



Manufacturer

TLV CO., LTD.

Kakogawa, Japan

is approved by LRQA Ltd. to ISO 9001/14001



Instruction Manual

PowerTrap[®] System Package

GP10L-1AJ

GP14L-1AJ

GP14M-1BJ

GP10-1CJ

GP10-2FJ

Contents

Introduction	1
Safety Considerations	2
General Description	4
Specifications	5
Configuration.....	6
Installation.....	8
Installation and Maintenance Space	13
Operation and Periodic Inspection.....	16
Storage	18
Storage Instructions	18
TLV EXPRESS LIMITED WARRANTY.....	19
Service	21

Introduction

Thank you for purchasing the TLV PowerTrap system package (hereinafter referred to as "system package").

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 instruction manual only describes contents regarding installation of the system package. Detailed instructions for PowerTrap unit(s) included in this system package are not described. Please refer to the instruction manual(s) for each PowerTrap unit.

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 and relocating the system package. Please keep it in a safe place for future reference.

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


Safety Considerations

- Read this section carefully before use and be sure to follow the instructions.
- This instruction manual only describes contents regarding installation of the system package. Detailed instructions for PowerTrap unit(s) included in this system package are not described. Please refer to the instruction manual(s) for each PowerTrap unit.
- 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

	Indicates a DANGER, WARNING or CAUTION item.
	Indicates an urgent situation which poses a threat of death or serious injury
	Indicates that there is a potential threat of death or serious injury
	Indicates that there is a possibility of injury or equipment / product damage
	<p>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.</p> <p>Use hoisting equipment for heavy objects (weighing approximately 20 kg (44 lb) or more). Failure to do so may result in back strain or other injury if the object should fall.</p> <p>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.</p> <p>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.</p>

Continued on the next page

 CAUTION	<p>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.</p>
	<p>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.</p>
	<p>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.</p>
	<p>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.</p>
	<p>Once the product has been installed and connected to the system piping, supply steam to heat the product piping. Only after the surface temperature of the product piping has returned to room temperature, retighten all the piping connections. Piping connections may loosen due to vibration during transportation or installation, or steam heat. This can lead to fluid discharge, which may cause burns or other injury.</p>

General Description



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.

Application

The PowerTrap is a non-electric mechanical pump used to discharge high-temperature liquid from vacuum-pressure or low-pressure areas to high-pressure areas, or from lower to higher elevations.


This system package is pre-assembled with all the necessary devices and pipes to operate the PowerTrap, greatly reducing labor required for installation, pipings, and maintenance.

The discharge capacity differs depending on the system package model. Check the latest product information to make sure the system package model you purchased is suitable for use on the application it is planned to be used on.

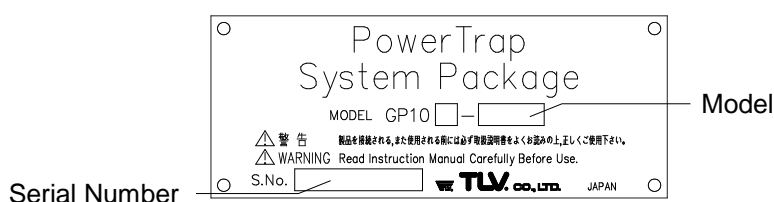
For the latest product information, please contact TLV.



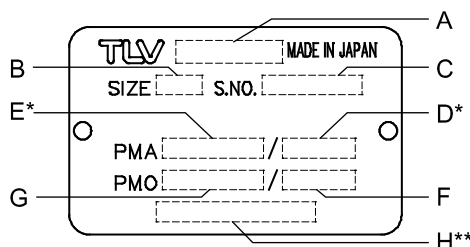
Specifications

	<p>Install properly and DO NOT use this product outside the recommended operating pressure, temperature and other specification ranges.</p> <p>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>Use only under conditions in which no freeze-up will occur.</p> <p>Freezing may damage the product, leading to fluid discharge, which may cause burns or other injury.</p>

- (1) The system package model is indicated on the nameplate located on the condensate receiver.
- Please check the latest product information for the specifications of each model.
- For the latest product information, please contact TLV.



- (2) For the model name of the PowerTrap unit(s), refer to the nameplate located on the PowerTrap unit(s).
- Please check the latest product information for the specifications of the PowerTrap unit(s).
- For the latest product information, please contact TLV.



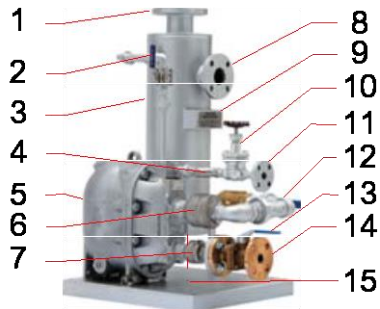
A	Model
B	Nominal Diameter
C	Serial Number
D	Maximum Allowable Temperature (TMA)*
E	Maximum Allowable Pressure (PMA)*
F	Maximum Operating Temperature (TMO)
G	Maximum Operating Pressure (PMO)
H	Valve No.**

* 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.

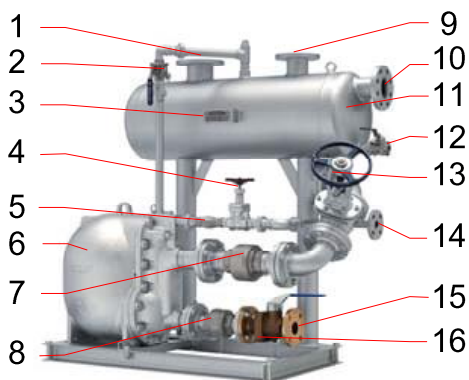
Configuration

GP10L-1AJ



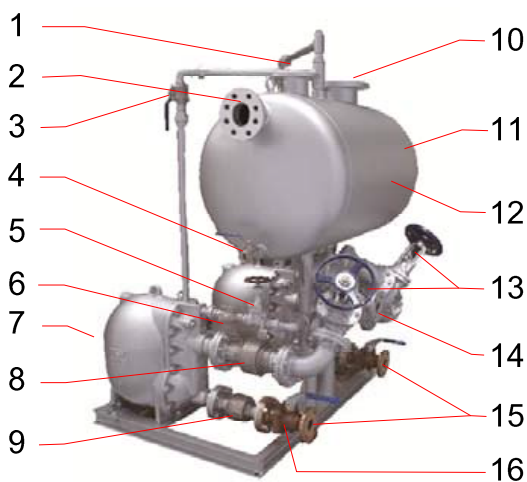
No.	Part Name
1	Vent Pipe and Overflow Connection
2	Exhaust Valve
3	Condensate Receiver*
4	Motive Medium Strainer
5	PowerTrap
6	Condensate Inlet Check Valve
7	Condensate Outlet Check Valve
8	Condensate Inlet
9	Nameplate
10	Motive Medium Supply Valve
11	Motive Medium Supply Connection
12	Condensate Inlet Valve
13	Condensate Outlet Valve
14	Condensate Outlet
15	Blow Valve (bottom of the condensate receiver)

GP10-1CJ



No.	Part Name
1	Vent Pipe Connection
2	Exhaust Valve
3	Nameplate
4	Motive Medium Supply Valve
5	Motive Medium Strainer
6	PowerTrap
7	Condensate Inlet Check Valve
8	Condensate Outlet Check Valve
9	Condensate Inlet
10	Overflow Connection
11	Condensate Receiver*
12	Blow Valve
13	Condensate Inlet Valve
14	Motive Medium Supply Connection
15	Condensate Outlet
16	Condensate Outlet Valve

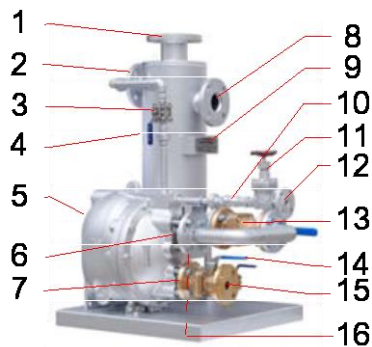
GP10-2FJ



No.	Part Name
1	Condensate Inlet
2	Overflow Connection
3	Exhaust Valve
4	Blow Valve
5	Motive Medium Supply Valve
6	Motive Medium Strainer
7	PowerTrap
8	Condensate Inlet Check Valve
9	Condensate Outlet Check Valve
10	Vent Pipe Connection
11	Nameplate (side of the condensate receiver)
12	Condensate Receiver*
13	Condensate Inlet Valve
14	Motive Medium Supply Connection
15	Condensate Outlet
16	Condensate Outlet Valve

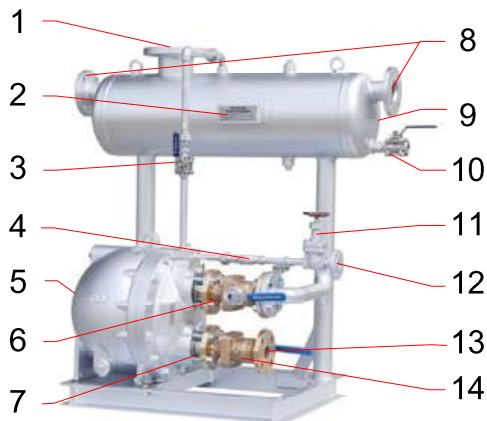
* Condensate receiver may be referred to as condensate tank or condensate header.

GP14L-1AJ



No.	Part Name
1	Vent Pipe Connection
2	Overflow Connection
3	Exhaust Valve
4	Condensate Receiver*
5	PowerTrap
6	Condensate Inlet Check Valve
7	Condensate Outlet Check Valve
8	Condensate Inlet
9	Nameplate
10	Motive Medium Strainer
11	Motive Medium Supply Valve
12	Motive Medium Supply Connection
13	Condensate Inlet Valve
14	Condensate Outlet Valve
15	Condensate Outlet
16	Blow Valve (bottom of the condensate receiver)

GP14M-1BJ



No.	Part Name
1	Vent Pipe Connection
2	Nameplate
3	Exhaust Valve
4	Motive Medium Strainer
5	PowerTrap
6	Condensate Inlet Check Valve
7	Condensate Outlet Check Valve
8	Condensate Inlet for Overflow Connection**
9	Condensate Receiver*
10	Blow Valve
11	Motive Medium Supply Valve
12	Motive Medium Supply Connection
13	Condensate Outlet
14	Condensate Outlet Valve

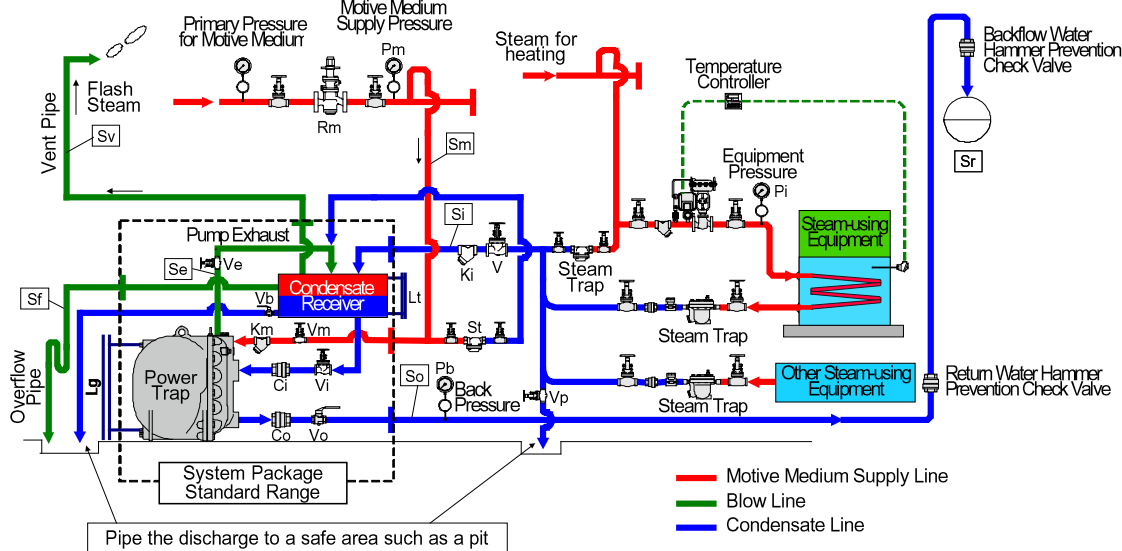
* Condensate receiver may be referred to as condensate tank or condensate header.

** One connection should be used for the condensate inlet pipe, the other one should be connected to the overflow pipe.

Installation

⚠ WARNING	Be sure to install an overflow pipe and discharge to a safe area such as a pit. Failure to install an overflow pipe is dangerous, as condensate may spurt from the vent pipe and could result in burns and other injuries.
⚠ 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 hoisting equipment for heavy objects (weighing approximately 20 kg (44 lb) or more). Failure to do so may result in back strain or other injury if the object should fall.
	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.
	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.
	Once the product has been installed and connected to the system piping, supply steam to heat the product piping. Only after the surface temperature of the product piping has returned to room temperature, retighten all the piping connections. Piping connections may loosen due to vibration during transportation or installation, or steam heat. This can lead to fluid discharge, which may cause burns or other injury.

System Package Piping



NOTE: This sketch is for explanation purposes only and is not intended as an installation design.

System Package (Standard)	System Package (Optional)	Piping & Accessories Provided by User
PowerTrap	Rm Motive Medium Pressure Reducing Valve	Sf Overflow Pipe
Condensate Receiver	Ki Condensate Inlet Strainer	Sv Vent Pipe
Vi Valve on Condensate Inlet Pipe	Lt Liquid Level Gauge for Tank (Condensate Receiver)	Sm Motive Medium Supply Pipe
Ci Condensate Inlet Check Valve	Lg Liquid Level Gauge for PowerTrap	Si Condensate Inlet Pipe
Co Condensate Outlet Check Valve	St Steam Trap on Drip Leg	So Condensate Outlet Pipe
Vo Valve on Condensate Outlet Pipe		Sr Condensate Recovery Line
Vm Valve on Motive Medium Supply Line		V Valve on Condensate Inlet Pipe
Km Motive Medium Strainer		Vp Bypass Valve
Ve Valve on Exhaust Pipe		
Se Exhaust Pipe		Others
Vb Condensate Blow Valve on Condensate Receiver		Pm Motive Medium Supply Pressure
		Pb Back Pressure

Installation Procedure

Figure on previous page is a simplified flow sketch. For the devices such as control valves, steam traps etc. that are not directly related to the system package, refer to the instruction manual for each product regarding installation. Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.

(1) Pumped Medium:

- Fluids that can be discharged through the PowerTrap are limited to steam condensate, water and non-flammable and non-toxic liquids with a specific gravity of 0.85 to 1.0. PowerTraps that have been specially constructed for other specific fluids are not limited by this restriction.

(2) Motive Medium Supply Piping [Sm]:

- The size of the motive medium supply pipe should be the same size as the system package motive medium supply pipe connection.
- Motive medium inlet pressure should not exceed 1.05 MPaG (150 psig, 10.5 barg).
- Steam, compressed air, non-flammable and non-toxic gases such as nitrogen, etc. may be used as the motive medium.
- When the motive medium is steam, if the application will require that the equipment be shut down (non-operating) for periods of 2 months or longer, install a drip leg on the motive medium supply line, and a steam trap [St] on the drip leg. The outlet pipe from the steam trap [St] may be connected to the exhaust pipe [Se] close to where it connects to the condensate receiver. This measure is not necessary when the motive medium is compressed air or nitrogen.

(3) Pressure Reducing Valve on the Motive Medium Supply Piping [Rm]:

- When the supply pressure of the motive medium is greater than 1.05 MPaG (150 psig, 10.5 barg), install a TLV COSPECT Series pressure reducing valve. Make sure that the motive medium pressure is lower than the maximum operating pressure of the PowerTrap. Use good piping practices when selecting the installation location for COSPECT. In this case, be sure to install a safety valve between the pressure reducing valve and the PowerTrap.
- When the motive medium pressure is less than 1.05 MPaG (150 psig, 10.5 barg), if a pressure reducing valve is to be installed to slow the speed of the flow, the installation of a safety valve is not required.
- Install the pressure reducing valve as far away from the PowerTrap as possible. When the motive medium pressure is less than 0.5 MPaG (72.5 psig, 5 barg): at least 3 m (10 ft).
When the motive medium pressure is 0.5 MPaG or greater (72.5 psig or greater, 5 barg or greater): at least 3 m + 1 m (10 ft + 3 ft) for every 0.1 MPaG (4.5 psig, 1 barg) over 0.5 MPaG (72.5 psig, 5 barg).
- The pressure setting on the pressure reducing valve should be between 0.05 and 0.15 MPa (7 – 20 psi, 0.5 – 1.5 bar) higher than the back pressure. When the discharge capacity of the PowerTrap is insufficient for the set motive pressure, increase this set pressure even further.

(4) Exhaust Piping [Se]:

- Unless problems occur, leave the exhaust pipe connected to the condensate receiver as designed.
- When steam is not used as the motive medium, steam clouds (flash steam) may come out from the vent pipe [Sv]. In this case it is possible to disconnect the exhaust line from the condensate receiver.

If the exhaust line has to discharge to atmosphere, a sound level of approximately 90 to 100 dB may be emitted from the exhaust pipe discharge outlet for two to three seconds. If soundproofing measures are necessary, install a silencer. (If the exhaust line is connected to the condensate receiver, the sound level will be below 60 dB.)

(5) Condensate Inlet Piping [Si]:

- Condensate Inlet Pipe [Si] should be as short and straight as possible so that condensate naturally flows down into the PowerTrap.
- Install a 40-mesh or finer strainer [Ki] on the PowerTrap condensate inlet pipe. The installation should be in a location that allows sufficient space for maintenance of the strainer.
- Install a valve [V] and a bypass valve [Vp] on the condensate inlet pipe. This allows operation of the equipment while carrying out maintenance work if the PowerTrap is malfunctioning or needs maintenance. Use a gate valve for valve [V] and a globe valve for the bypass valve [Vp].

(6) Condensate Outlet Piping [So], Condensate Recovery Line [Sr]:

- The flow velocity in the pipe should be considered when determining the pipe size.

Condensate in the PowerTrap is discharged by the motive medium supply pressure. The instantaneous flow through the condensate outlet pipe during the discharge operation is between 2 and 40 metric tonnes (530 and 10,600 U.S. gal) per hour.

The instantaneous discharge amount should be considered when determining the outlet pipe diameter. For each system package, motive medium supply pressure and back pressure instantaneous discharge amount, contact TLV. If you have the "PowerTrap Design & Data Sheet", installed piping should be the size recommended by TLV.

(7) Vent Pipe [Sv] and Overflow Pipe [Sf]:

**WARNING****Be sure to install a vent pipe and an overflow pipe.**

Failure to install an overflow pipe is dangerous, as condensate may spurt from the vent pipe and could result in burns and other injuries.

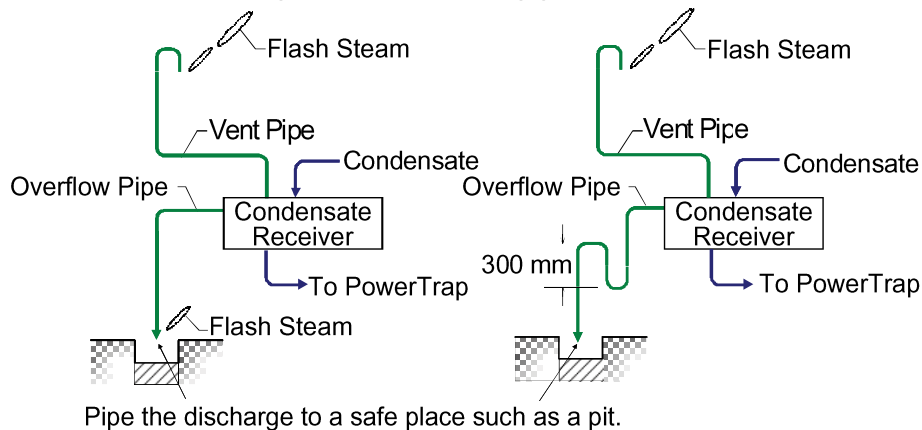
- The nominal diameter of the vent pipe [Sv] should be the same as the connection port.
(If provided with a "PowerTrap Design & Data Sheet", the installed piping should be the size recommended by TLV.)

- Install overflow pipe [Sf] and vent pipe [Sv] separately.

The overflow pipe [Sf] should be installed by branching from the condensate tank as shown in the figure below to the left, and should have the same nominal diameter as the condensate inlet pipe [Si]. If flash steam should not be released from the overflow pipe, install a loop seal (approx. 300 mm (12 in)) as shown in the figure below to the right.

Condensate may blow out of the overflow pipe [Sf] not only from overload or malfunction, but also if the bypass valve for the steam trap on the steam-using equipment is opened. Pipe the discharge to a safe place such as a pit.

Note: Do not install a loop seal on the vent pipe.

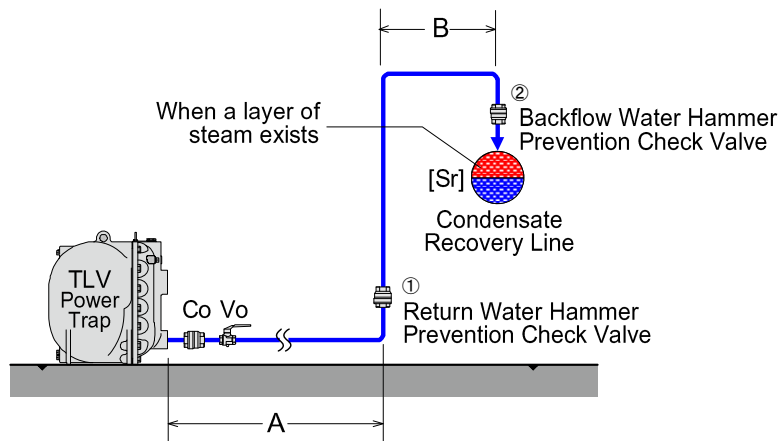


(8) Return Water Hammer Prevention Check Valve ①:

If length "A" in the following figure (from the PowerTrap to a rise in the piping) is longer than 30 m (100 ft), return water hammer may occur in the piping after a discharge cycle finishes. To prevent this, installation of a spring-return type check valve just above the rise is recommended.

(9) Backflow Water Hammer Prevention Check Valve ②:

If length "B" in the following figure is longer than 500 mm ($19\frac{11}{16}$ in) and steam (including flash steam) enters the condensate recovery line [Sr], backflow water hammer may occur in the piping. To prevent this, installation of a spring-return type check valve close to the condensate recovery line [Sr] is recommended.



(10) General Precautions

- Install the equipment in a horizontal position. When piping from the equipment, make sure that no excessive force is applied from the piping. Excessive force may cause an accident or damage to the equipment.
- Periodic maintenance is required for the components of the system. Ensure there is sufficient maintenance space in the system layout to allow for disassembly and inspection of each component.

Installation and Maintenance Space

Anchoring the Body

Anchor the 4 corners of the base with anchor bolts. Anchor bolts are not supplied with the system package, so prepare appropriate anchor bolts separately.

- GP10L-1AJ: Anchor Bolt M12 × 4 pcs
Embedment depth of 50 mm (2 in) or more is recommended
- GP14L-1AJ: Anchor Bolt M12 × 4 pcs
Embedment depth of 50 mm (2 in) or more is recommended
- GP14M-1BJ: Anchor Bolt M12 × 4 pcs
Embedment depth of 50 mm (2 in) or more is recommended
- GP10-1CJ: Anchor Bolt M16 × 4 pcs
Embedment depth of 150 mm (6 in) or more is recommended
- GP10-2FJ: Anchor Bolt M16 × 4 pcs
Embedment depth of 150 mm (6 in) or more is recommended

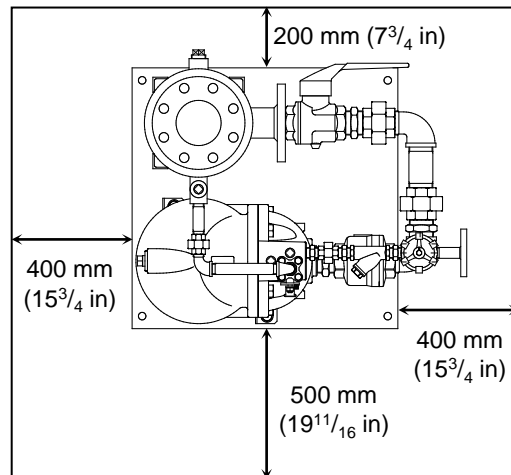
Refer to the latest drawings for the anchoring positions of each model.

For the latest product information, please contact TLV.

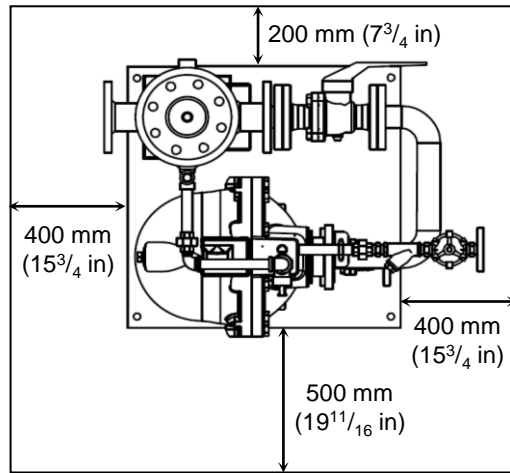
Maintenance Space

The maintenance space shown in the figure below should be provided to enable disassembly, inspection and replacement of the system package. If there is insufficient maintenance space, TLV may decline to perform maintenance work.

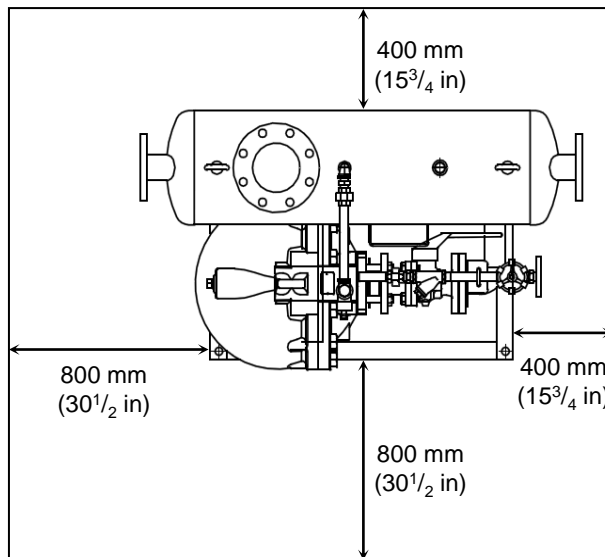
GP10-1AJ



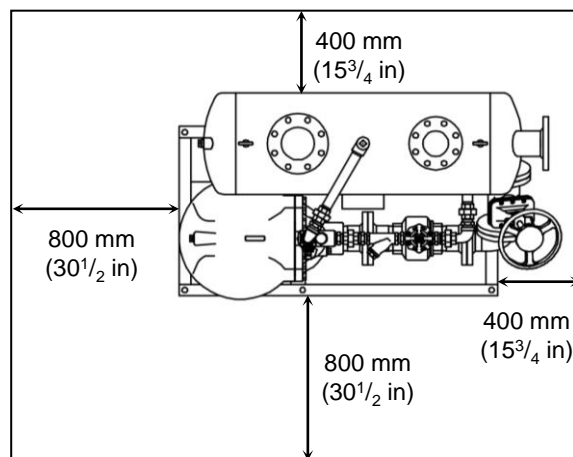
GP14L-1AJ



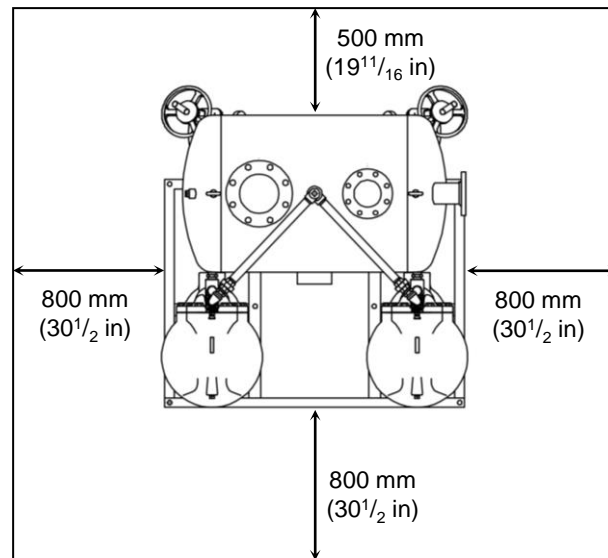
GP14M-1BJ





GP10-1CJ



GP10-2FJ



Operation and Periodic Inspection

 WARNING	<ul style="list-style-type: none"> • After all piping work has been completed in accordance with the specific piping system designed when the decision to utilize the PowerTrap System Package was made, check once again to make sure that all pipe connections have been tightened, gaskets have been inserted where needed and all parts are securely installed. • During commissioning and test runs, as well as during start-up of normal operation, take measures to prevent people from coming into direct contact with vent and overflow outlets. At the start-up of operation, large quantities of condensate may flow, causing the Power Trap System Package to momentarily overload. If this occurs, hot Condensate may spurt from the pipe connections, the vent piping or overflow piping and could result in burns, other injuries or damage to equipment.
 CAUTION	<p>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.</p> <p>During maintenance/disassembly all connections, piping and bolts should be removed slowly to prevent fluids from spurting due to the release of retained internal pressure. Failure to do so may result in burns or other injury with the discharge of fluids.</p> <p>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.</p> <p>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.</p>

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

Operation

(1) Valve Operation

Refer to the drawings in the "Installation" section to become familiar with the symbols used for the various valves.

If water hammer has occurred, immediately cease operation and close any valves that are operating.

- Drain condensate in the condensate receiver by opening the condensate blow valve [Vb], making sure the condensate blow valve [Vb] is piped to a safe area. If the condensate receiver is filled up with condensate, condensate may spurt from the vent pipe [Sv] during PowerTrap exhaust. Make sure to close the condensate blow valve [Vb] after condensate is drained.
- Slowly open the exhaust valve [Ve].
- Slowly open the valve [Vm] on the motive medium supply pipe. Make sure that there is no sound of flow from the exhaust pipe [Se] or the check valve [Ci] on the condensate inlet pipe.
- Slowly open the valve [Vo] on the condensate outlet pipe.
- Slowly open the valve [Vi] on the condensate inlet pipe.

The PowerTrap is normal if it operates intermittently; first exhausting the motive medium to fill with condensate, and then taking in motive medium to force the condensate out.

- The interval of operation will vary greatly depending on the amount of condensate inflow, the temperature, the motive medium (steam or gas) and the motive pressure. The interval of operation is considered to be the length of time between the start of one discharge cycle and the start of the next discharge cycle.

- The interval of operation T_c (s) can be roughly determined using the following formula:

GP10L-1AJ:	$T_c = 21,600/Q$	$T_c = 47,600/Q_p$
GP14L-1AJ:	$T_c = 28,800/Q$	$T_c = 63,400/Q_p$
GP14M-1BJ:	$T_c = 45,000/Q$	$T_c = 99,100/Q_p$
GP10-1CJ/GP10-2FJ:	$T_c = 108,000/Q$	$T_c = 238,000/Q_p$

Q : amount of inflowing condensate (kg/h)

Q_p : amount of inflowing condensate (lb/h)

- The GP10L, GP14L, GP14M and GP10 condensate discharge capacity for each discharge operation is listed below. The amount of time required for each discharge operation will be between 3 and 30 seconds, depending on the back pressure and the motive medium pressure.

GP10L-1AJ: approx. 6 liters (1.6 U.S. gal)

GP14L-1AJ: approx. 8 liters (2.1 U.S. gal)

GP14M-1AJ: approx. 12.5 liters (3.3 U.S. gal)

GP10-1CJ/GP10-2FJ*: approx. 30 liters (8 U.S. gal)

*Value per GP10

- If an error such as a leak or water hammer occurs after beginning operation of the system package, shut off the valves immediately in the following order:
valve [Vm] on the motive medium supply pipe → valve [Vi] on the condensate inlet pipe → valve [Vo] on the condensate outlet pipe → valve [Ve] on the exhaust pipe.
- Whenever any type of malfunction is suspected in the system package, refer to the "Troubleshooting" in the corresponding product's instruction manual, as shown below:

System Package	Instruction Manual
GP10L-1AJ GP14L-1AJ GP14M-1BJ	PowerTrap GP10L/GT10L/GP14L/GT14L/GP14M/GT14M
GP10-1CJ GP10-2FJ	PowerTrap GP10/GT10/GP14/GT14

Periodic Inspection and Diagnosis

There are two types of periodic inspection: the visual inspection and the disassembly inspection.

(1) Visual Inspection

- As a general rule, this inspection should be performed at least once every 3 months.
- Check the following items:
 - a) There should be no leakage from the PowerTrap or from any of the connections.
 - b) The PowerTrap unit should be operating cyclically (one indication being the sharp, mechanical sound of the snap-action unit operating at the transition between the filling and the discharge parts of the cycle). Immediately after the end of the discharge part of the cycle and during the filling part of the cycle, the sound of flow in the exhaust pipe should be heard. During the pumping (discharge) part of the cycle, flow in the motive medium supply pipe should be heard.
 - c) Condensate should not accumulate in the steam-using equipment, and the temperature of the equipment should not be abnormally low.
 - d) There should be no condensate overflow from the overflow pipe [Sf] or vent pipes [Sv].
 - e) There should be no continuous steam discharge through the vent pipe [Sv] (it is normal for the PowerTrap to release retained steam from the vent pipe [Sv] after motive steam forces the condensate discharge.)
 - f) There should not be any abnormal noise such as water hammer from the condensate outlet pipe [So] or the condensate recovery line [Sr] while the PowerTrap operates.

(2) Disassembly Inspection

- Only the PowerTrap unit(s) and check valves need disassembly inspection. For the disassembly inspection, refer to the corresponding product's instruction manual.

Storage

The openings of the unit are sealed with a label, plastic sheet, etc., and delivered after taking measures to prevent rust and contamination.

Observe the storage instructions until the unit is installed on the piping. If the following storage instructions cannot be observed, rust or foreign matter may void the warranty.

Storage Instructions

- (1) Store the unit indoors to prevent it from getting wet by rainwater, dew, etc.
- (2) If the label or plastic sheet used for sealing or packaging of the unit is damaged, replace it immediately or repair it with appropriate tape to maintain the seal.
- (3) When repacking the unit, pack it with cushioning material so that it does not fall or collide when moving or transporting.
- (4) If the unit is stored for a long period of time (approx. six months or more), unpack it at intervals of six months or less to check visually for rust and foreign matter.
- (5) If an antirust agent is used, replace it with a new one of the same amount.
- (6) After no abnormalities are confirmed, seal the opening as it was.
- (7) Remove labels, plastic sheets, etc. sealing the opening just before installing the unit.

TLV EXPRESS LIMITED WARRANTY

Subject to the limitations set forth below, TLV CO., LTD., a Japanese corporation (“**TLV**”), warrants that products which are sold by it, TLV International Inc. (“**TII**”) or one of its group companies excluding TLV Corporation (a corporation of the United States of America), (hereinafter the “**Products**”) are designed and manufactured by TLV, conform to the specifications published by TLV for the corresponding part numbers (the “**Specifications**”) and are free from defective workmanship and materials. The party from whom the Products were purchased shall be known hereinafter as the “**Seller**”. With regard to products or components manufactured by unrelated third parties (the “**Components**”), TLV provides no warranty other than the warranty from the third party manufacturer(s), if any.

Exceptions to Warranty

This warranty does not cover defects or failures caused by:

1. improper shipping, installation, use, handling, etc., by persons other than TLV, TII or TLV group company personnel, or service representatives authorized by TLV; or
2. dirt, scale or rust, etc.; or
3. improper disassembly and reassembly, or inadequate inspection and maintenance by persons other than TLV or TLV group company personnel, or service representatives authorized by TLV; or
4. disasters or forces of nature or Acts of God; or
5. abuse, abnormal use, accidents or any other cause beyond the control of TLV, TII or TLV group companies; or
6. improper storage, maintenance or repair; or
7. operation of the Products not in accordance with instructions issued with the Products or with accepted industry practices; or
8. use for a purpose or in a manner for which the Products were not intended; or
9. use of the Products in a manner inconsistent with the Specifications; or
10. use of the Products with Hazardous Fluids (fluids other than steam, air, water, nitrogen, carbon dioxide and inert gases (helium, neon, argon, krypton, xenon and radon)); or
11. failure to follow the instructions contained in the TLV Instruction Manual for the Product.

Duration of Warranty

This warranty is effective for a period of one (1) year after delivery of Products to the first end user. Notwithstanding the foregoing, asserting a claim under this warranty must be brought within three (3) years after the date of delivery to the initial buyer if not sold initially to the first end user.

ANY IMPLIED WARRANTIES NOT NEGATED HEREBY WHICH MAY ARISE BY OPERATION OF LAW, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ANY EXPRESS WARRANTIES NOT NEGATED HEREBY, ARE GIVEN SOLELY TO THE INITIAL BUYER AND ARE LIMITED IN DURATION TO ONE (1) YEAR FROM THE DATE OF SHIPMENT BY THE SELLER.

Exclusive Remedy

THE EXCLUSIVE REMEDY UNDER THIS WARRANTY, UNDER ANY EXPRESS WARRANTY OR UNDER ANY IMPLIED WARRANTIES NOT NEGATED HEREBY (INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE), IS **REPLACEMENT**; PROVIDED: (a) THE CLAIMED DEFECT IS REPORTED TO THE SELLER IN WRITING WITHIN THE WARRANTY PERIOD, INCLUDING A DETAILED WRITTEN DESCRIPTION OF THE CLAIMED DEFECT AND HOW AND WHEN THE CLAIMED DEFECTIVE PRODUCT WAS USED; AND (b) THE CLAIMED DEFECTIVE PRODUCT AND A COPY OF THE PURCHASE INVOICE IS RETURNED TO THE SELLER, FREIGHT AND TRANSPORTATION COSTS PREPAID, UNDER A RETURN MATERIAL AUTHORIZATION

AND TRACKING NUMBER ISSUED BY THE SELLER. ALL LABOR COSTS, SHIPPING COSTS, AND TRANSPORTATION COSTS ASSOCIATED WITH THE RETURN OR REPLACEMENT OF THE CLAIMED DEFECTIVE PRODUCT ARE SOLELY THE RESPONSIBILITY OF BUYER OR THE FIRST END USER. THE SELLER RESERVES THE RIGHT TO INSPECT ON THE FIRST END USER'S SITE ANY PRODUCTS CLAIMED TO BE DEFECTIVE BEFORE ISSUING A RETURN MATERIAL AUTHORIZATION. SHOULD SUCH INSPECTION REVEAL, IN THE SELLER'S REASONABLE DISCRETION, THAT THE CLAIMED DEFECT IS NOT COVERED BY THIS WARRANTY, THE PARTY ASSERTING THIS WARRANTY SHALL PAY THE SELLER FOR THE TIME AND EXPENSES RELATED TO SUCH ON-SITE INSPECTION.

Exclusion of Consequential and Incidental Damages

IT IS SPECIFICALLY ACKNOWLEDGED THAT THIS WARRANTY, ANY OTHER EXPRESS WARRANTY NOT NEGATED HEREBY, AND ANY IMPLIED WARRANTY NOT NEGATED HEREBY, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, DO NOT COVER, AND NEITHER TLV, TII NOR ITS TLV GROUP COMPANIES WILL IN ANY EVENT BE LIABLE FOR, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO LOST PROFITS, THE COST OF DISASSEMBLY AND SHIPMENT OF THE DEFECTIVE PRODUCT, INJURY TO OTHER PROPERTY, DAMAGE TO BUYER'S OR THE FIRST END USER'S PRODUCT, DAMAGE TO BUYER'S OR THE FIRST END USER'S PROCESSES, LOSS OF USE, OR OTHER COMMERCIAL LOSSES. WHERE, DUE TO OPERATION OF LAW, CONSEQUENTIAL AND INCIDENTAL DAMAGES UNDER THIS WARRANTY, UNDER ANY OTHER EXPRESS WARRANTY NOT NEGATED HEREBY OR UNDER ANY IMPLIED WARRANTY NOT NEGATED HEREBY (INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE) CANNOT BE EXCLUDED, SUCH DAMAGES ARE EXPRESSLY LIMITED IN AMOUNT TO THE PURCHASE PRICE OF THE DEFECTIVE PRODUCT. THIS EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES, AND THE PROVISION OF THIS WARRANTY LIMITING REMEDIES HEREUNDER TO REPLACEMENT, ARE INDEPENDENT PROVISIONS, AND ANY DETERMINATION THAT THE LIMITATION OF REMEDIES FAILS OF ITS ESSENTIAL PURPOSE OR ANY OTHER DETERMINATION THAT EITHER OF THE ABOVE REMEDIES IS UNENFORCEABLE, SHALL NOT BE CONSTRUED TO MAKE THE OTHER PROVISIONS UNENFORCEABLE.

Exclusion of Other Warranties

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, AND ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY DISCLAIMED.

Severability

Any provision of this warranty which is invalid, prohibited or unenforceable in any jurisdiction shall, as to such jurisdiction, be ineffective to the extent of such invalidity, prohibition or unenforceability without invalidating the remaining provisions hereof, and any such invalidity, prohibition or unenforceability in any such jurisdiction shall not invalidate or render unenforceable such provision in any other jurisdiction.

Service

For Service or Technical Assistance: Contact your TLV representative or your TLV office.

In Europe:

TLV EURO ENGINEERING GmbH

Daimler-Benz-Straße 16-18, 74915 Waibstadt, **Germany**

Tel: [49]-(0)7263-9150-0
Fax: [49]-(0)7263-9150-50

TLV EURO ENGINEERING UK LTD.

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

Tel: [44]-(0)1242-227223
Fax: [44]-(0)1242-223077

TLV EURO ENGINEERING FRANCE SARL

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

Tel: [33]-(0)4-72482222
Fax: [33]-(0)4-72482220

In North America:

TLV CORPORATION

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

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

In Mexico and Latin America:

TLV ENGINEERING S. A. DE C. V.

Av. Jesús del Monte 39-B-1001, Col. Hda. de las Palmas, Huixquilucan, Edo. de México, 52763, **Mexico**

Tel: [52]-55-5359-7949
Fax: [52]-55-5359-7585

In Oceania:

TLV PTY LIMITED

Unit 8, 137-145 Rooks Road, Nunawading, Victoria 3131, **Australia**

Tel: [61]-(0)3-9873 5610
Fax: [61]-(0)3-9873 5010

In East Asia:

TLV PTE LTD

36 Kaki Bukit Place, #02-01/02, **Singapore** 416214

Tel: [65]-6747 4600
Fax: [65]-6742 0345

TLV SHANGHAI CO., LTD.

Room 5406, No. 103 Cao Bao Road, Shanghai, **China** 200233

[86]-(0)21-6482-862
2
Tel: [86]-(0)21-6482-862
Fax: 3

TLV ENGINEERING SDN. BHD.

No.16, Jalan MJ14, Taman Industri Meranti Jaya, 47120 Puchong, Selangor, **Malaysia**

Tel: [60]-3-8052-2928
Fax: [60]-3-8051-0899

TLV PRIVATE LIMITED

252/94 (K-L) 17th Floor, Muang Thai-Phatra Complex Tower B, Rachadaphisek Road, Huaykwang, Bangkok 10310, **Thailand**

Tel: [66]-2-693-3799
Fax: [66]-2-693-3979

TLV INC.

#302-1 Bundang Technopark B, 723 Pangyo-ro, Bundang, Seongnam, Gyeonggi, 13511, **Korea**

Tel: [82]-(0)31-726-2105
Fax: [82]-(0)31-726-2195

In the Middle East:

TLV ENGINEERING FZCO

Building 2W, No. M002, PO Box 371684, Dubai Airport Free Zone, Dubai, **UAE**

Email: sales-me@tlv.co.jp

In Other Countries:

TLV INTERNATIONAL, INC.

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

Tel: [81]-(0)79-427-1818
Fax: [81]-(0)79-425-1167

Manufacturer:

TLV CO., LTD.

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

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