, have 750 mm or more)



Installation

Caution

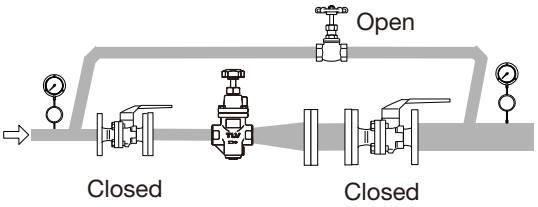
Install properly and DO NOT use this product outside the recommended operating pressure, temperature and other specification ranges. Improper use may result in such hazards as damage to the product or malfunctions that may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted.

Take measures to prevent people from coming into direct contact with product outlets. Failure to do so may result in burns or other injury from the discharge of fluids.

Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.

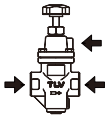
1. Blowdown

   Blowdown is especially important for newly installed piping or after the system has been shut down for a long period of time. This will reduce operation failure caused by condensate or foreign matter.



2. Removing protective caps and seals

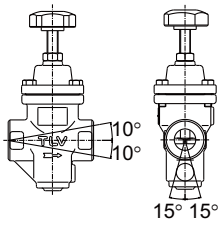
   Before installation, be sure to remove all protective seals and caps. (Found in 3 locations, on the product inlet and outlet(s).)



3. Installation angle

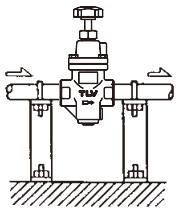
   Install the product vertically, so that the arrow mark on the body points horizontally in the direction of flow.

   Allowable inclination is 10 degrees in the fore-aft direction and 15 degrees in the plane perpendicular to the flow line.



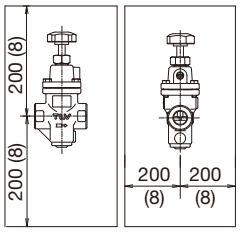
4. Piping support

   Install the product, paying attention to avoid excessive load, bending and vibration. Support the inlet and outlet pipes securely.



5. Maintenance space

   Leave sufficient space for maintenance, inspection and repair.

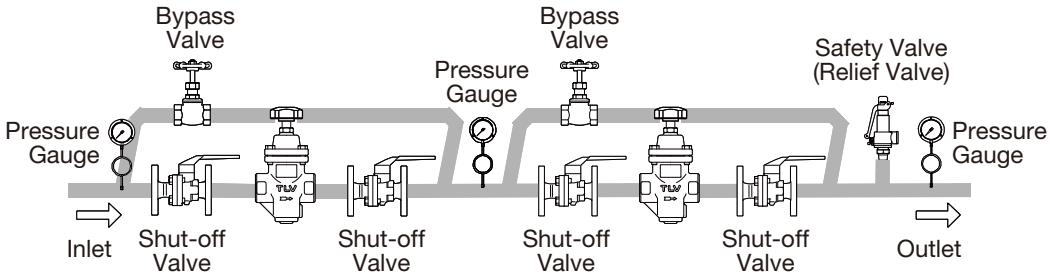


6. Piping size/diffuser

   If it is expected that the secondary flow velocity will be more than 30m/s (100 ft/s), install a diffuser in order to keep the flow velocity below 30m/s(100 ft/s). If the distance between the product and the air-using equipment is great, a possible drop in pressure should be taken into consideration when selecting the piping size. If installing a strainer, horizontal installation is recommended in order to prevent pooling of condensate.

Straight piping (d = pipe diameter)	
a	10d or longer upstream
b	15d or longer downstream

7. Two-stage pressure reduction



8. Accessories

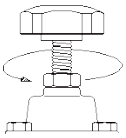
   Always install a bypass line. At the inlet and outlet, install a pressure gauge and a shut-off valve.

   Ball valves, which will not retain condensate, are recommended for inlet and outlet shut-off valves. The bypass pipe should be at least $^1/_2$ of the size of the inlet (primary side) pipe.

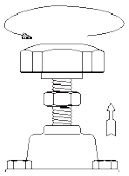
Adjustment

To protect air-using equipment, the product should be correctly adjusted.

1. It is necessary to blow down all pipe lines thoroughly. The blowdown is especially important if the line is new or has been shut down for a long period of time.
   Take particular care to ensure that matter such as condensate and dirt does not remain inside the air-using equipment. (Stay clear of any pressurized blow-out from the safety valve.)
2. Make sure that the shutoff valve and the bypass valve located upstream and downstream of the product are completely closed.
3. Remove the spanner cap, loosen the locknut and turn the adjustment screw counterclockwise to reduce tension on the coil spring.
   Loosen the locknut, then turn the adjustment handle counter-clockwise to free the coil spring.

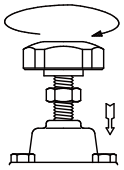


Loosen the locknut

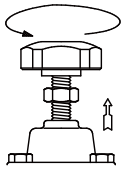


Fully raise the adjustment handle

4. Slowly, fully open the shutoff valve at the inlet of the product.
5. Slightly open the shutoff valve at the outlet of the product.
6. Turn the adjustment handle clockwise until the desired outlet pressure is obtained. Wait several minutes.

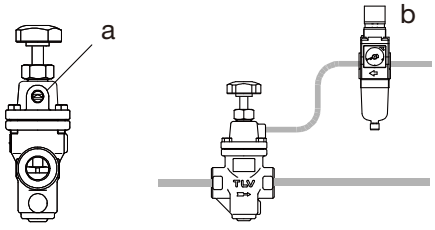


Clockwise to increase pressure



Counter-clockwise to decrease pressure

7. Slowly, fully open the shutoff valve at the outlet of the product.
8. Supply clean air for the motive air and adjust the air pressure to match desired value by using the air regulator or similar device.



a	Motive air connection port	b	Air regulator for motive air

9. When shutting down the system, always close the outlet shutoff valve first and then the inlet valve.
   Closing the inlet shut-off valve first may cause the outlet pressure to rise and cause the safety valve to blow out.

Maintenance

Caution
Take measures to prevent people from coming into direct contact with product outlets. Failure to do so may result in burns or other injury from the discharge of fluids.

Be sure to use only the recommended components when repairing the product, and NEVER attempt to modify the product in any way. Failure to observe these precautions may result in damage to the product and burns or other injury due to malfunction or the discharge of fluids.

Operational check

To ensure long service life of the product, the following inspection and maintenance should be performed regularly.

Part Name	Inspection and Maintenance Frequency
Screen	Disassemble and clean annually. If there is substantial blockage, install a strainer (approximately 60 mesh) ahead of the product.
Steel Ball, Valve Seat [01]	If there is chattering or dirt, premature wear may result.
Valve Stem, Spacer (Slide Bearing)	If there is chattering, premature wear may result.
Bellows	If hunting or chattering takes place, premature wear may result.
Seal Ring	Replace annually. Premature wear may occur.
Packing	Replace annually. Premature wear may occur.

[01]PTFE is inlaid in the seating surface of the valve seat

Disassembly

Caution
When disassembling or removing the product, wait until the internal pressure equals atmospheric pressure and the surface of the product has cooled to room temperature.
Disassembling or removing the product when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries or damage.

It is a recommended practice to dismantle and inspect the product once a year for preventive maintenance purposes. It is especially important to perform an inspection immediately after the initial run of a new line or before or after equipment that is out of service for a long period of time.

(Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.)

Remove all pressurized air from the piping (both upstream and downstream). Remove all motive air pressure. Wait for the body to cool before attempting to remove the product from the line. Then remove the product from the piping, and secure it in a vise to perform the inspection.

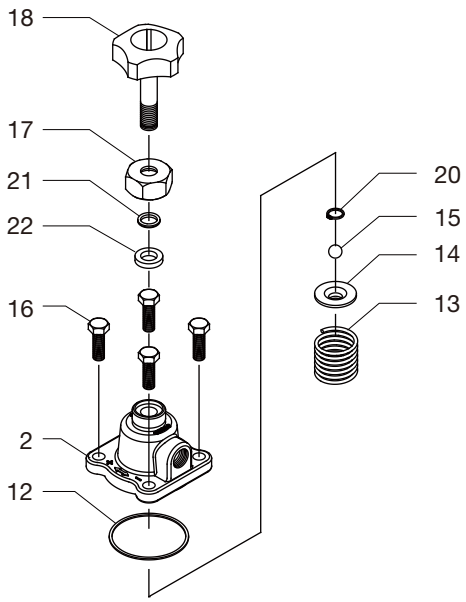
Disassembling the adjustment section

Loosen the adjustment handle completely and remove the cover bolts. After removing the cover, you will see the steel ball, the spring retainer and the coil spring.

Important
Check for seizure or any damaged screw threads.

Remove the retaining ring. The seal ring and the packing can be removed by loosening the adjustment handle and the holder nut.

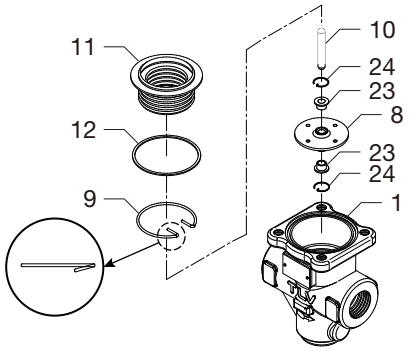
Important
Check and make sure that the seal ring has not deteriorated and the packing has no abnormalities.



No.	Part Name	No.	Part Name
2	Cover	17	Holder Nut
12	Gasket	18	Adjustment Handle
13	Coil Spring	20	Retaining Ring
14	Spring	21	Seal Ring
15	Steel Ball	22	Gland Packing
16	Cover Bolt		

Disassembling the Bellows Section

Remove the bellows from the body, then the valve stem. Pinch the straight sections of the snap ring that is holding the spacer together using a tool such as needle-nose pliers and remove the snap ring. Remove the spacer.

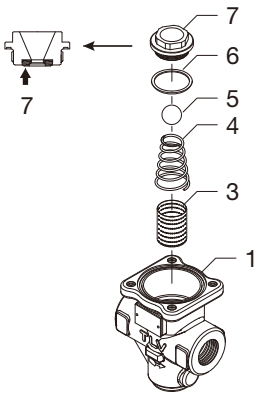


No.	Part Name	No.	Part Name
1	Body	11	Bellows
8	Spacer	12	Cover Gasket
9	Snap Ring [01]	23	Slide Bearing [02]
10	Valve Stem [03]	24	Snap Ring [02]

[01]Insert the snap ring so that both ends are facing down.
[02]Cannot be removed individually as it is incorporated with the spacer
[03]Point the round tip upward.

Disassembling the Valve Section

Loosen the valve seat with a wrench and remove it from the body. The coil spring is exerting an upward pressure on the bottom of the valve seat, so be careful that the valve seat is not thrown out. After removing the valve seat, remove the main valve, the coil spring and the screen.



No.	Part Name	No.	Part Name
1	Body	5	Steel Ball
3	Screen	6	Valve Seat Gasket
4	Coil Spring	7	Valve Seat [01]

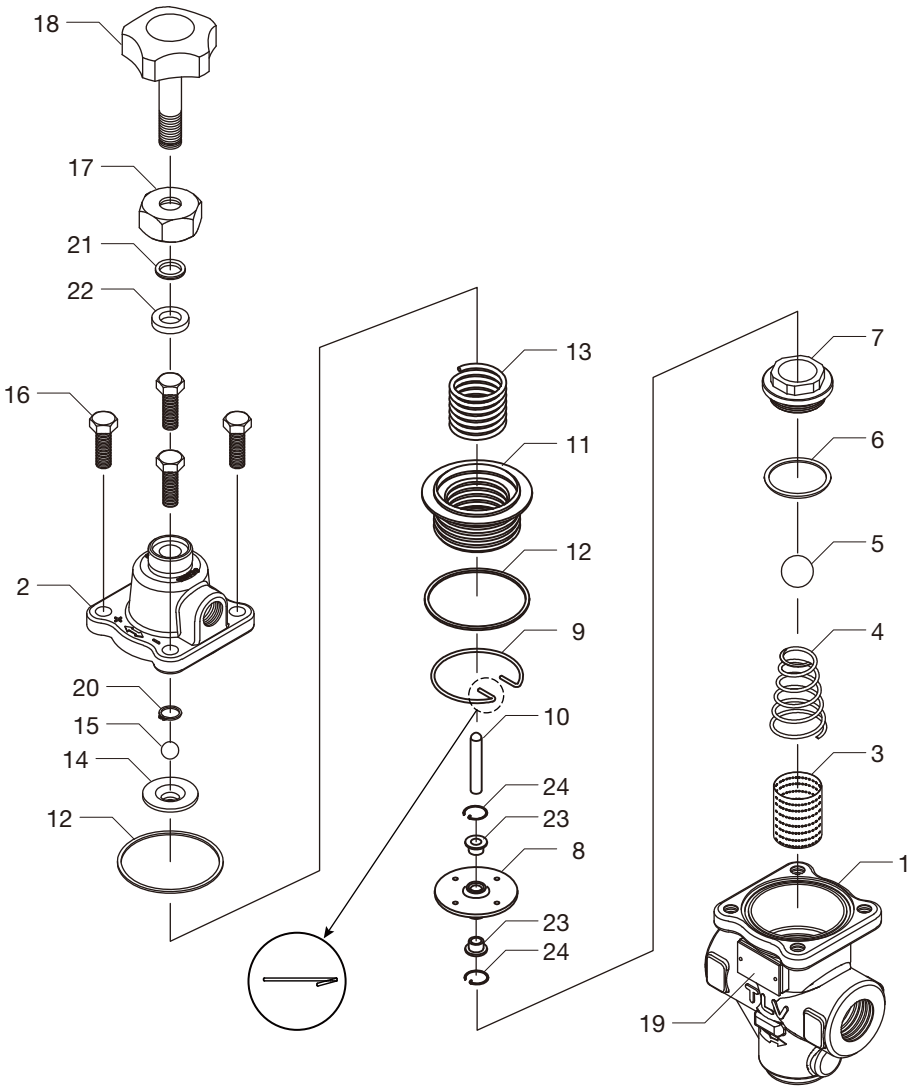
[01]PTFE is inlaid in the seating surface of the valve seat

Cleaning

After inspection and removal of any abnormality, clean and reassemble the parts. The following parts will require cleaning before reassembly:

Threads of the adjustment handle, threads of the cover, bellows, valve stem, main valve, valve seat, spacer (including slide bearing), screen.

Exploded view



No.	Part Name	No.	Part Name
1	Body	13	Coil Spring
2	Cover	14	Spring Guide
3	Screen	15	Steel Ball
4	Coil Spring	16	Cover Bolt
5	Steel Ball	17	Holder Nut
6	Valve Seat Gasket	18	Adjustment Handle
7	Valve Seat [01]	19	Nameplate
8	Spacer	20	Retaining Ring
9	Snap Ring [02]	21	Seal Ring
10	Valve Stem	22	Gland Retainer
11	Bellows	23	Side Bearing [03]
12	Cover Gasket	24	Snap Ring

[01]PTFE is inlaid in the seating surface of the valve seat
[02]Insert the snap ring so that both ends are facing down.
[03]Cannot be removed individually as it is incorporated with the spacer and must be replaced as a set with the spacer

Reassembly

Reassemble the unit using the same procedure as used for disassembly; but in reverse order. In addition, observe the following precautions:

1. The PTFE gasket may be re-used if free from fault, crushing or deformation.
2. Apply anti-seize to the steel ball and threaded portions of screws, bolts and the adjustment handle. Apply a small amount of anti-seize agent to the threads of the valve seat carefully to ensure it does not come into contact with other parts.
3. Fasten the bolts one at a time in a diagonal pattern alternately to provide uniform seating.
4. After assembly, make sure that the valve stem operates smoothly without binding.
   As shown in the figures above, when the valve is tightened it may become off-centered on the valve seat. If this occurs, move the valve back to center.
5. When reinserting the steel ball, make sure it does not fall out from the product outlet.

Table of Tightening Torques

Part Name	Torque (N·m)	Distance Across Flats (mm)
Cover Bolt	25	13
Valve Seat [01]	120	27
Holder Nut	10	30

[01]PTFE is inlaid in the seating surface of the valve seat

Note
If drawings or other special documentation were supplied for the product, any torque given there takes precedence over values shown here.

Troubleshooting

Caution
When disassembling or removing the product, wait until the internal pressure equals atmospheric pressure and the surface of the product has cooled to room temperature.
Disassembling or removing the product when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries or damage.

This product is shipped after stringent checks and inspection and should perform its intended function for a long period of time without failure. However, should there be any problem encountered in the operation of the product, consult the troubleshooting guide below.

Problems are classified as follows:

1. The secondary pressure does not increase.
2. The secondary pressure cannot be adjusted or increases abnormally.
3. Hunting (fluctuation of the secondary pressure) occurs.
4. Chattering (a heavy mechanical noise) occurs.
5. Abnormal noises.

Major causes for the above problems are usage under non-specified conditions (out of specifications), insufficient pressure or flow rate, and clogs by dirt and scale.

To ensure performance for a long period of time, it is recommended that the "Acceptable Operating Range", "Correct Usage of the Product" and "Adjustment" sections be reviewed.

It is a recommended practice to dismantle and inspect the product once a year for preventive maintenance purposes. It is especially important to perform an inspection immediately after the initial run of a new line or before or after equipment such as a heater is out of service for a long period of time. (Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.)

Problem	Symptom	Cause	Remedy
The secondary pressure does not rise	The pressure does not increase	No steam is being supplied	Check the primary/ secondary piping and valves of the unit
		The valve at the primary side is closed	
		The filter at the primary side is clogged	Clean or blow down or replace with a new filter
		Flow rate exceeds specifications	Check the flow rate; check the model selection, replace with a more suitable unit if necessary [01]
		The secondary pressure exceeds the adjustable range	Check the model selection, replace with a more suitable unit if necessary [01]

Problem	Symptom	Cause	Remedy
The secondary pressure cannot be adjusted or increases abnormally	Adjustment is difficult, and set pressure varies	The flow rate is too low	Check the flow rate; check the model selection, replace with a more suitable unit if necessary [01]
		Pressure fluctuation at the primary side is large	Check the primary pressure; check the model selection, replace with a more suitable unit if necessary [01]
		Flow rate fluctuation is too large	Check the flow rate, re-set the pressure; check the model selection, replace with a more suitable unit if necessary [01]
		The adjustment screw has seized	Replace with a new adjustment screw
		The slide bearing is distorted or damaged	Replace with a new valve guide (when replacing the slide bearing or snap ring, these parts need to be replaced as a set with the valve guide)
		The diaphragm or protective sheet is distorted or damaged	Replace with a new diaphragm and protective sheet
		The selected model is inappropriate for the service conditions (specifications)	Check the model selection, replace with a more suitable unit if necessary [01]
	Upon closing the valves on the secondary side, the secondary pressure abruptly rises as high as the primary pressure	The bypass valve is leaking	Check, clean, and replace with a new valve if necessary [01]
		There is a build-up of dirt on or damage to the pilot valve seat or main valve seat	Clean and align
Hunting or chattering occurs	Occurs at low steam demand	Flow rate is too low	Check the flow rate; check the model selection, replace with a more suitable unit if necessary [01]
	Hunting never stops	The reduction ratio is too high	Use two-stage reduction
		The selected model is inappropriate for the service conditions (specifications)	Check the model selection, replace with a more suitable unit if necessary [01]
	Chattering never stops	Condensate is entrained	Check the trap Check the piping
		The selected model is inappropriate for the service conditions (specifications)	Check the model selection, replace with a more suitable unit if necessary [01]

Problem	Symptom	Cause	Remedy
Abnormal noises	Makes a high-pitched noise	The required pressure reduction exceeds specifications	Use two-stage reduction
		Flow rate exceeds specifications	Check the flow rate; check the model selection, replace with a more suitable unit if necessary [01]
		The valve installed close to the reducing valve opens/closes too quickly	Install the valve at as great a distance away as possible

[01]Contact TLV for model selection and replacement.

Note
When replacing parts with new, use the parts list for reference and replace with parts from the maintenance kit, repair kit, etc. (Please note that replacement parts are only available in pre-packaged kits.)

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