

ISO 9001  
ISO14001



Manufacturer

**TLV** CO., LTD.

Kakogawa, Japan

is approved by LRQA Ltd. to ISO 9001:2001



# Instruction Manual

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## **Free Float Steam Trap**

Featured Model: JH7.2R-B

172-65458M-05

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# Introduction

Thank you for purchasing the TLV free float 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 free float steam trap employs a hinge-less and lever-less free float to rapidly, automatically and continuously discharge the inflowing condensate that is continuously generated inside the equipment, thus preventing the accumulation of condensate and thereby improving the heat transfer efficiency of the equipment.

In addition, the integral bimetal type automatic air vent allows for the rapid release of start-up air and thereby reduces start-up time.

These features make this free float steam trap ideally suited for use on process systems and equipment (steam-using equipment), and it is especially well-suited for removing condensate from equipment used for batch operations, which often experience entrained air during operation.

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 necessary 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



### 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 this product in excess of the maximum operating pressure differential.** Such use could make discharge impossible (blocked).



### 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

**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

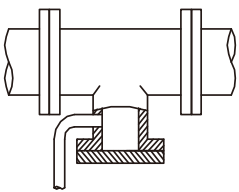
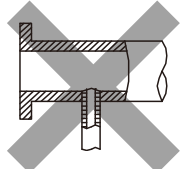
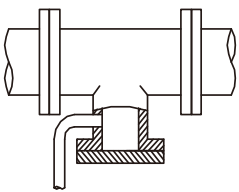
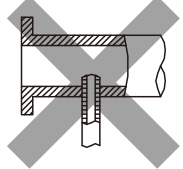
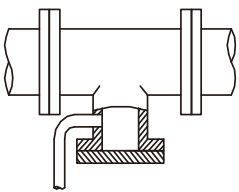
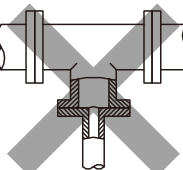
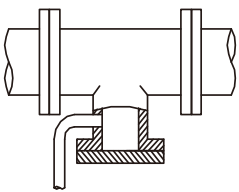
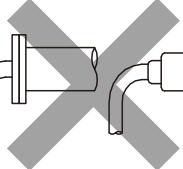


## Caution

**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. Is the piping where the product is to be installed horizontal?
3. Has sufficient space been secured for maintenance?
4. Have maintenance 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 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?
6. Has the piping work been done correctly, as shown in the figures below?

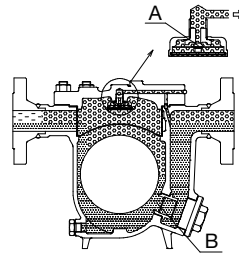
| Requirement                                                                                                                           | Correct                                                                             | Incorrect                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Install catchpot with the proper diameter.                                                                                            |  | <br>Diameter is too small.                                         |
| Make sure the flow of condensate is not obstructed.                                                                                   |  | <br>Diameter is too small and inlet protrudes into pipe interior. |
| To prevent rust and scale from flowing into the product, the inlet pipe should be connected 25 to 50 mm above the base of the T-pipe. |  | <br>Rust and scale flow into the trap with the condensate.        |
| When installing on the blind end, make sure the flow of condensate is not obstructed.                                                 |  | <br>Condensate collects in the pipe.                              |

# Operation

Principles of condensate discharge:

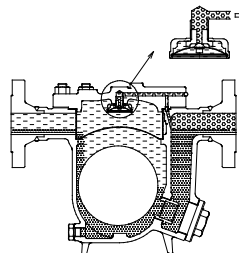
1. Start-up air and cold condensate discharge

At start-up, before steam is supplied, the system is cold and the bimetal plate is contracted (flexed downward), keeping the air vent valve (A) open. When steam is first supplied to the system, air is discharged through the vent (A) while cold condensate is discharged through the orifice (B).



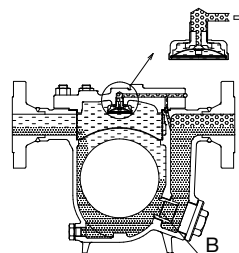
2. Condensate discharge

After the discharge of initial air and cold condensate, the heat of the inflowing steam and condensate cause the bimetal plate to flex upward, closing the air vent valve (A). The inflowing condensate causes the float to rise due to buoyancy, opening the orifice (B) and allowing condensate to be discharged. The air vent valve will remain closed throughout normal operation due to the high operating temperatures.



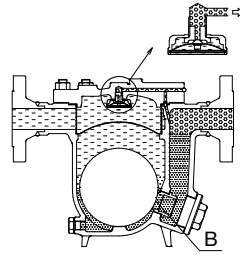
3. Discharge of large quantities of condensate

Increases in the condensate inflow rate cause the condensate level in the trap to rise. The float consequently rises and enlarges the opening of the orifice (B), allowing more condensate to be discharged. In this manner, continuous condensate discharge occurs with the orifice opening size varying depending on the condensate flow rate.



4. Closed position

When the condensate flow rate decreases, the float falls, closing off the orifice opening (B). A water seal is maintained at all times over the orifice (B) to prevent steam loss.



Air



Steam



Condensate

# Specifications



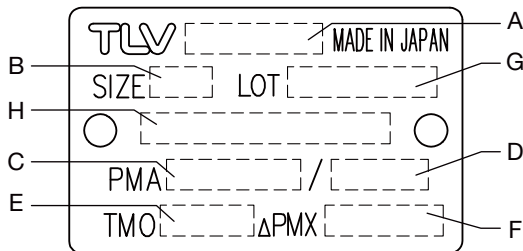
## Caution

**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 this product in excess of the maximum operating pressure differential.** Such use could make discharge 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.

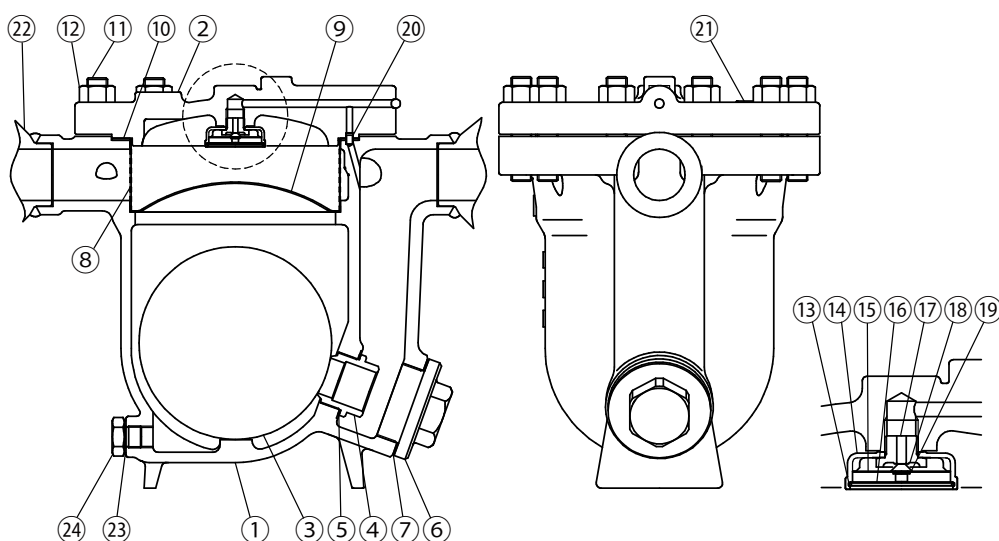


|   |                                                   |   |                                     |
|---|---------------------------------------------------|---|-------------------------------------|
| A | Model                                             | E | Maximum Operating Temperature (TMO) |
| B | Nominal Diameter                                  | F | Maximum Differential Pressure (PMX) |
| C | Maximum Allowable Pressure (PMA) <sup>01</sup>    | G | Production Lot No.                  |
| D | Maximum Allowable Temperature (TMA) <sup>01</sup> | H | Valve No. <sup>02</sup>             |

<sup>01</sup>Maximum allowable pressure (PMA) and maximum allowable temperature (TMA) are PRESSURE SHELL DESIGN CONDITIONS, **NOT** OPERATING CONDITIONS.

<sup>02</sup>Valve No. is displayed for products with options. This item is omitted from the nameplate when there are no options.

# Configuration



| No. | Part Name           | A <sup>01</sup> | B <sup>01</sup> | C <sup>02</sup> | No. | Part Name           | A <sup>01</sup> | B <sup>01</sup> |
|-----|---------------------|-----------------|-----------------|-----------------|-----|---------------------|-----------------|-----------------|
| 1   | Body                |                 |                 |                 | 13  | Snap Ring           |                 | ✓               |
| 2   | Cover               |                 |                 |                 | 14  | Air Vent Case       |                 | ✓               |
| 3   | Float               |                 |                 | ✓               | 15  | Bimetal Plate       |                 | ✓               |
| 4   | Orifice             |                 | ✓               |                 | 16  | Air Vent Screen     |                 | ✓               |
| 5   | Orifice Gasket      | ✓               | ✓               |                 | 17  | Air Vent Valve Seat |                 | ✓               |
| 6   | Orifice Plug        |                 |                 |                 | 18  | Air Vent Valve Plug |                 | ✓               |
| 7   | Orifice Plug Gasket | ✓               | ✓               |                 | 19  | Snap Ring           |                 | ✓               |
| 8   | Screen              |                 | ✓               |                 | 20  | Connector           |                 |                 |
| 9   | Screen Holder       |                 |                 |                 | 21  | Nameplate           |                 |                 |
| 10  | Cover Gasket        | ✓               | ✓               |                 | 22  | Flange/Socket       |                 |                 |
| 11  | Cover Bolt          |                 |                 |                 | 23  | Drain Plug Gasket   | ✓               | ✓               |
| 12  | Cover Nut           |                 |                 |                 | 24  | Drain Plug          |                 |                 |

<sup>01</sup>Replacement parts are available only in the following kits: A = Maintenance Kit; B = Repair Kit

<sup>02</sup>C = Float

# 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.

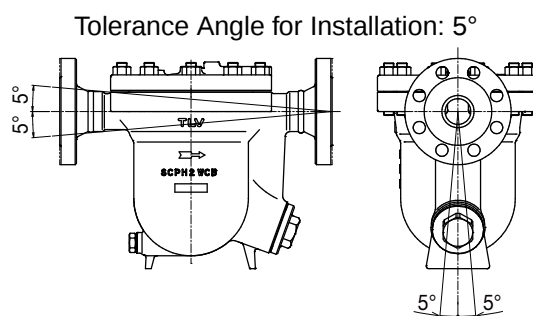
**Use hoisting equipment for heavy objects (weighing approximately 20 kg (44 lb) or more).** Failure to do so may result in back strain or other injury if the object should fall.

**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 and adjustment and valve opening/closing should be carried out only by trained maintenance personnel.

1. Before installation, be sure to remove all protective seals.
2. 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.
3. Install the product so the arrow on the body is pointing in the direction of flow.
4. The product must be inclined no more than 5° horizontally and front-to-back.
5. Install a condensate outlet valve and outlet piping.
6. Open the inlet and outlet valves and ensure that the product functions properly.

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



Make sure the product is installed with the raised TLV lettering on the body horizontal.

# 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.

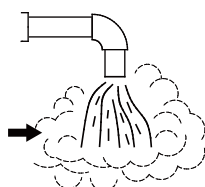
## Operational Check

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 Pocket TrapMan or TLV 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.

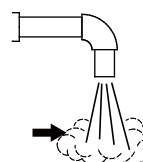
|                                       |                                                                                                                                                                             |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Normal:                               | Condensate is discharged continuously, together with flash steam, and the sound of flow can be heard. If there is very little condensate, there is almost no sound of flow. |
| Blocked<br>(Discharge<br>Impossible): | No condensate is discharged. The product is quiet and makes no noise, 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.

Gaskets: Check for warping or scratches

Screen: Check for clogging or corrosion

Bimetal Plate: Check for damage

Air Vent Valve Plug: Check for damage

Air Vent Valve Seat: Check for scratches

Air Vent Case: Check for damage

Float: Check for scratches or dents

Body Interior: Check for build-up of scale

Orifice Opening: Check dirt, oil film, wear and damage

# Disassembly/Reassembly



## 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.

**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.

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.)

## Drain Plug

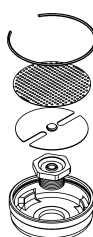
| Part Name & No.      | During Disassembly                           | During Reassembly                                                        |
|----------------------|----------------------------------------------|--------------------------------------------------------------------------|
| Drain Plug 24        | Remove with a socket wrench                  | Consult the table of tightening torques and tighten to the proper torque |
| Drain Plug Gasket 23 | Remove the gasket and clean sealing surfaces | Replace with a new gasket; coat surfaces with anti-seize                 |

## Detaching/Reattaching the Cover

| Part Name & No. | During Disassembly                           | During Reassembly                                                                                                        |
|-----------------|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Cover Nut 12    | Remove with a socket wrench                  | Consult the table of tightening torques and tighten to the proper torque                                                 |
| Cover 2         | Remove by lifting up and off                 | Make sure there are no pieces of the old gasket left on the sealing surfaces and then reattach, lining up the connector. |
| Connector 20    | Remove the connector                         | Reinsert into the hole in the gasket/body                                                                                |
| Cover Gasket 10 | Remove the gasket and clean sealing surfaces | Replace with a new gasket and insert, lining up with the connector hole                                                  |

## Disassembly/Reassembly of Components Inside the Cover

| Part Name & No.                                                       | During Disassembly                                           | During Reassembly                                                       |
|-----------------------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------------------|
| Snap Ring 13<br>(Air Vent Case 14)                                    | Pinch the insides together and remove from the air vent case | Insert securely into the groove in the air vent case                    |
| Air Vent Screen 16                                                    | Remove, being careful not to misshape                        | Replace, being careful not to misshape                                  |
| Bimetal Unit<br>(Bimetal Plate 15/<br>Snap Ring 19/<br>Valve Plug 18) | Remove air vent parts from cover                             | Make sure to reinsert in the proper orientation                         |
| Air Vent Valve Seat 17                                                | Remove with a socket wrench                                  | Consult the table of tightening torque and tighten to the proper torque |
| Air Vent Case 14                                                      | Remove from the cover                                        | Place it in the cover                                                   |



## Disassembly/Reassembly of Components Inside the Body

| Part Name & No.       | During Disassembly                                        | During Reassembly                                                               |
|-----------------------|-----------------------------------------------------------|---------------------------------------------------------------------------------|
| Screen 8              | Pull straight up and off                                  | Set the screen on the screen holder                                             |
| Screen Holder 9       | Remove without bending                                    | Place on the ledge inside the body, making sure that the rounded side is on top |
| Float 3               | Remove, being careful not to scratch the polished surface | Insert, being careful not to scratch the polished surface                       |
| Orifice Plug 6        | Remove with a wrench                                      | Consult the table of tightening torques and tighten to the proper torque        |
| Orifice Plug Gasket 7 | Remove the gasket and clean sealing surfaces              | Replace with a new gasket; coat surfaces with anti-seize                        |
| Orifice 4             | Remove with a socket wrench                               | Consult the table of tightening torques and tighten to the proper torque        |
| Orifice Gasket 5      | Remove the gasket and clean sealing surfaces              | Replace with a new gasket; coat surfaces with anti-seize                        |

## Table of Tightening Torques

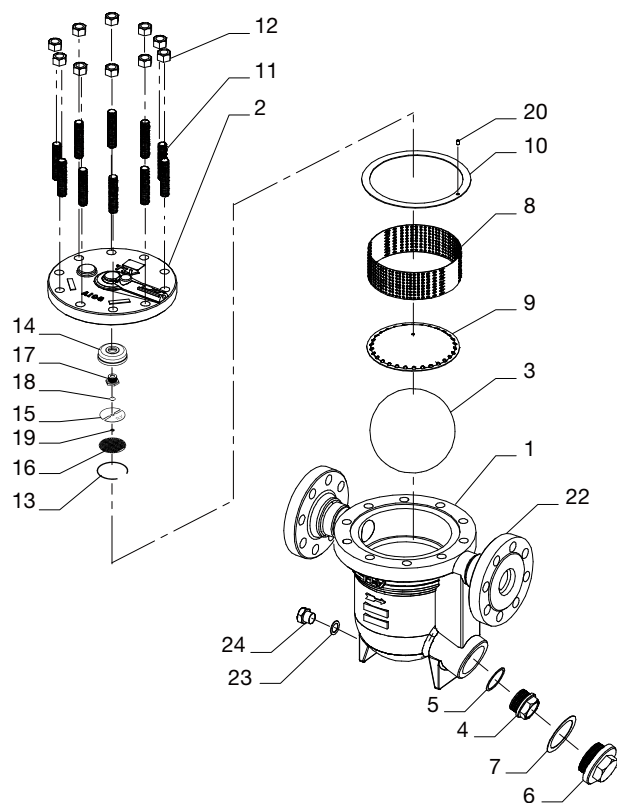
| Part Name & No.        | Torque<br>N·m | Distance Across Flats<br>mm |
|------------------------|---------------|-----------------------------|
| Cover Nut 12           | 150           | 24                          |
| Air Vent Valve Seat 17 | 30            | 19                          |
| Orifice Plug 6         | 700           | 46                          |
| Orifice 4              | 350           | 38                          |
| Drain Plug 24          | 100           | 26                          |



### Note

- 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.

Exploded View



| No. | Part Name           | No. | Part Name               |
|-----|---------------------|-----|-------------------------|
| 1   | Body                | 13  | Snap Ring               |
| 2   | Cover               | 14  | Air Vent Case           |
| 3   | Float               | 15  | Bimetal Plate           |
| 4   | Orifice             | 16  | Air Vent Screen         |
| 5   | Orifice Gasket      | 17  | Air Vent Valve Seat     |
| 6   | Orifice Plug        | 18  | Air Vent Valve Plug     |
| 7   | Orifice Plug Gasket | 19  | Snap Ring               |
| 8   | Screen              | 20  | Connector               |
| 9   | Screen Holder       | 21  | Nameplate <sup>01</sup> |
| 10  | Cover Gasket        | 22  | Flange/Socket           |
| 11  | Cover Bolt          | 23  | Drain Plug Gasket       |
| 12  | Cover Nut           | 24  | Drain Plug              |

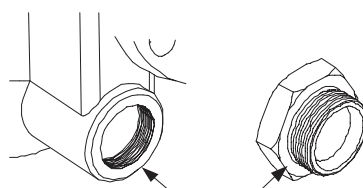
<sup>01</sup>Not shown

# Instructions for Plug/Holder Disassembly and Reassembly

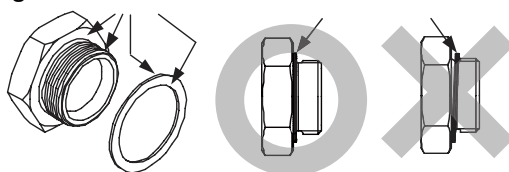
The seal on the threaded plugs/holders found on TLV products is formed by a flat metal gasket. There are various installation orientations for the gaskets, such as horizontal, diagonal and downward, and the gasket may be pinched in the thread recesses during assembly.

## Instructions for Disassembly and Reassembly

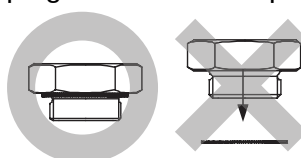
1. Remove the plug/holder using a tool of the specified size (distance across flats).
2. The gasket should not be reused. Be sure to replace it with a new gasket.
3. Clean the gasket surfaces of the plug/holder and the product body using a rag and/or cleaning agents, then check to make sure the surfaces are not scratched or deformed.



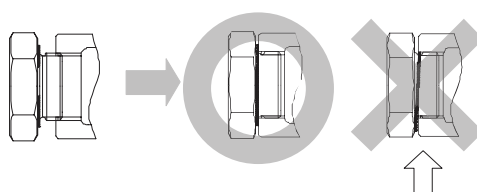
4. Coat both the gasket surface of the plug/holder and the threads of the plug/holder with anti-seize, then press the gasket onto the center of the gasket surface of the plug/holder, making sure the anti-seize affixes the gasket tightly to the plug/holder. Check to make sure the gasket is not caught in the recesses of the threads.



5. Hold the plug/holder upside down to make sure that the anti-seize makes the gasket stick to the plug/holder even when the plug/holder is held upside down.



6. Screw the plug/holder by hand into the product body while making sure that the gasket remains tightly affixed to the center of the gasket surface of the plug/holder. Make sure the entire gasket is making contact with the gasket surface of the product body. It is important at this point to make sure the gasket is not pinched in the thread recesses of the plug/holder.



7. Tighten the plug/holder to the proper torque.
8. Next, begin the supply of steam and check to make sure there is no leakage from the part just tightened. If there is leakage, immediately close the inlet valve and, if there is a bypass valve, take the necessary steps to release any residual pressure. After the surface of the product cools to room temperature, repeat the procedure beginning from step 1.

# 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.

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 float is damaged or filled with condensate                                                                                                                     | Replace with a new float                                                                 |
|                                                                        | The orifice opening, screen or piping are clogged with rust and scale                                                                                              | Clean parts                                                                              |
|                                                                        | Steam-locking has occurred                                                                                                                                         | Perform a bypass blowdown or close the product inlet valve and allow the product to cool |
|                                                                        | Air binding has occurred (air vent valve seat is blocked or bimetal plate is damaged)                                                                              | Clean the valve seat or replace with a new bimetal unit                                  |
|                                                                        | The product operating pressure exceeds the maximum specified pressure, or whether 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) | Build-up on the seating surface of the orifice or rust and scale build-up beneath the float                                                                        | Clean parts                                                                              |
|                                                                        | The orifice is scratched or damaged                                                                                                                                | Replace with a new orifice                                                               |
|                                                                        | The float is misshapen or has a build-up                                                                                                                           | Clean or replace with a new float                                                        |
|                                                                        | Improper installation orientation                                                                                                                                  | Correct the installation                                                                 |
|                                                                        | Product vibration                                                                                                                                                  | Lengthen the inlet piping and fasten it securely                                         |
|                                                                        | The bimetal air vent valve surface and/or the air vent valve seat has a build-up or is scratched                                                                   | Clean or replace with a new bimetal and/or air vent valve seat                           |
|                                                                        | The bimetal is damaged                                                                                                                                             | Replace with a new bimetal                                                               |
| Steam is leaking from a place other than the outlet                    | Gasket deterioration or damage                                                                                                                                     | Replace with new gasket(s)                                                               |
|                                                                        | Improper tightening torques were used                                                                                                                              | Tighten to the proper torque                                                             |
| Float frequently becomes damaged                                       | Water hammer has occurred                                                                                                                                          | Study and correct the piping                                                             |

**Note**

When replacing parts with new, use the parts list for reference, and replace with parts from the Maintenance kit, Repair kit, etc. Please note that replacement parts are only available as part of a replacement parts kit.

# 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**

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#### **TLV EURO ENGINEERING UK LTD.**

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#### **TLV EURO ENGINEERING FRANCE SARL**

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#### **TLV ENGINEERING S. A. DE C.V.**

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#### **TLV SHANGHAI CO., LTD.**

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#### **TLV ENGINEERING SDN. BHD.**

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#### **TLV ENGINEERING FZCO**

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### In Other Countries:

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

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

### Manufacturer:

#### **TLV CO., LTD.**

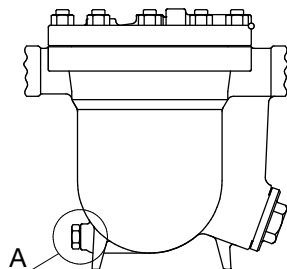
881 Nagasuna, Noguchi, Kakogawa, Hyogo 675-8511, **Japan**

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

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

## Options

The options shown below are available for this product on request. Please compare with the product you received.



### Options for Area A (standard: with drain plug)

Without Drain Plug

