IM-P605-11
TES Issue 5

spirax sarco

by HITER

DA
Variable Area Desuperheaters
Installation and Maintenance Instructions

1. Safety information

Safe operation of these products can only be guaranteed if they are properly installed, commissioned, used and maintained by qualified personnel (see Section 1.11) in compliance with the operating instructions. General installation and safety instructions for pipeline and plant construction, as well as the proper use of tools and safety equipment must also be complied with.

Unit inspection and performance confirmation

Receiving the unit and inspection

Spirax Sarco carries out full inspection of all units before despatch, however damage may have occurred during transit. On receipt of the unit, a visual inspection will highlight any external damage and hence indicate any internal damage that may have occurred. If this is the case please contact us immediately.

User's rating inspection

Before installing the DA, the user must ensure the mechanical rating of the unit is suitable for the intended application. Details of the mechanical rating can be found on the name-plate and associated documentation for the unit.

1.1 Intended use

Referring to the Installation and Maintenance Instructions, name-plate and Technical Information Sheet, check that the product is suitable for the intended use/application. The products listed comply with The requirements of The EU Pressure Equipment Directive/UK Pressure Equipment (Safety) Regulations and carry the CE / UKCA mark when so required.

It should be noted that products rated as 'SEP' are required by the Directive not to carry the mark. The products fall within the Pressure Equipment Directive categories as shown below:

DA		Group 2 Gases	Group 2 Liquids
Body Material	Pressure Rating		
ASME A216 WCB	ASME 150	SEP	SEP
	ASME 300		
	ASME 600		
	ASME 900		
	PN40		
EN 10213 GP240GH (1.0619)	PN63		
	PN100		

1.1 Intended use (continued)

ASME A217 WC9	ASME 150	SEP	SEP
	ASME 300		
	ASME 600		
	ASME 900		
	PN40		
EN 10213 G17CrMo9-10 (1.7379)	PN63		
	PN100		
ASME A351 CF8M	ASME 150	SEP	SEP
	ASME 300		
	ASME 600		
	ASME 900		
	PN40		
EN 10213 GX5CrNiMo19-11-2 (1.4408)	PN63		
	PN100		

i) The products have been specifically designed for use on steam, water/condensate which are in Group 2 gases and liquids of the above mentioned Pressure Equipment Directive.

ii) Check material suitability, pressure and temperature and the maximum and minimum design pressure and design temperature values on the product name- plate. If the maximum operating limits of the product are lower than those of the system in which it is being fitted, or if malfunction of the product could result in a dangerous overpressure or over-temperature occurrence, ensure a safety device is included in the system to prevent such over-limit situations.

iii) Determine the correct installation situation and direction of fluid flow.

iv) Spirax Sarco products are not intended to withstand external stresses that may be induced by any system to which they are fitted. It is the responsibility of the installer to consider these stresses and take adequate precautions to minimise them.

v) Remove protective covers from all connections and protective film from all name-plates, where appropriate, before installation on steam and water lines.

vi) Be aware of moving parts in the actuator. This could lead to personal injury.

1.2 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.

1.3 Lighting

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

1.4 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.

1.5 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.

1.6 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.

1.7 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 labelling of closed valves.
Do not assume that the system has depressurised even when the pressure gauge indicates zero.

1.8 Temperature

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

1.9 Tools and consumables

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

1.10 Protective clothing

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

1.11 Permits to work

All work must be carried out or be supervised by a suitably competent person.
Installation and operating personnel should be trained in the correct use of the product according to the Installation and Maintenance Instructions.
Where a formal 'permit to work' system is in force it must be complied with. Where there is no such system, it is recommended that a responsible person should know what work is going on and, where necessary, arrange to have an assistant whose primary responsibility is safety.
Post warning notices if necessary.

1.12 Danger of moving parts

Caution is required. Equipment can move without warning. Ensure control system and ancillary suppliers are isolated before any maintenance or inspection is undertaken.

1.13 Handling

Manual handling of large and/or heavy products may present a risk of injury. Lifting, pushing, pulling, carrying or supporting a load by bodily force can cause injury particularly to the back. You are advised to assess the risks taking into account the task, the individual, the load and the working environment and use the appropriate handling method depending on the circumstances of the work being done.

1.14 Safe Lifting Practice

It is recommended to lift the desuperheater using the correct equipment and techniques so as not to cause damage or injury. For the correct lifting of the product, it is recommended to use an eye bolt that will fit on the blanking bolt (bolt (Thread 5/16/18 UNC) at the top of the actuator. The eye bolt is suitable to lift the product. Before lifting the product ensures all flanges have been removed and faces are fully loosened.

1.15 Residual hazards

In normal use the external surface of the product may be very hot. If used at the maximum permitted operating conditions the surface temperature of some products may reach temperatures of 538 °C (1000.4 °F)

Many products are not self-draining. Take due care when dismantling or removing the product from an installation (refer to 'Maintenance instructions').

1.16 Freezing

Provision must be made to protect products which are not self-draining against frost damage in environments where they may be exposed to temperatures below freezing point.

1.17 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.

Regulation (EC) No 1907/2006 - Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Should any substances of very high concern be found within a product, details of the location will be identified within installation and maintenance instructions Section 2.3 : Materials. Further information about product compliance is available at www.spiraxsarco.com/product compliance

1.18 Returning products

Customers and stockists are reminded that under EC Health, Safety and Environment Law, when returning products to Spirax Sarco they must provide information on any hazards and the precautions to be taken due to contamination residues or mechanical damage which may present a health, safety or environmental risk. This information must be provided in writing including Health and Safety data sheets relating to any substances identified as hazardous or potentially hazardous.

1.19 Responsibilities of the operator and operating (including maintenance) personnel.

The operator is responsible for ensuring that safe systems of operation and practice are implemented and maintained. Only competent persons must be allowed and be able to operate and maintain these devices and these persons must be familiar with, and comply with, the applicable health and safety standards or guidelines.

The installation and maintenance instructions should form part of the standard operating procedures for maintenance and must therefore be kept in an accessible location and in a legible condition. Product identification and safety related labels must also be kept in a clean and legible condition. Identification and safety labels must be replaced if they become damaged or obscured in operation.

1.20 Installation and maintenance of valves in hazardous environments.

The Hiter DA valve and actuator are classified as out of scope for ATEX and therefore suitable for use in hazardous environments. However, the valve must be correctly insulated in accordance to any local auto-ignition temperature. Regular cleaning must be considered for areas where dust may settle.

Maintenance programs must consider the correct use of non-sparking tools, and the installation must consider the potential for ignition source as a result of dissimilar metals in the pipeline. Ancillary products must meet local hazardous area requirements.

2. General product information

2.1 Description

Spirax Sarco direct contact desuperheaters reduce the temperature of superheated steam to produce steam temperatures approaching saturation temperature Spray water is injected directly into the steam, flashing into vapour by absorbing heat from the steam.

The DA series desuperheater is designed to precisely and economically control the downstream steam temperature by injecting cooling water directly into the superheated steam flow. It consists of a single actuator and a spray control valve integrated into a single unit.

2.2 Pressure/temperature limits

Please note that the pressure and temperature limits for the DA product range are governed by the flange connection of choice. Also, be aware of the following actuator considerations:
ASME A216 WCB and EN 10213 GP240GH (1.0619) denotes a carbon steel desuperheater.
ASME A217 WC9 and EN 10213 G17CrMo9-10 (1.7379) denotes an alloy steel desuperheater.
ASME A351 CF8M and EN 10213 GX5CrNiMo19-11-2 (1.4408) denotes a stainless steel desuperheater.

- Actuator spring range is 2.07 bar to 3.45 bar (30 psi to 50 psi).
- Maximum supply air pressure of the actuator is 6.21 bar (90 psi)
- Actuator temperature range is -10 °C to 80 °C (14 °F to 176 °F)

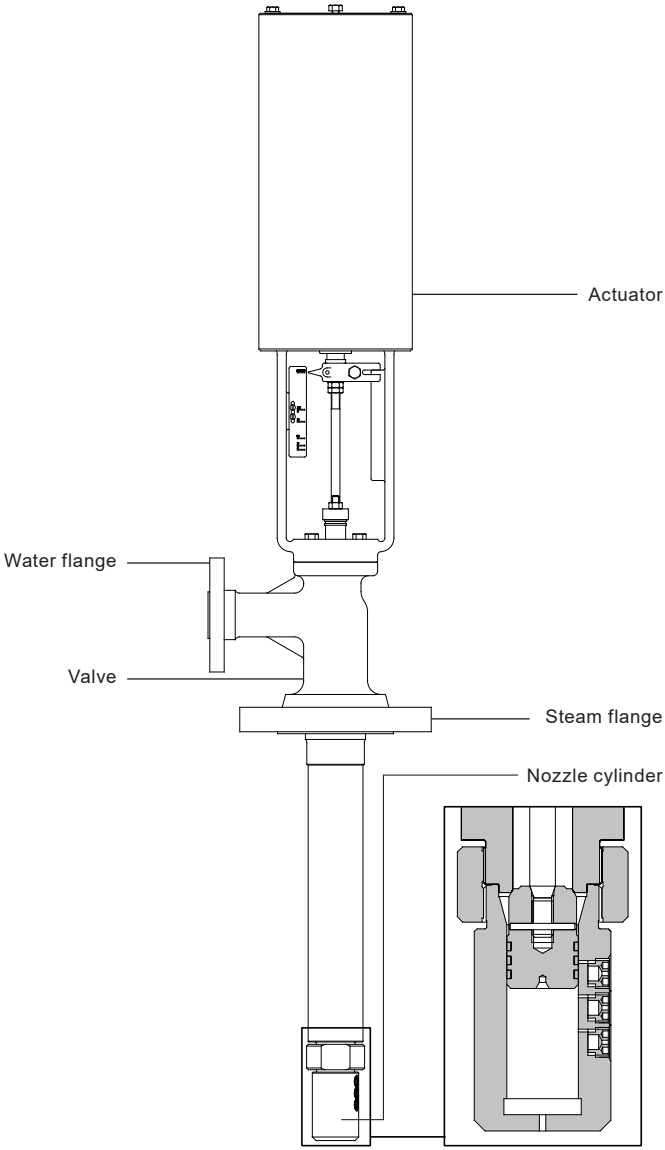
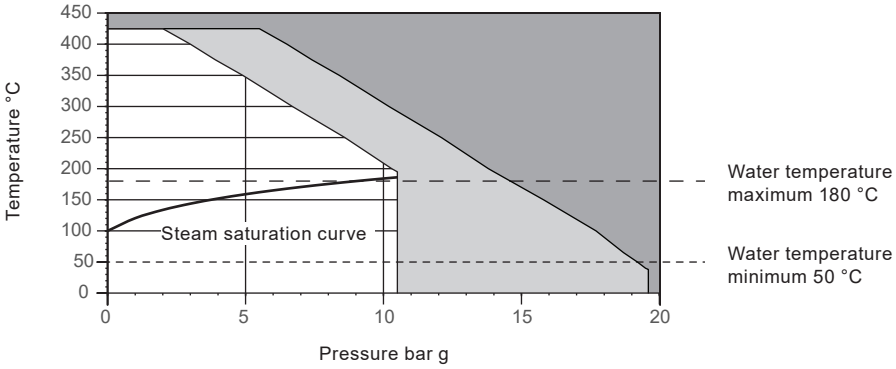


Fig. 1 Main components identification

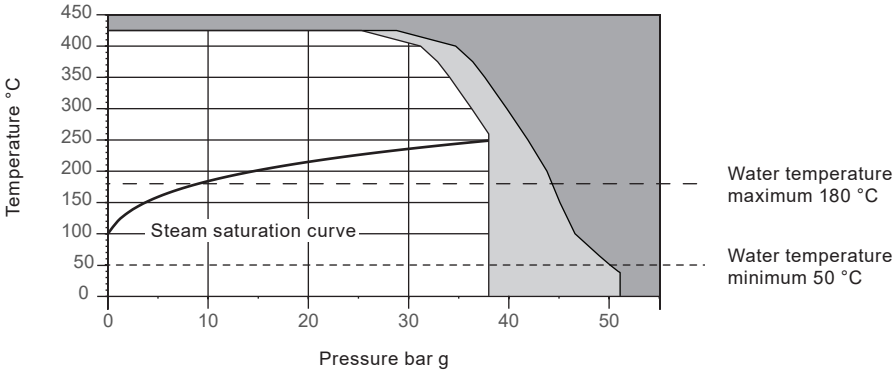
WCB ASME 150 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

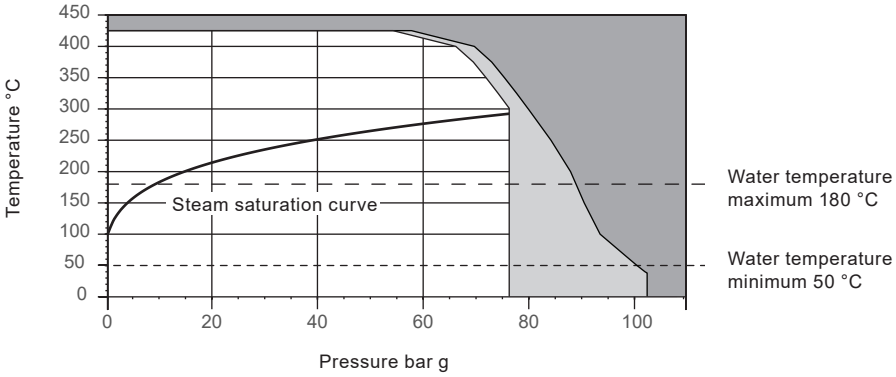
WCB – ASME 300 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

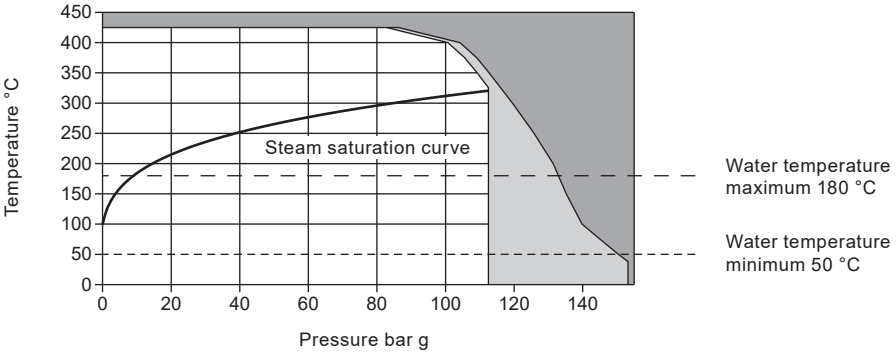
WCB – ASME 600 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

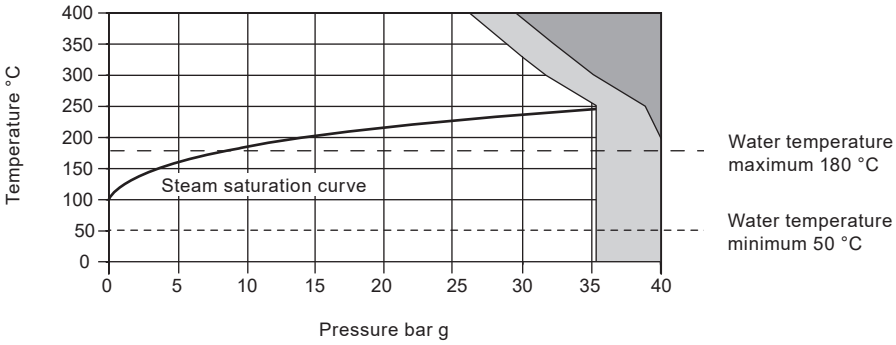
WCB – ASME 900 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

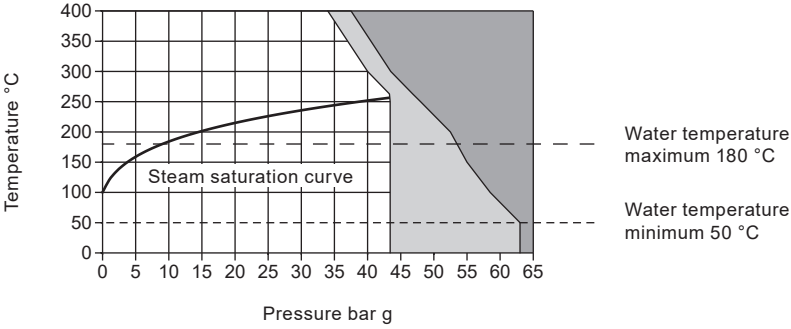
WCB - PN40 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

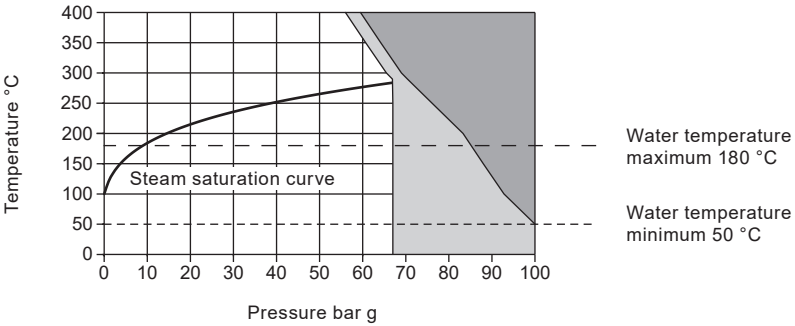
1.0619 – PN63 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

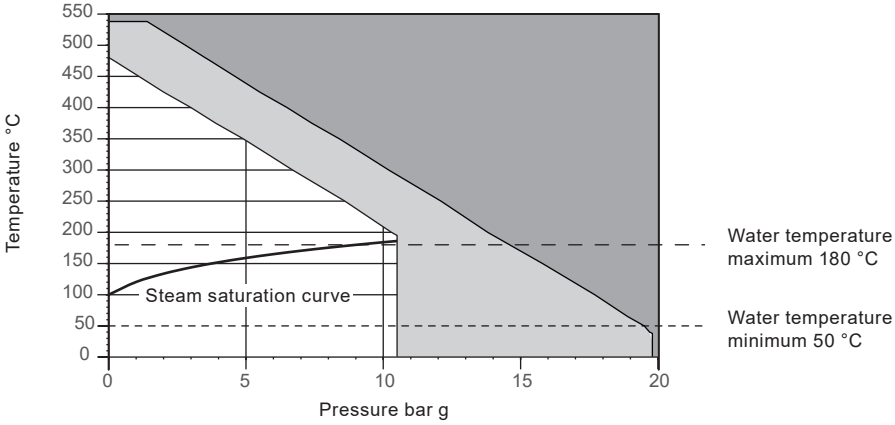
1.0619 – PN100 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

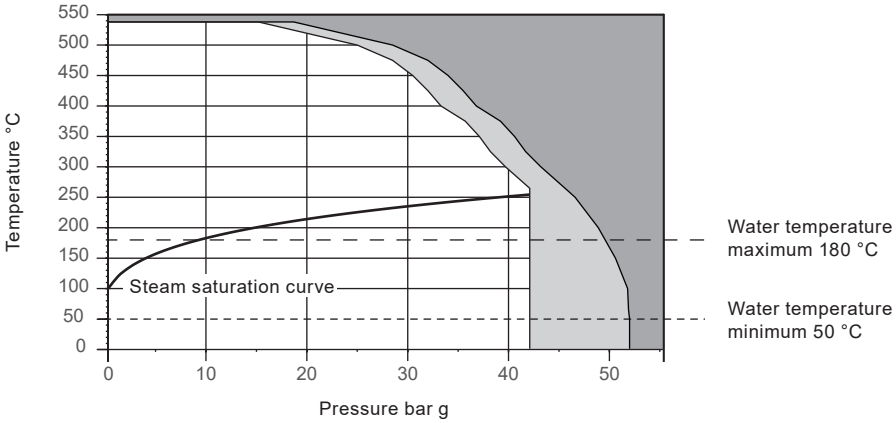
WC9 – ASME 150 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

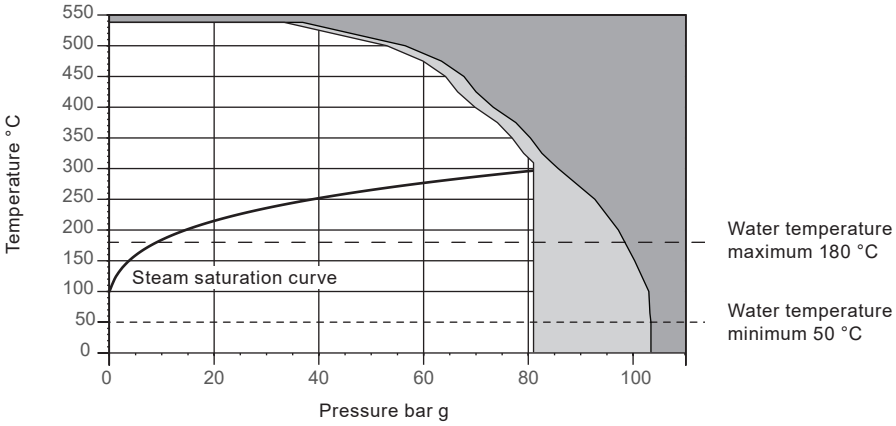
WC9 – ASME 300 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

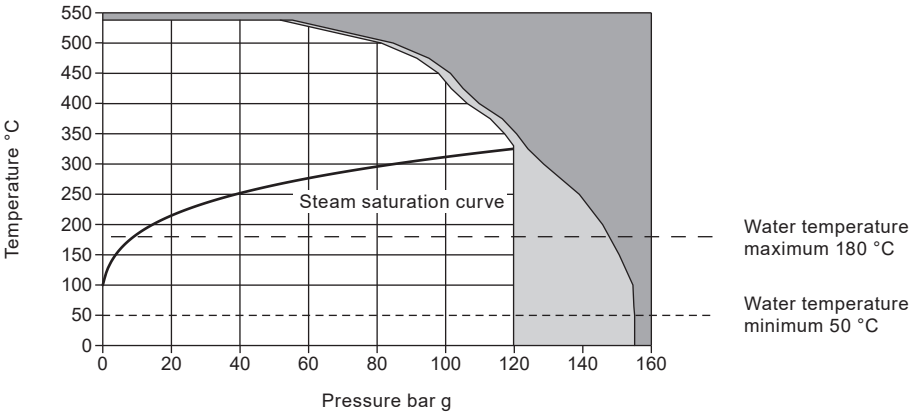
WC9 – ASME 600 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

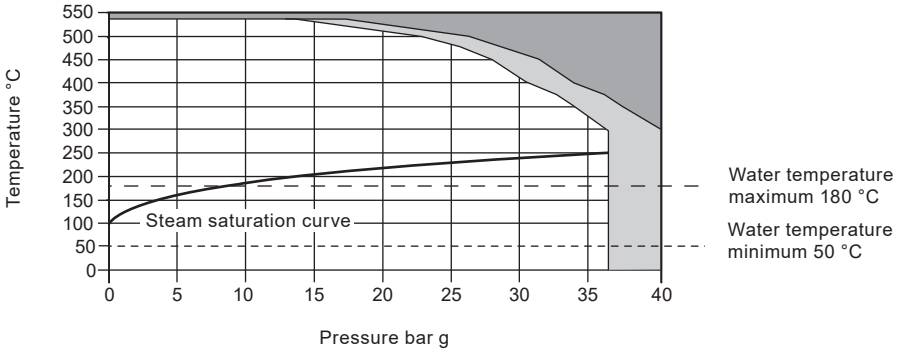
WC9 – ASME 900 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

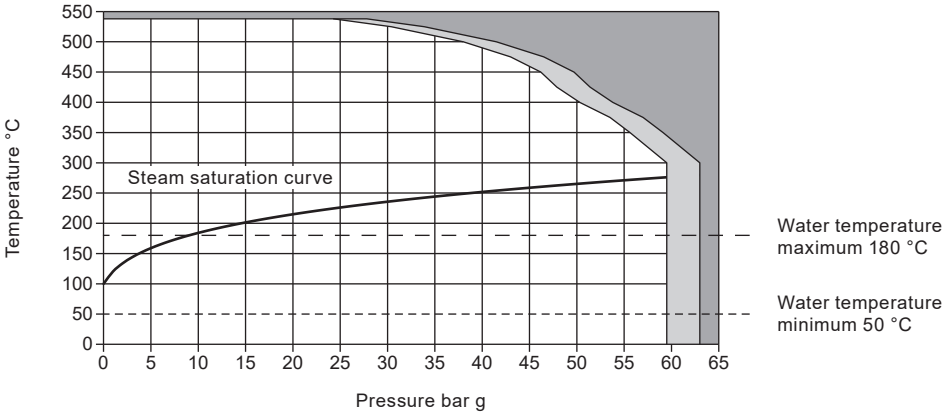
WC9 – PN40 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

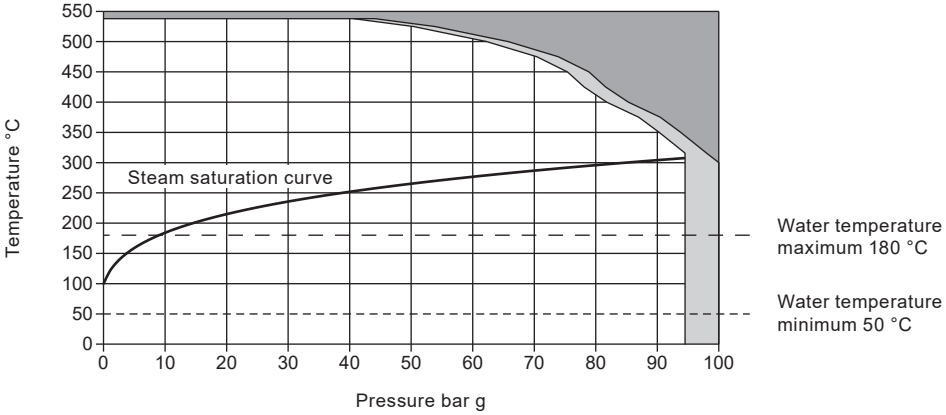
1.7379 – PN63 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

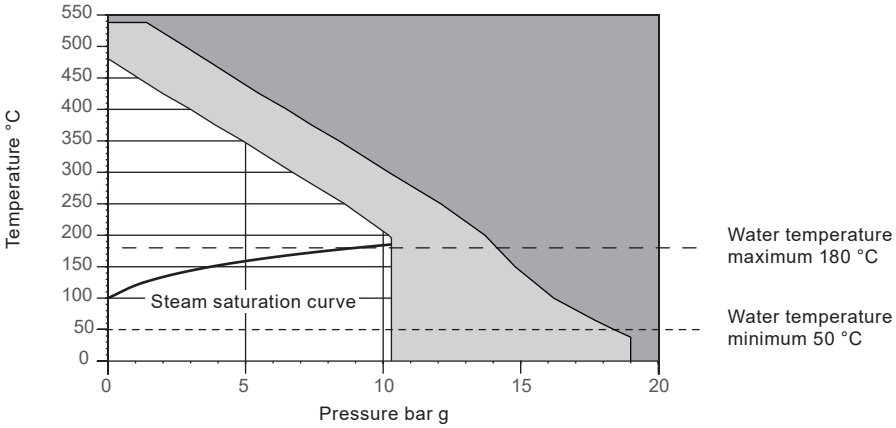
1.7379 – PN100 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

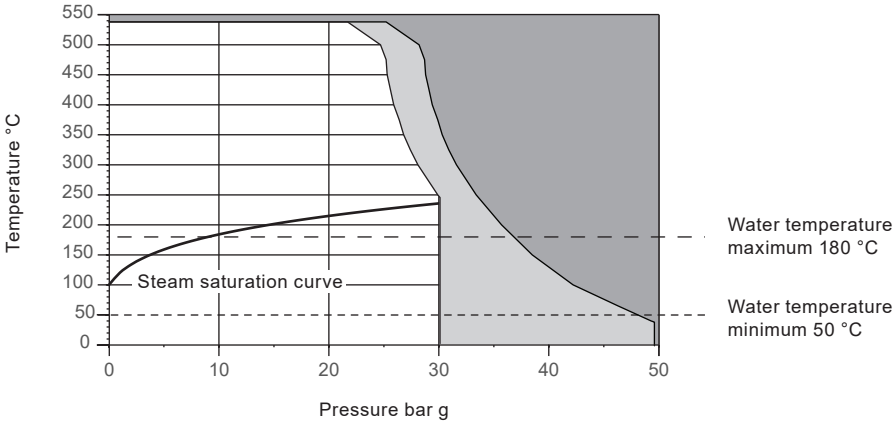
CF8M – ASME 150 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

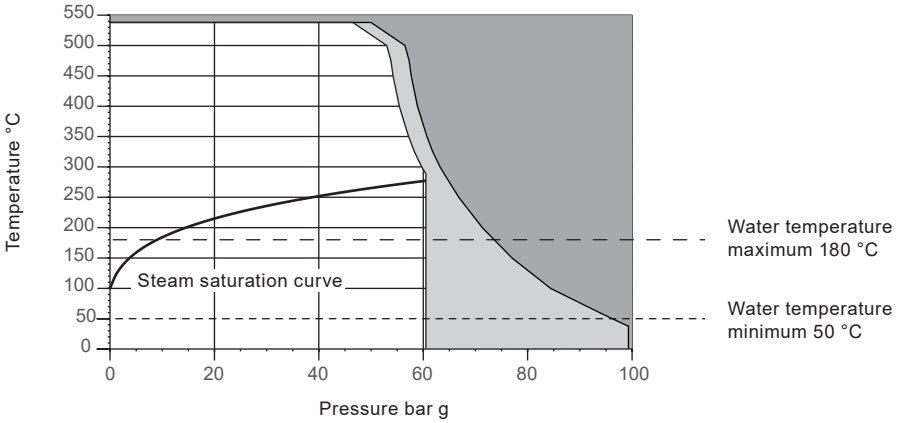
CF8M – ASME 300 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

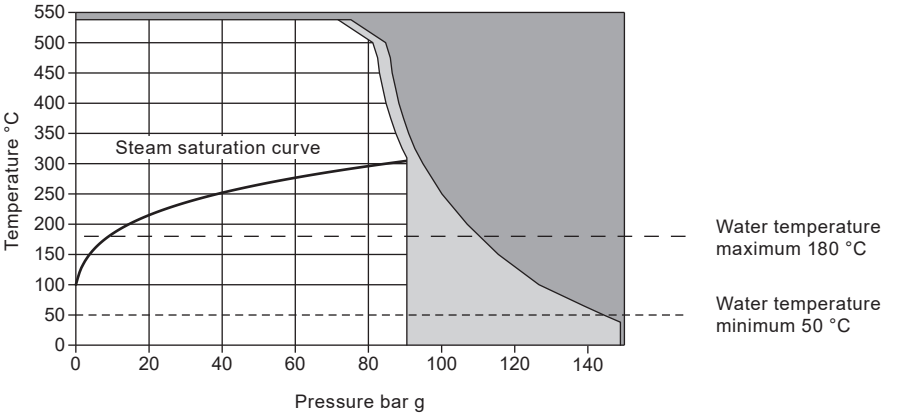
CF8M – ASME 600 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

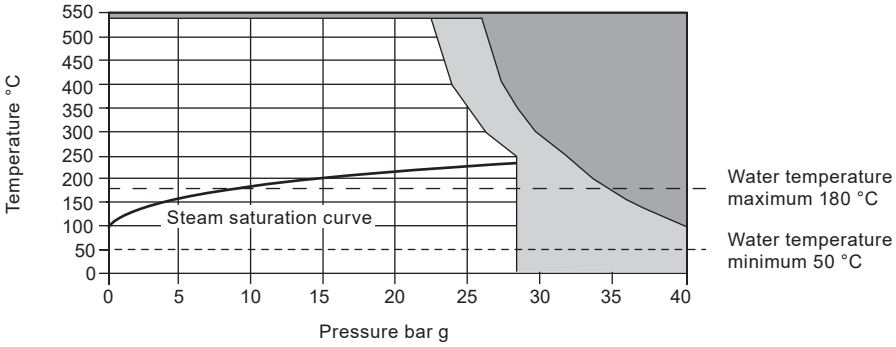
CF8M – ASME 900 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

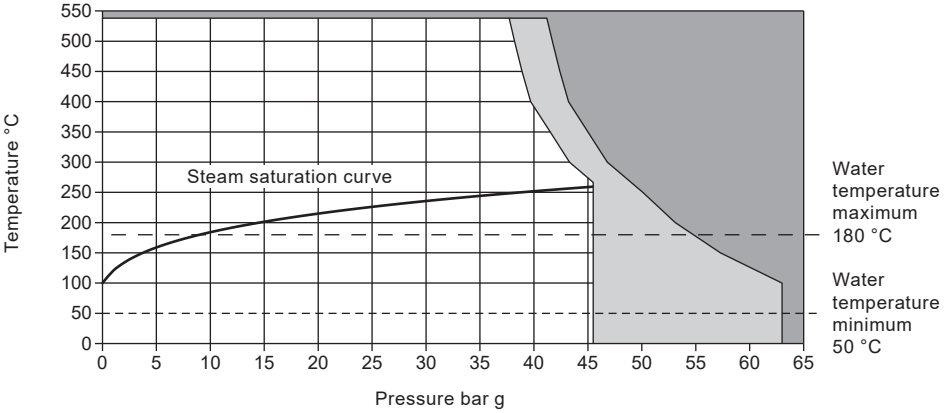
CF8M – PN40 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

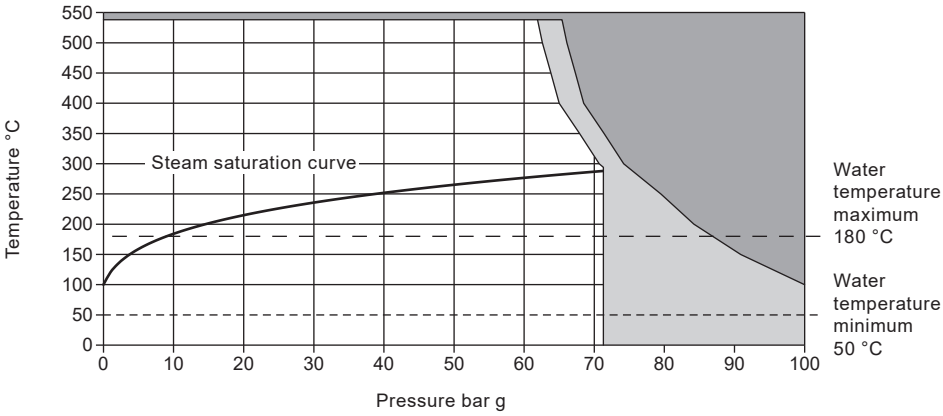
1.4408 – PN63 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

1.4408 – PN100 pressure/temperature limits



Product should not be used in this region because it is beyond the operating limits.

The product **must not** be used in this region.

Pressure/temperature table

METRIC UNITS

Material	Pressure Rating	PMA	TMA	PMO	TMO	PM @ SST
WCB	ASME 150	19.6 bar g @ 38.0 °C	425.0 °C @ 5.5 bar g	10.5 bar g @ 195.0 °C	425.0 °C @ 2.0 bar g	13.8 bar g @ 197.7 °C
	ASME 300	51.1 bar g @ 38.0 °C	425.0 °C @ 28.8 bar g	38.0 bar g @ 259°C	425.0 °C @ 25.3 bar g	41.7 bar g @ 254.3 °C
	ASME 600	102.1 bar g @ 38.0 °C	425.0 °C @ 57.5 bar g	76.0 bar g @ 301.1 °C	425.0 °C @ 54.0 bar g	79.9 bar g @ 295.8 °C
	ASME 900	153.2 bar g @ 38.0 °C	425.0 °C @ 86.3 bar g	112.5 bar g @ 325.5 °C	425.0 °C @ 82.8 bar g	116.3 bar g @ 323.0 °C
	PN40	40.0 bar g @ 200.0 °C	400.0 °C @ 29.5 bar g	35.4 bar g @ 250.3 °C	400.0 °C @ 26.0 bar g	38.9 bar g @ 250.3 °C
1.0619	PN63	63.0 bar g @ 50.0 °C	400.0 °C @ 37.5 bar g	43.3 bar g @ 262.8 °C	400.0 °C @ 34.0 bar g	46.9 bar g @ 261.3 °C
	PN100	100.0 bar g @ 50.0 °C	400.0 °C @ 59.5 bar g	66.9 bar g @ 289.8 °C	400.0 °C @ 56.0 bar g	70.7 bar g @ 287.5 °C
WC9	ASME 150	19.8 bar g @ 38.0 °C	538.0 °C @ 1.4 bar g	10.5 bar g @ 195.0 °C	480.5 °C @ 0.0 bar g	13.8 bar g @ 197.7 °C
	ASME 300	51.7 bar g @ 50.0 °C	538.0 °C @ 18.4 bar g	41.8 bar g @ 264.7 °C	538.0 °C @ 14.9 bar g	45.6 bar g @ 259.6 °C
	ASME 600	103.4 bar g @ 50.0 °C	538.0 °C @ 36.9 bar g	81.0 bar g @ 309.6 °C	538.0 °C @ 33.4 bar g	85.6 bar g @ 300.6 °C
	ASME 900	155.1 bar g @ 50.0 °C	538.0 °C @ 55.3 bar g	119.8 bar g @ 330.3 °C	538.0 °C @ 51.8 bar g	123.6 bar g @ 327.6 °C
	PN40	40.0 bar g @ 300.0 °C	538.0 °C @ 17.2 bar g	36.5 bar g @ 300.0 °C	538.0 °C @ 13.7 bar g	40.0 bar g @ 251.9 °C
1.7379	PN63	63.0 bar g @ 300.0 °C	538.0 °C @ 27.8 bar g	59.5 bar g @ 300.0 °C	538.0 °C @ 24.3 bar g	63.0 bar g @ 279.8 °C
	PN100	100.0 bar g @ 300.0 °C	538.0 °C @ 44.1 bar g	94.5 bar g @ 315.8 °C	538.0 °C @ 40.6 bar g	98.6 bar g @ 310.7 °C
CF8M	ASME 150	19.0 bar g @ 38.0 °C	538.0 °C @ 1.4 bar g	10.3 bar g @ 195.4 °C	480.5 °C @ 0.0 bar g	13.7 bar g @ 197.4 °C
	ASME 300	49.6 bar g @ 38.0 °C	538.0 °C @ 25.2 bar g	30.1 bar g @ 245.6 °C	538.0 °C @ 21.7 bar g	33.7 bar g @ 242.1 °C
	ASME 600	99.3 bar g @ 38.0 °C	538.0 °C @ 50.0 bar g	60.5 bar g @ 288.8 °C	538.0 °C @ 46.5 bar g	64.5 bar g @ 281.4 °C
	ASME 900	148.9 bar g @ 38.0 °C	538.0 °C @ 75.2 bar g	90.5 bar g @ 309.6 °C	538.0 °C @ 71.7 bar g	94.2 bar g @ 307.4 °C
	PN40	40.0 bar g @ 100.0 °C	538.0 °C @ 26.0 bar g	28.4 bar g @ 247.3 °C	538.0 °C @ 22.5 bar g	32.1 bar g @ 240.0 °C
1.4408	PN63	63.0 bar g @ 100.0 °C	538.0 °C @ 41.2 bar g	45.5 bar g @ 266.6 °C	538.0 °C @ 37.7 bar g	49.1 bar g @ 264.2 °C
	PN100	100.0 bar g @ 100.0 °C	538.0 °C @ 64.5 bar g	71.3 bar g @ 294.0 °C	538.0 °C @ 61.9 bar g	75.1 bar g @ 291.5 °C

IMPERIAL UNITS

Material	Pressure Rating	PMA	TMA	PMO	TMO	PM @ SST
WCB	ASME 150	284.2 psi g @ 100.4 °F	797.0 °F @ 79.7 psi g	152.2 psi g @ 383.0 °F	797.0 °F @ 29.0 psi g	200.1 psi g @ 387.8 °F
	ASME 300	741.1 psi g @ 100.4 °F	797.0 °F @ 417.7 psi g	551.1 psi g @ 499.1 °F	797.0 °F @ 366.9 psi g	604.8 psi g @ 489.7 °F
	ASME 600	1480.8 psi g @ 100.4 °F	797.0 °F @ 833.9 psi g	1102.2 psi g @ 573.9 °F	797.0 °F @ 783.2 psi g	1158.8 psi g @ 564.4 °F
	ASME 900	2221.9 psi g @ 100.4 °F	797.0 °F @ 1251.6 psi g	1631.6 psi g @ 617.9 °F	797.0 °F @ 1200.9 psi g	1686.7 psi g @ 613.4 °F
	PN40	580.1 psi g @ 392.0 °F	752.0 °F @ 427.8 psi g	513.4 psi g @ 482.5 °F	752.0 °F @ 377.0 psi g	564.1 psi g @ 482.5 °F
1.0619	PN63	913.7psi g @ 122.0 °F	752.0 °F @ 543.8 psi g	628.0 psi g @ 505.0°F	752.0 °F @ 493.1 psi g	680.2 psi g @ 502.3 °F
	PN100	1450.3 psi g @ 122.0 °F	752.0 °F @ 862.9 psi g	970.3 psi g @ 553.6 °F	752.0 °F @ 812.2 psi g	1025.4 psi g @ 549.5 °F
WC9	ASME 150	287.1 psi g @ 100.4 °F	1000.4 °F @ 20.3 psi g	152.2 psi g @ 383.0 °F	896.9 °F @ 0.0 psi g	200.1 psi g @ 387.8 °F
	ASME 300	749.8psi g @ 122.0 °F	1000.4 °F @ 266.8 psi g	606.2 psi g @ 508.4 °F	1000.4 °F @ 216.1 psi g	661.3 psi g @ 499.2 °F
	ASME 600	1499.6 psi g @ 122.0 °F	1000.4 °F @ 535.1 psi g	1174.8 psi g @ 589.2 °F	1000.4 °F @ 484.4 psi g	1241.5 psi g @ 573.0 °F
	ASME 900	2249.5 psi g @ 122.0 °F	1000.4 °F @ 802.0 psi g	1737.5 psi g @ 626.5 °F	1000.4 °F @ 751.2 psi g	1792.6 psi g @ 621.6 °F
	PN40	580.1 psi g @ 572.0 °F	1000.4 °F @ 249.4 psi g	529.3 psi g @ 572.0 °F	1000.4 °F @ 198.7 psi g	580.1 psi g @ 485.4 °F
1.7379	PN63	913.7 psi g @ 572.0 °F	1000.4 °F @ 403.2 psi g	862.9 psi g @ 572.0 °F	1000.4 °F @ 352.4 psi g	913.7 psi g @ 535.6 °F
	PN100	1450.3 psi g @ 572.0 °F	1000.4 °F @ 639.6 psi g	1370.6 psi g @ 600.4 °F	1000.4 °F @ 588.8 psi g	1430.0 psi g @ 591.2 °F
CF8M	ASME 150	275.5 psi g @ 100.4 °F	1000.4 °F @ 20.3 psi g	149.3 psi g @ 383.7 °F	896.9 °F @ 0.0 psi g	198.7 psi g @ 387.3 °F
	ASME 300	719.3 psi g @ 100.4 °F	1000.4 °F @ 365.4 psi g	436.5 psi g @ 474.0 °F	1000.4 °F @ 314.7 psi g	488.7 psi g @ 467.7 °F
	ASME 600	1440.2 psi g @ 100.4 °F	1000.4 °F @ 725.1 psi g	877.4 psi g @ 551.8 °F	1000.4 °F @ 674.4 psi g	935.4 psi g @ 538.5 °F
	ASME 900	2159.6 psi g @ 100.4 °F	1000.4 °F @ 1090.6 psi g	1312.5 psi g @ 589.2 °F	1000.4 °F @ 1039.9 psi g	1366.2 psi g @ 585.3 °F
	PN40	580.1 psi g @ 212.0 °F	1000.4 °F @ 377.0 psi g	411.9 psi g @ 477.1 °F	1000.4 °F @ 326.3 psi g	465.5 psi g @ 464.0 °F
1.4408	PN63	913.7 psi g @ 212.0 °F	1000.4 °F @ 597.5 psi g	659.9 psi g @ 511.8 °F	1000.4 °F @ 546.7 psi g	712.1 psi g @ 507.5 °F
	PN100	1450.3 psi g @ 212.0 °F	1000.4 °F @ 948.5 psi g	1034.1 psi g @ 561.2 °F	1000.4 °F @ 897.7 psi g	1089.2 psi g @ 556.7 °F

3. Installation

Please read Section 1, 'Safety information' before proceeding with installation.

Read all of Section 3 before installing the unit.

The DA consists of several moving parts that can move unexpectedly during installation, commissioning and maintenance activities. Exercise caution at all times.

3.1 General

It is important that installation should only be carried out by qualified, experienced personnel, who are familiar with fitting desuperheaters, and who have read and understood the instructions in this IM.
Referring to the Installation and Maintenance Instruction, name-plate and Technical Information Sheet, check that the desuperheater is suitable for the intended installation.

- Check materials, pressure and temperature and their maximum values. If the maximum operating limit of the product is lower than that of the system in which it is being fitted, ensure that a safety device is included in the system to prevent overpressurisation.
- Remove protective covers from all connections and protective film from all name-plates, where appropriate, before installation on steam and water lines.
- Determine the correct installation situation and the direction of fluid flow:
  - i) Desuperheaters may be installed either horizontally or vertically with the steam flowing upwards.
  - ii) Spirax Sarco strongly advises against installations in which the steam flow is vertically downwards.
- The temperature sensor should be located a minimum distance (12 m) calculated on the sizing sheet after the DA, however for optimum temperature control it is recommended that it be installed at the point of use.
- Allow a minimum of 4.5 metres of pipeline before an elbow. A thermal sleeve is recommended to protect the elbow from corrosion and erosion.
- The smallest steam pipeline that can be considered for an application using the DA type desuperheater is 6"- We also recommend that a thermal sleeve be used on the steam pipeline after the desuperheater - See Section 3.2.1.
- The differential pressure between steam and water must be a minimum of 3.5 bar (50.76 psi) and a maximum of 75 bar (1087.78 psi).
- The DA must be sited in location on the pipeline that offers a stable flow - An unstable flow will affect the mixing efficiency of the DA.
- **Never use the water connection to carry the desuperheater.**
- Minimum recommended steam velocity 6.1 m/s (20 ft/s) and maximum steam velocity 91 m/s (300 ft/s).

The components that are illustrated are the same for all applications that incorporate a DA variable area type desuperheater.

A typical desuperheater installation is shown:

1st isolation valve	Required to isolate the system from inlet water.
Strainer	Required with 100 mesh screen to maintain the water supply in a condition that won't block the desuperheater nozzles.
Check valve	Required to prevent steam from flowing back into the water inlet - Consider the installation of a check valve in the cooling water line located before the cooling water inlet connection to prevent back flow of steam into the cooling water inlet line in the event of either cooling water failure or excess pressure in the desuperheater.
2nd isolation valve	Required to isolate the system for maintenance.

Temperature sensor

Installation must be a minimum distance of 12 meters after the DA variable area desuperheater. The following recommendations must be considered before installation:

- Recommended distance: 12 m (minimum)
- Bends should be avoided, if this is not possible, bends of the long radius type should be used
- T-shaped connections should be avoided
- Branches and/or obstruction are not allowed
- The speed may be increased by pipeline diameter reduction between desuperheater and temperature sensor
- Position the temperature sensor in pipeline top +/- 45 °. It cannot be assembled on an elbow

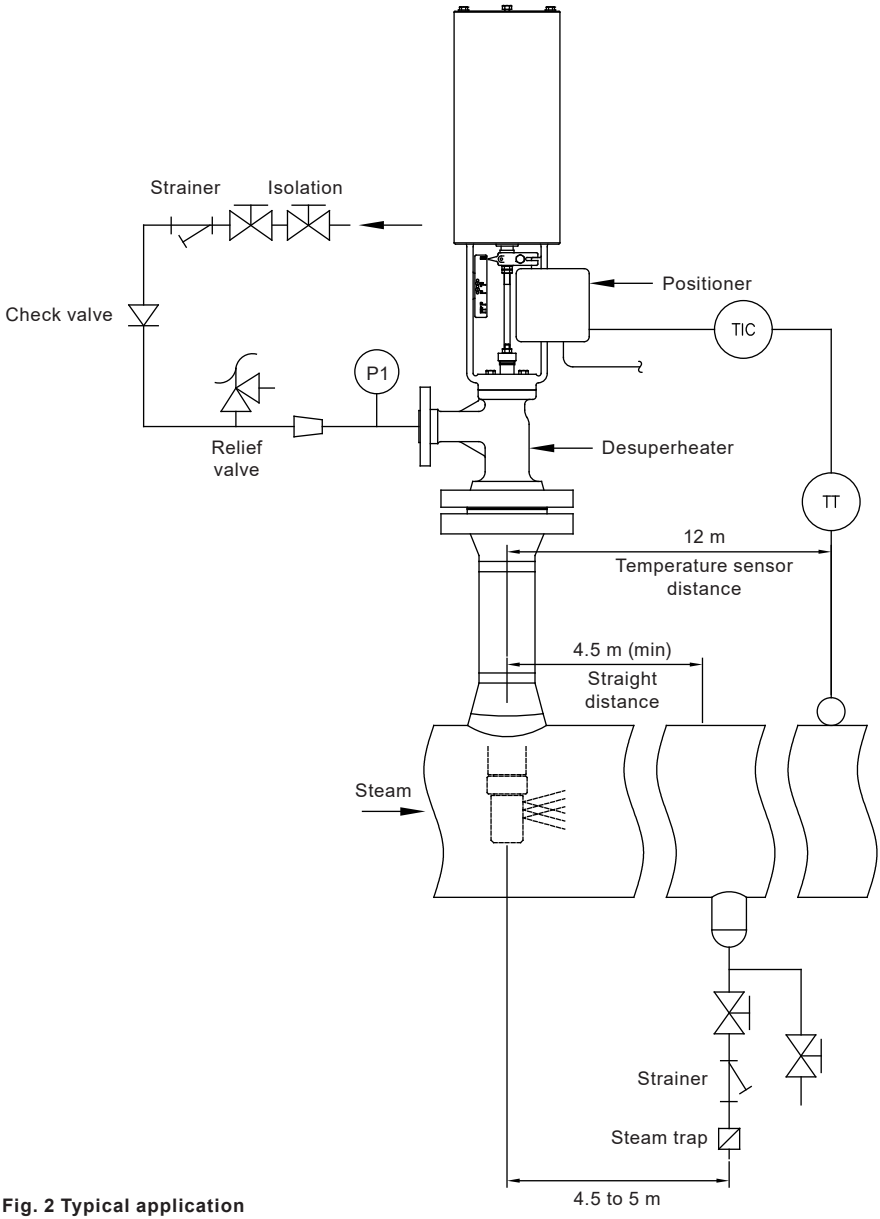


Fig. 2 Typical application

3.2 Installation considerations

3.2.1 Thermal sleeve

We strongly recommend that a thermal sleeve is installed in the steam line. The purpose of the thermal sleeve is:

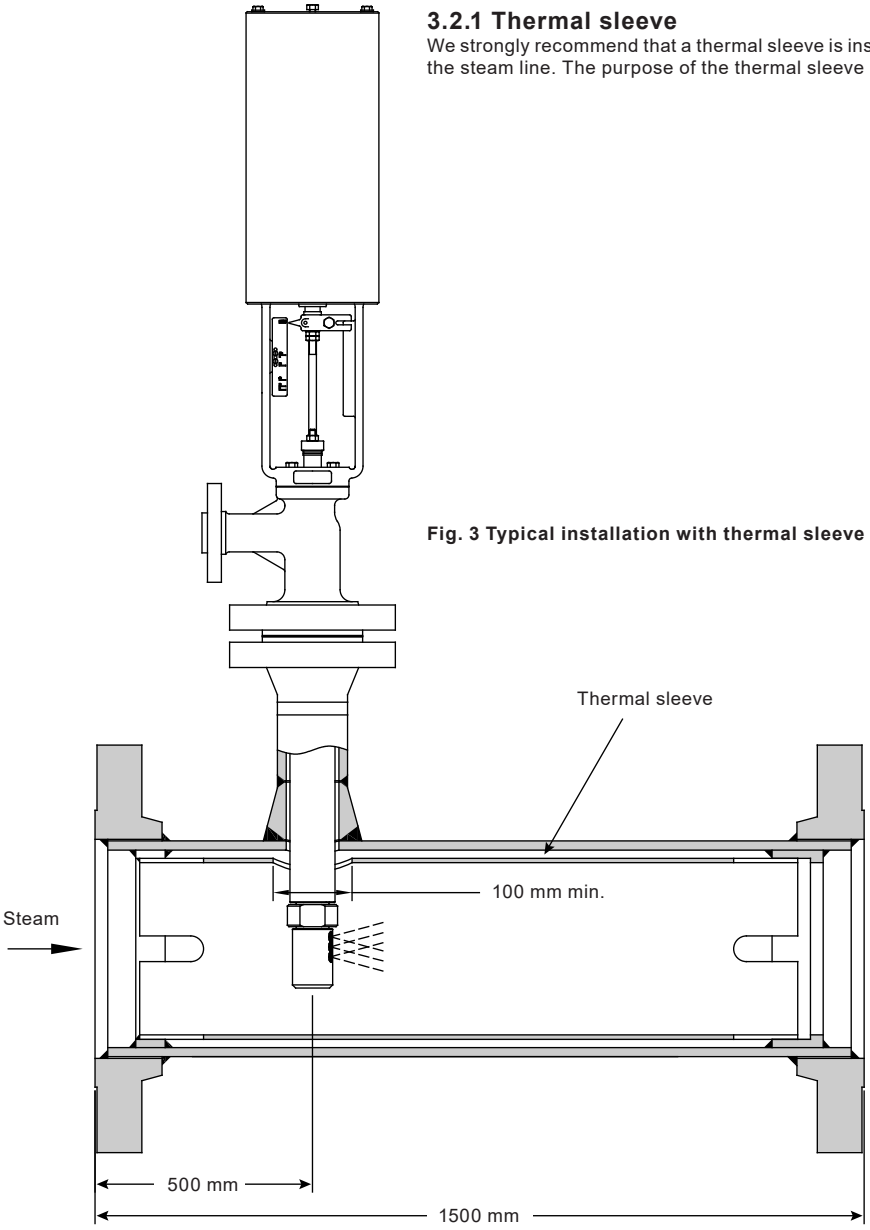


Fig. 3 Typical installation with thermal sleeve

- The thermal sleeve allows circulation of superheated steam between the outside of the sleeve and the inside diameter of the pipe. This arrangement heats the thermal sleeve and provides a hot surface which serves to assist the evaporation of the water droplets and aids operation of the DA at the bottom of its rangeability when the spray pattern of the nozzle is not at its most efficient.
- It protects the pipe from erosion due to the impingement of the sprayed water droplets.
- It prevents local thermal shock (and possible subsequent thermal stress in the pipe wall where the cold water would otherwise impinge on the hot pipe.
- Thermal sleeve should be used when the differential temperature between water and steam exceeds 232 °C (449.6 °F) and the steam pipeline wall thickness is larger than 12 mm.
- Thermal sleeve wall thickness: SCH 40 (maximum).

	Provide enough space for the thermal expansion of the sleeve in order not to stress the desuperheater pipe.

- Thermal sleeve material is the same as the pipeline or in stainless steel.
- The following components must be installed in the cooling (spray) water pipeline: isolation valve, pressure relief valve, and check valve at the end of ancillaries, strainer and pressure gauge (PI).
- The cooling water should comply with the following requirements:
  - Minimum: 3.5 bar g (50.76 psi g) above steam pipeline pressure
  - Maximum: 75 bar g (1087.78 psi g) above steam pipeline pressure
  - Use clean and filtered condensate or boiler feed water

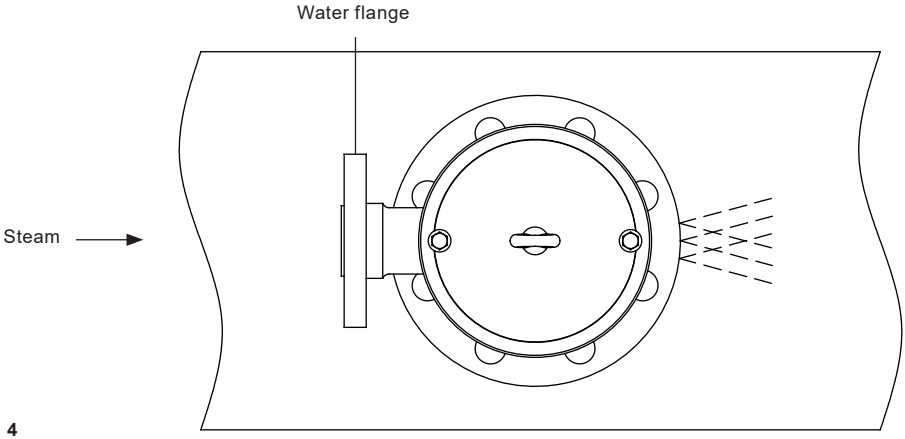


Fig. 4
Water connection

Standard assembly position

Spray water flange can be mounted in any orientation. This MUST be specified at point of order and confirmed with the factory prior to delivery.

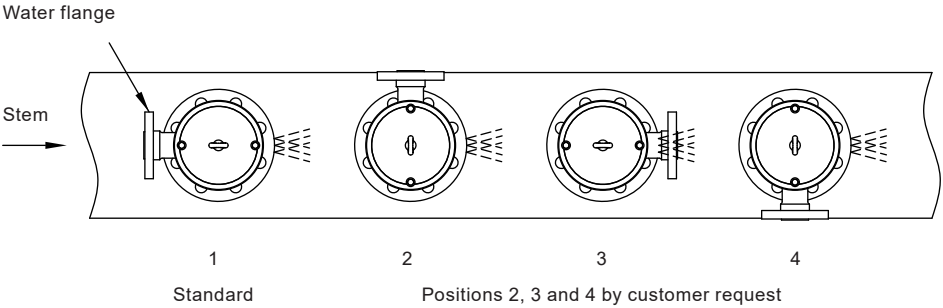
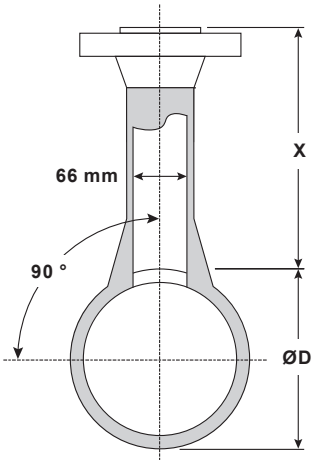


Fig. 5 DA assembly positions

Sizes (mm)

Nozzle	A (Central line insertion distance)	Total insertion distance
6A	395	445
6A1		
9A1		
6B	402	457
9B		
6C	411	477
6D	415	485
3C6D		
6E	417	489
3C6E		
9E		



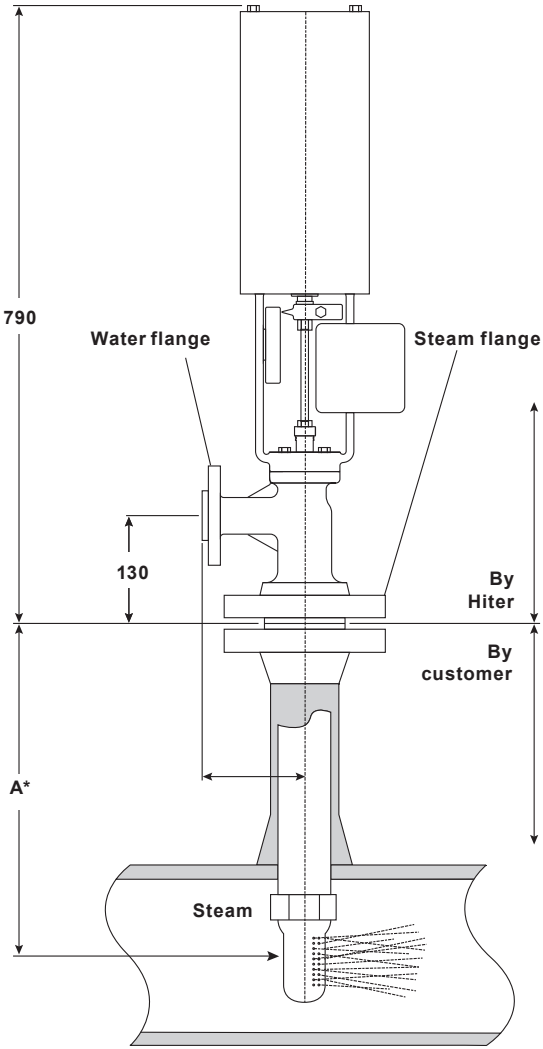


Fig. 6
Desuperheater dimensions installation

A* = Approximate distance to steam pipe centre

Typical installation (mm)

Nozzle	ØD (Piping diameter)
6A/6A1/9A1	6" to 24" (DN150 to DN600)
6B/9B	
6C	8" to 24" (DN200 to DN600)
6D/3C6D	
6E/3C6E/9E	

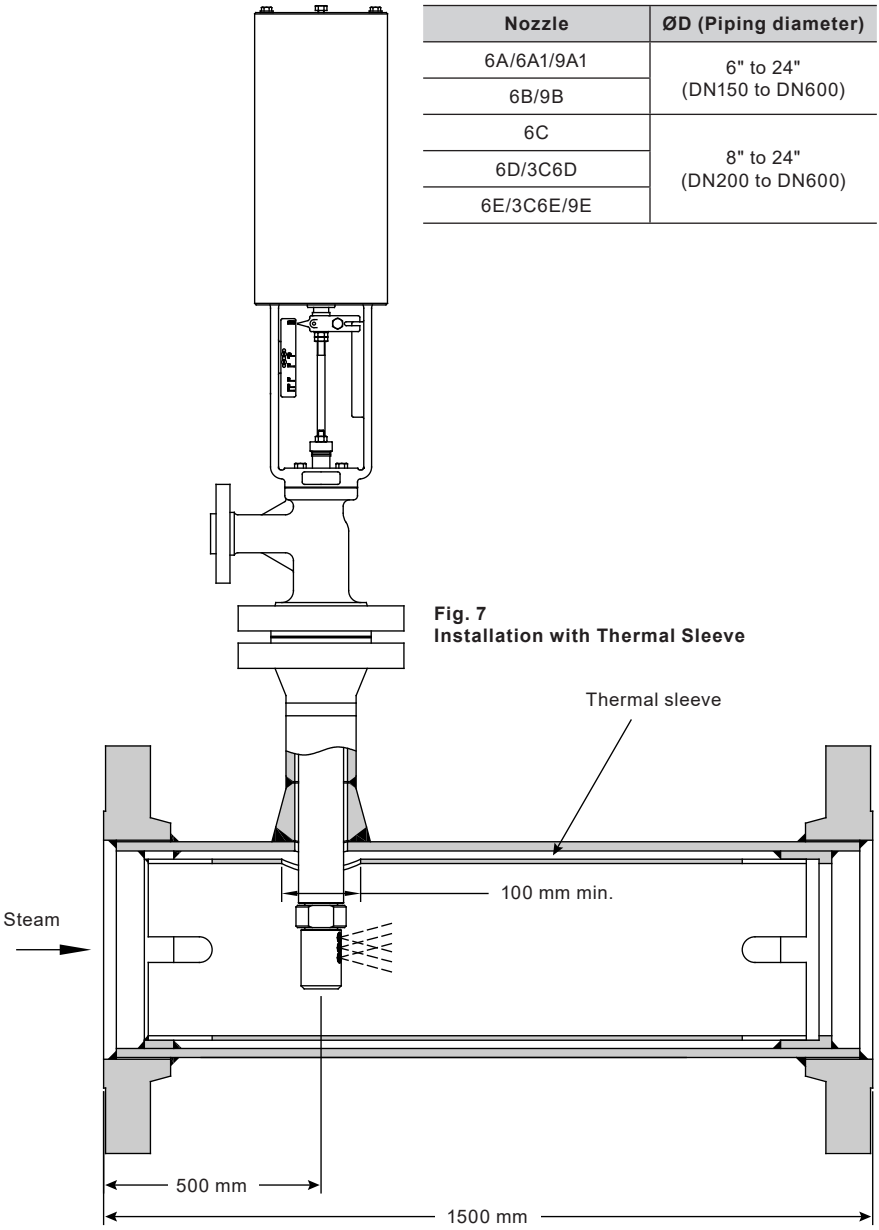


Fig. 7
Installation with Thermal Sleeve

3.2.2 Steam piping upstream of the desuperheater

a) Where noise from the pressure reducing valve (PRV) is expected to be a problem, consider making this pipe thicker than that required to just contain the pressure. This will help reduce noise levels emitted to atmosphere. Under extreme conditions this pipe may have to be acoustically insulated.

b) The distance between the PRV and inlet to the DA should be as short as possible but long enough to accommodate cooling water pipework.

c) It is recommended that there is a minimum of 5 pipe diameters of straight pipe upstream of the pressure reducing valve.

d) The temperature sensor should be located a minimum distance of 12 metres after the DA, however for optimum temperature control it is recommended that it be installed at the point of use.

3.2.3 Discharge steam piping

a) If bends or restrictions are placed in this pipework within the specified distance, before the droplets have had chance to evaporate, inertia causes the droplets to separate out from the main steam flow and run along the bottom or side wall of the pipe. Contact between the steam and cooling water is lost and desuperheating is compromised.

b) Use thermal insulation over this pipe section to help prevent false temperature readings (condensation can still occur on the walls of a 50 °C (122 °F) superheated steam line). Measurement error can be quite large, especially at low flow rates when heat lost through condensation is a high percentage of total heat energy in the line.

3.2.4 Temperature sensor

a) Speed of controlled response is important. For this reason, thermocouples or resistance thermometers are usually employed.

b) The size of an associated thermowell is important. Ones with large mass slow down rate of heat transfer and can cause serious measurement time lags. At low flowrates the problem is worse. Sometimes it's sufficient to simply improve contact between the sensor and well. But in other cases a special well may be needed, such as an extended-surface type. Recommendations should be sought from the instrument supplier.

3.2.5 Pressure sensor

Ideally this should be located at the point of use so that the pressure control valve can compensate for any line loss between the desuperheater and the point of use. This should be located at a minimum distance of whichever is greater of 5 pipe diameters or 1.5 meters away from the DA discharge flange.

3.2.6 Safety valve

In applications involving simultaneous pressure reduction and depending upon the pressure rating of the equipment, a safety relief valve to protect both the DA and downstream equipment from the effects of excess pressure should be considered. This would protect the DA and downstream equipment if the PRV failed fully-open for example.

3.2.7 Installation orientation

The equipment is inspected at the manufacturing facility and shipped in proper packages. However, another inspection must be performed before installation to ensure there is no damage caused during transport and/or storage.
Valves can be damaged when they are firstly placed in service due to the lack of a proper and complete internal cleaning of piping before installation. Complete a thorough internal clean of the system lines and also inside the valve, to remove any debris.
Be sure the adjacent flanges are perfectly aligned to each other. The misalignment may cause installation problems and seriously compromise the equipment performance due to abnormal stresses appearing.
Be sure the flange face is free of imperfections, sharp edges and burrs.
Insert the studs and tighten the nuts alternately in a diametrically crossed sequence. The crossed sequence should be repeated several times, increasing the torque applied in a gradual and uniform way, until the recommended value is reached.
The desuperheater should placed in an area to allow ease of access, and enough space for actuator removal.
Remove all protections before installation and note the following requirements:

- Minimum steam pipeline diameter:
  - Nozzles 6A/6A1/9A1/6B/9B – 6" to 24" (DN150 to DN600)
  - Nozzles 6C/6D/3C6D – 8" to 24" (DN200 to DN600)
  - Nozzles 6E/3C6E/9E - 8" to 24" (DN200 to DN600)
- Position the desuperheater at 90 ° to the pipeline centerline.
- Primary orientation: vertical.
- The nozzle cylinder should be positioned so that the water sprays in the same direction as the steam (Figure 5) and should be located in the center of steam pipeline for up to 24" (DN600) (Figure 6).
- The steam pipeline branch should have an internal diameter at least 65 mm (Figure 5).
- The straight distance between desuperheater and the first curve or other obstruction should be at least 4.5 metres.
- After expansion, the steam pipe should have a fall of 1:25 for the first 6m downstream of the desuperheater. It is recommended that a suitable steam trap is installed to drain overspray and mitigate the risk of water hammer.

3.3 Other installation considerations

a) Strainers: Consider installing strainers equipped with a 100 mesh screen in the pipelines in order to prevent the small bores within the desuperheater from becoming blocked.

b) Separator station: In applications where there must be no moisture in the resulting steam (such as steam supply to a turbine or motive steam supply to a thermocompressor for example) it is recommended that a separator is installed downstream of the desuperheater system. This will protect downstream pipework and equipment from the effects of moisture in the event of a control system failure or from abnormal operating conditions, such as at start-up for example.

c) It is also considered prudent to install a separator station when desuperheating close to saturation temperature or for applications involving large steam turndowns. The separator must be located after the temperature sensor thereby giving the water droplets as much time as possible to evaporate.

d) The associated steam trap should be selected to prevent air binding and the discharge pipe from the steam trap should have ample capacity to deal with the drainage and be installed as near to the vertical as possible. There must be sufficient space in the drainpipe for the water to flow down and the air to pass up the pipe.

e) Check valve: Consider the installation of a check valve in the cooling water line located immediately before the cooling water inlet connection to prevent back flow of steam into the cooling water inlet line in the event of either cooling water failure or excess pressure in the desuperheater caused by failure of the steam pressure reducing valve for example.

f) Pressure tappings: Include plugged pressure tappings within the connecting pipework which will allow gauges to be fitted to assist troubleshooting in the event of operational problems.

g) All connecting pipework must be sized in accordance with good working practice.

h) All auxillary components that are used in the application must be carefully selected as there must not be any reduction in the cross sectional area of the connecting pipelines. This is of particular importance in smaller bore pipework.

i) Ensure that low points of all interconnecting pipework have suitable connections for drains.

j) Ensure the system can be safely vented back to atmospheric pressure following a shutdown.

k) Consider the installation of air vents to remove air on start-up.

3.4 Unit installation

3.4.1 Pre-installation check

a) The gasket materials used for the installation must be compatible with the fluids passing through the desuperheater and must be suitable for the design conditions of the installation.

b) Ensure that the connecting pipelines are clean and that all weld spatter and foreign bodies have been removed.

c) Ensure the desuperheater is free of foreign bodies such as packing materials etc.

3.4.2 Installation

Only two connections to the connecting pipework are required:

a) The steam connection is to be connected to the superheated steam line.

b) The cooling water inlet connection is to be connected to the cooling water inlet line.

4. Operation

4.1 Unit operation

The DA series variable area desuperheaters may be installed either horizontally or vertically with the steam flowing upwards.
Spirax Sarco strongly advises against installations in which the steam flow is vertically downwards.
In a vertical installation we recommend that the cooling water pipework should be brought to the desuperheater from below the corresponding connections on the desuperheater. This will provide the best layout for drainage of fluids on shutdown.
The fail safe position of the standard DA unit is in the shut off position, spring-retact and will shut off water when retracted.

4.2 Pre-operational check

a) Check control system has been tested and is operational.

b) Check relief valve (if fitted) has been tested and is fit for operation.

c) Ensure that any discharge line valves are fully-open.

d) Ensure that the steam supply valve is fully-closed.

f) Ensure that all line restrictions have been removed.

g) Take all precautions necessary to handle the possibility of leakage, both in terms of protection of personnel and nearby equipment.

4.3 Start-up procedure

The following start-up procedure should be considered as our initial recommendation on how to start-up the DA desuperheater. It must be reviewed by the end user, preferably within a HAZOP, to determine whether it is consistent with the operating philosophy of the rest of the plant. The sequence of steps can be revised if necessary. However, the approach of ensuring the cooling water is made available to the DA before admitting steam must be followed.

1. Activate the control system. The DA actuator should be retracted to shut off the DA nozzles.

2. Open the liquid inlet valve fully and allow the flow to settle down.

3. Check that the necessary pressure is available at the liquid inlet.

4. Very slowly open the steam supply valve to admit superheated steam to the DA. Steam will begin to flow through the DA. The PRV (if fitted) will begin to modulate to control the downstream pressure and the DA actuator should begin to extend to allow water flow through the DA nozzles

5. Check that the necessary steam pressure is available at the steam inlet.

6. At this point the DA is fully operational. Operational checks should be made to ensure:

- The pressure reducing valve (PRV) (if fitted) is modulating correctly.
- The pressures of all streams around the DA are correct.
- The desired desuperheated temperature is being met.
- All other ancillary items related to the DA operation are functioning satisfactorily.

4.4 Shutdown procedure

This procedure must be reviewed and checked for consistency of operation with the rest of the plant. The sequence of steps may be revised if necessary, but the general principle of isolating the cooling water as the last step must be followed.

1. Slowly close the steam supply valve.
2. Close the liquid inlet valve of the DA desuperheater.
3. Close the cooling water supply.
4. De-activate the control system.

The DA variable area desuperheater is now shut down.

5. Commissioning

After installation or maintenance ensure that the system is fully functional. Carry out tests on any alarms or protective devices.

6. Removing from line

6.1 Removing from line

WARNING: Before starting the disassembly, isolate the steam supply, then relieve all the pressure of the process, disconnect the positioner's supply, close the cooling water block valve and remove the desuperheater from steam pipeline. Disassembly procedure description uses figures 8 and 9 as reference.

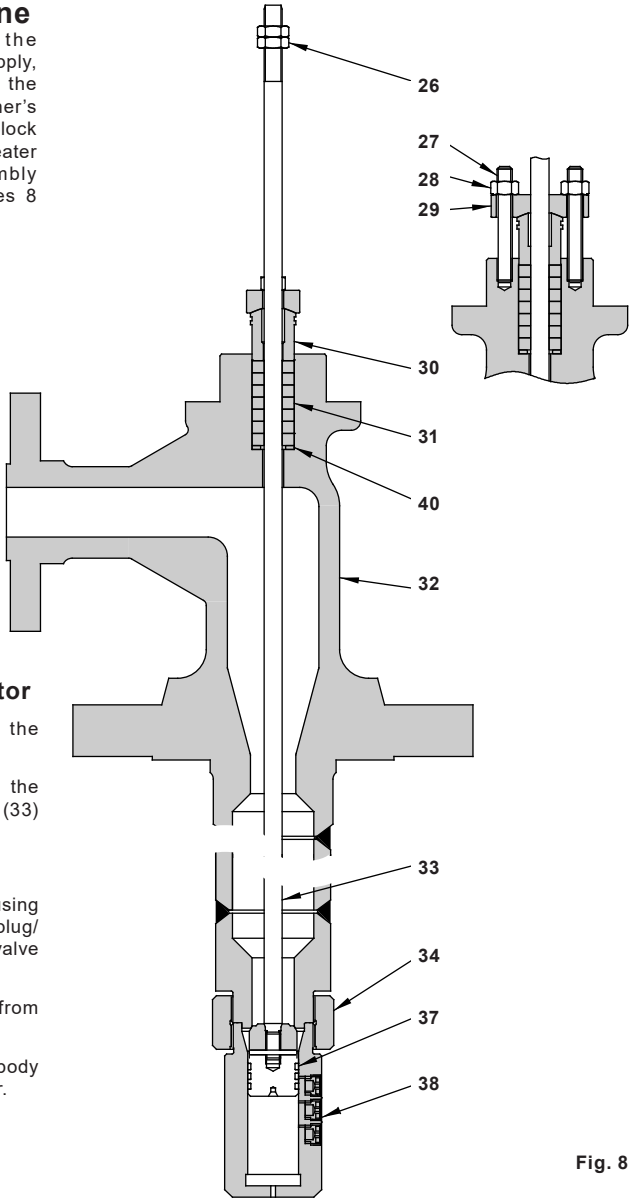


Fig. 8

6.1.1 Removing the actuator

- Remove the positioner and the respective accessories.
- Apply a light air pressure in the cylinder until the plug/stem (33) moves away from seat.
- Loose the stem nuts (26).
- Fit together both stem nuts using a wrench, unscrew the valve plug/stem (33) until separated the valve stem from actuator stem.
- Remove the bolt yoke (39) from valve body.
- Separate the desuperheater body from the actuator from actuator.

7. Disassembly, maintenance and assembly

7.1 Disassembly

Caution
Do not proceed with any maintenance unless the DA has:

- Been relieved of all pressure and/or vacuum.
- Been allowed to reach ambient temperature.
- Been drained and purged of all fluid.
- Had all connecting lines fully isolated.

7.1.2 Disassembling the desuperheater nozzle cylinder

- Mark the relative position between nozzle cylinder (38) and valve body (32).
- Remove welding points (A) between sleeve, pipe and cylinder. (Figure 8).
- Loose sleeve (34) from nozzle cylinder from the valve body (left hand thread).
- Remove the sleeve from nozzle cylinder (right-side thread).
- Remove the stem nuts (26) from valve plug/stem assembly (33).
- Remove the packing nuts (28), packing flange (29), packing follower (30) and packing bolt (27).
- Remove the packing (31) from valve body housing (32).
- Remove the plug/stem assembly (33) from inside valve body.
- Remove the sealing rings (37) from plug/stem assembly (33).
- Remove the sleeve (34) from valve body (left hand thread).

7.1.3 Disassembling the actuator
WARNING: Spring (11) is assembled with a pre-load in the actuator. Disassembly or assembly without proper devices may cause material damage or personal injuries.

- Loosen the stroke indicator bolt (15) and remove the stroke indicator (14).
- Remove the cylinder lock screw (24).
- Remove the split ring (23) and cylinder (1).
- Remove bolts and washers (4 and 5), pressing the cover (33) and remove from below.
- Remove the O-ring (10).
- Using a proper device to compress the piston (8) against spring (11), remove the bolt (6) and washer (7).
- Remove the stem (12) by from below and remove bushing guide (13) from yoke (19).
- Carefully, decompress the spring until it is totally extended, i.e., no residual load.
- Remove the piston disassembly/assembly device.
- Remove the piston (8) and O-ring (9).
- Remove the spring (11).
- Unscrew the stroke limiter (25).

7.2 Maintenance

Note: Please read Section 1, 'Safety information' before proceeding with any maintenance.

Maintenance should only be carried out by qualified, experienced personnel, who are familiar with desuperheaters and who have read and understood all the instructions in this document.

7.2.1 Preventative maintenance

Spirax Sarco suggests that the user creates maintenance schedules, safety manuals and inspection schedules for each specific desuperheater installation.
On all installations, the following items should be inspected by the user:

a) Desuperheater for blockages, particularly the steam nozzle, and cooling water holes. Check cooling water holes for scale build-up which could indicate poor cooling water quality.

b) Desuperheater for internal wear, particularly the steam nozzle, and cooling water holes.

c) Discharge piping and fittings to be checked for signs of erosion, corrosion, debris build- up and blockages.

d) Sufficient tightness of flange connecting bolts.

e) Strainers for debris build-up.

f) All other associated ancillary equipment and valves, in particular:

- The correct operation of all control equipment.
- The correct operation of instrumentation.

In case of the equipment show any damage, which cannot be solved by parts replacement and/or corrective actions, return the equipment assembled to Spirax Sarco for general revision.

7.2.2 Maintenance and Cleaning

After disassembly of the product, it is important to inspect the condition of the internal parts. All the metallic parts must be cleaned using solvent and dried with compressed air. After cleaning, keep clean all the parts that will not be replaced until reassembly of the desuperheater.

For non painted carbon steel parts, application of a protective oil is recommended.
Inspect all components, especially the areas in contact with the sealing ring. These areas must be smooth and scratch free.
After detailed inspection, the damaged components shall be replaced.
If any damage is found which is beyond economical repair contact Spirax Sarco for further advice.

7.3 Assembly

7.3.1 Desuperheater body

- Insert the plug/stem assembly (33) in the valve body (32) from underneath.
- Lapping of seat and plug should be done at this time to ensure leak free operation.
- Insert the sealing ring (37) in the plug/stem assembly (33).
- Apply graphite-based grease NEVER SEEZ PURE NICKEL SPECIAL on sleeve (34), nozzle cylinder (38) and body threads.
- Screw the sleeve (34) with the nozzle/cylinder assembly (38) in the body (32) until it locks. See in Specification Sheet the assembly position of the atomization nozzles and the valve inlet flange. If that is not specified, assemble the atomization nozzles aligned at 180◦ degrees in relation to valve inlet flange. This position must be held until the assembly is finally tightened.

- Insert the retainer ring (40) into the packing housing in the valve body (32).
- Insert the packing (31) into the packing housing in the valve body (32).
- Apply graphite-based grease NEVER SEEZ PURE NICKEL SPECIAL on the threads of the studs (27) and underneath the head of the nuts (28).
- Screw the packing bolts (27) into the valve body (32).
- Insert the packing follower (30) onto the plug/stem assembly (33).
- Place the packing flange (29).
- Screw the packing nuts (28) and tighten the nuts alternately applying the torque from Table 3. Following as a first pass 2 N m, second pass 4 N m, third pass 5 N m, fourth pass 6.5 N m and a final pass at the end to confirm 6.5 N.m.
- Apply graphite-based grease NEVER SEEZ PURE NICKEL SPECIAL on stem threads.
- Assemble the two nuts (26) onto the stem.

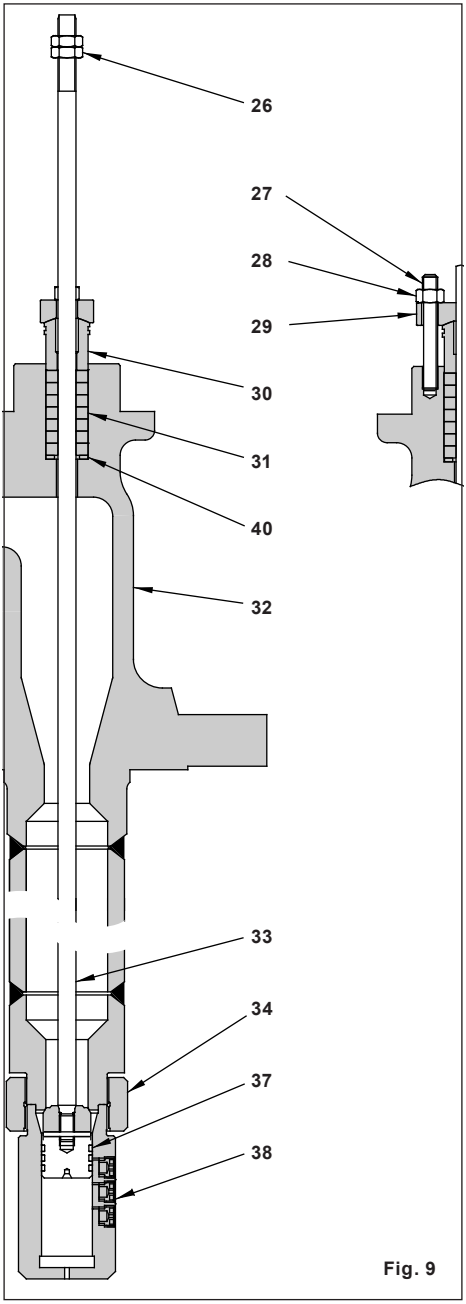


Fig. 9

7.3.2 Actuator

- Insert the bushing guide (13) into the yoke (19).
- Apply silicone-based grease on bonnet housing.
- Apply graphite-based grease NEVER SEEZ PURE NICKEL SPECIAL on stroke limiter (25) threads.
- Screw the stroke limiter (25) into the yoke (19) until some mechanical resistance is felt and tighten with one hand using a short length of bar.
- Apply silicone-based grease LUMOMOLY TF-92 on stem (12) and insert into the yoke (19) from underneath.
- Introduce the spring (11) into the yoke (19).
- Apply silicone sealant DOW CORNING 732 at the end of the stem (12). See figure 10.
- Lock the stem (12) at the lower yoke end (19), with appropriate device.
- Apply graphite-based grease NEVER SEEZ PURE NICKEL SPECIAL on bolt (6) threads.
- Compress the spring (11) with the piston (8) using an appropriate device, until the stem top end is in the piston (8) far enough to be able to insert the washer (7) and screw in the bolt (6) and tighten applying the torque from Table 3.
- Apply silicone-based grease LUMOMOLY TF-92 and insert the O-ring (9) into the piston (8).
- Apply silicone-based grease LUMOMOLY TF-92 and insert the O-ring (10) into the cylinder cover (2).
- Insert the cylinder cover (2) into the cylinder (1).
- Apply graphite-based grease NEVER SEEZ PURE NICKEL SPECIAL on bolt (4) threads.
- Lock the cylinder cover (2) with bolts (4) and washers (5) and tighten applying the torque from table 3.
- Lubricate the cylinder (1) inside surface with silicone-based grease LUMOMOLY TF-92.
- Insert the cylinder (1) into the yoke (19). Ensure the large side hole in the cylinder and the threaded hole in the yoke are lined up.
- Insert the split ring (23) into the cylinder (1) from underneath. Ensure the both sides of the two halves of the split ring and two small side holes in the cylinder are lined up. These small holes are used to disassemble the split ring. See figure 8.
- Apply graphite-based grease NEVER SEEZ PURE NICKEL SPECIAL on bolt threads (24).
- Pull the cylinder (1) vertically until the split ring (23) fits into the bonnet (19) and lock them with bolt (24). Tighten applying the torque from table 3.
- Assemble the stroke indicator (14) into the stem (12) and lock with bolt (15) and tighten applying the torque from table 3.
- Assemble the stroke nameplate (17) into the yoke (19) with bolts (16) and tighten applying the torque from table 3.
- Insert the blanking bolt (3) into the cylinder cover (2).

7.3.3 Actuator/Valve assembly

- Place the actuator onto the valve.
- Thread the valve stem/plug assembly (33) into the actuator stem (12) until some mechanical resistance is felt due to the sealing of plug (35) on the seating.
- Apply graphite-based grease NEVER SEEZ PURE NICKEL SPECIAL on bolts (39) threads.
- Couple the actuator on the valve using the bolts (39). Tighten applying the torque from table 3.
- Adjust the stroke according to the nozzle type, following the sequence: supply (pressurize) the actuator until the stroke indicator aligns to the letter corresponding to the stroke position - according to the Specification Sheet. Interrupt the actuator supply (depressurize) and check if the stroke indicator is aligned to the letter “F" (closed). If it is not, rotate the valve stem (33 on figure 14) through the lock nuts 2 turns at a time. If it aligns, lock the valve stem to the actuator stem by the lock nut, otherwise, repeat the sequence until it aligns.
- Proceed with seat tightness test. In case of excessive leakage, unplug the actuator from the valve, disassemble the actuator from the valve and verify the sealing surfaces and the condition of the joints are good. Replace if necessary, and repeat the lapping and test procedure.
- If the leaking persists and after no more than 3 lapping attempts, return the equipment assembled to Spirax Sarco for general revision.
- Weld in two equidistant points, locking at the position, the sleeve (34) and body (32) then another two points locking the nozzle (38) and the sleeve (34)., as per figure 8.

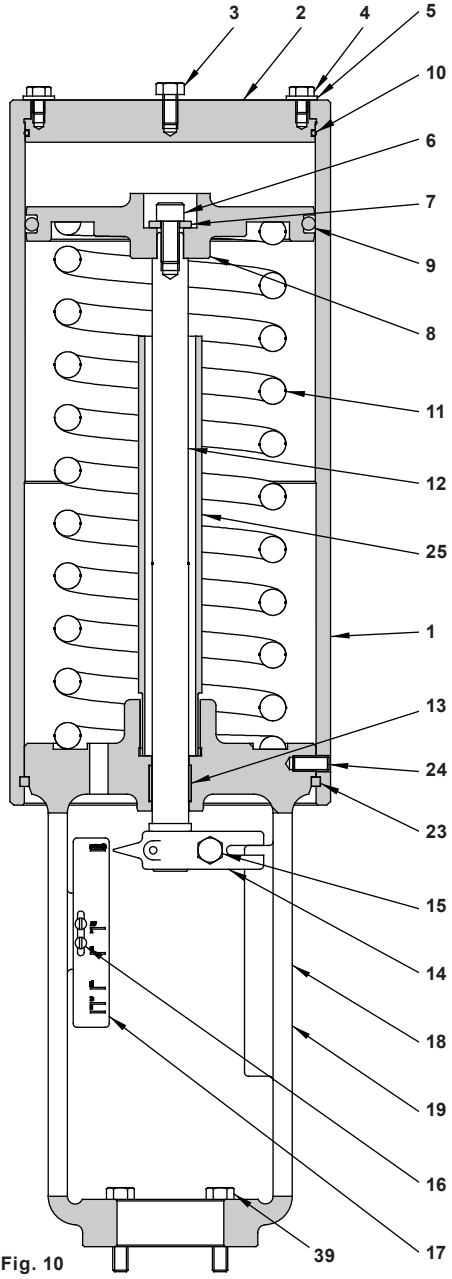


Fig. 10

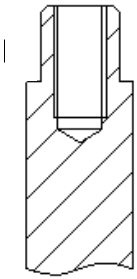


Fig. 11 Silicone sealant application

Fig. 12 Split ring assembly

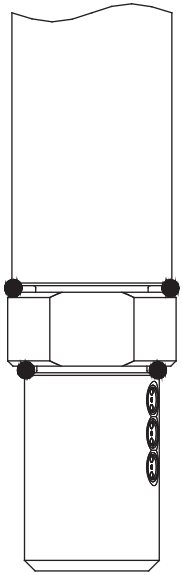


Fig. 13 Spot welds representation

Table 3 Torque Table

Item	Thread Size	Torque (N m)
4	¼"	3
6	⅜"	10
15	5⁄16"	6
16	⅛"	0.5
24	5⁄16"	9
26	⅜"	7
28	5⁄16"	6.5
39	5⁄16"	4.5

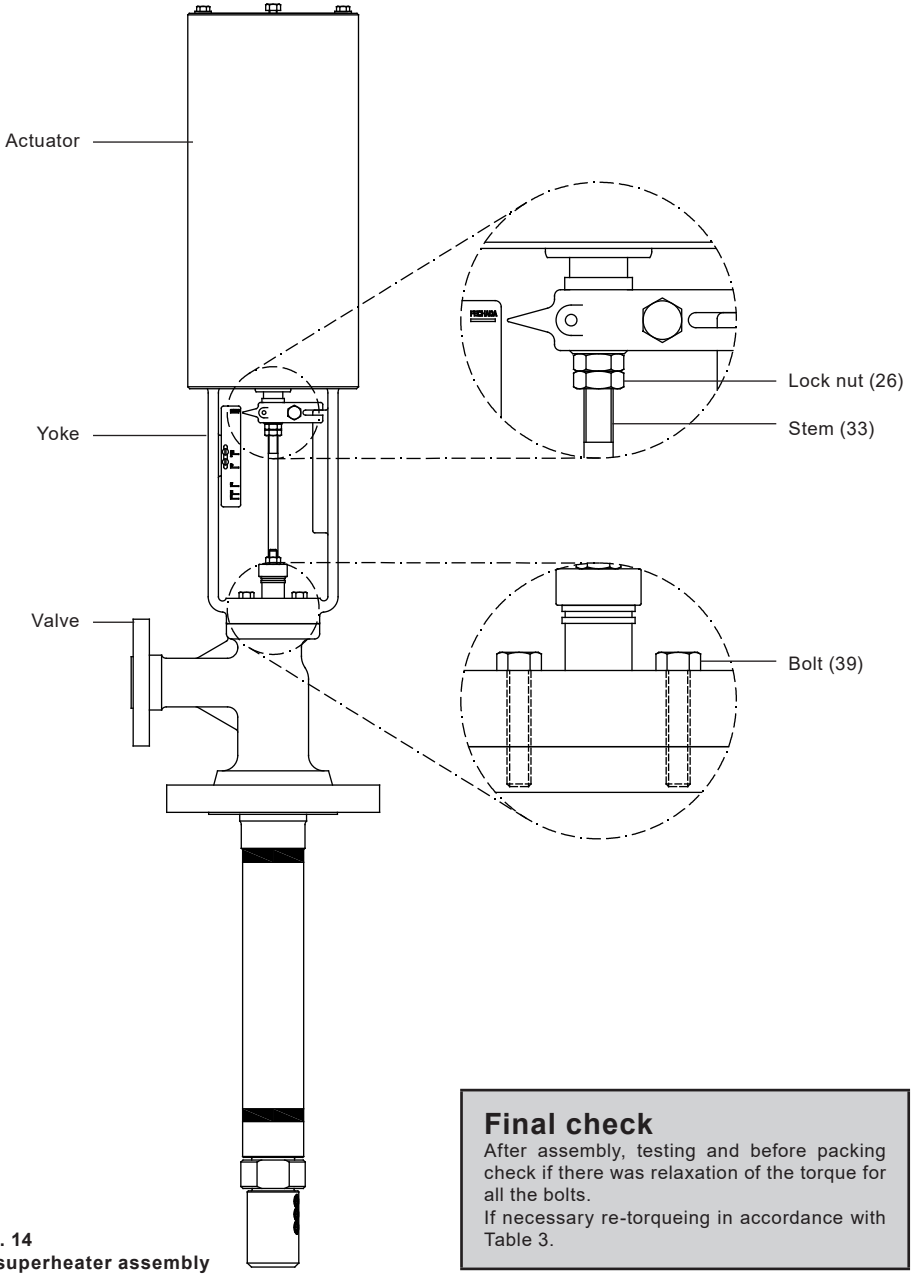


Fig. 14
Desuperheater assembly

Final check

After assembly, testing and before packing check if there was relaxation of the torque for all the bolts.
If necessary re-torqueing in accordance with Table 3.

7. Parts list

Actuator

Item	Description
1	Cylinder
2	Cover
3	Blanking bolt (Thread 5/16/18 UNC)
4	Bolt (cover)
5	Washer (cover)
6	Bolt (piston)
7	Washer (piston)
8	Piston
9*	'O' ring (piston)
10*	'O' ring (cover)
11	Spring
12	Stem
13	Bushing guide
14	Stroke indicator
15	Bolt (Stroke indicator)
16	Screw (stroke nameplate)
17	Stroke nameplate
18	Nameplate
19	Yoke
23*	Split ring
24	Screw lock (cylinder)
25	Stroke limiter
39	Bolt (yoke)

* Recommended spare parts, see page 46

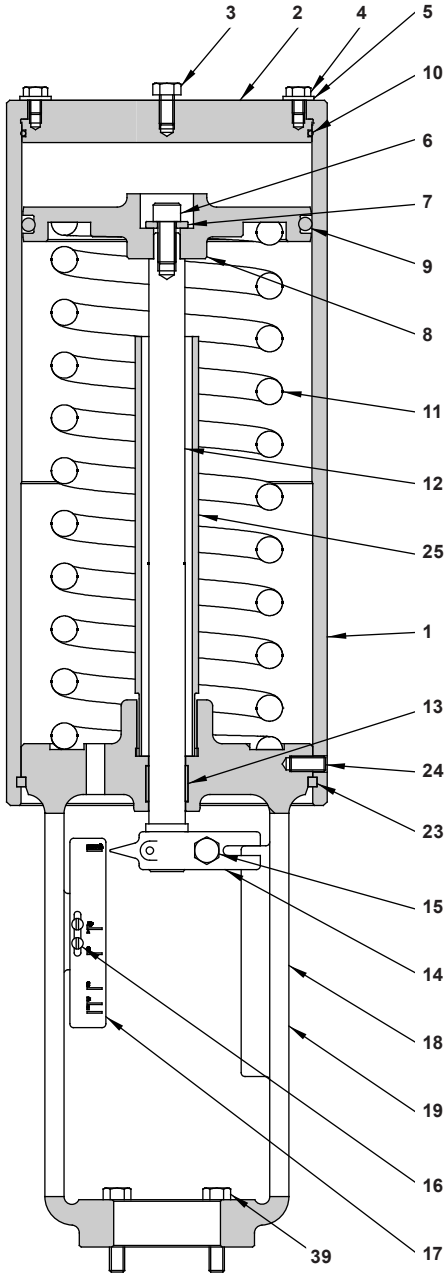


Fig. 15

Valve

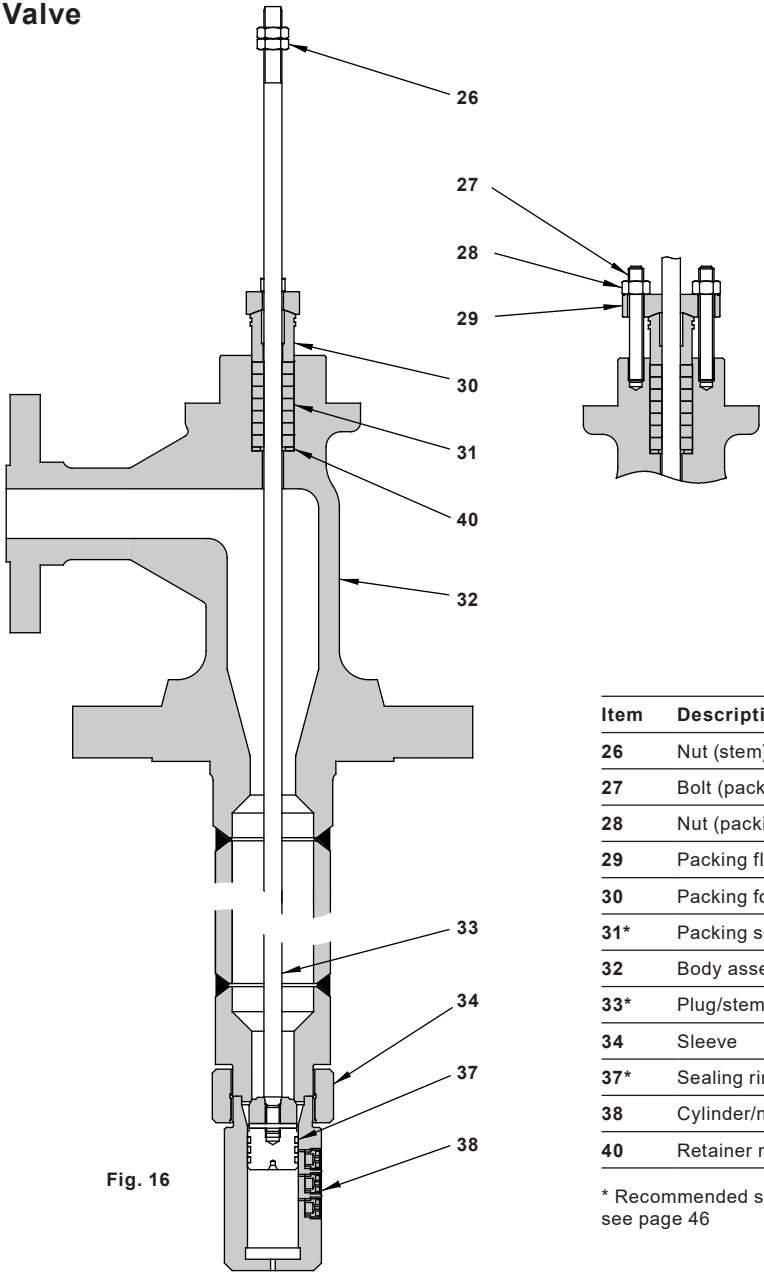


Fig. 16

Item	Description
26	Nut (stem)
27	Bolt (packing)
28	Nut (packing)
29	Packing flange
30	Packing follower
31*	Packing set
32	Body assembly
33*	Plug/stem assembly
34	Sleeve
37*	Sealing ring
38	Cylinder/nozzle assembly
40	Retainer ring

* Recommended spare parts,
see page 46

8. Spare parts

Actuator

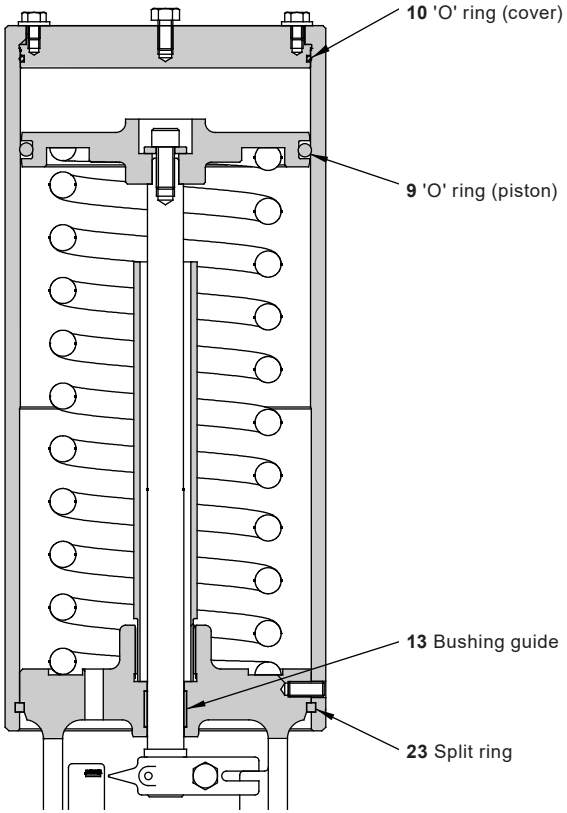


Fig. 17

Item	Description	Part number
9	O-Ring (Piston)	4510600
10	O-Ring (Cover)	4510601
13	Bushing Guide	4510602
23	Split Ring	4510603

Valve

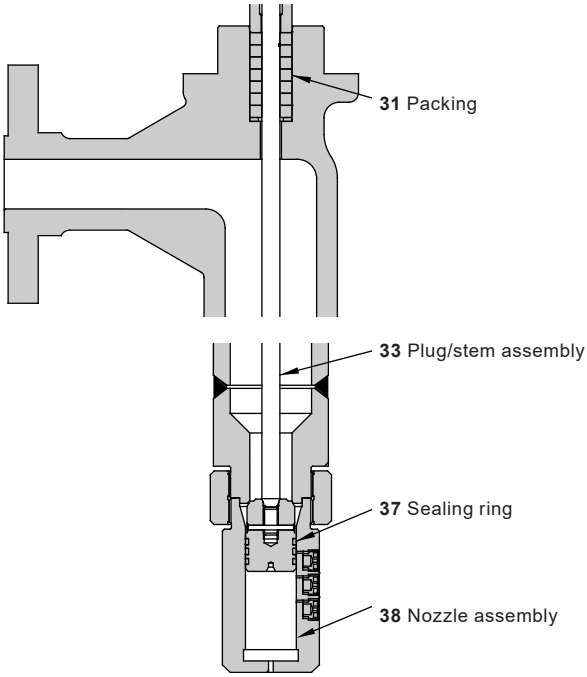


Fig. 18

Item	Description	Part number
31	Graphite stem seal ⅜" 7 PCS	4510604
33	Plug and Stem DA	4510605
37	Plug piston ring DA 3 PCS	4510606
	Nozzle Assembly 6A (CV0.19)	4510609
	Nozzle Assembly 6A1 (CV0.3)	4510610
	Nozzle Assembly 9A1 (CV0.45)	4510611
	Nozzle Assembly 6B (CV0.8)	4510612
	Nozzle Assembly 9B (CV1.2)	4510613
38	Nozzle Assembly 6C (CV2.1)	4510614
	Nozzle Assembly 6D (CV3.18)	4510615
	Nozzle Assembly 3C6D (CV4.23)	4510616
	Nozzle Assembly 6E (CV5,4)	4510617
	Nozzle Assembly 3C6E (CV6.45)	4510618
	Nozzle Assembly 9E (CV8.1)	4510619

9. Troubleshooting

9.1 Introduction

Once successfully commissioned, desuperheaters provide trouble free service. However, as with any equipment in erosive or corrosive service, break down beyond control may occur.
A knowledge of the correct procedures for locating and correcting faults can lead to considerable time saving. Poor performance of a desuperheater can be caused by either external or internal factors. Secondly, all performance can also be classified as either being gradual or sudden.
In general, a gradual loss of performance will normally suggest internal corrosion or erosion, whereas a sudden loss in performance will normally suggest an external factor is to blame.
Before setting out to examine why the desuperheater is not performing correctly, we strongly recommend that all instruments and any Control Systems are first checked that they are not giving false readings.

9.2 External causes of poor performance

At this stage, if an actual control system is fitted, ensure that all pressure and temperature indicating controllers are functioning and set correctly. Also check supply and signal lines, pneumatic or electric lines to the respective actuated control valve. Then check the operation of both the pressure and temperature control valves.

Steam outlet pressure not in accordance with the specification

- Check the operation of the actuated or manually operated pressure control valve, prior to the Desuperheater.
- Check the steam pressure upstream and downstream of the pressure control valve. The superheated steam at the inlet to the desuperheater must be in accordance with the design specification or the design of the unit must be modified.
- A varying steam pressure will cause a fluctuating outlet steam pressure unless a pressure control system is fitted.

Steam outlet temperature not in accordance with the specification

- Check temperature and pressure of cooling water prior to unit is in accordance with the design specification. If the pressure and temperature cannot be changed in accordance with the design specification, the desuperheater must be modified.
- Check all ancillary equipment associated with the cooling water supply line, including possible booster pumps, strainers, non-return valves and manually operated or automated shut-off valves and associated control systems.

Consumption of water in excess

Check that the DA is installed in a flow stabilised section - If not, review the installation. Please note that a PRV pressure reducing valve or an elbow on the pipeline are possible causes of unstabilised flow.

9.3 Internal causes of poor performance

Due to the simple construction of the DA, the only internal problems are associated with the cooling water spray nozzle.

The problems encountered are:

Blocked or partially blocked spray nozzle due to the presence of a foreign body.

Blocked or partially blocked spray nozzle due to scaling, which in turn is due to poor cooling water quality.

Excessive wear within the spray nozzle - This is very rare.