

November 2021

# Spence™ N650 Series Thermostatic Steam Traps

## Features

- **Positive Shutoff** – Valve and seats are lapped in matched sets, providing tight shutoff for light and no-load conditions which results in improved energy savings.
- **Freeze Proof** – Self draining when installed vertically.
- **Compact–Easy to Install** – Ample extension for pipe wrench provided.
- **Easily Maintained** – Actuator element and valve are attached to cover to facilitate inspection and servicing. Optional stainless blowdown valve permits easy strainer cleaning while in service.
- **Directional Discharge** – Pipe and thread erosion prevented by directing condensate to center of discharge pipe.
- **Hardened Stainless Steel Valve and Seat** – Long life. Lapped as a matched set for water tight seal.
- **Temperature Sensitive Actuators** – One moving part. Stainless steel, fail open or fail closed, welded actuator for maximum corrosion, thermal and hydraulic shock resistance.
- **Positive Shutoff and Long Life** – Integral stainless steel strainer helps prevent debris from depositing onto valve and seat.
- **Strainer** – Integral stainless steel strainer standard on all models.

## Introduction

A steam trap is an automatic valve which discharges condensate, undesirable air and non-condensibles from a system while trapping, or holding in, steam. Thermostatic steam traps operate in direct response to the temperature within the trap.



Figure 1. N650 Series Thermostatic Steam Traps

N650 Series is a balanced pressure design with stainless steel welded actuator capable of discharging condensate within 10°F / -12°C of saturated temperature.

For greater sensitivity or protection from flash steam locking, SLR orifice is available to allow condensate and flash steam evacuation at or near saturated temperatures. If subcooling of condensate is desired, alternate thermostatic actuator is available to allow condensate evacuation at or near 40°F / 4.4°C below saturated temperatures.

Thermostatic actuator has a conical valve lapped in matched sets with the seat ring assuring tight shut off. A minimum of four orifice sizes is available allowing for custom capacity sizing. Trap is forged carbon steel Y pattern body with strainer and blow down valve suitable for pressures up to 650 psig / 44.8 bar and available in NPS 1/2 and 3/4 / DN 15 to 20 in NPT or socket weld end connection.

# N650 Series

## Specifications

This section lists the specifications for the N650 Series. Factory specifications are stamped on the nameplate fastened on the steam trap at the factory.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Available Configuration</b><br/> <b>Type N651-FO:</b> Y pattern body with strainer and blowdown port tapped and plugged; low capacity, fail open<br/> <b>Type N652<sup>(1)</sup>:</b> Reduced capacity<br/> <b>Type N653<sup>(1)</sup>:</b> Standard capacity<br/> <b>Type N654<sup>(1)</sup>:</b> High capacity</p> <p><b>Body Size</b><br/> NPS 1/2 and 3/4 / DN 15 and 20</p> <p><b>End Connection</b><br/> NPT and Socket Weld</p> <p><b>Maximum Operating Pressure<sup>(2)</sup></b><br/> <b>Standard Traps:</b> 500 psig / 34.5 bar g<br/> <b>ISO Option Traps:</b> 650 psig / 44.8 bar g</p> <p><b>Maximum Allowable Pressure<sup>(2)</sup></b><br/> 650 psig / 44.8 bar g</p> <p><b>Maximum Operating Temperature<sup>(2)</sup></b><br/> <b>Standard Traps:</b> 600°F / 316°C<br/> <b>ISO Option Traps:</b> 650°F / 343°C</p> <p><b>Maximum Allowable Temperature<sup>(2)</sup></b><br/> 750°F / 399°C</p> <p><b>Capacity Information</b><br/> See Table 1</p> | <p><b>Materials of Construction</b><br/> <b>Body and Cover:</b> Forged steel<br/> <b>Actuator:</b> Welded Stainless Steel<br/> <b>Cover Gasket:</b> Stainless Steel Spiral Wound with Graphite Fill<br/> <b>Strainer and Blowdown Valve:</b> Stainless Steel<br/> <b>Valve and Seat:</b> Hardened 416 Stainless Steel</p> <p><b>Applications</b><br/> Unit Heaters<br/> Air Vents<br/> Steam Tracing<br/> Drip Legs<br/> Platen Presses<br/> Plating Tanks<br/> Sterilizers<br/> Tire Presses<br/> Cooking Equipment<br/> Laundry Equipment<br/> Other Process Equipment</p> <p><b>Options</b><br/> <b>B:</b> Blowdown Valve<br/> <b>ISO:</b> ISO Filled Actuator<sup>(3)</sup><br/> <b>SK:</b> Skirted Seat<sup>(3)</sup><br/> <b>SLR:</b> SLR Orifice<br/> <b>SW:</b> Socket weld</p> <p><b>Approximate Weight</b><br/> 5 lbs / 2.3 kg</p> |
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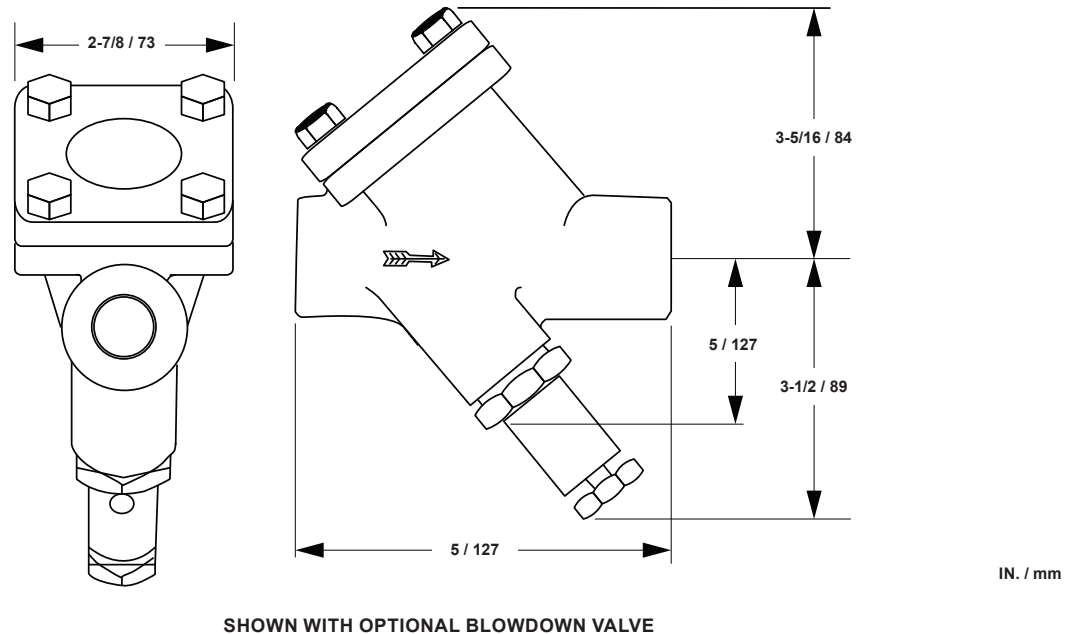
1. Add (-FC) for fail closed or (-FO) for fail open to end of type number.

2. The pressure/temperature limits in this Bulletin and any applicable standard or code limitation should not be exceeded.

3. Emerson Process Management Regulator Technologies, Inc. (Emerson) recommends ISO filled Actuator above 500 psi / 34.5 bar and for superheated steam. Emerson recommends skirted seat above 300 psi / 20.7 bar.

**Table 1. Maximum Capacity – Lbs/hr 10°F Below Saturation / Kg/hr 5°C Below Saturation**

| TYPE | ORIFICE,<br>IN. /<br>mm | DIFFERENTIAL PRESSURE, PSIG / bar g |               |               |                |                |                |                |                |                |                |                |                |                |                |                |                |                |
|------|-------------------------|-------------------------------------|---------------|---------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|      |                         | 5 /<br>0.34                         | 10 /<br>0.7   | 20 /<br>1.4   | 50 /<br>3.5    | 100 /<br>6.9   | 125 /<br>8.62  | 150 /<br>10.3  | 200 /<br>13.8  | 250 /<br>17.2  | 300 /<br>20.7  | 350 /<br>24.1  | 400 /<br>27.6  | 450 /<br>31.0  | 500 /<br>34.5  | 550 /<br>37.9  | 600 /<br>41.4  | 650 /<br>44.8  |
|      |                         | lbs/hr / kg/hr                      |               |               |                |                |                |                |                |                |                |                |                |                |                |                |                |                |
| N651 | 5/64 /<br>2             | 84 /<br>38                          | 119 /<br>54   | 168 /<br>76   | 265 /<br>120   | 348 /<br>158   | 375 /<br>170   | 398 /<br>181   | 439 /<br>199   | 472 /<br>214   | 502 /<br>228   | 529 /<br>240   | 553 /<br>251   | 575 /<br>261   | 595 /<br>270   | 615 /<br>280   | 635 /<br>289   | 650 /<br>295   |
| N652 | 1/8 /<br>3              | 216 /<br>98                         | 265 /<br>120  | 375 /<br>170  | 592 /<br>269   | 778 /<br>354   | 838 /<br>381   | 890 /<br>405   | 980 /<br>445   | 1055 /<br>480  | 1121 /<br>510  | 1180 /<br>536  | 1235 /<br>561  | 1284 /<br>584  | 1331 /<br>604  | 1377 /<br>625  | 1425 /<br>646  | 1471 /<br>667  |
| N653 | 1/4 /<br>6              | 550 /<br>249                        | 825 /<br>374  | 1210 /<br>549 | 1975 /<br>896  | 2825 /<br>1281 | 3140 /<br>1424 | 3425 /<br>1554 | 3650 /<br>1656 | 3960 /<br>1796 | 4100 /<br>1860 | 4230 /<br>1919 | 4420 /<br>2005 | 4600 /<br>2086 | 4760 /<br>2161 | 4910 /<br>2232 | 5060 /<br>2297 | 5190 /<br>2359 |
| N654 | 5/16 /<br>8             | 860 /<br>390                        | 1220 /<br>554 | 1725 /<br>783 | 2725 /<br>1237 | 3575 /<br>1623 | 3850 /<br>1748 | 4090 /<br>1857 | 4505 /<br>2045 | 4850 /<br>2202 | 5155 /<br>2340 | 5425 /<br>2463 | 5675 /<br>2576 | 5900 /<br>2679 | 6110 /<br>2774 | 6310 /<br>2868 | 6480 /<br>2945 | 6625 /<br>3011 |



SHOWN WITH OPTIONAL BLOWDOWN VALVE

IN. / mm

Figure 2. N650 Series Dimensions

## Principle of Operation

Thermal actuator is filled at its free length with a liquid having a lower boiling point than water. As assembled, valve is normally open. When very hot condensate enters trap, thermal actuator fill vaporizes to a pressure higher than line pressure. This forces valve into seat orifice to prevent any further flow. As condensate collects, it takes heat from the actuator, lowering internal pressure. Line pressure will then compress thermal actuator to open valve and discharge condensate. Valve opening automatically adjusts to load conditions from minimum on very light loads to full lift at maximum load. Optional blowdown valve allows fast and easy cleaning of internal strainer without removing trap from operation.

## Installation

1. Before installing trap, blow all dirt and scale from apparatus and piping.
2. Install trap with arrow on body in flow line as close as possible to apparatus with strainer and valve upstream of trap.
3. Pitch all drain lines toward trap.

## Note

**Approved practice is to install separate traps on each piece of apparatus to be drained. Steam supplied to inlets of several units may be of uniform pressure, but invariably there is a differential at the outlets. Although this differential may be small, unit discharging highest pressure will control the action of trap, while other units become air-bound and water logged. Piping upstream and downstream of trap should be at least equal to or one size larger than trap connection.**

4. Record the location of the trap for maintenance accessibility.

## Capacity Information

Capacity information for every type of N650 Series is shown in Table 1.

## Ordering Information

When ordering, complete the ordering guide on this page. Refer to the Specifications section on page 2.

Review the description to the right of each specification and the information in each referenced table or figure. Specify your choice whenever a selection is offered.

# N650 Series

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## Ordering Guide

### Type (Select One)

- Type N651-FO
- Type N652-FO
- Type N652-FC
- Type N653-FO
- Type N653-FC
- Type N654-FO
- Type N654-FC

### Body Size (Select One)

- NPS 1/2 / DN 15
- NPS 3/4 / DN 20

### End Connection (Select One)

- NPT
- Socket Weld

### Options

- B - Blowdown Valve
- ISO - ISO Filled Actuator
- SK - Skirted Seat
- SLR - SLR Orifice
- SW - Socket weld

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