



Manufacturer

TLV CO., LTD.

Kakogawa, Japan

is approved by LRQA Ltd. to ISO 9001/14001



Instruction Manual

Pneumatic Control Valve for Steam

COSPECT

PN-COS-16

Manufacturer

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TLV CORPORATION

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Introduction

Thank you for purchasing the TLV pneumatic control valve for steam, model PN-COS-16.

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 pneumatic control valve for steam, model PN-COS-16 is a new type of pneumatic control valve for steam that utilizes the structure of the COSPECT series pilot operated pressure reducing valve, which is our unique product. Steam-using equipment can achieve its intended efficiency only if the steam being used is very dry. Using steam in which matter such as condensate, scale, types of grease or air is entrained can not only result in problems with the steam-using equipment and in lowered productivity, but can also lead to shortened service life for and malfunction of the control valves.

The TLV pneumatic control valve for steam, model PN-COS-16, has a built-in cyclone separator, screen, and steam trap that eliminates these problems and makes possible the supply of very dry steam at a stable pressure.

The PN-COS-16 can operate automatically and provide accurate pressure control and temperature control when combined with the TLV SC-F70 digital indicator controller or a general-purpose controller. (However, for process temperature control, the desired process temperature must be controllable by a secondary pressure within the adjustable pressure range of the PN-COS-16.) Additionally, manual remote setting or 2 point pressure switching as a pressure reducing valve is possible by combination with an air regulator (with relief function).

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.

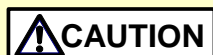
Symbols

	Indicates a DANGER, WARNING or CAUTION item.
	Indicates an urgent situation which poses a threat of death or serious injury
	Indicates that there is a potential threat of death or serious injury
	Indicates that there is a possibility of injury or equipment / product damage
	<p>NEVER apply direct heat to the float. The float may explode due to increased internal pressure, causing accidents leading to serious injury or damage to property and equipment.</p>
	<p>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.</p>
	<p>DO NOT use the product in excess of the maximum operating pressure differential. Such use could make discharge through the steam trap impossible (blocked).</p>
	<p>Use hoisting equipment for heavy objects (weighing approximately 20 kg (44 lb) or more). Failure to do so may result in back strain or other injury if the object should fall.</p>
	<p>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.</p>

Continued on the next page

 CAUTION	<p>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.</p>
	<p>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.</p>
	<p>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.</p>
	<p>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.</p>
	<p>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.</p>
	<p>Make sure the power supply is OFF before carrying out work on the wiring or inspections involving disassembly. If such work is carried out with the power on, there is a danger that equipment may malfunction or electric shock may occur, leading to injury or other accidents.</p>
	<p>Make sure that wiring work requiring a special license is carried out by qualified personnel. If carried out by unqualified personnel, overheating or short circuits leading to injury, fires, damage or other accidents may occur.</p>
	<p>When using this product, NEVER stand close to, or leave tools anywhere near moving parts, such as the shaft. Contact with moving parts or objects becoming caught in moving parts could lead to injury or damage or other accidents.</p>

Specifications



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 which may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted.

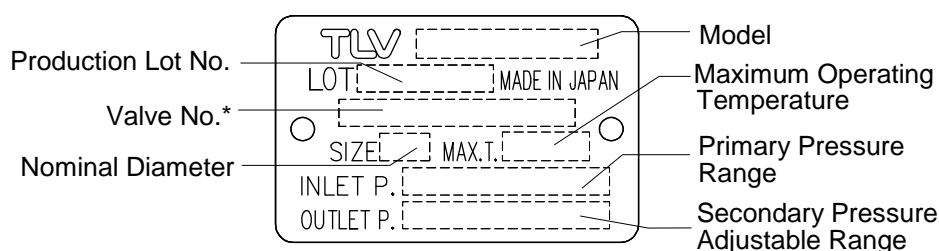


DO NOT use the product in excess of the maximum operating pressure differential; such use could make discharge through the steam trap impossible (blocked).



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.



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

<Required utilities>

Adjustment Section (Drive Section)	Motive Air	Maximum Pressure	1.6 MPaG (250 psig)
		Required Air Pressure	[Desired secondary pressure + 0.1] MPaG or higher [Desired secondary pressure + 15] psig or higher
		Air Connecting Port	Rc(PT), BSP or NPT 1/4"
		Air Quality	Oil-free air, filtered to 5 μm

(1 MPa = 10.197 kg/cm²)

<CV Value>

Size: mm (in)	15 (1/2)	20 (3/4)	25 (1)	40 (1 1/2)	50 (2)
CV (US)	3.8	6.9	11.1	24.0	37.2
CV (UK)	3.2	5.7	9.2	20.0	31.0
Kvs (DIN)	3.3	5.9	9.5	20.6	31.9

Acceptable Operating Range

Model	PN-COS-16
Primary Pressure Range*	0.2 – 1.6 MPaG (30 – 250 psig)
Adjustable Pressure Range (All conditions must be met)	Within 10 – 84% of the primary pressure
	(Minimum adjustable pressure of 0.03 MPaG (5 psig) Pressure differential between 0.07 to 0.85 MPa (10 to 120 psi)
Minimum Adjustable Flow Rate	5% of rated flow rate

(1 MPa = 10.197 kg/cm²)

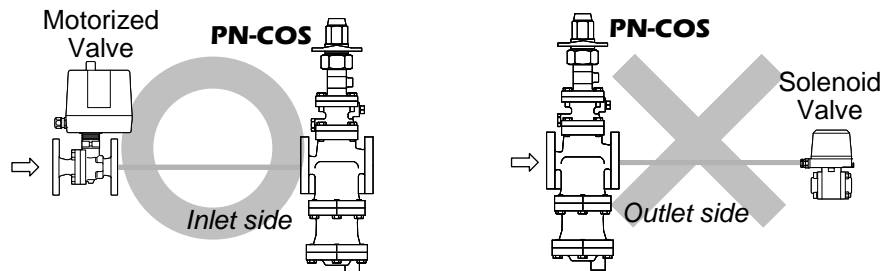
*For process temperature control, the desired process temperature must be controllable by a secondary pressure within the adjustable pressure range of the PN-COS-16.

Correct Usage of the PN-COS-16



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 which may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted.

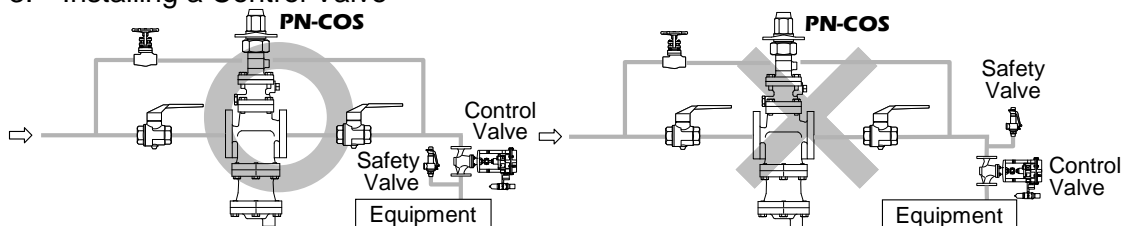
1. The PN-COS-16 should be operated only within its specifications.
2. Installing an ON / OFF Valve (Solenoid Valve or Motorized Valve)



If an on-off valve, such as a motorized valve, is required to stop supply of steam to the steam-using equipment, install it at the inlet side of the PN-COS-16. If a solenoid valve is installed at the outlet of the PN-COS-16, its opening and closing will cause heavy chattering and may lead to damage of the piston and main valve. (When the on-off valve opens, the secondary pressure of the PN-COS-16 changes from zero to the set pressure. Passing through an area of the reducing ratio of less than 10:1, where adjustment is impossible, chattering occurs momentarily.) To save energy, it is recommended to install the on-off valve as near to the boiler as possible.

NOTE: To prevent water hammer, it is recommended that a slow-acting motorized on-off valve be used. In particular, if a fast-acting on-off solenoid valve is used for frequent temperature control, the potential water hammer effect can damage the steam-using equipment and the PN-COS-16.

3. Installing a Control Valve



A control valve installed between the PN-COS-16 and the steam-using equipment (downstream of the PN-COS-16) for controlling equipment temperature may raise the pressure between the PN-COS-16 and the control valve when the control valve is closed, depending on the spatial relationship. A safety valve should be installed downstream of the control valve.

NOTE: When installing a safety valve to protect the steam-using equipment, be sure to install it on the steam-using equipment or directly before the inlet of the steam-using equipment. If the safety valve is installed on the outlet side of the PN-COS-16 between the PN-COS-16 and a control valve, an eventual pressure rise could activate the safety valve.

4. Precautions for the Installation of Additional Fittings Before or After the PN-COS-16

In order to ensure stable steam flow, the piping upstream and downstream of the PN-COS-16 must be straight runs. If the PN-COS-16 is installed either directly before or after an elbow or control valve, unevenness in steam flow may result in chattering and unstable pressure.

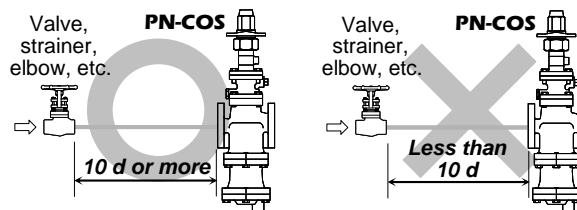
To ensure stable steam flow, it is recommended that the PN-COS-16 be installed on straight runs of piping, as illustrated below.

1) Inlet (primary side) of the PN-COS-16

(d = pipe diameter)

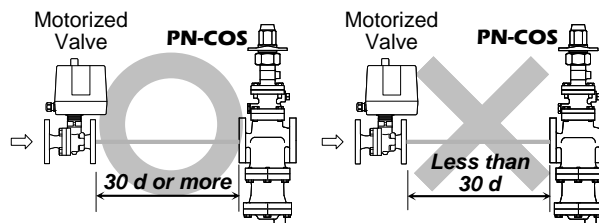
Maintain a straight piping run of **10 d or more** when a manual valve, a strainer or an elbow, etc. is installed.

(Example: if nominal size is 25 mm (1 in), have 250 mm (10 in) or more)



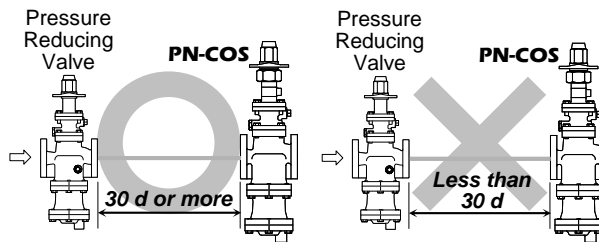
Maintain a straight piping run of **30 d or more** when an automated valve (on-off valve) is installed.

(Example: if nominal size is 25 mm (1 in), have 750 mm (30 in) or more)



Maintain a straight piping run of **30 d or more** when a pressure reducing valve is installed.

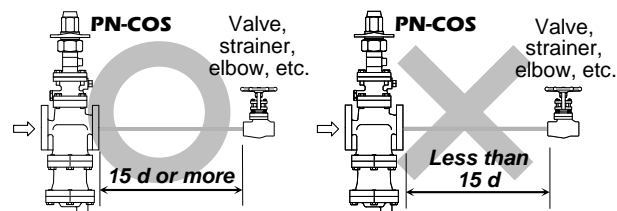
(Two-stage pressure reduction)
(Example: if nominal size is 25 mm (1 in), have 750 mm (30 in) or more)



2) Outlet (secondary side) of the PN-COS-16

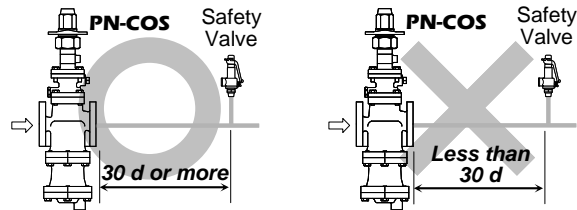
Maintain a straight piping run of **15 d or more** when a manual valve, a strainer or an elbow, etc. is installed.

(Example: if nominal size is 25 mm (1 in), have 375 mm (15 in) or more)



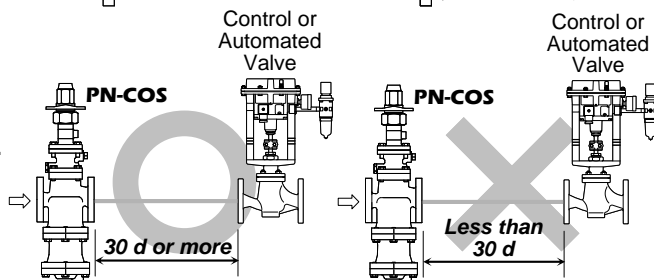
Maintain a straight piping run of **30 d or more** when a safety valve is installed.

(Example: if nominal size is 25 mm (1 in), have 750 mm (30 in) or more)



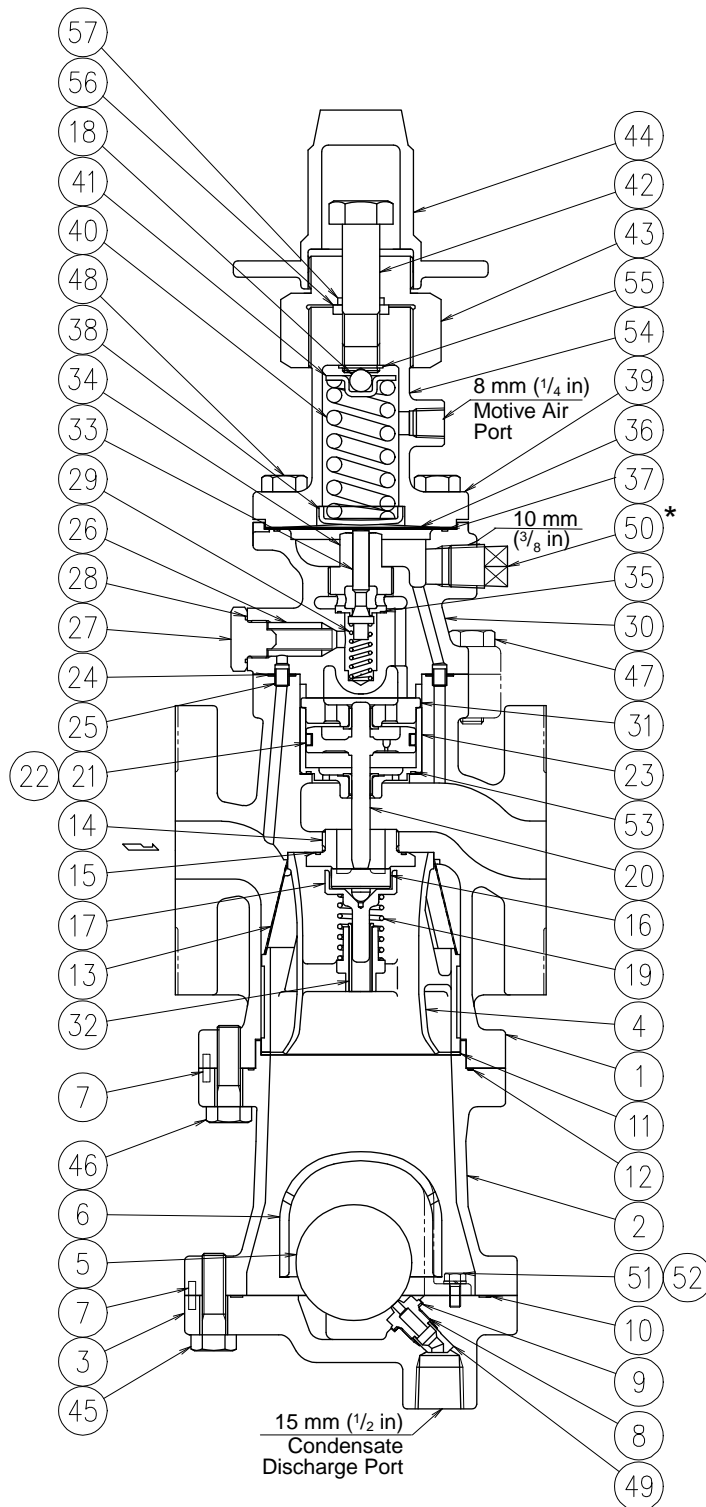
Maintain a straight piping run of **30 d or more** when a control valve or an automated valve (on-off valve) is installed.

(Example: if nominal size is 25 mm (1 in), have 750 mm (30 in) or more)



Configuration

15 – 50 mm (1/2 – 2 in)



No.	Name
1	Main Body
2	Trap Body
3	Trap Cover
4	Separator
5	Float
6	Float Cover
7	Guide Pin
8	Trap Valve Seat
9	Trap Valve Seat Gasket
10	Gasket (Trap Body/Trap Cover)
11	Wave Spring
12	Gasket (Main Body/Trap Body)
13	Separator Screen
14	Main Valve Seat
15	Main Valve Seat Gasket
16	Main Valve
17	Main Valve Holder
18	Steel Ball
19	Main Valve Spring
20	Piston
21	Piston Ring
22	Tension Ring
23	Cylinder
24	Gasket (Pilot Body/Main Body)
25	Connecting Tube
26	Pilot Screen
27	Pilot Screen Holder
28	Pilot Screen Holder Gasket
29	Pilot Valve Spring
30	Pilot Body
31	Piston Guide
32	Sleeve
33	Pilot Valve
34	Pilot Valve Seat
35	Pilot Valve Seat Gasket
36	Diaphragm
37	Diaphragm Gasket
38	Diaphragm Support
39	Spring Housing
40	Coil Spring
41	Spring Retainer
42	Adjustment Screw
43	Packing Retainer
44	Spanner Cap
45	Hex Bolt (Trap Body/Trap Cover)
46	Hex Bolt (Main Body/Trap Body)
47	Hex Bolt (Pilot Body/Main Body)
48	Hex Bolt (Spring Housing/Pilot Body)
49	Bushing
50	Plug – Sensing Line Port*
51	Float Cover Bolt
52	Spring Washer
53	Cylinder Gasket
54	Nameplate
55	C-ring
56	Gland Packing
57	O-ring

*North American model does not equip this plug.

Installation



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 which may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted.



Use hoisting equipment for heavy objects (weighing approximately 20 kg (44 lb) or more). Failure to do so may result in back strain or other injury if the object should fall.



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.

Installation Environment

Avoid installation in the following types of environments:

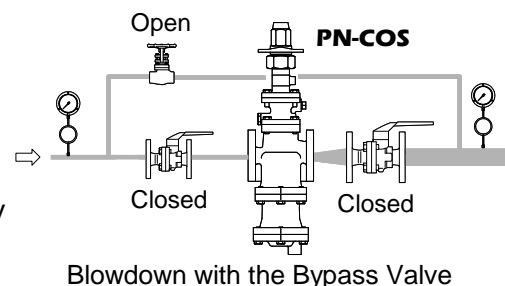
- Locations with ambient temperatures above 50 °C (122 °F) or below 0 °C (32 °F)*
- Locations with ambient humidity above 90% RH and below 10% RH
- Locations where corrosive gas is generated
- Locations with heavy vibration or shock
- Locations with high inductive interference or other factors that would have a harmful effect on electrical circuitry*

*When the PN-COS-16 is used with electrical equipment such as an electro-pneumatic transducer, controller, etc.

1. Blowdown

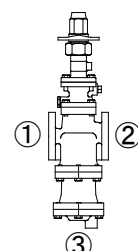
Before installing the PN-COS-16 unit, be sure to blow down all piping thoroughly. If this is not possible, perform a blowdown using the bypass valve.

Blowdown is especially important for newly installed piping or after the system has been shut down for a long period of time.



2. Removing Seal and Cap

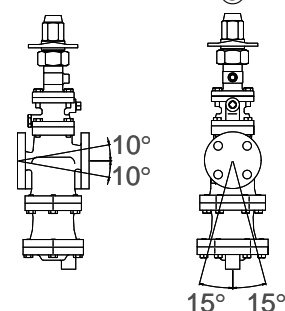
Before installation, be sure to remove all protective seals and caps. (Found in 3 locations, on the product inlet and outlets.)



3. Installation Angle

Install the PN-COS-16 vertically, so that the arrow mark on the body points horizontally in the direction of steam flow.

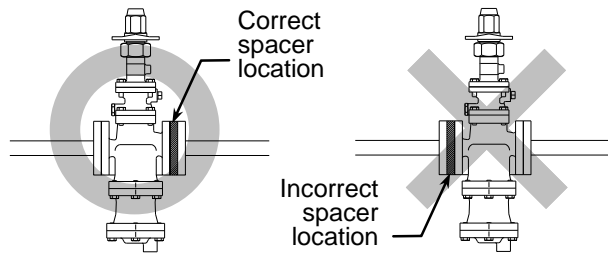
Allowable inclination is 10 degrees in the fore-aft direction and 15 degrees in the plane perpendicular to the steam flow line.



4. Spacer Installation

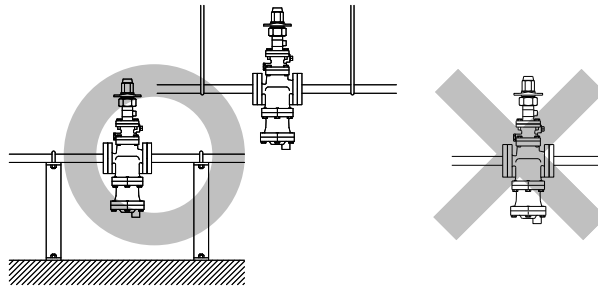
If spacing adjustment is necessary to accommodate installation, install a spacer on the outlet flange.

The spacer should consist of a spacer, gaskets, bolts and nuts. Fit gaskets to both sides of the spacer between the PN-COS-16 outlet and the pipe flange. Fasten with bolts and nuts.



5. Piping Support

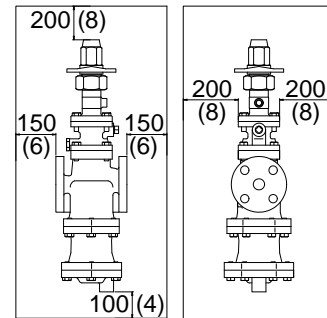
Install the PN-COS-16, paying attention to avoid excessive load, bending and vibration. Support the inlet and outlet pipes securely.



6. Maintenance Space

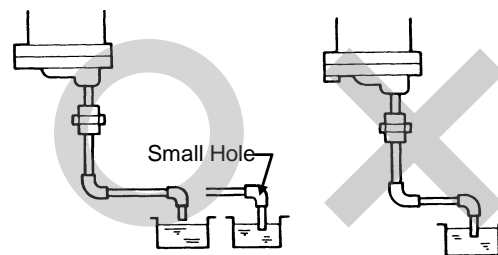
Leave sufficient space for maintenance, inspection and repair.

(Unit: mm (in))

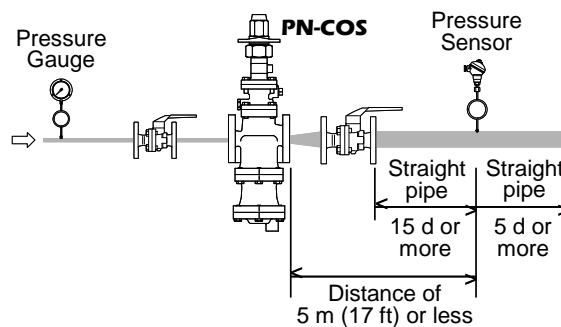


7. Trap Outlet Pipe

For ease of maintenance, installation of a union connection is recommended for the trap outlet pipe. Connect the outlet pipe to a condensate return line, or extend it to a trench. In the case of the latter, make sure the end of the pipe is above the waterline. (Dirt and water may be sucked up by the vacuum formed during trap closure and system shutdown.)



8. **Pressure Sensor Installation (for pressure control)**
The length of piping between the PN-COS-16 and the pressure sensor should be no more than 5 m (17 ft). If the piping distance is too great, pressure loss and delay of pressure change along this distance will increase, resulting in steam flow rate fluctuations.

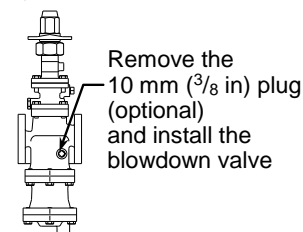


Steam fluctuations at the pressure sensor may impair the stability of the pressure control. Ensure a straight piping run of at least 15 d upstream and 5 d downstream from the pressure sensor.

9. **Blowdown Valve (requires an optional plug)**

In an environment of heavy dirt or scale, or when the steam-using equipment is used only periodically, such as for room heating equipment, be sure to use a blowdown valve.

- 1) Remove the plug (option) from the main body.
- 2) Install the blowdown valve.
- 3) Open the blowdown valve and blow any residual dirt and scale off of the screen.
- 4) Periodically activate the blowdown valve to keep the system free of dirt and scale.

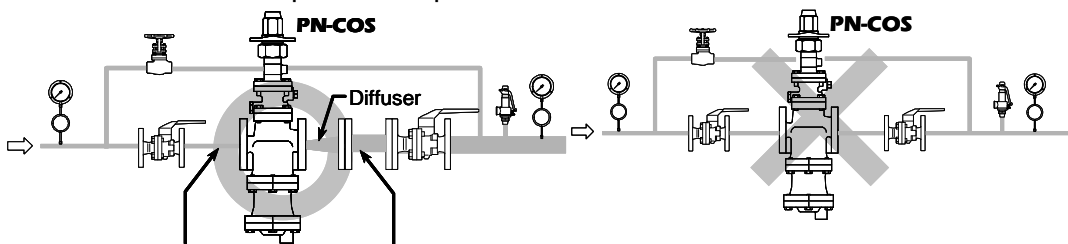


10. **Piping Size**

If the secondary steam flow velocity is expected to be more than 30 m/s (100 ft/s), install a diffuser in order to keep the flow velocity below 30 m/s (100 ft/s).

If the distance between the PN-COS-16 and the steam-using equipment is great, a possible drop in pressure should be taken into consideration when selecting the piping size.

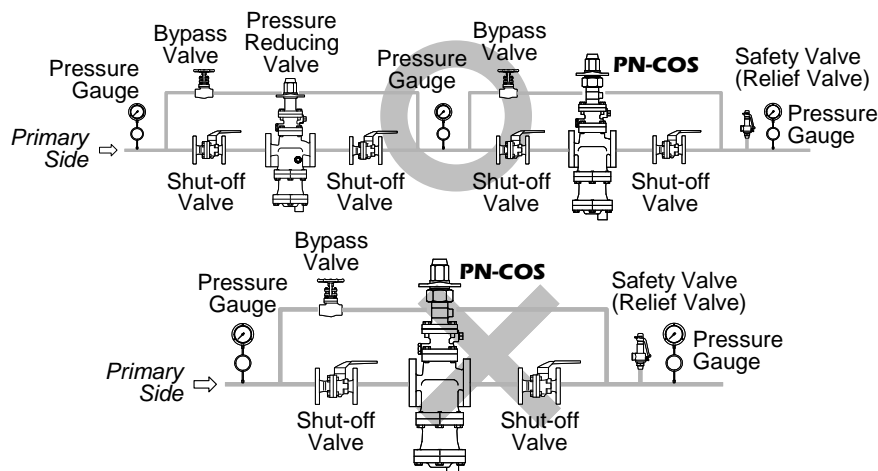
In addition, when installing the strainer, the strainer screen should be either at the 3 o'clock or 9 o'clock position to prevent condensate accumulation.



Straight-run piping lengths (d = pipe diameter):
Upstream = 10 d or more; Downstream = 15 d or more

11. Two-stage Pressure Reduction

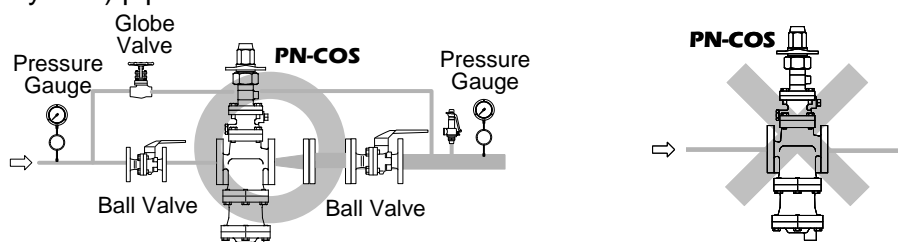
Whenever the pressure cannot be reduced to the desired level with a single PN-COS-16 due to operating range limitations, such as when the reduction ratio is greater than 10:1, the pressure reducing valve should be installed at the primary side.



12. Accessories

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

Ball valves, which will not retain condensate, are recommended for inlet and outlet shut-off valves. The bypass pipe should be at least $\frac{1}{2}$ of the size of the inlet (primary side) pipe.



13. External secondary pressure-sensing line (when required)

North American Models:

North American Models are factory prepared for external sensing.

An external sensing line **MUST** be installed.

DO NOT SUPPLY STEAM until all piping and a 10 mm ($\frac{3}{8}$ in) secondary pressure sensing line with a slightly falling pitch have been properly installed. Install a shutoff valve in the pressure sensing line for maintenance purposes.



Keep the shutoff valve open at all times during operation. If the shutoff valve is closed, PN-COS-16 will fully open and PRIMARY PRESSURE WILL BE SUPPLIED TO THE EQUIPMENT (see "Piping Example" on next page).

Non-North American Models:

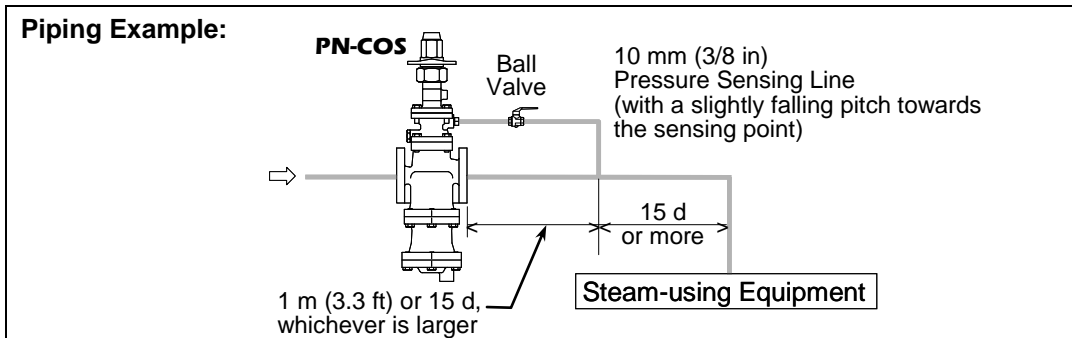
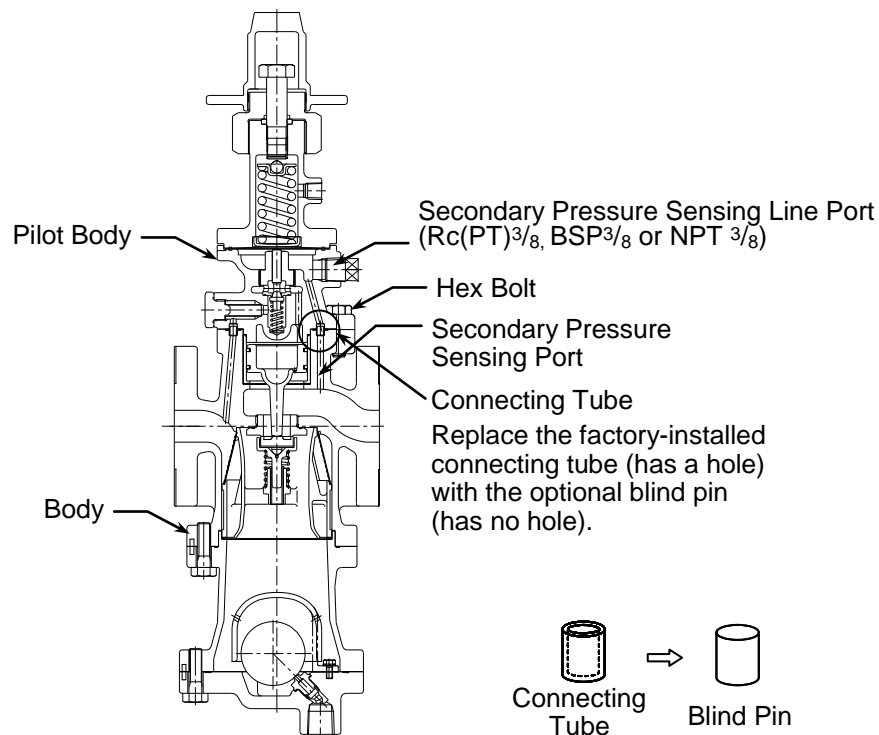
Factory-standard PN-COS-16 employs an internal secondary pressure-sensing channel built into the body, saving the need to install an external pressure-sensing line to detect the secondary pressure.

Installation of an external secondary pressure-sensing line involves closing the internal pressure-sensing channel and installing a line from the sensing line port to the point where pressure should be controlled. This can increase stability of pressure control where steam loss in secondary piping and flow rate fluctuation is

high. In addition, the rated flow rate will be greater than an internal pressure-sensing channel under the operational pressure reduction ratio of 2:1 or more.

Installation procedure

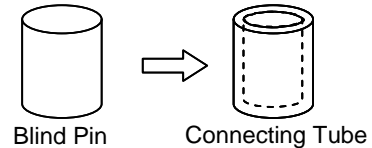
- 1) Loosen and remove the bolts that attach the pilot body to the main body and remove the pilot body.
- 2) Install the blind pin (optional) by first removing the connecting tube from the main body or pilot cover and then substituting the blind pin.
- 3) Re-install the pilot body and fasten the bolts evenly to the proper torque (see the torque chart in the "Reassembly" section).
- 4) Remove the plug from the secondary pressure sensing line port and connect the secondary pressure sensing line.
- 5) Install the secondary pressure sensing line with a slightly falling pitch. The end of the secondary pressure sensing line should be connected to the place on the main piping where the pressure is to be sensed (see the piping example on the next page). A shut-off valve and union should be installed in the secondary pressure sensing line.



14. Internal sensing for North American models

All models except North American models are factory prepared for internal sensing. When internal pressure sensing is required for North American models, please contact the nearest TLV representative to request both a connecting tube, which must be installed in place of the blind pin, and a threaded secondary pressure sensing plug. Follow the connecting tube installation procedure shown below:

- 1) Loosen and remove the four (4) bolts that attach the pilot body to the main body and remove the pilot body.
- 2) Install the connecting tube by first removing the blind pin from the secondary side of the main body and then substituting the connecting tube.
- 3) Re-install the pilot body and fasten the four (4) bolts evenly. See the torque chart in the "Reassembly" section in this manual for torque requirements of these bolts.
- 4) If a secondary pressure sensing pipe has previously been installed, remove it and be certain to install the threaded secondary pressure sensing line plug in its place.



NOTE: When 15 mm ($1/2$ in) or 20 mm ($3/4$ in) PN-COS-16 is used below 0.3 MPaG (45 psig) and 0.1 MPaG (15 psig) respectively, and below 50% of primary pressure, internal sensing may provide decreased capacity (Rated Flow Rate) compared to external sensing. Verify the capacity before switching to internal sensing.

Operation



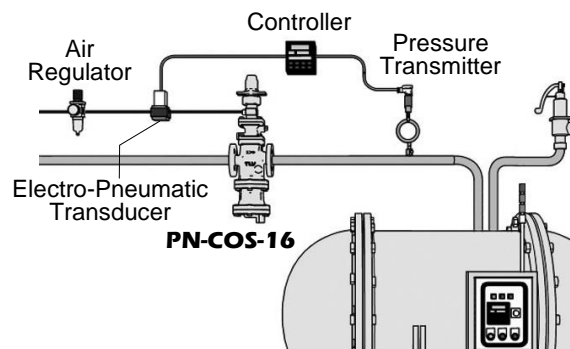
When using this product, NEVER stand close to, or leave tools anywhere near moving parts, such as the shaft. Contact with moving parts or objects becoming caught in moving parts could lead to injury or damage or other accidents.

Procedure

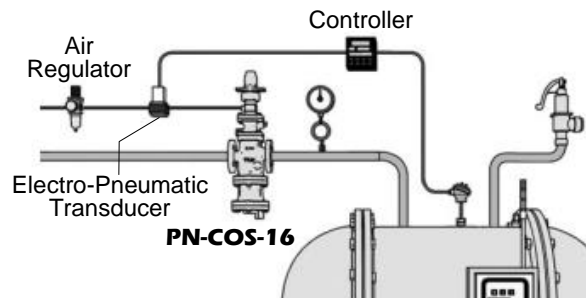
The system configuration examples (diagrams) shown in this section are for explanation purposes only, and are not intended as installation designs.)

● Automatic Control

<Example: Pressure control system (as control valve)>



<Example: Temperature control (as control valve)>



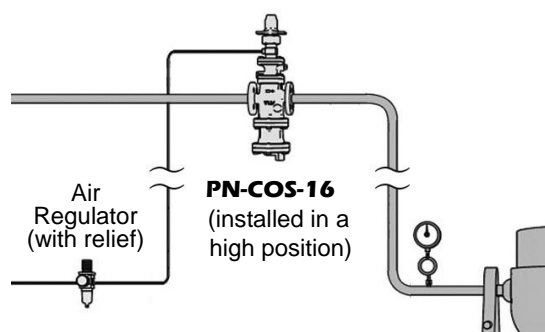
Automatic control is possible when the PN-COS-16 is used with a controller. However, an electro-pneumatic transducer is required in order to control the air for operation. The wiring, etc. should be carried out according to the instruction manual for the controller, the electro-pneumatic transducer, or related devices.

Please set the position of the adjustment screw on the PN-COS-16 according to the steps shown in the “Setting the pressure with the adjustment screw”.

In addition, for process temperature control, the secondary pressure of the PN-COS-16 needs to be within the pressure adjustable range at the time of normal operation.

●Manual Control

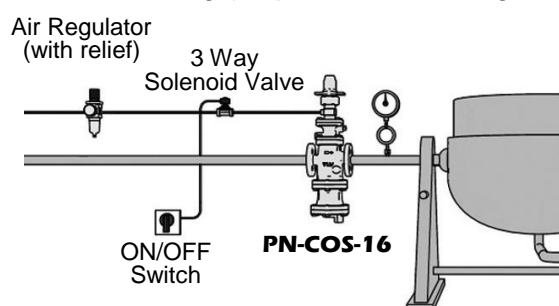
<Example: Manual remote operation (as pressure reducing valve)>



When operating the PN-COS-16 remotely by manual operation, an air regulator (with relief function) that adjusts motive air pressure is required. Adjust the set pressure with the air regulator while checking the pressure gauge on the secondary side.

Please set the position of the adjustment screw according to the steps shown in the "Setting the pressure with an adjustment screw" on the following page.

<Example: 2 point pressure switching (as pressure reducing valve)>



Pressure at the secondary side can be switched manually between 2 points with an ON/OFF switch. To do so, an air regulator (with relief function), which adjusts the motive air, a 3 way solenoid valve, and an ON/OFF switch are required. Pressure setting at the higher pressure side should be adjusted with the motive air by checking the pressure gauge at the secondary side. For pressure setting at the lower pressure side, follow the steps in the "Setting the pressure with the adjustment screw" below.

●Setting the pressure with the adjustment screw

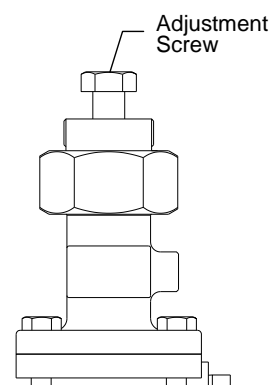
Other than setting the secondary steam pressure of PN-COS-16 using air pressure, it can be set by the adjustment screw.

- To Maintain minimum required pressure by adjustment screw

Set the steam pressure at the secondary pressure side to a minimum required pressure using the adjustment screw.

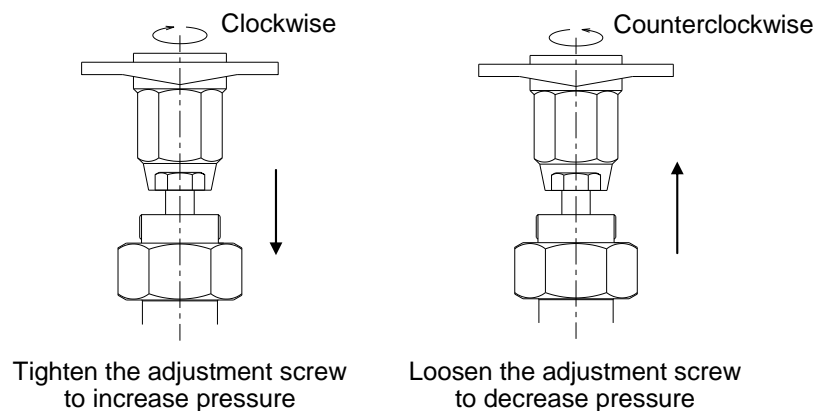
- When setting the pressure using only motive air

Loosen the adjustment screw until there is no load on the coil spring. The valve should be closed once there is no motive air.



<Adjustment>

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 steam-using equipment. (Stay clear of any pressurized blow-out from the safety valve.)
2. Make sure that the shut-off valve and the bypass valve located upstream and downstream of the PN-COS-16 are completely closed.
3. Remove the spanner cap and turn the adjustment screw counterclockwise to reduce tension on the coil spring.
NOTE: Do not pull up the adjustment screw forcibly once the adjustment screw has reached the point at which it stops. The internal stopper (C-ring) may break.
4. Slowly, fully open the shut-off valve at the inlet of the PN-COS-16. Allow sufficient time for condensate remaining at the inlet of the PN-COS-16 to be discharged through the built-in steam trap.
5. Slightly open the shut-off valve at the outlet of the PN-COS-16.
6. Turn the adjustment screw clockwise until the desired outlet pressure is obtained. Wait several minutes.



7. Slowly, fully open the shut-off valve at the secondary side of the PN-COS-16. After setup, put the spanner cap back on.
8. When shutting down the system, always close the shut-off valve at the outlet first and then the inlet.

Maintenance



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 or burns or other injury due to malfunction or the discharge of fluids.



Make sure the external power supply switch is OFF before carrying out work on the wiring or inspections involving disassembly. If such work is carried out with the power on, there is a danger that equipment may malfunction or electric shock may occur, leading to injury or other accidents.

Operational Check

To ensure long service life of the PN-COS-16, the following inspection and maintenance should be performed regularly.

Part	Inspection and Maintenance Frequency
Screens (Separator, Pilot)	Disassemble and clean annually. If there is substantial blockage, install a strainer (approximately 60 mesh) ahead of the PN-COS-16.
Main Valve, Main Valve Seat, Pilot Valve and Pilot Valve Seat	Replace after approximately 15,000 hours. If there is chattering or dirt, premature wear may result.
Piston Ring	Replace after approximately 8,000 hours. If there is chattering or if scale build-up is severe, premature wear may result.
Piston	Replace after approximately 30,000 hours. If hunting or chattering takes place, premature wear may result.
Trap Valve Seat	Replace after approximately 40,000 hours. If scale build-up is severe, blockage may occur in a short period of time.
Diaphragm	Replace after approximately 30,000 hours. If hunting or chattering takes place, cracks or fatigue may develop in a short period of time.

Disassembly



WARNING

NEVER apply direct heat to the float. The float may explode due to increased internal pressure, causing accidents leading to serious injury or damage to property and equipment.



CAUTION

Use hoisting equipment for heavy objects (weighing approximately 20 kg (44 lb) or more). Failure to do so may result in back strain or other injury if the object should fall.



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.

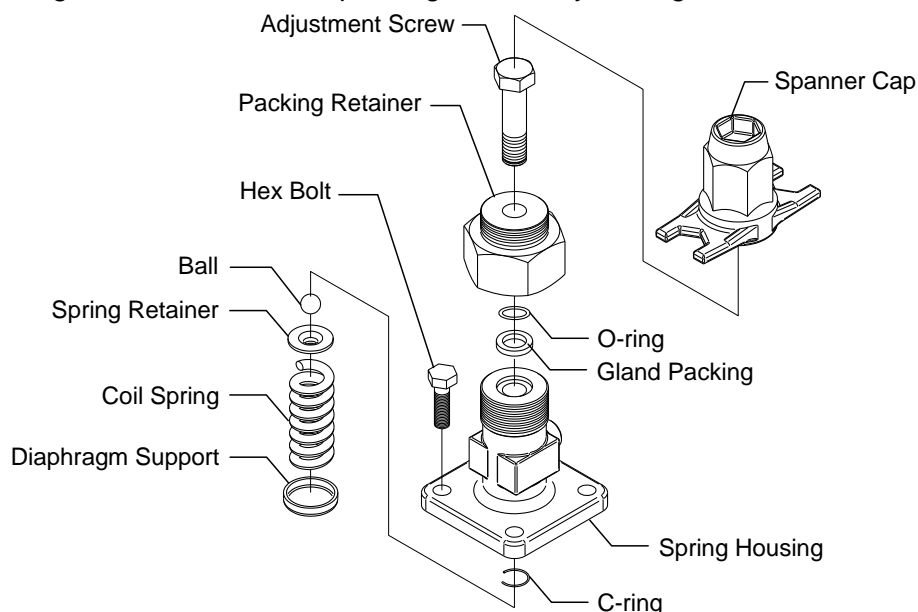
It is a recommended practice to dismantle and inspect the PN-COS-16 once a year for preventive maintenance purposes. It is especially important to perform an inspection immediately after the initial run of a new line or before or after equipment such as a heater is out of service for a long period of time. (Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.)

Remove all steam from the piping (both upstream and downstream). Stop supplying motive air to the PN-COS-16. Remove the spanner cap, and then pull up the adjustment screw until there is no load on the coil spring. Wait for the body to cool before attempting to remove the PN-COS-16 from the line as it may be heated with the residual heat of steam. Then remove the inlet and outlet flange retaining bolts and nuts to permit removal of the PN-COS-16. Secure the PN-COS-16 in a vise to perform the inspection.

Disassembling the Adjustment Section (Drive Section)

Make sure that the position of the adjustment screw is such that no load is applied to the coil spring.

Remove the hex bolts and then take off the spring housing. Remove the C-ring with an appropriate tool to remove the adjustment screw. Remove the adjustment screw by loosening it. Then remove the packing retainer by turning it counterclockwise.



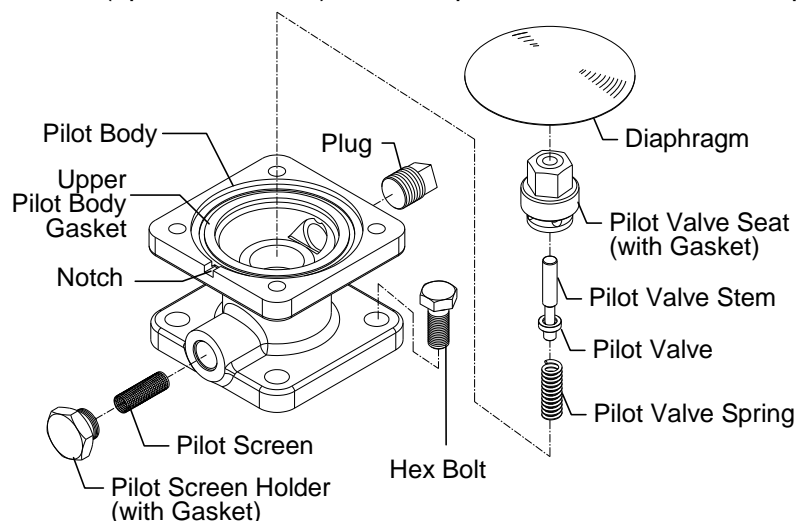
NOTE: Make sure that there are no scratches or wear on the internal parts. Do not reuse the O-ring and the gland packing.

Disassembling the Pilot Section

The diaphragm is removed by utilizing the notch in the pilot body. Loosen the pilot valve seat with a box wrench and remove it. Lift the pilot valve spring up and out with a pair of tweezers. Then loosen and remove the pilot screen holder to remove the pilot screen.

⇒ Check for any fault on the seating surface of the pilot valve, flaws on the gaskets, and clogging of the pilot screen.

Check for deformation, corrosion or faults on the diaphragm. The diaphragm should be convex (open downward), with the printed UP mark on the top.

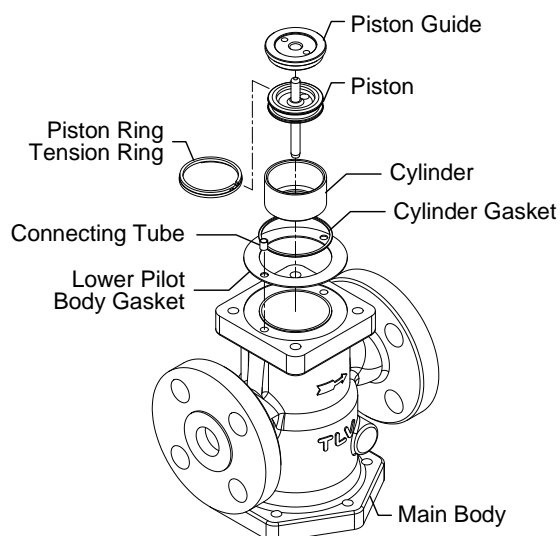


Disassembling the Piston Section

Take the pilot body off after removing the hex bolts. During this process, pay attention not to lose the connecting tubes (2 pcs).

Remove the piston guide, piston and cylinder from the main body. Then remove the piston rings and the tension rings from the piston. Do not apply too much force when removing the piston rings and tension rings.

⇒ Check the interior of the cylinder, the exterior of the piston rings, the small hole on the piston and the cylinder gasket for any fault or abnormality.



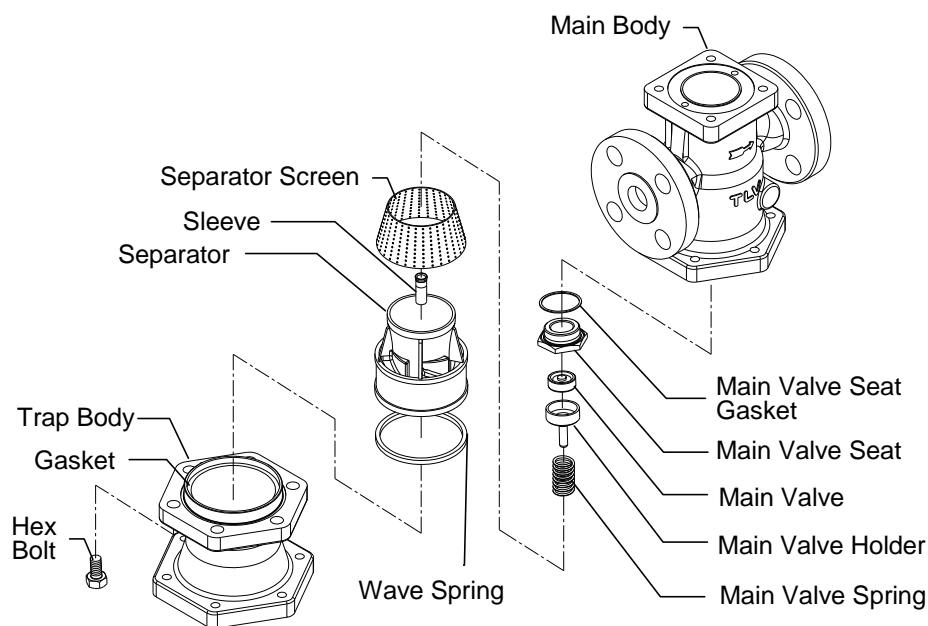
Disassembling the Separator / Main Valve Section

Turn the PN-COS-16 upside down for easy dismantling of the separator and main valve. Loosen the hex bolts and remove the trap body. Be careful, as the separator may drop off when the PN-COS-16 is returned to the normal attitude.

Removal of the separator and pressed-in sleeve permits removal of the main valve, main valve holder, main valve spring and separator screen.

Loosen the main valve seat with a socket wrench and remove it from the main body.

⇒ Check for damage on the seating surfaces of the main valve and main valve seat, gaskets, and sliding surfaces of each part, and for clogging of the separator screen.

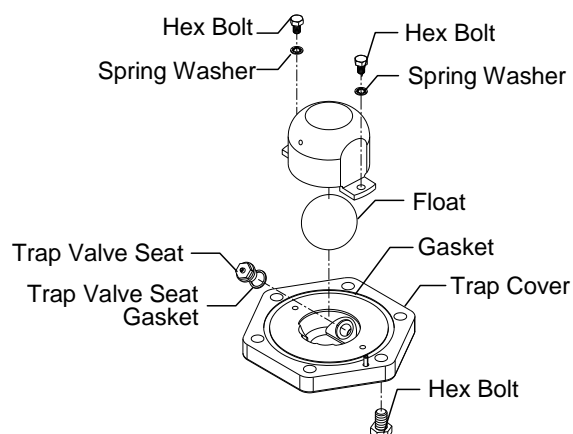


Disassembling the Steam Trap Section

Loosen the hex bolts (for the trap cover) and remove the trap cover. Be careful, as hot condensate may splash out.

Remove the hex bolts (for the float cover) and remove the float cover to reveal the float. Remove the float, then loosen the trap valve seat with a socket wrench and remove it.

⇒ Check to determine that there is no deformation of the float, abnormality in the trap valve seat or dirt accumulation in the trap cover.



Cleaning

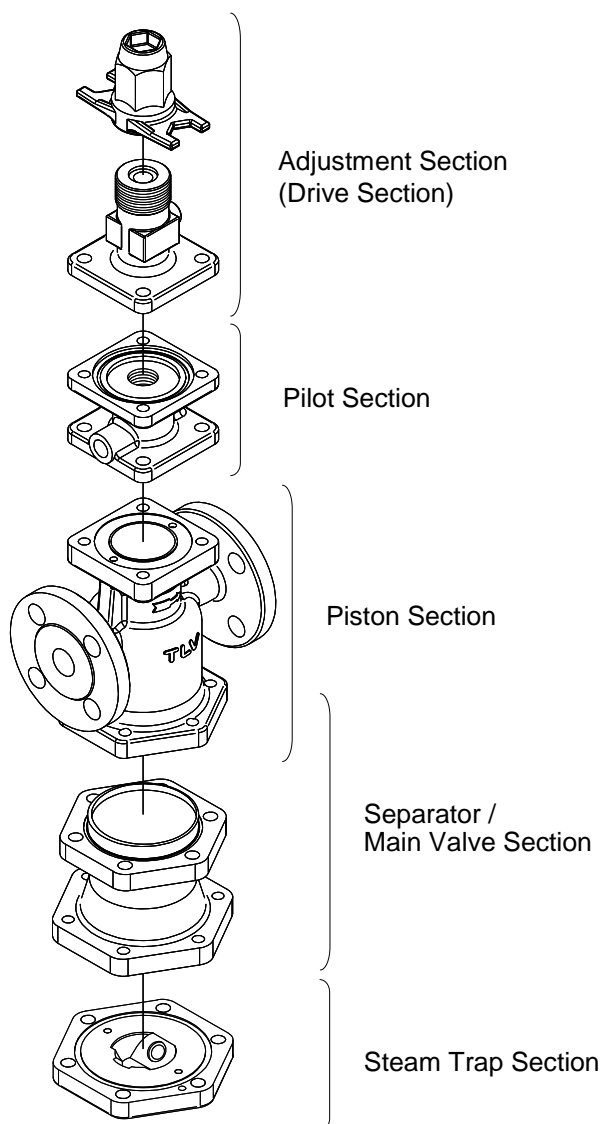
After inspection and removal of any abnormality, clean and reassemble the parts. The following parts will require cleaning before reassembly:

Trap Cover	Piston
Float	Piston Ring
Trap Valve Seat	Cylinder
Pilot Screen	Separator Screen
Main Valve Seat	Pilot Valve
Main Valve	Pilot Valve Seat
Main Valve Holder	

It is permissible to clean using water, however cleaning with a mild detergent is recommended for more effective cleaning.

(Coat threaded position with anti-seize after cleaning.)

Exploded View

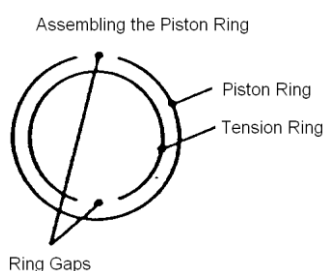


NOTE: Configuration of each part varies depending on nominal size.

Reassembly

Assemble the unit using the same procedure as used for disassembling it; but in reverse order. Observe the following precautions:

1. The PTFE gaskets may be re-used if free from fault, crushing or deformation.
2. Apply anti-seize to the threaded portion of screws and bolts and adjustment screw. Apply a small amount of anti-seize to the threads of the main valve seat, pilot valve seat and screen holder to ensure it does not come into contact with other parts.
3. Fasten the bolts one at a time in an alternating diagonal pattern to provide uniform seating.
4. After the assembly, make sure that the piston and the pilot valve operate smoothly without binding.



- 1) Fit the piston ring to the outside of the tension ring.
- 2) The ring gaps should be opposite each other.

5. Standard fastening torque and the distance across flats for the tools to be used are as follows:

Part	PN-COS-16 Connection Size		Distance Across Flats		Tightening Torque	
	(mm)	(in)	(mm)	(in)	(N·m)	(lbf·ft)
Bolts (Spring Housing/ Pilot Body)	15 – 50		17	(²¹ / ₃₂)	40	(29)
Pilot Valve Seat	15 – 50		19	(³ / ₄)	70	(51)
Pilot Screen Holder	15 – 50		24	(¹⁵ / ₁₆)	40	(29)
Hex Bolts (Pilot body/ Main Body)	15 – 40	(¹ / ₂ – ¹ / ₂)	17	(²¹ / ₃₂)	60	(44)
	50	(2)	19	(³ / ₄)	70	(51)
Hex Bolts (Main Body/ Trap Body and Trap body/ Trap Cover)	15 – 40	(¹ / ₂ – ¹ / ₂)	17	(²¹ / ₃₂)	60	(44)
	50	(2)	19	(³ / ₄)	70	(51)
Main Valve Seat	15, 20	(¹ / ₂ , ³ / ₄)	36	(¹⁷ / ₁₆)	100	(73)
	25	(1)	41	(¹⁵ / ₈)	125	(92)
	40	(¹ / ₂)	60	(²³ / ₈)	250	(185)
	50	(2)	70	(²³ / ₄)	300	(220)
Hex Bolt (Float Cover)	15, 20	(¹ / ₂ , ³ / ₄)	8	(⁵ / ₁₆)	7	(5)
	25, 40	(1, ¹ / ₂)	10	(³ / ₈)	10	(7)
	50	(2)	13	(¹ / ₂)	20	(15)
Trap Valve Seat	15, 20	(¹ / ₂ , ³ / ₄)	11	(⁷ / ₁₆)	10	(7)
	25, 40	(1, ¹ / ₂)	13	(¹ / ₂)	15	(11)
	50	(2)	17	(²¹ / ₃₂)	40	(29)

(1 N·m ≈ 10 kg·cm)

- NOTE: -If a torque greater than that recommended is applied, the body or components may be damaged.
 -Coat all threaded portions with anti-seize.
 -If drawings or other special documentation were supplied for the product, any torque given there takes precedence over values shown here.

Troubleshooting



NEVER apply direct heat to the float. The float may explode due to increased internal pressure, causing accidents leading to serious injury or damage to property and equipment.



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.



When using this product, **NEVER** stand close to, or leave tools anywhere near moving parts, such as the shaft. Contact with moving parts or objects becoming caught in moving parts could lead to injury or damage or other accidents.

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 PN-COS-16, consult the troubleshooting guide below.

Trouble could occur in the drive section, pressure-reducing section (including separator and trap sections), or the controller used together with the PN-COS-16. The location where the trouble has occurred should be identified first.

<Diagnosis of malfunctions in the pressure-reducing section>

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.
6. Steam leaks from the steam trap or condensate is not discharged.

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.

Problem	Symptom	Cause	Remedy
The secondary pressure does not rise	The PN-COS-16 body is not warm	No steam is being supplied or the valve at the primary side is closed	Check the primary piping and valves
	The body is warm, but the pressure does not increase	The strainer at the primary side or the separator screens is clogged	Clean or blow down
		No motive air is being supplied	Check the motive air supply line
The secondary pressure cannot be adjusted or increases abnormally	Adjustment is difficult, and set pressure varies	The pilot screen is clogged	Clean
		The flow rate is too low	Check the flow rate; check the model selection, replace with a unit that has a smaller nominal diameter or a more suitable unit if necessary
		The piston is clogged with dirt	Clean Check the piston ring

Continued on the next page

Problem	Symptom	Cause	Remedy
The secondary pressure cannot be adjusted or increases abnormally	Adjustment is difficult, and set pressure varies	The piston rings are worn	Replace with new piston rings
		The small hole in the piston is clogged	Clean
		There is a build-up of dirt on the sliding surfaces of the pilot valve, piston or main valve	Clean
		The setting for the motive air is inappropriate	Check the motive air supply line; check the set pressure
		Flow rate exceeds rated flow rate	Check the flow rate, replace with a larger size
		The adjustment screw has seized	Replace with a new adjustment screw
		The diaphragm is distorted or damaged	Replace with a new diaphragm
		There is fluctuation in steam consumption	Check the flow rate; replace the PN-COS-16 if necessary
		The PN-COS-16 is inappropriate for the service conditions (specifications)	Check the model selection, replace the PN-COS-16 if necessary
	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 bypass valve if necessary
There is a build-up of dirt on or damage to the pilot valve seat or main valve seat		Clean Align Replace if necessary	
Hunting or chattering occurs	Occurs at low steam demand	It is being used below the minimum adjustable flow rate	Replace with a smaller size
	Hunting never stops	There is too high a reduction ratio (operated at below 10% of the primary pressure)	Use two-stage reduction
		The PN-COS-16 is inappropriate for the service conditions (specifications)	Check the model selection, replace the PN-COS-16 if necessary
	Chattering never stops	Condensate is contained, or the trap is blocked	Check the trap Check the piping
		The PN-COS-16 is inappropriate for the service conditions (specifications)	Check the model selection, replace the PN-COS-16 if necessary

Continued on the next page

Problem	Symptom	Cause	Remedy
Abnormal noises	Makes a high-pitched noise	There is too high a reduction ratio, the flow is too great, or there is a high-speed open/close valve nearby	Use two-stage reduction Check the flow rate, use a larger size Install the valve as far away as possible
Faulty steam trap	Steam is blowing	There is a build-up of dirt on the trap valve seat or at the float base	Clean
		The body is installed tilted	Check the piping
		The float is deformed	Check for water hammer Replace with a new float
		There is vibration in the piping	Secure the piping
	No condensate is discharged	The primary pressure exceeds the trap valve seat maximum operating pressure	Adjust the primary pressure
		Water is inside the float	Replace with a new float
		The secondary piping is clogged	Check the piping Clean
		The trap valve seat is clogged	Clean Replace with a new trap valve seat

TLV EXPRESS LIMITED WARRANTY

Subject to the limitations set forth below, TLV Corporation, a North Carolina corporation (“**TLV**”) warrants that products which are sold by it, TLV CO., LTD., a Japanese corporation (“**TLVJ**”) or TLV International, Inc., a Japanese corporation (“**TII**”), (hereinafter the “**Products**”) are designed and manufactured by TLVJ, conform to the specifications published by TLV for the corresponding part numbers (the “**Specifications**”) and are free from defective workmanship and materials. With regard to products or components manufactured by unrelated third parties (the “**Components**”), TLV provides no warranty other than the warranty from the third party manufacturer(s), if any.

Exceptions to Warranty

This warranty does not cover defects or failures caused by:

1. improper shipping, installation, use, handling, etc., by other than TLV or service representatives authorized by TLV; or
2. dirt, scale or rust, etc.; or
3. improper disassembly and reassembly, or inadequate inspection and maintenance by other than TLV or service representatives authorized by TLV; or
4. disasters or forces of nature or Acts of God; or
5. abuse, abnormal use, accidents or any other cause beyond the control of TLV; or
6. improper storage, maintenance or repair; or
7. operation of the Products not in accordance with instructions issued with the Products or with accepted industry practices; or
8. use for a purpose or in a manner for which the Products were not intended; or
9. use of the Products in a manner inconsistent with the Specifications; or
10. use of the Products with Hazardous Fluids (fluids other than steam, air, water, nitrogen, carbon dioxide and inert gases (helium, neon, argon, krypton, xenon and radon)); or
11. failure to follow the instructions contained in the TLV Instruction Manual for the Product.

Duration of Warranty

This warranty is effective for a period of the earlier of: (i) three (3) years after delivery of Products to the first end user in the case of sealed SST-Series Products for use in steam pressure service up to 650 psig; (ii) two (2) years after delivery of Products to the first end user in the case of PowerTrap® units; or (iii) one (1) year after delivery of Products to the first end user in the case of all other Products. Notwithstanding the foregoing, asserting a claim under this warranty must be brought by the earlier of one of the foregoing periods, as applicable, or within five (5) years after the date of delivery to the initial buyer if not sold initially to the first end user.

ANY IMPLIED WARRANTIES NOT NEGATED HEREBY WHICH MAY ARISE BY OPERATION OF LAW, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ANY EXPRESS WARRANTIES NOT NEGATED HEREBY, ARE GIVEN SOLELY TO THE INITIAL BUYER AND ARE LIMITED IN DURATION TO ONE (1) YEAR FROM THE DATE OF SHIPMENT BY TLV.

Exclusive Remedy

THE EXCLUSIVE REMEDY UNDER THIS WARRANTY, UNDER ANY EXPRESS WARRANTY OR UNDER ANY IMPLIED WARRANTIES NOT NEGATED HEREBY (INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE), IS **REPLACEMENT**; PROVIDED: (a) THE CLAIMED DEFECT IS REPORTED TO TLV IN WRITING WITHIN THE APPLICABLE WARRANTY PERIOD, INCLUDING A DETAILED WRITTEN DESCRIPTION OF THE CLAIMED DEFECT AND HOW AND WHEN THE CLAIMED

DEFECTIVE PRODUCT WAS USED; AND (b) THE CLAIMED DEFECTIVE PRODUCT AND A COPY OF THE PURCHASE INVOICE IS RETURNED TO TLV, FREIGHT AND TRANSPORTATION COSTS PREPAID, UNDER A RETURN MATERIAL AUTHORIZATION AND TRACKING NUMBER ISSUED BY TLV. ALL LABOR COSTS, SHIPPING COSTS, AND TRANSPORTATION COSTS ASSOCIATED WITH THE RETURN OR REPLACEMENT OF THE CLAIMED DEFECTIVE PRODUCT ARE SOLELY THE RESPONSIBILITY OF BUYER OR THE FIRST END USER. TLV RESERVES THE RIGHT TO INSPECT ON THE FIRST END USER'S SITE ANY PRODUCTS CLAIMED TO BE DEFECTIVE BEFORE ISSUING A RETURN MATERIAL AUTHORIZATION. SHOULD SUCH INSPECTION REVEAL, IN TLV'S REASONABLE DISCRETION, THAT THE CLAIMED DEFECT IS NOT COVERED BY THIS WARRANTY, THE PARTY ASSERTING THIS WARRANTY SHALL PAY TLV FOR THE TIME AND EXPENSES RELATED TO SUCH ON-SITE INSPECTION.

Exclusion of Consequential and Incidental Damages

IT IS SPECIFICALLY ACKNOWLEDGED THAT THIS WARRANTY, ANY OTHER EXPRESS WARRANTY NOT NEGATED HEREBY, AND ANY IMPLIED WARRANTY NOT NEGATED HEREBY, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, DO NOT COVER, AND NEITHER TLV, TII NOR TLVJ WILL IN ANY EVENT BE LIABLE FOR, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO LOST PROFITS, THE COST OF DISASSEMBLY AND SHIPMENT OF THE DEFECTIVE PRODUCT, INJURY TO OTHER PROPERTY, DAMAGE TO BUYER'S OR THE FIRST END USER'S PRODUCT, DAMAGE TO BUYER'S OR THE FIRST END USER'S PROCESSES, LOSS OF USE, OR OTHER COMMERCIAL LOSSES. WHERE, DUE TO OPERATION OF LAW, CONSEQUENTIAL AND INCIDENTAL DAMAGES UNDER THIS WARRANTY, UNDER ANY OTHER EXPRESS WARRANTY NOT NEGATED HEREBY OR UNDER ANY IMPLIED WARRANTY NOT NEGATED HEREBY (INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE) CANNOT BE EXCLUDED, SUCH DAMAGES ARE EXPRESSLY LIMITED IN AMOUNT TO THE PURCHASE PRICE OF THE DEFECTIVE PRODUCT. THIS EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES, AND THE PROVISION OF THIS WARRANTY LIMITING REMEDIES HEREUNDER TO REPLACEMENT, ARE INDEPENDENT PROVISIONS, AND ANY DETERMINATION THAT THE LIMITATION OF REMEDIES FAILS OF ITS ESSENTIAL PURPOSE OR ANY OTHER DETERMINATION THAT EITHER OF THE ABOVE REMEDIES IS UNENFORCEABLE, SHALL NOT BE CONSTRUED TO MAKE THE OTHER PROVISIONS UNENFORCEABLE.

Exclusion of Other Warranties

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, AND ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY DISCLAIMED.

Severability

Any provision of this warranty which is invalid, prohibited or unenforceable in any jurisdiction shall, as to such jurisdiction, be ineffective to the extent of such invalidity, prohibition or unenforceability without invalidating the remaining provisions hereof, and any such invalidity, prohibition or unenforceability in any such jurisdiction shall not invalidate or render unenforceable such provision in any other jurisdiction.

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