

ISO 9001
ISO14001



Manufacturer

TLV CO., LTD.

Kakogawa, Japan

is approved by LRQA Ltd. to ISO 9001:2001



Instruction Manual

Free Float Steam Trap

Featured Models: J3B/JF3B

172-65173M-06

Publication date 22 May 2024

Copyright © 2024 TLV CO., LTD.

Table of Contents

Introduction 3

Safety Considerations 4

Checking the Piping 6

Operation 7

Specifications 9

Configuration 10

Installation 11

Maintenance 12

Lock Release Valve 14

Disassembly/Reassembly 15

Troubleshooting 18

TLV EXPRESS LIMITED WARRANTY 19

Service 21

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 is suitable for condensate discharge from process and steam-using equipment. It automatically and continuously discharges the inflowing condensate that is continuously generated by the steam-using equipment, preventing the collection of condensate and thereby improving the heat transfer efficiency of the equipment.

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

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

Use heat-resistant gloves when operating the lock release valve and keep all body parts well clear of the product. Failure to do so could result in burns, other injury or damage from the blowing of small amounts of steam and condensate.

**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.

Checking the Piping

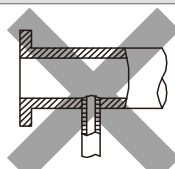
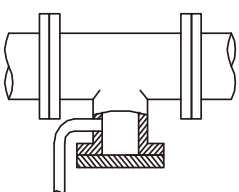
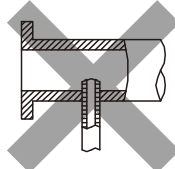
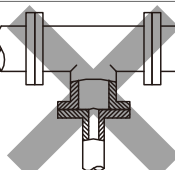
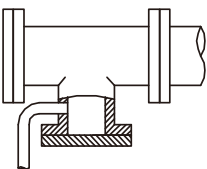
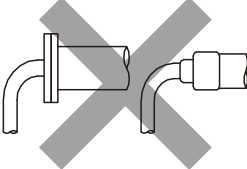


Caution

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 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 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?

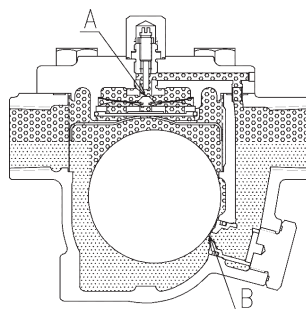
Requirement	Correct	Incorrect
Install catchpot with the proper diameter.		 Diameter is too small.
Make sure the flow of condensate is not obstructed.		 Diameter is too small and inlet protrudes into pipe interior.
To prevent rust and scale from flowing into the product, the inlet pipe should be connected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

Operation

Principles of air and condensate discharge:

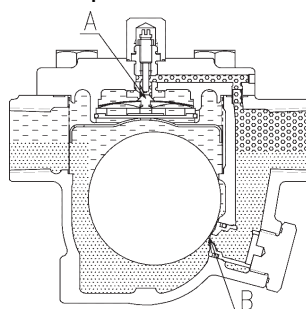
1. Start-up air and cold condensate discharge

At start-up, before steam is supplied the system is cold and the bimetal plate is flexed downward, keeping the air vent valve (A) open. This allows for the rapid discharge of air through the vent (A) and cold condensate through the orifice (B) when steam is first supplied to the system.



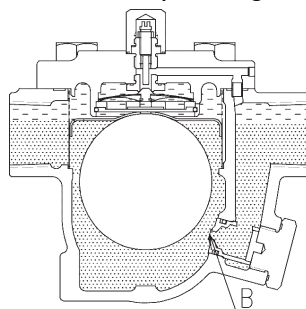
2. Condensate discharge

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 rising condensate level causes the float to rise due to buoyancy, opening the orifice (B) and allowing condensate to be discharged. The flexed bimetal plate keeps the vent closed and will not open again during normal operation.



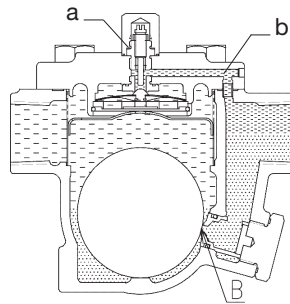
3. Discharge of large quantities of condensate

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 while the opening size of the orifice varies depending on the condensate flow rate.

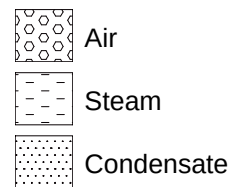


4. Closed position

When the condensate flow rate decreases, the float falls, closing off the orifice (B) opening. A water seal is maintained at all times over the orifice (B) to prevent steam loss. On equipment where steam-locking or air-binding tends to occur, system integrity can be maintained by operating the properly adjusted lock release valve (a).



(b): Flash Steam



Specifications



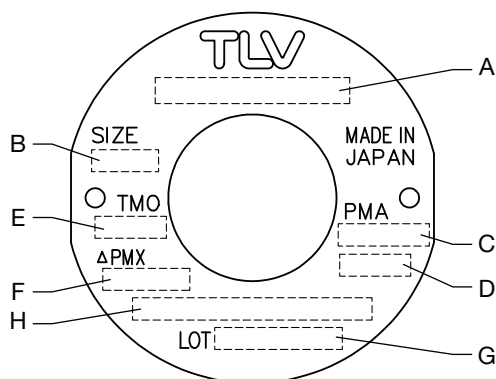
Caution

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.

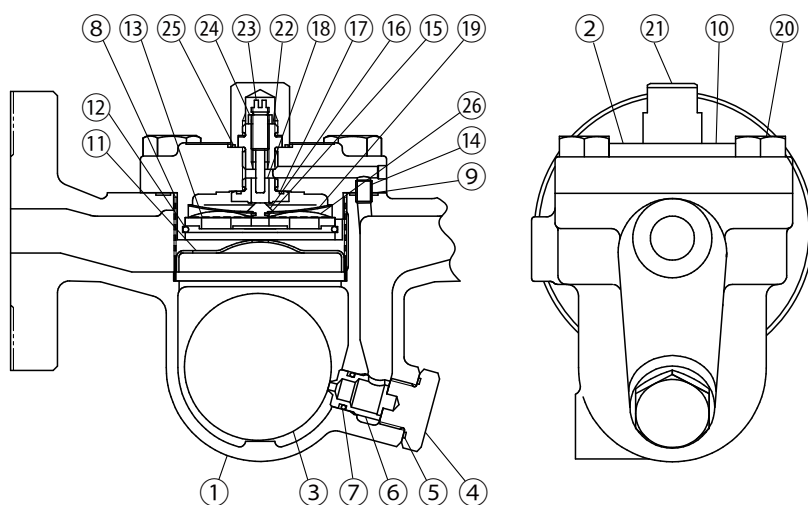


A	Model	E	Maximum Operating Temperature (TMO)
B	Nominal Diameter	F	Maximum Differential Pressure (PMX)
C	Maximum Allowable Pressure (PMA) ⁰¹	G	Production Lot No.
D	Maximum Allowable Temperature (TMA) ⁰¹	H	Valve No. ⁰²

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

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

Configuration



JF3B shown; J3B has screwed connections

No.	Part Name	No.	Part Name
1	Body	14	Connector
2	Cover	15	Snap Ring
3	Float	16	Air Vent Valve Plug
4	Orifice Holder Plug	17	Air Vent Valve Seat Gasket
5	Orifice Plug Gasket	18	Air Vent Valve Seat
6	Orifice	19	Bimetal Plate
7	Orifice O-Ring	20	Cover Bolt
8	Screen	21	Cap Nut
9	Cover Gasket	22	Valve Holder
10	Nameplate	23	Valve Push Rod
11	Float Cover	24	Lock Nut
12	Snap Ring	25	Cap Nut Gasket
13	Air Vent Cover	26	Wave Spring

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.

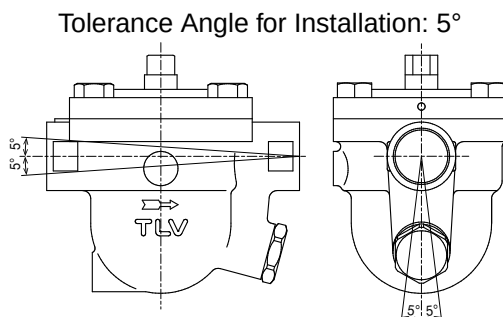
Take measures to prevent people from coming into direct contact with product outlets. Failure to do so may result in burns or other injury from the discharge of fluids.

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.

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, blow out the inlet 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 should 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 check to make sure 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.

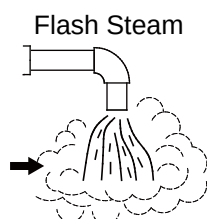
If the product should fail, it may cause damage to piping and equipment, resulting in faulty or low quality products or losses due to steam leakage.

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.

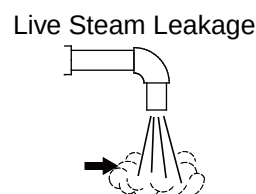
Blocked (Discharge Impossible): No condensate is discharged. The product is quiet and makes no noise, and the surface temperature of the product is low.

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.



White jet containing water droplets



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

O-Ring: Check for warping or scratches

Screen: Check for clogging or corrosion

Bimetal Plate: Check for scratches

Air Vent Valve Plug: Check for scratches

Air Vent Valve Seat: Check for scratches

Float: Check for scratches or dents

Body Interior: Check for build-up

Orifice Opening: Check for dirt, oil film wear or scratches

Lock Release Valve



Caution

Use heat-resistant gloves when operating the lock release valve and keep all body parts well clear of the product. Failure to do so could result in burns, other injury or damage from the blowing of small amounts of steam and condensate.

Use on equipment where steam-locking or air-binding, which slows the discharge of condensate and reduce equipment efficiency, tends to occur (cylindrical dryers, air fin heater, etc.).

Operating Instructions for lock release valve

Remove the cap nut.

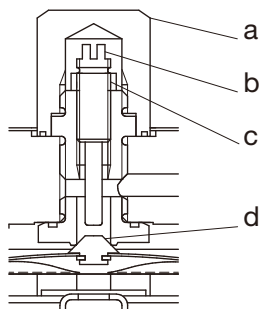
Loosen the lock nut slightly and screw the valve push rod in 1.5 turns clockwise. This causes the tip of the valve push rod to come into contact with the air vent valve plug. Further turning the valve push rod causes the air vent valve to open.

Adjust the degree of opening as necessary (clockwise: increase opening; counterclockwise: decrease opening).

After adjustment, be sure to retighten the lock nut.

Reattach the cap nut.

1. While use of the lock release valve eliminates the problem of steam-locking and improves heat transfer efficiency, a small amount of steam is lost.
2. When the product is shipped from the factory, the lock release valve is in the position indicated in figure right, and does not operate. To operate, adjust according to the procedure outlined in the "Operation" section above.



a: Cap Nut
b: Valve Push Rod
c: Lock Nut
d: Air Vent Valve Plug

Part Name	Tools Required	Torque N·m	Blade thickness mm	Distance across flats mm
Valve Push Rod	Flat-head screwdriver	—	max.1.2	—
Lock Nut	Wrench	10	—	8
Cap Nut	Wrench	15	—	17

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

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.

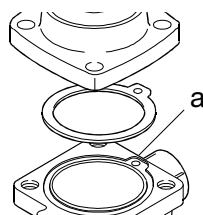
(Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.)

Drain Plug (Option)

Part Name	During Disassembly	During Reassembly
Drain Plug	Remove with a socket wrench	Consult the table of tightening torques and tighten to the proper torque
Drain Plug Gasket	Remove the gasket and clean sealing surfaces	Replace with a new gasket; coat surfaces with anti-seize

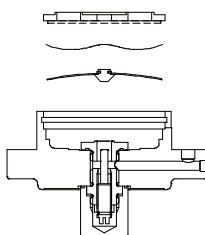
Detaching/Reattaching the Cover

Part Name & No.	During Disassembly	During Reassembly
Cover Bolt 20	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	Reattach, lining up the connector
Connector 14	Remove the connector	Insert into the hole (a) in the body
Cover Gasket 9	Remove the gasket and clean sealing surfaces	Replace with a new gasket



Disassembly/Reassembly of Components Inside the Cover

Part Name & No.	During Disassembly	During Reassembly
Snap Ring 12	Pinch the insides together and remove from the cover	Insert securely into the groove
Air Vent Cover 13	Remove from the cover	Set in cover with the proper orientation
Wave Spring 26	Remove	Insert securely into the groove
Bimetal Plate 19 Air Vent Valve Plug 16 Snap Ring 15	Remove the air vent parts from cover	Make sure to reinsert in the proper orientation
Air Vent Valve Seat 18	Remove with a socket wrench	Consult the table of tightening torques and tighten to the proper torque
Air Vent Valve Seat Gasket 17	Remove the gasket and clean sealing surfaces	Replace with a new gasket if warped or damaged



Disassembly/Reassembly of the Lock Release Valve

Part Name & No.	During Disassembly	During Reassembly
Cap Nut 21	Remove with a wrench	Consult the table of tightening torques and tighten to the proper torque
Cap Nut Gasket 25	Remove the gasket and clean sealing surfaces	Replace with a new gasket only if misshapen or damaged
Valve Holder 22	Remove with a wrench	Consult the table of tightening torques and tighten to the proper torque
Lock Nut 24	Remove with a wrench	Consult the table of tightening torques and tighten to the proper torque
Valve Push Rod 23	Remove with a flat-head screw driver	Screw into the valve holder; be careful not to screw in far enough to prevent the air vent valve from closing

Disassembly/Reassembly of Components Inside the Body

Part Name & No.	During Disassembly	During Reassembly
Float Cover 11 Screen 8	Lift straight up and out while gently rocking	Align the arrows (a) on the float cover/screen and body and insert the tab (b) on the bottom of the float cover/screen into the slot in the body; make sure the top of the screen does not stick up out of the body (Fig. A)
Float 3	Remove, being careful not to scratch the polished surface	Insert, being careful not to scratch the polished surface
Orifice Holder Plug 4	Remove with a socket wrench	Consult the table of tightening torques and tighten to the proper torque
Orifice Plug Gasket 5	Remove the gasket and clean sealing surfaces	Replace with a new gasket; coat surfaces with anti-seize
Orifice 6	Remove with a socket wrench	Insert with the proper orientation (Fig. B): insert from the outside, pushing in until it contacts the stopper inside; if the condensate discharge hole is pointing sideways, extended use may result in a hole in the body
Orifice O-Ring 7	Remove, being careful not to damage the rubber orifice O-ring	Replace with a new o ring; coat with heat resistant grease

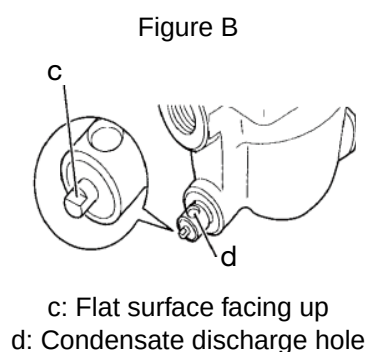
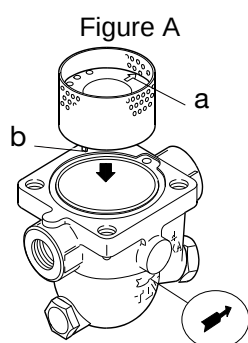


Table of Tightening Torques

Part Name & No.	Torque N·m	Distance Across Flats mm
Orifice Holder Plug 4	50	24
Drain Plug (option)	50	21
Air Vent Valve Seat 18	30	17
Cover Bolt 20	50	17
Cap Nut 21	15	17
Valve Holder 22	20	14
Lock Nut 24	10	8



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.

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
	The bimetal plate is damaged	Replace with a new bimetal plate
	Steam-locking has occurred	Operate the lock release valve
	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)	The orifice opening is clogged or there is 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 buildup	Clean or replace float
	Improper installation orientation	Correct the installation
	Product vibration	Lengthen inlet piping and fasten securely
	The air vent valve plug and/or the air vent valve seat has buildup or is scratched	Clean or replace the air vent valve plug/ bimetal plate and/or the air vent valve seat
	The bimetal plate is damaged	Replace with a new bimetal plate
	The lock release valve is holding the air vent valve plug open	If steam-binding had occurred, this is normal; otherwise adjust the lock release valve to allow the air vent to close
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

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**

TLV EURO ENGINEERING UK LTD.

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

TLV EURO ENGINEERING FRANCE SARL

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

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

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

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.**

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: [1]-704-597-9070

Fax: [1]-704-583-1610

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

TLV SHANGHAI CO., LTD.

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

Tel: [65]-6747 4600

Fax: [65]-6742 0345

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 9W, B163, 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