

ISO 9001
ISO14001



Manufacturer

TLV CO., LTD.

Kakogawa, Japan

is approved by LRQA Ltd. to ISO 9001:2001



Instruction Manual

Thermodynamic Steam Trap
PowerDyne.

Featured Model: P46S

172-65563MJ-05

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Table of Contents

- Introduction 3
- Safety Considerations 4
- Checking the Piping 6
- Specifications 7
- Configuration 8
- Operation 9
- Installation 10
- Maintenance 11
- Disassembly/Reassembly 12
- Instructions for Plug/Holder Disassembly and Reassembly 14
- Troubleshooting 15
- TLV EXPRESS LIMITED WARRANTY 16
- Service 18
- Options 19

Introduction

Thank you for purchasing the TLV PowerDyne 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 thermodynamic steam trap employs an air-jacketed pressure chamber that prevents no-load actuation and steam loss in general.

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



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

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. Has sufficient space been secured for maintenance?
3. 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?
4. 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?
5. 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.

Specifications

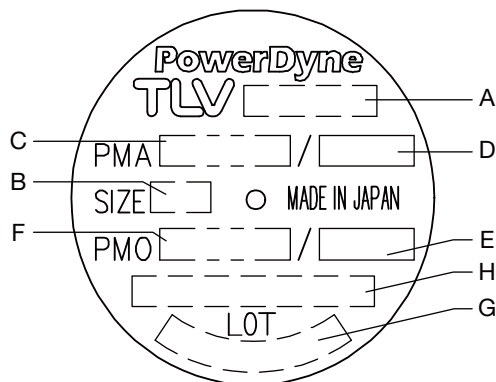


Caution

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	E	Maximum Operating Temperature (TMO)
B	Nominal Diameter	F	Maximum Operating Pressure (PMO) ⁰¹
C	Maximum Allowable Pressure (PMA) ⁰²	G	Production Lot No.
D	Maximum Allowable Temperature (TMA) ⁰²	H	Valve No. ⁰³

⁰¹For best performance over extended periods, it is recommended that the trap be operated at or below 2.1 MPaG.

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

⁰³Valve No. is displayed for products with options. This item is omitted from the nameplate when there are no options.

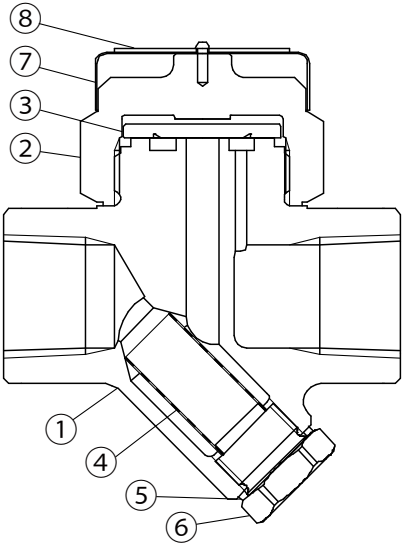


Note

Minimum Operating Pressure: 0.03 MPaG

Maximum Allowable Back Pressure: 50% of the inlet pressure

Configuration



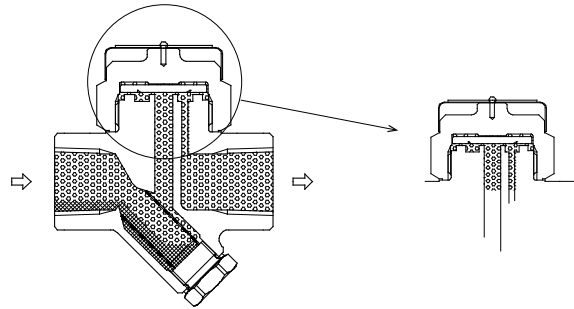
No.	Part Name	M ⁰¹	R ⁰¹
1	Body		
2	Cover		✓
3	Disc		✓
4	Screen		✓
5	Screen Holder Gasket	✓	✓
6	Screen Holder		
7	Cap		✓
8	Nameplate		✓

⁰¹Replacement parts are available only in the following kits: M = Maintenance Kit, R = Repair Kit

Operation

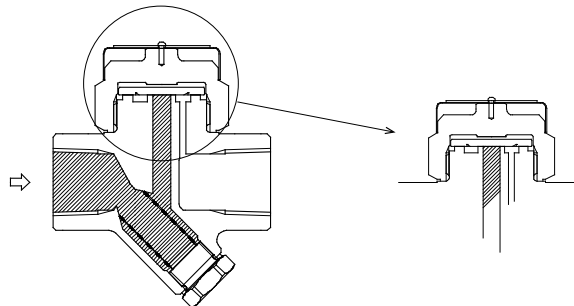
1. Start-up: Discharge of Initial Air and Cold Condensate

At start-up, the flow of large quantities of initial air and cold condensate lift the disc off the seat, thus opening the valve. This allows for the rapid discharge of initial air and cold condensate.



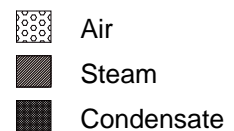
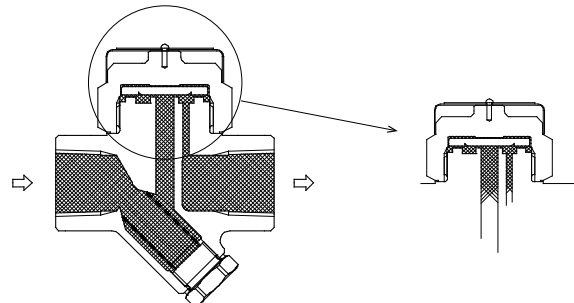
2. Steam Enters, Valve Closes

The rapid influx of steam creates a low-pressure region under the disc, which suctions it onto the seat. The pressure chamber above the disc becomes a high-pressure region when entering steam is compressed. This difference in the pressures above and below the disc gives the closed valve a tight seal.



3. Condensate Discharge

When condensate enters the trap, the temperature in the pressure chamber drops, causing the steam to condense and the pressure to drop. The inlet pressure, which is now greater than the pressure pushing down on the disc, opens the valve, thus allowing condensate to be discharged. When steam again enters the trap, the valve closes, as in step 2. In this manner, condensate is automatically and intermittently discharged as the valve opens and closes.



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, 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 may be installed either horizontally or vertically; there are no restrictions on the orientation of installation. (Fix the product securely in place.)
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.

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.

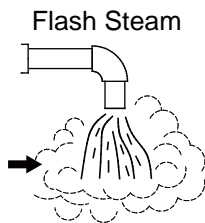
Be sure to use only the recommended components when repairing the product, and NEVER attempt to modify the product in any way. Failure to observe these precautions may result in damage to the product and burns or other injury due to malfunction or the discharge of fluids.

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.

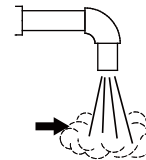
If the product should fail, it may cause damage to piping and equipment, resulting in faulty or low quality products or losses due to steam leakage.

Normal:	Condensate is discharged intermittently together with flash steam, and the sound of flow can be heard.
Blocked (Discharge Impossible):	No condensate is discharged. 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

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

Disc: Check for scratches or wear

On-body Valve Seat Surface: Check for scratches or wear

Check for build-up inside the body

Disassembly/Reassembly



Caution

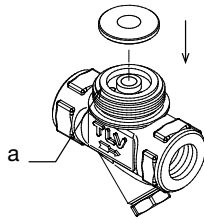
When disassembling or removing the product, wait until the internal pressure equals atmospheric pressure and the surface of the product has cooled to room temperature. Disassembling or removing the product when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries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

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.)

Removing/Reattaching the Cover and its Components

Part Name & No.	During Disassembly	During Reassembly
Cover 2	Remove with a socket wrench (The cap is not removable as it is riveted to the cover)	Consult the table of tightening torques and tighten to the proper torque
Disc 3	Remove, being careful not to scratch the lapped surface (a)	Make sure that the seat surface (lapped side with larger groove) is facing down toward the valve seat



Disassembly/Reassembly of Components Inside the Body

Part Name & No.	During Disassembly	During Reassembly
Screen Holder 6	Remove with a socket wrench	Consult the table of tightening torques and tighten to the proper torque
Screen Holder Gasket 5	Remove the gasket and clean sealing surfaces	Replace with a new gasket; coat surfaces with anti-seize
Screen 4	Remove without bending	Reinsert without bending

Table of Tightening Torques

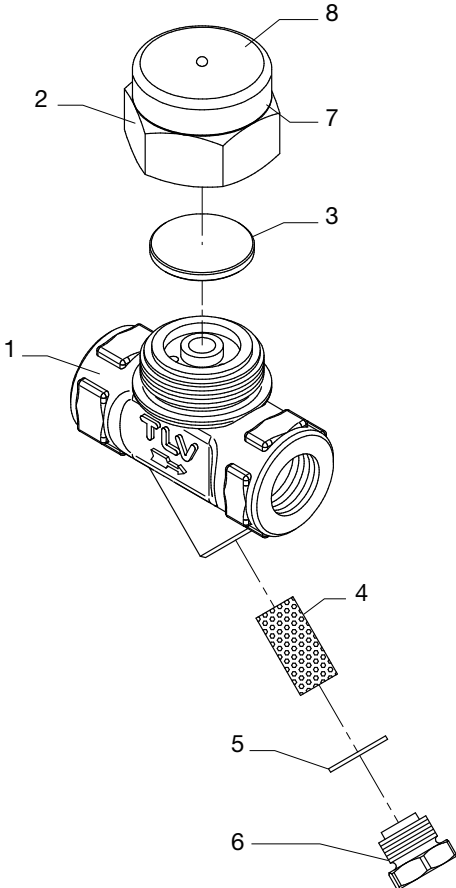
Part Name & No.	Torque N·m	Distance Across Flats mm
Cover 2	120	36
Screen Holder 6	40	17



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



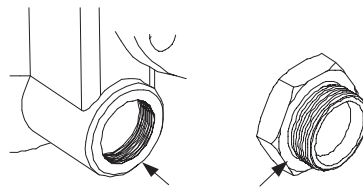
No.	Part Name	No.	Part Name
1	Body	5	Screen Holder Gasket
2	Cover	6	Screen Holder
3	Disc	7	Cap
4	Screen	8	Nameplate

Instructions for Plug/Holder Disassembly and Reassembly

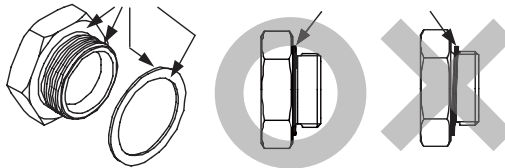
The seal on the threaded plugs/holders found on TLV products is formed by a flat metal gasket. There are various installation orientations for the gaskets, such as horizontal, diagonal and downward, and the gasket may be pinched in the thread recesses during assembly.

Instructions for Disassembly and Reassembly

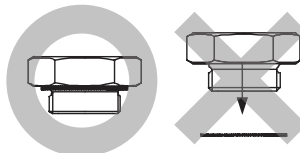
1. Remove the plug/holder using a tool of the specified size (distance across flats).
2. The gasket should not be reused. Be sure to replace it with a new gasket.
3. Clean the gasket surfaces of the plug/holder and the product body using a rag and/or cleaning agents, then check to make sure the surfaces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



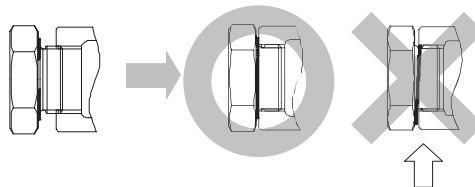
4. Coat both the gasket surface of the plug/holder and the threads of the plug/holder with anti-seize, then press the gasket onto the center of the gasket surface of the plug/holder, making sure the anti-seize affixes the gasket tightly to the plug/holder. Check to make sure the gasket is not caught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



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	Module valve seat, screen or piping are clogged with rust or scale	Clean parts
	Disc is stuck to the module valve seat	Clean parts
	Air binding has occurred	Perform a bypass blowdown, or close the inlet valve and allow the product to cool
	Steam-locking has occurred	Perform a bypass blowdown, or close the inlet valve and allow the product to cool. Piping correction may also be required.
	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)	Rust or scale on the disc or on the module valve seat	Clean parts
	Disc damage or wear	Replace with a new disc
	On-body valve seat damage or wear	Replace with a new product
	Improper installation	Correct the installation
	Product vibration	Lengthen the inlet piping and fasten it securely
	The product operating pressure is less than the minimum specified pressure or the back pressure exceeds the allowable back pressure	Compare specifications and actual operating conditions
Steam leaks 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



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.

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Options

With Blowdown Valve (TLV BD1)



Caution

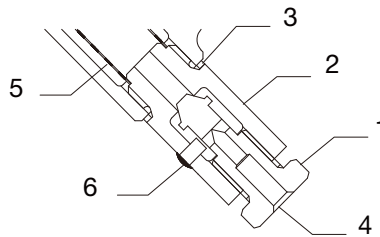
Always wear eye protection and heat-resistant gloves when operating the blowdown valve. Failure to do so may result in burns or other injury.

When operating the blowdown valve, stand to the side well clear of the outlet to avoid contact with internal fluids that will be discharged. Operate the valve slowly and surely, taking care to avoid the area from which internal fluids are discharged and any fluids deflected off piping or the ground etc. Failure to do so may result in burns or other injury.

Do not tighten the BD1 valve or the BD1 valve seat in excess of the appropriate tightening torque. Over tightening may cause breakage to threaded portions, which may cause burns, other injuries or damage.

Do not excessively loosen the BD1 valve when opening the blowdown valve. The valve stopper pin installed to prevent the BD1 valve from being removed may break and internal pressure may result in the BD1 valve being blown off, leading to injuries, damage and fluid discharge, causing burns.

Configuration



No.	Part Name	Torque N·m	Distance Across Flats mm
1	BD1 Valve	11	14
2	BD1 Valve Seat (Screen Holder)	40	17
3	Screen Holder Gasket	—	—
4	Discharge Hole	—	—
5	Screen	—	—
6	Valve Stopper Pin	—	—



Note

Avoid the use of excessive tightening torques, as threaded parts may become damaged.

TLV Blowdown Valve: BD1

The BD1 Blowdown Valve, installed in the screen area of the body, uses the trap's internal pressure to blow any condensate, steam, dirt or scale accumulated around the screen area out to the atmosphere.

BD1 Blowdown Valve Operation

1. The BD1 valve is in the closed position when the BD1 is shipped from the factory. Before attempting to operate the BD1, reconfirm that the BD1 valve is still in the closed position. Locate the blow outlet and, during operation, stand to the side and well clear of it, as the jet of condensate or steam could cause burns.
2. Remain in the area the entire time the BD1 valve is in the open position. Before opening the BD1 valve, grip the BD1 valve seat with a wrench and hold firmly in place so that it will not rotate when the BD1 valve is loosened. Grip the BD1 valve with another wrench and slowly loosen. Condensate and steam will discharge from the blow outlet in a jet stream. Be careful not to loosen the BD1 valve so far that it becomes removed from the BD1 valve seat. (If the grooved pin becomes damaged, large quantities of steam will be discharged in a jet stream.)
3. Close the BD1 valve until the flow of fluid completely stops. If the flow of fluid does not stop, re-open the BD1 valve (as in step "2") to blow out any scale or dirt that may be caught in the BD1. Re-tighten the BD1 valve until the flow of fluid stops completely.