

INSTRUCTION MANUAL

Keep this manual in a safe place for future reference

TLV® UNIVERSAL TEMPERATURE CONTROL STEAM TRAP FX1

QuickTrap® FX1 Trap Unit X1



(Option
BD2)

Manufacturer

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Introduction

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

The FX1 temperature control steam trap (connector body unit F46 or former connector unit F32* and steam trap unit X1) with built-in scale removal function is suitable for the accurate control of condensate discharge temperatures for applications with operating pressures up to 2.1 MPaG (300 psig).

DO NOT USE on any application **except** steam tracing lines, storage tank coils and instrument enclosures.

Note: The FX1 can only control the temperature of condensate discharge from the trap; it cannot control product temperature nor the temperature of condensate backing up in the system.

* Configuration of F32 differs slightly from that of F46

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

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

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

1. Safety Considerations

- Read this section carefully before use and be sure to follow the instructions.
- Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.
- The precautions listed in this manual are designed to ensure safety and prevent equipment damage and personal injury. For situations that may occur as a result of erroneous handling, three different types of cautionary items are used to indicate the degree of urgency and the scale of potential damage and danger: DANGER, WARNING and CAUTION.
- The three types of cautionary items above are very important for safety; be sure to observe all of them, as they relate to installation, use, maintenance, and repair. Furthermore, TLV accepts no responsibility for any accidents or damage occurring as a result of failure to observe these precautions.



Indicates a DANGER, WARNING or CAUTION item.



DANGER

Indicates an urgent situation that poses a threat of death or serious injury.



WARNING

Indicates that there is a potential threat of death or serious injury.



CAUTION

Indicates that there is a possibility of injury, or equipment/product damage.




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.

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.

Always wear heat-insulated gloves when handling products with high body temperatures, such as when in operation. Failure to do so may result in burns.

Continued on the next page

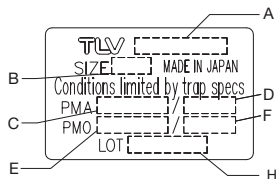
 CAUTION	<p>DO NOT disassemble or remove this product or use the scale removal function while it is under pressure. Allow internal pressure of this product to equal atmospheric pressure and its surface to cool to room temperature before disassembling, removing or using the scale removal feature. Failing to do so could cause burns or other injury.</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>
	<p>The pressure and temperature values displayed on the nameplate of the connector body are the values for the connector body itself and not for the entire trap. Improper use may result in such hazards as damage to the product or malfunctions that may lead to serious accidents.</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 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>

2. Specifications

Refer to the product nameplate on the trap unit for detailed specifications.

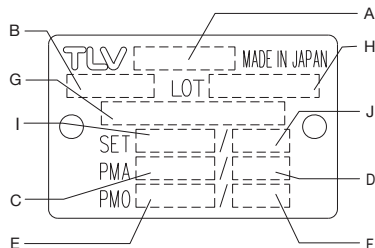
A nameplate is also mounted on the F46 connector unit. The specifications displayed on the nameplate are the values for the connector body itself. When a trap unit is installed, the PMA/TMA and PMO/TMO are limited to the trap unit specifications.

Connector Unit (mounted only on F46)



- A: Model
- B: Nominal Diameter
- C: Max. Allowable Press.*
- D: Max. Allowable Temp.* (TMA)
- E: Max. Operating Press.
- F: Max. Operating Temp. (TMO)
- G: Valve No.**
- H: Production Lot No.
- I: Set Pressure***
- J: Set Temperature***

Trap Unit



* Maximum allowable pressure (PMA) and maximum allowable temperature (TMA) are PRESSURE SHELL DESIGN CONDITIONS, **NOT** OPERATING CONDITIONS.

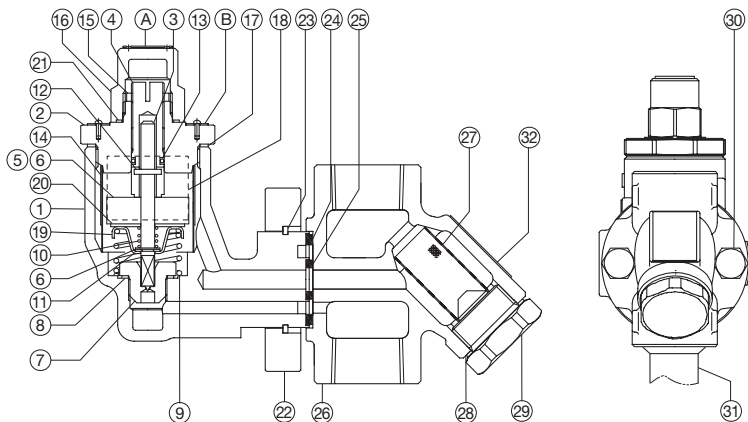
** Valve No. is displayed for products with options. This item is omitted from the nameplate when there are no options.

*** Set pressure and set temperature are the initial settings when shipped from the factory.



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



Replacement parts for F32 differ from those for F46. When ordering replacement parts, please include the trap unit name, size, connection type and also the connector unit name.

No.	Description	M	R	T	No.	Description	M	R	T	No.	Description	M	R	T
1	Trap Body			✓	13	Seal Ring	✓	✓	✓	24	Outer Connector Gasket	✓	✓	✓
2	Cover			✓	14	Screen		✓	✓	25	Inner Connector Gasket	✓	✓	✓
3	Valve Stem		✓	✓	15	Locknut			✓	26	Connector Body			
4	Adjusting Screw		✓	✓	16	Cap Nut			✓	27	Screen			
5	Bimetal Element		✓	✓	17	Cover Gasket	✓	✓	✓	28	Screen Holder Gasket	✓	✓	
6	Washer		✓	✓	18	Nameplate (Trap Unit)			✓	29	Screen Holder			
7	Valve Seat		✓	✓	19	Spring Guide		✓	✓	30	Connector Bolt			✓
8	Valve Seat Gasket	✓	✓	✓	20	Thrust Plate		✓	✓	31	Flange			
9	Overexpansion Spring		✓	✓	21	Cap Nut Gasket	✓	✓	✓	32	Nameplate (Connector Unit)			
10	Return Spring		✓	✓	22	Connector Flange		✓	✓	A	Caution Plate A			✓
11	Snap Ring		✓	✓	23	Snap Ring			✓	B	Caution Plate B			✓
12	Spring Pin		✓	✓										

Replacement parts are available only in the following kits: M = Maintenance Parts, R = Repair Parts, T = Trap Unit

4. Exploded View

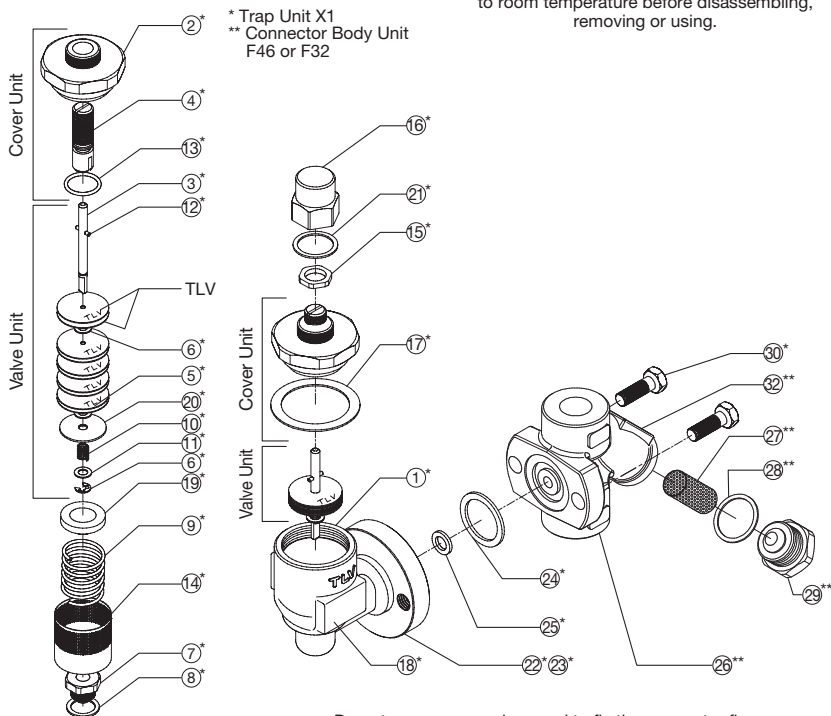
Trap unit X1 is designed for use with TLV F46 and F32 connector units, trap stations (V1/V2/V1P/V2P Series) and QuickStation QS10.

This trap unit is not compatible with TLV F46J connector unit.

The connector unit name is indicated on the connector body.



DO NOT DISASSEMBLE OR REMOVE THIS PRODUCT OR USE THE SCALE REMOVAL FUNCTION WHILE IT IS UNDER PRESSURE. Allow internal pressure of this product to equal atmospheric pressure and its surface to cool to room temperature before disassembling, removing or using.



Do not remove snap ring used to fix the connector flange.

5. Applications

- **DO NOT USE** on any application **except** steam tracing lines, storage tank coils and instrument enclosures.
- **SUITABLE** for steam tracing lines or storage tank coils **ONLY IF** the required product viscosity will be maintained when the condensate is sub-cooled at least 15 °C (27 °F), even to the point of the condensate having a lower temperature than the product temperature.
- **SUITABLE** for use on instrument enclosures **ONLY IF** the steam or condensate temperature in the enclosures will **NOT** damage the instrument.

6. 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.
- Install for use under conditions in which no freeze-up will occur.
- Install for use under conditions in which no water hammer will occur.

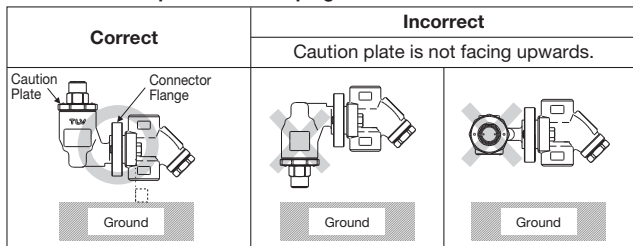
Note: For socket weld connections, use electric arc welding with a single pass. As internal parts are not damaged by one pass welding, there is no need to remove them before welding.

1. In some instances, the trap unit and the connector body are sent as separate units. When attaching them together, make sure the connector gaskets are still in place after having removed their protective seal (See page 10 for details).
2. There are no restrictions on the installation direction beyond the following conditions:
 - a. The arrow on the connector body must point in the direction of condensate flow.
 - b. The connector body must be adjusted so that the connector flange face (for connecting to the trap unit) is in the vertical plane.
 - c. The caution plates on the trap unit must face upward.
3. Before installation, be sure to remove all protective seals.
4. Before installing the trap, blow out the inlet piping to remove all dirt and oil.
5. Verify that piping is of a suitable diameter.
6. Support the pipes properly within 800 mm (2.5 ft) on either side of the trap.
7. Install in a place where caution plates (including cap) can clearly be seen during periods of maintenance, in the lowest part of the pipeline so that condensate flows into the trap by gravity.
8. Install inlet and outlet valves to isolate the product in event of trap failure or maintenance.
9. If the product is subject to back pressure, install a check valve.
10. Open the inlet valve gradually and make sure that the product functions properly.

Installation Examples: Horizontal Piping

Correct	Incorrect			
	Caution plate is not facing upwards.		Universal Connector Flange is not in the vertical plane.	

Installation Examples: Vertical Piping



7. Operational Check

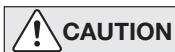
A visual inspection can be carried out to aid in determining the necessity for immediate maintenance or repair, if the trap is open to atmosphere. If the trap does not discharge to atmosphere, use diagnostic equipment such as a stethoscope, thermometer, TLV Pocket TrapMan or TrapMan (within its pressure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

Normal:	Condensate is being discharged from the discharge outlet. (The surface temperature of the trap should be about 10 to 20 °C (20 to 40 °F) lower than the set temperature.)
Blocked:	No condensate is discharged and the surface temperature of the trap is low.
Blowing:	Live steam continually flows from the outlet and there is a continuous hissing sound of flow. The surface temperature of the trap is higher than the set temperature.

(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.)

8. Adjusting Temperature Setting

The temperature setting can be easily adjusted.



- To prevent possible injury, always relieve pressure from trap before opening to adjust the temperature setting.
- Always wear heat-insulated gloves and eye protection when handling products exposed to high temperatures. Failure to do so may result in burns.

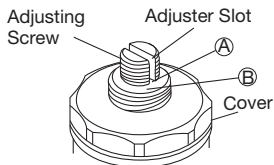
Instructions for Adjusting Temperature Setting

1. First close the external valve from which the steam and condensate flow to the trap (the "inlet isolation valve"), followed by then closing the external valve to which the condensate flows from the trap (the "outlet isolation valve"). Wait until the pressure between the inlet isolation valve and the trap equals atmospheric pressure (when the trap body temperature cools to room temperature). Do not remove the cap nut unless the trap is isolated from and is not subjected to steam pressure.
2. Hold the cover with one wrench and use another wrench to slowly loosen and remove the cap nut. Remove cap nut slowly to allow any residual pressurized steam to leak from the trap interior through the threads of the adjustment screw and the cover.
3. Hold the adjusting screw in place with a flat-head screwdriver and remove the locknut slowly in case of any additional steam leakage.
4. Use a flat-head screwdriver to turn the adjusting screw to adjust temperature. To raise the temperature setting, turn the adjusting screw counterclockwise. To lower the temperature setting, turn the adjusting screw clockwise. Refer to the set temperature adjustment chart for the number of turns required from the "0" position to reach the desired temperature.
5. After completing the adjustment, replace the locknut. Hold the adjusting screw in place with a flat-head screwdriver and tighten the locknut securely.
6. Replace the cap nut and tighten it to the proper torque (see page 10).
7. First fully open the outlet isolation valve, followed by then slowly opening the inlet isolation valve – carefully checking for any steam leaks that might occur. In the event steam leaks are detected, immediately close the inlet isolation valve, then the outlet isolation valve, and repair the source of leakage.
8. Check the temperature setting by observing an inline temperature sensor or by measuring the temperature at the wrench flat on the trap's inlet side at least 30 minutes after supplying steam with the new setting. The trap set temperature will be approximately 10 to 20 °C (20 to 40 °F) higher than the surface reading. If the resultant temperature is not as desired, repeat procedure from step "1" above.

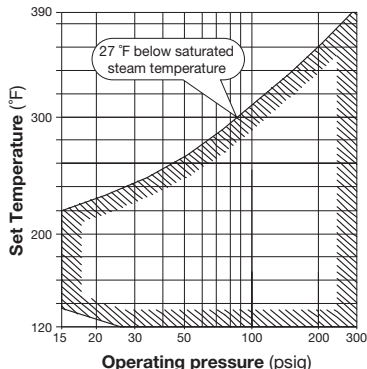
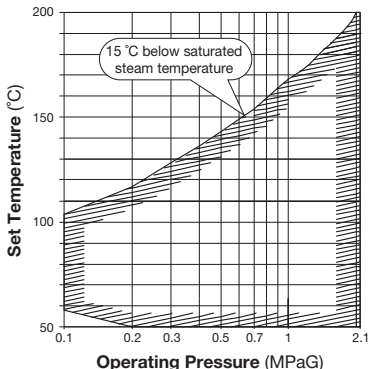
Standard Factory Setting ("0" Position):

The standard "0" position is the position where point (A), the bottom of the adjusting screw slot is even with point (B), the top surface of the cap.

FX1
100 °C at 0.9 MPaG (9 barg), 212 °F at 130 psig



Temperature Setting Range

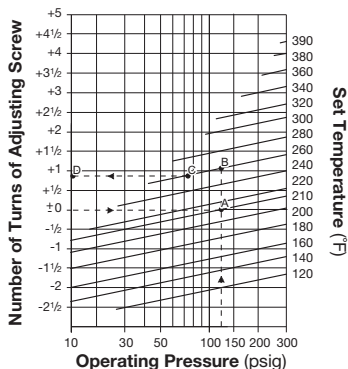
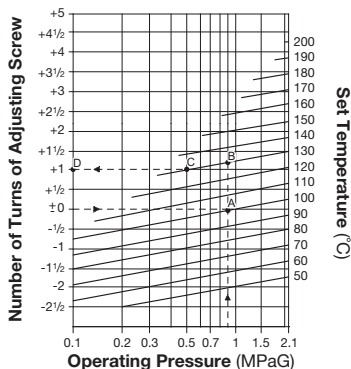


1 MPa = 10.197 kg/cm² = 10 bar

Set Temperature Adjustment Chart

The trap can be set to open at any temperature between 50 °C and 200 °C (120 °F and 390 °F) provided the set temperature is at least 15 °C (27 °F) below saturated steam temperature. To determine the number and direction of adjusting screw turns required for the desired set temperature, refer to the charts below.

1. Start at the standard factory setting (point A) (100 °C at 0.9 MPaG, 9 barg; 212 °F at 130 psig).
2. Move up or down vertically to the desired set temperature (point B).
3. Follow the set temperature line in either direction to the vertical line corresponding to the actual operating steam pressure (point C).
4. Follow the horizontal line to where it meets the left side of the chart (point D), indicating the number and direction of turns required. (- turn: clockwise, + turn: counterclockwise)



1 MPa = 10.197 kg/cm² = 10 bar

- turn: clockwise, + turn: counterclockwise

Standard "0" position = 100 °C at 0.9 MPaG, 9 barg; 212 °F at 130 psig

9. Cleaning Function

Rust, scale and other buildup on the valve seat may hinder the sealing ability of the steam trap and cause steam leakage and resultant higher product temperature; or block the valve seat opening - thereby preventing condensate discharge and resultant lowered product temperature. The FX1 contains a built-in cleaning device that can be used without removing the trap from the line. Follow the steps below to remove contaminant accumulation from around the valve opening.



- To prevent possible injury, always relieve pressure from trap before opening to clean the trap.
- Always wear heat-insulated gloves and eye protection when handling products exposed to high temperatures. Failure to do so may result in burns.

Cleaning Function Instructions

1. First close the inlet isolation valve, followed by then closing the outlet isolation valve. Wait until the pressure between the inlet isolation valve and the trap equals atmospheric pressure (when the trap body temperature cools to room temperature). Do not remove the cap nut or the cover unless the trap is isolated from and is not subjected to steam pressure.
2. Hold the cover with one wrench and use another wrench to slowly loosen and remove the cap nut. Remove cap nut slowly to allow any residual pressurized steam to leak from the trap interior through the threads of the adjustment screw and the cover. If steam leakage occurs while loosening cap nut or locknut, disassemble the trap and replace both the seal ring and the cover gasket (see chapter 10).
3. Hold the adjusting screw in place with a flat-head screwdriver and remove the locknut slowly in case of any additional steam leakage.
4. Check the current set position of the adjusting screw. Check and record the number of turns required to return to the standard factory setting (when points (A) and (B) are even with each other as shown on page 7).
5. Use a flat-head screwdriver to slowly turn the adjusting screw clockwise (to tighten) until it stops. (This causes the cleaning edge of the stem to reach the valve seat and loosen debris).
6. Slowly turn the adjusting screw counterclockwise (to loosen) until it stops. (This will allow flushing once the steam is safely turned on using the instructions that follow).
7. Replace the cap nut and tighten it to the proper torque (see page 10).
8. First fully open the outlet isolation valve, and then slowly and carefully open the inlet isolation valve - checking for any steam leaks. In the event steam leaks are detected, immediately close the inlet isolation valve, then the outlet isolation valve, and repair the source of leakage.
9. Wait 10 seconds to allow any loose scale to be flushed internally. Be aware of any external steam leak - including the outlet connection if opened to atmosphere. Be careful to not come in contact with any steam that is discharging from an open outlet connection. If any steam leaks are detected elsewhere on the trap or piping, immediately close the inlet isolation valve, then the outlet isolation valve, and repair the source of leakage.
10. Next, prepare to set the trap temperature again by first isolating the trap and safely relieving all steam pressure from the trap as follows.
11. First close the inlet isolation valve, followed by then closing the outlet isolation valve. Wait until the inlet pressure equals atmospheric pressure. (When the trap body temperature cools to room temperature)
12. Hold the cover with one wrench and use another wrench to slowly remove the cap nut as in step 2 above.
13. Slowly turn the adjusting screw clockwise (to tighten) to return to the original position checked in step 4 above.
14. Replace the locknut. Hold the adjusting screw in place with a flat-head screwdriver and tighten the locknut securely.
15. Replace the cap nut and tighten it to the proper torque (see page 10).
16. First fully open the outlet isolation valve, followed by then slowly opening the inlet isolation valve - carefully checking for any steam leaks. In the event steam leaks are detected, immediately close the inlet isolation valve, then the outlet isolation valve, and repair the source of leakage.
17. Check the temperature setting by observing an inline temperature sensor or by measuring the temperature at the trap inlet wrench flat at least 30 minutes after supplying steam with the new setting. The trap set temperature will be approximately 10 to 20 °C (20 to 40 °F) higher than the temperature reading on the trap body surface. If the resultant temperature is not as desired, use the above instructions for adjusting temperature settings (see page 9).

10. Inspection and Maintenance

Operational inspections should be performed at least twice per year, or as called for by trap operating conditions. Steam trap failure may result in temperature drop in the equipment, poor product quality or losses due to steam leakage.



- 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 isolation valves and wait until the trap has cooled completely. Failure to do so may result in burns.
- Be sure to use the proper components and NEVER attempt to modify the product.

Parts Inspection Procedure	
Gasket(s)	Check for warping and damage
Seal Ring	Check for scratches and wear
Valve Stem	Check for scratches and wear
Bimetal Element	Check for wear and deformation
Over-expansion and Return Springs	Check for wear
Screen	Check for clogging, corrosion 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.	Disassembly	Reassembly
Connector Bolt	Remove with a socket wrench	Consult the table of tightening torques and tighten to the proper torque
Connector Gaskets	See separate instruction 10.1	See separate instruction 10.1
Cap Nut Gasket 21	Remove and clean sealing surfaces	Replace with a new gasket if warped or damaged
Locknut 15	Remove with a spanner or socket wrench	Reattach and tighten
Cover 2	Remove with a spanner or socket wrench	Line up spring pin in valve stem with grooves cut into the adjusting screw as cover is placed onto the body; consult the table of tightening torques and tighten to the proper torque
Cover Gasket 17	Remove and clean sealing surfaces	Replace with a new gasket; coat surfaces with anti-seize
Adjusting Screw 4	Screw in by using a flat-head screwdriver	Be careful not to damage the seal ring during reassembly
Seal Ring 13	Remove	Replace with a new seal ring if damaged; coat with heat resistant silicon grease
Snap Ring 11	Remove from the valve stem	Reattach to the valve stem
Washer 6	Lift up and off from the valve stem	Slide onto the valve stem
Return Spring 10	Remove from the valve stem	Place on the valve stem
Thrust Plate 20	Remove from the valve stem by lifting up and off	Slide onto the valve stem
Washer (5 sets) 6	Lift up and off from the valve stem	Slide onto the valve stem
Bimetal Element (5 sets of 2 discs) 5	Remove the bimetal element from the valve stem by lifting up and off	Reassemble the bimetal elements, paying special attention to the proper orientation (the TLV marks on the outside, see Exploded View, p. 4)

Continued on the next page

Disassembly/Reassembly (to reassemble, follow procedures in reverse)		
Part & No.	Disassembly	Reassembly
Spring Pin 12	Remove from the valve stem only if damaged	Replace with new if damaged
Screen 14	Remove without bending	Reinsert without bending
Spring Guide 19	Remove from the trap body	Reinsert in the proper orientation
Overexpansion Spring 9	Remove from the trap body	Reinsert
Valve Seat 7	Remove with a socket wrench, being careful not to scratch the sealing surfaces	Consult the table of tightening torques and tighten to the proper torque; be careful not to scratch seating surfaces
Valve Seat Gasket 8	Remove and clean sealing surfaces	Replace with a new gasket; coat surfaces with anti-seize
Screen Holder 29	Use a socket wrench to remove	Coat threads with anti-seize, then tighten to the proper torque
Screen Holder Gasket 28	Remove the gasket and clean the sealing surface	Replace with a new gasket, apply anti-seize to both surfaces
Screens 14 & 27	Remove without bending	Insert without bending

Tightening Torque and Distance Across Flats						
Part Name & No.		Torque		Distance Across Flats		
		N-m	(lbf-ft)	mm	(in)	
Cap Nut 16		35	(26)	24	(1 ⁵ / ₁₆)	
Cover 2		250	(185)	46	(1 ¹³ / ₁₆)	
Connector Bolt 30		39	(28)	14	(⁹ / ₁₆)	
Valve Seat 7		30	(22)	19	(³ / ₄)	
Screen Holder F46 (all connections and sizes) 29		100	(73)	30	(1 ³ / ₁₆)	
Screen Holder (F32) 29	Screwed,	15, 20 mm (1/2", 3/4")	60	(43)	22	(7/8)
	Socket Welded					
	Flanged	15 – 25 mm (1/2" - 1")	60	(43)	22	(7/8)

NOTE: - Coat all threaded portions with anti-seize. 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.

10.1 Separating/Attaching Trap and Connector Bodies

- Loosen and remove the connector bolts, remove the entire trap unit from the connector body and take it to a repair area where it can be supported in a vise during disassembly.
- A When reinstalling the original trap:
 - Using a small screwdriver, remove the old gaskets from their housings in the trap body, then clean the housings.
 - New connector gaskets must be installed.
 - To facilitate assembly and prevent loosening of the gaskets, apply a small amount of suitable adhesive at 120° intervals around the outer edge of the gaskets.
 - Holding the trap body so that the gasket housings are horizontal, place the gaskets into the housings.
- B When installing a replacement trap:
 - Be sure to remove all protective seals, making sure the connector gaskets are still in place after having removed their seal.
 - Before installation, scrape the mounting surface of the connector body clean using a soft tool.
- Align the bottom edge of the trap body with that of the connector body (see Fig. A), making sure the gasket housings on the trap body align with the corresponding recesses in the connector body. Maintaining the proper alignment, close the tops together until the two faces are flush, making sure that connector gaskets remain in position.
- Insert the connector bolts and finger-tighten, keeping trap and connector bodies flush. Tighten the connector bolts to the proper torque.

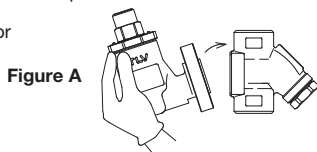


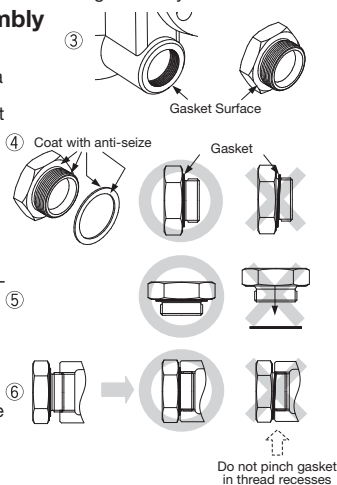
Figure A

11. Instructions for Plug / Holder Disassembly and Reassembly

The seal on the threaded plugs/holders found on TLV products is formed by a flat metal gasket. There are various installation orientations for the gaskets, such as horizontal, diagonal and downward, and the gasket may be pinched in the thread recesses during assembly.

Instructions for Disassembly and Reassembly

- Remove the plug/holder using a tool of the specified size (distance across flats).
- The gasket should not be reused. Be sure to replace it with a new gasket.
- Clean the gasket surfaces of the plug/holder and the product body using a rag and/or cleaning agents, then check to make sure the surfaces are not scratched or deformed.
- Coat both the gasket surface of the plug/holder and the threads of the plug/holder with anti-seize, then press the gasket onto the center of the gasket surface of the plug/holder, making sure the anti-seize affixes the gasket tightly to the plug/holder. Check to make sure the gasket is not caught in the recesses of the threads.
- Hold the plug/holder upside down to make sure that the anti-seize makes the gasket stick to the plug/holder even when the plug/holder is held upside down.
- Screw the plug/holder by hand into the product body while making sure that the gasket remains tightly affixed to the center of the gasket surface of the plug/holder. Make sure the entire gasket is making contact with the gasket surface of the product body. It is important at this point to make sure the gasket is not pinched in the thread recesses of the plug/holder.
- Tighten the plug/holder to the proper torque.
- Next, begin the supply of steam and check to make sure there is no leakage from the part just tightened. If there is leakage, immediately close the inlet valve and, if there is a bypass valve, take the necessary steps to release any residual pressure. After the surface of the product cools to room temperature, repeat the procedure beginning from step ①.



12. Troubleshooting

If the expected performance is unachievable after installation of the steam trap, read chapters 5 and 6 again and check the following points to take appropriate corrective measures.

Problem	Cause	Remedy
No condensate is discharged or temperature does not rise to the set temperature	A bimetal element is damaged or broken	Replace with a new bimetal element
	The assembly (orientation) of the bimetal elements is incorrect	Correct the assembly of the bimetal elements
	There is a build-up of foreign matter in the spaces between the bimetal elements	Clean the bimetal elements
	The valve seat is clogged with rust and scale	Use cleaning function
	The screen or piping are clogged with rust and scale	Clean parts
Steam is blowing or the temperature rises above the set temperature	The adjusting screw is not correctly positioned	Readjust the screw
	There is a build-up of dirt or scale on the valve stem or seating surfaces of the valve seat	Use cleaning function
	The valve stem is worn or seating surfaces are damaged	Replace with a new valve stem
	The valve seat is worn or seating surfaces are damaged	Replace with a new valve seat
	The valve seat is loose	Tighten to the proper torque
	The valve seat gasket is damaged	Replace with a new gasket
There is leakage to the outside of the trap	The adjusting screw is not correctly positioned	Readjust the screw
	Leakage from the cap nut gasket: the gasket or the seal ring is damaged or deteriorated	Replace with a new gasket or seal ring
	Leakage from the adjusting screw: the seal ring is damaged or deteriorated	Replace with a new seal ring
	Leakage from the cover gasket: the cover gasket is damaged or deteriorated	Replace with a new gasket

NOTE: When replacing parts with new, use the parts list on page 3 for reference, and replace with parts from the Maintenance Kit and/or Repair Kit. Please note that replacement parts are only available as part of a replacement parts kit.

13. Optional Blowdown Valve BD2

The BD2 blowdown valve, installed in place of the screen holder, uses internal pressure to blow out condensate/steam, dirt and scale to the atmosphere.

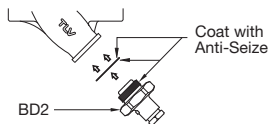


• Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.

- 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.
- Do not tighten the BD2 valve or the BD2 valve seat in excess of the appropriate tightening torque. Over-tightening may cause breakage to threaded portions, which may cause burns, other injuries or damage.

13.1 Reassembly of Blowdown Valve

1. Clean the trap, BD2 threads, and sealing surfaces, and apply a small amount of anti-seize.
2. Replace gasket.
3. Carefully place the gasket over the threaded portion, and position carefully so that it does not become off-center.
4. Fasten to the steam trap with the proper torque.

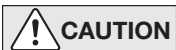


Torque (T) and Distance Across Flats (D)

	①	BD2 Valve		(T): 30 N·m (22 lbf·ft) (D): 17 mm ($2\frac{1}{32}$ ")	
	②	BD2 Valve Seat (Screen Holder)	F46	All connections and sizes	(T): 100 N·m (73 lbf·ft) (D): 30 mm ($1\frac{3}{16}$ ")
			F32	Flanged 15 - 25 mm ($\frac{1}{2}$ "-1") Screwed & Socket Weld	(T): 60 N·m (43 lbf·ft) (D): 22 mm ($\frac{7}{8}$ ")
				Screwed & Socket Weld 25 mm (1")	(T): 150 N·m (110 lbf·ft) (D): 38 mm ($1\frac{1}{2}$ ")

13.2 Operation Instructions for BD2

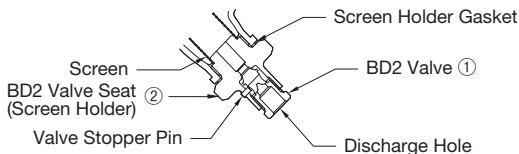
Note: Do not leave the vicinity while the blowdown valve is in the open position.



• Always wear eye protection and heat-resistant gloves when operating the blowdown valve. Failure to do so may result in burns or other injury.

- When operating the blowdown valve, stand to the side well clear of the outlet to avoid contact with internal fluids that will be discharged. Operate the valve slowly and surely, taking care to avoid the area from which internal fluids are discharged and any fluids deflected off piping or the ground etc. Failure to do so may result in burns or other injury.
- Do not excessively loosen the BD2 valve when opening the blowdown valve. The valve stopper pin installed to prevent the BD2 valve from being removed may break and internal pressure may result in the BD2 valve being blown off, leading to injuries, damage and fluid discharge, causing burns.

1. With two wrenches, firmly hold the BD2 valve seat (screen holder) ② (22 mm, $\frac{7}{8}$ ") in place while slowly opening the BD2 valve ① (17 mm, $2\frac{1}{32}$ "). Be careful to avoid contact with fluid that will be discharged through the hole in the center of the blowdown valve as the valve opens.
2. Close the BD2 valve ① and tighten to a torque of 30 N·m (22 lbf·ft), and confirm that there is no leakage. If leakage continues, dirt or scale may prevent the valve from sealing. Open and blow out again, then try to close once more.



14. 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.

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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.

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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.

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