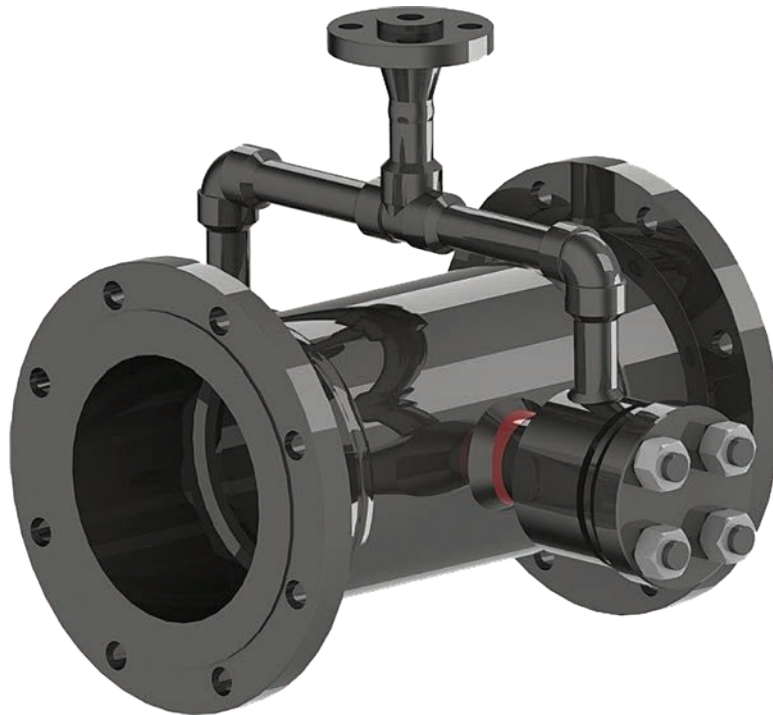


# DSH™ Series

## Desuperheater

Instruction Manual (Rev.B)



**THESE INSTRUCTIONS PROVIDE THE CUSTOMER/OPERATOR WITH IMPORTANT PROJECT-SPECIFIC REFERENCE INFORMATION IN ADDITION TO THE CUSTOMER/OPERATOR'S NORMAL OPERATION AND MAINTENANCE PROCEDURES. SINCE OPERATION AND MAINTENANCE PHILOSOPHIES VARY, BAKER HUGHES COMPANY (AND ITS SUBSIDIARIES AND AFFILIATES) DOES NOT ATTEMPT TO DICTATE SPECIFIC PROCEDURES, BUT TO PROVIDE BASIC LIMITATIONS AND REQUIREMENTS CREATED BY THE TYPE OF EQUIPMENT PROVIDED.**

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## Safety Information

### Important - Please read before installation

These instructions contain **DANGER**, **WARNING**, and **CAUTION** labels, where necessary, to alert you to safety related or other important information. Read the instructions carefully before installing and maintaining your control valve. **DANGER** and **WARNING** hazards are related to personal injury. **CAUTION** hazards involve equipment or property damage. Operation of damaged equipment can, under certain operational conditions, result in degraded process system performance that can lead to injury or death. Total compliance with all **DANGER**, **WARNING**, and **CAUTION** notices is required for safe operation.



This is the safety alert symbol. It alerts you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.



Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



Indicates a potentially hazardous situation which, if not avoided, could result in serious injury.



Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.



When used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, could result in property damage.

**Note: Indicates important facts and conditions.**

## About this Manual

- The information in this manual is subject to change without prior notice.
- The information contained in this manual, in whole or part, shall not be transcribed or copied without Baker Hughes's written permission.
- Please report any errors or questions about the information in this manual to your local supplier.
- These instructions are written specifically for the **Masoneilan™** DSH Series Desuperheater, and do not apply for other valves outside of this product line.

## Useful Life Period

The current estimated useful life period for the Masoneilan DSH Series Desuperheater is 25+ years. To maximize the useful life of the product, it is essential to conduct annual inspections, routine maintenance and ensure proper installation to avoid any unintended stresses on the product. The specific operating conditions will also impact the useful life of the product. Consult the factory for guidance on specific applications if required prior to installation.

## Warranty

Items sold by Baker Hughes are warranted to be free from defects in materials and workmanship for a period of one year from the date of shipment provided said items are used according to Baker Hughes recommended usages. Baker Hughes reserves the right to discontinue manufacture of any product or change product materials, design or specifications without notice.

### **Note: Prior to installation:**

- The valve must be installed, put into service and maintained by qualified and competent professionals who have undergone suitable training.
- All surrounding pipe lines must be thoroughly flushed to ensure all entrained debris has been removed from the system.
- Under certain operating conditions, the use of damaged equipment could cause a degradation of the performance of the system which may lead to personal injury or death.
- Changes to specifications, structure, and components used may not lead to the revision of this manual unless such changes affect the function and performance of the product.

Under certain applications this product:

- Can result in surfaces that present burn (hot) hazards to the end user including potential exposure to the media being processed by/through the product or equipment.
- Can have sharp or protruding edges or surfaces. When working on or with this product additional care may be necessary to avoid contact with these sharp surfaces.
- Can result in surfaces that present slip or loss of footing conditions to the end user. Additional measures should be considered during installation to prevent the collection of fluids/media or the occurrence of slip or trip hazards.
- Can be installed in poorly ventilated or confined areas, or in areas that may contain gases other than oxygen, which can lead to a risk of oxygen depletion and/or personnel asphyxiation. Additional protection shall be used in such installations.
- Can be installed in areas subjecting the end user to cramped or strained working positions. Additional policies and procedures shall be considered to reduce or remove the end user exposure to these conditions.
- Can produce elevated noise levels outside allowable limits for end user exposure. Site monitoring and testing shall be performed to verify any need for engineering or administrative controls to eliminate or reduce hazardous noise levels.
- Can be installed, serviced, or maintained at elevated heights. The end user shall properly use fall protection and appropriate safety equipment and practices to prevent the dropping of tools or equipment when working at heights.
- Can require manual or assisted lifting. It is the end user's responsibility to ensure the lifting means (product lifting points or equipment) are properly installed, torqued, and inspected for use in accordance with local codes and standards.
- Can shift during shipping/transportation. The end user shall take all precautions to determining a load shift and avoid harm.
- Can potentially release process/pressure if defects exist. Additional policies and procedures shall be considered to reduce or remove the end user exposure to these conditions.
- Can contain residual process media or stored energy (eg. trapped pressures, loaded springs, heavy shifting or unstable parts, etc.).
- Horizontal orientation or installations exposure the end user to additional risks for assembly/disassembly.
- Proper techniques shall be followed to reduce the end users exposure to these hazards.

Personal protective equipment (PPE) and safety equipment shall be used in accordance with local requirements.

**Note: Material Safety Data Sheets (MSDS) shall be available and reviewed in accordance with local requirements. Products shall be installed, serviced, and maintained in accordance with all local and national codes and standards by properly qualified (licensed/certified/ trained) personnel.**

Prior to installing, maintaining, servicing, or inspecting the product or equipment, ensure the system or process is in a safe state (e.g., depressurized, adjusted to ambient temperature, properly secured, process properly contained/ isolated, etc.)

Prior to commissioning or returning the equipment to service, local codes and standards may require that testing (e.g., overpressure, leakage, mechanical or electrical operation, etc.) be conducted to verify the installation. Additional protection shall be taken into consideration to protect the end user from exposure to the hazards associated to the failure modes of the testing, potential hazards should leaks be found, etc.

## **WARNING**

**Installation of this device in proximity of people, or property that may be adversely affected should the device fail, leak, generate excessive noise, or other such hazard, should be minimized and/or precautions taken to reduce the associated hazards. Loitering or gathering around this type of equipment should be avoided.**

### **Recommendations prior to Installation into Pipeline**

The desuperheater should be properly prepared and configured as per the recommendations below prior to installation to ensure the best performance.

Note: The functional desuperheater nozzles should not be installed when connecting into the pipeline or during flushing.

### **Working Space Requirements**

## **DANGER**

**At a minimum, an envelope 3 feet (1m) from any working surface on the desuperheater body should be maintained to facilitate easy access.**

### **Appropriate Lift Points**

The Desuperheater assembly may be lifted by the body. Take note of the C.O.G. for the assembly or component to be lifted. Straps should be used around the desuperheater pipe in the horizontal orientation. Care must be taken to avoid damage to any installed fixtures and accessories throughout the lifting process.

## **CAUTION**

**Do not lift any portion of the assembly by the water ring or related piping connections.**

The center of gravity (C.O.G.) for each component and assembly is included on their respective drawings for reference. Appropriate lifting locations are included if necessary.

# Introduction

## Scope

The following instructions are designed to guide the user through the installation and maintenance of the DSH Series Desuperheater.

The Desuperheater product is part of Baker Hughes Masoneilan's Severe Service Product portfolio, and is custom designed to fit our customers' high temperature and high pressure applications. For this reason, sections of this instruction manual may be replaced with specific drawings and descriptions that apply only to the desuperheaters that are specified for use on a given project. For further detailed information on your specific DSH Series Desuperheater design, please contact the Baker Hughes Masoneilan factory.

## Serial Plate

The serial plate is usually fixed to the nozzle housing. It indicates information about the desuperheater including size and type, pressure class rating, body material, and serial number.

Careful attention must be paid towards the serial plate prior to pressurizing of the Desuperheater. Inlet, outlet, and water connections may be independently designed for the conditions at their point of operation, thus ANSI pressure class ratings may differ at each connection.

## After Sales Service

Baker Hughes offers Masoneilan After Sales Service comprised of highly qualified technicians to support the installation, operation, maintenance and repair of its equipment. For support contact the local Baker Hughes representative or Baker Hughes Masoneilan factory located closest to you.

## Spare Parts

Only Masoneilan replacement parts should be used when carrying out maintenance operations. Obtain replacement parts through local Baker Hughes representatives or Masoneilan Parts Department.

When ordering spare parts, the MODEL AND SERIAL NUMBERS indicated on the manufacturer's serial plate MUST BE GIVEN. The serial plate is on the nozzle housing.

# Unpacking

Care must be exercised when unpacking the product to prevent damage to the accessories and component parts. Contact the local Baker Hughes Sales Office or Service Center with any issues or problems. Be sure to provide the model number and serial number in all correspondence.

# Installation

Note: It is highly recommended to review the Desuperheater Installation Guide (GEA33465) for a thorough explanation of the proper Desuperheater system layout. These design guidelines are intended for performance optimization of the steam conditioning system.

The recommendations provided on the installation guide include, but are not limited to:

- Upstream straight pipe length
- Downstream straight pipe length
- Temperature sensor quantity and location
- Pressure sensor location
- Pipe size and selection
- Downstream piping material transition
- Spray water system and strainer recommendations
- Piping drain locations

For optimum valve performance, it is critical to implement as recommended on the SteamForm Installation Guideline.

## Piping Cleanliness

Before installing the desuperheater in the line, clean piping and desuperheater of all foreign material such as welding chips, scale, oil, grease or dirt. Gasket mating surfaces must be thoroughly cleaned to ensure leak-free joints. Sacrificial start-up fixtures can be purchased to protect the operational components during the installation and line flushing phases.

## WARNING

**If major system or piping modifications (or repairs) are performed, thorough flushing and blow down of the system will be required. Sacrificial components should be installed in the desuperheater to protect the integrity of the flow passages. Failure to follow this warning will violate the valve warranty agreement and could result in control instability, excessive noise levels, and leakage.**

## Isolation Bypass Valve

To allow for in-line inspection, maintenance and removal of the desuperheater without service interruption, provide a manually operated shutoff valve on each side of the desuperheater and a manually operated throttling valve in the bypass line. The location of the downstream isolation valves requires special consideration in the case of the DSH Series Desuperheater as a result of the spray water injection system on the outlet of the Desuperheater valve. If the downstream isolation valve is close coupled to the Desuperheater, it will be difficult to properly control downstream temperature as the water injection becomes interrupted by the location of the isolation valve. Please contact the factory for specific recommendations on a suitable downstream location of the isolation valve.

## Flow Direction

The desuperheater must be installed so that the process fluid will flow through the desuperheater in the direction indicated by the flow arrow located on the body.

## Welded Connections

### CAUTION

Carefully follow the installation steps defined in the sections noted below prior to performing weld procedures.

### CAUTION

Carefully review the information in this section prior to welding any desuperheaters inline. Refer any additional questions to the local Baker Hughes Sales Office or Service Center.

## Welding Process

Perform welding process in accordance with the standard requirements for the materials and weld construction of the specific desuperheater. Apply post weld heat treatment if required.

## Post Weld Cleaning and Assembly

Inspect the body and components for cleanliness and surface condition. Remove any foreign materials, such as weld chips, slag or scale. Make sure there are no nicks, scratches, burrs or sharp corners on any sealing surfaces. Clean all gasket interface surfaces and reassemble using new gaskets to ensure sealing integrity.

## Nozzles

### Opening Nozzle Housing

**Note: If the Desuperheater is shipped with the spray water nozzles installed, it is advisable to remove these critical devices during operations such as pipeline flushing and hydrostatic testing. Blank (blind) nozzles may be employed to separate hydrostatic test regions and protect important surfaces.**

The valve nozzle housings must always be reassembled with a new set of gaskets.

Before disassembling, make sure the appropriate gaskets are available for replacement.

Remove the nozzle flange nuts from the nozzle housing (Figure 1).

Lift the nozzle housing flange from the nozzle housing.

Remove the nozzle flange gasket.

The nozzle holder may have a snug fit within the nozzle housing. For ease of removal of the nozzle holder, screw a bolt (per Table 1) into the exposed threaded connection to provide a lifting point. Pull nozzle holder to remove from nozzle housing.

Remove nozzle gasket from the bottom of the nozzle housing.

If installing an alternative nozzle, complete the following additional steps:

Install a new inner nozzle gasket in the gasket groove at the bottom of the nozzle housing.

Install the nozzle into the housing.

Install a new outer nozzle gasket in the gasket groove.

Mount the nozzle flanges and nuts to the housings.

Torque the nuts to the values indicated on the assembly drawing and to the required torquing sequence shown in Figure 1 in at least 6 equal torque steps (10%, 20%, 40%, 60%, 80%, and 100% of the prescribed value) unless otherwise specified.

| Nozzle C <sub>v</sub> | Lifting Bolt Size |
|-----------------------|-------------------|
| 0.4                   | 1/4"              |
| 0.8                   | 3/8"              |
| 1.5                   | 1/2"              |
| 3.0                   | 3/4"              |
| 5.0                   | 1"                |
| 10.0                  | 1-1/2"            |

Table 1 - Nozzle removal bolts

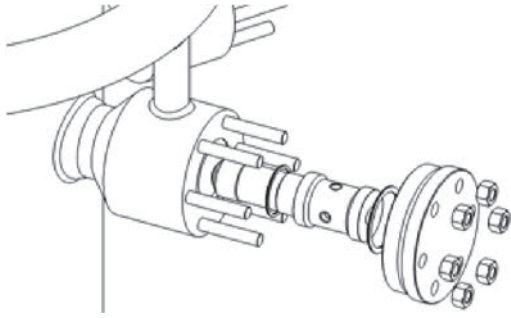


Figure 1 - Nozzle housing

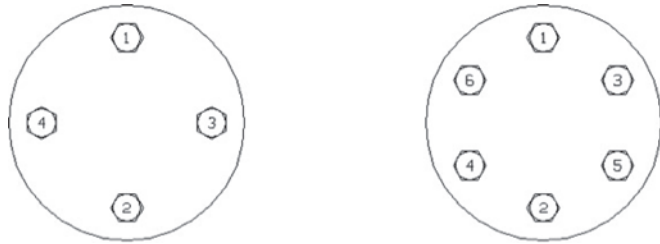


Figure 2 - Bolt torquing sequences for nozzle flanges

## Flushing Operations

Pipeline flushing is recommended to clean debris from the pipeline resulting from its construction.

## Water Ring Hydrostatic Testing

The hydro assembly drawing will specify whether the water ring should require a separate hydrostatic test. DO NOT perform a water ring hydrostatic test with the functional nozzles as expected leakage and damage may occur to the functional nozzles. When the blank nozzles are installed, ensure that both the inner and outer gaskets are installed.

## Downstream or Full Pipeline Hydrostatic Testing

If the water ring is to be hydrostatically tested in conjunction with the downstream pipe, it will be necessary at this point to remove the blank nozzles, and reinstall the flange with a new outer gasket and inner guide ring if required. It is important to note that until hydrostatic testing has been fully completed; functional spray nozzles must not be installed.

## Nozzle Assembly

Desuperheating performance is reliant upon water injection of the desuperheater spray nozzles. The nozzle must maintain an aerosol spray effect, and a hollow cone spray pattern. Weld slag, rust, and other debris in the water lines can disturb the nozzle spray pattern and can result in poor water injection and temperature control. Periodic inspection of the spray nozzle's water pattern should be conducted to ensure nozzle performance. Refer to the instructions under "Inspecting Nozzle Performance" for the detailed test procedure.

To assemble the nozzles into the desuperheater:

After inspecting the surfaces of the nozzle housing for any damage or debris, install the nozzle gasket into the bottom of the nozzle housing.

Securely install the nozzle holder into the nozzle housing. The nozzle holder should fit flush with the housing surface, otherwise remove the nozzle holder and confirm the nozzle is clean from debris.

Install the nozzle flange gasket into the groove on the nozzle housing.

Place the nozzle housing flange over the nozzle flange studs. Securely tighten the nozzle flange nuts to the factory suggested torque.

## CAUTION

The nozzle assembly is screwed and locked in place using a high temperature adhesive to prevent part from coming loose due to thermal expansion caused by the steam line. This assembly should not be disassembled, and must be purchased as a complete assembly.

## Gaskets

Gasket seating surfaces must be free of dents, scratches, and corrosion. Metal gasket glands should have a radial or circular serration pattern with a surface roughness of 63 to 250 RMS. Clean mating surfaces as required and replace any non-conforming parts. Spiral-wound gaskets must always be replaced after disassembly.

## Inspecting Nozzle Performance

Follow the disassembly instructions shown under the "Opening Nozzle Housing" section.

1. With the nozzle holder removed from the nozzle housing, plug the threaded holes in the side of the nozzle housing using threaded plugs as listed in Table 2 (nozzle plug size).
2. Connect a water source to the threaded connection shown in Table 1 (lifting bolt size).
3. Apply pressure to the water line and observe the spray pattern of the nozzle. The spray pattern should be uniform and consistent around the perimeter of the nozzle head.
4. If nozzle spray pattern is disturbed, continue flushing procedure with higher pressure water to determine if nozzle can be unblocked.
5. If problem persists, contact the Baker Hughes Masoneilan factory for a replacement nozzle assembly.

**Note: The water pressure must be a minimum of 30 PSIG to ensure the nozzle will overcome the spring coefficient and spray properly.**



| Nozzle C <sub>v</sub> | Threaded Plug Size | No. of Plugs Required |
|-----------------------|--------------------|-----------------------|
| 0.4                   | 1/8"               | 2                     |
| 0.8                   | 1/8"               | 3                     |
| 1.5                   | 1/4"               | 3                     |
| 3                     | 1/4"               | 5                     |
| 5                     | 3/8"               | 4                     |
| 10                    | 1/2"               | 6                     |

Table 2 - Nozzle plug size

## Replacing Nozzle Assembly

The Desuperheater spray nozzles are carefully assembled and calibrated to provide the specified performance. When replacing nozzles that have become blocked or damaged, only disassemble the parts noted in the following instructions.

1. Remove the spray nozzle holder, shown in Figure 5, from the nozzle housing.
2. Break the tack weld attaching the spray nozzle assembly to the nozzle holder.
3. Unscrew the nozzle assembly from the nozzle holder.

| Nozzle C <sub>v</sub> | Strainer Mesh Size |
|-----------------------|--------------------|
| 0.4                   | 200                |
| 0.8                   | 200                |
| 1.5                   | 100                |
| 3                     | 100                |
| 5                     | 100                |
| 10                    | 50                 |

Table 3 - Recommended Strainer Size

### CAUTION

The nozzle assembly, shown in Figure 6, is screwed together and locked in place using a high temperature adhesive to prevent the part from coming loose due to the thermal expansion caused by the steam line. This assembly should not be disassembled, and must be purchased as a complete assembly.

### WARNING

Failure to install the appropriate strainer can result in blockage of nozzle. This can impact heat sensitive systems.

4. Inspect the inside of the nozzle holder to ensure it is clean and free of any debris.
5. Screw replacement nozzle assembly into nozzle holder.
6. Tack weld nozzle assembly to nozzle holder to ensure nozzle does not unscrew while in line.

**Note:** To prevent blockage of the small nozzle orifices, an inline strainer must be installed upstream of the valve. Table 3 provides a list of recommended strainer sizes.

# Inspection and Maintenance

For applications that may see high thermal gradients, Baker Hughes recommends periodic inspections of the liner and weld joints.

## External Inspection

Inspect equipment at ambient temperature and pressure with insulation removed. Visually inspect all welds on the desuperheater for cracks or inconsistencies per ASME B31.1 Section 136.4.2. Welds to be inspected:

- liner pins, water connection branch,
- nozzle housing branch
- down tube connections
- water ring caps
- inlet/ outlet circumferential field welds.

Consult Baker Hughes if cracks or damage is discovered.

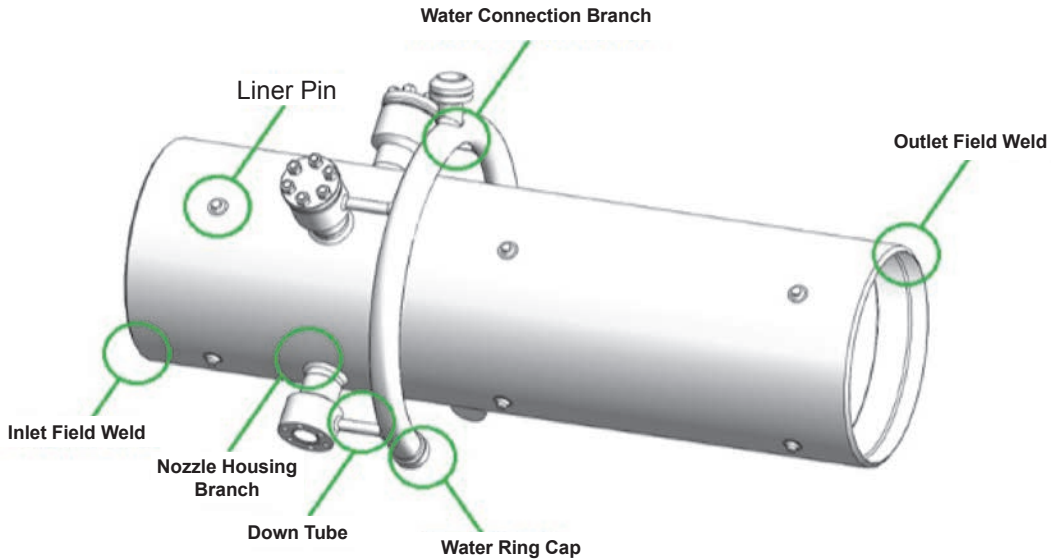


Figure 3 - External inspection

## Internal Inspection

Inspect equipment at ambient temperature and pressure. Visually inspect the liner, pins, and accessible weld roots per ASME B31.1 Section 136.4.2. Inspect the downstream liner surface for erosion. Visual inspection can be accomplished using a borescope. The inside of the pipe can be accessed by removing one of the spray water nozzles as shown below. Areas to be inspected:

- liner pins
- inside surfaces of liner
- inlet/outlet weld roots

Consult Baker Hughes if cracks or erosion damage is discovered.

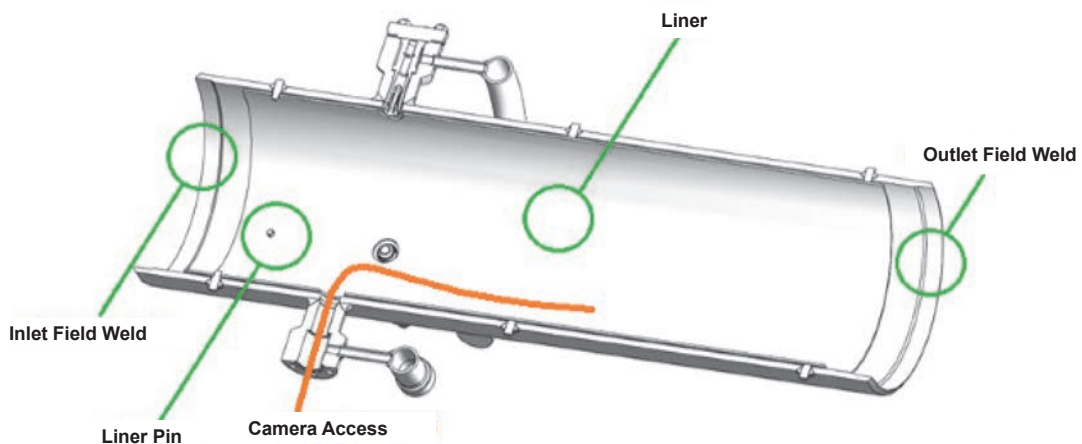


Figure 4 - Internal inspection

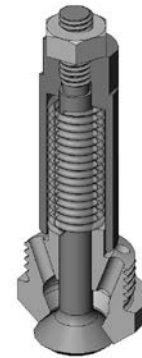
# Parts Reference For DSH Series Desuperheater

| Item No. | Description               |
|----------|---------------------------|
| 1        | Body                      |
| 2        | Nozzle S/A                |
| 3        | Nozzle Holder             |
| 4        | Nozzle Gasket             |
| 5        | Nozzle Flange Gasket      |
| 6        | Nozzle Housing Flange     |
| 7        | Nozzle Flange Stud        |
| 8        | Nozzle Flange Nut         |
| 9        | Flow profiler/Lo-dB plate |

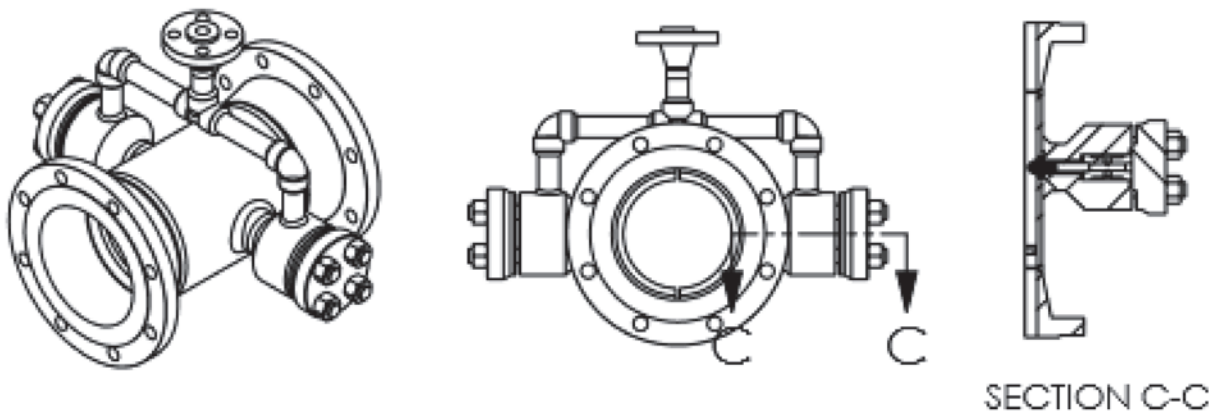
**Table 4 - Parts reference**



**Figure 5 - Spray nozzle holder**



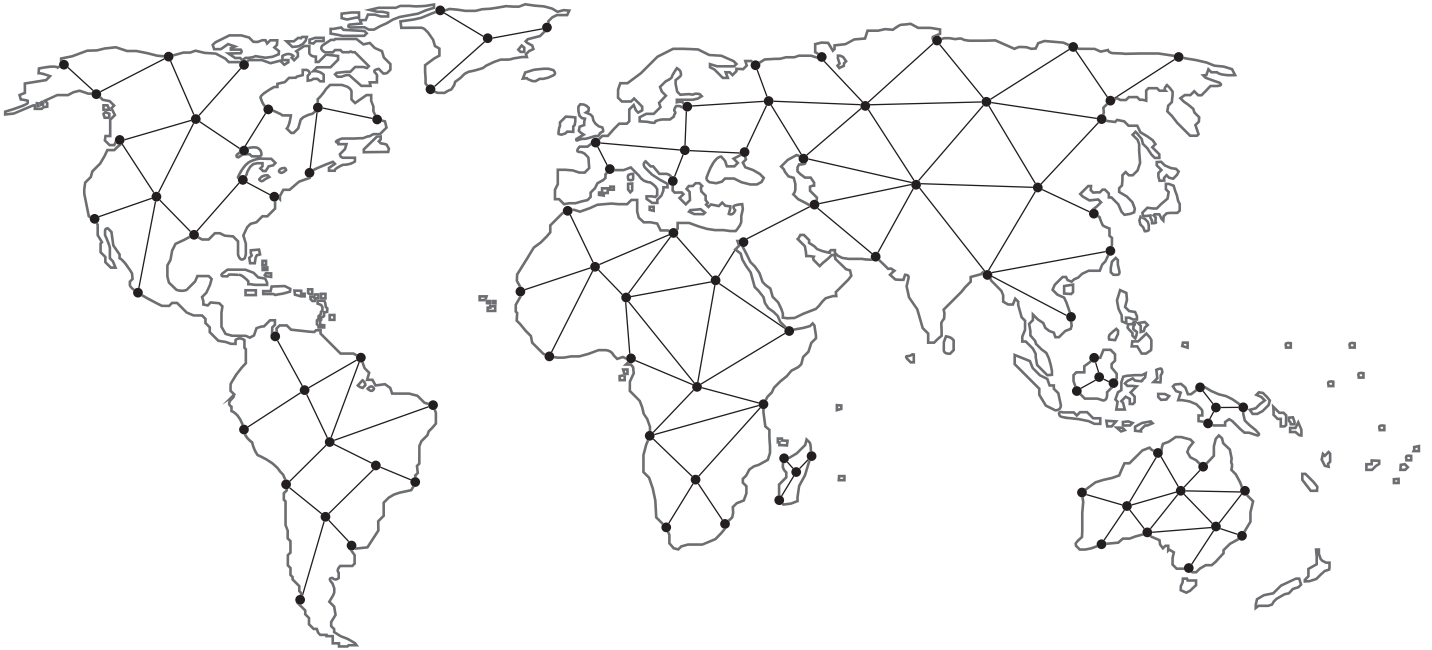
**Figure 6 - Spray nozzle assembly**



**Figure 7 - Flow Profiler Style with Nozzle Section View**

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[valvesupport@bakerhughes.com](mailto:valvesupport@bakerhughes.com)

[valves.bakerhughes.com](https://valves.bakerhughes.com)

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