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ISO 9001/ ISO 14001

Manufacturer

TLV CO., LTD.

Kakogawa, Japan

is approved by LRQA LTD. to ISO 9001/14001

Instruction Manual

PowerDyne™

Thermodynamic Steam Trap

P21S

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Introduction

Thank you for purchasing the TLV **PowerDyne** Thermodynamic 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 **PowerDyne** Thermodynamic Steam Trap employs an air-jacketed pressure chamber that prevents no-load actuation and steam loss in general. For products with special order specifications or options, if detailed instructions for the special order specifications or options are not contained in this manual, 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

	**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

	**Install properly and DO NOT use this product outside the recommended operating pressure, temperature and other specification ranges.** Improper use may result in such hazards as damage to the product or malfunctions that may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted.
	Take measures to prevent people from coming into direct contact with product outlets. Failure to do so may result in burns or other injury from the discharge of fluids.
	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.

Safety considerations continued on next page.

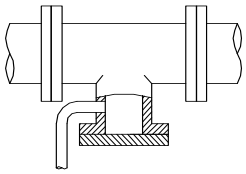
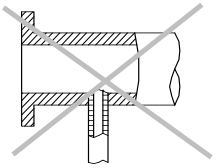
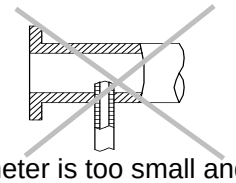
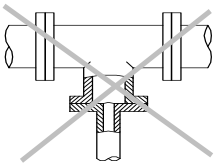
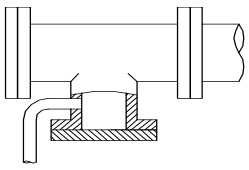
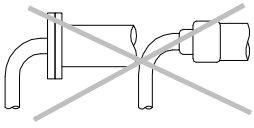
⚠ CAUTION	**Be sure to use only the recommended components when repairing the product, and NEVER attempt to modify the product in any way.** Failure to observe these precautions may result in damage to the product and burns or other injury due to malfunction or the discharge of fluids.
	Use only under conditions in which no freeze-up will occur. Freezing may damage the product, leading to fluid discharge, which may cause burns or other injury.
	Use only under conditions in which no water hammer will occur. The impact of water hammer may damage the product, leading to fluid discharge, which may cause burns or other injury.

Checking the Piping

⚠CAUTION **Use only under conditions in which no water hammer will occur. The impact of water hammer may damage the product, leading to fluid discharge, which may cause burns or other injury.**

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

1. Is the pipe diameter suitable?
2. Has sufficient space been secured for maintenance?
1. Have isolation valves been installed at the inlet and outlet? If the outlet is subject to back pressure, has a check valve been installed?
2. 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?
3. Has the piping work been done correctly, as shown in the figures below?

Requirement	Correct	Incorrect
Install catchpot with the proper diameter.		 Diameter is too small.
Make sure the flow of condensate is not obstructed.		 Diameter is too small and inlet protrudes into pipe interior.
To prevent rust and scale from flowing into the trap, the inlet pipe should be connected 25 – 50 mm (1 – 2 in) above the base of the T-pipe.		 Rust and scale flow into the trap with the condensate.
When installing on the blind end, make sure the flow of condensate is not obstructed.		 Condensate collects in the pipe.

Specifications

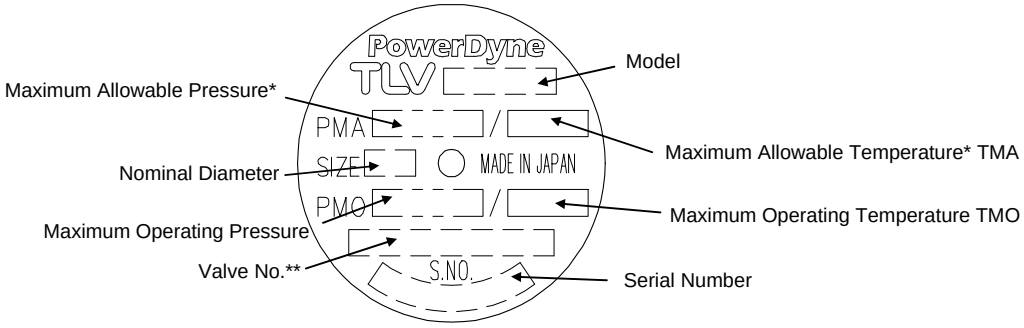
⚠CAUTION

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

⚠CAUTION

Use only under conditions in which no freeze-up will occur. Freezing may damage the product, leading to fluid discharge, which may cause burns or other injury.

Refer to the product nameplate for detailed specifications.



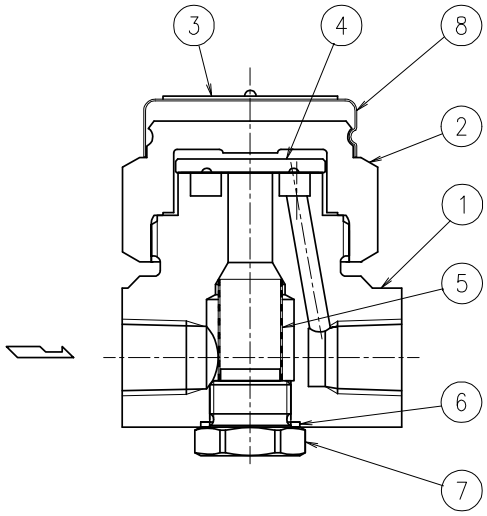
Minimum Operating Pressure: 0.025MPaG (3.5 psig)

Back pressure should not exceed 50% of the inlet pressure

* 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



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

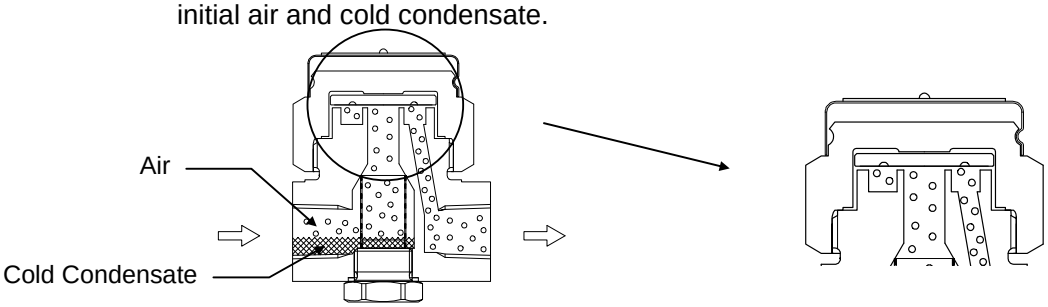
* Replacement parts are available only in the following kits:
M = Maintenance Kit; R = Repair Kit

Operation

Principle of Air and Condensate Discharge

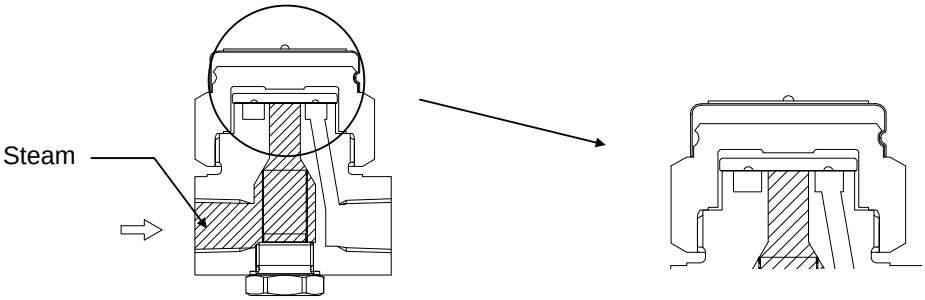
1. Start-up: Discharge of Initial Air and Cold Condensate

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



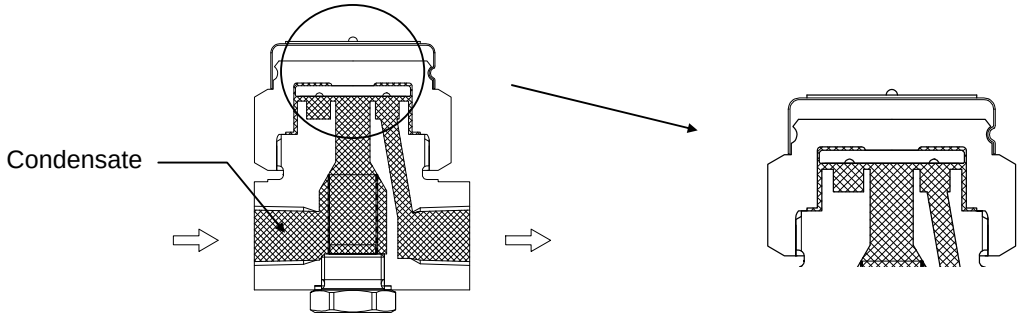
2. Steam Enters, Valve Closes

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



3. Condensate Discharge

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



Installation

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

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

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

1. Before installation, be sure to remove all protective seals.
2. Before installing the product, open the inlet valve and blow out the piping to remove any piping scraps, dirt and oil. Close the inlet valve after blowdown.
3. Install the product so the arrow on the body is pointing in the direction of flow.
4. The trap may be installed either horizontally or vertically; there are no restrictions on the orientation of installation. (Fix the trap securely in place.)
5. Install a condensate outlet valve and outlet piping.
6. Open the inlet and outlet valves and check to make sure that the product functions properly.

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

Maintenance

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

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

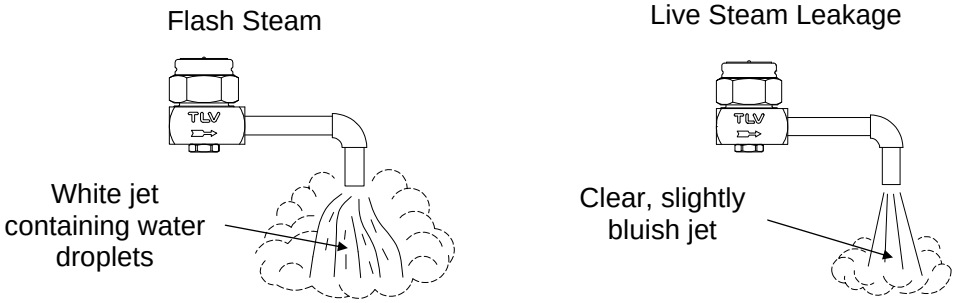
Operational Check

A visual inspection of the following items should be done on a daily basis to determine whether the trap is operating properly or has failed. Periodically (at least biannually) the operation should also be checked by using diagnostic equipment, such as a stethoscope, thermometer, TLV TrapMan or TLV Pocket TrapMan.

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

Normal	: Condensate is discharged intermittently together with flash steam, and the sound of flow can be heard.
Blocked (Discharge Impossible)	: No condensate is discharged. The trap is quiet and makes no noise, and the surface temperature of the trap is low.
Blowing	: Live steam continually flows from the outlet and there is a continuous metallic sound.
Steam Leakage	: Live steam is discharged through the trap outlet together with condensate, accompanied by a high-pitched 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 [TLV: TrapMan] in conjunction with the visual inspection is highly recommended.)



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
Gaskets: check for warping or scratches
Screen: check for clogging or corrosion
Disc: check for scratches or wear
On-body Valve Seat Surface: check for scratches or wear
Check for build-up inside the body

Disassembly / Reassembly

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

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

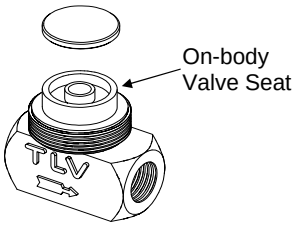
Removing / Reattaching the Cap

Part	During Disassembly	During Reassembly
Cap	Gently turn the cap to remove	Being careful not to bend it, gently turn the cap to tighten

Removing / Reattaching the Cover and its Components

Part	During Disassembly	During Reassembly
Cover	Remove with a socket wrench	Consult the table of tightening torques and tighten to the proper torque
Disc	Remove, being careful not to scratch the lapped surface	Make sure that the seat surface (lapped side with groove) is facing down toward the valve seat (see figure A)

Figure A



Disassembly / Reassembly of Components Inside the Body

Part	During Disassembly	During Reassembly
Screen Holder	Remove with a socket wrench	Consult the table of tightening torques and tighten to the proper torque
Screen Holder Gasket	—	Replace with new gasket; coat surfaces with anti-sieze
Screen	Remove without bending	Reinsert without bending

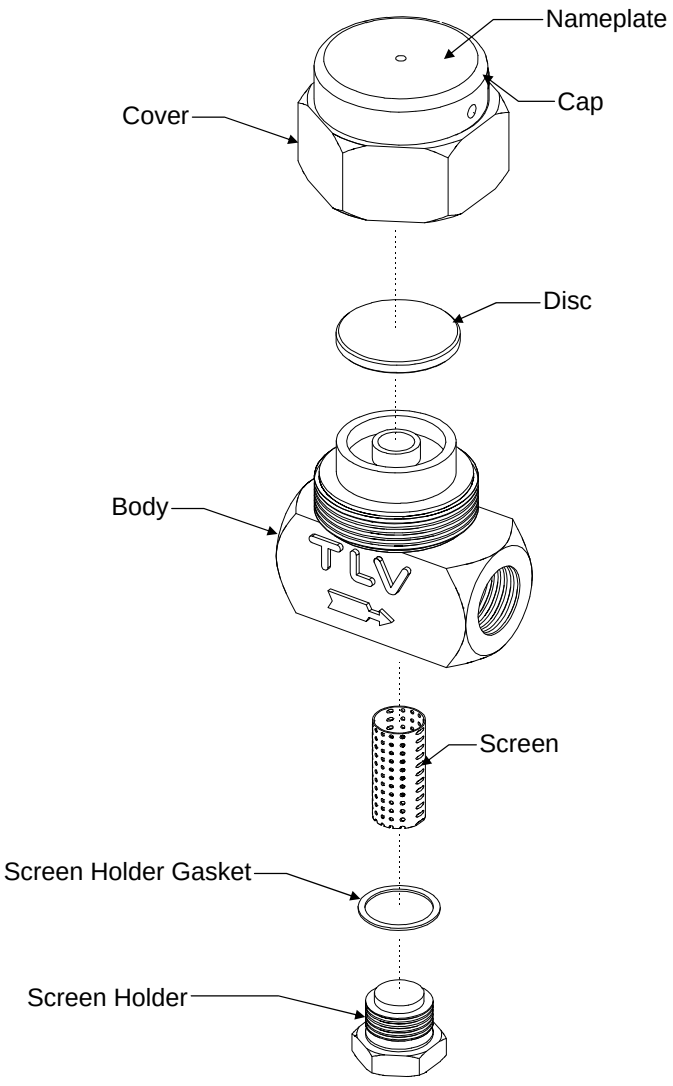
Table of Tightening Torques

Part Name	Torque		Distance Across Flats	
	N·m	(lbf·ft)	mm	(in)
Cover	120	(88)	38	($1^{1}/_{2}$)
Screen Holder	40	(29)	17	($^{21}/_{32}$)

(1 N·m ≈ 10 kg·cm)

NOTE: Coat all threaded portions with anti-seize.

Exploded View



Troubleshooting

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

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

Problem	Cause	Remedy
No condensate is discharged or discharge is poor (blocked)	On-body valve seat, screen or piping are clogged with rust or scale	Clean parts
	Disc is stuck to the on-body valve seat	Clean parts
	Air binding has occurred	Perform a bypass blowdown, or close the trap inlet valve and allow the trap to cool
	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 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)	Rust or scale on the disc or on the on-body valve seat	Clean parts
	Disc damage or wear	Replace with new disc
	On-body valve seat damage or wear	Replace product
	Improper installation	Correct the installation
	Trap vibration	Lengthen inlet piping and fasten securely
	Trap operating pressure is less than the minimum specified pressure or the back pressure exceeds the allowable back pressure	Compare specifications and actual operating conditions
Steam is leaking from a place other than the outlet	Gasket deterioration or damage	Replace with new gasket(s)
	Improper tightening torques were used	Tighten to the proper torque

NOTE: When replacing parts with new, use the parts list for reference, and replace with parts from the Maintenance Kit, Repair Kit, etc. Please note that replacement parts are only available as part of a replacement parts kit.

Product Warranty

1. Warranty Period
   One year following product delivery.

2. Warranty Coverage
   TLV CO., LTD. warrants this product to the original purchaser to be free from defective materials and workmanship. Under this warranty, the product will be repaired or replaced at our option, without charge for parts or labor.

3. This product warranty will not apply to cosmetic defects, nor to any product whose exterior has been damaged or defaced; nor does it apply in the following cases:

   1) Malfunctions due to improper installation, use, handling, etc., by other than TLV CO., LTD. authorized service representatives.

   2) Malfunctions due to dirt, scale, rust, etc.

   3) Malfunctions due to improper disassembly and reassembly, or inadequate inspection and maintenance by other than TLV CO., LTD. authorized service representatives.

   4) Malfunctions due to disasters or forces of nature.

   5) Accidents or malfunctions due to any other cause beyond the control of TLV CO., LTD.

4. Under no circumstances will TLV CO., LTD. be liable for consequential economic loss damage or consequential damage to property.

* * * * * * *

For Service or Technical Assistance:

Contact your TLV representative or your regional TLV office.

Manufacturer

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