YARWAY TEMPLOW® STEAM DESUPERHEATER
INSTALLATION AND MAINTENANCE INSTRUCTIONS

Before installation these instructions must be fully read and understood.

When the temperature control unit signals for a reduction in steam temperature, the pneumatic actuator moves the stem/disc downward, progressively uncovering a series of vortex feedholes. The water enters the vortex, acquires a rotational sense and exits the spray nozzle as a thin spinning conical fan which immediately breaks up into a finely atomized mist of water droplets. These mix with the superheated steam for rapid evaporation. There are seven stages of water control for each vortex nozzle. Multiple nozzles are fitted to the spray cylinder, thus giving a fine control capability and fast response to a change in the temperature control signal. Use of multiple swirl chamber, orifice fan type spray nozzles provide the sequential application of an efficiently generated spray cone. The combination provides a precise method of control with a high order of rangeability. In the normally closed position, the desuperheater maintains a tight shutoff by virtue of the actuator top works.

Valve selection is based on flow requirement at maximum conditions of water need and nominal water pressure. The valve exhibits a linear or modified linear characteristic. Nominal flow should be in the range of 50% to 80% of maximum valve capacity. Follow the Yarway certified engineering drawing for specific details which supersede these general instructions. If the conditions differ from those specified, consult the Yarway Customer Services Department.

- Cooling water supply pressure - water pressure 50 psi greater than steam pressure as measured at the valve inlet.
- Steam line nozzle and valve outlet flange - 3 inch ASME B16.5 (DN 80) raised face - pressure class as specified.
- Extension pipe 3 inch schedule 160 maximum (2.6 inch diameter clearance).
- Valve water inlet flange - 1 inch (DN 25) ASME B16.5 raised face flange; pressure class or DIN flange as specified.
- Valve actuator/positioner - standard actuator; Yarway Model 20, air failure to close diaphragm type. Positioner upon client request.
- Instrument air failure mode - loss of instrument air, valve fails closed.
- Instrument electric signal: 4-20 mA.
- Instrument air signal - standard - 3 to 15 psig (.21 to 1.03 bar).
- Connections - ¼ inch - NPT instrument air supply (IA) and PG 20 instrument signal (IS). Check certified order drawing for specific details.

PRINCIPLES OF OPERATION

The Yarway TempLow Desuperheater (also model 91 and 93) responds to pneumatic or electric signals generated by a temperature instrumentation control loop to provide automatic introduction and metering of cooling water for steam temperature control. This desuperheating process effectively and efficiently cools steam in accordance to a thermodynamic heat balance at constant pressure. Desuperheating water, at a pressure at least 50 psi above steam pressure, enters the valve at a flanged inlet. Water flows down through the jacket to the seating area above the disc where tight shutoff is achieved.

- Steam pressure and temperature ratings - Standard Class Valve ASME B16.34 - limits as specified for ASTM-A217-WC6 in Pressure Classes 150, 300, 600, 900 and 1500.
- Steam line installation diameters (minimum) - nozzle sizes A6 and B6 - 6 inch diameter minimum, C6, D6, and E6 - 8 inch diameter minimum. Consult certified drawing.

STANDARD SPECIFICATIONS
YARWAY TEMPLOW® STEAM DESUPERHEATER
INSTALLATION AND MAINTENANCE INSTRUCTIONS

UNPACKING, PREPARATION AND STORAGE

Upon receipt of the valve, inspect valve and shipping container for transit damage such as a broken crate, broken yoke, bent valve stem or broken accessories. Check the documentation, identification plate, valve tag data, instruction manual, etc. Locate and identify spare parts included in the shipment. Use the shipping container for temporary valve protection. Leave protective covers in place until ready to proceed with inspection and installation. Store the valve in a clean, dry location. If outdoor storage is unavoidable, support the valve off the ground or pavement and provide a waterproof covering. Lift the valve by means of straps around valve body and inlet flange. Do not use the actuator yoke to attach lifting straps.

LONG TERM STORAGE

Use a dry, heated, inside storage area. Remove the valve stem packing. Make sure valve is dry and free from moisture. Apply Cosmoline-type protective grease to the flange face, packing stuffing box and valve stem.

PREPARATION FOR INSTALLATION

Remove all paper, tape and packing materials, and all foreign materials. Transport carefully to the installation site. Remove valve protective covers and install the valve in the system.

INSTALLATION

See Yarway Engineering Approval Drawings for certified dimensions, installation details and marking for each TempLow Desuperheater by serial no./tag no.

Main steam system piping (Figures 1 and 2)

1. The desuperheater requires a minimum of 15 feet (4.6 meters) of straight pipe from the valve installation to the first bend downstream and six straight pipe diameters upstream.
2. Branching of the main steam pipe should not be allowed between the desuperheater and the temperature sensor.
3. Pipe bends should be long radius type to aid keeping the steam/water vapor mixture in suspension until evaporated.
4. Avoid using “T” fittings between the desuperheater and the temperature sensor.
5. The distance from the desuperheater to the temperature sensor is nominally 40 feet (12.2 meters). The certified drawing specifies a minimum based on system requirements. Greater distance assures full mixing and total evaporation at low steam velocities.
6. Care must be exercised to accommodate low steam flow conditions near saturation temperature. A water film can form on the pipe wall and reach the temperature sensor.
7. The temperature sensor should be mounted in accordance with manufacturer’s recommendation. Yarway recommends mounting in the top of the line ± 45°. The sensor should not be mounted at the outside of an elbow.
8. The steam velocity can be increased by reducing the steam pipe size by one or two sizes for the distance between the desuperheater and the sensor.
9. Desuperheater applications requiring control over large turn down load ranges can utilize split range control from a single sensor for multiple desuperheaters installed in the steam pipe.
10. Steam dump systems may require multiple units to control maximum temperature.

Pipe mounting orientation

1. The desuperheater may be mounted at 90° to the steam line for all orientations of steam flow.
2. The “vertical-up” position is preferred for the valve stem and actuator. If the TempLow is installed in other than vertical position, consideration must be given to supporting the actuator.
3. The cooling water supply should be clean, filtered condensate or boiler feed water. The source selection must consider water temperature.
4. Yarway recommends that the cooling water line include a locked open shut-off valve and a strainer with 0.004 inch (0.1 mm) perforated mesh sized for the flow requirements. The cooling water line must be thoroughly flushed prior to connection for use.
5. The water line pressure at the inlet to the valve is to be per certified drawing data sheet.

STEAM LINE

Mounting flange and pipe (Figure 3)

1. The spray cylinder should be located at the center line of the pipe which is most important in small lines.
2. The primary dimension variable is the length “X” of the 3-inch (DN 80) nozzle that supports the mounting flange. The 3-inch (DN 80) connecting pipe must provide a 2.60-inch (65 mm) diameter internal clearance. A 3-inch schedule 160 pipe provides the maximum wall thickness pipe allowed.

3. The variable “X” is nominally calculated by subtracting ½ the pipe OD dimension from 15½ inches (394 mm). This dimension varies in order that the spray cylinder portion of the valve is centered within the pipe OD (“Y”). For pipe sizes greater than 24 inches (600 mm) the “X” dimension is 3½ inches (88.9 mm). (See certified drawing.)
RECOMMENDED STANDARD INSTALLATION

DESUPERHEATING STATION

FIGURE 1

Steam flow

Water inlet orientation

Configuration position
1 2 3 4

Spray nozzles must be oriented to direct spray with the direction of flowing steam. No deviation allowed.

FIGURE 2
YARWAY TEMPLOW® STEAM DESUPERHEATER
INSTALLATION AND MAINTENANCE INSTRUCTIONS

FIGURE 3

Y = O.D. pipe diameter - inches
When Y is greater than 24” O.D. X is 3.5 inches
Consult Yarway certified drawing for "X" dimension

By Yarway
By customer

FIGURE 3

Spray cylinder

1” [DN 25] flange water inlet
1½” [DN 40] for class 2500/pn400

3” [DN 80] flange

Thickness max. wall
sched. 160 pipe

By Yarway
By customer

Reinforcement

Pipe O.D.

X

Gasket

90°

2.60 dia. clear

Pip O.D.

90°

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**YARWAY TEMPLOW® STEAM DESUPERHEATER**
**INSTALLATION AND MAINTENANCE INSTRUCTIONS**

**MOUNTING INSTRUCTIONS**
1. Use gasket and bolting material, installed and meeting recommendations of ASME B31.1 “Power Piping” Code or another recognized standard.
2. Put the gasket on the mounting flange.
3. Carefully insert the desuperheater into the 3-inch [DN 80] nozzle.
4. Mount the desuperheater to aim water spray outlet points with the direction of steam flow.
5. Assemble the bolting and tighten.
6. Clean and flush the cooling water line.
7. Connect the water line.

**OPERATING CONTROLS**
The desuperheating station instrument control loop should include an indicating temperature controller, a temperature transmitter, and a thermo well (Figure 1). If the steam pressure varies widely, a self-compensating cascade pressure loop can be added to vary the temperature set point to assure control close to saturation conditions.

**START UP**
1. Verify the proper system installation, the sensor location and the distance.
2. Connect the instrument air supply (IA) and the instrument signal (IS) tubing.
3. Adjust the instrument air regulator for correct output pressure.
4. Switch the temperature controller to manual.
5. Assuming an instrument air signal (IS) of 3-15 psi, the valve has three important instrument signal response points.

<table>
<thead>
<tr>
<th>Inst. signal, psi (IS)</th>
<th>Valve position</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Closed</td>
</tr>
<tr>
<td>3.5</td>
<td>Valve stem starting to move</td>
</tr>
<tr>
<td>15</td>
<td>Full valve stem stroke</td>
</tr>
</tbody>
</table>

The zero positioner output pressure (diaphragm pressure) at 3 psig (IS) instrument signal provides full actuator spring force to close the desuperheater and assure tight shutoff.
6. Set (IS) at 3.5 psi. Adjust the positioner so the valve is barely closed.
7. Set (IS) at 15 psi. Check the valve stem for full stroke. Adjust the positioner to the correct range and re-zero if needed by checking the 3.5 psi point.

**IMPORTANT**
*Verify tightness of the valve stuffing box regularly after start-up.
Re-tighten if necessary. Do not overtighten the stuffing box.*
Spray nozzle assemblies (3) and (6), fastener ring (4), stem assembly (2) and piston rings (5) shall be considered wear parts. The materials selected are such that they do cope with the conditions as found on applications in steam/water environments. Thermal cycling does occur and users should realize that the temperature differentials at Desuperheaters are usually the highest found in the Plant. It is recommended to check the spray nozzle assembly, with the integrally vacuum brazed injection nozzles, fastener ring and tack-welds after the first year of service. At the inspection, by use of dye check or fluor penetrant investigation, these parts shall be checked for cracks. Parts with hair crack indications shall not be re-used. ‘Defect free’ heads in such installations shall be inspected once per 2 year of operation. It is advised to replace the above mentioned components at least once per 5 years of service. Taking these precautions has historically proven to give reliable service. **Note:** spray nozzle assemblies may have been made specifically for the specification. Delivery time of such components will be 8 weeks.

**ASSEMBLY, INSPECTION AND OVERHAUL**

1. Isolate (valve out) the desuperheater valve from the system.
2. **CAUTION:** secure the steam line by shutting off the block valves. Cool the line and vent, assure the steam line is cold and depressurized. Shut off the water supply.
3. Stroke the valve full open to fully closed. Check the stroke and adjustments. Note the smoothness of operation. Repeat several times noting the positioner gage readings. Observe the motion and inspect for freeness and proper action.
4. Disconnect and remove the valve. **CAUTION:** use care in lifting by using the proper sling rigging. Assure proper removal without bending the positioner linkages, etc.
5. Check leakage.
6. Connect the temporary supply of water to the inlet port.
7. Increase the water pressure to approximate the difference between the installed water pressure and the steam pressure (differential pressure).
8. Factory test: leakage allowed 7 drops per minute at 550 psig.

**INSPECTION**

1. Review the current operating conditions of temperature, steam flow, pressure of steam and pressure of cooling water and compare with those specified on the installation drawing.
2. Estimate the valve position from the operating conditions and the heat balance.
3. Check the valve stem position.
4. Check the valve stem packing leakage. The packing gland should appear slightly wet.
5. Check to assure that the packing gland is equally centered on the valve stem.
6. Check to assure that the valve stem is smooth and not scored due to rubbing or binding.
7. Check the instrument air supply pressure and check the filter.
8. Check the air signal from the controller.
9. Inspect the positioner linkage to assure proper non-binding action.
10. Check the steam pressure and temperature.
11. Compare the temperature, temperature setpoint of the controller and the steam pressure to provide a minimum margin above saturation.
12. Blow down the strainer-changes in water inlet pressures indicate a contaminated supply.
13. Evaluate.
14. If operation conditions permit: manually cause small changes to the system.
   1. To stroke valve.
   2. To change temperature.
   3. Note changes.
15. If the findings for the above checkpoints are satisfactory, return the valve to service.
**PARTS LIST**

<table>
<thead>
<tr>
<th>Item</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Body assembly</td>
</tr>
<tr>
<td>2</td>
<td>Stem assembly</td>
</tr>
<tr>
<td>3</td>
<td>Spray cylinder assembly</td>
</tr>
<tr>
<td>4</td>
<td>Fastener ring</td>
</tr>
<tr>
<td>5</td>
<td>Set Piston ring</td>
</tr>
<tr>
<td>6</td>
<td>Vortex nozzle</td>
</tr>
<tr>
<td>7*</td>
<td>Set Packing</td>
</tr>
<tr>
<td>8</td>
<td>Packing gland</td>
</tr>
<tr>
<td>9</td>
<td>Gland bushing</td>
</tr>
<tr>
<td>10</td>
<td>Cap screw</td>
</tr>
<tr>
<td>11</td>
<td>Lock nut</td>
</tr>
<tr>
<td>12</td>
<td>Data plate</td>
</tr>
<tr>
<td>13</td>
<td>Drive screw</td>
</tr>
<tr>
<td>14</td>
<td>Split nut stem connector</td>
</tr>
<tr>
<td>15</td>
<td>Actuator</td>
</tr>
<tr>
<td>16</td>
<td>Jam nut</td>
</tr>
<tr>
<td>17</td>
<td>Scale plate</td>
</tr>
<tr>
<td>18</td>
<td>Coupling bolt (2x)</td>
</tr>
<tr>
<td>19</td>
<td>Welded Stellite 6 seat**</td>
</tr>
<tr>
<td>20</td>
<td>Positioner</td>
</tr>
</tbody>
</table>

**NOTES**

- * Recommended spare part. Specify spare part by item no., figure no., serial no.
- ** Integral part of the body, no spare part
**YARWAY TEMPLOW® STEAM DESUPERHEATER**

**INSTALLATION AND MAINTENANCE INSTRUCTIONS**

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**DISASSEMBLE WITH VALVE IN BENCH VISE (FIGURES 4, 5 AND 6)**

1. Mark the body assembly (1) and the spray cylinder assembly (3) (Figure 4) with witness marks to ensure proper alignment at reassembly. Fastener ring (4) has right and left hand threads to allow properly oriented tightening at reassembly. RH and LH for right hand and left hand respectively are stamped on fastener ring (4).

2. Grind out the tack weld (A) (Figure 5) at two places. To release the fastener ring (4) from the body assembly (1) and the spray assembly (3):
   a. Hold cylinder (3); loosen the ring (4) by turning the ring clockwise.
   b. Inspect the piston rings (5) for wear or erosion.
   c. Inspect the cylinder bore (3) for gouges or ridges.
   d. Clean the spray cylinder assembly (3) using boiler acid wash to remove scale. Thoroughly rinse in clean water.
   e. Inspect the spray nozzles (6) for erosion of outlet orifices.
   f. Replace worn or eroded parts.
   g. Connect the filtered air supply (IA) and, using the regulator, supply approximately 9 psi to the instrument signal (IS) ports of the positioner.
   h. The actuator will cause the stem assembly (2) to extend.
   i. Inspect the seat (19) and the disc (2) seating surface. The seating surface should be clean and free from cuts, gouges or wiredrawing. A proper seat shows a narrow concentric lapped seating band.
   j. Slowly decrease the instrument signal (IS) allowing the actuator to retract, closing the valve. Shut off the air and vent.

**DECISION POINT**

If the seat band and leakage are correct, proceed to Reassembly procedure. If the stem and disc are to be replaced or refinished, proceed to “Removal of stem/disc assembly.”

**Removal of stem/disc assembly**

Place valve in vise. The instrument air (IA and IS) should be connected to the positioner.

1. Carefully observe and make sketch notes of the orientation of the:
   a. Positioner link attachment to valve stem and the orientation of the split nut stem connector (14). Count the stem threads above and below the connector to aid in proper reassembly.
   b. Carefully disconnect the positioner links.
   c. Loosen the jam nut (16) and leave on the actuator stem.
   d. With (IA) at 40 to 50 psi and (IS) at 7 psi, slowly move the positioner arm to cause the actuator stem to extend to mid-travel.
   e. With the valve stem at mid-position, loosen the split nut stem connector bolts (18) and stem connector (14).
   f. Slowly retract the actuator stem.
   g. Loosen and remove the cap screws (10), packing gland (8) and gland bushing (9).
   h. With a packing hook, remove packing (7).
   i. Remove the valve stem and disc (2).
   j. Clean the packing box of packing and foreign material.
   k. The stem disc (2) and seat (19) may be lapped to repair the seat using Carborundum Compound, Grade 360 (fine) or equivalent. A proper seat shows a narrow concentric lapped seating band.
   l. Clean the seat and disc thoroughly after lapping.
**REASSEMBLY OF VALVE**

1. Insert the stem/disc assembly (2) into the valve body (1).
2. Install the packing rings (7) alternating the ring gaps. Bottom each ring. Refer to packing installation instructions supplied with replacement packing.
3. Install the gland bushing (9).
4. Install the packing gland (8).
5. Install the cap screws (10).
6. Pull down the packing evenly taking up slack, making sure not to bind the stem, bushing, or gland.
7. Leave the final packing adjustment until later in this instruction.
8. Place the scale plate (17) on actuator stem (Figure 8).
9. Actuator/stem coupling (Figure 7).
   a. Make a temporary witness mark at the actuator stem and spring adjustor - actuator fully retracted.
   b. Connect 7 to 9 psi regulated instrument air to actuator port to cause actuator to extend \( \frac{3}{4} \) (19 mm).
   c. Couple valve stem and actuator stem with two-piece stem connector (14). Stems to touch or gap slightly to match the thread form. Valve stem to have a full thread engagement with stem connector.
   d. Attach mating stem connector half, assemble positioner bracket if applicable. Tighten assembly using connector bolts (18). Tighten to 20 ft/lb (27 Nm) torque.
   e. Slowly remove regulated instrument air to allow actuator stem to retract at final position (0” air pressure) and valve disc on seat. The actuator stem witness mark shall be extended \( \frac{1}{16} \) (1.5 mm) minimum. Full actuator spring force is on valve to close, assuring tight shutoff.
10. Tighten the jam nut (16) to 50 ft/lb (68 Nm) on the scale plate (17) and the split nut (14). Adjust indicator scale.
11. Remove the air pressure to the actuator.
12. Connect the positioner link in the same position as found at disassembly.
13. Reconnect actuator line to the positioner. Cause valve to open and close by raising and lowering pressure (IS) (3 to 15 psi).
14. Turn off the air pressure to the positioner.

**REASSEMBLY SPRAY CYLINDER ASSEMBLY**

1. Inspect the piston ring (5) position and make proper orientation with respect to witness marks established at disassembly (Figure 4).
2. Orient piston rings as shown in Figure 8.
3. Engage ring (4) 1-2 threads on body (1) to hold in place. Align the witness marks on cylinder (3) and valve body (1). Assemble cylinder (3) by inserting disc (2) with properly oriented piston rings (5). Water can be used as a lubricant.
4. Engage the threads in ring (4) simultaneously with thread in body (1) and cylinder (3).
5. Rotate the ring (4) counterclockwise to pull body (1) and the cylinder (3) into face to face contact. Do not rotate cylinder (3).
6. Tighten the ring (4) to 40 to 50 ft/lb (54-68 Nm).
7. The fastener ring (4) must have a gap on both sides - \( \frac{1}{64} \) (0.4 mm) minimum.
8. Inspect location of witness marks for alignment of spray cylinder (3) and body (1).
9. Turn on the instrument air supply pressure port (IA). Apply 3 to 15 psi at port (IS). Slowly extend and retract the valve stem (2). Valve action should be smooth.
10. Shut off the air pressure and vent. Remove connections.
11. Tack weld ring (4) to the body (1) and to the cylinder (3) - 2 places, 180° apart.
13. Apply 500 psi water at water inlet flange. Check leakage.
14. Tighten packing cap screws (10) equally until gland leakage is a drop per minute. Do not bind stem.
15. Remove pressure.
Spray cylinder nozzle assemblies are furnished in 7 standard capacities depending on application requirements. Special nozzle configuration may be supplied. Consult certified order drawing.

Valve and Actuator Reassembly and Adjustment

1. Actuator and positioner adjustment are covered in manufacturer’s manuals.
2. **Caution:** the actuator has springs installed with a preload in place. Do not disassemble without proper preparation.
3. Pin the positioner arm linkage to the split nut stem connector (14) in the same manner as noted at disassembly. Take care to ensure freedom of motion to linkage.
4. The valve trim has a linear or modified linear stroke/flow characteristic.
5. Valve to remain on valve seat at 3 psi instrument signal (IS), “0” diaphragm pressure, and to start open at 3.5 psi (IS). This ensures positive seating force at minimum signal. Full stroke at 15 psi (IS).
6. Install the valve using new gaskets as described in mounting and startup instructions above.

**Valve and Actuator Reassembly and Adjustment**

<table>
<thead>
<tr>
<th>ANSI class rating</th>
<th>ISO rating</th>
<th>Figure number</th>
<th>Weight*</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>20</td>
<td>4322</td>
<td>141 (64)</td>
</tr>
<tr>
<td>300</td>
<td>50</td>
<td>4324</td>
<td>150 (68)</td>
</tr>
<tr>
<td>600</td>
<td>110</td>
<td>4326</td>
<td>155 (70)</td>
</tr>
<tr>
<td>900</td>
<td>150</td>
<td>4328</td>
<td>171 (77)</td>
</tr>
<tr>
<td>1500</td>
<td>260</td>
<td>4330</td>
<td>187 (85)</td>
</tr>
<tr>
<td>2500</td>
<td>420</td>
<td>4332</td>
<td>231 (105)</td>
</tr>
</tbody>
</table>

* Including pneumatic actuator
YARWAY TEMPLOW® STEAM DESUPERHEATER
INSTALLATION AND MAINTENANCE INSTRUCTIONS

RECOMMENDED SPARES

Packing set - Item (7).

Special note:
1. All parts are available. Identify by name, item number, and desuperheater valve serial number. The seat is a part of the body assembly and not available separately.
2. Spray cylinder assembly (3) includes vortex nozzles (6) which are not available separately.
3. When ordering a spray cylinder (3), matching piston rings (5) must be ordered to assure proper sealing.
4. When ordering stem assembly (2), piston ring set (5) will be supplied.

HOW TO ORDER SPARE PARTS

When ordering spare parts, always give the:
- Figure no.
- Serial no.

Describe parts by name and item number. See Figure 5.

Data plate is attached to actuator yoke.

TROUBLESHOOTING CHART FOR SYSTEM

<table>
<thead>
<tr>
<th>Steam flow</th>
<th>Steam pressure</th>
<th>Actual effective steam temp.</th>
<th>Temp. control</th>
<th>Valve action</th>
<th>Cause</th>
<th>What is wrong</th>
<th>To correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Closed</td>
<td>Startup</td>
<td>Water on sensor</td>
<td>Raise system pressure</td>
</tr>
<tr>
<td>Very high</td>
<td>Low</td>
<td>Low</td>
<td>OK</td>
<td>Normal</td>
<td>PJk</td>
<td>Evap. beyond sensor</td>
<td>Lower system pressure</td>
</tr>
<tr>
<td>Normal</td>
<td>Normal</td>
<td>Low</td>
<td>OK</td>
<td>Normal</td>
<td>Wet sensor</td>
<td>Sensor too close to valve</td>
<td>Move sensor</td>
</tr>
<tr>
<td>Very low</td>
<td>High</td>
<td>Low</td>
<td>OK</td>
<td>Normal to flood</td>
<td>Setpoint at press. sat. temp.</td>
<td>Poor heat transfer</td>
<td>Raise setpoint or lower pressure</td>
</tr>
<tr>
<td>Normal</td>
<td>Normal</td>
<td>OK</td>
<td>OK</td>
<td>Due to syst. heat losses</td>
<td>OK</td>
<td>Sat. steam</td>
<td>Raise setpoint or lower pressure</td>
</tr>
<tr>
<td>Normal</td>
<td>Low</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
<td>Wet steam</td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>High</td>
<td>OK</td>
<td>OK</td>
<td>Normal</td>
<td>Normal to flood</td>
<td>Sensor too close to valve</td>
<td>Move sensor</td>
</tr>
<tr>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>Fails open</td>
<td>Temp. above</td>
<td>Over temperature</td>
<td>Lower system pressure</td>
</tr>
<tr>
<td>Low</td>
<td>Normal</td>
<td>High</td>
<td>OK</td>
<td>Closes</td>
<td>Water on sensor</td>
<td>Sensor too close to valve</td>
<td>Move sensor</td>
</tr>
<tr>
<td>Very low</td>
<td>Normal</td>
<td>High</td>
<td>High</td>
<td>Opens</td>
<td>Water fallout</td>
<td>Steam velocity low</td>
<td>Lower system pressure</td>
</tr>
<tr>
<td>Normal</td>
<td>Normal</td>
<td>High</td>
<td>High</td>
<td>Opens</td>
<td>Operating saturated</td>
<td>Wet steam</td>
<td>Lower system pressure</td>
</tr>
<tr>
<td>Normal</td>
<td>Normal</td>
<td>High</td>
<td>High</td>
<td>Founds</td>
<td>Needs water</td>
<td>Water supply</td>
<td>Clean the strainer</td>
</tr>
<tr>
<td>Very high</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>Needs water</td>
<td>Check water supply</td>
<td>Raise water pressure</td>
</tr>
</tbody>
</table>
### VALVE TROUBLESHOOTING CHART

<table>
<thead>
<tr>
<th>Malfunction</th>
<th>Reason</th>
<th>Corrective action</th>
</tr>
</thead>
</table>
| Low temperature | Valve cycling, low system flow, valve throttling too close to seat | 1. Reduce water pressure  
Must be steam saturated pressure plus 50 psi |
| Low temperature | Controller action reversed | 1. Check system signal sense |
| Low temperature | Water pressure too high | 1. Reduce inlet water pressure |
| Low temperature | Valve does not shut off | 1. Check valve stroke  
2. Check 3.5 psi Instrument Signal (IS) shutoff point |
| Low temperature | Valve seal leakage indicated | 1. Secure system and evaluate seat leakage |
| High temperature, no control | Water pressure at valve inlet less than specified | 1. Open water valve  
2. Blow down strainer  
3. Check supply pressure |
| High temperature, no control | Air pressure to actuator/positioner | 1. Air pressure too low. Adjust to 40-50 psi  
2. Clean air set filter  
3. Blow down air supply line  
4. Check for moisture in instrument air |
| High temperature, no control | Water pressure at valve as specified | 1. Check valve stroke  
2. Check water temperature  
3. Check for valve plugging  
4. Check water quality |
| Hunting or limit cycling | Temperature setpoint too close to saturation pressure temperature | 1. Increase temperature (steam superheat)  
2. Evaluate and readjust controller action |
| Hunting or limit cycling | Temperature controller tuning not correct | 1. Positioner arm link bent, loose or binding |
| Hunting or limit cycling | Valve binding or friction | 1. Check packing adjustment (some leakage expected)  
2. Check packing gland/stem clearance  
3. Use correct original type packing  
4. Review positioner calibration  
5. Check instrument air supply pressure |

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