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# Air-Operated Steam-Atomizing and Mechanical-Atomizing Desuperheaters



## WARNING

Failure to follow these instructions or to properly install and maintain this equipment could result in property damage and personal injury or death.

Air-Operated Desuperheater must be installed, operated and maintained in accordance with federal, state and local codes, rules and regulations and Emerson Process Management Regulator Technologies, Inc. instructions.

Installation, operation and maintenance procedures performed by unqualified personnel may result in improper adjustment and unsafe operation. Either condition may result in equipment damage or personal injury. Only a qualified person shall install or service the Air-Operated Desuperheater.



Figure 1. Air-Operated Desuperheater

## Introduction

### Scope of the Manual

This manual provides installation, operation and maintenance instructions for Spence air-operated, steam atomizing and mechanical-atomizing desuperheaters.

### Product Description

The Steam-Atomizing and Mechanical-Atomizing Desuperheater are designed to reduce and control the temperature of superheated steam by the controlled injection of a cooling water mist.

## Principle of Operation

### Steam-Atomizing

The controls consist of two valves: one for cooling water and one for atomizing steam. The valve's position is determined by the air signal from a pneumatic temperature controller. On a rise in temperature, the controller's air signal varies and the control valves open. This provides a balanced flow of steam and water to the Spence injector nozzle.

Cooling water emerges from the nozzle in a swirling spray. Atomizing steam issues from the concentric impact nozzle and disperses the water spray in the form of a fine mist. The coolant is injected counterflow

# Air-Operated Desuperheater

## Specifications

The specifications section on this page provides the ratings and other specifications for the air-operated, steam-atomizing and mechanical-atomizing desuperheater.

### Available Types

1, 3, 5, 6 and 8

### Maximum Temperature<sup>(1)</sup>

750°F / 399°C

### Maximum Pressure<sup>(1)</sup>

600 psig / 41.4 bar

### Material of Construction

Stainless steel

1. The pressure/temperature limits in this Instruction Manual and any applicable standard or code limitation should not be exceeded.

to the superheated steam to promote full evaporation. Coolant flow is modulated to maintain the desired temperature setpoint.

## Mechanical-Atomizing

The control valve modulates the flow of cooling water. The valve is normally closed, air to open. The valve's position is determined by the air signal from a pneumatic temperature controller. On a rise in temperature, the controller's air signal increases and the control valve opens. This provides a flow of cooling water to the Spence injector nozzle.

Cooling water emerges from the nozzle in a swirling spray. The coolant is injected counterflow to the superheated steam to promote full evaporation. Coolant flow is modulated to maintain the desired temperature setpoint.

## Installation



### WARNING

**Failure of the thermal system or foreign material lodged between the valve's closure members can lead to an over-temperature and/or an overpressure condition which may cause injury and/or property damage.**

**Never install an Air-Operated Desuperheater in a system, which does not have a properly installed, code approved temperature and pressure safety valve or other approved safety device.**

**These devices must be suitable for the equipment and processes involved and in conformance to applicable codes.**

## Planning the Installation

1. Locate the injector nozzle in the superheated steam main. There should be at least 8 diameters (6 ft / 1.83 m minimum) of straight run ahead of the nozzle. The nozzle will operate in any position in a horizontal or vertical pipe. The center-to-face dimension of the flanged connection must equal that of the nozzle. This will place the nozzle on the steam main's centerline. See Figure 2.
2. Locate the thermostat well at least 20 ft / 6.1 m of pipe run downstream of the injector nozzle. The well must extend fully across the inside of the pipe.
3. Position the control valves as close as practical to the injector nozzle. Locate where they can stand upright in horizontal water and steam lines.
4. Provide 3-valve bypasses around the control valves. Provide pressure gauges to monitor steam and water pressure at the inlet of both the control valves and the injector nozzle. These gauges should have equal ranges.
5. Provide a thermometer located at the thermostat and a pressure gauge to monitor steam properties.
6. Provide a suitable check valve for the water line of the control valve.
7. Supply a source of clean, dry air for the pneumatic temperature controller. Minimum supply pressure is 20 psig / 1.38 bar.

# Air-Operated Desuperheater

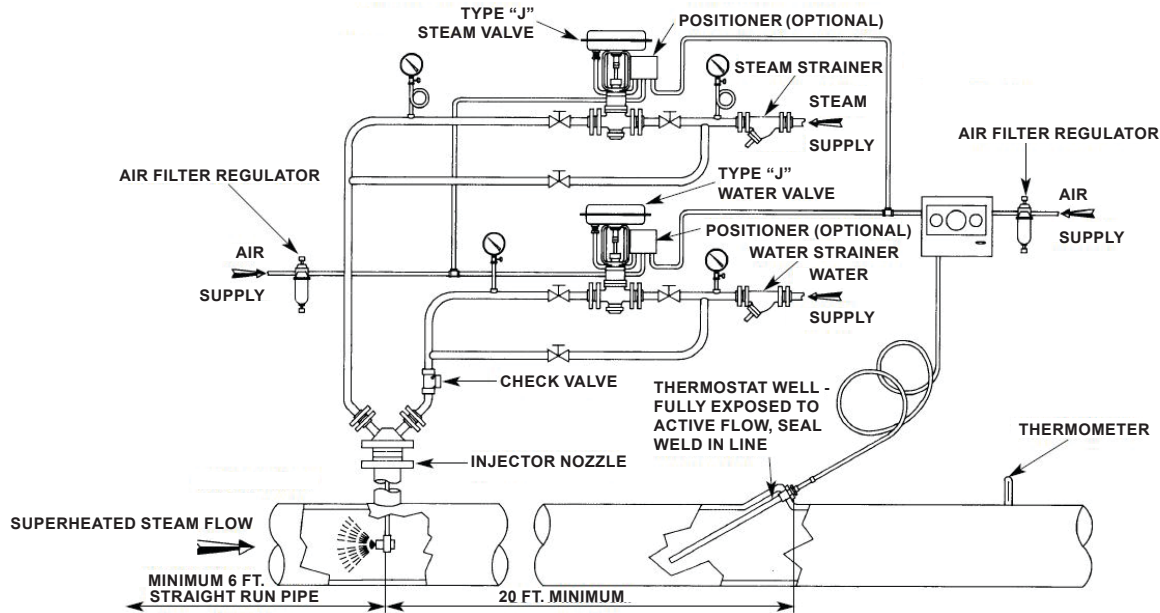


Figure 2. Air-Operated Desuperheater Station Installation

## Desuperheater Installation

1. Install the injector assembly with the nozzle outlet facing upstream.

### Note

**The injector nozzle is orificed for specific water and steam supply pressures. Verify the actual pressures against your order specification.**

2. Install the control valves and strainers as shown with the arrows pointing in the direction of flow. See Figure 2.
3. Install the thermostat well so that its full length extends across the inside of the pipe. Seal weld the well to the pipe.
4. Read the separate instructions supplied with the pneumatic controller. Then install the controller at a convenient location remote from the thermostat well.
5. Pour heat transfer oil into the thermostat well and install the thermostat bulb.
6. Connect the output connection of the controller to the control valves with 3/8 in. / 9.53 mm copper tubing.

7. Connect a regulated source of instrument air to the supply connection of the controller and the positioner, if required.
8. Install the required pressure gauges and thermometer as shown in Figure 2.

## Startup and Adjustment

### Initial startup on bypass:

1. Check water and steam supply gauges to confirm if proper pressures are available. If so, blow down strainers.
2. Cut in a moderate flow of superheated steam, crack open the atomizing steam bypass valve and monitor the temperature as the line warms up. Open the cooling water bypass valve slowly as required to hold the desired steam temperature.
3. Observe the dial of the controller to confirm that the controller thermostat is operating. DO NOT start the controller unless proper operation is observed.
4. Shut down the bypasses and superheated steam main.

# Air-Operated Desuperheater

## Troubleshooting



### WARNING

**Steam is potentially dangerous and should be treated with respect. All installation, troubleshooting and maintenance should be performed by qualified personnel who are familiar with steam systems.**

1. Steam temperature rises above normal:
  - a. Low cooling water pressure. (Check pressure at source and control valve inlet. Blow down water strainer.)
  - b. Injector nozzle plugged. (Use bypass to apply full water pressure. If temperature remains high, remove nozzle from main and back flush to wash away obstruction.)
2. Steam temperature drops to saturation:
  - a. Water bypass valve open (Check bypass.)
  - b. Faulty nozzle installation.

## Maintenance

See instructions for control valves, controllers and associated equipment.

## Parts Ordering

When corresponding with your local Sales Office about this equipment, always reference the service and serial number.

 [SpenceValve.com](http://SpenceValve.com)

### Emerson Automation Solutions

#### Americas

McKinney, Texas 75070 USA  
T +1 800 558 5853  
+1 972 548 3574

#### Europe

Bologna 40013, Italy  
T +39 051 419 0611

#### Asia Pacific

Singapore 128461, Singapore  
T +65 6777 8211

#### Middle East and Africa

Dubai, United Arab Emirates  
T +971 4 811 8100

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