

# INSTRUCTION MANUAL

Keep this manual in a safe place for future reference

## TLV® BALANCED PRESSURE THERMOSTATIC STEAM TRAPS LV SERIES

### LV5 / LV13 / LV13L / LV13N / LV21



LV5 / LV13 / LV21



LV13L



LV13N

Manufacturer

# TLV® CO., LTD.

881 Nagasuna, Noguchi, Kakogawa, Hyogo 675-8511, Japan  
Tel: [81]-(0)79-427-1800 Fax: [81]-(0)79-422-2277

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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/cm<sup>2</sup>, 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.

 <b>CAUTION</b>	<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, which may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted.
	<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.
	<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.

Continued on the next page

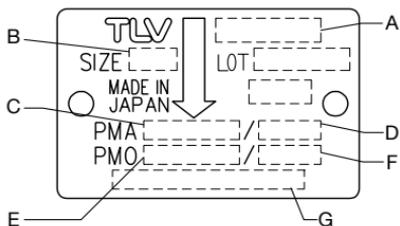
	<p><b>Be sure to use only the recommended components when repairing the product, and NEVER attempt to modify the product in any way.</b> Failure to observe these precautions may result in damage to the product or burns or other injury due to malfunction or the discharge of fluids.</p>
	<p><b>Do not use excessive force when connecting threaded pipes to the product.</b> Over-tightening may cause breakage leading to fluid discharge, which may cause burns or other injury.</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 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>

## 2. Specifications

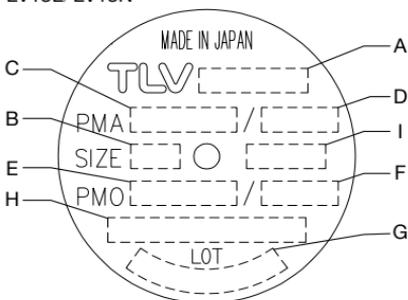
Refer to the product nameplate for detailed specifications.

LV5/LV13/LV21

- 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



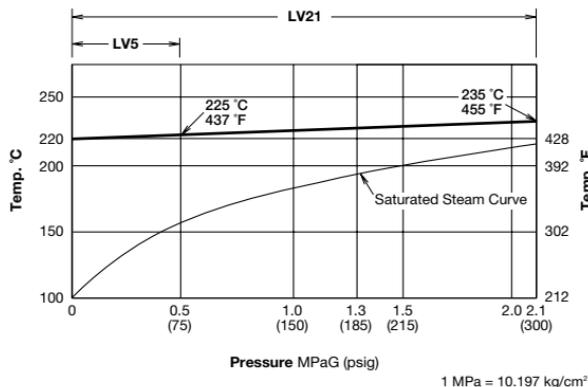
LV13L/LV13N



\* 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)

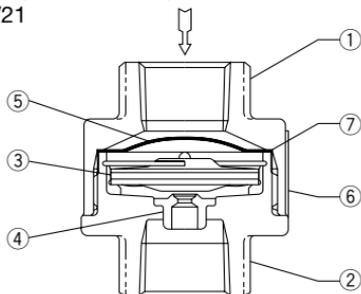


**CAUTION**

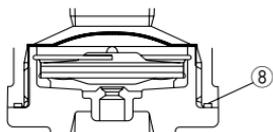
To avoid malfunctions, product damage, accidents or serious injury, install properly and **DO NOT** use this product outside the specification range. Local regulations may restrict the use of this product to below the conditions quoted.

## 3. Configuration

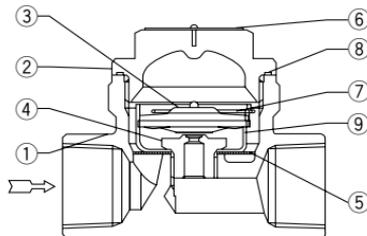
LV5 (Stainless Steel)  
LV21



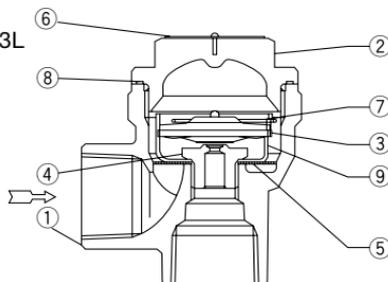
LV5 (Brass)  
LV13



LV13N



LV13L



No.	Description	R*	No.	Description	R*	No.	Description	R*
1	Body		4	Valve Seat**	✓	7	Spring Clip	✓
2	Cover		5	Screen	✓	8	Cover Gasket	✓
3	X-element	✓	6	Nameplate		9	X-element Guide	✓

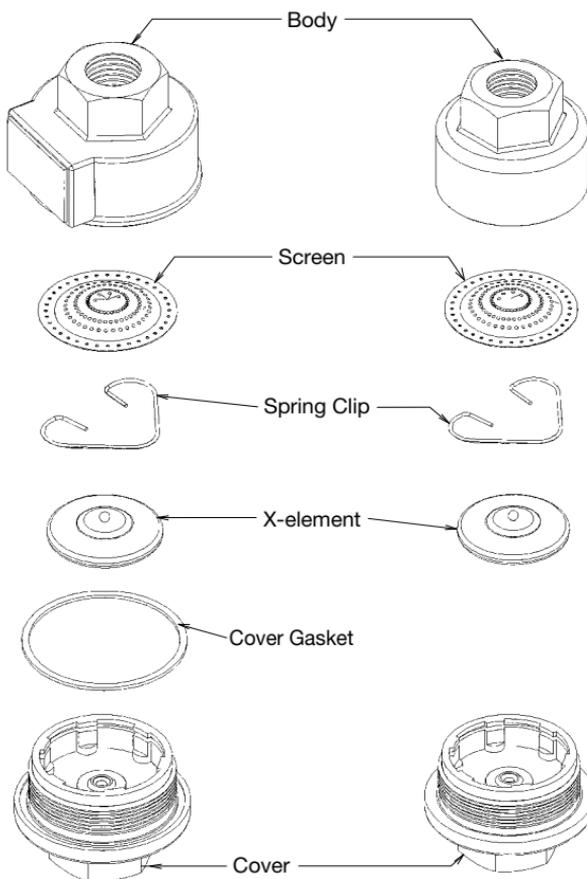
\* R: Replacement parts only for LV13L and LV13N, available in this repair kit.

\*\* 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

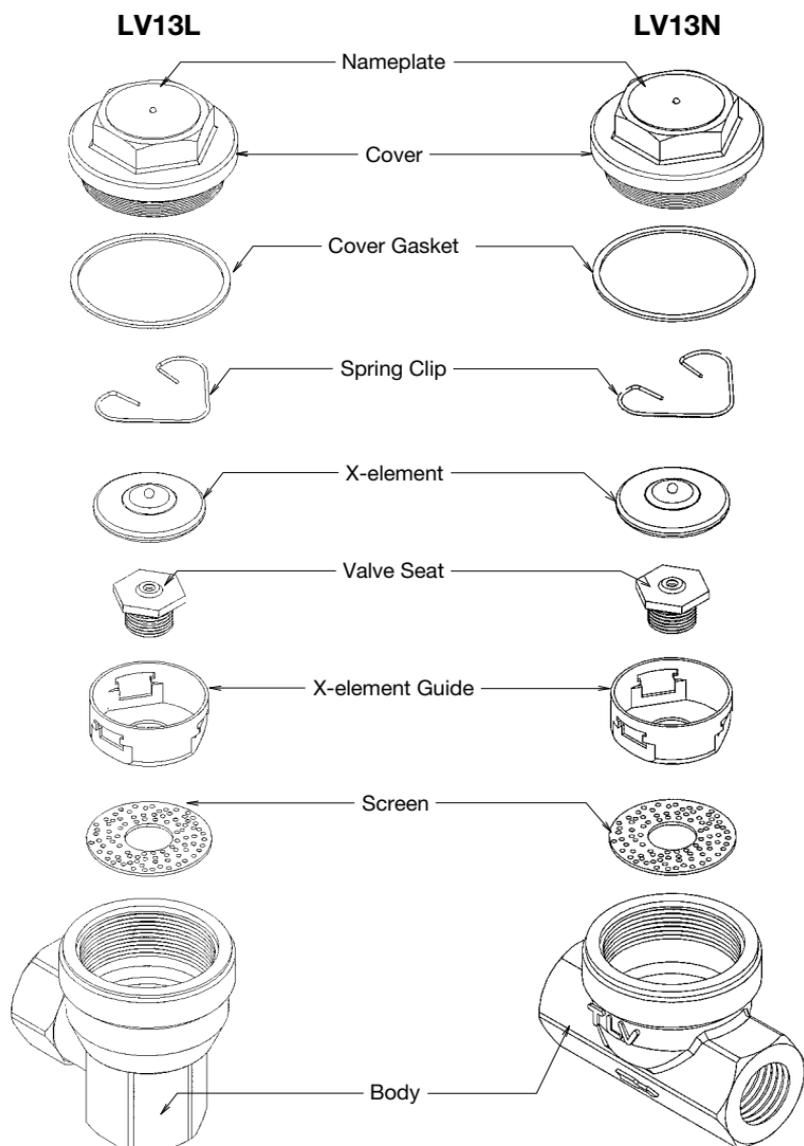
**LV5 / LV13  
(Brass)**

**LV5 / LV21  
(Stainless Steel)**



## 4. Exploded View

(Continued)



## 5. Proper Installation

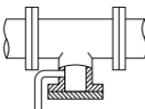
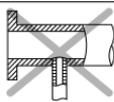
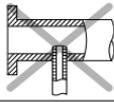
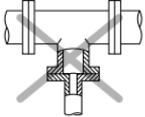
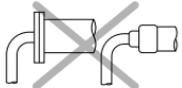


- Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.
  - Take measures to prevent people from coming into direct contact with product outlets.
  - Do not use excessive force when connecting threaded 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?

Requirement	Correct	Incorrect
Install a catchpot with the proper diameter.		 <p>Diameter is too small.</p>
Make sure the flow of condensate is not obstructed.		 <p>Diameter is too small and inlet protrudes into pipe.</p>
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.		 <p>Rust and scale flow into the trap with the condensate.</p>
When installing on the blind end, make sure nothing obstructs the flow of condensate.		 <p>Condensate collects in the pipe.</p>

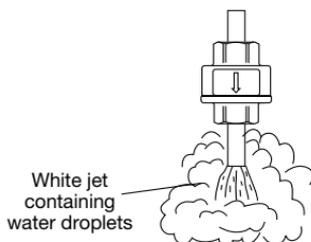
## 7. Operational Check

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).

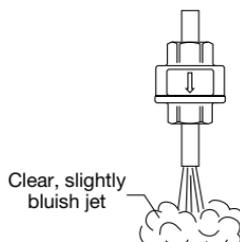
Normal:	Condensate is discharged intermittently with flash steam and the sound of flow can be heard.
Blocked: (Discharge Impossible)	No condensate is discharged. The trap is quiet and makes no noise. The surface temperature of the trap is low.
Blowing:	Live steam continually flows from the outlet and 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.)

Flash Steam



Live Steam Leakage



## 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.

Parts Inspection Procedure	
Gasket	Check for warping or damage (brass models)
Screen	Check for clogging or corrosion damage
X-element	Check for rust, scale, oil film, wear or damage
Valve Seat	Check for rust, scale, oil film, wear or damage
Body, Cover	Check inside for rust and scale

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

## Installation of X-element

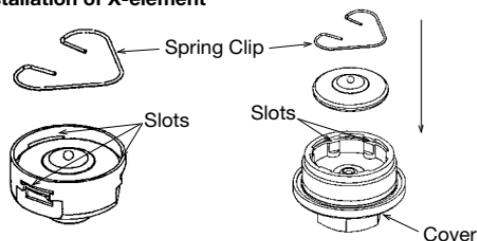


Figure A

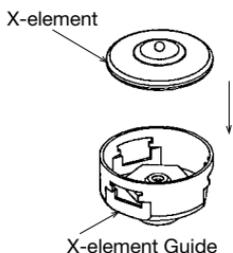


Figure B

Tightening Torque and Distance Across Flats				
Part	Torque		Distance Across Flats	
	N·m	(lbf·ft)	mm	(in)
Cover LV5, LV13 (Brass) 8 - 15 (1/4 - 1/2)	80	(59)	27	(1 1/16)
Cover LV5, LV13 (Brass) 20 - 25 (3/4 - 1)	80	(59)	41	(1 5/8)
Cover LV5, LV21 (Stainless Steel)	120	(88)	27	(1 1/16)
Cover LV13L, LV13N	80	(59)	32	(1 1/4)
Valve Seat LV13L, LV13N	35	(26)	19	(3/4)

1 N·m ≈ 10 kg·cm

If drawings or other special documentation were supplied for the product, any torque given there takes precedence over values shown here.

## 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.

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

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.

## 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, 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

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