TRAP STAR™ TSF-13,13F,13CF STEAM TRAP

PRODUCT MANUAL

Thank you very much for choosing the Yoshitake's product. To ensure the correct and safe use of the product, please read this manual before use. This manual shall be kept with care for future references.
The symbols used in this manual have the following meanings.

Warning	This symbol indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.
Caution	This symbol indicates a hazardous situation that, if not avoided, may result in minor or moderate injury or may result in only property damage.

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YOSHITAKE

1. Specifications

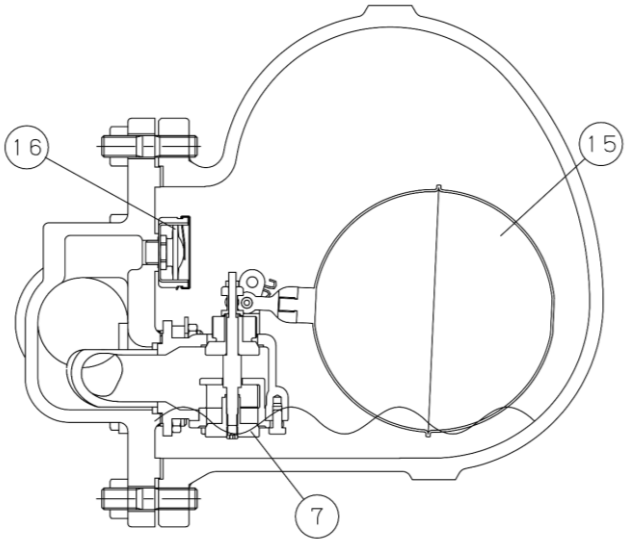
Model		TSF-13	TSF-13F	
Nominal size		40A,50A		
Application		Steam condensate		
Max. pressure		1.6 MPa	1.0 MPa	1.6MPa
Maximum working differential pressure (ΔPMX)		TSF-13-5: 0.5 MPa TSF-13-10:1.0 MPa TSF-13-14:1.4 MPa	TSF-13F-5: 0.5 MPa TSF-13F-10: 1.0 MPa	TSF-13F-5: 0.5 MPa TSF-13F-10: 1.0 MPa TSF-13F-14: 1.4 MPa
Minimum working differential pressure		0.01 MPa		
Max. temperature		220°C		
Material	Body	Ductile cast iron		
	Float	Stainless steel		
	Valve, valve seat	Stainless steel		
Connection		JIS Rc screwed NPT screwed	JIS 10K RF ASME 150lb RF	JIS 20K RF EN PN16/25 RF ASME 300lb RF

Model		TSF-13CF		
Nominal size		40A,50A		
Application		Steam condensate		
Max. pressure		1.0 MPa	1.6 MPa	3.2 MPa
Maximum working differential pressure (ΔPMX)		TSF-13CF-5: 0.5 MPa TSF-13CF-10: 1.0 MPa	TSF-13CF-5: 0.5 MPa TSF-13CF-10: 1.0 MPa	TSF-13CF-5: 0.5 MPa TSF-13CF-10: 1.0 MPa TSF-13CF-32: 3.2 MPa
Minimum working differential pressure		0.01 MPa		
Max. temperature		240°C		
Material	Body	WCB		
	Float	Stainless steel		
	Valve, Valve seat	Stainless steel		
Connection		ASME 150lb RF	ASME 300lb RF EN PN25/40 RF	JIS 30K RF ASME 300lb RF EN PN25/40 RF

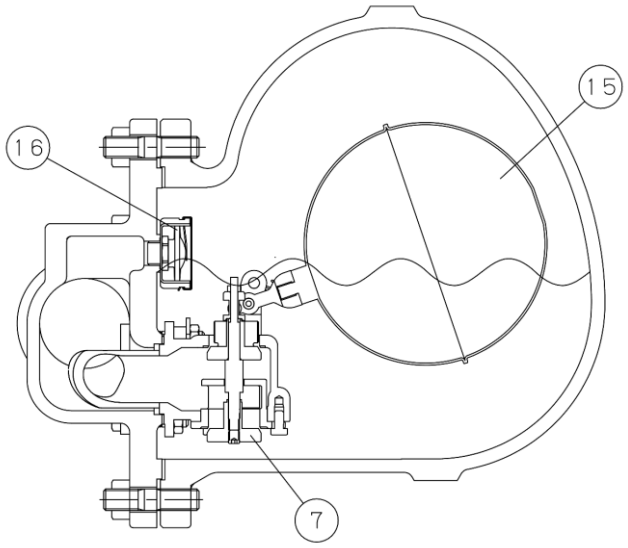
* For installation posture, see 6 of “4.2 Precaution for installation” on Page 7.
* Install a strainer (mesh size of 80 or more is recommended) at the inlet side of the product. Due to the double-port structure, foreign substances stuck on the valve and valve seat may cause significant steam leakage.

Caution	Please confirm that the indications on the product correspond with the specifications of the ordered product model before use. * If they are different, do not use the product and contact us.

2. Operation



At start-up, since the ⑮float is down, the ⑦valve set is closed. In this state, air in the system and piping is discharged out through the ⑯air vent which is opened.

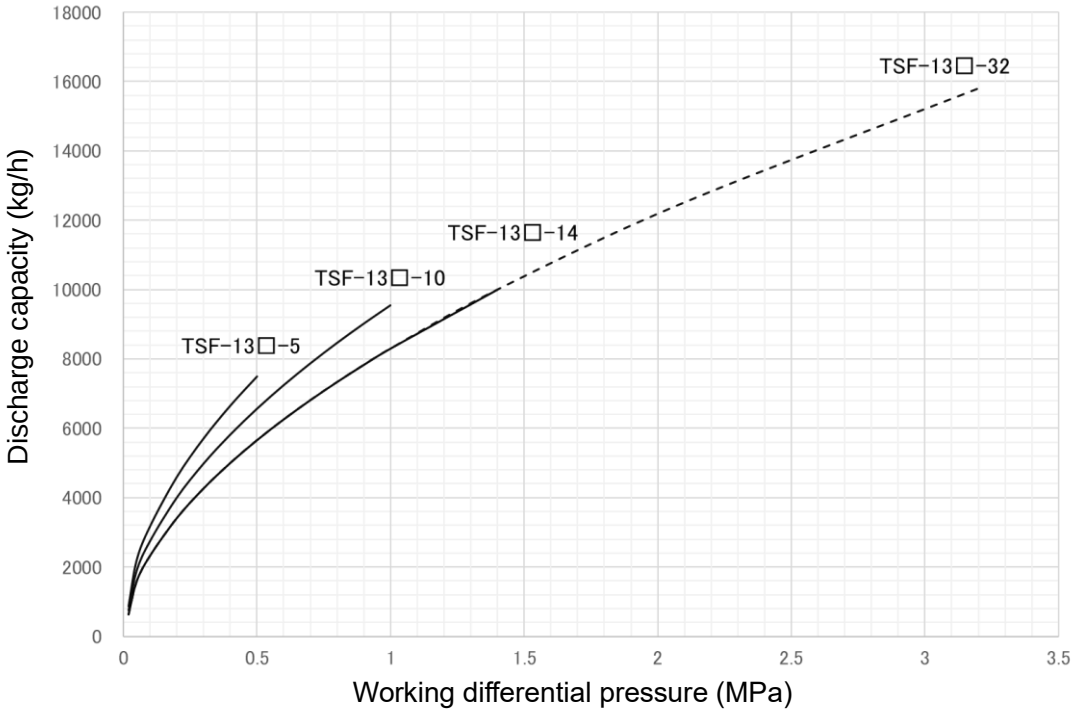


When condensate flows into the product, the ⑮float lifts up and opens the ⑦valve set, and then discharges condensate. Air is continuously discharged out from the ⑯air vent. When steam flows into the product, internal pressure of the ⑯air vent rises by steam temperature, and the ⑯air vent closes. According to the amount of condensate inflow, the ⑮float position moves up and down changing the opening degree of the ⑦valve set, and thus condensate is continuously discharged.

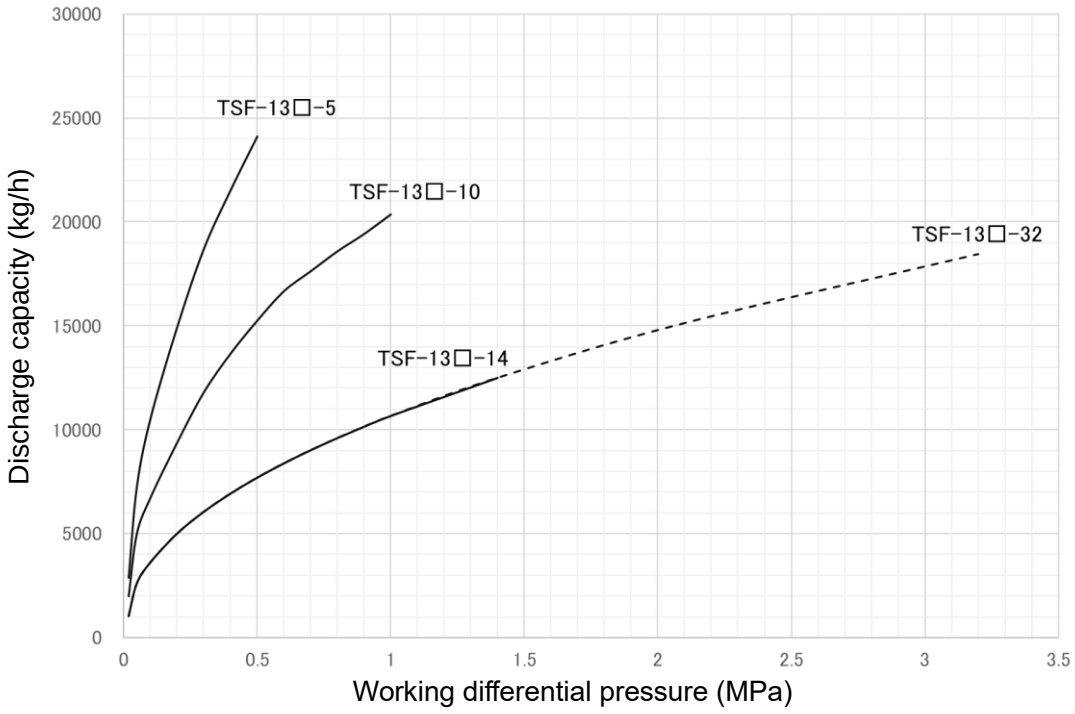
3. Maximum Continuous Discharge Capacity

1. Discharging capacity of the steam trap differs by working differential pressure, that is, difference between inlet pressure and outlet pressure (back pressure). In selecting discharge capacity, consider outlet pressure. If inlet pressure is 0.5 MPa and outlet pressure is 0.2 MPa, discharge capacity is of working differential pressure of 0.3 MPa.

2. The discharge capacity shown in the charts below is the maximum value. In designing a system, select a steam trap with a sufficient safety factor (at least twice). That is, for example, if a discharge capacity of 2000 kg/h is required, select a steam trap capable of discharging more than 4000 kg/h (maximum discharge).

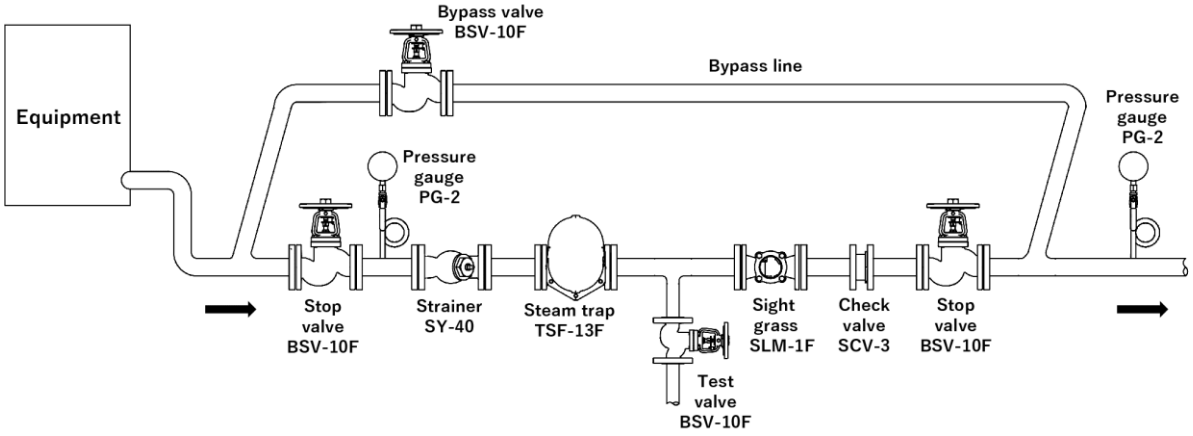


Maximum Continuous Discharge Capacity of 40A

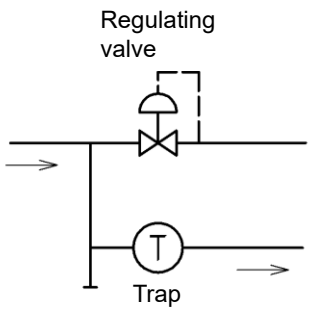
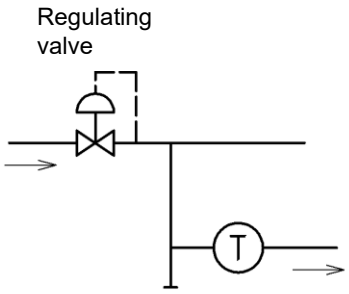
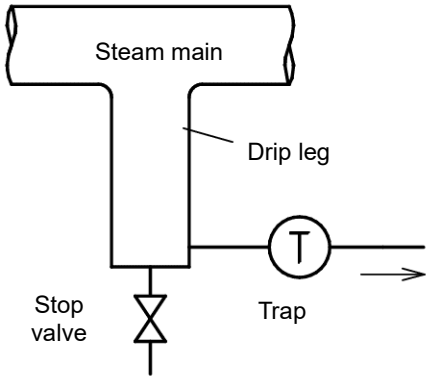
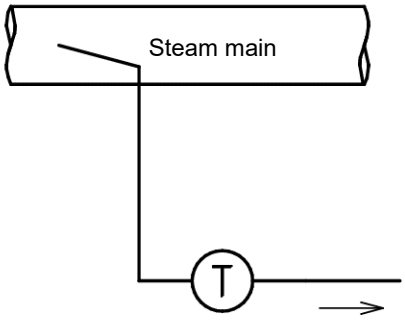
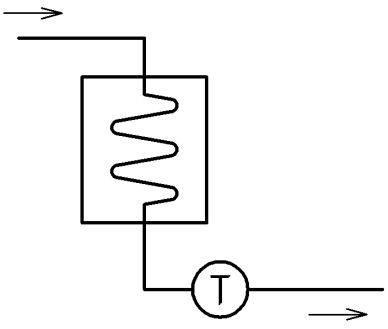
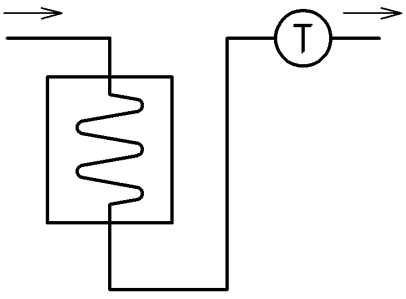


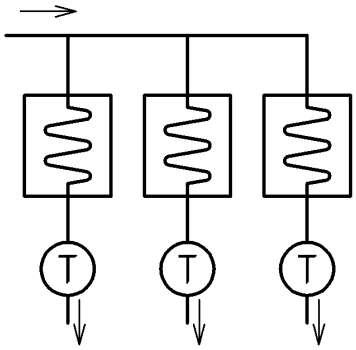
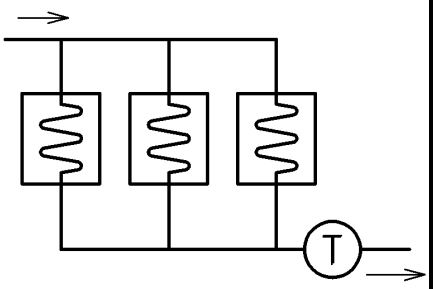
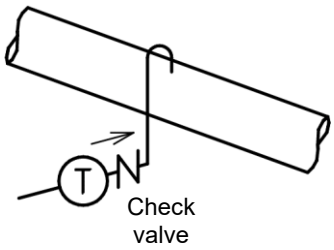
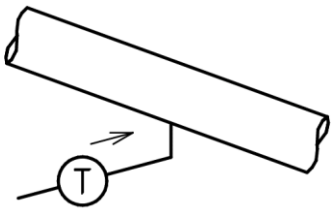
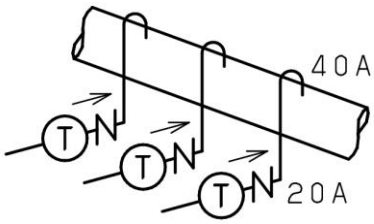
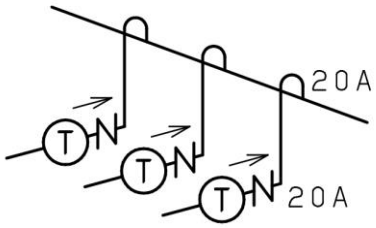
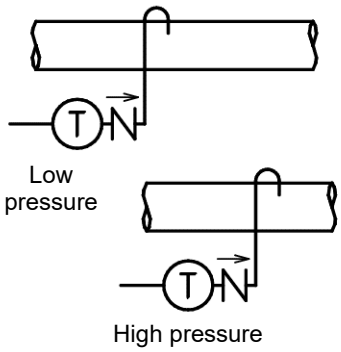
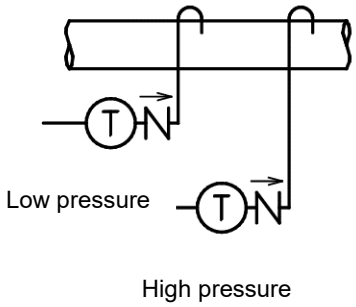
Maximum Continuous Discharge Capacity of 50A

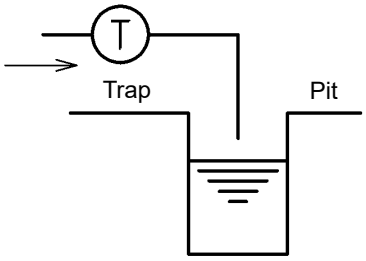
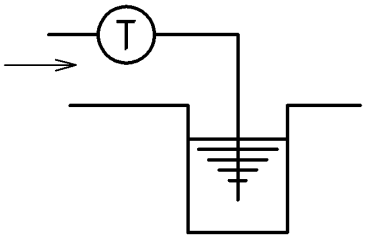
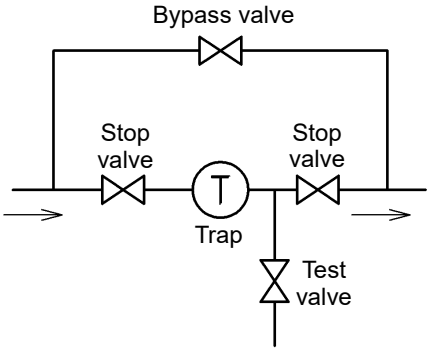
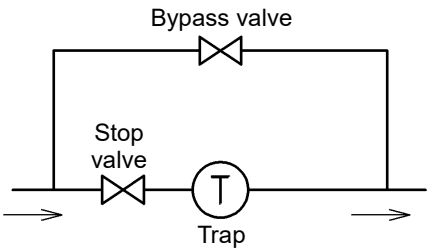
4.1 Piping example



*Pipe size of the outlet side of the product should be large enough so that the discharged condensate flows without any resistance.

Description	Correct	Incorrect
If the product is installed close to a regulating valve, make sure to install the product at the inlet side of the regulating valve.		
To discharge condensate from the steam main, be sure to install the product on piping taken from the lower part of drip leg.		
Install the product below a device which generates condensate.		

Description	Correct	Incorrect
Install the products for each device independently.		
When collecting condensate, connect the trap discharge pipe to the top of the condensate collecting pipe and install a check valve to prevent backflow.		 * Load fluctuations on the inlet side of the trap may cause condensate to flow backwards, resulting in trap malfunction due to debris, etc.
The diameter of collecting pipe shall be more than summation of sectional areas of discharge pipes.		 * Smaller collecting pipes increase back pressure and reduce the discharge capacity of the trap.
For traps with different pressure lines, install separate collecting pipes for each pressure.		 * Re-evaporated steam in high pressure line increases the back pressure of low-pressure trap.

Description	Correct	Incorrect
End portion of discharge pipe shall be off the water surface in the pit.		 * If the discharge pipe is in contact with the water, it absorbs dirty water in the pit and causes malfunction of the product.
Provide a bypass line around the product, and install stop valves at the outlet side of the product.		

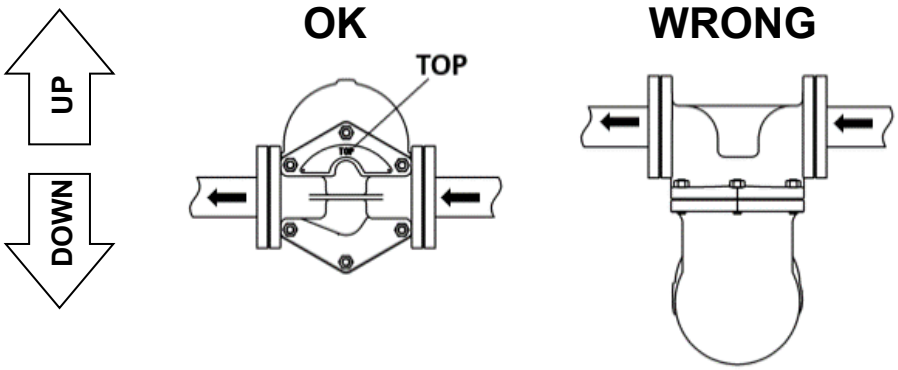
4.2 Precaution for installation

⚠ Warning

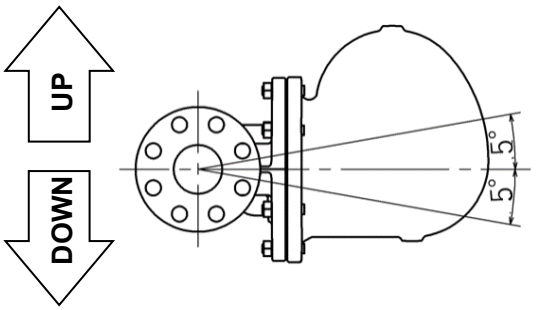
1. In order to discharge condensate to the atmosphere, lead the outlet to a safe place where there is no possibility of physical damage even if condensate blows out.
   * There are risks of scalding or injury when the condensate blows out.

⚠ Caution

1. Before connecting the product to piping, remove foreign substances and scale from the piping.
   * Failure to follow this notice may prevent the product from functioning properly.
2. Protective covers are attached to the inlet and outlet connections of some products to prevent foreign matter from entering the product. Please remove them before installation.
3. To install the product, check the direction of the product so that the fluid flowing and the arrow marked on the product are in the same direction.
   * Setting the product in wrong directions prevents it from functioning properly.
4. When installing the product in piping, be careful not to allow sealant or sealing tape to enter the product.
5. Do not apply excessive load, torque or vibration to the valve.
6. **The mounting position of the product is horizontal piping. Do not tilt the product during use.**
   * Do not install in vertical piping.
   * Wrong posture hampers proper operation.



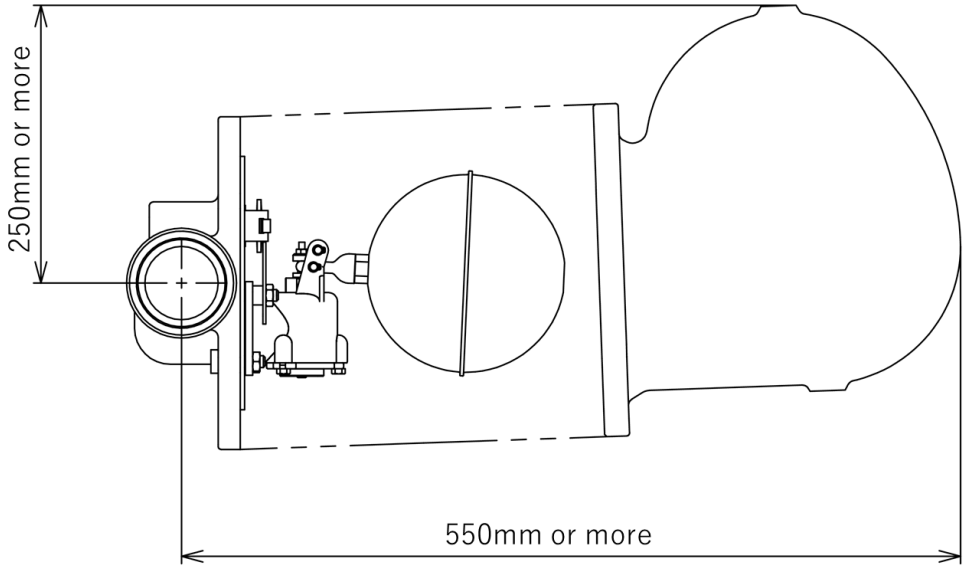
   * Allowable tilt from horizontal line is within ±5°.
   * Support the product cover when it is necessary.



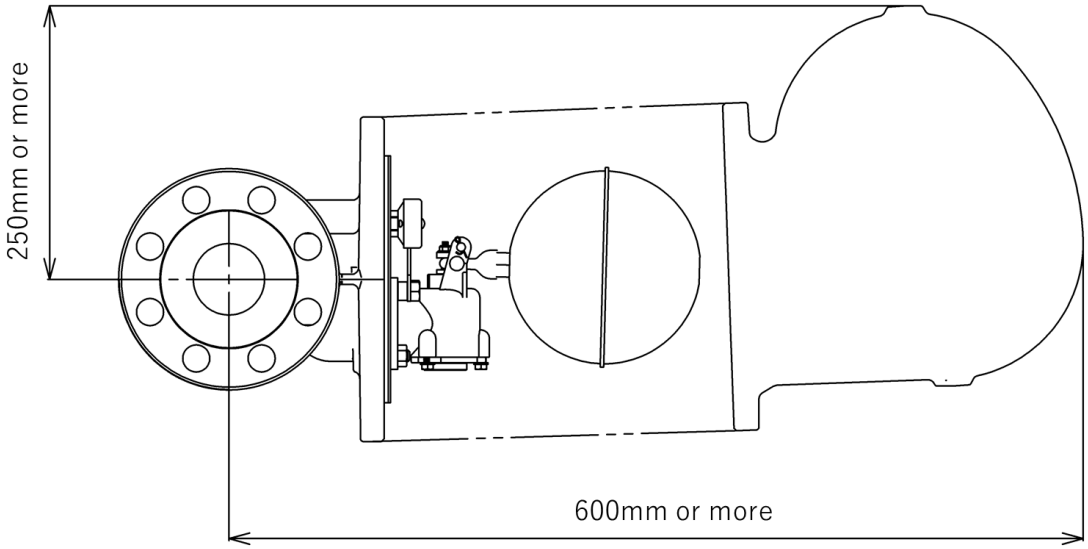
7. Make sure to support the piping immovably.
   * If an excessive piping stress is applied, there are cases when the product will not open or close.
8. Do not disassemble the product unless it is necessary.
   *Unnecessary disassembly may prevent the product from functioning properly.

9. Secure enough space for maintenance, inspections and repair as shown below.
   * Failure to follow this notice prevents maintenance, inspection and repair.
   *Common to 40A and 50A

TSF-13



TSF-13F, 13CF



10. Slope the piping and place the product at as a low position as possible in order to make condensate flow into the product by its own weight.
11. To install the product in a main steam pipe, provide a drip leg at the inlet side of the product.
12. Install a strainer (mesh size of 80 or more is recommended) at the inlet side of the product.
13. When connecting the trap discharge pipe to the condensate collecting pipe, install a check valve on the outlet side of the trap to prevent backflow.
    *If the outlet pressure is higher than the inlet pressure, backflow will occur. Backflow may cause the trap to malfunction due to debris, etc.

14. Install the product in a way it is not subjected to the shock of water hammer. Do not install a quick operating valve before and/or after the product.
    * Failure to follow this notice may result in malfunction due to damage to the ⑮float or ⑯air vent, or may result in scalds or injury due to blow off when the product is subjected to an excessive shock and damaged.
15. Install a bypass line.
    * The system has to stop operation while inspection and maintenance of the product if the bypass line is not installed.
16. Pipe size of the outlet side of the product should be large enough so that the discharged condensate flows without any resistance.
    * If the outlet piping causes resistance, the specified discharge amount may not be obtained.
17. If there is a possibility of freezing, take proper measures to remove water inside of the product and piping, and insulate the product.
    * Freezing may damage the product.
18. In case of conducting an airtightness test or a pressure test, apply the pressure of 0.4 MPa or less during the testing.
    * The air vent may be damaged when high pressure is applied at room temperature, resulting in malfunction.

5. Operating Procedure

5.1 Precaution for operating procedure

⚠ Warning

1. Before leading fluid, make sure that the product is securely connected to piping and that there is no loose.
   * There are risks of scalding or injury when the steam or condensate blows out.
2. Do not touch the product with bare hands while the product operates.
   * There are risks of scalding.
3. Do not stand in front of the outlet opening of the product while the product operates.
   * There are risks of scalding or injury due to blow off.

⚠ Caution

1. Slowly open each stop valve to prevent water hammer.
   * When opening stop valves quickly, there are cases when the equipment will be damaged due to hunting or water hammer.
2. When the operation is stopped for a long period of time, drain the condensate from the product and piping.
   * Failure to follow this notice may cause malfunction due to rust inside of the product and piping, or damage due to freezing.

6. Maintenance

6.1 Precaution for maintenance

⚠ Warning

1. Disassembly and inspections must be performed by a professional or the manufacturer.
2. Do not touch the product with bare hands.
   * There are risks of scalding.
3. Completely discharge internal pressure of the product, piping and equipment, and cool down the product prior to disassembly or maintenance.
   * There are risks of scalding or injury due to residual pressure.

⚠ Caution

1. Conduct daily inspection in order to maintain the optimal performance of the product.
   * Failure to follow this notice may prevent the product from functioning properly.
   * See “6.3 Troubleshooting” on Page 11 if trouble is observed.
2. After leaving the product not operated for a long period, perform inspection before start-up of operation.
   * Failure to follow this notice may cause malfunction due to rust inside of the product and piping.
3. Put a container under the product at disassembly since condensate may flow out.
   * Failure to follow this notice may result in making the surroundings dirty.
4. Be careful not to drop the parts at the time of disassembly. The disassembled parts should be placed on soft cloth in order to avoid scratches and damage.
   * Damage on the parts may cause malfunction and affect the optimal performance.
5. To assemble, connect all the parts securely and tighten the bolts uniformly in diagonal order.
   * Failure to follow this notice may cause malfunction or outside leakage.
6. When repairing, do not use the parts other than the dedicated parts manufactured by Yoshitake. Do not modify the product.
   * Failure to follow this notice may cause damage to the product, or may result in scalds or injury due to blow-off or malfunction.
7. In case of problems due to foreign substances or scale, the product needs repair or part replacement. Please contact us for details.
   (Please note that any repair due to foreign substances or scale in the product is subject to a charge even during the warranty period.)

6.2 Daily and periodic inspections

Conduct daily and periodic inspections in order to maintain the optimal performance of the product.
See ”6.3 Troubleshooting” on Page 11 for the remedies if trouble is observed.

- Daily inspection (once a day)

  Conduct daily inspection during operation of the product.

Items	Standards for Inspection
Discharge condition of condensate	Condensate is discharged smoothly.
Outside leakage	No outside leakage of condensate or steam.

- Periodic inspection (once a year)

  Conduct disassembly inspection periodically.

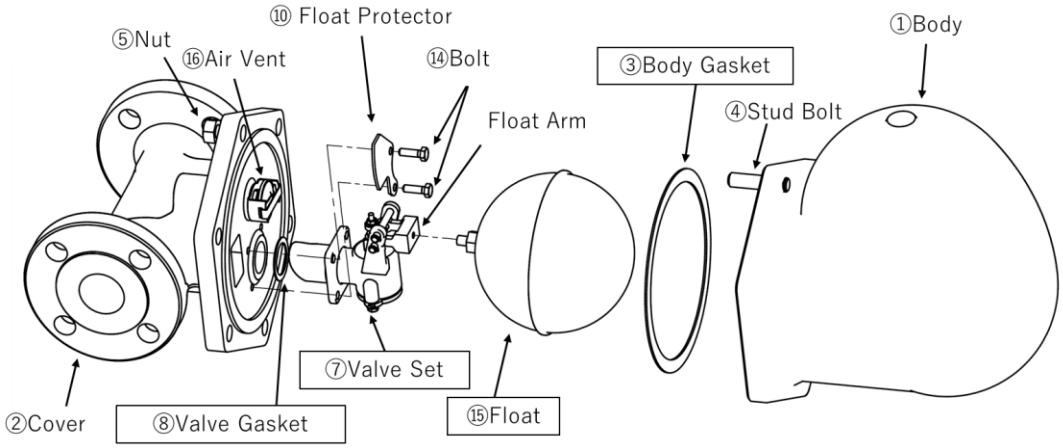
Items	Standards for Inspection
Seat surfaces of the valve and valve seat	No scratch or foreign substances on seat surfaces. *See Procedure 3, “6.5 Disassembly” on Page 13.
Shape of float	No deformation or damage on the ⑮float *See Procedure 1~2, “6.5 Disassembly” on Page 13. See Procedure 3~5, “6.6 Reassembly” on Page 17.

6.3 Troubleshooting

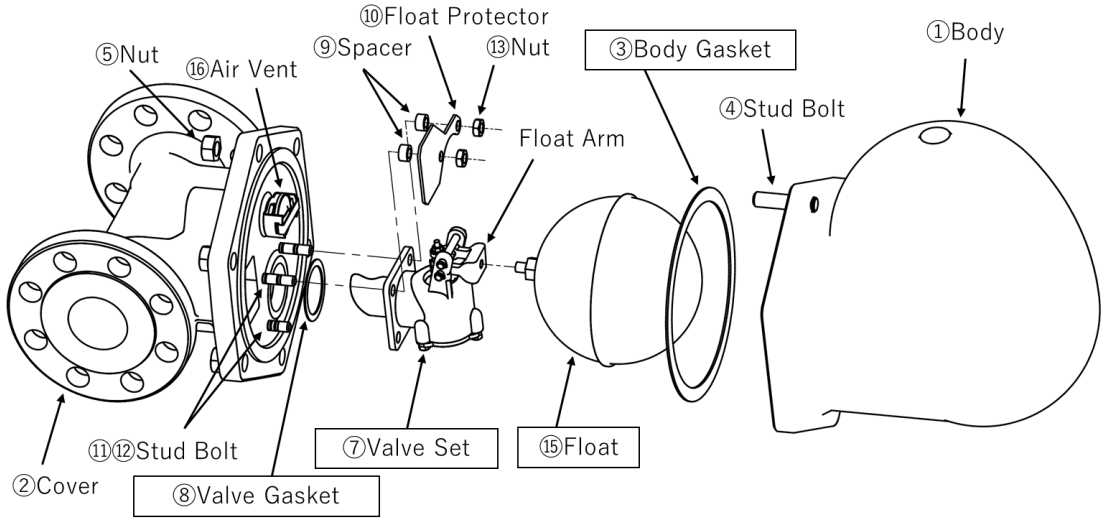
Trouble	Cause	Remedy
Condensate is not discharged.	1. Blockage of foreign substances in the valve seat.	1. Clean the ⑦valve set. *See Procedure 3, “6.5 Disassembly” on Page 13.
	2. ⑮Float is broken	2. Change it into new one. *See Procedure 1~2, “6.5 Disassembly” on Page 13. *See Procedure 3~5, “6.6 Reassembly” on Page 17.
	3. Breakage as a result of abnormal pressure rising due to freezing or water hammer, etc.	3. Replace the product with new one.
	4. Steam locking.	4. Change the piping system layout.
	5. Product is in wrong posture.	5. Install it correctly. *See Caution No. 6, “4.2 Precaution for Installation” on Page 7.
Continuous blowout.	1. Foreign substances stuck on valve or valve seat.	1. Clean the valve set. *See Procedure 3, “6.5 Disassembly” on Page 13.
	2. scratches on the valve or valve seat.	2. Replace the ⑦valve set. *See Procedure 1~2,4 “6.5 Disassembly” on Page 13~14. *See Procedure 1~5, “6.6 Reassembly” on Page 15~17.
	3. Insufficient capacity of the product.	3. Replace the product with another model of sufficient capacity.
	4. Product is in wrong position.	4. Install it correctly *See Caution No. 6, “4.2 Precaution for Installation” on Page 7.
Steam leakage.	1. Leakage due to loosening of the ⑤nut fixing the ①body and ② cover, or damage due to deterioration of ③body gasket.	1. Replace the ③body gasket with new one, and retighten the ⑤nut. *See Procedure 1, “6.5 Disassembly” on Page 13. *See Procedure 4~5, “6.6 Reassembly” on Page 17.
	2. Leakage as a result of abnormal pressure rising due to freezing or water hammer, etc.	2. Replace the product with new one.

6.4 Exploded drawing

*The parts shown in the rectangle boxes are available as consumable supply.
*The ⑯air vent cannot be removed from the ②cover.
*⑦Valve Set can not be disassembled.



40A Exploded drawing



50A Exploded drawing

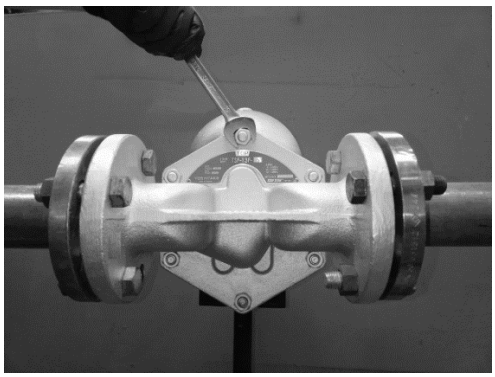
6.5 Disassembly

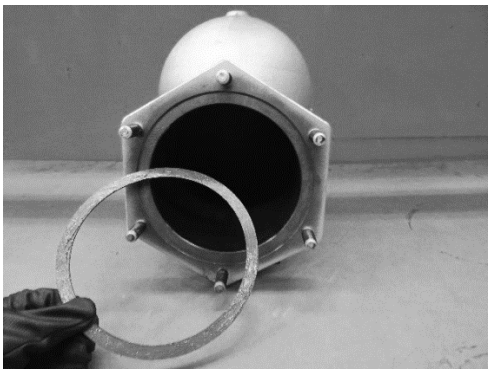
- Tools to be used

Name of tool	Contents (size, nominal size, etc.)
Spanner	Width across flats:10 mm*1, 13 mm*2, 17 mm, 19 mm

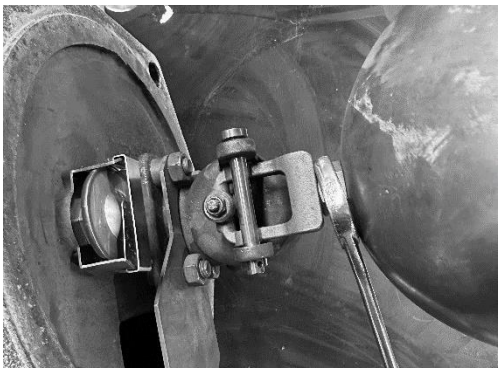
*1For 40A *2 For 50A

[Procedure 1] Remove the ⑤nut that secures the ①body with a spanner (width across flats: 19 mm), and remove the ①body and the ③body gasket from the ② cover.

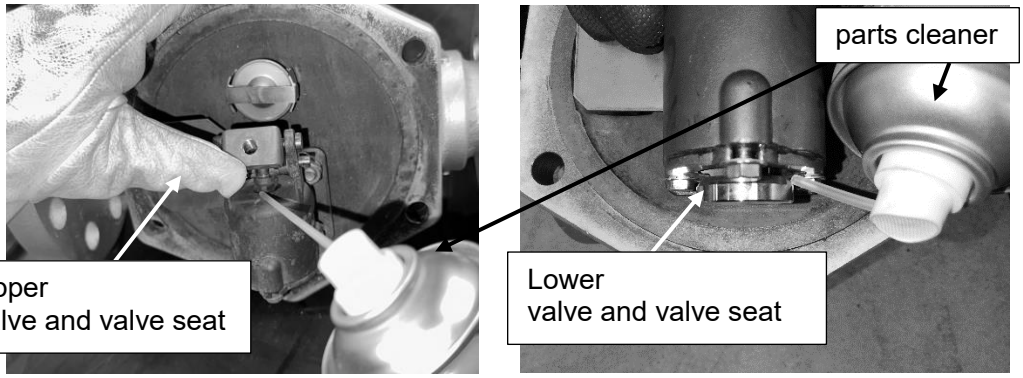




[Procedure 2] Remove the ⑮float from the float arm with a wrench (width across flats: 17 mm).



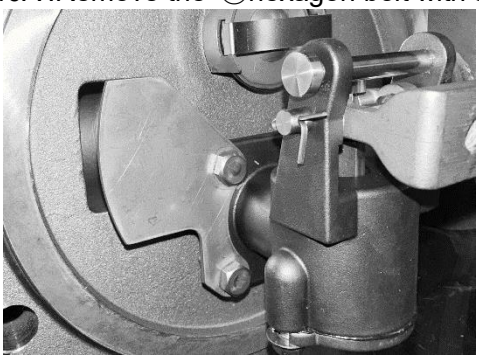
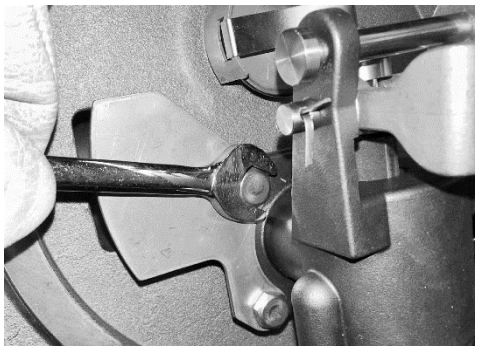
[Procedure 3] Clean the upper and lower valve and valve seat of the ⑦valve set with a cleaning agent (recommended: parts cleaner).



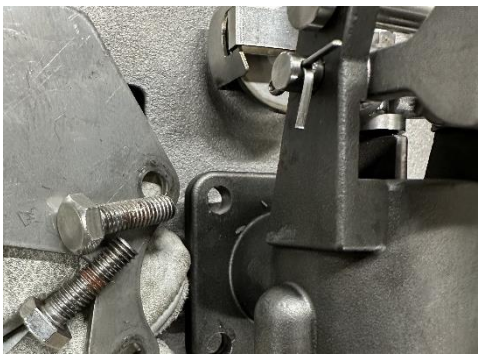
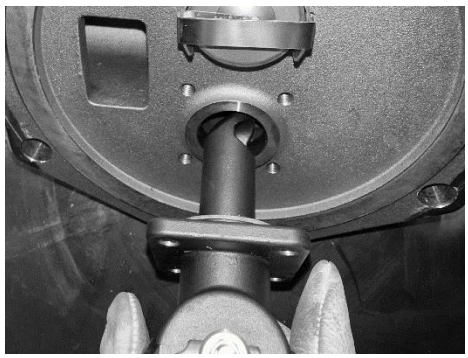
*⑦Valve Set can not be disassembled.

[Procedure 4] Remove the ⑦valve set from the ②cover.

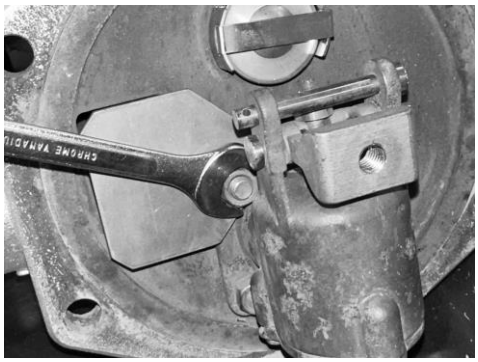
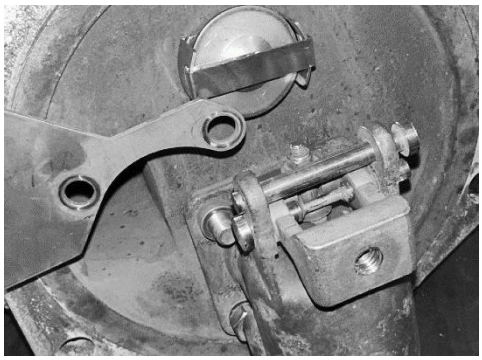
40A :Remove the ⑭hexagon bolt with a spanner (width across flats: 10 mm).

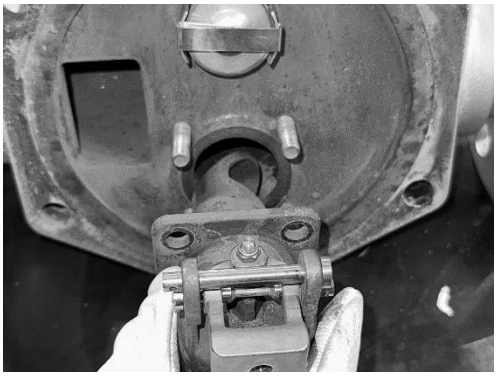
Remove the ⑩float protector and remove the ⑦valve set from the ②cover.

50A :Remove the ⑬nut with a spanner (width across flats: 13mm) and remove the ⑩float protector.

Remove the ⑨spacer and remove the ⑦valve set from the ②cover.

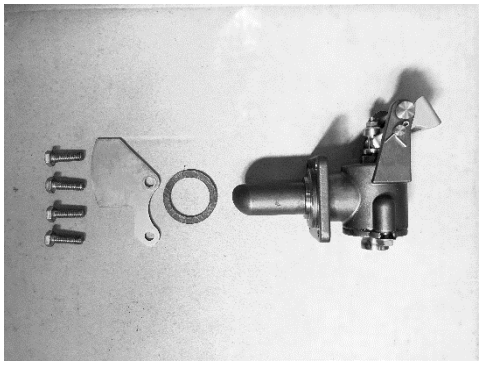
6.6 Reassembly

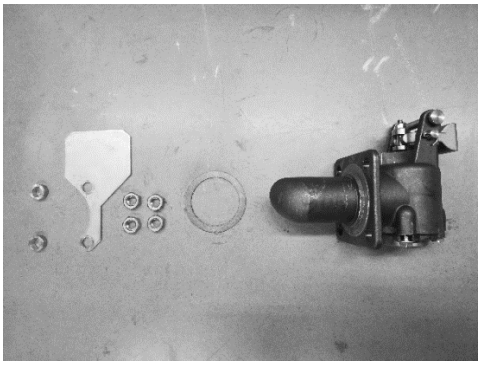
- Tools to be used

Name of tool	Contents (size, nominal size, etc.)
Torque Wrench	Tightenable with torque of 70 N·m (for TSF-13, 13F) or 100 N·m (for TSF-13CF), Open-head type. Width across flats: 19 mm
Torque Wrench	*1 Tightenable with torque of 9 N・m, Open-head type. Width across flats: 10 mm
Torque Wrench	*2 Tightenable with torque of 15 N・m, Open-head type. Width across flats: 13 mm

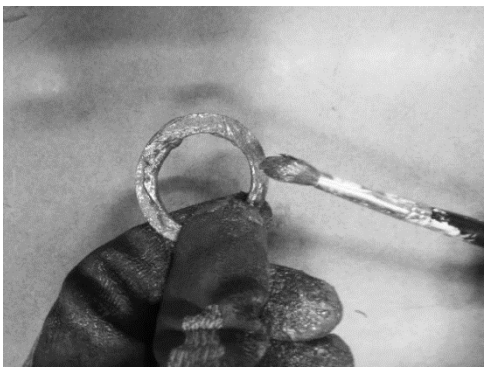
*1For 40A *2 For 50A

[Procedure 1] Check that the following set is complete.

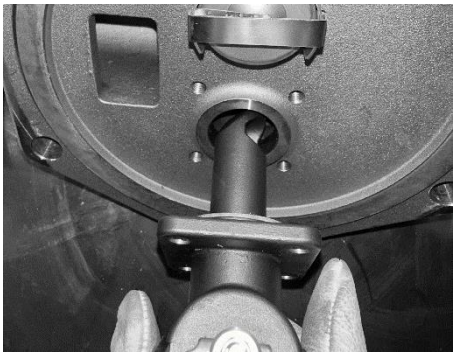
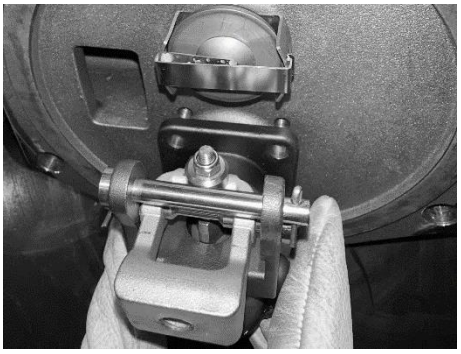




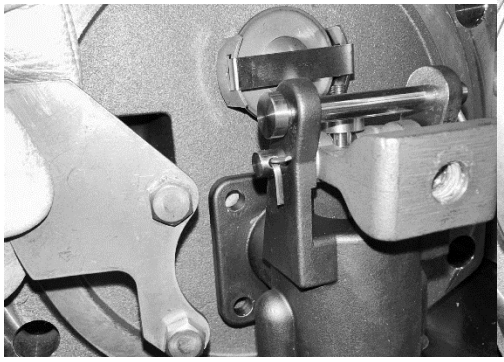
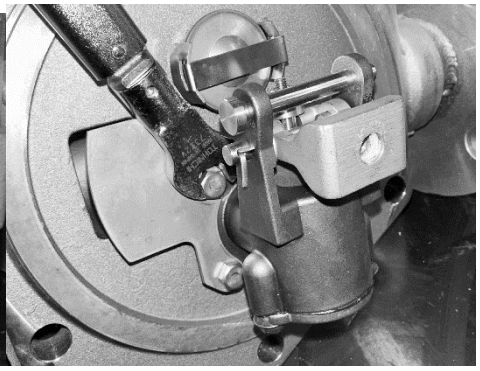
Apply a paste-like lubricant (recommended: STT Inc, SOLVEST No. 110) to the ⑧valve gasket, and attach it to the ⑦valve set.



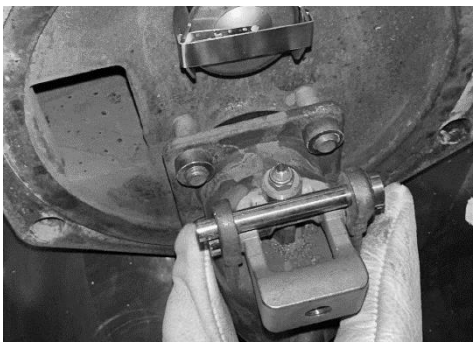
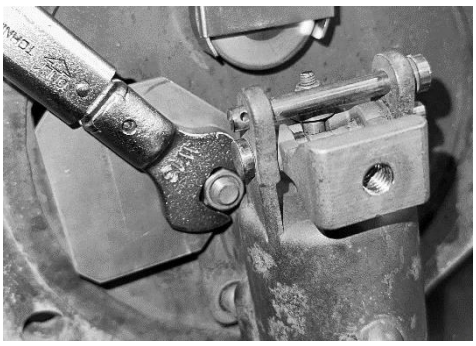
[Procedure 2] Attach the ⑦valve set to the ②cover.

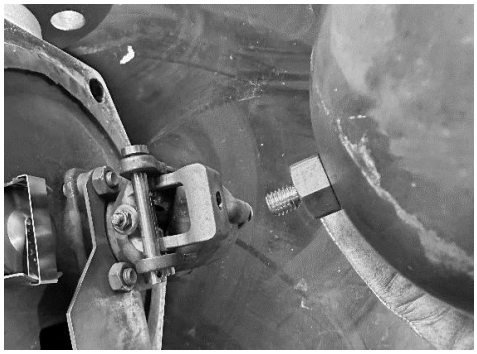
40A: Attach the ⑩float protector and tighten the ⑭hexagon bolt with a wrench (width across flats: 10 mm) to a torque of 9 Nm. Also, tighten the ⑭hexagon bolts of each part uniformly so that they are not one-sided.

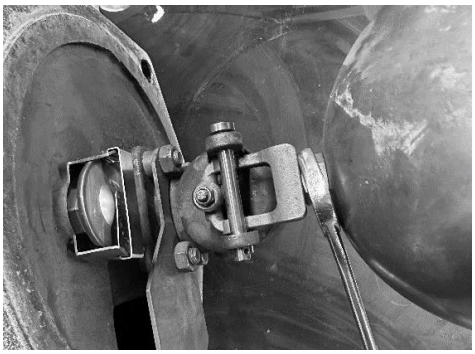



50A:Attach the ⑩float protector and ⑨spacer, and tighten the ⑬nut with a torque wrench to a torque of 15 Nm. Also, tighten the ⑬nuts of each part uniformly so that they are not completely tightened. If the ⑪⑫stud bolt is loose, use a double nut and tighten with a spanner (width across flats: 13 mm).

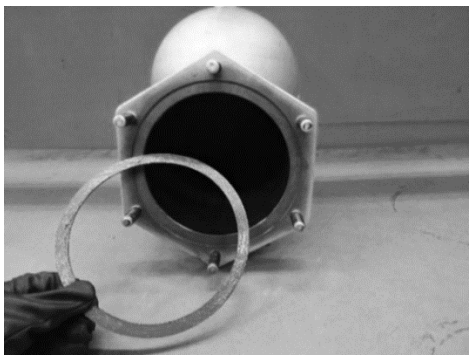



[Procedure 3] Apply adhesive (Henkel LOCTITE 272 recommended) to the threads of the ⑮float. Then attach the ⑮float to the float arm using a spanner (width across flats: 17 mm).

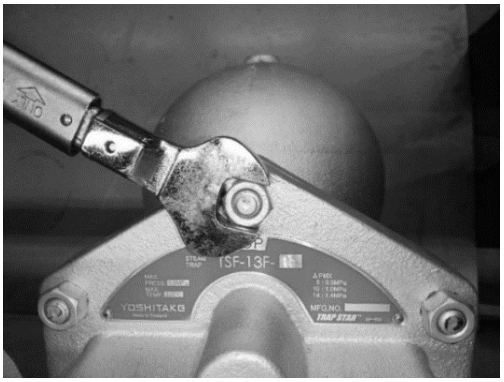




[Procedure 4] Apply paste-like lubricant (recommended: STT Inc, SOLVEST No.110) to the ③body gasket, and attach it to the ①body. If the ④stud bolt is loose, use a double nut and tighten with a spanner (width across flats: 19 mm).



[Procedure 5] Attach the ②cover to the ①body and use the ⑤nut with a torque wrench (width across flats: 19 mm) at a torque of 70 N·m (for TSF-13, 13F) or 100 N·m (for TSF-13CF). Also, tighten the ⑤nuts of each part uniformly so that they are not completely tightened.



6.7 Parts replacement procedure

Part name	Disassembly (See 6.5.)	Reassembly (See 6.6.)
③Body gasket	Procedure 1	Procedures 4 to 5
⑮Float	Procedures 1 to 2	Procedures 3 to 5
⑦Valve Set	Procedures 1 to 2 & 4	Procedures 1 to 5

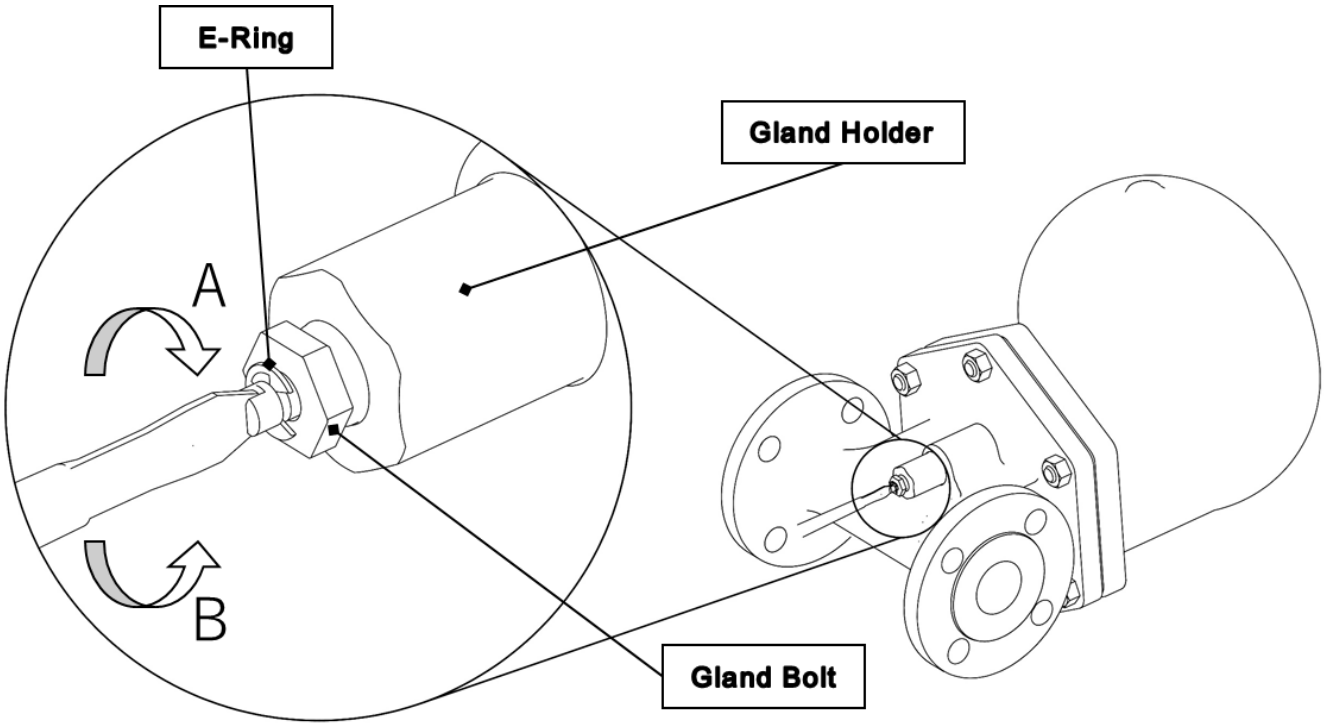
7. TSF-13,13F with Steam Lock Release（SLR）

7.1 What is SLR

If you need the product with ⑱Steam Lock Release (SLR), please let us know when you purchase. It cannot be attached to the standard product later.

Steam locking occurs when the pipe to the trap is filled with steam and the steam prevents condensate from flowing into the trap. The ⑱SLR bypasses the ⑯Air Vent to discharge steam and prevent steam locking.

7.2 How to use SLR



(1) To open the ⑯Air Vent

Turn the slotted head of ⑱SLR in the direction of A by a flathead screwdriver. The more you screw in, the more the ⑯Air Vent opens. However, do not screw in beyond E ring stopper. If you turn it any further, the ⑯Air Vent may be damaged.

(2) To use the ⑯Air Vent normally

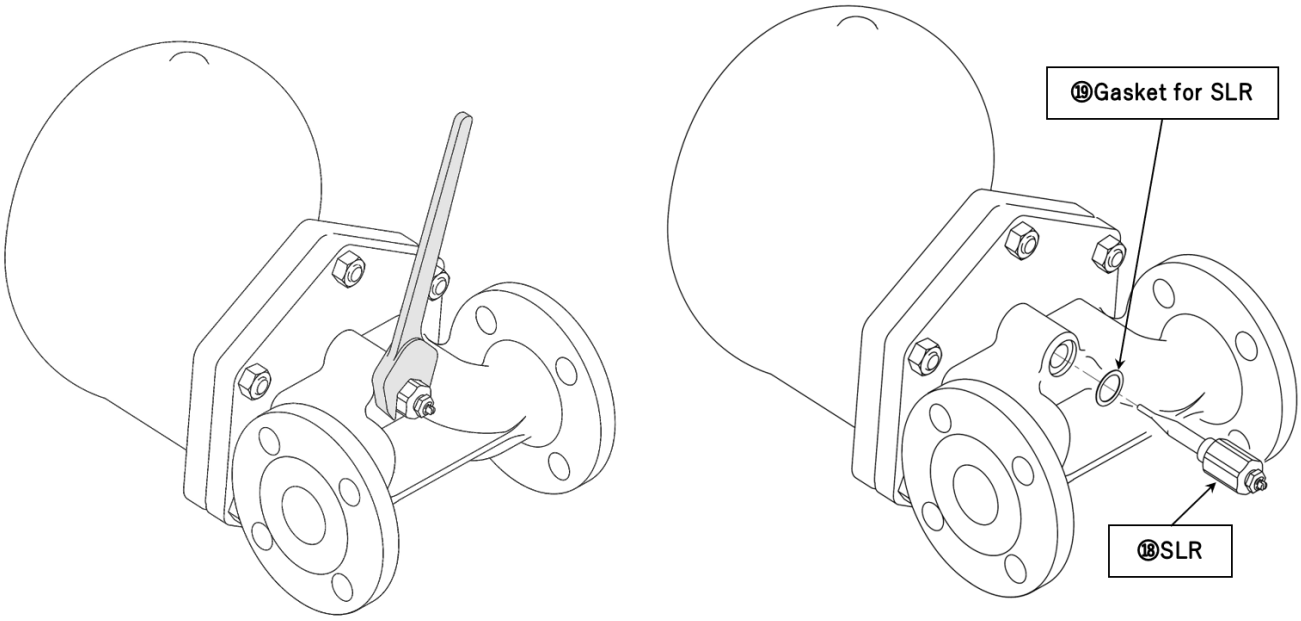
Turn the slotted head of ⑱SLR in the direction of B until it stops. At the time of product shipment, the ⑱SLR is in this state.

※Be careful not to strip the slotted head when you turn it.
※Do not turn Gland Holder or Gland Bolt, or outside leakage may occur.

7.3 Troubleshooting

Trouble	Cause	Remedy
Steam leakage	1. Leakage due to loosening of the ⑱SLR fixing the ②Cover, or damage due to deterioration of ⑲ SLR Gasket.	1. Replace the ⑲SLR Gasket with new one. *See “8.5 How to replace SLR”
	2. Leakage due to loosening of the Gland Bolt on the ⑱SLR.	2. Tighten the gland bolt to a torque of 6 Nm.
	3. ⑱ Leakage due to deterioration of the Gland Packing inside the SLR.	3. Replace the ⑱SLR、⑲SLR Gasket with new one. *See “8.5 How to replace SLR”

7.4 How to replace SLR



【Procedure 1】 Remove the ⑱SLR from ②Cover with a spanner (width across flats: 23 mm).

【Procedure 2】 Apply a paste-like lubricant (recommended: STT Inc, SOLVEST No. 110) to the ⑲ SLR Gasket, and attach it to the ②Cover.

【Procedure 3】 Tighten the ⑱SLR with a wrench (width across flats: 23 mm) to a torque of 50 Nm.

Warranty Information

1. Limited warranty

   This product has been manufactured using highly-advanced techniques and subjected to strict quality control. Please be sure to use the product in accordance with instructions on the manual and the label attached to it.

   Yoshitake warrants the product to be free from any defects in material and workmanship under normal usage for a period of one year from the date of receipt by the original user, but no longer than 24 months from the date of shipment from Yoshitake's factory.

2. Parts supply after product discontinuation

   This product may be subject to discontinuation or change for improvement without any prior notice. After the discontinuation of the product, Yoshitake supplies the repair parts for 5 years otherwise individually agreed.

3. This warranty does not cover the damage due to any of below:
   (1) Valve seat leakage or malfunction caused by foreign substances inside piping.
   (2) Improper handling or misuse.
   (3) Improper supply conditions such as abnormal water pressure/quality.
   (4) Water scale or freezing.
   (5) Trouble with power/air supply.
   (6) Any alteration made by other than Yoshitake.
   (7) Use under severe conditions deviating from the design specifications
   (e.g. in case of corrosion due to outdoor use).
   (8) Fire, flood, earthquake, thunder and other natural disasters.
   (9) Consumable parts such as O-ring, gasket, diaphragm and etc.

   Yoshitake is not liable for any damage or loss caused by malfunction or defect of the product.

YOSHITAKE