

TRAP STAR™ TSF-10, 11 series **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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Warranty Information

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1. Specifications

Model		TSF-10	TSF-10F	TSF-11	TSF-11F
Nominal size		15A-25A		25A-50A	
Application		Steam condensate			
Working pressure (Maximum working differential pressure)		TSF-1□□-5: 0.01-0.5 MPa (0.5 MPa) TSF-1□□-10: 0.01-1.0 MPa (1.0 MPa) TSF-1□□-21: 0.01-2.1 MPa (2.1 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 FF JIS 20K FF	JIS Rc screwed NPT screwed	JIS 10K FF JIS 20K FF
Flow direction		All directions *			

Model		TSF-10S	TSF-10SF	TSF-11S	TSF-11SF
Nominal size		15A-25A		25A-50A	
Application		Steam condensate			
Working pressure (Maximum working differential pressure)		TSF-1□S□-5: 0.01-0.5 MPa (0.5 MPa) TSF-1□S□-10: 0.01-1.0 MPa (1.0 MPa) TSF-1□S□-21: 0.01-2.1 MPa (2.1 MPa)			
Max. temperature		220°C			
Material	Body	Cast stainless steel			
	Float	Stainless steel			
	Valve, Valve seat	Stainless steel			
Connection		JIS Rc screwed NPT screwed	JIS 10K FF JIS 20K RF ASME 150lb RF ASME 300lb RF BSEN 25/40 RF	JIS Rc screwed NPT screwed	JIS 10K FF JIS 20K RF ASME 150lb RF ASME 300lb RF BSEN 25/40 RF
Flow direction		All directions *			

Model		TSF-10CF
Nominal size		15A-25A
Application		Steam condensate
Working pressure (Maximum working differential pressure)		TSF-10CF-5: 0.01-0.5 MPa (0.5 MPa) TSF-10CF-10: 0.01-1.0 MPa (1.0 MPa) TSF-10CF-32: 0.01-3.2 MPa (3.2 MPa)
Max. temperature		240°C
Material	Body	Cast carbon steel
	Float	Stainless steel
	Valve, Valve seat	Stainless steel
Connection		JIS 30K RF flanged ASME 150lb RF flanged ASME 300lb RF flanged EN PN25/40 RF flanged
Flow direction		All directions *

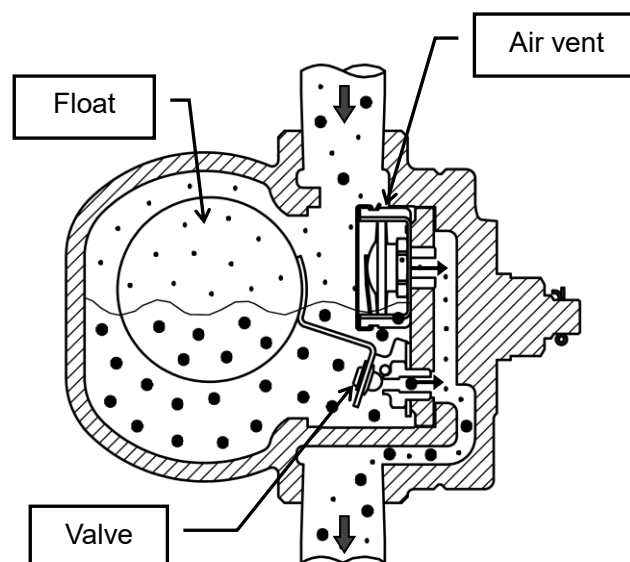
* For installation posture, see Caution No. 6, "4.2 Precaution for installation" on Page 8.

 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.
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2. Operation

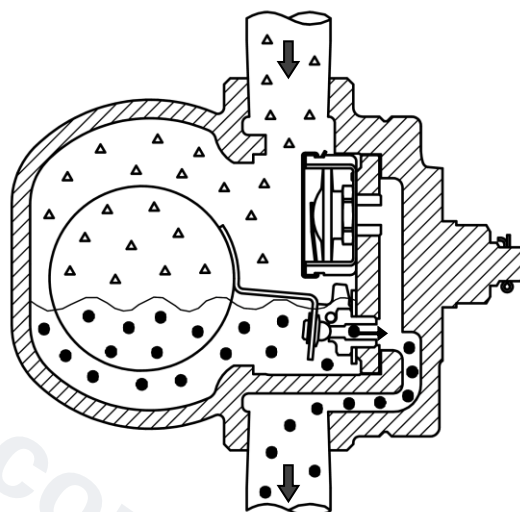
1. Start-up of the operation

At start-up, since the float is down, the valve is closed. In this state, air in the system and piping is discharged out through the air vent which is opened. When condensate flows into the product, the float lifts up and opens the valve, and then discharges condensate. Air is continuously discharged out from the air vent.



2. Condensate discharging operation

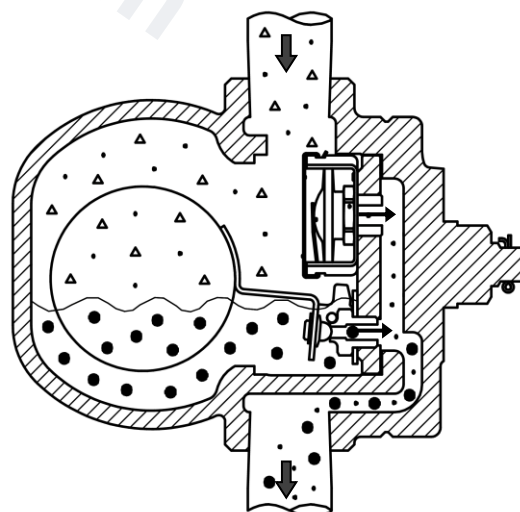
When steam flows into the product, internal pressure of the air vent rises by steam temperature, and the air vent closes. According to the amount of condensate inflow, the float position moves up and down changing the opening degree of the valve, and thus condensate is continuously discharged. The float moves down and the valve closes when condensate inflow stops.



3. Air vent operation

When air or non-condensable gas flows into the product, it accumulates in the upper part of the product. When temperature of air or non-condensable gas decreases with condensate inflow, the air vent opens and discharges it to outside of the product.

Then, operations 2 and 3 repeats according to the inflow amount of condensate and air.



Condensate



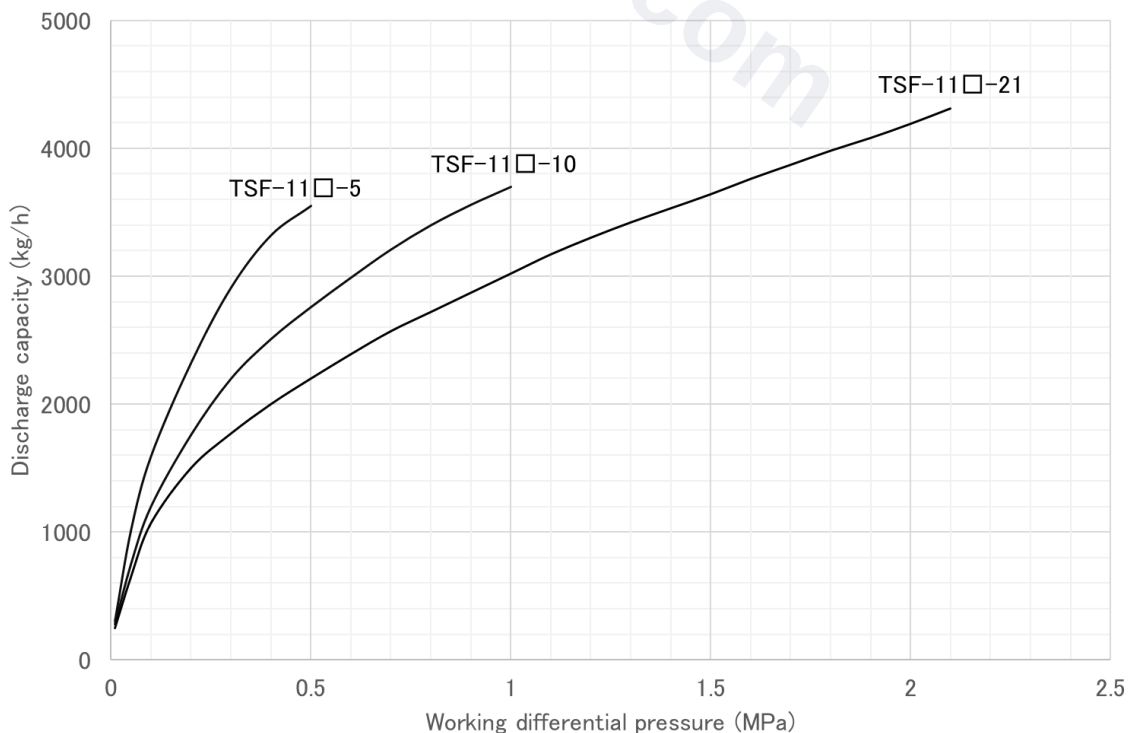
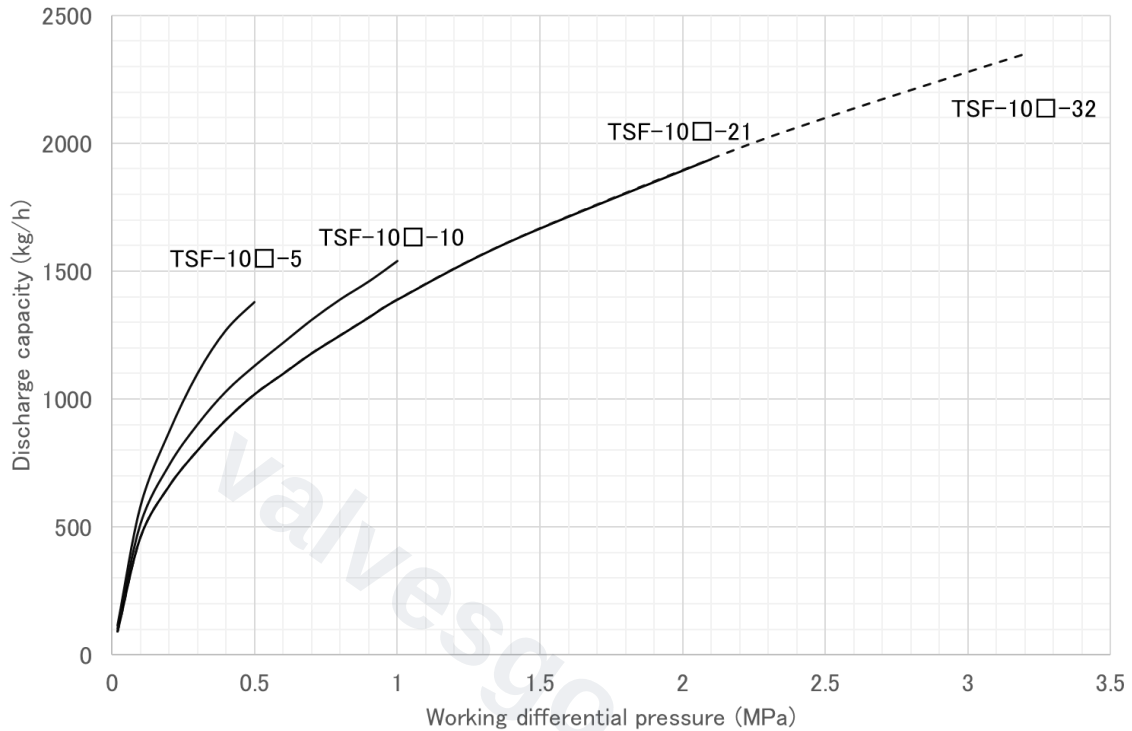
Steam



Air

3. Maximum Continuous Discharge Capacity

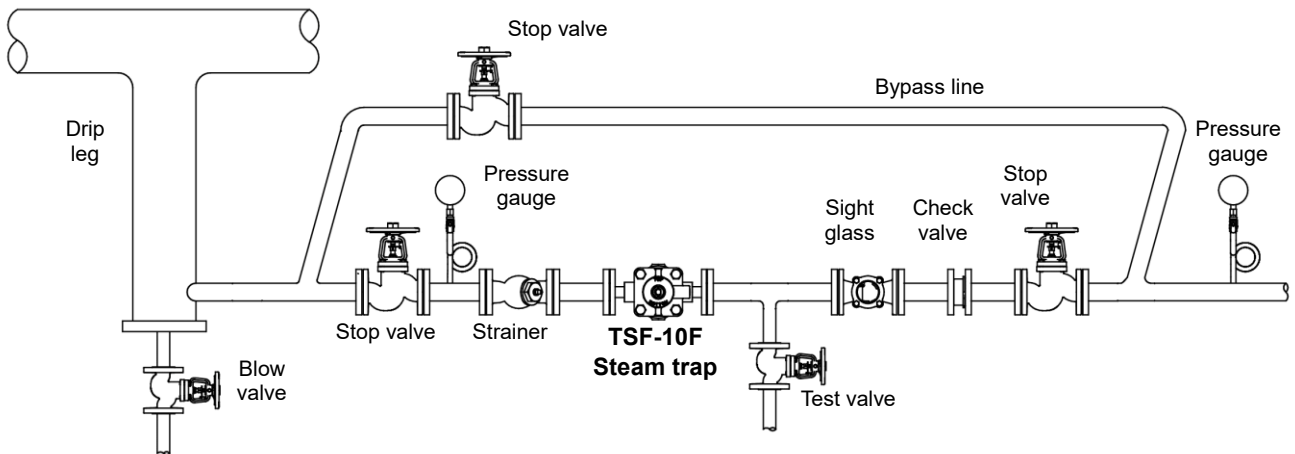
1. Discharging capability of the steam trap differs by working differential pressure, that is, difference between inlet pressure and outlet pressure (back pressure). In selecting discharge capacity, consider outlet pressure. If inlet pressure is 0.5 MPa and outlet pressure is 0.2 MPa, discharge capacity 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 (two times the regular level). That is, for example, if a discharge capacity of 500 kg/h is required, select a steam trap capable of discharging more than 1,000 kg/h (maximum discharge).



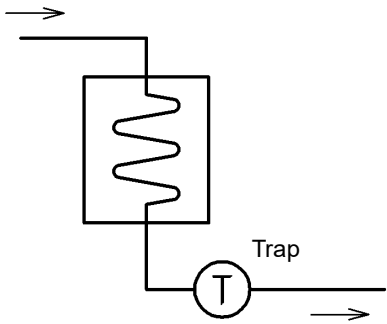
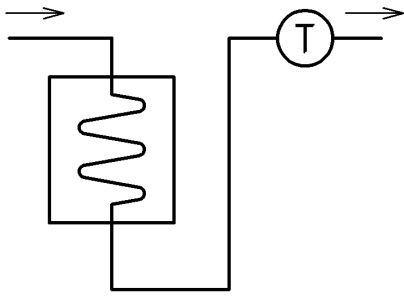
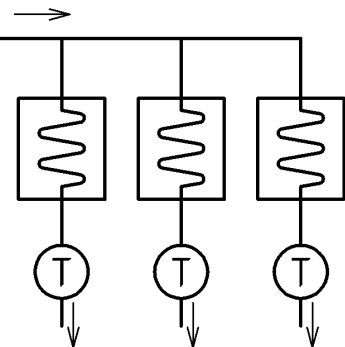
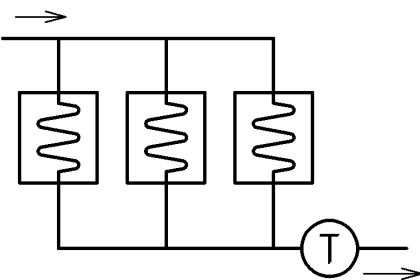
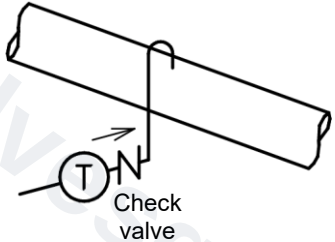
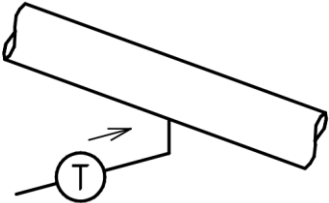
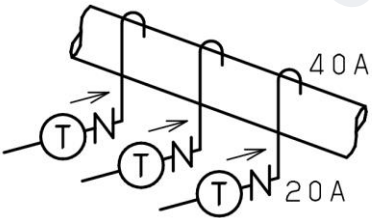
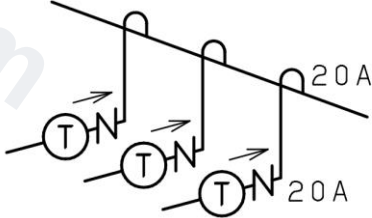
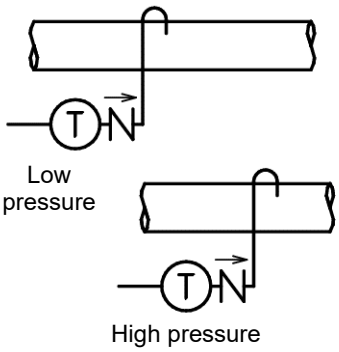
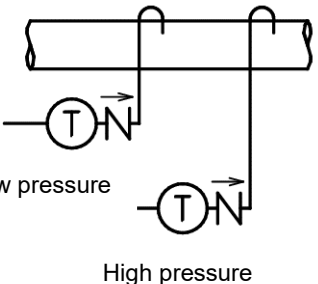
Maximum Continuous Discharge Capacity

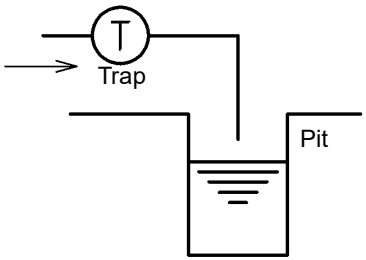
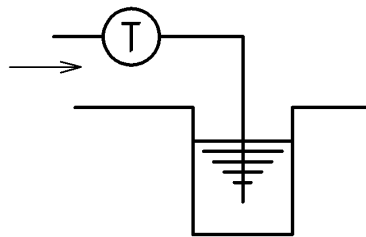
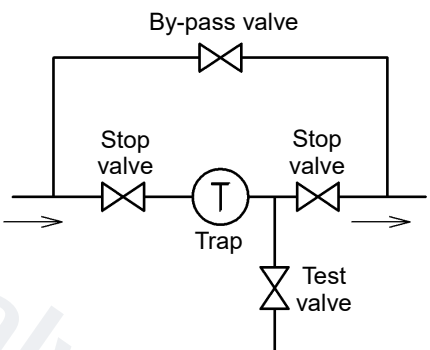
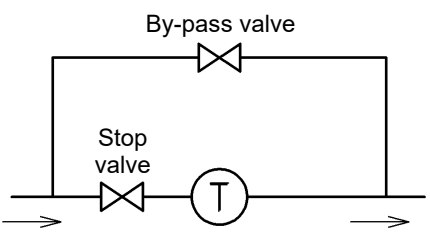
4. Installation

4.1 Piping example



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 so that condensate can be discharged from the bottom of the steam main by drip leg.		

Description	Correct	Incorrect
Install the product below a device which generates condensate.		
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.

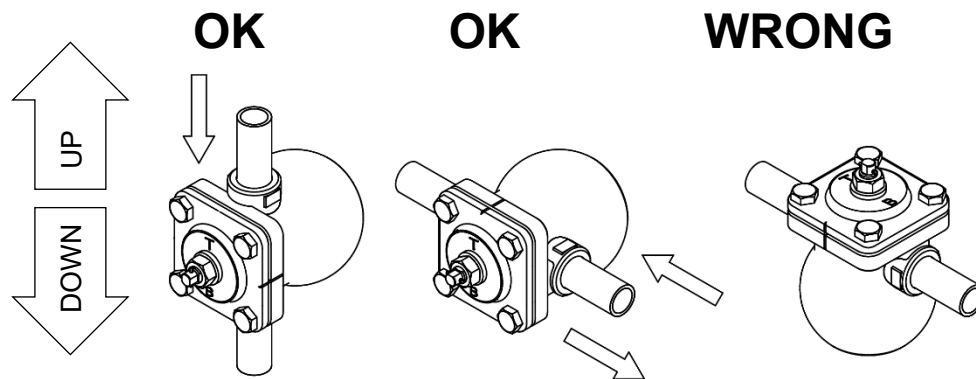
Description	Correct	Incorrect
End portion of discharge pipe shall be off the water surface in the pit.		 * If the discharge pipe is in contact with the water, it absorbs dirty water in the pit and causes malfunction of the product.
Provide a by-pass line around the product, and install stop valves at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

4.2 Precaution for installation

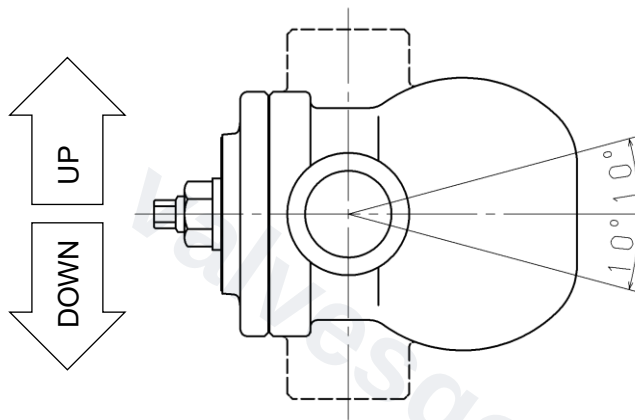
⚠ Caution
- Before connecting the product to piping, remove foreign substances and scale from the piping. * Failure to follow this notice may prevent the product from functioning properly. - Protective covers are attached to the inlet and outlet connections of some products to prevent foreign substances from entering the product. Please remove them before installation. - 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. - When installing the product in piping, be careful not to allow sealant or sealing tape to enter the product. - Do not apply excessive load, torque or vibration to the valve.

6. **Check installation posture.**

* Wrong posture hampers proper operation.



* Allowable tilt from horizontal line is within $\pm 10^\circ$.



7. **Adjust direction of the nameplate in no pressure condition after installation.**

* Do not turn the cock unless the pressure inside of the product and piping is completely discharged. Forcing the cock to turn may result in damage to the cock.

* Wrong direction hampers proper operation.

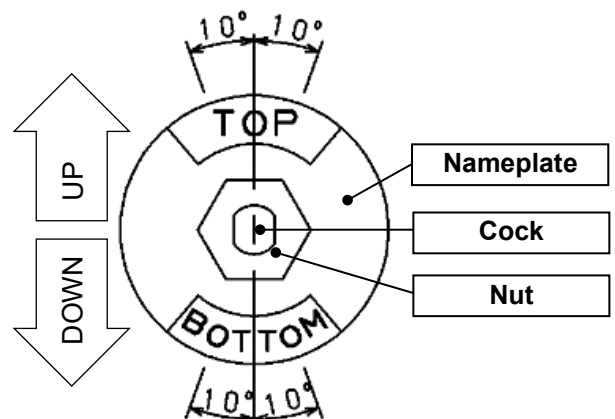
* Do not remove the split pin inserted in the upper part of the cock.

* Fix the cock with spanner and loosen the nut.

Turn the cock and adjust direction of the Nameplate to position "TOP" and "BOTTOM" signs on upside and downside respectively.

* Fix the cock with spanner and fasten the nut after adjustment.

* Allowable tilt from vertical line is within $\pm 10^\circ$.



8. Make sure to support the piping immovably.

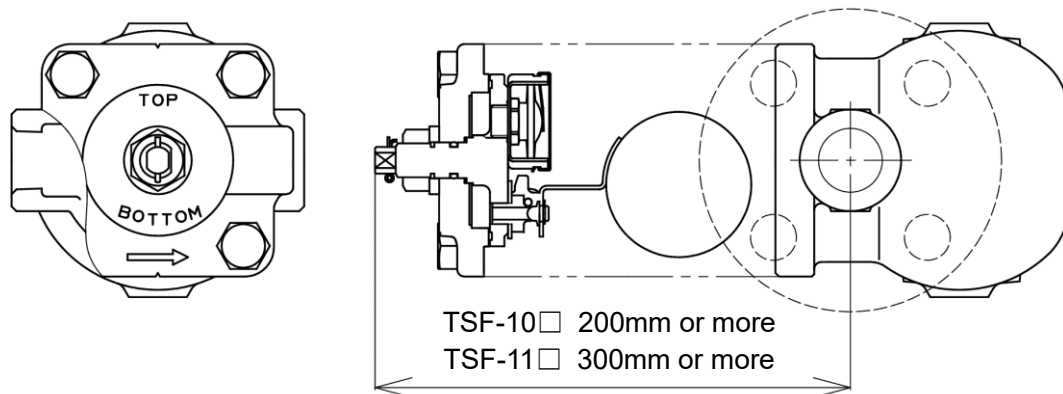
* If an excessive piping stress is applied, the product may not open or close.

9. Do not disassemble the product unless it is necessary.

* Disassembly may prevent the product from functioning properly.

10. Secure enough space for maintenance (such as cleaning of strainer), inspections and repair as shown below.

* Failure to follow this notice prevents maintenance, inspection and repair.



11. 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.

12. To install the product in a main steam pipe, provide a drip leg at the inlet side of the product.

13. Install a strainer (mesh size of 80 or more is recommended) at the inlet side of the product.

14. 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.

15. Install the product so that 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 float, or may result in scalds or injury due to blow off when the product is subjected to an excessive shock and damaged.

16. Install a bypass line.

* The system must stop operation while inspection and maintenance of the product if the bypass line is not installed.

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.
 - * Failure to follow this notice may result in scalds or injury due to blow-off.
2. Do not touch the product with bare hands while the product operates.
 - * Failure to follow this notice may result in scalds.
3. Do not stand in front of the outlet opening of the product while the product operates.
 - * Failure to follow this notice may result in scalds or injury due to blow-off.

Caution

1. Slowly open each stop valve to prevent water hammer.
 - * Opening stop valves quickly may result in damage to other equipment due to hunting or water hammer.
2. Do not turn the cock while the product operates.
 - * Do not turn the cock unless the pressure inside of the product and piping is completely discharged. Forcing the cock to turn may result in damage to the cock.
 - * Wrong direction of the cock hampers proper operation.
3. 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.
 - * Failure to follow this notice may result in burns.
3. Completely discharge internal pressure of the product, piping and equipment, and cool down the product prior to disassembly or maintenance.
 - * Failure to follow this notice may result in scalds 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 13 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 13 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.

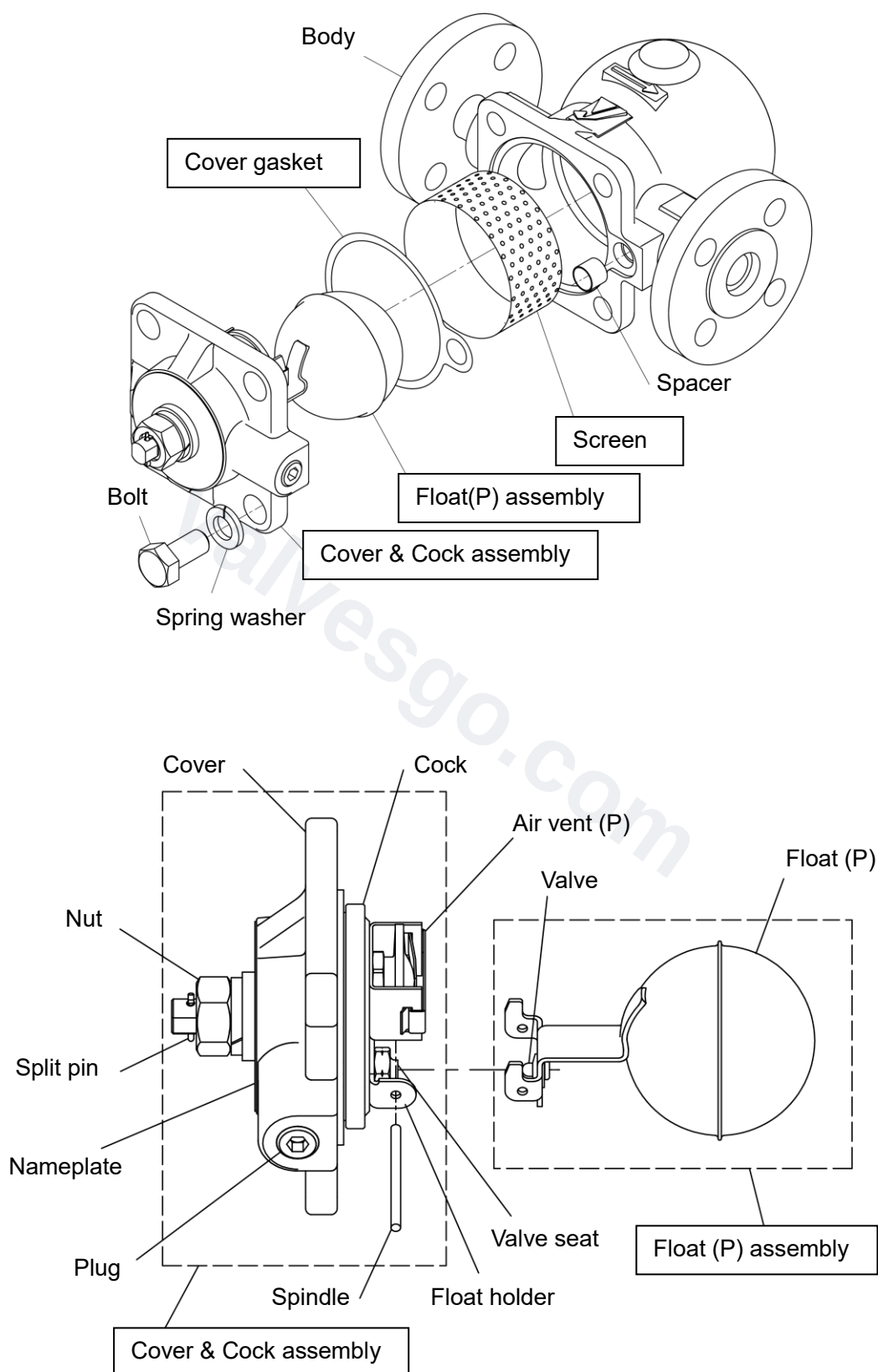
Items	Standards for Inspection
Seat surfaces of the valve and valve seat	No scratch, abrasion, or foreign substances on seat surfaces.
Shape of float (P)	No deformation or damage on the float (P)
Dirt on the screen	No clogging on the screen

6.3 Troubleshooting

Trouble	Cause	Remedy
Condensate is not discharged.	1. Blockage of foreign substances in a discharge hole of the valve seat.	1. Disassemble and clean it.
	2. The screen is clogging.	2. Disassemble and clean it.
	3. The float (P) is damaged.	3. Replace it with a new one.
	4. Breakage as a result of abnormal pressure rising due to freezing or water hammer, etc.	4. Replace the product with new one and use it within the working pressure range.
	5. Steam locking.	5. Change the piping system layout.
	6. "TOP" and "BOTTOM" signs on the Nameplate are in wrong positions.	6. Adjust direction of the Nameplate to position "TOP" and "BOTTOM" signs on upside and downside respectively. * See Caution No. 7, "4.2 Precaution for installation" on Page 8.
Continuous blowout.	1. Foreign substances stuck on valve, valve seat or air vent (P).	1. Disassemble and clean them.
	2. Abrasion or scratches on the valve, valve seat or air vent (P).	2. Replace the parts with new ones.
	3. Insufficient capacity of the product.	3. Replace the product with another model of sufficient capacity.
	4. "TOP" and "BOTTOM" signs on the Nameplate are in wrong positions.	4. Adjust direction of the Nameplate to position "TOP" and "BOTTOM" signs on upside and downside respectively. * See Caution No. 7, "4.2 Precaution for installation" on Page 8.
Steam leakage.	1. Leakage due to loosening of the bolts.	1. Replace the cover gasket with new one, and retighten the bolts.
	2. Leakage due to deterioration of cock gasket (P2) and O-ring.	2. Replace the parts with new ones.
	3. Leakage as a result of abnormal pressure rising due to freezing or water hammer, etc.	3. Replace the product with new one and use it within the working pressure range.

6.4 Exploded drawing

- * The parts shown in the rectangle boxes are available as consumable supply.
- * Parts and shapes may vary depending on the model. For details, please refer to the delivery drawing.
- * The air vent (P) cannot be removed from the cock.
- * Do not remove the plug from the cover except when disposing.

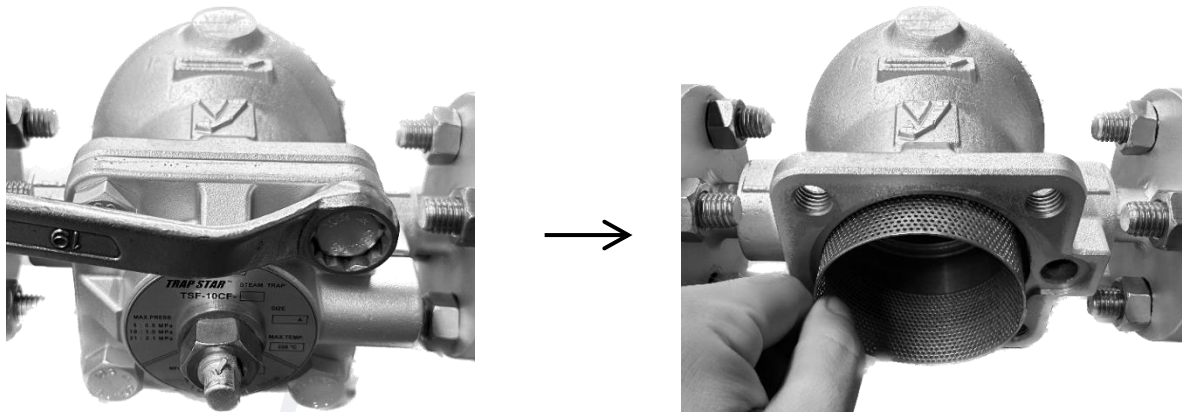


6.5 Disassembly

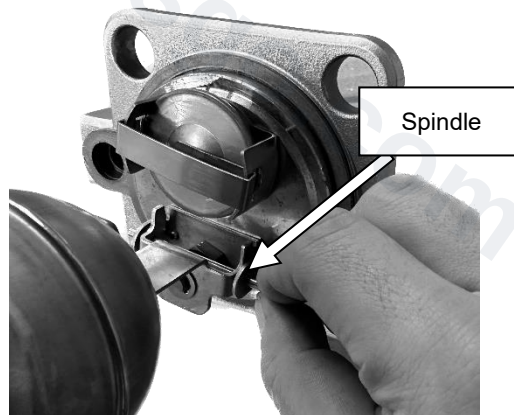
- Tools to be used

Name of tool	Contents (size, nominal size, etc.)
Ring wrench	19 mm

[Procedure 1] Loosen and remove the bolts fixing the cover with ring wrench (width across flats: 19 mm). Remove the cover and gasket from the body. Pull out the screen from the body.



[Procedure 2] Pull out the spindle from the float holder and remove the float (P) assembly.

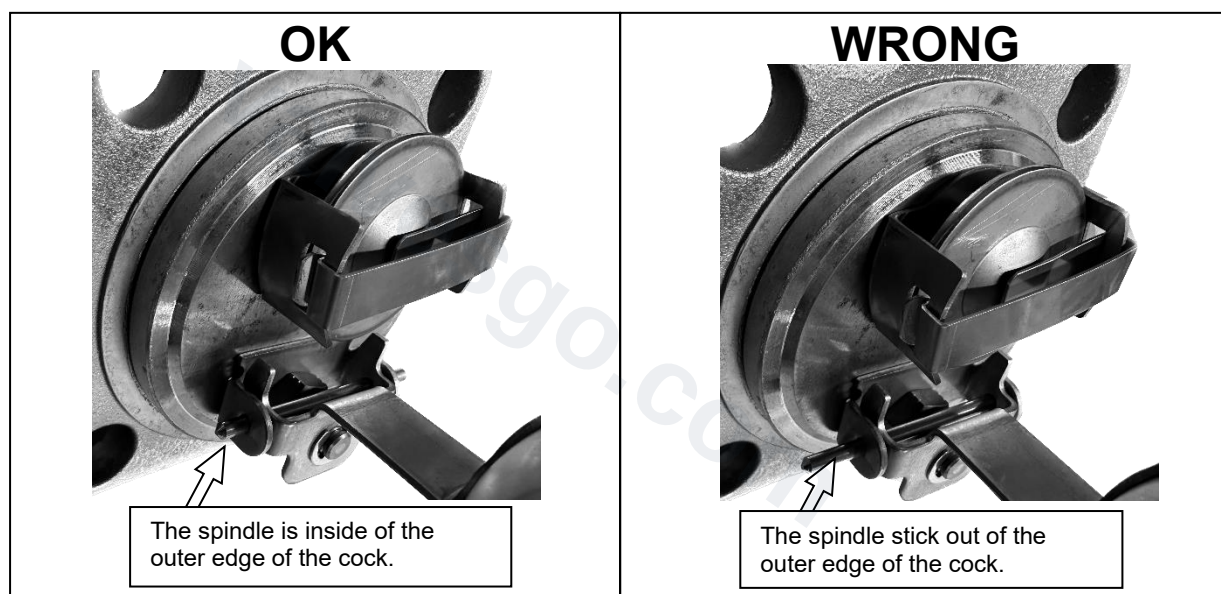


6.6 Reassembly

- Tools to be used

Name of tool	Contents (size, nominal size, etc.)
Torque Wrench	Width across flats: 19 mm * See Procedure 4 for the torque specifications.
Torque Wrench	Width across flats: 22 mm, Open-head type * See Procedure 5 for the torque specifications.
Spanner	9 mm
Ring Wrench	22 mm

[Procedure 1] Connect the float holder and float (P) assembly with the spindle. Check that the float (P) assembly moves smoothly, and that the seat surface of the valve is in contact with that of the valve seat.



[Procedure 2] Attach the screen to the body. The screen can be inserted from either end.



[Procedure 3]

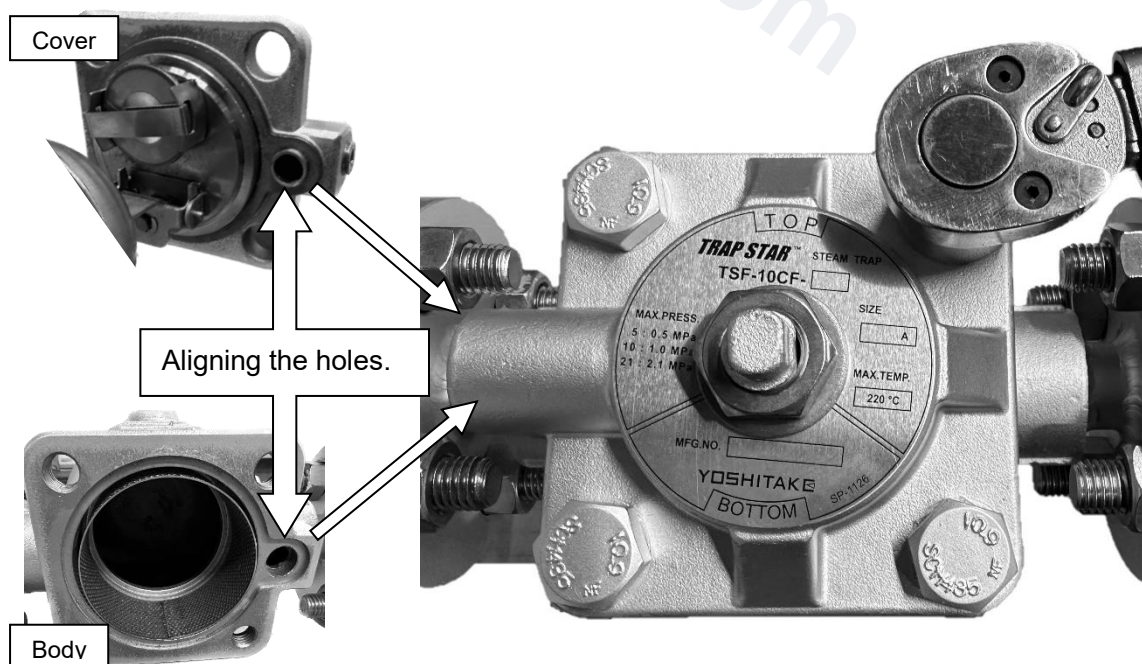
Install the cover gasket to the cover. Align the holes of the cover and the cover gasket. If spacer is present, insert it to the hole. Make sure to use a new cover gasket. Apply lubricant agent to the cover gasket (Recommendation: SOLVEST No.110 paste, STT Inc.)



[Procedure 4]

Install the cover to the body, aligning the holes on the cover and the body. Tighten the bolts with a torque wrench (width across flats: 19 mm). The tightening torque varies depending on the model. Please tighten the bolts according to the torque specified in the table below.
* Do not use impact wrench to tighten the bolts. Using it may cause unevenly tightened bolts or damaged gasket, resulting in leakage of condensate or steam.

Model	Torque (N · m)
TSF-10, 10F, 11, 11F, 10S, 10SF	45
TSF-11S, 11SF	55
TSF-10CF	30



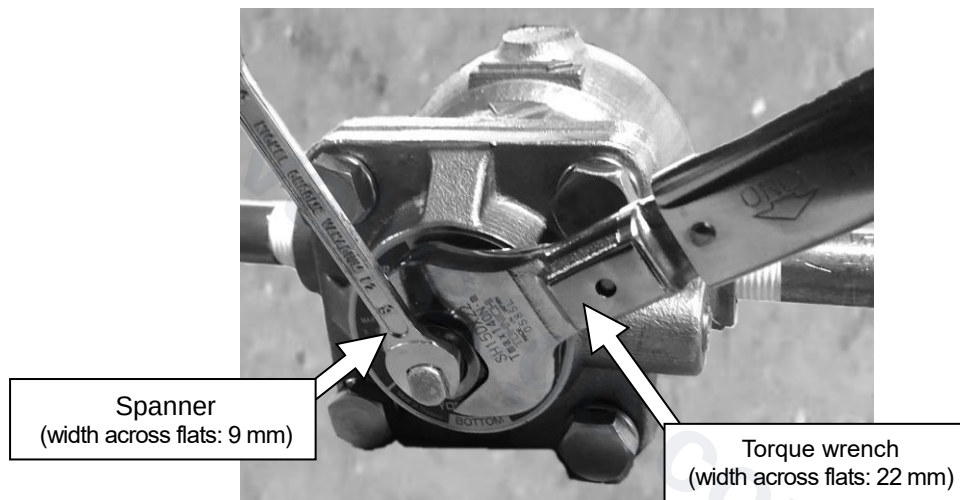
[Procedure 5]

Fix the cock with spanner (width across flats: 9 mm) and loosen the nut with a ring wrench (width across flats: 22 mm) until it contacts the split pin. With a spanner applied to the cock, adjust the direction of the nameplate. After adjustment, tighten the nut using a torque wrench (width across flats: 22 mm). The tightening torque varies depending on the model. Please tighten the nut according to the torque specified in the table below.

* If the nameplate is not in correct direction, the product does not work properly. See Caution No. 7, "4.2 Precaution for installation" on Page 8 for the adjustment procedure.

* Do not remove the split pin inserted in the upper part of the cock.

Model	Torque (N · m)
TSF-10, 10F, 11, 11F, 10S, 10SF, 11S, 11SF	35
TSF-10CF	45



6.7 Parts replacement procedure

Part name	Disassembly (See 6.5.)	Reassembly (See 6.6.)
Cover gasket	Procedure 1	Procedures 3 to 5
Float (P) assembly	Procedures 1 to 2	Procedures 1 to 5
Cover & Cock assembly	Procedures 1 to 2	Procedures 1 to 5
Screen	Procedure 1	Procedures 2 to 5

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.

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