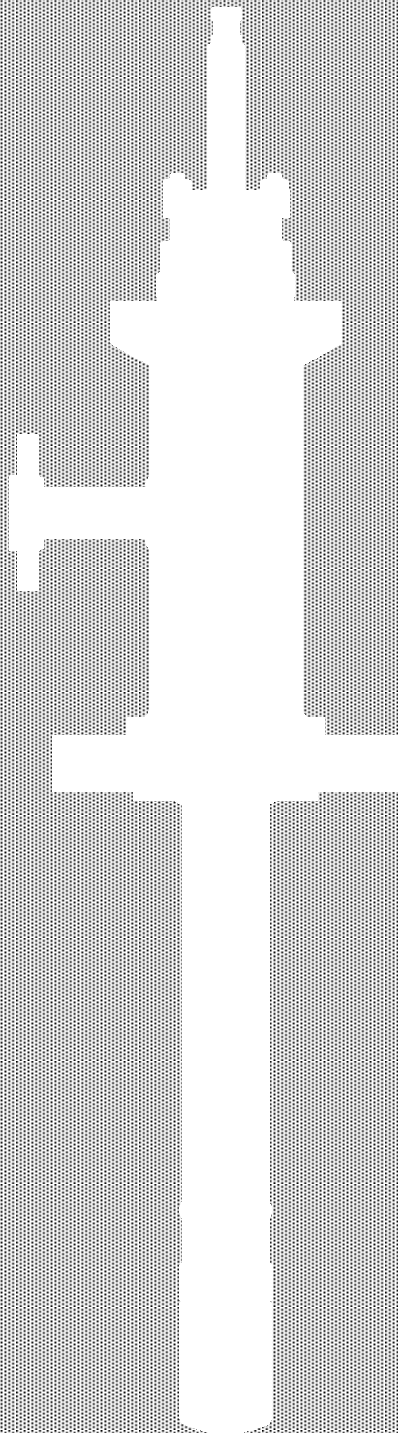




# I N S T R U C T I O N S

For the installation and maintenance of DS1525 - DS1550 -  
DS2525 - DS2550 desuperheaters



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For the installation and maintenance of DS1525 - DS1550 -  
DS2525 - DS2550 desuperheaters

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# I N S T R U C T I O N S

## For the installation and maintenance of DS1525 - DS1550 - DS2525 - DS2550 desuperheaters

### 1. GENERAL INFORMATION:

#### 1.1. - RIGHT TO MAKE MODIFICATIONS AND "COPYRIGHT"

The regulations, standards etc. quoted in these instructions are valid at the time of preparation of this document and are not subsequently updated. It is the duty of the user to take full responsibility for applying the most up-to-date version of the standards and regulations in question.

The supplier reserves the right to make changes and technical improvements to data and information whenever it sees fit to do so. The user shall on no account be entitled to claim a right of modification or improvement in relation to desuperheaters already supplied.

### 2. GUARANTEE

The extent and duration of the guarantee are defined in the manufacturer's "General Conditions of Sale". The applicable conditions are those stipulated in the most up-to-date version in existence at the time of delivery.

The guarantee does not cover, amongst other cases, damage to valves caused by the following:

- ° Ignorance of or non-compliance with these instructions for use!
- ° The work of personnel insufficiently qualified to undertake fitting, use or maintenance;
- ° Normal wear;
- ° Erroneous or negligent use of the desuperheaters.

The guarantee shall not be valid and the manufacturer shall accept no responsibility in the event of:

- ° Non-compliance with regulations for the prevention of accidents and/or safety standards;
- ° Imperfect installation, poor commissioning and incorrect use;
- ° Improper or incorrect use, inappropriate application or work conditions differing from those agreed.

The user shall bear sole responsibility in the event of physical and/or material damage deriving from failure to observe the above.

### 3. VALIDITY OF INSTRUCTIONS

**These instructions relate to variable area desuperheaters:**

- **DS1525 - DS1550 - DS2525 - DS2550** **SEE PARAGRAPH 8) (Fig.1)**





# I N S T R U C T I O N S

## For the installation and maintenance of DS1525 - DS1550 - DS2525 - DS2550 desuperheaters

### 4. PRODUCT SAFETY INDICATIONS AND TAG SYSTEM

If and where appropriate, safety indications have been put inside tags on the sides of the pages of this manual.

These rectangular tags are placed vertically (as shown in the following examples) and contain four different messages communicating:

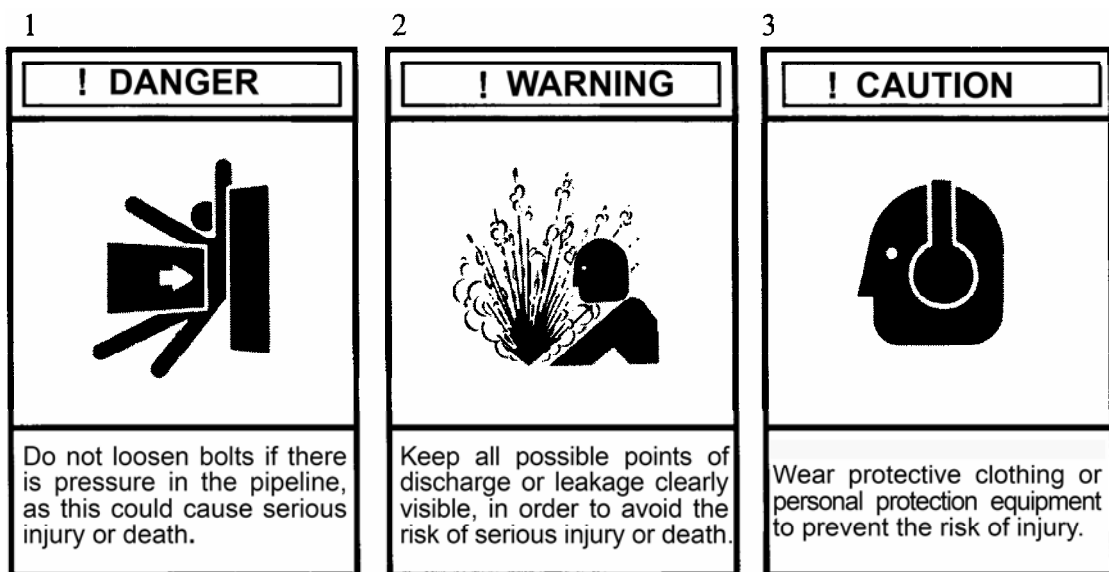
- The level of risk;
- The nature of the risk;
- The effects of the risk on people or products;
- Instructions, if necessary, on how to avoid the risk.

The box at the top contains a warning word (DANGER – WARNING – CAUTION – ATTENTION) which indicates the level of risk.

The box in the middle contains a drawing indicating the nature of the risk and its possible effects on people and property. In some cases, the drawing may suggest what preventive measures can be taken, such as wearing safety clothing.

The box at the bottom may contain a message with instructions on how to avoid the risk. In the event of risks for people, the message may also contain a more precise definition of the risk and its effects on people.

- 1) DANGER – Immediate risk which will certainly cause serious injury or death.**
- 2) WARNING – Risk or hazardous behaviour which may cause serious injury or death.**
- 3) CAUTION – Risk or hazardous behaviour which may cause minor injury.**





# I N S T R U C T I O N S

## For the installation and maintenance of DS1525 - DS1550 - DS2525 - DS2550 desuperheaters

### 5. SAFETY WARNINGS

Thorough maintenance operations and overhauls are important for the safe and reliable operation of all desuperheaters.

The service procedures recommended by CARRARO and described in this manual are effective methods for carrying out maintenance operations. Please note that this service manual contains various warning and caution notices which should be read carefully in order to minimise the risk of injury to people or the possibility of using incorrect work methods which may damage the desuperheaters or make them unsafe. It is important to realise, however, that these warnings cannot be exhaustive.

CARRARO is unable to know, assess and inform customers or users of all the conceivable methods of performing maintenance operations and all the risks deriving from the use of such methods.

Consequently, CARRARO has not even attempted to start such a task. Therefore, whoever uses a service method or piece of equipment which is not recommended by CARRARO must make sure that neither his own or other people's safety, nor desuperheater safety and performance are jeopardised by the chosen method.

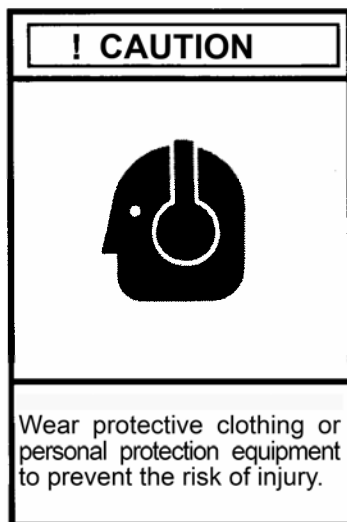
In case of doubt about the method used, please contact CARRARO.

Take all safety precautions while testing, installing or dismantling the product; these include, wearing ear plugs, goggles and safety clothing, such as gloves, both in or near the work area.

Given the large number of conditions and circumstances that may arise while working on the products and the consequent risks deriving from the way this is done, CARRARO is not able to prevent all risks of injury to people and damage to property and can only help by asking you to take the utmost care and giving you the following safety suggestions.

Users of CARRARO products are responsible for training the staff that will use the product.

It is most important for these people to acquire a thorough knowledge of the instructions relative to the product, especially the ones contained in this manual.



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# I N S T R U C T I O N S

## For the installation and maintenance of DS1525 - DS1550 - DS2525 - DS2550 desuperheaters

### 6. SAFETY PRECAUTIONS

**! DANGER**




Lower the pressure and keep at a safe distance from the outlet when working on a valve.

Always follow the safety regulations applicable to the plant and observe the following precautions:

- ° Wear protective clothing. Hot water causes burns and superheated vapour is invisible.
- ° Before starting disassembly, make certain that the desuperheater is isolated from any source of pressure that may exist within the system.

**! CAUTION**



Wear the appropriate personal protection equipment to prevent possible injury.

- ° Carry out checking/maintenance of desuperheaters *at least once two years*.

- ° The outer surfaces of desuperheaters reach temperatures approximately equal to the temperature of the fluid flowing through them. For this reason, if fitting a desuperheater in a potentially explosive atmosphere, check that the explosion point of the atmosphere surrounding the desuperheater is sufficiently higher than fluid temperature inside the desuperheater itself, and prevent deposits of dust from forming on its outer surfaces.

**! WARNING**



Keep all possible points of discharge or leakage clearly visible, in order to avoid the risk of serious injury or death.

- ° In the connection between the desuperheater and line, ensure the equipotentiality of the system in order to prevent the accumulation of electro-static charges on the outer surfaces of the plant, which could act as an effective trigger in a potentially explosive atmosphere.

- ° Before carrying out any work on desuperheater components, consult CARRARO.



# I N S T R U C T I O N S

## For the installation and maintenance of DS1525 - DS1550 - DS2525 - DS2550 desuperheaters

### 7. TRANSPORT, STORAGE AND HANDLING

**! ATTENTION**



Do not lift desuperheaters horizontally.

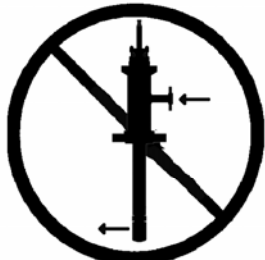
#### Transport

Carraro DS desuperheaters are packed with the utmost care in wooden crates or cardboard boxes so that they are protected during handling and transport to their place of installation. The connections are protected to prevent the entry of dirt. Follow any directions marked on the packaging.

 **ATTENTION!**

**Personnel assigned to load-handling activities must take all the necessary safety precautions.**

**! ATTENTION**



Prevent foreign matter from entering inside desuperheaters.

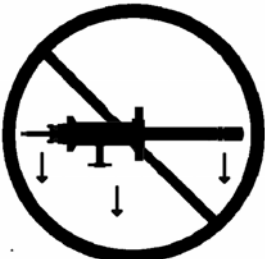
#### Storage

The desuperheaters must be stored in a dry environment and protected against atmospheric conditions. They must not be removed from their crates or packaging until immediately before installation.

The protective materials on the connections must be left in place until the last minute. Whether packed or not, the desuperheaters must not be subject to violent impacts.

Whether packed or not, the desuperheaters must always be stored in an upright position, i.e. never laid on one side, in order to prevent distortion or damage to internal components.


**! ATTENTION**



Handle with care. Do not drop or knock.

#### Handling

When removing desuperheaters from their packaging and removing the protective materials from the connections immediately prior to installation, take the utmost care to prevent foreign matter from entering inside the desuperheater.

 **ATTENTION!**

**When handling desuperheaters, keep the work area clear in order to prevent damage to property or injury to persons.**



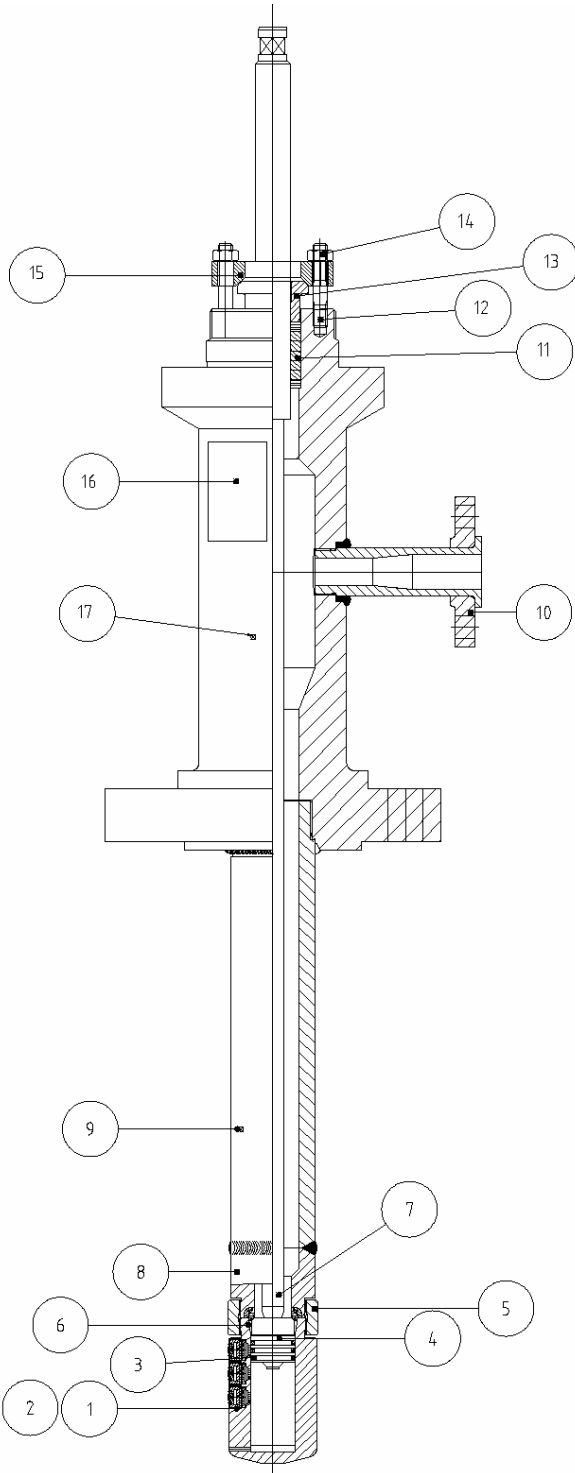
# I N S T R U C T I O N S

## For the installation and maintenance of DS1525 - DS1550 - DS2525 - DS2550 desuperheaters

### 8 INSTALLATION AND ASSEMBLY INSTRUCTIONS DS1525 – DS1550 – DS2525 – DS2550

#### 8.1 Cross-section drawings

- **DS1525 – DS1550:**



| Pos.   | Part name             | Material                |
|--------|-----------------------|-------------------------|
| 1+ 2 • | Spray nozzle assembly | AISI 410                |
| 3 •    | Piston ring           | AISI 431 Nitrided       |
| 4 •    | Piston                | AISI 420                |
| 5 •    | Tightening ring       | A-182 F11-F22           |
| 6      | Seat                  | Stellite 6              |
| 7 •    | Plunger               | AISI 431                |
| 8      | Seat housing          | A-182 F11               |
| 9      | Body pipe             | A-335 P11 / P22         |
| 10     | Water flange          | A217 WC6 o A182 F11/F22 |
| 11 •   | Gasket                | Graphite                |
| 12     | Stud                  | A-193 B7                |
| 13 •   | Packing gland         | AISI 431                |
| 14     | Nut                   | A-194 2H                |
| 15     | Gland plate           | AISI 304                |
| 16     | Name plate            | AISI 304                |
| 17     | Central body          | A-217 WC6 / WC9         |

- **RECOMMENDED SPARE PARTS**

- **DS2525 – DS2550:**

| Pos.   | Part name             | Material          |
|--------|-----------------------|-------------------|
| 1+ 2 • | Spray nozzle assembly | AISI 410          |
| 3 •    | Piston ring           | AISI 431 Nitrided |
| 4 •    | Piston                | AISI 420          |
| 5 •    | Tightening ring       | A-182 F91         |
| 6      | Seat                  | Stellite 6        |
| 7 •    | Plunger               | AISI 431          |
| 8      | Seat housing          | A-182 F91         |
| 9      | Body pipe             | A-182 F91         |
| 10     | Water flange          | A-182 F91         |
| 11 •   | Gasket                | Graphite          |
| 12     | Stud                  | A-193 B7          |
| 13 •   | Packing gland         | AISI 431          |
| 14     | Nut                   | A-194 2H          |
| 15     | Gland plate           | AISI 304          |
| 16     | Name plate            | AISI 304          |
| 17     | Central body          | A-182 F91         |

- **RECOMMENDED SPARE PARTS**

**Fig.1**





# I N S T R U C T I O N S

## For the installation and maintenance of DS1525 - DS1550 - DS2525 - DS2550 desuperheaters

### 8.2 REMOVING THE PACKAGING

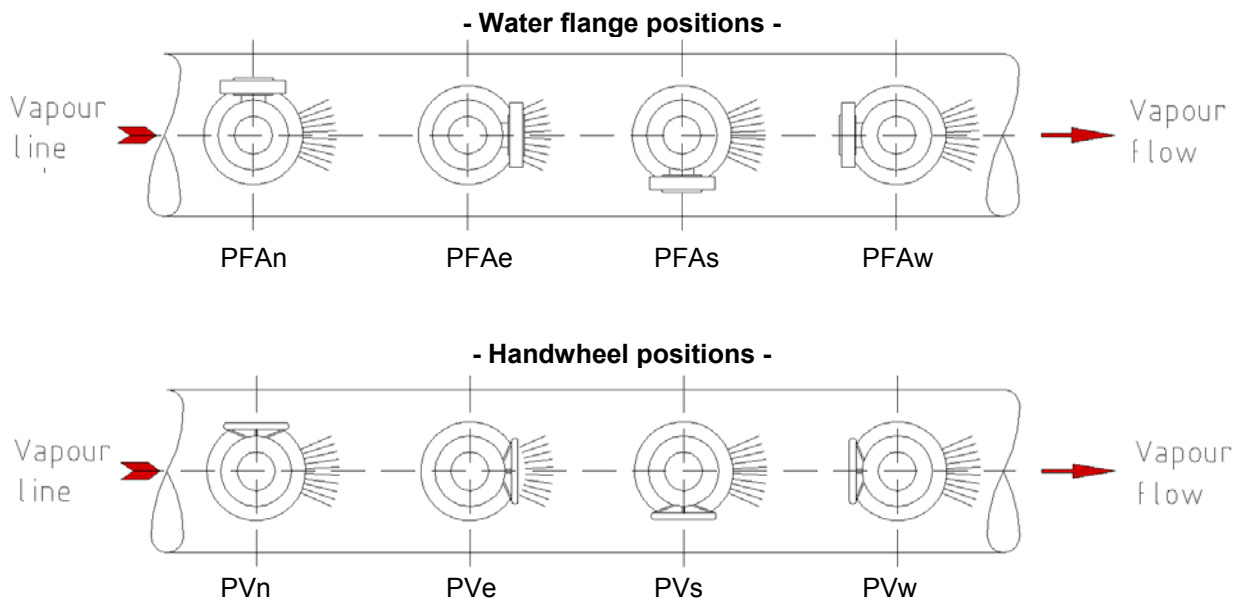
Carraro DS desuperheaters are packed with the utmost care in wooden crates or cardboard boxes so that they are protected during handling and transport to their place of installation. After hydrostatic testing, the desuperheater is flushed through with a protective agent formulated to protect the internal surfaces against corrosion. Should any damage occur during transport, however, the transport company or a representative of Carraro must be notified immediately. Remove the packaging with care, then check that the surfaces of the flanges, threads, actuators, connection pipes, etc. are not damaged (see Fig. 1).

### 8.3 INSTALLATION

Before installation, visually inspect the desuperheater, the actuator and any accessories, to make certain that they are not damaged. Check that the information given in the documentation and on the data plate, and the tag number correspond to the specifications of the order. Remove the desuperheater from its package by lifting it with slings (for heavy loads) wrapped round its body. Do not lift the unit by the water inlet connection, the actuator or other accessories. Do not remove the flange coverings until immediately before installation.

During installation of the desuperheater, use gaskets and fasteners which comply with the appropriate standards. Position the gasket on the mounting flange and gently insert the nozzle into the secondary pipe. Before tightening the studs, check that the spray cylinder is directed in the same direction as the vapour flow (see Fig. 2).

The desuperheater must not be installed in such a way that it is subject to tensions, forces and torque.



**Fig. 2**

The DS desuperheater has a standard body length as specified in the contractual drawings, whereas the mounting trunk of the vapour pipe must be made to measure. The length of this secondary pipe must be such that the central axis of the spray cylinder corresponds with the central axis of the vapour line ( $\pm 5$  mm). The nominal diameter of the mounting trunk must be as follows: for DS1525/DS2525 25 m<sup>3</sup>/h version - 3" (DN 80), with maximum tube schedule of 160; for DS1550/DS2550 50 m<sup>3</sup>/h version - 4" (DN 100) with maximum tube schedule of 160.

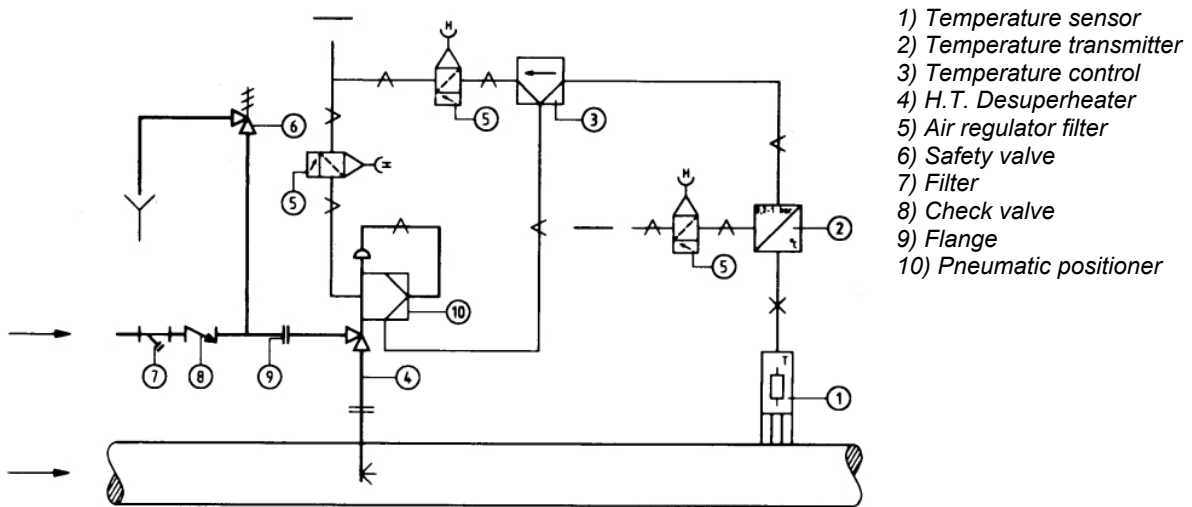


# I N S T R U C T I O N S

## For the installation and maintenance of DS1525 - DS1550 - DS2525 - DS2550 desuperheaters

The minimum length of tube required downstream varies according to application and is specified in the respective quote. This length without bends is necessary to prevent erosion caused by drops of water deposited on the walls of the pipes, the valves and the fittings, and is normally a minimum of 4, 6 m (a straight length of pipe is not generally necessary upstream). The distance that separates the desuperheater from the temperature sensor is between 12 and 15 m, although the specific distance for the application is generally specified in the quote.

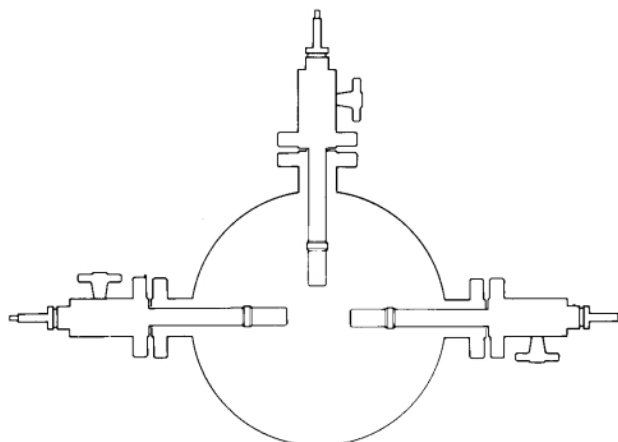
Longer distances ensure complete evaporation of the water at lower vapour speeds. The temperature sensor must be positioned in the top half of the pipe. Avoid fitting branches of the vapour pipe between the desuperheater and the sensor (see Fig. 3).



- 1) Temperature sensor
- 2) Temperature transmitter
- 3) Temperature control
- 4) H.T. Desuperheater
- 5) Air regulator filter
- 6) Safety valve
- 7) Filter
- 8) Check valve
- 9) Flange
- 10) Pneumatic positioner

**Fig. 3**

The unit can be fitted on either horizontal or vertical pipes. The direction of water injection must correspond to the direction of vapour flow. The desuperheater can be fitted at 90° to the vapour pipe, regardless of direction of flow. The possible variations are illustrated in Fig. 4. If installed horizontally, the unit must be mounted with a weight-compensation system.



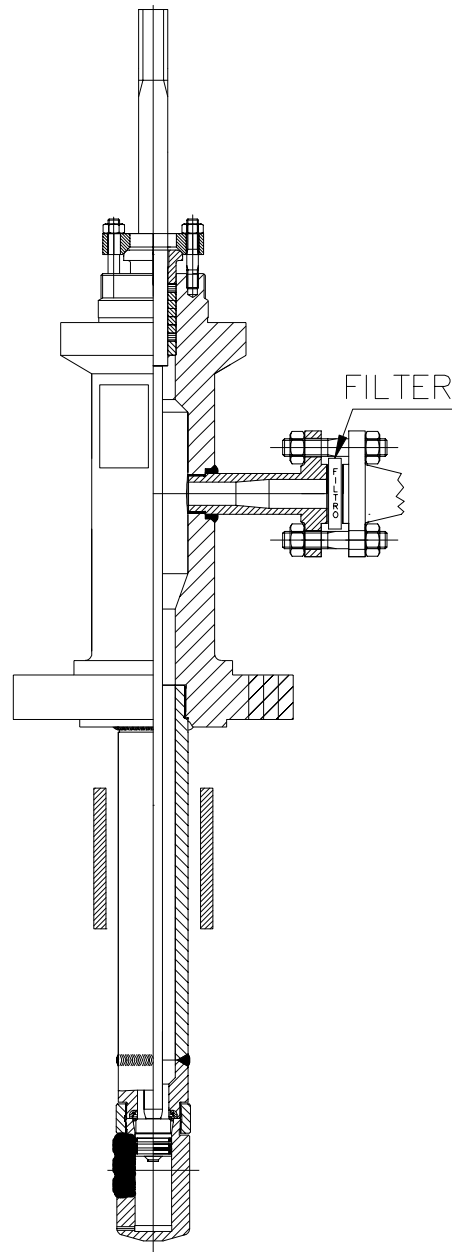
**Fig. 4**



# I N S T R U C T I O N S

## For the installation and maintenance of DS1525 - DS1550 - DS2525 - DS2550 desuperheaters

The supply water must be clean filtered and of excellent quality (e.g. boiler supply water) and must be at constant pressure at all times, as specified in the order documents. Each water supply line must be protected by its own filter with maximum mesh size of 0.1 mm (0.4 mm acceptable for nozzles from 'E' upwards). On request Carraro can supply a supplementary filter. The mainly application of Carraro's filter is to clean water from particles during the start up operations. If no other filter system is installed this filter can be left and periodically inspected.

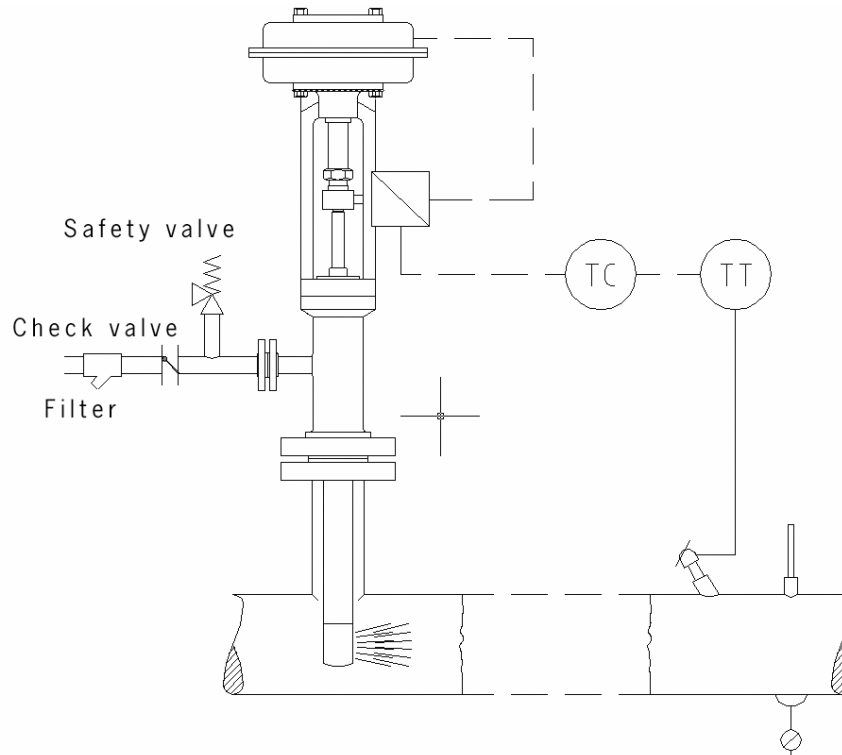


If closure components are envisaged in the water supply line, fit a safety valve of approved type. As for the vapour pipe, use gaskets and fasteners which comply with the codes of the respective pipes. Flush the water supply line before connecting the mounting flange of the desuperheater (see Fig. 5).



# I N S T R U C T I O N S

**For the installation and maintenance of DS1525 - DS1550 -  
DS2525 - DS2550 desuperheaters**



**Fig. 5**

## 8.4 START-UP

Make certain that all the components are installed correctly. The supply for the instrumentation air pipes must be connected as indicated in the instruction manual, together with the filter regulators and valve positioners. Similarly, calibrate the temperature control unit/transmitter in such a way that it responds automatically to temperature variations.

Heat the main vapour line and open the valve of the water supply line. Check the water pressure in the desuperheater and the operation of the transmitter and temperature control unit by manually increasing and reducing the output signal and observing the temperatures shown and recorded. Once there is satisfactory correspondence between the signals sent by the instruments and the actual temperature, it is possible to set the regulation point and activate the system in automatic mode.

You are advised to record the various coordinates of the vapour over a sufficiently long period, in order to check the operation of the system and make the necessary modifications.

## 9 MAINTENANCE

Maintenance of the desuperheater is extremely simple and does not require specific instruments or knowledge. Take extreme care when carrying out maintenance work, especially if using honing machines, compressed air and rotary machinery. It is imperative to wear goggles, gloves and other protective equipment, in accordance with the applicable safety procedures.



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# I N S T R U C T I O N S

## For the installation and maintenance of DS1525 - DS1550 - DS2525 - DS2550 desuperheaters

### 9.1 REMOVAL

Before removing the desuperheater from the system, check that the vapour and water pipes are completely depressurised, drained and bled. Bleed and remove the air supply line to the instrumentation. Slacken the studs on the water and vapour flange and remove the desuperheater from the system. It is advisable to move the unit to a workshop equipped with workbench and vice. Lift the unit using suitable slings wrapped round its body. Do not attempt to lift it by the actuator or any of the other accessories. The coupling of the plunger varies according to the type of actuator installed.

### 9.2 DISASSEMBLY

The desuperheater can be disassembled more easily if it is positioned horizontally with the section of the body extension firmly gripped in the vice. Grind the weld points on the nozzle, with a standard angle grinder. Check that the weld has been sufficiently removed to allow unobstructed rotation of the tightening ring. Unscrew the tightening ring by turning it anti-clockwise. Note that the body extension has a right-hand thread. To facilitate removal of the ring, tap it gently with a hammer. Note that the spray cylinder has a left-hand thread. In the event of difficulty in removing the tightening ring, grind it at two diametrically opposed points. Take care not to damage the thread of the body and of the cylinder (see Fig. 6).

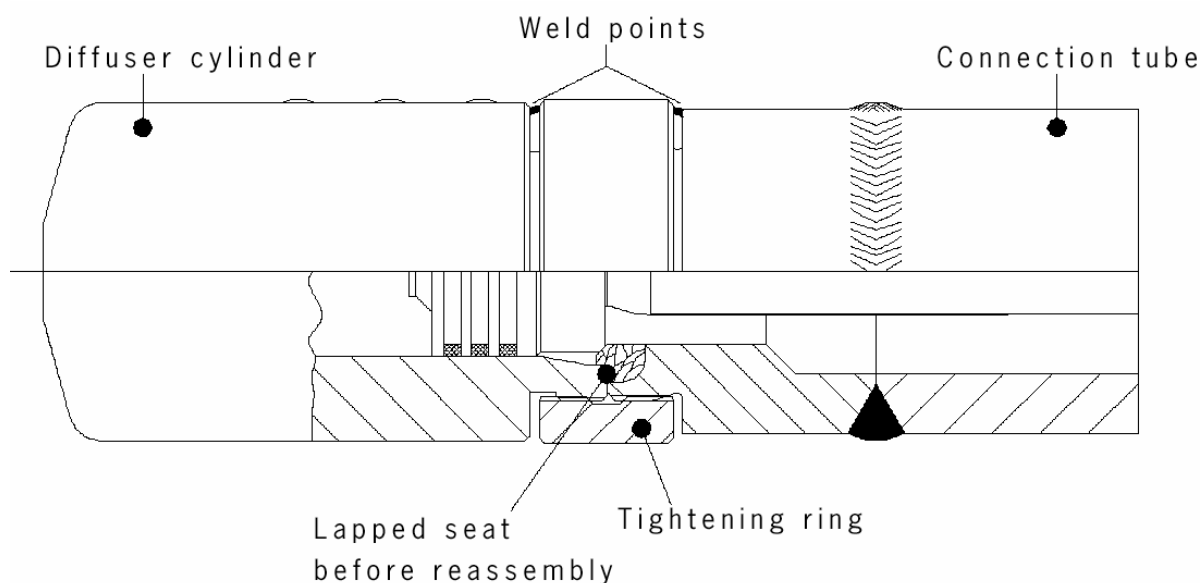


Fig. 6

### 9.3 SPRAY CYLINDER

Once removed, inspect the inside of the cylinder and check for any surface scratches or marks, which can be removed by polishing or grinding. The bore of the cylinder must not exceed 32 mm for the DS1525/DS2525 model and 45 mm for the DS1550/DS2550 model, with maximum out-of-round of 0.25 mm. Any debris must be removed from the nozzles with a compressed air jet. Inspect the nozzle outlet holes. These must show no signs of elliptical wear, roughness or damage that could adversely affect their performance. Thoroughly clean the thread of the cylinder, filing it with a small file where necessary.



# I N S T R U C T I O N S

## For the installation and maintenance of DS1525 - DS1550 - DS2525 - DS2550 desuperheaters

### 9.4 BODY EXTENSION

Examine the thread of the body extension and file it, if necessary, with a small file. If carried out regularly, scheduled maintenance and repair will ensure the correct operation of the valve.

### 9.5 PISTON ASSEMBLY

Extract the piston and plunger. The piston and plunger are always supplied as a single assembly. If the piston shows no signs of wear, it can be re-used. Replace the piston rings each time the unit is disassembled, taking care not to overload the rings during fitting. The rings have a mark on the top and must always be oriented in the direction of the gland for correct operation. Examine the condition of the plunger at the point at which it slides inside the gland, and remove any traces of graphite by polishing lengthways with fine emery cloth.

### 9.6 PACKING GLAND

Remove all the rings and components of the sealing system from the valve body. Thoroughly clean the gland with a rotary metal brush and/or a honing tool. The area must be kept clean in order to ensure that the valve seals correctly. *Do not use grease or lubricants in the area of the sealing system.* Always use genuine Carraro components supplied as a set (see Fig. 7).

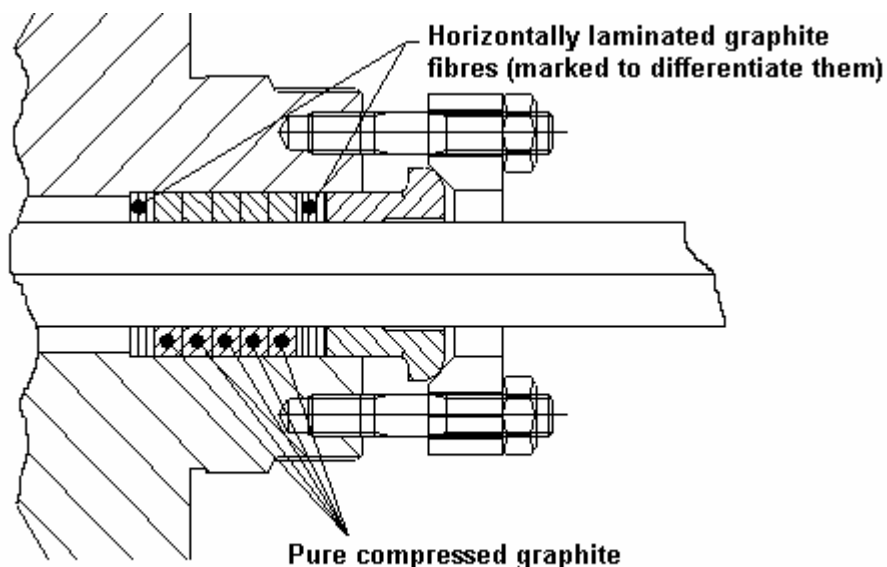


Fig. 7

### 9.7 RE-ASSEMBLY

Before refitting the valve, lubricate all the threads with a high-temperature-resistant nickel compound. Do not use grease or other oily lubricants because they could cause disassembly problems. Apply a thin layer of compound to the piston rings to prevent scoring. Position the grooves in the piston rings in such a way that they are at 120° to each other. Re-assemble the spray cylinder to the body extension. Use a fine abrasive paste to hone the seat of the cylinder and the body extension. As the seal is metal on metal, a perfectly concentric area of the seat is essential. Always use a new tightening ring. Position the spray



# I N S T R U C T I O N S

## For the installation and maintenance of DS1525 - DS1550 - DS2525 - DS2550 desuperheaters

cylinder so that it is correctly oriented (the nebulised water must be in the same direction as the vapour flow), then tighten the tightening ring.

### 9.8 WELDING

Once re-assembled, weld the spray cylinder for improved safety. It is imperative that this operation be undertaken by a competent welder. A welding procedure specification is available from Carraro on request. Both TIG and ARC welding are acceptable, and the recommended electrode material is ER NiCrMo3. At least 4 welds are necessary for the DS1525/DS2525 and at least 8 for the DS1550/DS2550. They must be 8 mm in length and diametrically opposed. One weld must secure the tightening ring to the body extension, and the other must secure the spray cylinder to the tightening ring. On completion, check the welding using appropriate penetrating liquids. There must be no cracks. If necessary, grind and check again until the weld is satisfactory (see Fig. 8).

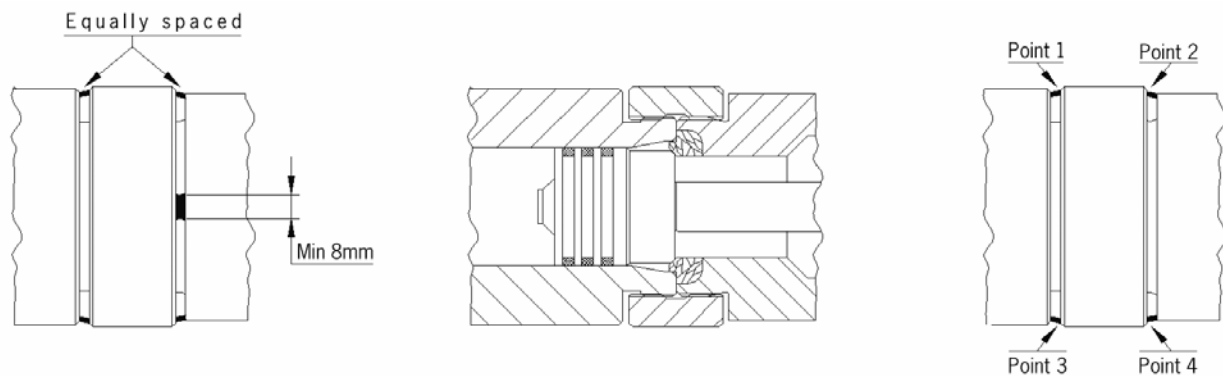


Fig. 8

### 9.9 RE-INSTALLATION

Refit the actuator to the desuperheater, referring to the data noted during disassembly when repositioning the plunger. Before re-installing the desuperheater check that the surfaces of the unit connection flanges are completely clean. Insert the desuperheater in the vapour pipe and check that the nozzle is correctly oriented, with the spray in the direction of the vapour flow. Lubricate the nuts and studs with a suitable lubricant for high temperatures and tighten uniformly, in accordance with the manufacturer's instructions. Before connecting the water supply line, flush the pipe and check that there are no restrictions and no contamination.



# I N S T R U C T I O N S

## For the installation and maintenance of DS1525 - DS1550 - DS2525 - DS2550 desuperheaters

### 10 REPLACEMENT PARTS

When ordering replacement parts, check and specify the identification number of the unit (shown on the data plate). For a cross-section drawing, see Fig. 1.

#### 10.1 INSPECTION PROCEDURE

The spray nozzles (1) and (2), the tightening rings (5), the piston (4) and the piston rings (3) are components subject to wear. The materials selected must be suited to the conditions of service of applications on vapour/water. It is also advisable to bear in mind that the temperature changes that take place at the desuperheaters are generally the largest in the whole plant. After the first year of service, you are advised to check the condition of the spray nozzle assembly, the integrated injection nozzles, the tightening ring and the welds. At the time of inspection, use penetrating or fluoride analysis liquids to check that these components are not cracked. Components with signs of cracking must not be re-used. Every two years of service, make certain that the heads are free from defects.

It is recommended that you replace the above components in any event, at least every five years of service.

It has been shown that observance of these precautions keeps the system reliable at all times.

**Note:** After each maintenance operation, replenish your stock of replacement parts, with all parts that you have used. The spray nozzle assemblies may have been specifically designed for a particular type of service. The delivery time for special components is 8 weeks.

#### 10.2 STORAGE

At the time of receipt, check that the crate and the desuperheater are free from damage. If you find damage to either the product or the package, notify a Carraro representative immediately. Before stocking the equipment, repair any superficial damage to the packaging in order to prevent the entry of dust or water. Check the information shown on the data plate and in the documentation, then return the units to their respective boxes/crates with the protective materials in place. In the event of short-term storage (up to 6 months), no additional conservation measures are necessary. Store the units in their original packing in a clean, dry, closed place. If it is necessary to store the valves outdoors, wrap the crates with a waterproof tarp.

In the event of long-term storage, use a dry, indoor area. Check that the desuperheater is completely dry and free from humidity. Apply a layer of lubricant, such as Cosmo, to machined surfaces, to the valve plunger and to the gland. Store the desuperheaters in their original packing and inspect them every 3 months to check their condition. Before bringing the desuperheaters into service, replace the sealing system and check the soundness of all components, such as the actuator seals, etc. in order to ensure correct operation. Follow the installation procedure shown in the use and maintenance manual.

**Note:** DS desuperheaters are classified as category I by European Directive 97/23/EC, and are marked with the CE mark.



### **ATTENTION!**

**Should it be necessary to weld the pipes, avoid connecting the earth connection to the valve, as this could cause damage to important sliding parts.**



# CARRARO®

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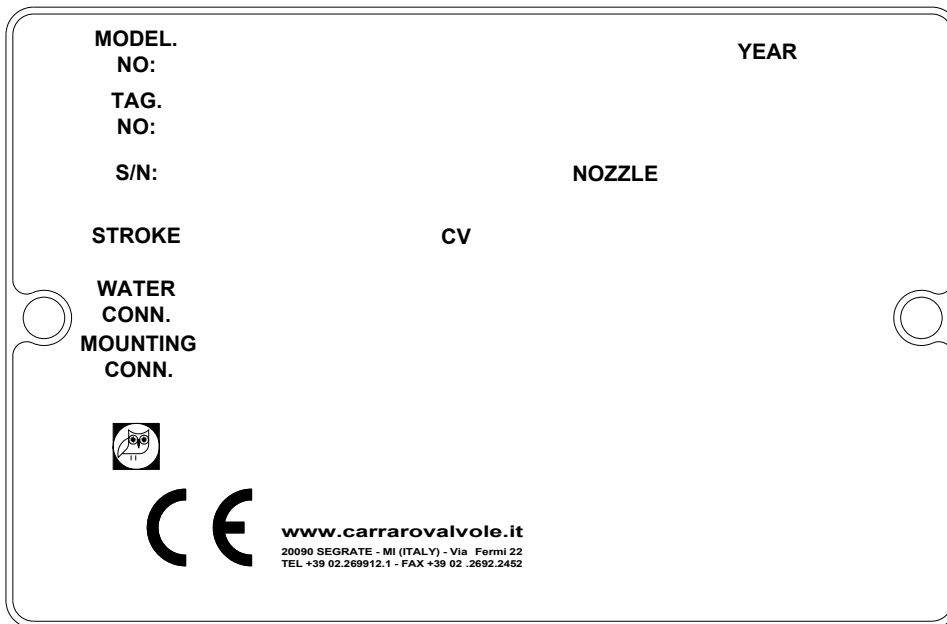


# I N S T R U C T I O N S

## For the installation and maintenance of DS1525 - DS1550 - DS2525 - DS2550 desuperheaters

### 11 REPAIRS

- 11.1 If it is not possible to eliminate the problems, send faulty desuperheaters to the supplier/manufacturer, together with a description of the problem.
- 11.2 In order to receive spare parts or information, always indicates the serial number shown on the name plate attached to the desuperheater.
- 11.3 Name plate (*example*)



- 11.4 To ensure the desuperheaters treated in this manual work correctly, they should be serviced by Carraro engineers or by Carraro-authorized Service Centres using original spare parts.



### ATTENTION!

**The manufacturer accepts no responsibility if modifications to the product or operations not described in this manual are carried out.**



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