TLV BALANCED PRESSURE
THERMOSTATIC STEAM TRAPS
LV SERIES

LV5 / LV13 / LV13L / LV13N / LV21

Manufacturer
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Introduction
Before beginning installation or maintenance, please read this manual to ensure correct usage of the product. Keep the manual in a safe place for future reference.

The LV Series steam traps can be used without adjustment for medium capacity applications up to 0.5, 1.3, or 2.1 MPaG (75, 185, or 300 psig). These models are suitable for steam-using equipment that discharges condensate at temperatures slightly below saturation temperature, such as tracer lines, vessels and heaters.

1 MPa = 10.197 kg/cm², 1 bar = 0.1 MPa

For products with special specifications or with options not included in this manual, contact TLV for instructions.

The contents of this manual are subject to change without notice.

1. 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.

⚠ Indicates a DANGER, WARNING or CAUTION item.

⚠ DANGER Indicates an urgent situation that 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.

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, which 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.

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.

Continued on next page
2. Specifications

Refer to the product nameplate for detailed specifications.

A Model
B Nominal Diameter
C Maximum Allowable Pressure*
D Maximum Allowable Temperature* TMA
E Maximum Operating Pressure
F Maximum Operating Temperature TMO
G Production Lot No.
H Valve No.**
I Type of X-element

* Maximum allowable pressure (PMA) and maximum allowable temperature (TMA) are PRESSURE SHELL DESIGN CONDITIONS, NOT OPERATING CONDITIONS.
** "Valve No." is displayed for products with options. This item is omitted from the nameplate when there are no options.
Maximum Operating Temperature (stainless steel models)

To avoid malfunctions, product damage, accidents or serious injury, install properly and DO NOT use this product outside the specification range. Local regulations may restrict the use of this product to below the conditions quoted.

3. Configuration

LV5 (Stainless Steel)
LV21

LV5 (Brass)
LV13

LV13N

LV13L

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>R*</th>
<th>No.</th>
<th>Description</th>
<th>R*</th>
<th>No.</th>
<th>Description</th>
<th>R*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Body</td>
<td></td>
<td>4</td>
<td>Valve Seat**</td>
<td>✔</td>
<td>7</td>
<td>Spring Clip</td>
<td>✔</td>
</tr>
<tr>
<td>2</td>
<td>Cover</td>
<td></td>
<td>5</td>
<td>Screen</td>
<td>✔</td>
<td>8</td>
<td>Cover Gasket</td>
<td>✔</td>
</tr>
<tr>
<td>3</td>
<td>X-element</td>
<td>✔</td>
<td>6</td>
<td>Nameplate</td>
<td></td>
<td>9</td>
<td>X-element Guide</td>
<td>✔</td>
</tr>
</tbody>
</table>

* R: Replacement parts only for LV13L and LV13N, available in this repair kit.
** For LV5, LV13 and LV21 the valve seat is pressed in the cover and not replaceable. Consult TLV if other parts are required.
4. Exploded View

LV5 / LV13  
(Brass)

LV5 / LV21  
(Stainless Steel)

Body

Screen

Spring Clip

X-element

Cover Gasket

Cover
4. Exploded View
(Continued)
5. Proper Installation

**CAUTION**

- Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.
- Take measures to prevent people from coming into direct contact with product outlets.
- Do not use excessive force when connecting threaded pipes.
- Install for use under conditions in which no freeze-up will occur.
- Install for use under conditions in which no water hammer will occur.

1. Before installation, be sure to remove all protective seals from product.
2. Install LV5, LV13, LV21 and LV13N either vertically or horizontally, but make sure the arrow on the product points in the direction of flow. LV13L should be installed horizontally in, vertically out. DO NOT install the traps upside down.
3. Before installing the steam trap, blow out the inlet piping to remove all dirt and oil.
4. Install a bypass valve to discharge condensate, and inlet and outlet valves to isolate the trap in the event of trap failure or when carrying out maintenance.
5. Install the trap in the lowest part of the pipeline or equipment so the condensate flows naturally downward into the trap by gravity. The inlet pipe should be as short and have as few bends as possible.
6. Install a check valve at the trap outlet whenever the condensate discharge pipe leads to a tank or recovery line, or whenever the condensate collection pipeline is connected to more than one trap.
7. In order to avoid excessive back pressure, make sure the discharge pipes are large enough (the outlet back pressure allowance should be no more than 90% of the inlet steam pressure).
8. The use of unions is recommended to facilitate connection and disconnection of the trap.
9. When completing the piping, support the pipes within 0.8 meters (2.5 ft) on either side of the trap.

6. Piping Arrangement

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

1. Has the piping work been done correctly, as shown on the next page?
2. Is the pipe diameter suitable?
3. Has the trap been installed with the arrow on the product pointing in the direction of flow?
4. Has sufficient space been secured for maintenance?
5. Have maintenance valves been installed at the inlet and outlet?
6. If the outlet is subject to back pressure, has a check valve been installed?
7. Is the inlet pipe as short as possible, with as few bends as possible, and installed so that the condensate will flow naturally down into the trap?
7. Operational Check

A visual inspection can be carried out to aid in determining the necessity for immediate maintenance or repair, if the trap is open to atmosphere. If the trap does not discharge to atmosphere, use diagnostic equipment such as TLV TrapMan or TLV Pocket TrapMan (within their pressure and temperature measurement range).

| Normal: | Condensate is discharged intermittently with flash steam and the sound of flow can be heard. |
| Blocked: (Discharge Impossible) | No condensate is discharged. The trap is quiet and makes no noise. The surface temperature of the trap is low. |
| Blowing: | Live steam continually flows from the outlet and there may be a high-pitched whistling sound. |
| Steam Leakage: | Live steam is discharged through the trap outlet together with the condensate and there may be a high-pitched whistling sound. |

(When conducting a visual inspection, flash steam is sometimes mistaken for steam leakage. For this reason, the use of a steam trap diagnostic instrument such as TLV TrapMan is highly recommended.)

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Correct</th>
<th>Incorrect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Install a catchpot with the proper diameter.</td>
<td>![Correct Diagram]</td>
<td>![Incorrect Diagram] Diameter is too small.</td>
</tr>
<tr>
<td>Make sure the flow of condensate is not obstructed.</td>
<td>![Correct Diagram]</td>
<td>![Incorrect Diagram] Diameter is too small and inlet protrudes into pipe.</td>
</tr>
<tr>
<td>To prevent rust and scale from flowing into the trap, connect the inlet pipe 25 - 50 mm (1 - 2 in) above the base of the T-pipe.</td>
<td>![Correct Diagram]</td>
<td>![Incorrect Diagram] Rust and scale flow into the trap with the condensate.</td>
</tr>
<tr>
<td>When installing on the blind end, make sure nothing obstructs the flow of condensate.</td>
<td>![Correct Diagram]</td>
<td>![Incorrect Diagram] Condensate collects in the pipe.</td>
</tr>
</tbody>
</table>

Flash Steam

- White jet containing water droplets

Live Steam Leakage

- Clear, slightly bluish jet
8. Inspection and Maintenance

Operational inspections should be performed at least twice per year, or as called for by trap operating conditions. Faulty steam traps may result in losses due to steam leakage. Follow the instructions below for disassembly and reassembly when cleaning or repair is necessary.

**CAUTION**

- Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.
- Before attempting to open the trap, close the inlet and outlet isolation valves and wait until the trap has cooled to room temperature. Failure to do so may result in burns or injury.
- LV13L and LV13N can be maintained without being removed from the pipeline, on the condition that the surrounding pipes are securely supported. If the pipes are not properly supported, they may be damaged when torque is applied in the loosening or tightening of the cover. Such damage could result in steam spraying out and causing serious injury.
- If using a vise when dismantling the trap, screw a nipple or pipe end into the outlet to prevent deformation of the threaded connection.
- Be sure to use the proper components and NEVER attempt to modify the product.

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### Parts Inspection Procedure

<table>
<thead>
<tr>
<th>Part &amp; No.</th>
<th>During Disassembly</th>
<th>During Reassembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasket</td>
<td>Check for warping or damage (brass models)</td>
<td></td>
</tr>
<tr>
<td>Screen</td>
<td>Check for clogging or corrosion damage</td>
<td></td>
</tr>
<tr>
<td>X-element</td>
<td>Check for rust, scale, oil film, wear or damage</td>
<td></td>
</tr>
<tr>
<td>Valve Seat</td>
<td>Check for rust, scale, oil film, wear or damage</td>
<td></td>
</tr>
<tr>
<td>Body, Cover</td>
<td>Check inside for rust and scale</td>
<td></td>
</tr>
</tbody>
</table>

**Disassembly/Reassembly** (to reassemble, follow procedures in reverse)

<table>
<thead>
<tr>
<th>Part &amp; No.</th>
<th>During Disassembly</th>
<th>During Reassembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover 2</td>
<td>Use an open-end wrench to remove</td>
<td>Clean seating surfaces; coat threaded portions of the stainless steel models with anti-seize; tighten to the proper torque</td>
</tr>
<tr>
<td>Cover Gasket 8</td>
<td>Remove carefully</td>
<td>Replace with a new gasket only if worn or damaged</td>
</tr>
<tr>
<td>(Brass models)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring Clip 7</td>
<td>Use pliers to remove</td>
<td>Insert securely into the 3 slots in the guide or cover (see Figure A, page 9)</td>
</tr>
<tr>
<td>X-element 3</td>
<td>Use pliers to grasp the ball at the tip of the element and remove</td>
<td>Insert with right side up; make sure it does not catch on guide or cover (see Figures A and B, page 9)</td>
</tr>
<tr>
<td>Valve Seat 4</td>
<td>Use a socket wrench to remove</td>
<td>Do not coat threaded portions with anti-seize, tighten to the proper torque</td>
</tr>
<tr>
<td>(LV13L, LV13N)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X-element Guide 9</td>
<td>Be careful not to bend the guide</td>
<td>Fix with Valve Seat and make sure the X-element can be inserted smoothly</td>
</tr>
<tr>
<td>(LV13L, LV13N)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Screen 5</td>
<td>Be careful not to bend the screen</td>
<td>Be careful not to bend the screen</td>
</tr>
</tbody>
</table>
9. Troubleshooting

If the expected performance is unachievable after installation of the steam trap, read the "Proper Installation" and "Piping Arrangement" chapters again, and check the following table for the appropriate corrective measures to be taken.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>No condensate is discharged (blocked) or discharge is poor</td>
<td>X-element is stuck to the valve seat</td>
<td>Clean</td>
</tr>
<tr>
<td></td>
<td>Valve seat is clogged</td>
<td>Clean</td>
</tr>
<tr>
<td></td>
<td>Screen is clogged with rust or scale</td>
<td>Clean</td>
</tr>
<tr>
<td></td>
<td>Steam-locking has occurred</td>
<td>Perform a bypass blowdown, or close the trap inlet valve and allow the trap to cool. Piping correction may also be required.</td>
</tr>
<tr>
<td></td>
<td>Trap operating pressure exceeds maximum specified operating pressure</td>
<td>Study inlet pressure</td>
</tr>
<tr>
<td></td>
<td>Differential pressure is insufficient</td>
<td>Study inlet / outlet pressure</td>
</tr>
<tr>
<td>Steam leakage or blow-off</td>
<td>Valve closure is obstructed by rust, etc</td>
<td>Clean (inspect screen as well)</td>
</tr>
<tr>
<td></td>
<td>X-element is worn or damaged</td>
<td>Replace X-element</td>
</tr>
<tr>
<td></td>
<td>Valve seat is worn or damaged</td>
<td>Replace valve seat (LV13L, LV13N) or cover</td>
</tr>
<tr>
<td></td>
<td>Improper installation</td>
<td>Correct the installation</td>
</tr>
<tr>
<td></td>
<td>Severe vibration of trap</td>
<td>Reinforce trap piping supports</td>
</tr>
<tr>
<td>Leakage from other location</td>
<td>Cover is loose or gasket is worn or damaged</td>
<td>Tighten cover or replace gasket</td>
</tr>
</tbody>
</table>

NOTE: When replacing parts with new, use the parts list on page 3 for reference, and replace with parts from the respective replacement parts kits.

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10. TLV® Express Limited Warranty

Subject to the limitations set forth below, TLV Corporation, a North Carolina corporation (“TLV”), warrants that products which are sold by it or TLV International, Inc., a Japanese corporation (“TII”), which products (the “Products”) are designed and manufactured by TLV Co., Ltd., a Japanese corporation (“TLVJ”), conform to the specifications published by TLV for the corresponding part numbers (the “Specifications”) and are free from defective workmanship and materials. 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).

Duration Of Warranty

This warranty is effective for a period of the earlier of: (i) three (3) years after delivery of Products to the first end user in the case of sealed SST-Series Products for use in steam pressure service up to 650 psig; (ii) two (2) years after delivery of Products to the first end user in the case of PowerTrap® units; or (iii) one (1) year after delivery of Products to the first end user in the case of all other Products. Notwithstanding the foregoing, asserting a claim under this warranty must be brought by the earlier of one of the foregoing periods, as applicable, or within five (5) 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 TLV.

Exceptions To Warranty

This warranty does not cover defects or failures caused by:
1. improper shipping, installation, use, handling, etc., by other than TLV 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 other than TLV or service representatives authorized by TLV; or
4. disasters or forces of nature; or
5. abuse, abnormal use, accidents or any other cause beyond the control of TLV; 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. failure to follow the instructions contained in the TLV Instruction Manual for the Product.

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 TLV IN WRITING WITHIN THE APPLICABLE 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 TLV, FREIGHT AND TRANSPORTATION COSTS PREPAID, UNDER A RETURN MATERIAL AUTHORIZATION AND TRACKING NUMBER ISSUED BY TLV. 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. TLV RESERVES THE RIGHT TO INSPECT ON THE FIRST END USER’S SITE ANY PRODUCTS
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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.