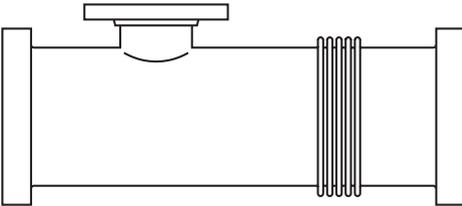


IJH

Instantaneous Jet Heater

Installation and Maintenance Instructions



1. Safety information
2. General product information
3. Installation
4. Operation
5. Maintenance
6. Commissioning
7. Spare parts

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.

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 product complies with the requirements of the European Pressure Equipment Directive 97/23/EC and carries the CE mark when so required. The product falls within the Pressure Equipment directive categories as shown below:

Application	Group 1 Gases	Group 2 Gases	Group 1 Liquids	Group 2 Liquids
Steam		Will not exceed Cat. 3		
Water				Will not exceed Cat. 2

- i) This product has been specifically designed for use on steam which is in Group 2 of the above mentioned Pressure Equipment Directive.
- ii) Check material suitability, pressure and temperature and their maximum and minimum values. 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 overtemperature 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.

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 opened and closed progressively 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 the 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 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.

1.13 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 may reach temperatures in excess of 570°C (1058°F).

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

1.14 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.

1.15 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.

1.16 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.

— 2. General product information —

2.1 General description

An IJH Instantaneous Jet Heater is designed to heat cold liquid when steam comes into direct contact with it. As the steam comes into contact with the liquid, it immediately condenses, thus giving up its latent heat and, in turn, heating the liquid.

The Instantaneous Jet Heater ensures that the steam and liquid are uniformly mixed, thereby eliminating both the noise and vibration usually associated with this type of process.

This document covers the Installation, Operation and Maintenance Instructions for Spirax Sarco IJH Instantaneous Jet Heaters having flanged connections. The internal combining nozzle is fully welded into the unit and cannot be removed. There are no spares for this type of unit.

Standards

These products fully comply with the requirements of the European Pressure Equipment Directive 97/23/EC.

Certification

This product is available with certification to EN 10204 3.1. **Note:** All certification / inspection requirements must be stated at the time of order placement.

2.2 Materials

The materials of construction for an IJH depend upon the following:

- a) The corrosive nature of the liquid passing through the IJH.
- b) The size of the IJH (reflects how the IJH is designed and made).
- c) The Mechanical Design Temperature (MDT).
- d) The Minimum Metal Design Temperature (MDMT, not often specified).

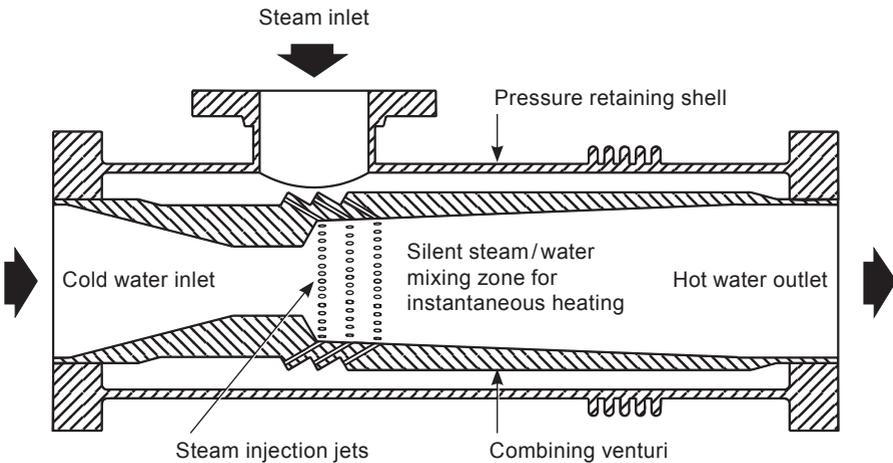
The most common materials of construction for an IJH is carbon steel and stainless steel. Sometimes, a carbon steel shell with a stainless steel combining tube is employed.

Component	Carbon steel	Stainless steel Gr. 316L
MDT Mechanical Design Temperature	up to and including 425°C	up to and including 500°C
Pipe	ASTM A106 Gr. B	ASTM A312 TP 316L
Fittings	ASTM A234 WPB	ASTM A403 WP 316L
Forgings	ASTM A105N or ASTM A350 LF2N	ASTM A182 F316L
Bar	ASTM A350 LF2N	ASTM A479 316L
Plate	ASTM A516 Gr. 70	ASTM A240 316L
Flanges	ASTM A105N	ASTM A182 F316L
Bolts	ASTM A193 Gr. 7	ASTM A193 Gr B8
Nuts	ASTM A194 Gr. 2H	ASTM A194 Gr 8
Washers	ASTM F436 Gr. 8 or BS 4320 Gr. 8 or BS 3410 Gr. 8	ASTM F436 Gr. A2 or ASTM F436 Gr. A4 or BS 4320 Gr. A4 or BS 3410 Gr. A2 or BS 3410 Gr. A4
Bellows	Options of: Stainless steel type 321 or Inconel 625	

2.3 Mechanical Design Temperature and Flange rating

< 374°C	ASME 150, ASME 300 and ASME 600
	EN 1092 PN16, PN25 and PN40 Slip-on (Weld neck optional)
374 - 525°C	ASME 150, ASME 300 and ASME 600
	EN 1092 PN16, PN25 and PN40 Weld neck (Slip on N/A)
375 - 570°C	ASME 150, ASME 300, ASME 600, ASME 900 and ASME 1500
	EN 1092 PN16, PN25, PN40, PN63 and PN100 Weld neck (Slip on N/A)

Please note: Other connections are available upon request e.g. Sanitary clamp connections.



Please note that for clarity welds are not shown.

Fig. 1 IJH Instantaneous Jet Heater

2.4 Inspection and Performance Confirmation

2.4.1 Receiving Inspection

Although Spirax-Sarco Limited carries out a full inspection of all units before dispatch, damage may occur during transit. On receipt of the unit, a visual inspection will show any external damage and hence indicate any possible internal damage that may have occurred. If damage has occurred, please do not hesitate to contact us.

2.4.2 User's Rating Inspection

Before installation of the IJH Instantaneous Jet Heater, the user must ensure that the mechanical rating of the unit is suitable for the intended service.

Details of the mechanical rating can be found on the name-plate and associated documentation.

3. Installation

Note: Before actioning any installation observe the 'Safety information' in Section 1.

It is important that installation should only be carried out by qualified, experienced personnel, who are familiar with the fitting of Instantaneous Jet Heaters and have read and understood all the instructions in these Installation and Maintenance Instructions.

Installation considerations:

- 3.1** Spirax Sarco IJH Instantaneous Jet Heaters can be installed and operated in any position but, the preferred orientation is to have the liquid flow horizontal with the steam branch on the top of the unit. If in doubt, contact Spirax-Sarco Limited to verify suitability of a non-standard orientation.
- 3.2** The connecting piping should be sized and installed so as to provide as little resistance to fluid flow as possible. Pipeline frictional losses must always be considered when specifying IJH Instantaneous Jet Heaters.
- 3.3** The incorporation of connections for pressure/temperature gauges in the connecting pipework is recommended. If any operating difficulties are encountered, it may be necessary to install gauges to identify a particular problem - The closer these connections are placed to the connecting flanges of the unit, the better.
- 3.4** It is recommended that the connecting pipework should have at least the same bore as the mating unit flange. However, if this is not possible, slow tapers should be installed, preferably 6 to 10 pipe diameters away from the unit.
- 3.5** All piping must be made free of foreign materials (weld spatter etc.) which could potentially clog the unit when in operation.
- 3.6** Please note that the unit is to be fully supported. The connections on the IJH Instantaneous Jet Heater are not designed to be load bearing – All pipework should be fully supported adjacent to the unit. Allowances for the effects of thermal expansion should also be included in the design of the connecting pipework. This is the responsibility of the customer.
- 3.7** Spirax-Sarco Limited strongly recommends the incorporation of strainers in both the steam line and cold liquid line. The strainer in the steam line should be positioned upstream of any control valve and, the strainer in the liquid line should be positioned upstream of the unit but, no closer than 6 pipe diameters from the liquid inlet flange.
- 3.8** It is essential that the installation provides a sufficient withdrawal distance on the cold liquid inlet to allow the internal combining nozzle to be pulled along the center line of the unit, out of the body. As a guide, the withdrawal distance required for removal of the combining nozzle is the same as the overall length of the unit.
The withdrawal distance can be provided by either installing a straight length of pipe or an elbow immediately before the cold liquid inlet. Whichever type of installation is provided, the following are essential:
 - i) Any adjacent pipework should not restrict the removal of this assembly.
 - ii) In the case of an elbow being used, any adjacent pipework or equipment must not foul the withdrawal distance.
- 3.9 Unit installation** - Installation into the surrounding pipework is easy; only three connections are necessary:
 - i) The '**inlet connection**' is to be connected to the cold liquid supply line.
 - ii) The '**steam connection**' is to be connected to the steam supply line.
 - iii) The '**outlet connection**' is to be connected to the downstream pipeline - Hot liquid supply line.

Please note that all connections are flanged.

4. Operation

4.1 General information

IJH Instantaneous Jet Heaters are simple in construction and essentially consist of two parts:

- i) The body or outer shell.
- ii) The combining nozzle.

Please note that for clarity welds are not shown.

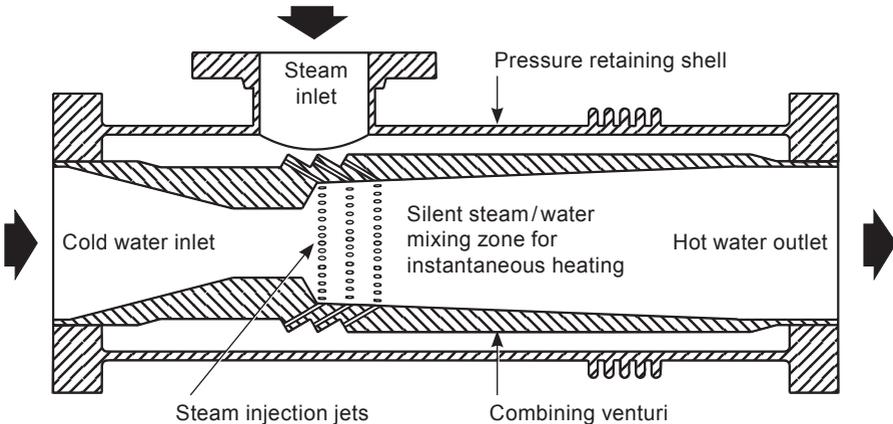


Fig. 2 IJH Instantaneous Jet Heater

Cold liquid is introduced to the IJH under pressure, whereupon it is accelerated through the converging jet nozzle, the speeding up of the liquid results in a local pressure drop as pressure energy is converted to kinetic (velocity) energy. Steam is then admitted to the low pressure area through a pre-designed series of small steam injection jets, which are drilled into the combining nozzle. When the steam enters the low-pressure region, the steam immediately condenses and gives up its latent heat, thereby increasing the temperature of the liquid. This method of direct contact between the incoming liquid and steam is a silent heating process and gives rise to the emerging hot liquid being well mixed and uniform in temperature. This method of combining the steam and liquid also prevents backing up of the liquid into the steam line, should the liquid be under a higher pressure than the heating steam.

The heated liquid discharges through the venturi outlet of the combining nozzle section, simultaneously undergoing a pressure rise, as velocity energy is re-converted back into pressure energy. This result in the unit being able to overcome normal line losses on the discharge side and, in some case, dependent upon the available steam pressure, the discharge pressure of the hot liquid may actually be higher than the cold liquid inlet pressure.

4.1.1 Pre-operational check

1. Check all installation procedures have been carried out.
2. Take all precautions necessary to handle the possibility of leakage.
3. Ensure that all line restrictions have been removed.
4. Ensure that any discharge line valves are fully-open.
5. Ensure that the steam supply valve is fully-closed.

4.1.2 Operation

1. Open the liquid inlet valve fully and allow the flow to settle down.
2. Check that the necessary pressure is available at the liquid inlet.
3. Open the steam supply valve.
4. Check that the necessary steam pressure is available at the steam inlet.
5. The IJH Instantaneous Jet Heater should now be working.
6. To shut down - close the steam supply valve first, followed by the liquid inlet valve.

5. Maintenance

Note: Before actioning any maintenance programme observe the 'Safety information' in Section 1.

Maintenance should only be carried out by qualified, experienced personnel, who are familiar with Instantaneous Jet Heaters and have read and understood all the installation and maintenance instructions within this document.

Reference should be made to the GA (General Arrangement) drawing or standard Spirax Sarco literature.

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

- i) All connecting lines fully isolated.
- ii) Been allowed to reach ambient temperature.
- iii) Been drained of all liquids.
- iv) Been relieved of all pressure.

5.1 Preventive maintenance

We recommend that the user creates maintenance schedules, safety manuals and inspection details for each specific installation of an IJH Instantaneous Jet Heater.

On all installations of the IJH Instantaneous Jet Heater, the following items and conditions should be regularly checked by the user, for the purposes of maintenance:

1. Corrosion debris build-up, particularly of the liquid jet nozzle and the steam injection jets in the combining nozzle - see Section 5.2.
2. Internal wear, particularly in the liquid jet nozzle and the steam jets in the combining nozzle - see Section 5.2.
3. Piping and fittings for corrosion debris build up.
4. Sufficient and / or correct tightness of screwed connections.
5. Strainers for debris build-up.

This schedule for maintenance checks on the unit must be the responsibility of the customer. Realistic maintenance schedules can only be determined with full knowledge of the services and the actual application involved.

5.2 Check for internal blockage and wear

As part of the user's maintenance schedule, Spirax Sarco suggest that the combining nozzle of the Instantaneous Jet Heater should be removed and checked, using the following procedure:

1. Disconnect the unit from its location on plant.
2. Check jet nozzle and steam ports for blockages.
3. Check for internal wear of nozzle, steam ports and diffuser.
4. Clean internals, using standard cleaning procedures to remove any sediment or blockage from the unit. If any fluids or solvents are used as cleaning agents, ensure that they are compatible with the materials of construction of the IJH Instantaneous Jet Heater.

6. Commissioning

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

7. Spare parts

There are no spares available for this type of unit. The combining nozzle is welded in to its body. For a complete replacement unit please contact Spirax Sarco and quote the following data:

Unit Serial number:

Original contract reference:

Your item number (if applicable):

