



Manufacturer

**TLV** CO., LTD.

Kakogawa, Japan

is approved by LROA Ltd. to ISO 9001/14001



# Instruction Manual

## Clean Steam Trap **LV6-CE / LV6-SF / LV6-P / LV6-EP**

**Manufacturer**

**TLV** CO., LTD.

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

Tel: [81]-(0)79-422-1122 Fax: [81]-(0)79-422-0112

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**TLV** CORPORATION

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## Introduction

Thank you for purchasing the TLV clean steam trap.

This product has been thoroughly inspected before being shipped from the factory. When the product is delivered, before doing anything else, check the specifications and external appearance to make sure nothing is out of the ordinary. Also be sure to read this manual carefully before use and follow the instructions to be sure of using the product properly.

This clean steam trap is of a revolutionary design that employs a high-performance X-element. This is a new type of valve mechanism in which a thermoliquid is sealed inside the X-element and the valve opens or closes based on the difference between the saturation temperatures of the thermoliquid and the water.

The X-element is very sensitive to changes in temperature and responds with great accuracy, quickly discharging air and the large quantities of condensate created immediately after operation start-up, thereby greatly reducing start-up time. It also reacts with great sensitivity to the inflow of large quantities of condensate and hot air during operation, thus preventing air-binding.

The above-listed superior features of the X-element employed in this clean steam trap help to increase heating efficiency and reduce manpower requirements for maintenance and bypass blowdown.






If detailed instructions for special order specifications or options not contained in this manual are required, please contact TLV for full details.

This instruction manual is intended for use with the model(s) listed on the front cover. It is 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.

### Symbols

	<p>Indicates a <b>DANGER, WARNING or CAUTION</b> item.</p>
	<p>Indicates an urgent situation which poses a threat of death or serious injury</p>
	<p>Indicates that there is a potential threat of death or serious injury</p>
	<p>Indicates that there is a possibility of injury or equipment/product damage</p>
	<p><b>Install properly and DO NOT use this product outside the recommended operating pressure, temperature and other specification ranges.</b> 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.</p> <p><b>Take measures to prevent people from coming into direct contact with product outlets.</b> Failure to do so may result in burns or other injury from the discharge of fluids.</p> <p><b>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.</b> Disassembling or removing the product when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries or damage.</p> <p><b>Be sure to use only the recommended components when repairing the product, and NEVER attempt to modify the product in any way.</b> 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.</p> <p><b>Use only under conditions in which no freeze-up will occur.</b> Freezing may damage the product, leading to fluid discharge, which may cause burns or other injury.</p> <p><b>Use only under conditions in which no water hammer will occur.</b> The impact of water hammer may damage the product, leading to fluid discharge, which may cause burns or other injury.</p>

## Checking the Piping



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.

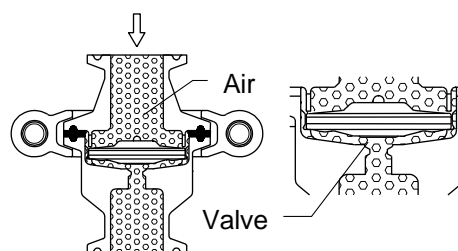
1. Is the pipe diameter suitable?
2. Has sufficient space been secured for maintenance?
3. Have maintenance valves been installed at the inlet and outlet? If the outlet is subject to back pressure, has a check valve been installed?
4. Is the inlet pipe as short as possible, with as few bends as possible,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

## Operation

Principles of air and condensate discharge:

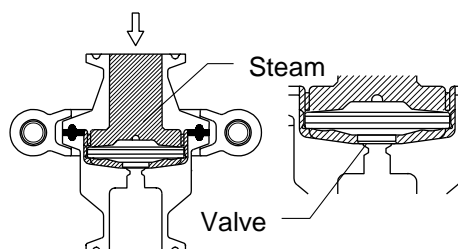
### 1. Start-up air and cold condensate discharge

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



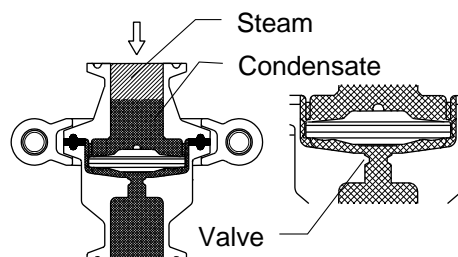
### 2. Closed position

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



### 3. Condensate discharge

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



## Specifications

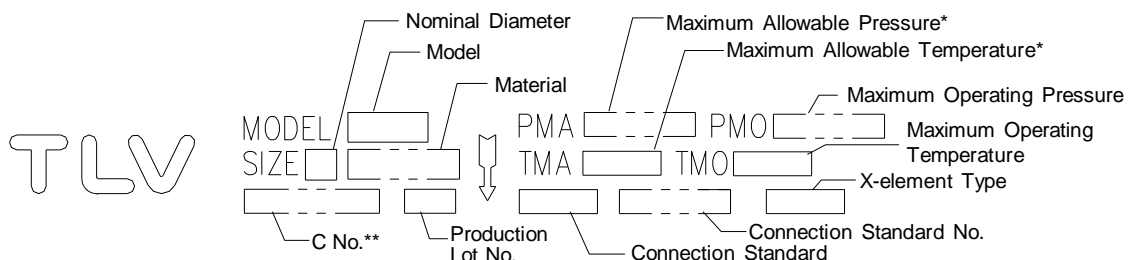


Install properly and **DO NOT** use this product outside the recommended operating pressure, temperature and other specification ranges. Improper use may result in such hazards as damage to the product or malfunctions which may lead to serious accidents. Local regulations may restrict the use of this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



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.

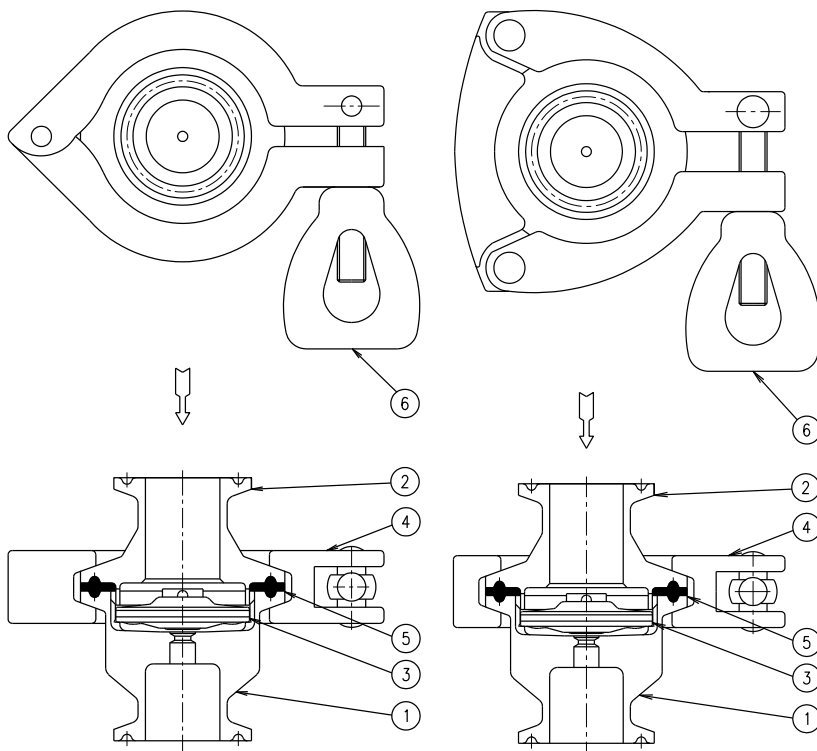


\* Maximum allowable pressure (PMA) and maximum allowable temperature (TMA) are PRESSURE SHELL DESIGN CONDITIONS, **NOT** OPERATING CONDITIONS.  
 \*\* C No. (Charge/Mill No.) is displayed for products with options. This item is omitted when there are no options.

## Configuration

LV6-CE/LV6-SF

LV6-P/LV6-EP



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

**NOTE:**  
 The direction of inlet flow must be from the top.

## Installation



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.



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

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

1. Before 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 vertically with the inlet at the top and the outlet at the bottom with the arrow on the body pointing in the direction of flow.
4. Install condensate outlet piping.
5. The outlet pipe should lead to a safe place such as a drainage vessel, pit, etc. Make sure the end of the pipe is above the water level, so that dirt and water cannot be sucked up by vacuum when the system shuts down.
6. Open the inlet and outlet valves and check to make sure that the product functions properly.
7. After steam has passed through the piping, allow the trap to cool and then further tighten the clamp.
8. Open the inlet valve again for normal operation.

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

## Maintenance



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 or 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 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 : During either intermittent or continual condensate discharge flash steam is discharged and the sound of flow can be heard.
- Blocked : No condensate is discharged. The trap is quiet, making no noise, and the surface temperature of the trap is low.  
(Discharge Impossible)
- Blowing : Live steam continually flows from the outlet and there is a continuous metallic sound.
- Steam Leakage : Live steam is discharged through the trap outlet together with condensate, accompanied by a high-pitched sound.

## 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.

Procedure
Gasket: Check for warping or damage
X-element valve area and valve seat area of body: Check for scratches, foreign matter or oil film
Body interior: Check for build-up, oil film, scratches and wear



## Disassembly/Reassembly



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



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

Use the following procedures to remove components. Use the same procedures in reverse to reassemble. (Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.)

### Disassembly/Reassembly of Upper and Lower Bodies

Part	During Disassembly	During Reassembly
Wing Nut Body Clamp	Loosen the wing nut with a tool such as an adjustable wrench, then remove the body clamp	Consult the table of tightening torques and tighten the wing nut to the proper torque; open inlet valve and allow live steam to enter and heat the trap, then close the inlet valve; after the internal and atmospheric pressures have equalized and the trap surface has cooled, tighten the wing nut to the proper torque again; Steam may leak if the wing nut is not re-tightened
Upper Body, Lower Body	Take apart, being careful not to scratch the gasket sealing surfaces	Reattach, being careful not to scratch the gasket sealing surfaces
Gasket	Remove the gasket and clean the sealing surfaces	Replace with a new gasket if damaged

### Removing/Reassembling Parts Inside Lower Body

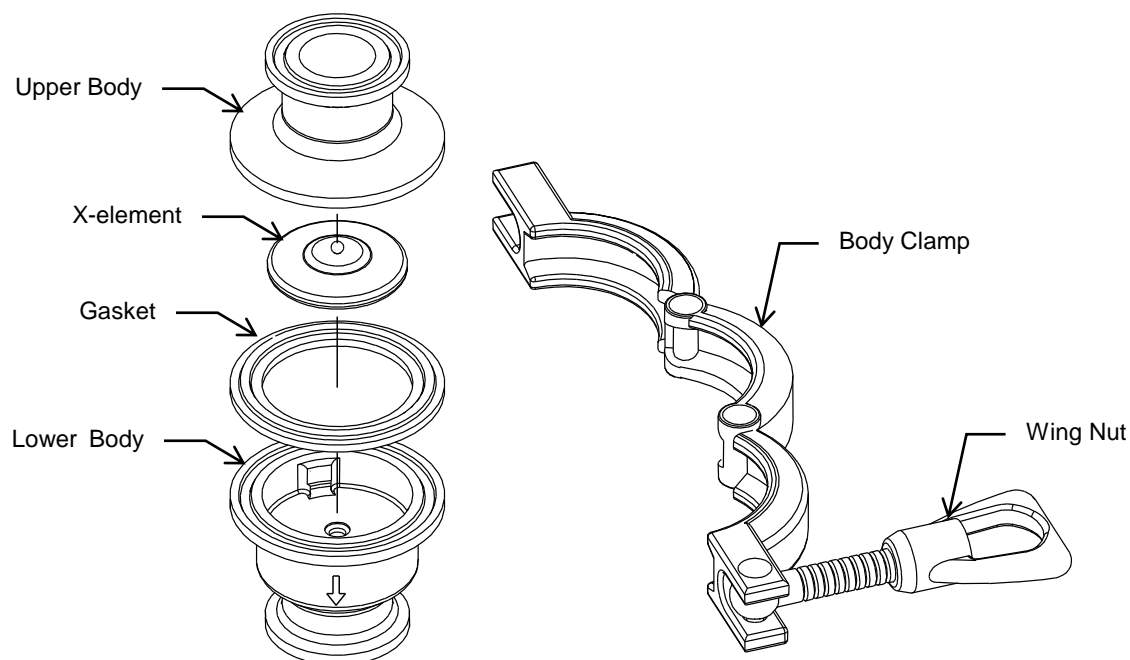
Part	During Disassembly	During Reassembly
X-element	Grasp the steel ball on the top of the X-element and remove	After making sure that the X-element is right-side-up, insert straight down into the guide-part of the lower body, making sure it does not catch on the sides

### Table of Tightening Torques

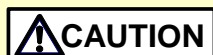
Part Name	Torque		Distance Across Flats	
	N·m	(lbf·ft)	mm	(in)
Wing Nut	8.0	(5.9)	—	

(1 N·m ≈ 10 kg·cm)

## Exploded View



## Troubleshooting



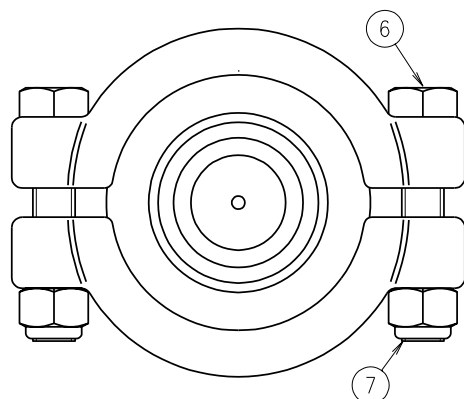
**When disassembling or removing the product, wait until the internal pressure equals atmospheric pressure and the surface of the product has cooled to room temperature. Disassembling or removing the product when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries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

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

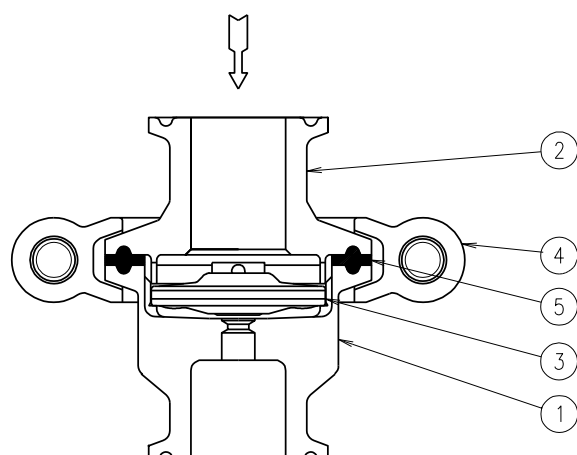
Problem	Cause	Remedy
No condensate is discharged (blocked) or discharge is poor	The X-element is sticking to the valve seat	Clean parts
	The Valve seat is blocked	Clean valve area of the lower body or replace lower body
	The trap operating pressure exceeds the maximum specified pressure or there is insufficient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

## Option (2-piece Clamp with Bolts and Nuts)

### Configuration



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



## Disassembly/Reassembly



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



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

Use the procedures on the following page to remove components. Use the same procedures in reverse to reassemble. (Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.)

### Disassembly/Reassembly of Upper and Lower Bodies

Part	During Disassembly	During Reassembly
Body Clamp, Clamp Bolt, Clamp Nut	Loosen clamp nuts with a tool such as an adjustable wrench, then remove the body clamp	When threading the clamp nut onto the clamp bolt, the direction of the clamp nut must be like that shown in the "Exploded View" section on the next page. Consult the table of tightening torques and tighten clamp nuts to the proper torque; avoid lopsided tightening by making sure that both sides are tightened evenly; open inlet valve and allow live steam to enter and heat the trap, then close the inlet valve; after the internal and atmospheric pressure have equalized and the trap surface has cooled, tighten clamp nuts to the proper torque again; Steam may leak if clamp nuts are not re-tightened
Upper Body, Lower Body	Take apart, being careful not to scratch the gasket sealing surfaces	Reattach, being careful not to scratch the gasket sealing surfaces
Gasket	Remove the gasket and clean the sealing surfaces	Replace with a new gasket if damaged

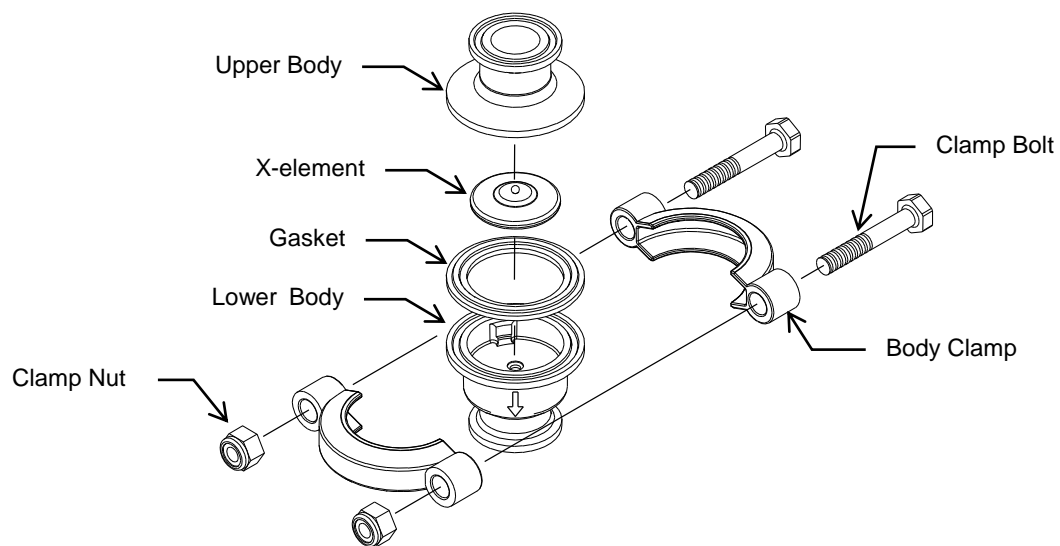
### Removing/Reassembling Parts Inside Lower Body

Part	During Disassembly	During Reassembly
X-element	Grasp the steel ball on the top of the X-element and remove	After making sure that the X-element is right-side-up, insert straight down into the guide-part of the lower body, making sure it does not catch on the sides

### Table of Tightening Torques

Part Name	Torque		Distance Across Flats	
	N·m	(lbf·ft)	mm	(in)
Clamp Bolt, Clamp Nut	8.0	(5.9)	13	(1/2)

(1 N·m ≈ 10 kg·cm)

**Exploded View**

## 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, TLV CO., LTD., a Japanese corporation (“**TLVJ**”) or TLV International, Inc., a Japanese corporation (“**TII**”), (hereinafter the “**Products**”) are designed and manufactured by 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), if any.

### 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 Acts of God; 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. 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 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.

### 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 CLAIMED TO BE DEFECTIVE BEFORE ISSUING A RETURN MATERIAL AUTHORIZATION. SHOULD SUCH INSPECTION REVEAL, IN TLV'S REASONABLE DISCRETION, THAT THE CLAIMED DEFECT IS NOT COVERED BY THIS WARRANTY, THE PARTY ASSERTING THIS WARRANTY SHALL PAY TLV 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 TLVJ 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.

## **TLV CORPORATION**

13901 South Lakes Drive, Charlotte, NC 28273-6790, U.S.A.

Tel: [1]-704-597-9070      Fax: [1]-704-583-1610