



Manufacturer

TLV CO., LTD.

Kakogawa, Japan

is approved by LRQA Ltd. to ISO 9001/14001



Instruction Manual

Bypass Blowdown Steam Trap
(Free Float Steam Trap with X-element)
J3S-X-BV/J3S-X-PB/J3S-X-MB

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Introduction

Thank you for purchasing the TLV bypass blowdown steam trap.

This product has been thoroughly inspected before being shipped from the factory. When the product is delivered, before doing anything else, check the specifications and external appearance to make sure nothing is out of the ordinary. Also be sure to read this manual carefully before use and follow the instructions to be sure of using the trap properly.

The TLV bypass blowdown steam trap features a combination of: a compact ball valve, with superior long-lasting sealing properties; and an actuator unit (electric, pneumatic). This free float steam trap is a revolutionary design that employs a high-performance X-element as an air vent. It is best suited for steam equipment use. The X-element is very sensitive to changes in temperature, and responds with great accuracy, allowing for the quick discharge of large quantities of initial air and cold condensate immediately after operation start-up, reducing start-up times. It also reacts with great sensitivity to the inflow of large quantities of condensate and hot air during operation, preventing air binding.

The following models are contained in this manual:

J3S-X-BV: Steam trap with an integrated compact bypass blowdown ball valve with a manual operation handle

J3S-X-MB: Steam trap with an integrated compact bypass blowdown ball valve with an electric actuator

J3S-X-PB: Steam trap with an integrated compact bypass blowdown ball valve with a pneumatic actuator

If detailed instructions for special order specifications or options not contained in this manual are required, please contact TLV for full details.

This instruction manual is intended for use with the model(s) listed on the front cover. It is necessary not only for installation but for subsequent maintenance, disassembly/reassembly and troubleshooting. Please keep it in a safe place for future reference.

Safety Considerations

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

Symbols

| | |
|---|---|
|  | Indicates a DANGER, WARNING or CAUTION item. |
|  | Indicates an urgent situation which poses a threat of death or serious injury |
|  | Indicates that there is a potential threat of death or serious injury |
|  | Indicates that there is a possibility of injury or equipment/product damage |

| | |
|---|--|
|  | <p>NEVER apply direct heat to the float. The float may explode due to increased internal pressure, causing accidents leading to serious injury or damage to property and equipment.</p> |
|  | <p>Install properly and DO NOT use this product outside the recommended operating pressure, temperature and other specification ranges. Improper use may result in such hazards as damage to the product or malfunctions that may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted.</p> <p>DO NOT use this product in excess of the maximum operating pressure differential. Such use could make discharge impossible (blocked).</p> <p>Take measures to prevent people from coming into direct contact with product outlets. Failure to do so may result in burns or other injury from the discharge of fluids.</p> <p>When disassembling or removing the product, wait until the internal pressure equals atmospheric pressure and the surface of the product has cooled to room temperature. Disassembling or removing the product when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries or damage.</p> |

Continued on the next page

| | |
|--|---|
|  CAUTION | <p>Be sure to use only the recommended components when repairing the product, and NEVER attempt to modify the product in any way. Failure to observe these precautions may result in damage to the product and burns or other injury due to malfunction or the discharge of fluids.</p> |
| | <p>Use only under conditions in which no freeze-up will occur. Freezing may damage the product, leading to fluid discharge, which may cause burns or other injury.</p> |
| | <p>Use only under conditions in which no water hammer will occur. The impact of water hammer may damage the product, leading to fluid discharge, which may cause burns or other injury.</p> |
| | <p>Do not stand on or apply body weight to the handle. The handle may break, resulting in injury or other accidents.</p> |
| | <p>Make sure the power supply is OFF before carrying out work on the wiring or inspections involving disassembly. If such work is carried out with the power on, there is a danger that equipment may malfunction or electric shock may occur, leading to injury or other accidents.</p> |
| | <p>Make sure that wiring work requiring a special license is carried out only by qualified personnel. If carried out by unqualified personnel, overheating or short circuits leading to injury, fires, damage or other accidents may occur.</p> |
| | <p>When using this product, NEVER stand close to, or leave tools anywhere near moving parts such as the shaft. Contact with moving parts or objects becoming caught in moving parts could lead to injury, damage or other accidents.</p> |

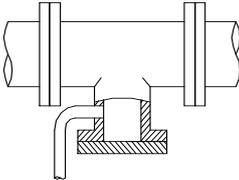
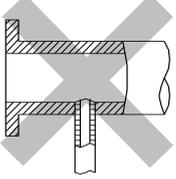
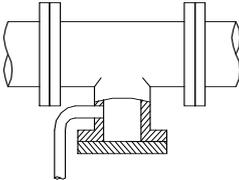
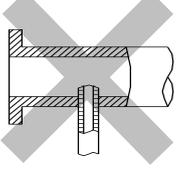
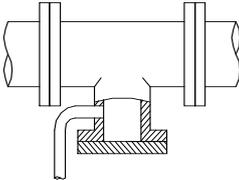
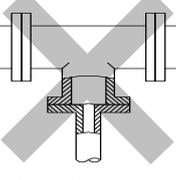
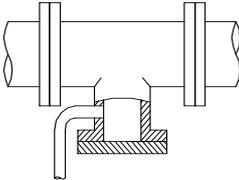
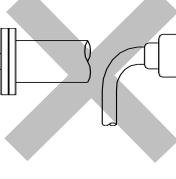
Checking the Piping



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

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

1. Is the pipe diameter suitable?
2. Has sufficient space been secured for maintenance? (Refer to step 3. in the "Installation" section.)
3. Are the inlet and outlet connections on the same horizontal plane?
4. Have maintenance valves been installed at the inlet and outlet? If the outlet is subject to back pressure, has a check valve (TLV-CK) been installed?
5. Is the inlet pipe as short as possible, with as few bends as possible, and installed so the liquid will flow naturally down into the trap?
6. Has the piping work been done with the proper methods, shown in the figures below?

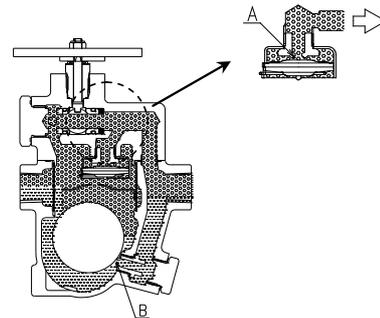
| Requirement | Correct | Incorrect |
|--|---|--|
| Install catchpot with the proper diameter. |  |  Diameter is too small. |
| Make sure the flow of condensate is not obstructed. |  |  Diameter is too small and inlet protrudes into pipe interior. |
| To prevent rust and scale from flowing into the trap,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

Operation

1. Initial Air and Cold Condensate Discharge

At startup, before steam is supplied, the trap is cold so the X-element is contracted and the air vent valve seat (A) is open. This allows for the rapid discharge of air through the air vent valve (A) and cold condensate through the orifice (B), when steam is first supplied to the system. Initial air/condensate can be discharged rapidly using the bypass blowdown valve as necessary.

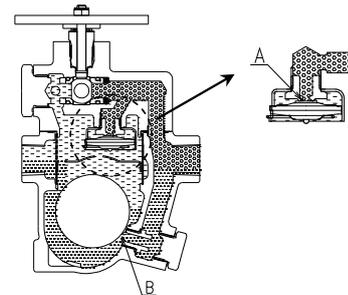
Bypass Blowdown Valve: Open



2. Condensate Discharge

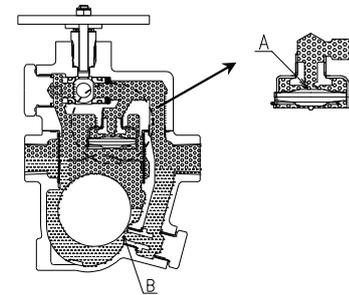
After the discharge of initial air and cold condensate (bypass blowdown valve closed), the heat of the inflowing steam and condensate causes the X-element to expand, closing the air vent valve (A). The rising condensate level causes the float to rise due to buoyancy, opening the orifice (B) and allowing condensate to be discharged.

Bypass Blowdown Valve: Closed



3. Hot Air Discharge

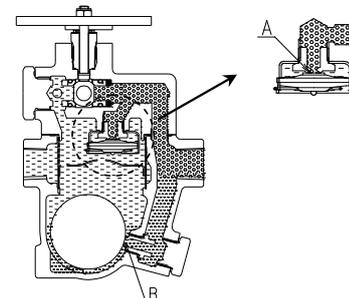
Should hot air flow into the trap with the steam during normal operation, the temperature of the X-element drops, causing it to momentarily contract and open the air vent valve (A), which allows for the rapid discharge of the air. After the air is discharged and steam contacts the X-element, the temperature will increase causing the air vent valve (A) to close.



4. Closed Position

When the condensate flow rate decreases, the float falls as condensate is discharged, closing off the orifice (B). A water seal is maintained at all times over the orifice (B) to prevent steam loss.

NOTE: The high steam temperature causes the X-element to expand, keeping the air vent closed.



Air, Condensate
Steam
Condensate

Specifications



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.



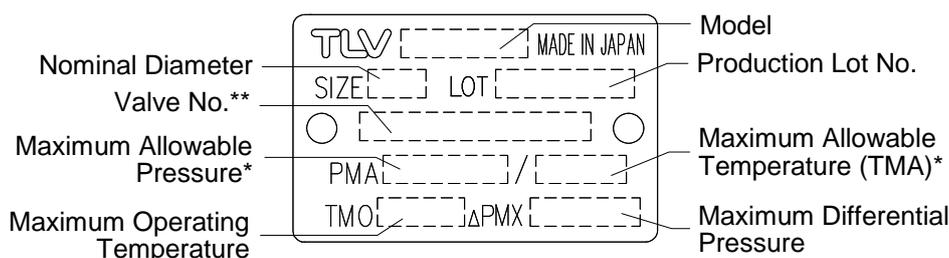
DO NOT use this product in excess of the maximum operating pressure differential; such use could make discharge impossible (blocked).



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.

Steam Trap Body

Refer to the product nameplate for detailed specifications.



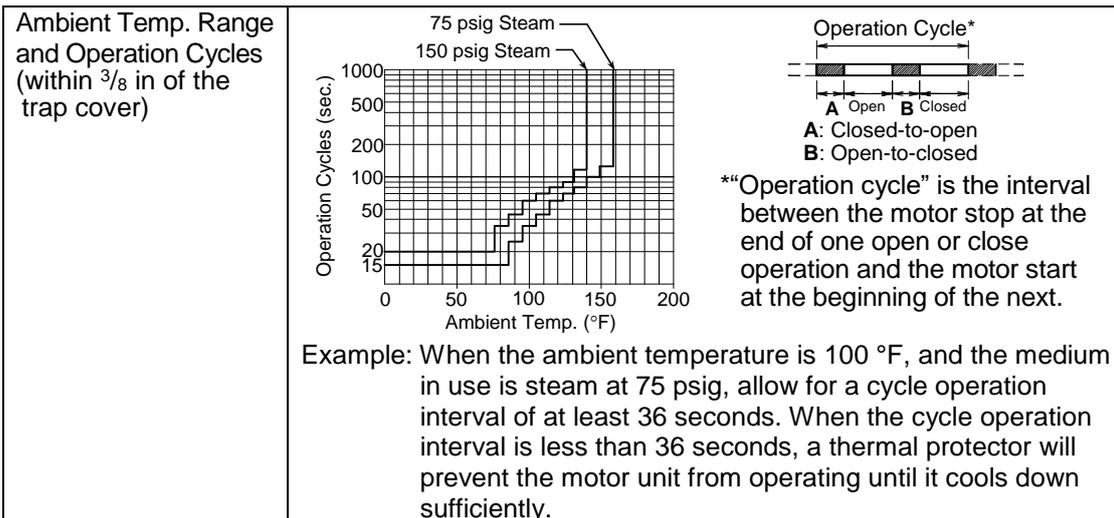
* Maximum allowable pressure (PMA) and maximum allowable temperature (TMA) are **PRESSURE SHELL DESIGN CONDITIONS, NOT OPERATING CONDITIONS.**

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

J3S-X-MB: Motor Unit

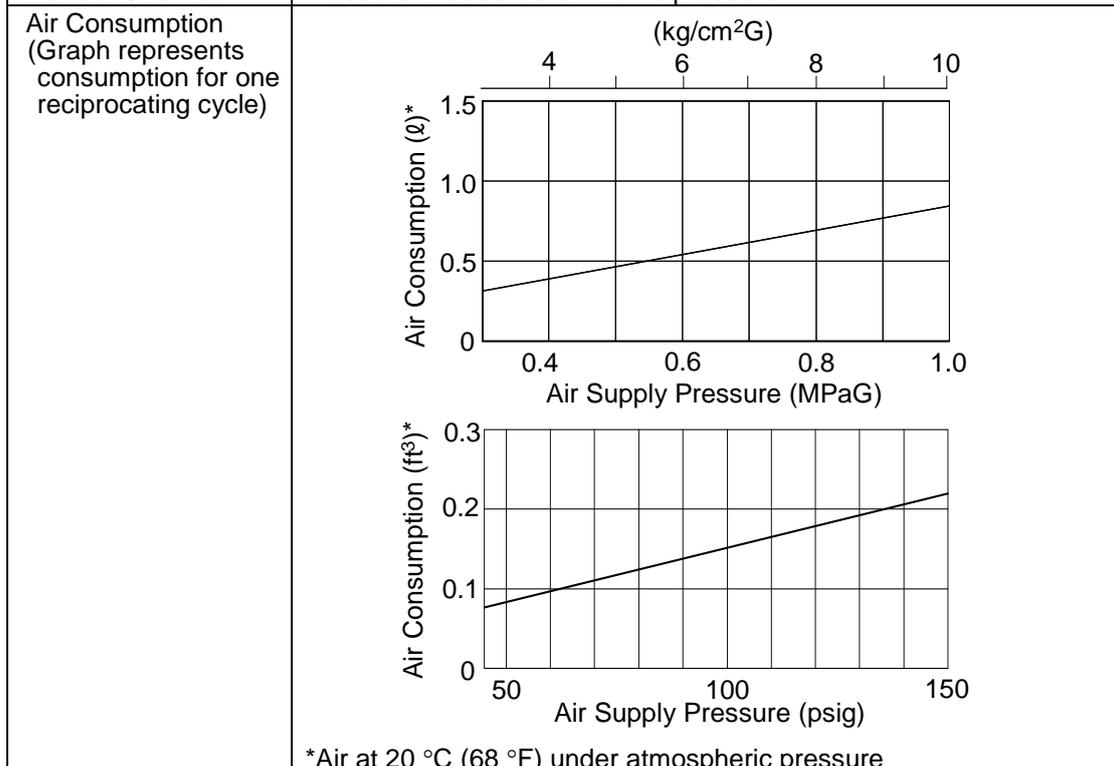
| | |
|--|---|
| Motor Type | Reversible motor (condenser run type single-phase induction motor) |
| Power Consumption | 52 VA (100 - 110 V), 62 VA (200 - 220 V) |
| Control System | ON-OFF (fully open/fully closed) |
| Overload Protection | Built-in thermal protector 120±5 °C (248±9 °F) |
| Direction of Rotation | 90° reciprocating |
| Open/Close Time (90° rotation) | 3.5 seconds/50 Hz 3.0 seconds/60 Hz |
| Water Resistance | Rainproof |
| Manual Override | Possible when the power is OFF |
| Ambient Temp. Range and Operation Cycles (within 1 cm of the trap cover) | <div style="display: flex; align-items: flex-start;"> <div style="flex: 1;"> </div> <div style="flex: 1; padding-left: 20px;"> <p>Operation Cycle*</p> <p>A: Closed-to-open B: Open-to-closed</p> </div> </div> <p>**"Operation cycle" is the interval between the motor stop at the end of one open or close operation and the motor start at the beginning of the next.</p> <p>Example: When the ambient temperature is 40 °C, and the medium in use is steam at 0.5 MPaG, allow for a cycle operation interval of at least 36 seconds. When the cycle operation interval is less than 36 seconds, a thermal protector will prevent the motor unit from operating until it cools down sufficiently.</p> |
| (See the graph on the following page for imperial units) | |

(1 MPa = 10.197 kg/cm²)



J3S-X-PB: Actuator Unit

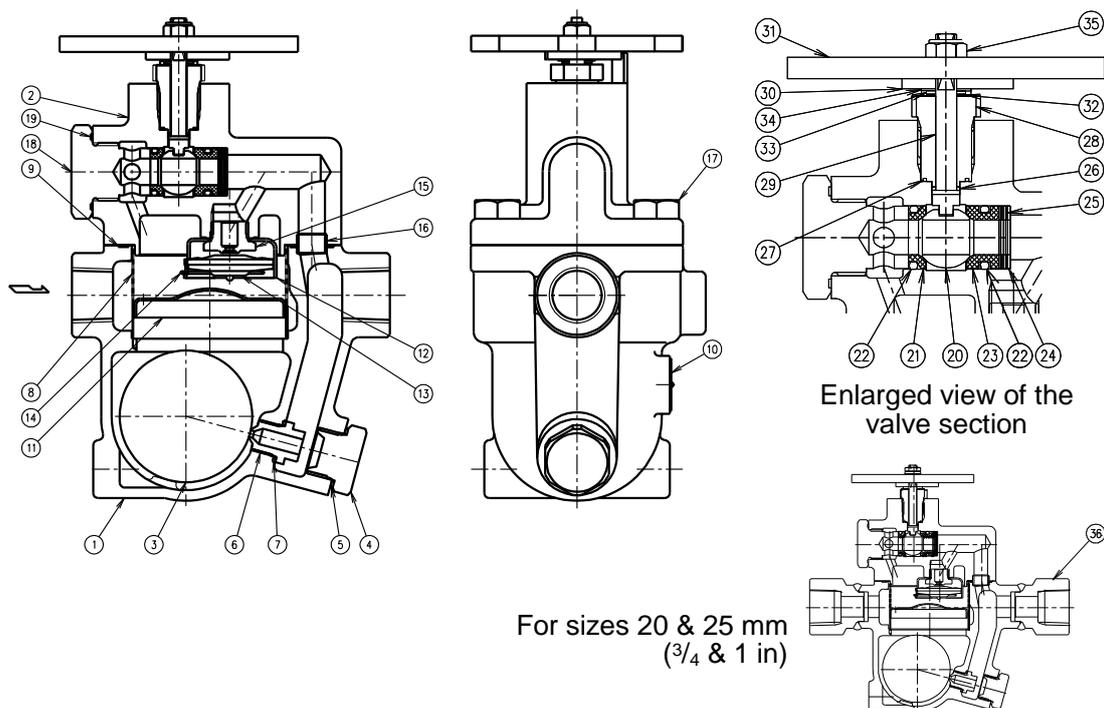
| | |
|--------------------------------|--|
| Actuator Type | Vane rotary actuator |
| Air Supply Pressure | 0.3 - 1.0 MPaG (45 – 150 psig) |
| Air Supply Port Size | Rc(PT) $\frac{1}{8}$ |
| Control System | ON-OFF (fully open/fully closed) reciprocating |
| Open/Close Time (90° rotation) | 0.09 - 0.8 seconds |
| Actuator Capacity | 42 cm ³ (2.6 in ³) |
| Ambient Temp. Range | 60 °C (140 °F) or lower |
| Water Resistance | Rainproof |
| Manual Override | Possible in absence of motive pressure |



(1 MPa = 10.197 kg/cm²)

Configuration

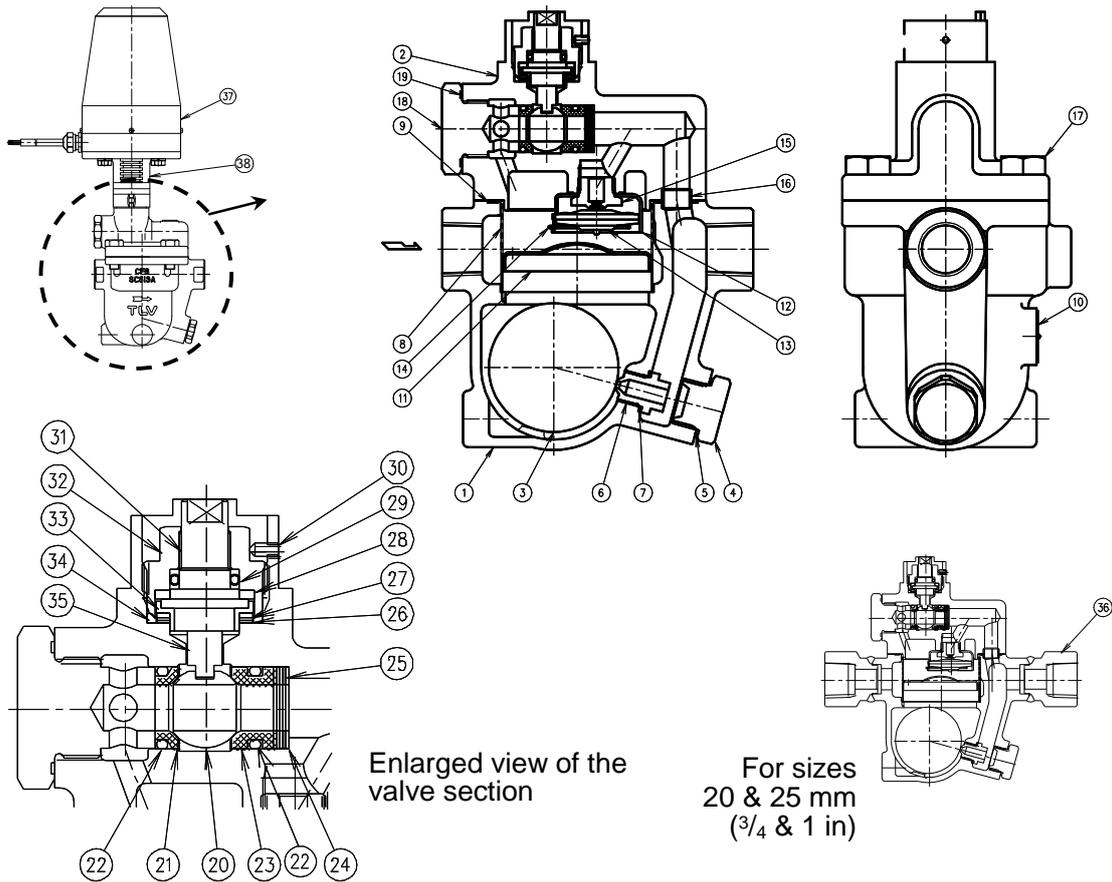
J3S-X-BV



NOTE: Removing the handle or locknut causes degradation of the gland section seal. Do not remove the handle or locknut except when performing a disassembly inspection.

| No. | Name | M | R | F | C | No. | Name | M | R | F | C |
|-----|---------------------|---|---|---|---|-----|----------------------------------|---|---|---|---|
| 1 | Body | | | | | 19 | Valve Holder Gasket | ✓ | ✓ | | ✓ |
| 2 | Cover | | | | ✓ | 20 | Ball | | | | ✓ |
| 3 | Float | | | ✓ | | 21 | Inlet Valve Seat | | | | ✓ |
| 4 | Orifice Plug | | | | | 22 | O-ring (Inlet/Outlet Valve Seat) | | | | ✓ |
| 5 | Orifice Plug Gasket | ✓ | ✓ | | | 23 | Outlet Valve Seat | | | | ✓ |
| 6 | Orifice | | ✓ | | | 24 | Washer | | | | ✓ |
| 7 | Orifice Gasket | ✓ | ✓ | | | 25 | Disc Spring | | | | ✓ |
| 8 | Screen | | ✓ | | | 26 | Gland Packing | | | | ✓ |
| 9 | Cover Gasket | ✓ | ✓ | | ✓ | 27 | Gland Gasket | ✓ | ✓ | | ✓ |
| 10 | Nameplate | | | | | 28 | Gland | | | | ✓ |
| 11 | Float Cover | | ✓ | | | 29 | Spindle | | | | ✓ |
| 12 | X-element Guide | | ✓ | | ✓ | 30 | Handle Stopper | | | | ✓ |
| 13 | X-element | | ✓ | | ✓ | 31 | Handle | | | | ✓ |
| 14 | Spring Clip | | ✓ | | ✓ | 32 | Thrust Washer | | | | ✓ |
| 15 | Air Vent Valve Seat | | ✓ | | ✓ | 33 | Washer | | | | ✓ |
| 16 | Connector | | | | | 34 | Disc Spring | | | | ✓ |
| 17 | Cover Bolt | | | | | 35 | Locknut | | | | ✓ |
| 18 | Valve Holder | | | | ✓ | 36 | Socket | | | | |

J3S-X-MB

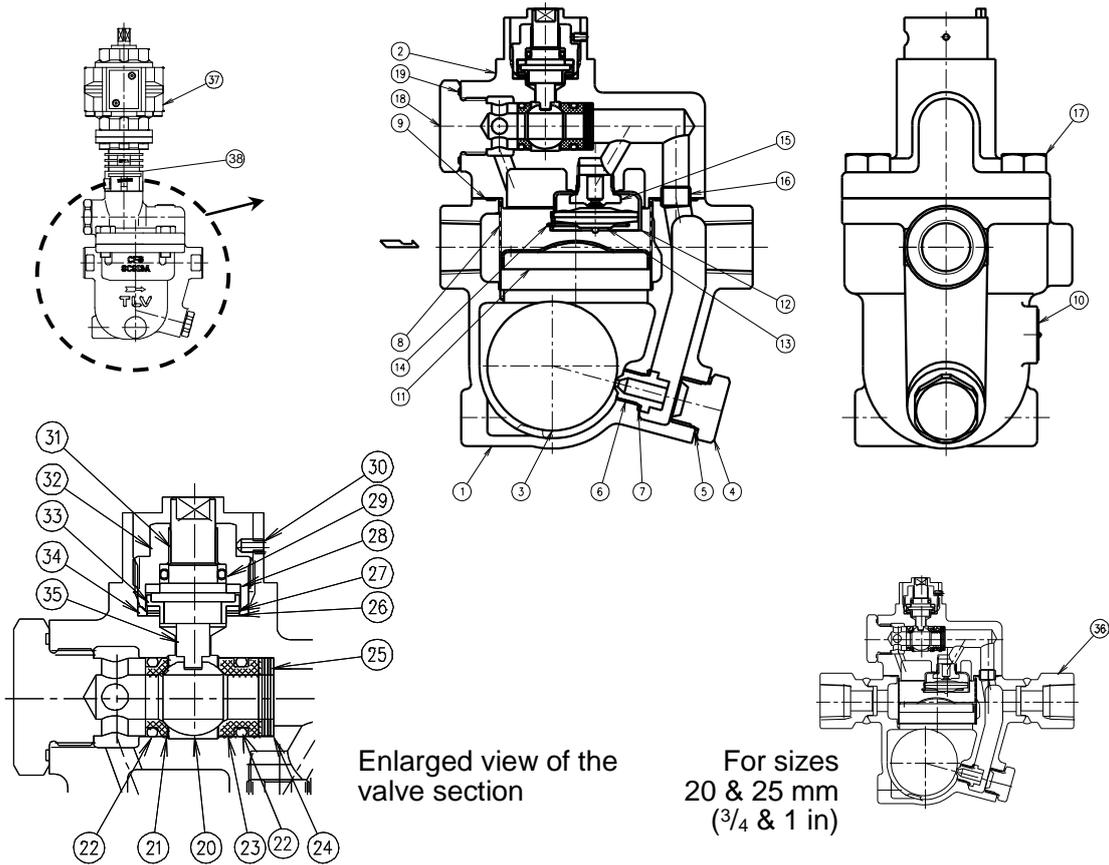


Enlarged view of the valve section

For sizes
20 & 25 mm
(3/4 & 1 in)

| No. | Name | M | R | F | C | No. | Name | M | R | F | C |
|-----|---------------------|---|---|---|---|-----|----------------------------------|---|---|---|---|
| 1 | Body | | | | | 20 | Ball | | | | ✓ |
| 2 | Cover | | | | ✓ | 21 | Inlet Valve Seat | | | | ✓ |
| 3 | Float | | | ✓ | | 22 | O-ring (Inlet/Outlet Valve Seat) | | | | ✓ |
| 4 | Orifice Plug | | | | | 23 | Outlet Valve Seat | | | | ✓ |
| 5 | Orifice Plug Gasket | ✓ | ✓ | | | 24 | Washer | | | | ✓ |
| 6 | Orifice | | ✓ | | | 25 | Disc Spring | | | | ✓ |
| 7 | Orifice Gasket | ✓ | ✓ | | | 26 | Disc Spring | | | | ✓ |
| 8 | Screen | | ✓ | | | 27 | Washer | | | | ✓ |
| 9 | Cover Gasket | ✓ | ✓ | | ✓ | 28 | Gland Packing | | | | ✓ |
| 10 | Nameplate | | | | | 29 | Seal | | | | ✓ |
| 11 | Float Cover | | ✓ | | | 30 | Holder Screw (Gland Holder) | | | | ✓ |
| 12 | X-element Guide | | ✓ | | ✓ | 31 | Guide Bushing | | | | ✓ |
| 13 | X-element | | ✓ | | ✓ | 32 | Gland Holder | | | | ✓ |
| 14 | Spring Clip | | ✓ | | ✓ | 33 | Gland Seat | | | | ✓ |
| 15 | Air Vent Valve Seat | | ✓ | | ✓ | 34 | Gland Holder Gasket | ✓ | ✓ | | ✓ |
| 16 | Connector | | | | | 35 | Spindle | | | | ✓ |
| 17 | Cover Bolt | | | | | 36 | Socket | | | | |
| 18 | Valve Holder | | | | ✓ | 37 | Motor Unit | | | | |
| 19 | Valve Holder Gasket | ✓ | ✓ | | ✓ | 38 | Shaft Coupling | | | | |

J3S-X-PB



| No. | Name | M | R | F | C | No. | Name | M | R | F | C |
|-----|---------------------|---|---|---|---|-----|----------------------------------|---|---|---|---|
| 1 | Body | | | | | 20 | Ball | | | | ✓ |
| 2 | Cover | | | | ✓ | 21 | Inlet Valve Seat | | | | ✓ |
| 3 | Float | | | ✓ | | 22 | O-ring (Inlet/Outlet Valve Seat) | | | | ✓ |
| 4 | Orifice Plug | | | | | 23 | Outlet Valve Seat | | | | ✓ |
| 5 | Orifice Plug Gasket | ✓ | ✓ | | | 24 | Washer | | | | ✓ |
| 6 | Orifice | | ✓ | | | 25 | Disc Spring | | | | ✓ |
| 7 | Orifice Gasket | ✓ | ✓ | | | 26 | Disc Spring | | | | ✓ |
| 8 | Screen | | ✓ | | | 27 | Washer | | | | ✓ |
| 9 | Cover Gasket | ✓ | ✓ | | ✓ | 28 | Gland Packing | | | | ✓ |
| 10 | Nameplate | | | | | 29 | Seal | | | | ✓ |
| 11 | Float Cover | | ✓ | | | 30 | Holder Screw (Gland Holder) | | | | ✓ |
| 12 | X-element Guide | | ✓ | | ✓ | 31 | Guide Bushing | | | | ✓ |
| 13 | X-element | | ✓ | | ✓ | 32 | Gland Holder | | | | ✓ |
| 14 | Spring Clip | | ✓ | | ✓ | 33 | Gland Seat | | | | ✓ |
| 15 | Air Vent Valve Seat | | ✓ | | ✓ | 34 | Gland Holder Gasket | ✓ | ✓ | | ✓ |
| 16 | Connector | | | | | 35 | Spindle | | | | ✓ |
| 17 | Cover Bolt | | | | | 36 | Socket | | | | |
| 18 | Valve Holder | | | | ✓ | 37 | Actuator Unit | | | | |
| 19 | Valve Holder Gasket | ✓ | ✓ | | ✓ | 38 | Shaft Coupling | | | | |

Installation and Operation



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.



Do not stand on or apply body weight to the handle. The handle may break, resulting in injury or other accidents.



Make sure the power supply switch is **OFF** before carrying out work on the wiring or inspections involving disassembly. If such work is carried out with the power on, there is a danger that equipment may malfunction or electric shock may occur, leading to injury or other accidents.



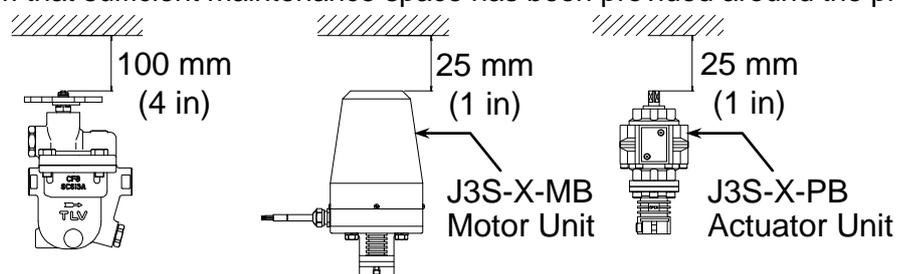
Make sure that wiring work requiring a special license is carried out by qualified personnel. If carried out by unqualified personnel, overheating or short circuits leading to injury, fires, damage or other accidents may occur.



When using this product, **NEVER** stand close to, or leave tools anywhere near moving parts, such as the shaft. Contact with moving parts or objects becoming caught in moving parts could lead to injury, damage or other accidents.

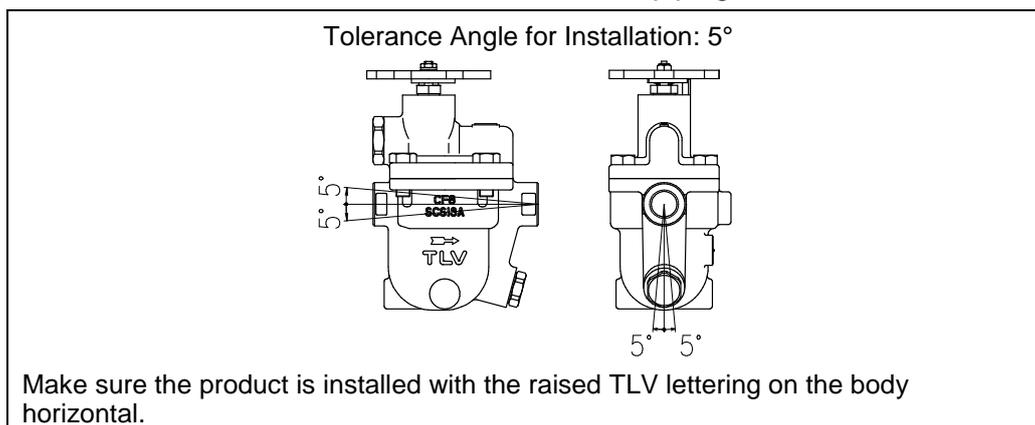
Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.

1. Before installation, be sure to remove all protective seals.
2. Before installing the product, open the inlet valve and thoroughly blow out the piping to remove any piping scraps, dirt and oil. Blowdown is possible after the product has been installed, however it is recommended that you remove all dirt, oil, etc. from the inlet piping before installation. Close the inlet valve after blowdown.
3. Confirm that sufficient maintenance space has been provided around the product.



4. Where the product is installed in a location that may be affected by radiant heat from nearby heat-generation, install a device to block the radiant heat, such as a protective plate.
5. Install the product so that the arrow on the product is pointing in the direction of condensate flow.

6. The product should be inclined no more than 5° horizontally and front-to-back.
7. Install the condensate outlet valve and the outlet piping.

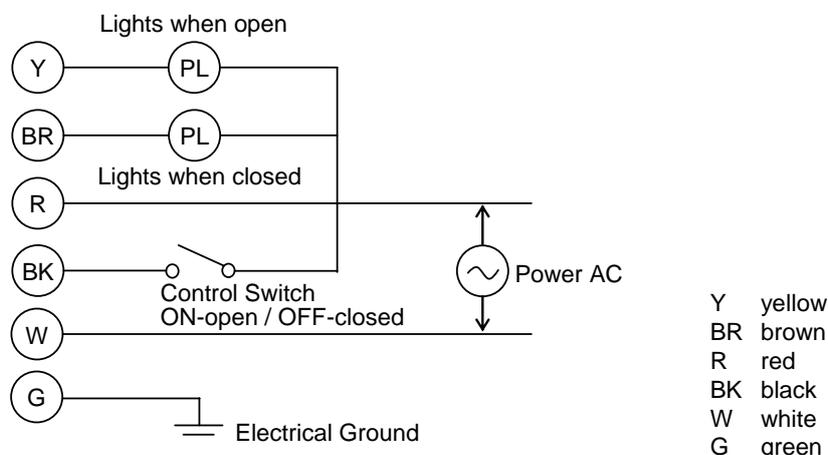


J3S-X-BV: Operation

1. Turn the handle clockwise to until it is stopped by the handle stopper.
(The integrated ball valve will close and the arrow on the handle will be perpendicular to the piping, causing the product to function as a trap.)
Open the inlet and outlet valves slowly and check to make sure that the product functions properly as a steam trap.
If there is a problem, determine the cause by using the “Troubleshooting” section in this manual.
 2. To use the bypass function, turn the handle counterclockwise until it is stopped by the handle stopper.
(The integrated ball valve will open and the arrow on the handle will be parallel to the piping.)
 3. To stop using the bypass function, turn the handle clockwise until it is stopped by the handle stopper (the arrow on the handle will be perpendicular to the piping).
(The integrated ball valve will close, causing the product to function as a trap.)
 4. The integrated ball valve should be closed when the product is used as a trap.
- NOTE: Operate the bypass valve (ball valve) in only the fully open or fully closed positions. Operation in an intermediate position will damage the valve seat and may lead to leaking of the valve.

J3S-X-MB: Wiring/Operation

1. Connect the ON/OFF control switch as follows:
When the control switch is ON, the valve will open; when it is OFF, the valve will close.
2. If connected to the yellow wire, a pilot lamp will light when the valve is open; if to the brown, a pilot lamp will light when the valve is closed.
3. When checking the operation of the motor unit before installation, keep fingers well clear of the bypass blowdown valve section.



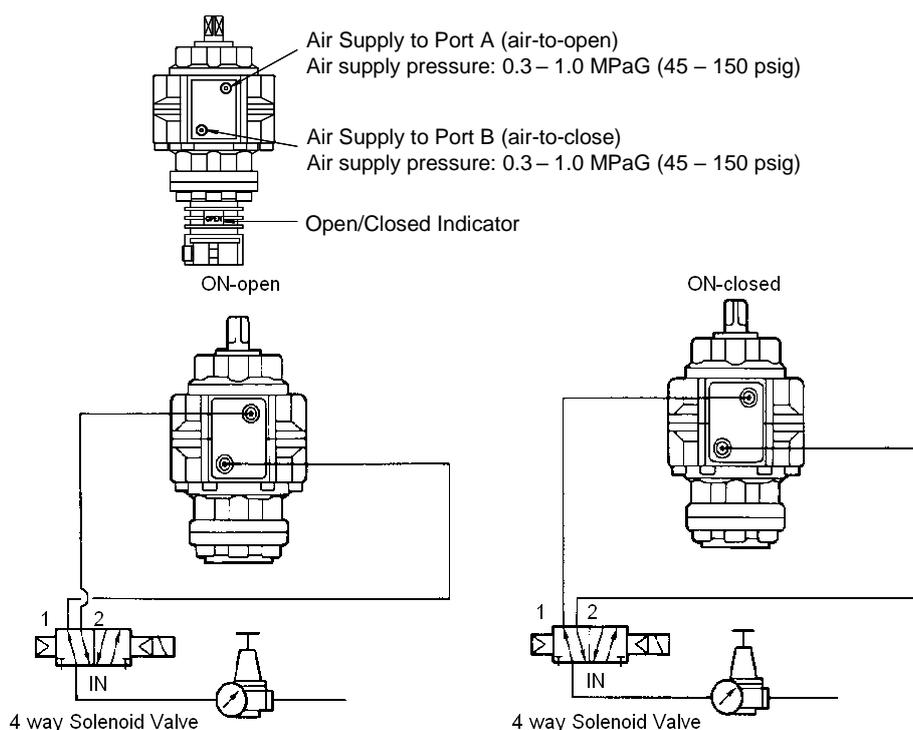
4. Carry out an operational check of the motor under no-load conditions (no pressure) before actual operation to ensure that the wiring is done properly.
You can check whether the valve is open or closed by checking the orientation of the flat surfaces on the shaft coupling at the base of the motor unit. (See p.15)
When the flat surfaces of the shaft coupling are lined up with the piping, the valve is open; when they are perpendicular, the valve is closed.
5. Make sure the control switch is OFF at start-up.
(The integrated ball valve is closed, causing the product to function as a trap.)
Open the inlet and outlet valves slowly and check to make sure that the product functions properly as a steam trap.
If there is a problem, determine the cause by using the "Troubleshooting" section of this manual.
6. Turn the control switch ON to use the bypass function.
(The integrated ball valve will be open.)
7. Turn the control switch OFF to stop using the bypass function.
(The integrated ball valve will be closed.)
8. The integrated ball valve should be closed when the product is used as a trap.

J3S-X-PB: Air Supply Piping/Operation

1. Use only clean air, which has been run through an air trap, filter, oiler, etc.
2. Make sure there is no foreign matter, particularly dirt or sealing tape, in the pneumatic actuator.
3. The table below shows the relationship between the air supply and valve opening/closing.

| Port: A | Port: B | Valve |
|---------|---------|--------|
| Supply | Exhaust | Open |
| Exhaust | Supply | Closed |

4. When checking operation of the pneumatic actuator before installation, keep fingers well clear of the bypass blowdown valve section.



5. Carry out an operational check of the actuator under no-load conditions (no pressure) before actual operation to ensure that the air is supplied properly. The “Open/Closed” Indicator located in the lower part of the actuator indicates whether the valve is open/closed.
6. Make sure that the integrated ball valve is closed at start-up, causing the product to function as a trap. The state of the integrated ball valve can be confirmed using the “open/closed” indicator. Open the inlet and outlet valves slowly and check to make sure that the product functions properly. If there is a problem, determine the cause by using the “Troubleshooting” section in this manual.
7. To use the bypass function, supply air through port A and exhaust the air in the actuator through port B. The integrated ball valve will open.
8. To stop using the bypass function, supply air through port B and exhaust the air in the actuator through port A. The integrated ball valve will close.
9. The integrated ball valve should be closed when the product is used as a trap.

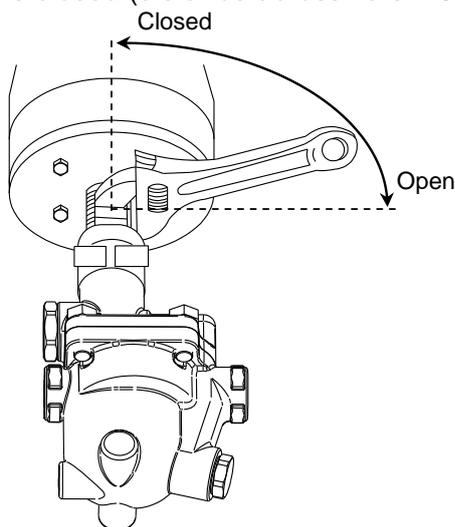
Manual Operation



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.

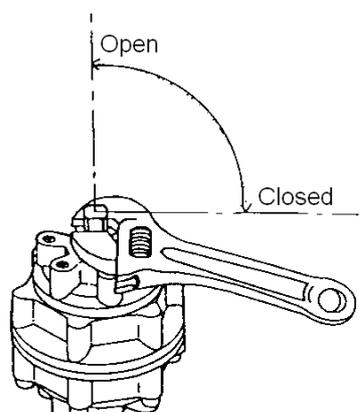
J3S-X-MB

1. Perform manual operation only after making sure that the power is OFF. Manual operation cannot be performed when the power is ON. For safety, make sure the power is OFF even during a power outage.
2. Grasp the flat surfaces of the shaft coupling at the base of the motor unit with a wrench, and turn in the direction of the arrows. When the flat surfaces of the shaft coupling are lined up with the piping, the valve is open; when they are perpendicular, the valve is closed (distance across flats: 19 mm ($\frac{3}{4}$ in)).



J3S-X-PB

1. Perform manual operation only after shutting off the air supply first and making sure there is no pressure remaining inside the actuator unit. Manual operation can not be performed if there is pressure remaining inside the actuator unit.
2. Grasp the manual operation key on the top of the actuator unit with a wrench, and turn in the direction of the arrows (distance across flats: 10 mm ($\frac{3}{8}$ in)).



Maintenance



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.



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.



When using this product, NEVER stand close to, or leave tools anywhere near moving parts, such as the shaft. Contact with moving parts or objects becoming caught in moving parts could lead to injury, damage or other accidents.

J3S-X-BV/J3S-X-PB/J3S-X-MB: Operational Check of the Steam Trap

The following inspections should be carried out only after making sure that the bypass valve is closed: A visual inspection of the following items should be done on a daily basis to determine whether the product is operating properly or has failed. Periodically (at least biannually) the operation should also be checked by using diagnostic equipment, such as a stethoscope or thermometer. (Inspection, installation, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.)

To determine whether the bypass valve is closed, make sure that the arrow on the handle (J3S-X-BV) or the flat surfaces of the shaft coupling (J3S-X-PB / J3S-X-MB) are perpendicular to the piping.

If the valve is not fully closed when the flat surfaces are in this position, there is a problem. Refer to the "Troubleshooting" section to determine the cause, then correct the problem.

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

- | | | |
|--------------------------------------|---|---|
| Normal | : | Condensate, together with flash steam, is discharged continuously, accompanied by the powerful rushing sound of flow. When the amount of condensate being discharged is very slight, the sound of flow is almost inaudible. |
| Blocked (Discharge Impossible) | : | No condensate is discharged. The product is quiet and makes no noise, and the surface temperature of the product is low. |
| Blowing | : | Live steam continuously flows from the outlet and there is a continuous piercing metallic sound. |
| Steam Leakage | : | Live steam is discharged through the outlet together with the condensate and there is a high-pitched hissing sound. |

(When conducting a visual inspection, flash steam is sometimes mistaken for steam leakage. For this reason, the use of a steam trap diagnostic instrument - such as TLV TrapMan - in conjunction with the visual inspection is highly recommended.)

J3S-X-MB: Operational Check of the Motor Unit and Bypass Valve Section

1. An operational check shall be performed at least once every 6 months.
2. Turn the motor unit power ON and check the operation of the motor unit (angle of rotation, time required to open/close the valve, sound).
3. After turning the motor unit power OFF, manually operate the valve, check for foreign matter in the valve and confirm torques.

Refer to the following table for tightening torques. A torque of more than 2 times the shown torque is considered abnormal, and an inspection should be performed.

| Tightening Torque N·m (lbf·ft) | | |
|--------------------------------|--------------------------|--------------------------|
| No load | 0.5 MPaG (7.5 psig) load | 1.0 MPaG (150 psig) load |
| 0.4 (0.29) | 0.5 (0.37) | 0.6 (0.44) |

(1 N·m ≈ 10 kg·cm)

(1 MPa = 10.197 kg/cm²)

J3S-X-PB: Operational Check of the Actuator Unit and Bypass Valve Section

1. An operational check shall be performed at least once every 6 months.
2. Making sure there is air supplied to the actuator, check the operation (angle of rotation, time required to open/close the valve, sound).
3. After shutting off the air supply, manually operate the valve, check for foreign matter in the valve and confirm torques.

Refer to the following table for tightening torques. A torque of more than 2 times the shown torque is considered abnormal, and an inspection should be performed.

| Tightening Torque N·m (lbf·ft) | | |
|--------------------------------|--------------------------|--------------------------|
| No load | 0.5 MPaG (7.5 psig) load | 1.0 MPaG (150 psig) load |
| 0.4 (0.29) | 0.5 (0.37) | 0.6 (0.44) |

(1 N·m ≈ 10 kg·cm)

(1 MPa = 10.197 kg/cm²)

J3S-X-BV: Additional Tightening of the Valve Unit Gland Section

It is possible to further tighten the gland section in the J3S-X-BV valve unit.

Holding the handle tightly, by hand, so that it cannot rotate, use a wrench to tighten the locknut at the top of the handle (distance across flats: 10 mm (³/₈ in)).

Cautions when applying additional tightening:

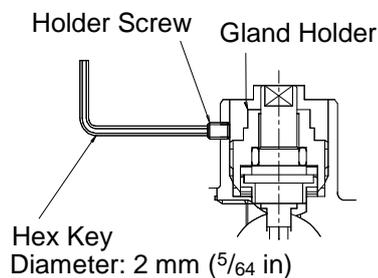
- Do not tighten the locknut completely the first time. Do not tighten it any more than is necessary to stop leakage.
- If leakage continues even after applying additional tightening to the locknut, replace parts (part No. 26, gland packing; part No. 27, gland gasket; part No. 29, spindle; part No. 35, locknut).

J3S-X-MB/J3S-X-PB: Additional Tightening of the Valve Unit Gland Section

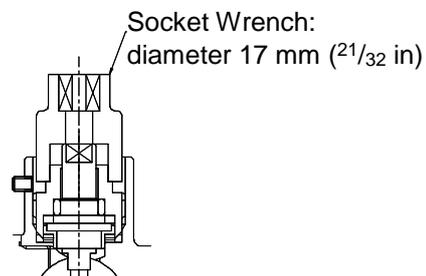
It is possible to further tighten the gland section in the J3S-X-MB/J3S-X-PB valve units.

1. Detach the actuator unit (refer to the “Disassembly/Reassembly” section for details).
2. Follow the steps given below to apply additional tightening.

1) Loosen the holder screw.



2) Tighten the gland holder further in with a socket wrench.



3) Retighten the holder screw.

Cautions when applying additional tightening:

- Do not tighten the gland holder completely the first time. Do not tighten it any more than necessary to stop leakage.
- If leakage continues even after applying additional tightening to the gland holder, replace parts.

Disassembly/Reassembly



NEVER apply direct heat to the float. The float may explode due to increased internal pressure, causing accidents leading to serious injury or damage to property and equipment.



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



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.



Make sure the power supply is **OFF** before carrying out work on the wiring or inspections involving disassembly. If such work is carried out with the power on, there is a danger that equipment may malfunction or electric shock may occur, leading to injury or other accidents.

Use the following procedures to remove components. Use the same procedures in reverse to reassemble.

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

Drain Plug (Option)

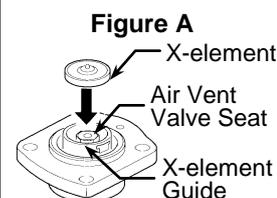
| Part | During Disassembly | During Reassembly |
|-------------------|--|--|
| Drain Plug | Remove with a socket wrench | Consult the table of tightening torques and tighten to the proper torque |
| Drain Plug Gasket | Remove the gasket and clean sealing surfaces | Replace with a new gasket; coat surfaces with anti-seize |

Detaching/Reattaching the Cover

| Part | During Disassembly | During Reassembly |
|--------------|--|--|
| Cover Bolt | Remove with a socket wrench | Consult the table of tightening torques and tighten to the proper torque |
| Cover | Remove by lifting up and off | Make sure there are no pieces of the old gasket left on the sealing surfaces of the body and cover, align the cover with the body and connector and reattach |
| Connector | Remove the connector | Reinsert into the hole in the body |
| Cover Gasket | Remove the gasket and clean sealing surfaces | Replace with a new gasket if misshapen or damaged |

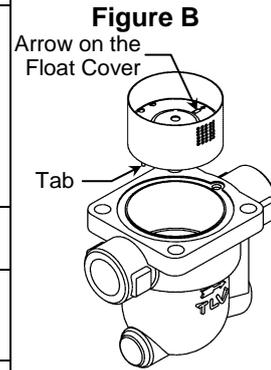
Disassembly/Reassembly of Components Inside the Cover (Where the X-element is mounted)

| Part | During Disassembly | During Reassembly |
|---------------------|--|---|
| Spring Clip | Pinch the insides together and remove from the X-element guide | Insert securely into the groove in the guide |
| X-element | Remove from the X-element guide | Insert after making sure it is in the correct orientation (Figure A) |
| Air Vent Valve Seat | Remove with a socket wrench | Consult the table of tightening torques and tighten to the proper torque |
| X-element Guide | Remove without bending | Fix with the air vent valve seat and make sure the X-element can be inserted smoothly |

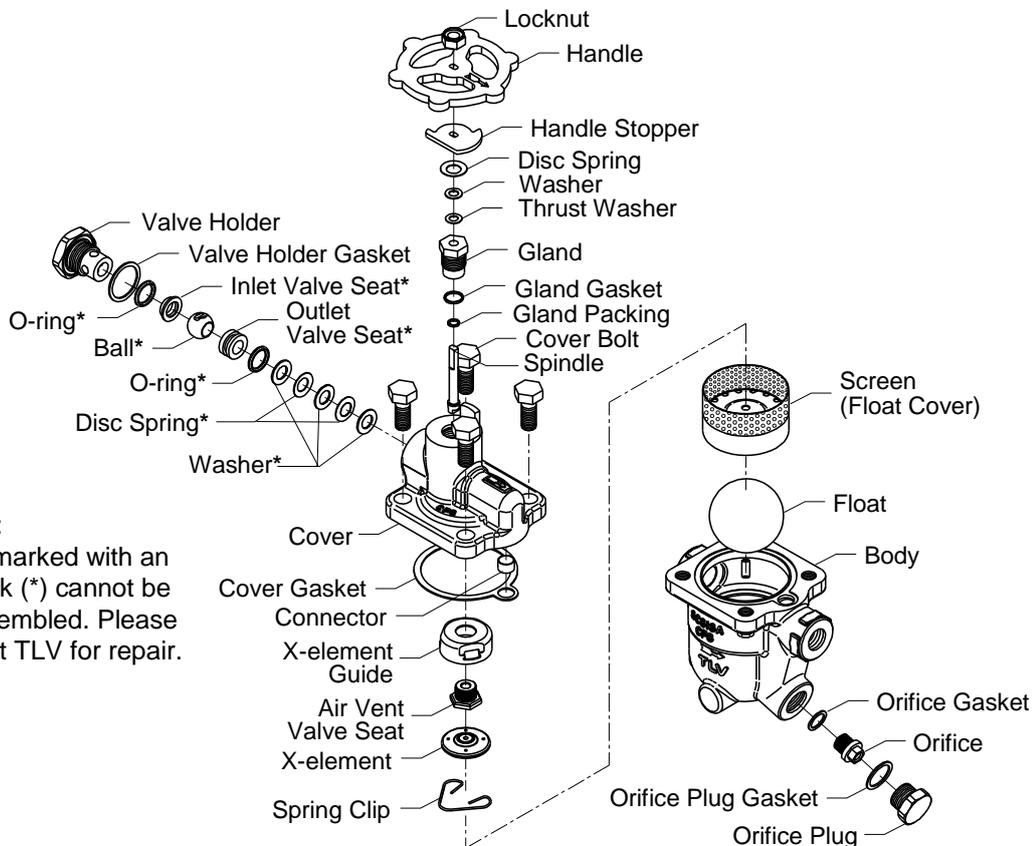


Disassembly/Reassembly of Components Inside the Body

| Part | During Disassembly | During Reassembly |
|----------------------|--|--|
| Float Cover & Screen | Lift straight up and out while rocking slowly | Align the arrows on the float cover/screen and the body, insert with the tab on the bottom fitting into the slot in the body; make sure the screen does not stick out out of the body (Figure B) |
| Float | Remove, being careful not to scratch the surface | Insert, being careful not to scratch the surface |
| Orifice Plug | Remove with a socket wrench | Consult the table of tightening torques and tighten to the proper torque |
| Orifice Plug Gasket | Remove the gasket and clean sealing surfaces | Replace with a new gasket; coat surfaces with anti-seize |
| Orifice | Remove with a socket wrench | Consult the table of tightening torques and tighten to the proper torque |
| Orifice Gasket | Remove the gasket and clean sealing surfaces | Replace with a new gasket; coat surfaces with anti-seize |



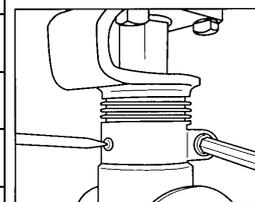
Exploded View



NOTE:
Parts marked with an asterisk (*) cannot be disassembled. Please contact TLV for repair.

J3S-X-MB/J3S-X-PB: Detaching/Reattaching the Motor Unit or Actuator Unit

| Part | During Disassembly | During Reassembly |
|------------------------|---------------------------------------|--|
| Screw & Spring Washer | Remove the screw & the spring washer | Consult the table of tightening torques and tighten to the proper torque |
| Hex Key Bolt | Remove with a hex key | Consult the table of tightening torques and tighten to the proper torque |
| Spring Washer | Remove the spring washer | Reinsert the spring washer |
| Motor or Actuator Unit | Detach the motor or the actuator unit | Reattach the motor or the actuator unit |
| Shaft Coupling | Detach the shaft coupling | Reattach the shaft coupling |

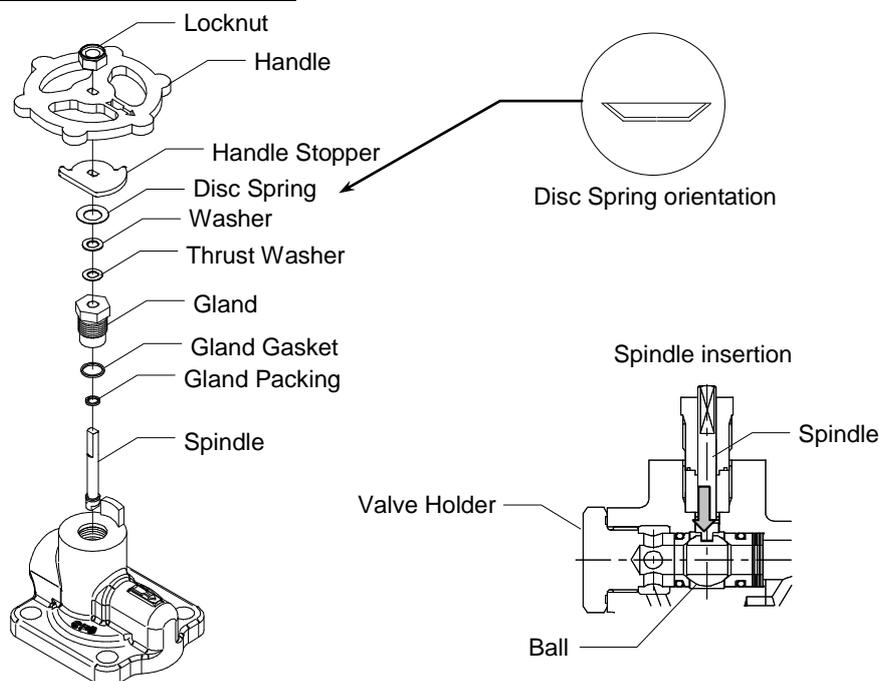


J3S-X-BV: Disassembly/Reassembly of the Bypass Valve Gland Section

| Part | During Disassembly | During Reassembly |
|----------------|---|---|
| Locknut | Remove with a wrench | A new locknut must be used Tighten to the proper torque |
| Handle | Pull the handle up off of the spindle | Reattach the handle, being careful of its orientation (see the drawing below) |
| Handle Stopper | Pull the handle stopper up off of the spindle | Be careful of its orientation (see the drawing below) |
| Disc Spring | Remove the disc spring | Reinsert the disc spring, referring to the drawing below for proper operation |
| Washer | Remove the washer | Reinsert the washer |
| Thrust Washer | Remove the thrust washer | Reinsert the thrust washer |
| Gland | Remove with a wrench | Consult the table of tightening torques and tighten to the proper torque |
| Spindle | Remove the spindle | Replace with a new spindle, coat sleeve area and threads with anti-seize |
| Gland Gasket | Remove the gasket and clean sealing surfaces | Replace with a new gasket only if warped or damaged |
| Gland Packing | Remove the gland packing | Replace with a new gland packing |

NOTE: 1. Finger-tightening the valve holder first makes it easier to reinsert the spindle into the ball. After reinserting the spindle, tighten the valve holder and the gland.

2. Removing the handle and the locknut from the J3S-X-BV destroys the gland section seal. Do not detach the handle and the locknut unless performing a disassembly inspection.



J3S-X-MB/J3S-X-PB: Disassembly/Reassembly of the Bypass Valve Gland Section

| Part | During Disassembly | During Reassembly |
|-----------------------------|--|--|
| Holder Screw (Gland Holder) | Remove with a hex key | Consult the table of tightening torques and tighten to the proper torque |
| Gland Holder | Remove with a socket wrench | Consult the table of tightening torques and tighten to the proper torque |
| Guide Bushing | Remove the guide bushing | Reinsert the guide bushing |
| Seal | Remove the seal | Replace with a new seal |
| Gland Packing | Remove the gland packing | Replace with a new gland packing |
| Spindle | Remove the spindle | Reinsert the spindle |
| Gland Seat | Remove the gland seat | Replace with a new gland seat |
| Washer | Remove the washer | Reinsert the washer |
| Disc Spring | Remove the disc springs | Reinsert with the proper orientation (see the fig. below) |
| Gland Holder Gasket | Remove the gasket and clean sealing surfaces | Replace with a new gasket only if misshapen or damaged, being careful of the orientation |

- NOTE: 1. Reassemble the gland section after reassembling the valve section.
 2. Finger-tightening the valve holder first makes it easier to reinsert the spindle into the ball. After reinserting the spindle, tighten the valve holder.

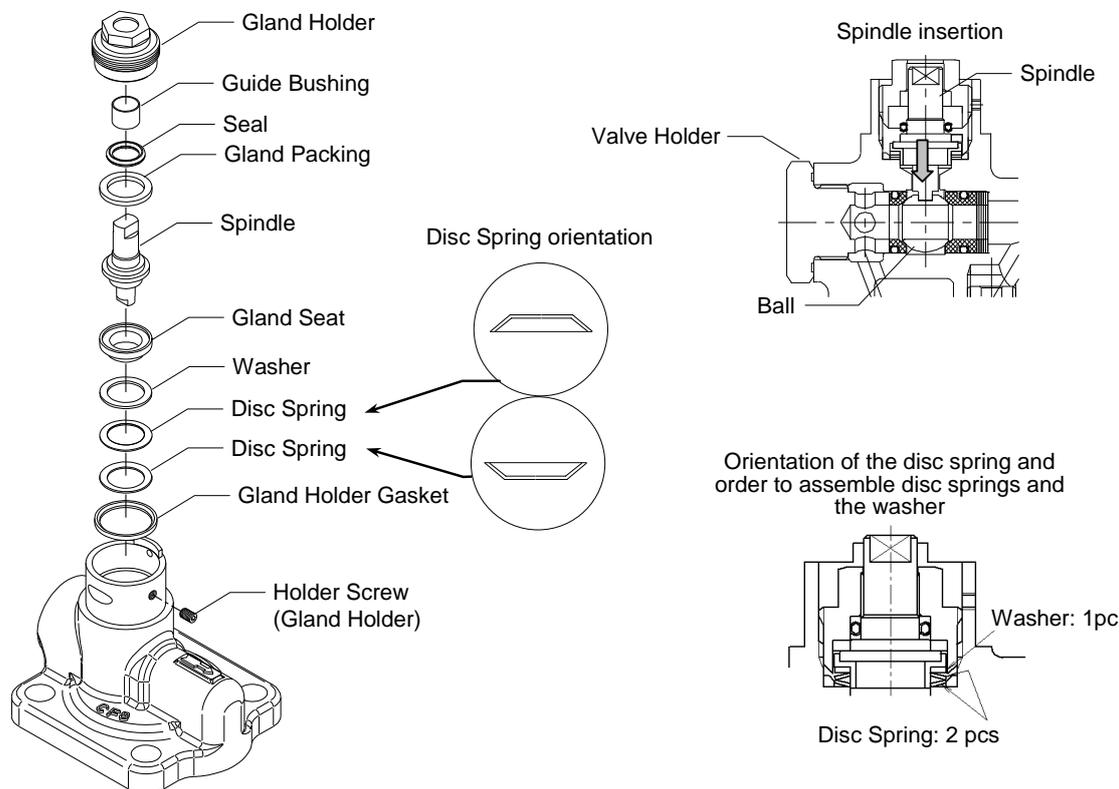


Table of Tightening Torques

| | Torque | | Distance Across Flats | |
|--|--------|----------|-----------------------|-----------------------------------|
| | N·m | (lbf·ft) | mm | (in) |
| Cover Bolt | 50 | (37) | 17 | (²¹ / ₃₂) |
| Air Vent Valve Seat | 35 | (26) | 19 | (³ / ₄) |
| Orifice Plug | 80 | (59) | 24 | (¹⁵ / ₁₆) |
| Orifice | 30 | (22) | 10 | (³ / ₈) |
| Screw & Spring Washer (J3S-X-MB/J3S-X-PB) | 0.8 | (0.59) | + | |
| Hex Key Bolt (J3S-X-MB/J3S-X-PB) | 10 | (7.3) | 5 | (³ / ₁₆) |
| Locknut | 2.5 | (1.83) | 10 | (³ / ₈) |
| Gland (J3S-X-BV) | 35 | (26) | 17 | (²¹ / ₃₂) |
| Holder Screw (Gland Holder) | 1.0 | (0.73) | 2 | (¹ / ₁₆) |
| Gland Holder | 35 | (26) | 17 | (²¹ / ₃₂) |
| Valve Holder | 80 | (59) | 32 | (1 ¹ / ₄) |

(1 N·m ≈ 10 kg·cm)

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

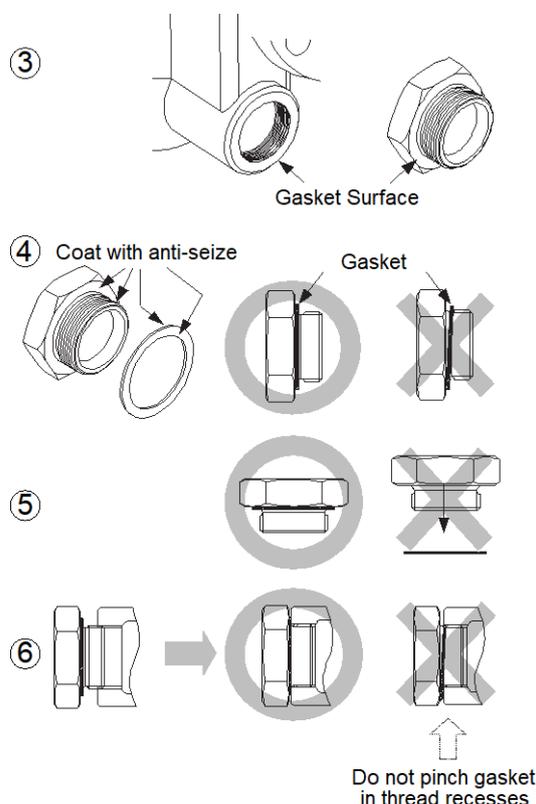
- If drawings or other special documentation were supplied for the product, any torque given there takes precedence over values shown here.

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

- ① Remove the plug/holder using a tool of the specified size (distance across flats).
- ② The gasket should not be reused. Be sure to replace it with a new gasket.
- ③ 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.
- ④ 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.
- ⑤ 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.
- ⑥ 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.
- ⑦ Tighten the plug/holder to the proper torque.
- ⑧ 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.



Troubleshooting



NEVER apply direct heat to the float. The float may explode due to increased internal pressure, causing accidents leading to serious injury or damage to property and equipment.



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

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

J3S-X-BV/J3S-X-MB/J3S-X-PB: Troubleshooting for the Steam Trap and Bypass Valve

| Problem | Diagnosis (Cause) | Remedy |
|---|--|--|
| No condensate is discharged (blocked) or discharge is poor | The float is damaged or filled with condensate | Replace with a new float |
| | The orifice opening, screen or piping are clogged with rust and scale | Clean parts |
| | The X-element is scratched or damaged | Replace with a new X-element |
| | The product operating pressure exceeds the maximum specified pressure, or whether there is insufficient pressure differential between the product inlet and outlet | Compare specifications and actual operating conditions |
| | Check to see if steam-locking has occurred | Perform a bypass blowdown |
| Steam is discharged or leaks from the outlet (blowing) (steam leakage) | Check for a clogged orifice opening or rust and scale build-up beneath the float | Clean parts |
| | Check for scratches on the orifice | Replace with a new orifice |
| | The float is not misshapen or has surface build-up | Clean or replace with a new float |
| | Improper installation orientation | Correct the installation |
| | Trap vibration | Lengthen the inlet piping and fasten it securely |
| | The bypass valve is open | Close the bypass valve |
| | Check the valve sealing surfaces for dirt or scratches, and the o-rings (inlet/outlet valve seat) for scratches or damage | Clean or replace parts |
| Check to see if the X-element and/or air vent valve seat have surface build-up or are scratched | Clean or replace with a new X-element/air vent valve seat | |
| Steam leaks from the bypass valve gland | Check for dirt, scratches or wear on the gland packing | Clean or replace with a new gland packing |
| The bypass valve does not move or remains half-open | Check to see if the valve seat or the ball have build-up (the ball should turn easily: normal operation torque is less than 1.0 N·m (0.73 lbf·ft)) | Clean parts |
| | Check the shaft coupling for wear or deformation | Replace with a new shaft coupling |
| | Check the motor unit or actuator unit (see following pages) | Replace with a new motor unit or an actuator unit |
| Steam is leaking from a place other than the outlet | Gasket deterioration or damage | Replace with new gasket(s) |
| | Improper tightening torques are used | Tighten to the proper torque |
| Float frequently becomes damaged | Water hammer has occurred | Study and correct the piping |

(1 N·m ≈ 10 kg·cm)

J3S-X-MB: Troubleshooting for the Motor Unit

When the motor unit fails to operate as it did when first installed, use the following table to locate and remedy the cause. Detach the motor unit from the trap body when checking the motor unit itself. (For detaching the actuator unit from the trap body, refer to the “Disassembly/Reassembly” section.)

| Problem | Diagnosis (Cause) | Remedy |
|---|---|--|
| Does not operate even though the control switch is ON | Turn OFF the power, and check to see if manual operation is possible | If it is, then the motor unit is broken; contact TLV |
| | Check for improper wiring or control method | Correct the problem |
| | Check to make sure that the main power is ON, and that the voltage is correct, also check current and fuses | Correct the problem |
| | Check whether the thermo-protector is in operation or not | After allowing the motor unit to cool down, check its operation again to ascertain whether the thermo-protector is the cause |
| Reciprocating action is repeated over and over | There is a problem with the control system | Correct the problem |
| Rotation only takes place in one direction | There is a problem with the control system | Correct the problem |
| Does not rotate the full 90°, stops at a partial rotation | There is a problem with the control system | Correct the problem |

If after attempting all of the above remedies the product still does not operate properly, contact TLV after confirming operating pressure, operating temperature, operating frequency and serial number.

All motor units must be repaired by TLV. DO NOT disassemble the motor unit yourself.

J3S-X-PB: Troubleshooting for the Actuator Unit

When the actuator unit fails to operate as it did when first installed, use the following table to locate and remedy the cause. Detach the actuator unit from the trap body when checking the actuator unit itself. (For detaching the actuator unit from the trap body, refer to the “Disassembly/Reassembly” section.)

| Problem | Diagnosis (Cause) | Remedy |
|---|--|---|
| Does not operate even though the control switch is ON | Shut off the air supply, make sure there is no pressure left in the actuator unit, then check to see if manual operation is possible | If it is, then the actuator unit is broken; contact TLV |
| | Check for a problem with the solenoid valve | Replace with a new solenoid valve |
| | Check to make sure that the power is reaching the solenoid valve and that the voltage is correct, also check current and fuses | Correct the problem |
| | Check for proper air supply | Correct irregularities |
| | The filter and the air supply ports are clogged | Clean parts |

Continued on the next page

| Problem | Diagnosis (Cause) | Remedy |
|---|---|---------------------|
| Reciprocating action is repeated over and over | There is a problem with the magnetic control system | Correct the problem |
| Rotation only takes place in one direction | There is a problem with the magnetic control system | Correct the problem |
| | The filter and the air supply ports are clogged | Clean parts |
| Does not rotate the full 90°, stops at a partial rotation | There is a problem with the air supply | Correct the problem |
| | The filter and the air supply ports are clogged | Clean parts |

If after attempting all of the above remedies the product still does not operate properly, contact TLV after confirming operating pressure, operating temperature, operating frequency and serial number.

All actuator units must be repaired by TLV. DO NOT disassemble the actuator unit yourself.

TLV EXPRESS LIMITED WARRANTY

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

Exceptions to Warranty

This warranty does not cover defects or failures caused by:

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

Duration of Warranty

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

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

Exclusive Remedy

THE EXCLUSIVE REMEDY UNDER THIS WARRANTY, UNDER ANY EXPRESS WARRANTY OR UNDER ANY IMPLIED WARRANTIES NOT NEGATED HEREBY (INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE), IS **REPLACEMENT**; PROVIDED: (a) THE CLAIMED DEFECT IS REPORTED TO THE SELLER IN WRITING WITHIN THE WARRANTY PERIOD, INCLUDING

A DETAILED WRITTEN DESCRIPTION OF THE CLAIMED DEFECT AND HOW AND WHEN THE CLAIMED DEFECTIVE PRODUCT WAS USED; AND (b) THE CLAIMED DEFECTIVE PRODUCT AND A COPY OF THE PURCHASE INVOICE IS RETURNED TO THE SELLER, FREIGHT AND TRANSPORTATION COSTS PREPAID, UNDER A RETURN MATERIAL AUTHORIZATION AND TRACKING NUMBER ISSUED BY THE SELLER. ALL LABOR COSTS, SHIPPING COSTS, AND TRANSPORTATION COSTS ASSOCIATED WITH THE RETURN OR REPLACEMENT OF THE CLAIMED DEFECTIVE PRODUCT ARE SOLELY THE RESPONSIBILITY OF BUYER OR THE FIRST END USER. THE SELLER RESERVES THE RIGHT TO INSPECT ON THE FIRST END USER'S SITE ANY PRODUCTS CLAIMED TO BE DEFECTIVE BEFORE ISSUING A RETURN MATERIAL AUTHORIZATION. SHOULD SUCH INSPECTION REVEAL, IN THE SELLER'S REASONABLE DISCRETION, THAT THE CLAIMED DEFECT IS NOT COVERED BY THIS WARRANTY, THE PARTY ASSERTING THIS WARRANTY SHALL PAY THE SELLER FOR THE TIME AND EXPENSES RELATED TO SUCH ON-SITE INSPECTION.

Exclusion of Consequential and Incidental Damages

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

Exclusion of Other Warranties

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

Severability

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

Service

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

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Email: sales-me@tlv.co.jp

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

Manufacturer:

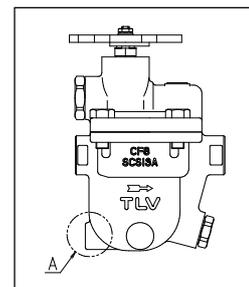
TLV CO., LTD.

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

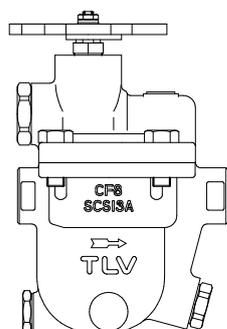
Tel: [81]-(0)79-422-1122
Fax: [81]-(0)79-422-0112

Option

The option shown below is available for this product on request. Please compare with the product you received.



Option for Area A (standard: without drain plug)



| Torque | | Distance Across Flats | |
|--------|----------|-----------------------|-----------------------------------|
| N·m | (lbf·ft) | mm | (in) |
| 35 | (26) | 21 | (¹³ / ₁₆) |