

ISO 9001
ISO14001



Manufacturer

TLV CO., LTD.

Kakogawa, Japan
is approved by LRQA Ltd. to ISO 9001/14001



Instruction Manual

Clean Steam Traps LV6 Series

Featured Models: LV6-CE/LV6-CF/LV6-SF/LV6-P/LV6-EP/LV6-HC/LV6-HS/LV6-HP/LV6-HE

172-65230M-11

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Introduction

Thank you for purchasing the TLV clean steam trap.

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.

This clean steam trap is of a revolutionary design that employs a high-performance X-element. This is a new type of valve mechanism in which a thermoliquid is sealed inside the X-element and the valve opens or closes based on the difference between the saturation temperatures of the thermoliquid and the water. The X-element is very sensitive to changes in temperature and responds with great accuracy, quickly discharging air and the large quantities of condensate created immediately after operation start-up, thereby greatly reducing start-up time. It also reacts with great sensitivity to the inflow of large quantities of condensate and hot air during operation, thus preventing air-binding. The above-listed superior features of the X-element employed in this clean steam trap help to increase heating efficiency and reduce manpower requirements for maintenance and bypass blowdown.

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 for subsequent maintenance, disassembly/reassembly and troubleshooting. Please keep it in a safe place for future reference.

Safety Considerations

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

Cautionary items and definitions



Danger

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



Warning

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



Caution

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

Safety Considerations for the Product



Caution

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



Caution

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



Caution

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



Caution

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



Caution

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.

Checking the Piping



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.

Check to make sure that the pipes to be connected to the product have been installed properly.

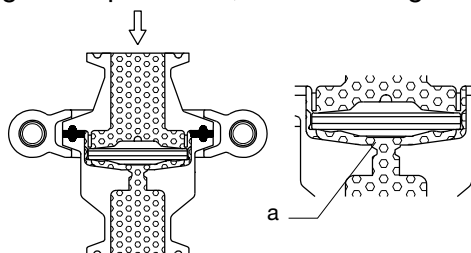
1. Is the pipe diameter suitable?
2. Has sufficient space been secured for maintenance?
3. Is the inlet pipe as short as possible, with as few bends as possible, and installed so the liquid will flow naturally down into the product?
4. Have isolation valves been installed at the inlet and outlet? If the outlet is subject to back pressure, has a check valve (TLV-CK) been installed?
5. Is there any vibration in the piping?

Operation

Principles of air and condensate discharge:

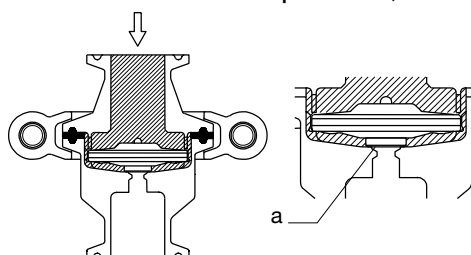
1. Start-up air and cold condensate discharge

When the system is cold before the supply of steam, the X-element is in its contracted state and the valve (a) is open. This allows for the rapid discharge of large quantities of air and cold condensate through the open valve, thus reducing start-up time.



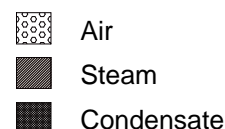
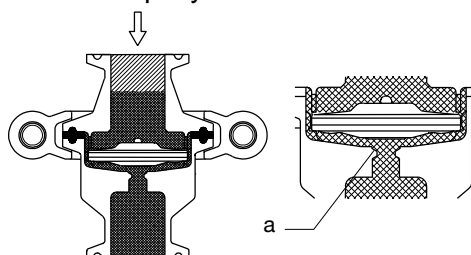
2. Closed position

When the discharge of initial air and cold condensate is completed, steam flows into the trap. This raises the temperature of the interior of the trap, causing the thermoliquid inside the X-element to expand. The valve (a) remains open as the temperature inside the trap approaches the inlet steam pressure's saturation temperature. When the temperature reaches a point slightly below the saturation temperature, the valve closes.



3. Condensate discharge

With the influx of condensate, the X-element is cooled, causing the valve (a) to immediately open and discharge the condensate. Additionally, the X-element responds with great sensitivity to the temperature difference of air that is close to saturation temperature and discharges the air rapidly.



Specifications

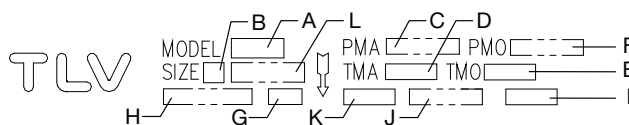


Caution

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

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

Refer to the product nameplate for detailed specifications.



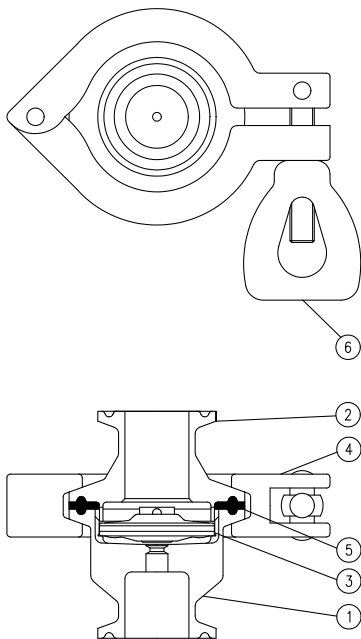
A	Model	G	Production Lot No.
B	Nominal Diameter	H	C No. ⁰¹
C	Maximum Allowable Pressure (PMA) ⁰²	I	X-element Type
D	Maximum Allowable Temperature (TMA) ⁰²	J	Connection Standard No.
E	Maximum Operating Temperature (TMO)	K	Connection Standard
F	Maximum Operating Pressure (PMO)	L	Material

⁰¹C No. (Charge/Mill No.) is displayed for products with options. This item is omitted when there are no options.

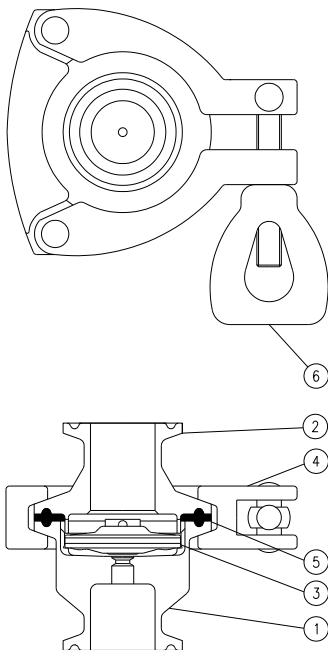
⁰²Maximum allowable pressure (PMA) and maximum allowable temperature (TMA) are PRESSURE SHELL DESIGN CONDITIONS, **NOT** OPERATING CONDITIONS.

Configuration

LV6-CE/LV6-CF/LV6-SF
LV6-HC/LV6-HS



LV6-P/LV6-EP
LV6-HP/LV6-HE



No.	Part Name	No.	Part Name
1	Lower Body	4	Body Clamp
2	Upper Body	5	Gasket
3	X-element	6	Wing Nut



Note
The direction of inlet flow must be from the top.

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. Before installing the product, open the inlet valve and blow out the piping to remove any piping scraps, dirt and oil. Close the inlet valve after blowdown.
2. Before installation, be sure to remove all protective seals.
3. Install the product vertically with the inlet at the top and the outlet at the bottom with the arrow on the body pointing in the direction of flow.
4. Install a condensate outlet valve and outlet piping.
5. Open the inlet and outlet valves and check to make sure that the product functions properly.
6. After steam has passed through the piping, allow the trap to cool and then further tighten the clamp.

If there is a problem, determine the cause using the “Troubleshooting” section in this manual.

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.

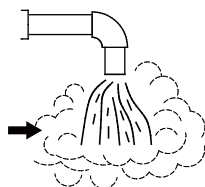
Operational Check

A visual inspection of the following items should be done on a daily basis to determine whether the product is operating properly or has failed. Periodically (at least biannually) the operation should also be checked by using diagnostic equipment such as a stethoscope, thermometer, TLV TrapMan or TLV Pocket TrapMan.

If the product should fail, it may cause damage to piping and equipment, resulting in faulty or low quality products or losses due to steam leakage.

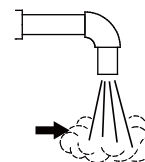
Normal:	Condensate is discharged intermittently together with flash steam, and the sound of flow can be heard.
Blocked (Discharge Impossible):	No condensate is discharged and the surface temperature of the product is low.
Blowing:	Live steam continually flows from the outlet and there is a continuous metallic sound.
Steam Leakage:	Live steam is discharged through the product outlet together with condensate, accompanied by a high-pitched sound.

Flash Steam



White jet containing water droplets

Live Steam Leakage



Clear, slightly bluish jet

Parts Inspection

When parts have been removed, or during periodic inspections, use the following table to inspect the parts and replace any that are found to be defective.

Gasket(s): Check for warping and damage

X-element valve area and valve seat area of body: Check for scratches, foreign matter or oil film

Body Interior: Check for build-up of scale

Disassembly/Reassembly



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.

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.

Use the following procedures to remove components. Use the same procedures in reverse to reassemble.

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

Disassembly/Reassembly of Upper and Lower Bodies

Part Name & No.	During Disassembly	During Reassembly
Wing Nut 6 Body Clamp 4	Loosen the wing nut with a tool such as an adjustable wrench, then remove the body clamp	Consult the table of tightening torques and tighten the wing nut to the proper torque; open inlet valve and allow live steam to enter and heat the trap, then close the inlet valve; after the internal and atmospheric pressures have equalized and the trap surface has cooled, tighten the wing nut to the proper torque again; Steam may leak if the wing nut is not re-tightened
Upper Body 2 Lower Body 1	Take apart, being careful not to scratch the gasket sealing surfaces	Reattach, being careful not to scratch the gasket sealing surfaces
Gasket 5	Remove the gasket and clean the sealing surfaces	Replace with a new gasket if damaged

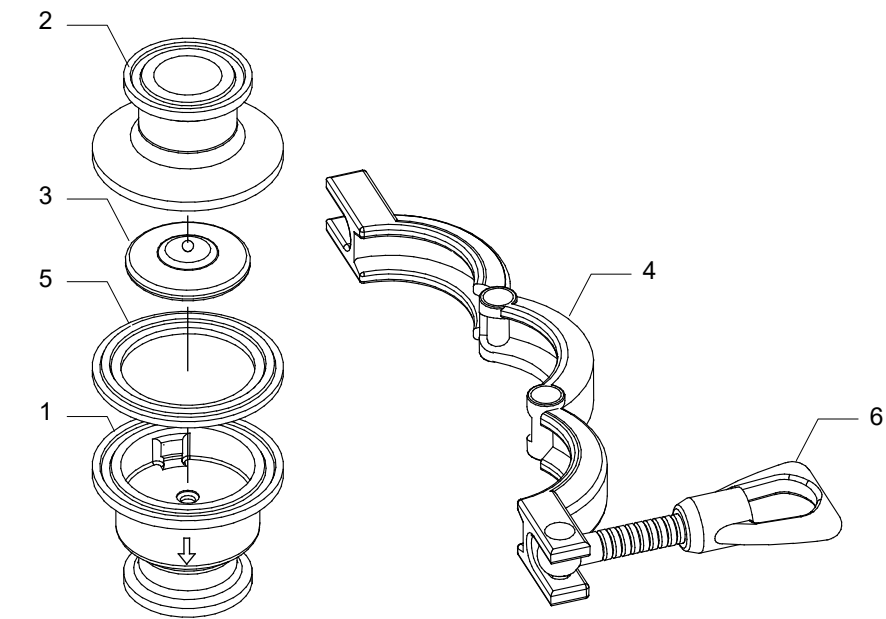
Removing/Reassembling Parts Inside the Lower Body

Part Name & No.	During Disassembly	During Reassembly
X-element 3	Grasp the steel ball on the top of the X-element and remove	After making sure that the X-element is right-side-up, insert straight down into the guide-part of the lower body, making sure it does not catch on the sides

Table of Tightening Torques

Part Name & No.	Torque N·m	Distance Across Flats mm
Wing Nut 6	8.0	-

Exploded View



No.	Part Name	No.	Part Name
1	Lower Body	4	Body Clamp
2	Upper Body	5	Gasket
3	X-element	6	Wing Nut

Troubleshooting



Caution

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

When the product fails to operate properly, use the following table to locate the cause and remedy.

Problem	Cause	Remedy
No condensate is discharged (blocked) or discharge is poor	The X-element is sticking to the valve seat	Clean parts
	The Valve seat is blocked	Clean valve area of the lower body or replace lower body
	The product operating pressure exceeds the maximum specified pressure or there is insufficient pressure differential between the product inlet and outlet	Compare specifications and actual operating conditions
Steam is discharged or leaks from the outlet (blowing) (steam leakage)	There is build-up of rust or scale between the X-element valve and valve seat on the lower body	Clean parts
	The X-element valve and valve seat are damaged	Replace with a new X-element and/or replace with new lower body
	The X-element is broken	Replace with a new X-element
	Improper installation	Correct the installation
	Product vibration	Lengthen the inlet piping and fasten it securely
Steam is leaking from a place other than the outlet	Gasket deterioration or damage	Replace with a new gasket
	Improper tightening torque was used on the clamp bolt and nut	Tighten to the proper torque
	The piping has been forcibly joined using a coupling with the incorrect bore	Correct the piping

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

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Manufacturer:

TLV CO., LTD.

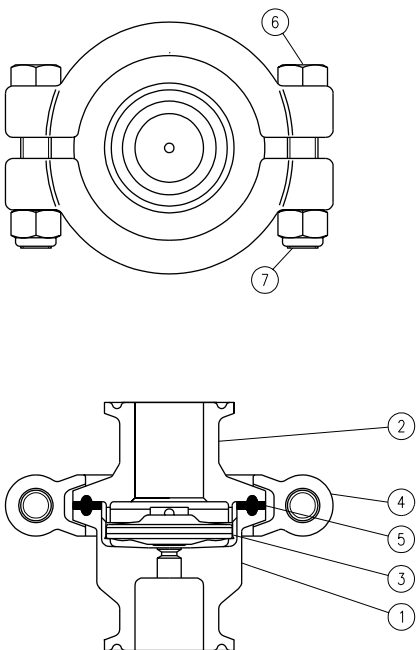
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Option (2-piece Clamp with Bolts and Nuts)

Configuration



No.	Part Name	No.	Part Name
1	Lower Body	5	Gasket
2	Upper Body	6	Clamp Bolt
3	X-element	7	Clamp Nut
4	Body Clamp		

Disassembly/Reassembly



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.

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.

Use the following procedures to remove components. Use the same procedures in reverse to reassemble.

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

Disassembly/Reassembly of Upper and Lower Bodies

Part Name & No.	During Disassembly	During Reassembly
Body Clamp 4 Clamp Bolt 6 Clamp Nut 7	Remove with a socket wrench	When threading the clamp nut onto the clamp bolt, the direction of the clamp nut must be like that shown in the "Exploded View" section on the next page. Consult the table of tightening torques and tighten clamp nuts to the proper torque; avoid lopsided tightening by making sure that both sides are tightened evenly; open inlet valve and allow live steam to enter and heat the trap, then close the inlet valve; after the internal and atmospheric pressure have equalized and the trap surface has cooled, tighten clamp nuts to the proper torque again; Steam may leak if clamp nuts are not re-tightened
Upper Body 2 Lower Body 1	Take apart, being careful not to scratch the gasket sealing surfaces	Reattach, being careful not to scratch the gasket sealing surfaces
Gasket 5	Remove the gasket and clean the sealing surfaces	Replace with a new gasket if damaged

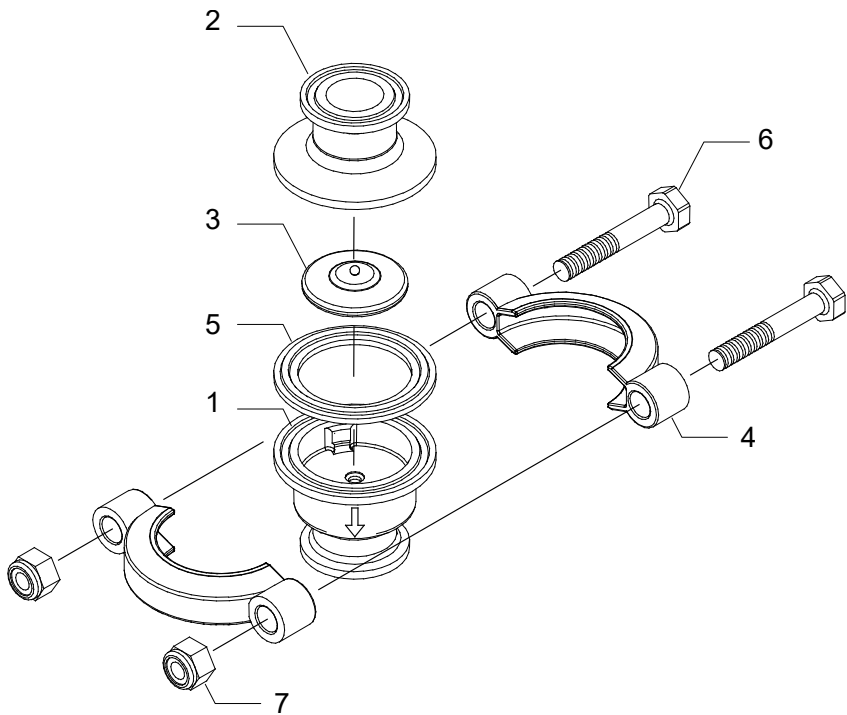
Removing/Reassembling Parts Inside the Lower Body

Part Name & No.	During Disassembly	During Reassembly
X-element 3	Grasp the steel ball on the top of the X-element and remove	After making sure that the X-element is right-side-up, insert straight down into the guide-part of the lower body, making sure it does not catch on the sides

Table of Tightening Torques

Part Name & No.	Torque N·m	Distance Across Flats mm
Clamp Bolt 6, Clamp Nut 7	8.0	13

Exploded View



No.	Part Name	No.	Part Name
1	Lower Body	5	Gasket
2	Upper Body	6	Clamp Bolt
3	X-element	7	Clamp Nut
4	Body Clamp		