

ISO 9001
ISO14001



Manufacturer

TLV CO., LTD.

Kakogawa, Japan

is approved by LRQA Ltd. to ISO 9001:2001



Instruction Manual

Pressure Reducing Valve for Steam
Featured Models: S-COS-16/S-COSR-16

172-65260M-09
Publication date 8 August 2023
Copyright © 2023 TLV CO., LTD.

Table of Contents

- Introduction 3
- Safety Considerations 4
- Specifications 6
- Acceptable Operating Range 7
- Correct usage of the product 8
- Configuration 11
- Installation 12
- Adjustment 15
- Maintenance 16
- Disassembly 17
- Troubleshooting 23
- TLV EXPRESS LIMITED WARRANTY 26
- Service 28

Introduction

Thank you for purchasing the TLV S-COS/S-COSR pressure reducing valve for steam.

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.

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 result not only in problems with the steam-using equipment and in lowered productivity, but can also lead to shortened service life for and malfunction of the pressure reducing valves. The TLV S-COS, with a built-in separator and steam trap, eliminates these problems and makes possible the supply of very dry steam at a constant pressure. Both the TLV S-COS and S-COSR provide a more stable secondary pressure than conventional pressure reducing valves. They are designed for long service life, with all major components made of stainless steel for superior durability.

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



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

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

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



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

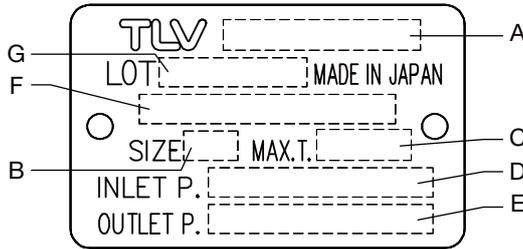


Caution
Install properly and DO NOT use this product outside the recommended operating pressure, temperature and other specification ranges. Improper use may result in such hazards as damage to the product or malfunctions that may lead to serious accidents. Local regulations may restrict the use of this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

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.



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		

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

Acceptable Operating Range

Model	S-COS-16, S-COSR-16
Primary pressure range	0.2 to 1.6 MPaG
Adjustable pressure range (all conditions must be met)	Within 10 to 84% of the primary pressure Minimum adjustable pressure of 0.03 MPaG Pressure differential between 0.07 to 0.8 MPa
Maximum adjustable flow rate	10% of rated flow rate

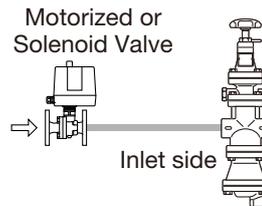
Correct usage of the product



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)



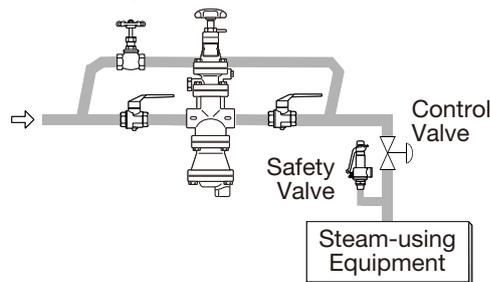
If an on-off valve, such as a motorized valve, is required to stop supply of steam to the steam-using equipment, install it at the inlet side of the product. If a solenoid valve is installed at the outlet of the product, its opening and closing will cause heavy chattering and may lead to damage of the piston and main valve. (When the on-off valve opens, the secondary pressure of the product 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. 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 product.

3. Installing a control valve and a safety valve



A control valve (i.e. for temperature control) installed between the product and the steam-using 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, the control valve should be installed closed to the steam-using equipment. Also, a safety valve should be installed downstream of the control valve.



Note

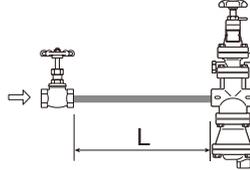
When installing a safety valve to protect the steam-using equipment, be sure to install it on the steam-using equipment or directly before the inlet of the steam-using equipment. If the safety valve is installed between the product and a control valve, an eventual pressure rise could activate the safety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

Recommended straight pipe runs

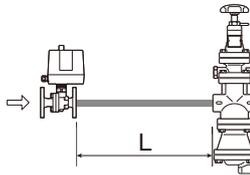
If the product is installed either directly before or after an elbow or control valve, unevenness in flow may result in chattering and unstable pressure. To ensure stable steam flow, it is recommended that the product be installed on straight runs of piping, as illustrated below. (d = pipe diameter)

1. Inlet (primary) side

- Maintain a straight piping run of **10 d 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)

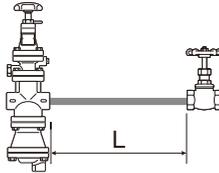


- Maintain a straight piping run of **30 d or more** (L) when an automated valve (on-off valve) is installed. (Example: if nominal size is 25 mm, have 750 mm or more)

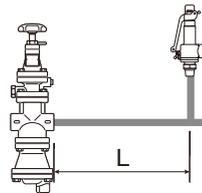


2. Outlet (secondary) side

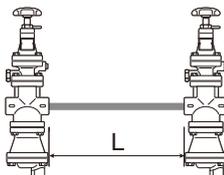
- Maintain a straight piping run of **15 d or more** (L) when a manual valve, a strainer or an elbow, etc. is installed. (Example: if nominal size is 25 mm, have 375 mm or more)



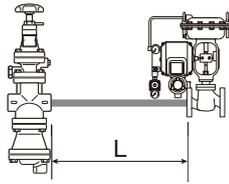
- Maintain a straight piping run of **30 d or more** (L) when a safety valve is installed. (Example: if nominal size is 25 mm, have 750 mm or more)



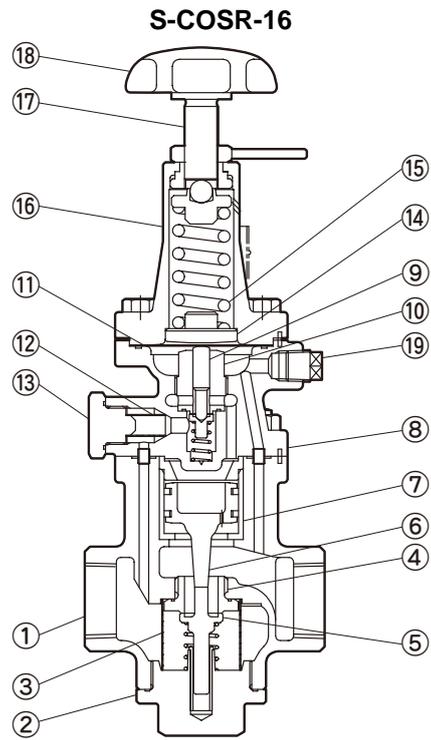
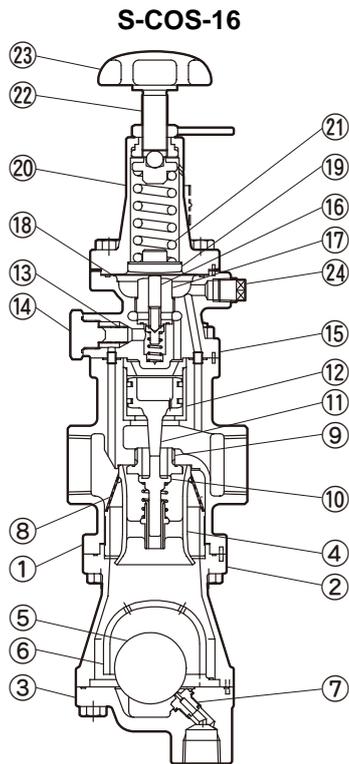
- Maintain a straight piping run of **30 d or more** (L) when another pressure reducing valve is installed. (Two-stage pressure reduction) (Example: if nominal size is 25 mm, have 750 mm or more)



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



Configuration



No.	Part Name
1	Main Body
2	Trap Body
3	Trap Cover
4	Separator
5	Float
6	Float Cover
7	Trap Valve Seat
8	Separator Screen
9	Main Valve Seat
10	Main Valve
11	Piston
12	Cylinder
13	Pilot Screen
14	Pilot Screen Holder
15	Pilot Body
16	Pilot Valve Stem & Valve
17	Pilot Valve Seat
18	Diaphragm
19	Diaphragm Support
20	Spring Housing
21	Coil Spring
22	Adjustment Screw
23	Adjustment Handle
24	Plug

No.	Part Name
1	Main Body
2	Cover Plug
3	Screen
4	Main Valve Seat
5	Main Valve
6	Piston
7	Cylinder
8	Pilot Body
9	Pilot Valve Stem
10	Pilot Valve Seat
11	Diaphragm
12	Pilot Screen
13	Pilot Screen Holder
14	Diaphragm Support
15	Coil Spring
16	Spring Housing
17	Adjustment Screw
18	Adjustment Handle
19	Plug

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.

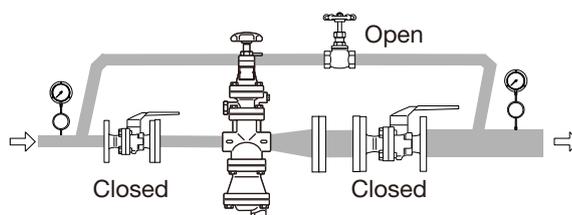
Take measures to prevent people from coming into direct contact with product outlets. Failure to do so may result in burns or other injury from the discharge of fluids.

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

1. Blowdown

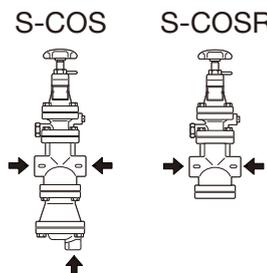
Before installing the product, be sure to blow down all piping thoroughly. If this is not possible, perform a blowdown using the bypass valve.

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



2. Removing protective caps and seals

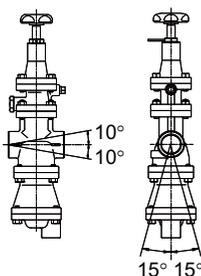
Before installation, be sure to remove all protective seals and caps. (Found in 3 (S-COS) or 2 (S-COSR) locations, on the product inlet and outlet(s).)



3. Installation angle

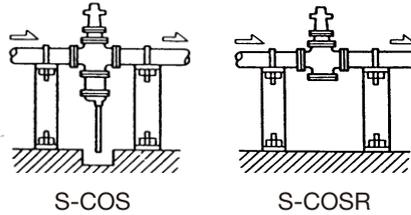
Install the product vertically, so that the arrow mark on the body points horizontally in the direction of flow.

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



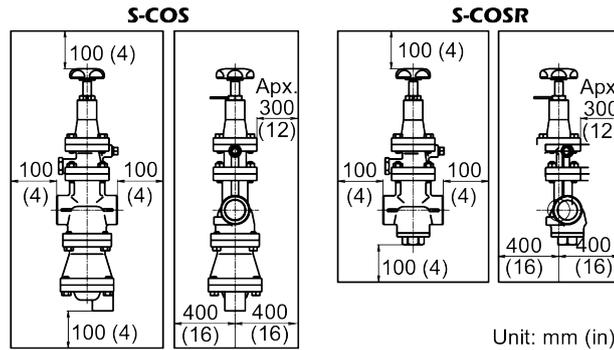
4. Piping support

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.

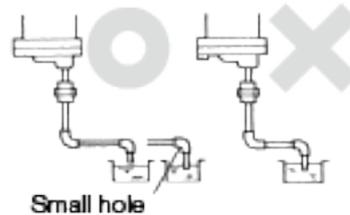


Unit: mm (in)

6. Trap outlet pipe

For ease of maintenance, installation of a union connection is recommended for the trap outlet pipe.

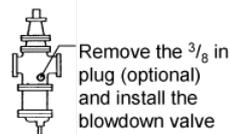
Connect the outlet pipe to a condensate return line, or extend it to a trench. In the case of the latter, make sure the end of the pipe is above the waterline. (Dirt and water may be sucked up by the vacuum formed during trap closure and system shutdown.)



7. Blowdown valve (requires 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 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.

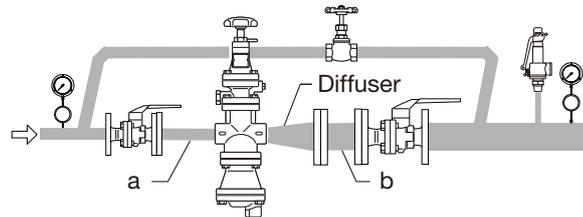


8. Piping size/diffuser

If it is expected that the secondary steam flow velocity will 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 product and the steam-using equipment is great, a possible drop in pressure should be taken into consideration when selecting the piping size.

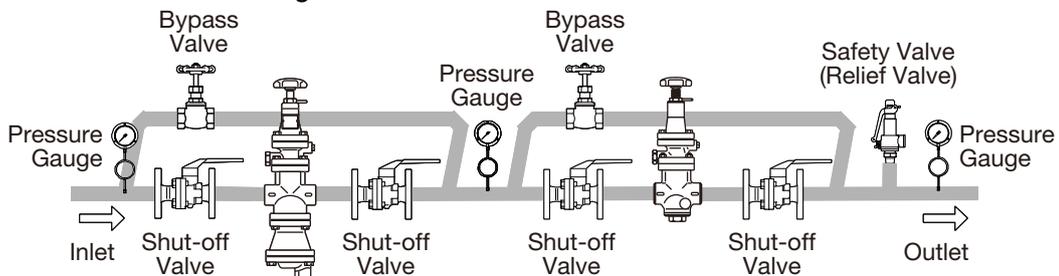
In addition, when installing the strainer, the strainer screen should be either at the 3 o'clock or 9 o'clock position to prevent condensate accumulation.



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

9. Two-stage pressure reduction

Two-stage pressure reduction should be performed whenever the pressure cannot be reduced to the desired level with a single unit due to operating range limitations, such as when the reduction ratio is greater than 10:1.

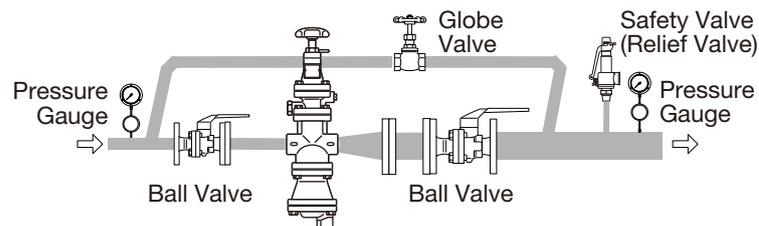


10. Accessories

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.

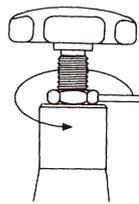
A strainer should always be installed ahead of the product has a built-in strainer, however in case an external strainer is installed, it should be installed ahead of the product and the strainer should be installed horizontally with the basket at the 3 or 9 o'clock position in order to prevent condensate accumulation.



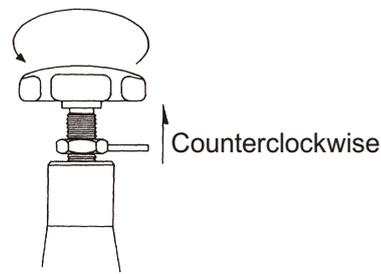
Adjustment

The product should be properly adjusted for protection of the steam-using equipment against water hammer.

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 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.

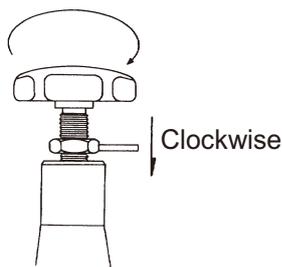


Loosen the locknut

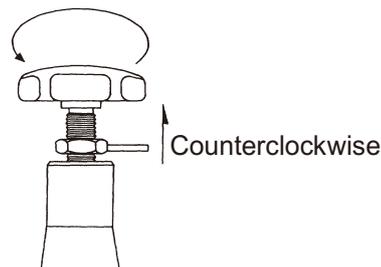


Fully raise the adjustment screw

4. Slowly, fully open the shutoff valve at the inlet of the product. Allow sufficient time for condensate remaining at the inlet of the product to be discharged.
5. Slightly open the shutoff valve at the outlet of the product.
6. Turn the adjustment screw 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. After setup, tighten the locknut.
9. When shutting down the system, always close the outlet shutoff valve first and then the inlet valve.

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
Screens (Separator and Pilot)	Disassemble and clean annually. If there is substantial blockage, install a strainer (approximately 60 mesh) ahead of the product.
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 (For S-COS only)	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

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 steam from the piping (both upstream and downstream). If the steam supply to the system cannot be shut off, change over to bypass operation. Close shut-off valves at the inlet and outlet of the product completely. Relieve residual steam pressure by loosening slightly the spring housing hex bolt and screen holder or plug. Wait for the body to cool before attempting to remove the product from the line. Then remove inlet and outlet flange retaining bolts and nuts to permit removal of the product. Secure the product in a vise to perform the inspection.

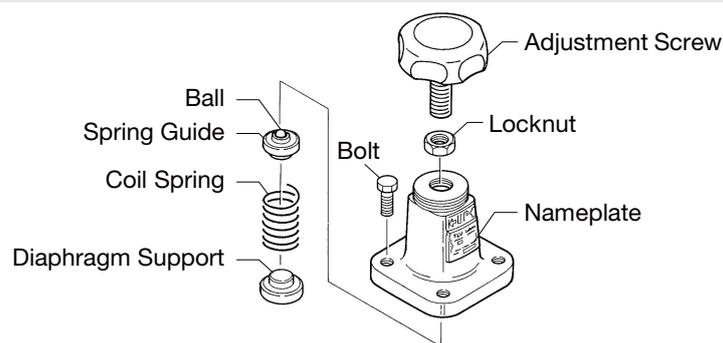
Disassembling the adjustment section

Loosen the adjustment screw completely and remove the bolts from the spring housing. Grasp the mounting plate and lift the spring housing straight up and off. Having removed the spring housing, you will see the diaphragm support, coil spring, bearing and spring retainer.



Important

Check for seizure or any damaged screw threads.



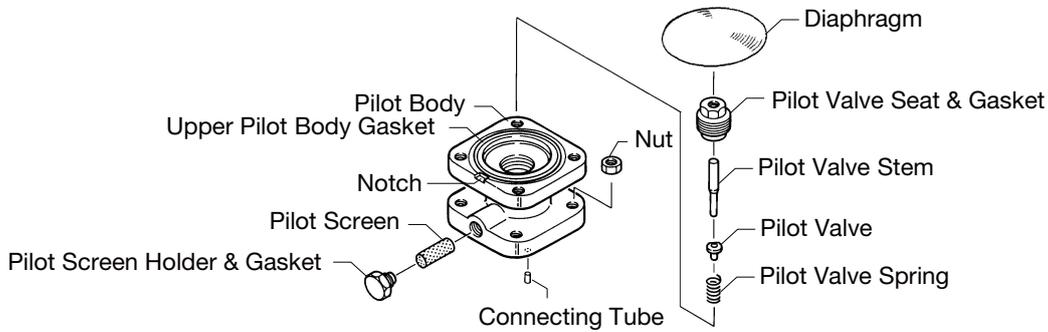
Disassembling the pilot section

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



Important

Check for any fault on the seat of the pilot valve and the pilot valve seat, flaws on the gaskets, and clogging of the 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

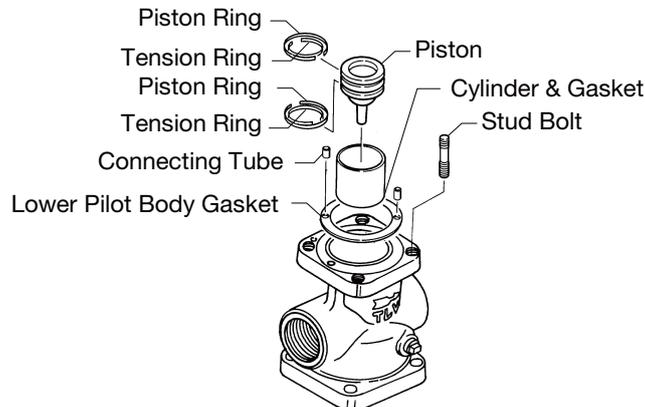
Remove the pilot body after loosening and removing the bolts (stud bolts). During this process, pay attention not to lose the connecting tubes (2 pieces).

Remove the piston and the 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.



Important

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



Disassembling the separator and main valve section

Turn the product 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 product is returned to the normal attitude.

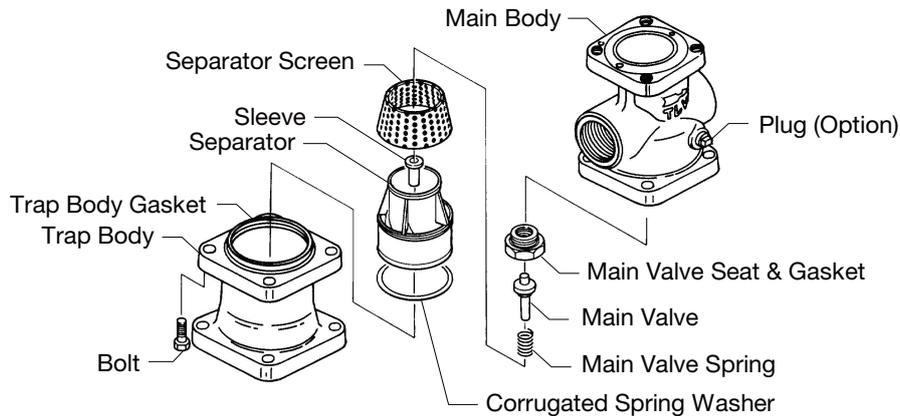
Removal of the separator and pressed-in sleeve permits removal of the main valve coil spring, the main valve, main valve holder and screen. Loosen the valve seat with a box wrench and remove it from the body.



Important

Check for damage on the seating and sliding surfaces of the main valve and main valve holder, the seating surface of the valve seat, the gaskets, and for clogging of the screen.

At start-up following shut-down for a long period, always blow down the piston section of the body through the plug (if an optional plug is supplied).



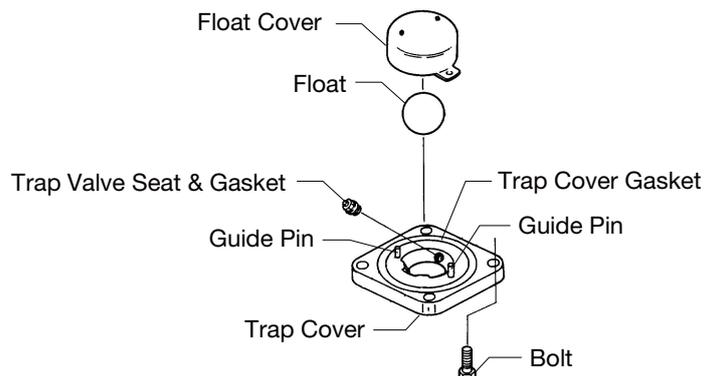
Disassembling the steam trap section

Loosen the bolts and remove the trap cover. Be careful, as hot condensate may splash out. Remove the bolt from the float cover to reveal the float. Remove the float, then loosen the valve seat with a box wrench and remove it.



Important

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



Disassembling the main valve and cover plug/cover section

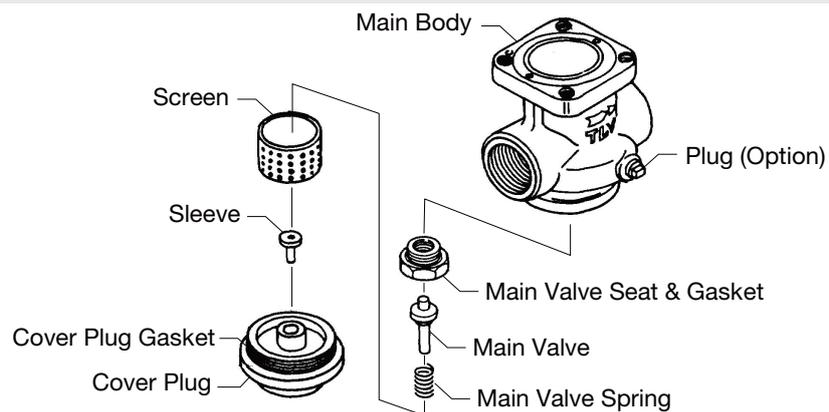
Turn the product upside down for easy dismantling of the main valve.

Loosen and remove the cover plug. Removal of the cover plug and pressed-in sleeve permits the removal of the main valve, main valve spring and the screen. Loosen the main valve seat with a box wrench and remove it from the main body.



Important

Check for damage on the seating and sliding surfaces of the main valve and main valve holder, the seating surface of the main valve seat, and for damage on the gaskets. At start-up following shut-down for a long period, always blow down the piston section of the body through the plug (option).



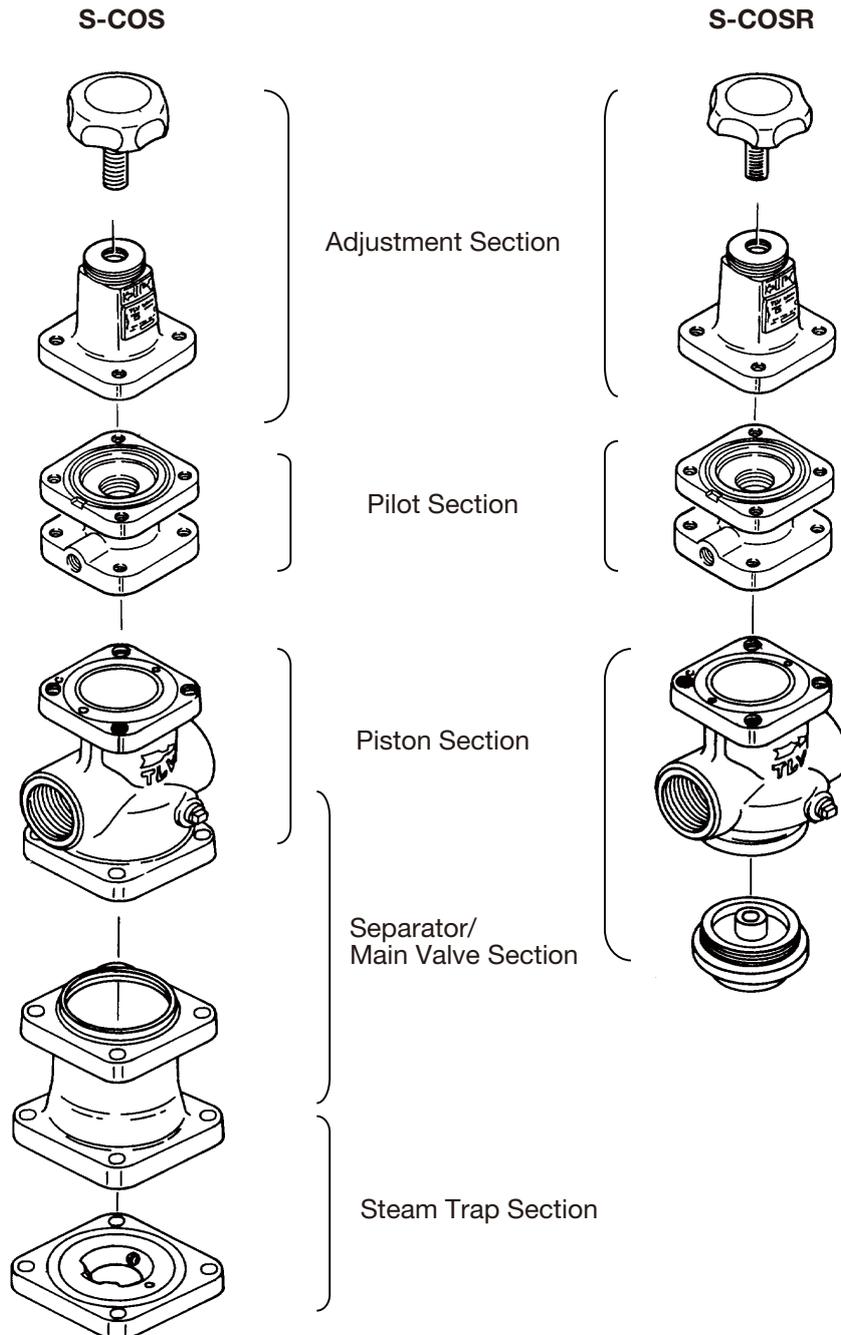
Cleaning

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

Trap cover (S-COS), cover plug (S-COSR), adjustment screw, pilot valve, pilot valve seat, main valve, main valve seat, pilot screen, pilot valve stem, piston, separator screen (S-COS), screen (S-COSR), piston ring, cylinder, float (S-COS), trap valve seat (S-COS)

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

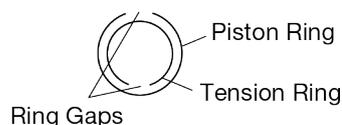


Reassembly

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, the spring retainer, ball and adjustment screw. Apply a small amount of anti-seize to the threads of the valve seat, pilot valve seat and screen holder. Apply anti-seize carefully 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 assembly, make sure that the piston and the pilot valve operate smoothly without binding.



Assembling the Piston Ring

- a. Fit the piston ring to the outside of the tension ring.
- b. The ring gaps should be opposite each other.

Table of Tightening Torques

Part Name	Torque (N·m)	Distance Across Flats (mm)
Bolt for spring housing/pilot body	25	13
Pilot valve seat	50	17
Pilot screen holder	40	24
Nut and bolt for pilot body/main body	30	13
Bolt for main body/trap body (S-COS)	30	13
Main valve seat	70	27
Trap valve seat (S-COS)	10	11
Bolt for trap cover/trap body (S-COS)	30	13
Cover plug (S-COSR)	120	32



Note

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

Troubleshooting



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

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 following troubleshooting guide.

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. Steam leaks from the steam trap or condensate is not discharged.
(For S-COS only)
6. 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.

Problem	Symptom	Cause	Remedy
The secondary pressure does not rise	The product body is not warm	No steam is being supplied or the inlet valve is closed	Check the valves and piping
	The body is warm, but the pressure does not increase	The entrance to the screens or strainer is clogged	Clean or blow down
The secondary pressure cannot be adjusted or increases abnormally	Adjustment is difficult, and set pressure varies	The pilot screen is clogged	Clean
		There is insufficient steam flow	Check the flow, replace the product if necessary
		The piston is clogged with dirt	Clean Check the piston ring
		The piston ring is worn	Replace with a new piston ring
		There is a build-up of dirt on the sliding surfaces of the pilot, piston or main valve	Clean
		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 small hole on the piston is clogged	Clean
		Wear on piston ring	Replace piston rings
		The diaphragm is distorted or damaged	Replace with a new diaphragm
		There is fluctuation in steam consumption	Check the flow rate, replace the product if necessary
		The selected model is inappropriate for the service conditions (specifications)	Check the model selection, replace the product 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
	There is a build-up of dirt on or damage to the pilot valve seat or main valve seat		Clean, align, and replace if necessary

Problem	Symptom	Cause	Remedy
Hunting or chattering occurs	Occurs at low steam demand	It is being operated below the lower flow rate limit	Check the volume of steam supply, replace with a smaller diameter valve
	Hunting never stops	There is too high a reduction ratio (operated at below 10% of the primary pressure)	Use a two-stage reduction arrangement
		The selected model is inappropriate for the service conditions (specifications)	Check the model selection, replace the product if necessary
	Chattering never stops	Condensate is contained, or the trap is blocked (S-COS only)	Check the trap Check the piping
		The selected model is inappropriate for the service conditions (specifications)	Check the model selection, replace the product if necessary
	Abnormal noises	Makes a high-pitched noise	There is too high a reduction ratio
The flow is too great			The flow is too great
There is a high-speed open/close valve nearby			Install the valve as far away as possible
Faulty steam trap (S-COS)	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 working pressure	Adjust primary pressure
		Water is inside the float	Replace with a new float
		The outlet 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 CO., LTD., a Japanese corporation (“**TLV**”), warrants that products which are sold by it, TLV International Inc. (“**TII**”) or one of its group companies excluding TLV Corporation (a corporation of the United States of America), (hereinafter the “**Products**”) are designed and manufactured by TLV, conform to the specifications published by TLV for the corresponding part numbers (the “**Specifications**”) and are free from defective workmanship and materials. The party from whom the Products were purchased shall be known hereinafter as the “**Seller**”. 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 persons other than TLV, TII or TLV group company personnel, 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 persons other than TLV or TLV group company personnel, 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, TII or TLV group companies; 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 one (1) year after delivery of Products to the first end user. Notwithstanding the foregoing, asserting a claim under this warranty must be brought within three (3) 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 THE SELLER.

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 THE SELLER IN WRITING WITHIN THE 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 THE SELLER, FREIGHT AND TRANSPORTATION COSTS PREPAID, UNDER A RETURN MATERIAL AUTHORIZATION AND TRACKING NUMBER ISSUED BY THE SELLER. 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. THE SELLER 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 THE SELLER'S REASONABLE DISCRETION, THAT THE CLAIMED DEFECT IS NOT COVERED BY THIS WARRANTY, THE PARTY ASSERTING THIS WARRANTY SHALL PAY THE SELLER 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 ITS TLV GROUP COMPANIES 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.

Service

For Service or Technical Assistance: Contact your TLV representative or your regional TLV office.

In Europe:

TLV EURO ENGINEERING GmbH

Daimler-Benz-Straße 16-18, 74915 Waibstadt, **Germany**

Tel: [49]-(0)7263-9150-0

Fax: [49]-(0)7263-9150-50

TLV EURO ENGINEERING UK LTD.

Units 7 & 8, Furlong Business Park, Bishops Cleeve,
Gloucestershire GL52 8TW, **U.K.**

Tel: [44]-(0)1242-227223

Fax: [44]-(0)1242-223077

TLV EURO ENGINEERING FRANCE SARL

Parc d'Ariane 2, bât. C, 290 rue Ferdinand Perrier, 69800 Saint
Priest, **France**

Tel: [33]-(0)4-72482222

Fax: [33]-(0)4-72482220

In North America:

TLV CORPORATION

13901 South Lakes Drive, Charlotte, NC 28273-6790, **U.S.A.**

Tel: [1]-704-597-9070

Fax: [1]-704-583-1610

TLV ENGINEERING S. A. DE C.V.

Av. Jesús del Monte 39-B-1001, Col. Hda. de las Palmas,
Huixquilucan, Edo. de México, 52763, **Mexico**

Tel: [52]-55-5359-7949

Fax: [52]-55-5359-7585

In Oceania:

TLV PTY LIMITED

Unit 8, 137-145 Rooks Road, Nunawading, Victoria 3131,
Australia

Tel: [61]-(0)3-9873 5610

Fax: [61]-(0)3-9873 5010

In East Asia:

TLV PTE LTD

36 Kaki Bukit Place, #02-01/02, **Singapore** 416214

Tel: [65]-6747 4600

Fax: [65]-6742 0345

TLV SHANGHAI CO., LTD.

5/F, Building 7, No.103 Caobao Road, Xuhui District, Shanghai,
China 200233

Tel: [86]-(0)21-6482-8622

Fax: [86]-(0)21-6482-8623

TLV ENGINEERING SDN. BHD.

No.16, Jalan MJ14, Taman Industri Meranti Jaya, 47120
Puchong, Selangor, **Malaysia**

Tel: [60]-3-8052-2928

Fax: [60]-3-8051-0899

TLV PRIVATE LIMITED

252/94 (K-L) 17th Floor, Muang Thai-Phatra Complex Tower B,
Rachadaphisek Road, Huaykwang, Bangkok 10310, **Thailand**

Tel: [66]-2-693-3799

Fax: [66]-2-693-3979

TLV INC.

#302-1 Bundang Technopark B, 723 Pangyo-ro, Bundang,
Seongnam, Gyeonggi, 13511, **Korea**

Tel: [82]-(0)31-726-2105

Fax: [82]-(0)31-726-2195

In the Middle East:

TLV ENGINEERING FZCO

Building 2W, No. M002, PO Box 371684, Dubai Airport Free
Zone, Dubai, **UAE**

Email: sales-me@tlv.co.jp

In Other Countries:

TLV INTERNATIONAL, INC.

881 Nagasuna, Noguchi, Kakogawa, Hyogo 675-8511, **Japan**

Tel: [81]-(0)79-427-1818

Fax: [81]-(0)79-425-1167

Manufacturer:

TLV CO., LTD.

881 Nagasuna, Noguchi, Kakogawa, Hyogo 675-8511, **Japan**

Tel: [81]-(0)79-427-1800

Fax: [81]-(0)79-422-2277