
DAC Series - Hiter Venturi Desuperheater Installation and Maintenance Guide



1. *Warranty*
2. *General Safety Information*
3. *Introduction*
4. *Principle of Operation (Figure1)*
5. *Specifications*
6. *Storage*
7. *Installation*
8. *Verification of Control Instrumentation*
9. *Maintenance*
10. *Troubleshooting*

1. Warranty

Spirax Sarco warrants, subject to the conditions described below, to repair and replace without charge, including labor costs, any components which fail within 1 year of product delivery to the customer. Such failure must have occurred because of defect in material or manufacturing and not as a result of product not being used in accordance with the instructions of this manual.

This warranty does not apply to products which require repair or replacement due to normal wear out or products that are subject to accident, misuse or improper maintenance.

Spirax Sarco Hiter only obligation with Warranty is to repair or replace any product that we consider defective. Spirax Sarco Hiter reserves the right to inspect the product in customer installations or request the return of the product with freight prepaid by the buyer.

Spirax Sarco Hiter may replace or repair any parts that are deemed defective without further responsibilities. All repairs or services executed by Spirax Sarco Hiter, which are not covered by this warranty, will be charged according to the current price list.

THIS IS THE ONLY SPIRAX SARCO HITER WARRANTY TERM AND ONLY HEREBY SPIRAX SARCO HITER EXPRESS.BUYER DISCLAIMS ALL OTHER WARRANTIES IMPLIED BY LAW, INCLUDING ANY MARKET WARRANTY FOR A PARTICULAR PURPOSE.

— 2. *General Safety Information* —

Access

Ensure safe access and if necessary a safe working platform (suitably guarded) before attempting to work on the product. Arrange suitable lifting gear if required.

Lighting

Ensure adequate lighting, particularly where detailed or intricate work is required.

Hazardous liquids or gases in the pipeline

Consider what is in the pipeline or what may have been in the pipeline at some previous time. Consider; flammable materials, substances hazardous to health, extremes of temperature.

Hazardous environment around the product

Consider; explosion risk areas, lack of oxygen (e.g. tanks, pits), dangerous gases, extremes of temperature, hot surfaces, fire hazard (e.g. during welding), excessive noise, moving machinery.

The system

Consider the effect on the complete system of the work proposed. Will any proposed action (e.g. closing isolation valves, electrical isolation) put any other part of the system or any personnel at risk? Dangers might include isolation of vents or protective devices or the rendering ineffective of controls or alarms. Ensure isolation valves are turned on and off in a gradual way to avoid system shocks.

Pressure systems

Ensure that any pressure is isolated and safely vented to atmospheric pressure.

Consider double isolation (double block and bleed) and the locking or labeling of closed valves. Do not assume that the system has depressurized even when the pressure gauge indicates zero.

Temperature

Allow time for temperature to normalize after isolation to avoid danger of burns.

Tools and consumables

Before starting work ensure that you have suitable tools and/or consumables available. Use only genuine Spirax Sarco Hiter replacement parts.

Tools and consumables

Before starting work ensure that you have suitable tools and/or consumables available. Use only genuine Spirax Sarco Hiter replacement parts.

Protective clothing

Consider whether any protective clothing required by yourself and / or others in the vicinity to protect against the hazards of, for example, chemicals, high / low temperature, noise, falling objects, and dangers to eyes and face.

Permits to work

All work must be carried out or be supervised by a suitably competent person. Post 'warning notices' if necessary.

Electrical works

Before starting work study the wiring diagram and wiring instructions, and check any special requirements. Consider special emphasis on primary and phase source, local isolation of the major systems, fuse requirements, grounding, special cables, cable entries and electrical voltage selection.

Commissioning

After installation or maintenance, ensure that the system is working properly. Perform tests on all alarms and protective devices.

Storage

Equipment and materials shall be stored in a proper place and securely.

Disposal

Unless otherwise stated in the Installation and Maintenance Instructions, this product is recyclable and no ecological hazard is anticipated with its disposal providing due care is taken.

3. Introduction

The **DAC series** steam desuperheater enables precise and economical temperature control by injecting cooling water into the superheated steam piping, keeping the final temperature above the saturation temperature. It shall apply to Steam lines from 1" to 12". It's simple and compact design provides even distribution of cooling water and allows easy installation between 150 to 1500 ASME flanges.

— 4. Principle of Operation (Figure 1) —

The operation of the DAC desuperheater is quite simple. Spray-water flow is throttled by a control valve that responds to the signal generated by the temperature control loop. The spray-water enters the desuperheater water tube and then continues into the distribution chamber (see figure 1). As the chamber fills, the spray-water is forced into the injection orifices. As the flow area is reduced, the spray water accelerates to the injection point. The accelerated flow results in a fine spray for efficient and rapid vaporization.

At the same time, the steam flow is entering the desuperheater venturi. The reduction in flow area continues until the point of water injection. This results in a higher velocity and turbulent steam flow, thus improving the mixing of the spray water with the steam and increasing overall system turndown.

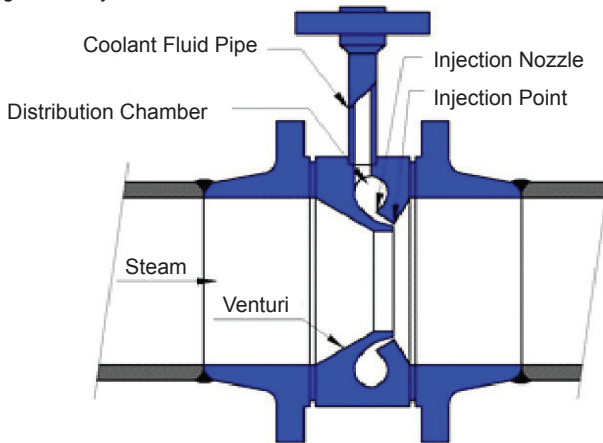


FIGURE 1 - DESUPERHEATED DAC SERIES

5. Specifications

- Pressure-Temperature Classes: 150 to 1500 ANSI.
- Nozzles: 6 nozzles with CV of 0.03 to 5.60.
- Water connection: 0.5", 0.75", 1" and 1-1/2" flange ASME Classes 150 to 1500.
- Required water vapor pressure: 50 to 363 psi above steam line pressure.

6. Storage

The **DAC Series** desuperheater is delivered in an appropriate packaging. Keep it in its original packaging and do not remove the protective caps until the time of installation.

The equipment should be stored in a dry and clean place. Outdoor storage is not recommended, but if unavoidable, the equipment should be placed on a pallet that keeps it away from the ground and protected from bad weather.

7. Installation

- Remove all guards before installation.
- Install the desuperheater on the steam pipe by centering it between the flanges.
- Clean and blow the water pipe before connecting it to the desuperheater. The cooling water must be condensed clean and filtered, or boiler feed water.

IMPORTANT:

A filter with a mesh of 100 - 200 μm should be used in the water line to avoid blockage of the desuperheater nozzles by solid particles.

A straight section of at least 6 times pipe diameter is required before the desuperheater.

A straight section of at least 20 feet of piping is required downstream of the desuperheater to ensure complete vaporization of the cooling water.

The recommended minimum distance for installing the temperature sensor is at least 40 feet downstream from the desuperheater.

There should be no leads or interferences such as a valve, orifice plate, intersection of other lines, in the vapor line between the desuperheater and the temperature sensor.

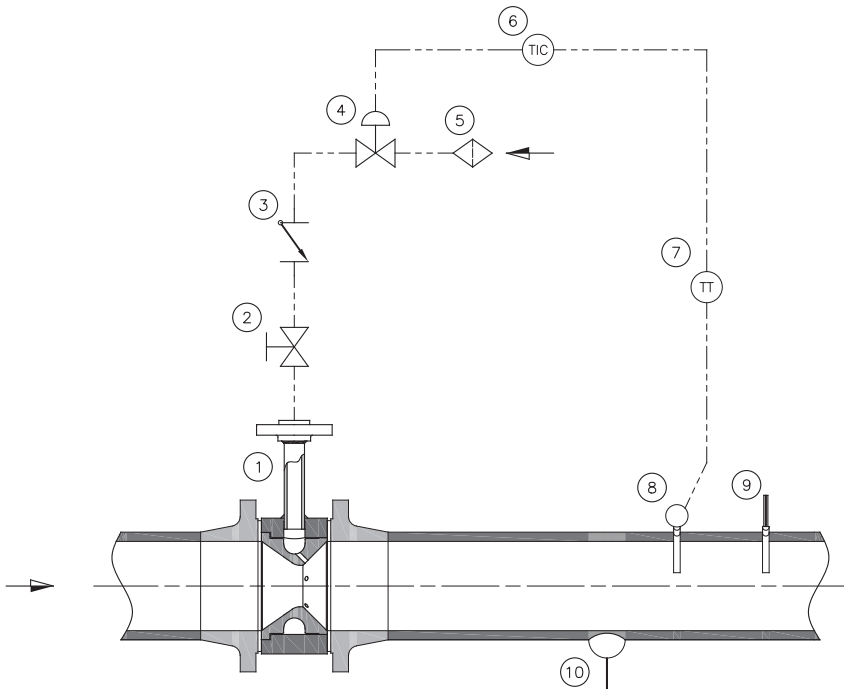


Figure 2 - Typical Installation

Typical Installation - Components

| | | | |
|---|---------------------------|----|--------------------------------------|
| 1 | DAC Desuperheater | 6 | Temperature Indicator and Controller |
| 2 | Manual Block Valve | 7 | Temperature Transmitter |
| 3 | Check Valve | 8 | Temperature Sensor |
| 4 | Temperature Control Valve | 9 | Thermometer |
| 5 | Strainer | 10 | Drain |

8. *Verification of Control Instrumentation*

1. Connect the appropriate signal lines to the temperature transmitter, indicating control station, and valve positioner in accordance with the instrumentation manufacturer's instructions.
2. Switch the controller to manual control.
3. This instruction manual assumes a pneumatic supply of 0.2 to 1.0 bar (3 to 15 psig). If 0.4 to 2.0 bar (6 to 30 psig) or another range is used, adjust the instrument signal referenced in the following steps accordingly. Adjust the instrument signal to 0.2 bar (3 psig). Check that the water valve is completely closed. Adjust the positioner if necessary.
4. Now adjust the instrument signal to 1.0 bar (15 psig). Check that the control valve opens to its full travel. Adjust the positioner to correct the range and re-zero if needed, by referring to step 3.
5. Thereafter, check that the controller is responding so that rising steam temperature gives an increasing instrument signal.
6. Adjust the instrument signal to 0.6 bar (9 psig).
7. Open the water supply.
8. Observe the downstream steam temperature.
9. Increase the instrument signal to 0.8 bar (11 psig). Check that the steam temperature decreases.
10. Adjust the instrument signal to 0.5 bar (7 psig) and check that the steam temperature rises.

Note

If the temperature does not fall when the instrument signal is increased, the cause may be that either the water valve has not been opened or that the steam temperature is close to saturation. If the latter is the case, set the instrument signal to 0.3 bar (4 psig) [water valve slightly open] and increase the signal to 0.4 bar (6 psig). Check if the temperature decreases.

11. When satisfactory coordination between the instrument signal and steam temperature is reached, adjust the controller in accordance with the manufacturer's instructions.
12. Switch the controller to "automatic" for automatic positioning.

9. Maintenance

Although the DAC desuperheater has a simple design requiring very little maintenance, in the event that the spray nozzles become clogged by debris, it may be necessary to service the unit. Prior to removal of the unit from the line, ensure that the necessary gaskets are available for rebuild if turnaround time for the repair is critical. Review the drawing and specification sheet for clarification.

Before starting disassembly, relieve process pressure, close the cooling water lock valve, and remove the desuperheater from the steam line.

1. Slowly loosen the flange stud bolts retaining the DAC desuperheater in line taking care to ensure that there is no residual pressure and that the weight of the unit is sufficiently supported to avoid personal injury. Normally the lower flange bolts will be left loosely in place during removal of the desuperheater from the line unless the location or design requires their complete removal.
2. Remove the DAC desuperheater from the line.
3. Inspect the desuperheater for cuts on the flange mating faces and repair if needed. If there is damage on the gasket surfaces that is too large for field repair, the unit may require replacement.
4. Inspect the spray orifices and wipe them with a wire or a small drill to clear all obstructions.
5. Thoroughly flush or wash the DAC desuperheater after unclogging.
6. Reinstall the desuperheater on the steam pipe by centering it between the flanges.
7. When reinstalling the equipment in line, take care to center the desuperheater between the steam line flanges as evenly as possible. This will help avoid leakage as well as making sure that the steam flow is not disrupted by not having the desuperheater installed evenly in the piping. Tighten the steamline flanges in accordance with good piping practice.
8. After installing the DAC desuperheater in the steam line, reconnect the water line flange connection.
9. After ensuring that the desuperheater is properly reinstalled in the pipeline, the unit may be returned to service. The desuperheater should be monitored as the unit is brought on line to ensure that there are no leaks in the connections.

10. Troubleshooting

| Problem | Possible Cause |
|--|---|
| Water in steam line | Check that steam traps are functioning properly |
| Water in steam line | Review piping configuration for downstream tees and elbows |
| Water in steam line when steam line isolated | Check for leakage of spray water control valve |
| Temperature setpoint is not reached | Check water source availability and pressure |
| Temperature setpoint is not reached. | Check nozzle(s) for plugging |
| Temperature setpoint is not reached. | Make sure that steam saturation pressure is not above set point |
| Temperature is below setpoint | Check temperature control loop - reset |
| Temperature is below setpoint | Check temperature sensor location - relocate per |
| Temperature is below setpoint | Check nozzle for fouling/poor spray pattern - clean/replace |
| Temperature oscillates around setpoint | Temperature set point may be too close to saturation |
| Temperature oscillates around setpoint | Tune control system parameters |

