

BRAUDE

Heating and Cooling Systems for Corrosive Solutions



Impervio
NAUTILUS[®]
NON-CORRODABLE TANK HEATERS AND COOLERS.

**INSTALLATION, OPERATION
AND MAINTENANCE
INSTRUCTIONS.**

These instructions should be carefully read and understood by all the operators before installing and commissioning the equipment. Failure to comply could invalidate warranty.

The element tubes of TEFLON* require some special attention. Keep in mind that they are different from all other immersion coils. You can, if careless, accidentally cut or burn them. Be careful.

[®] Impervio and Impervio Nautilus are registered trade names of E. Braude (London) Ltd

* Teflon is a registered trade name of DuPont

1. The Impervio NAUTILUS Heat Exchanger

This Impervio NAUTILUS is manufactured from high performance non-corrodable materials and should give trouble free service provided it is installed, operated and maintained in accordance with these instructions. The successful performance and length of service of this equipment will depend on its situation in the tank; correct installation of hangers, supports, piping and controls; and the degree of care taken during operation.

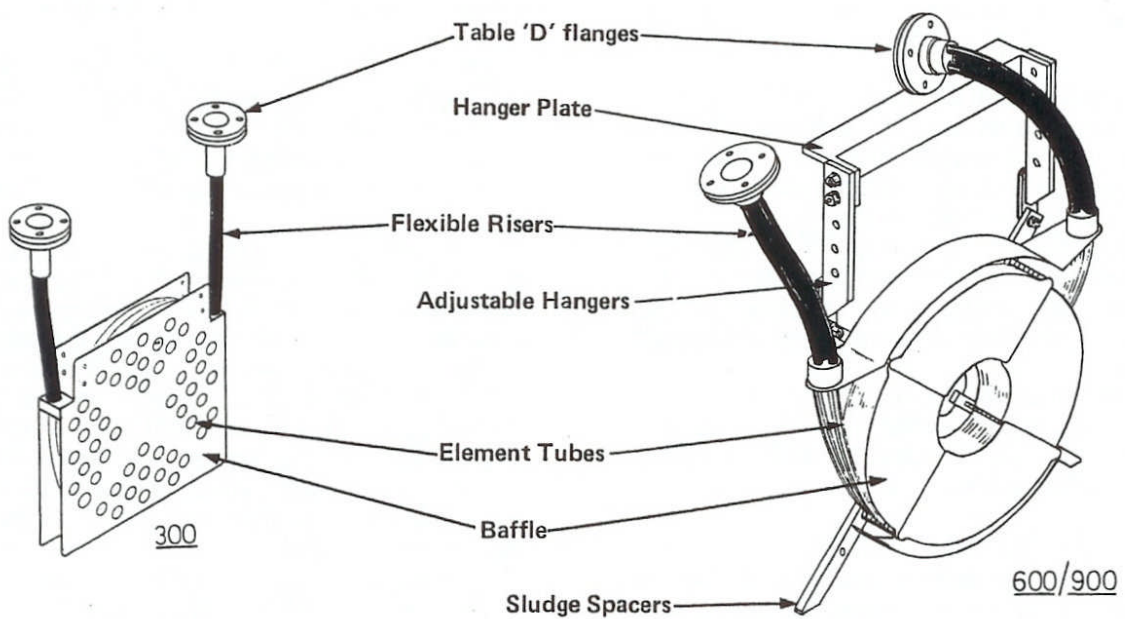


Figure 1: The Impervio Nautilus Heat Exchanger

2. INSTALLATION IN TANK

- The NAUTILUS should be sited within the tank clear of scale and sludge.
- Free flow of solution on all sides is essential to obtain the maximum efficiency.
- Locate the coil in the tank where it will be protected from damage caused by contact with the tank wall or with objects in the tank.
- If the element needs protection from mechanical damage due to the nature of the workload, protective baffles, which are available from BRAUDE, should be fitted. A heavy duty guard is also available.
- The Nautilus is specially designed for use in either a vertical or horizontal position (see figure 2).

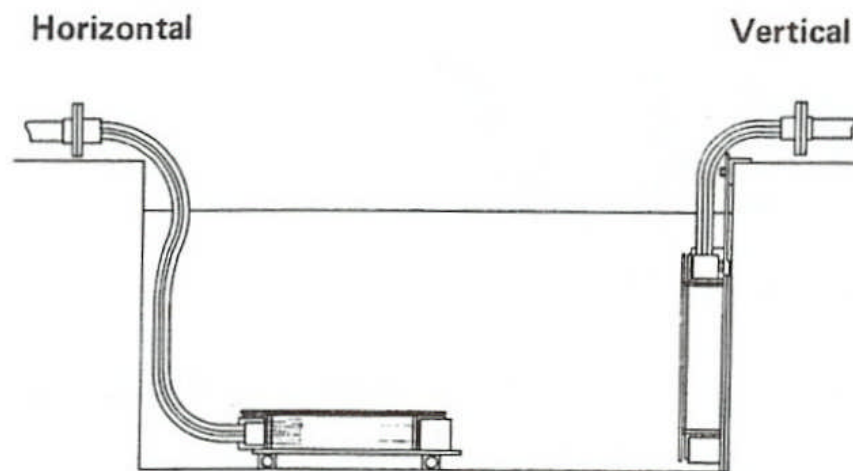


Figure 2: Position of Nautilus in tank

- **VERTICAL MOUNTING** - The Nautilus may be mounted vertically in the tank by using the adjustable hangers. These are attached to the mounting points on the Nautilus frame (frame 3).

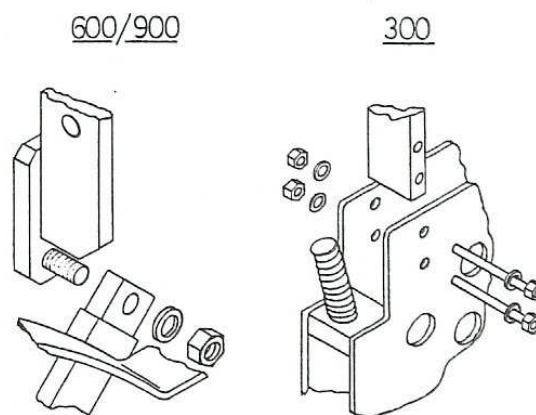


Figure3: Fixing adjustable hangers to Nautilus

Securely fix the hanger plate to the tank by clamping or bolting. Lower the Nautilus into the tank and fix hangers to hanger plate at the desired height. Any excess on the adjustable hangers may be cut off.

Note: Should flotation occur on installing the unit, use a broad ended blunt pole to hold the unit in a vertical position whilst lowering and finally securing.

- **HORIZONTAL MOUNTING** - Weight boxes should be fitted to the Nautilus frame using the fixings provided. Lower the unit into the tank supporting it by its frame and/or lifting holes. Do not carry the weight on the flexible rises. If the coil shows a tendency to float it will not function satisfactorily and additional weighting will be necessary.

3. PIPEWORK CONNECTIONS TO NAUTILUS

Heating or cooling medium pipework should be connected as shown in figures 4 and 5.

Ensure all traps, valves and pipework are adequately sized for the duty and that flanges connected to the NAUTILUS unit are correctly aligned and square.

Maximum element pressure should not exceed the values shown in table 1.

Standard Units	Maximum Pressure	Maximum temperature
Steam/Thermal Fluid	3.4 Bar (50 psig)	148°C
Hot Water	3.1 Bar (45 psig)	20°C
Coolant (eg Chilled Water)	6.8 Bar	20°C
<u>High Temperature Units</u> Thermal Fluid	3.0 Bar	200°C

Table 1: Pressure Conditions for Teflon* elements

3.1 HEATING DUTY - STEAM

If the steam supply is in excess, a pressure reducing valve should be fitted. A pressure relief valve must be fitted in all cases.

A suitable bursting disc must be fitted in the steam supply line prior to the NAUTILUS. When fitting a bursting disc the line must be vented to atmosphere. A strainer in the feeder piping is required. The fitting of a steam separator and an air vent on the feeder line is recommended for removal of excess moisture and entrapped air from the steam supply to maximise the efficiency of the heater.

A motorised valve must be fitted for automatic operation, as slow action is required. This should be of equal percentage trim type. The use of solenoid type valves for this duty must be avoided. The steam or water supply system must be free of hammer, as this condition could cause damage to the element. Condensate Trap: The condensate return pipe should run downwards from the outlet flange to prevent excess back pressure in the coil. If this is not possible, the condensate must be pumped away from the coil.

WARNING: In the event of electrical power failure there will be no signal to close a motorised valve. Therefore, either a motorised valve with a fail safe closure (spring reserve) or an alternative back up system should be fitted to close the steam supply in the event of power failure, in order to prevent damage to the NAUTILUS.

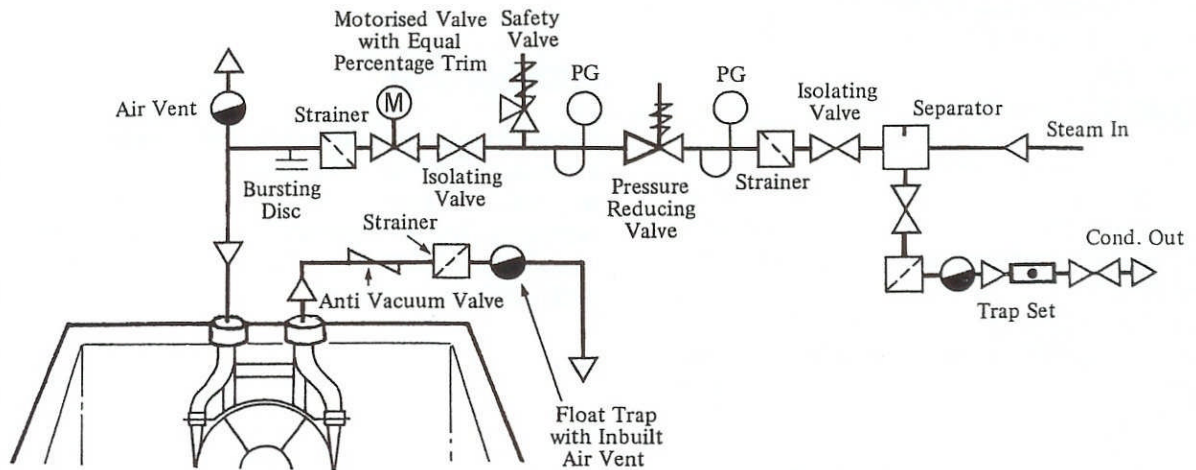


Figure 4: Heating duty – steam pipework installation

3.2 HEATING DUTY – HOT WATER

The pressure in the system should be controlled so that it does not exceed the safe operating pressure. The system should be designed to avoid pressure fluctuation. Delivery of hot water from a header system is recommended.

A bypass system can be beneficial to the operation of multiple units.

3.3 COOLING DUTY – CHILLED WATER

The pressure in the system should be controlled so that it does not exceed the safe operating pressure and that the flow rate through the element is as set out in the design specification.

3.4 HEATING SYSTEM – THERMAL FLUID

Appropriate gaskets to suit the thermal fluid should be used on the flange connections. The temperature of the thermal fluid should not exceed 200°C at any time.

Only use a Nautilus specifically manufactured for high temperature operation on a thermal fluid supply.

3.5 FLANGE CONNECTION

The Nautilus heater/cooler is fitted with substantial polymer flanges that should not distort or leak under load. It is recommended that they are connected to a metal full face mating flange in a good clean condition. It is essential that the O ring is seated correctly in the groove when connected. Mating flanges with large serrations or stub flanges are not recommended.

Backing rings may be used to ensure the load is evenly spread over the flange face.

Bolts should be of the correct size for the flange, as shown in the table below. All bolts should be fitted with washers, in accordance with good engineering practices.

Polymer bolts or studding are not recommended.

FLANGE SIZE	NO OF BOLTS	BOLT SIZE	TORQUE LOAD NM*
32MM/1"	4	M12	8
63mm/2"	4	M16	10
90MM/3"	4/8	M16	10
110MM/4"	8	M16	10

* These figures are for guideline purposes only.

IMPORTANT

- Do not over-tighten flange connections. Use a good quality flange sealant.
- Ensure that all traps, valves and pipework are adequately sized.
- It is essential that flanges are connected squarely. Strain on element tubes must be avoided.

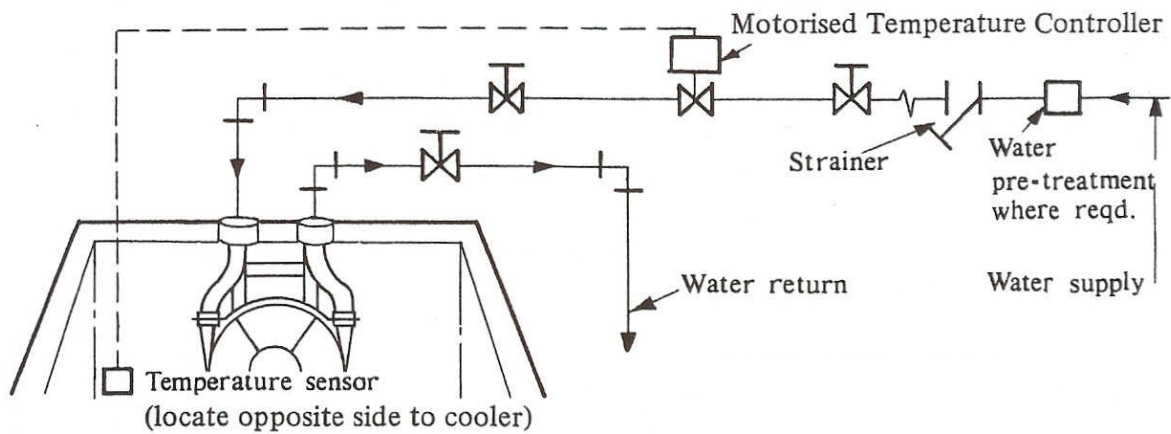


Figure 5: Heating and cooling duty – water and thermal fluid

IMPORTANT

Before operating ensure that the system is clean and that no debris has been left in the piping during installation. Flush the piping with water before connecting to the coil.

4. OPERATING INSTRUCTIONS

Maximum steam pressure inside the element tubes must not exceed 50 psig. (3.4 Bar) saturated (148°C). Maximum coolant pressure inside the element tubes must not exceed 100 psig (6.8 Bar). (Otherwise as stated in Table 1).

1. Ensure that the tube element is below the solution level before commencing duty.
2. Open all valves on the discharge side of the coil.
3. Slowly open valve on the supply side of the coil. For automatic operation a slow action is required as obtained by using a motorised valve. The use of solenoid type valves for this duty should be avoided.
4. Do not alternate cycle from cooling to heating without allowing stabilisation time, as thermal shock will cause grave damage to the element. Allow at least 15 minutes.
5. If the unit is used to heat halogenated bath, the steam condensate should be taken to drain rather than back to boiler since halogens can permeate TEFLON* and could contaminate the condensate. (Permeation of TEFLON* by halogens does not attack or degrade the tubing of TEFLON*).
6. Units can be used for pre-heating of a batch solution but stabilisation time must be observed.
7. Do not lift the unit whilst in operation as damage could be caused through unnecessary scale build-up.
8. Cooling applications, in some areas, may need pre-treated cooling medium to prevent unnecessary scale build-up.
9. In order to prevent any siphonic action, in the event of a tube leak, maintain positive pressure.

5. MAINTENANCE

The Impervio NAUTILUS heater/cooler is manufactured from non-corrodable materials and therefore requires minimum maintenance. In order to obtain maximum performance however, the following procedures should be observed.

- Filters or strainers should be checked for debris. Clean as required.
- Check steam pressure and temperature at coil inlet to ensure they are within limits (50 psig, 148°C).
- Check water flow and temperature, to be sure it meets design conditions.
- Check temperature controllers to make sure they are functioning properly.
- Check back pressure in condensate or water return line to ensure there is no obstruction, which would restrict flow through the coil.
- Check all valves and traps regularly to ensure that they are fully operational.
- Check unit for possible leakage caused by mechanical damage.
- Inspect element for rubbing etc., and make sure all clamps and mountings are fully tightened.
- If baffles are fitted, they must be secure.
- Units that are susceptible to build up or fouling due to the type of application should be cleaned frequently. For example, very severe situations about once a month, less severe every two or three months. Experience of operation will determine this frequency. For general purpose cleaning, immersion or soft brushing in a suitable solution on a regular basis according to requirement will suffice. Generally, alkaline deposits are removed with an acid such as hydrochloric, greasy and oily deposits are removed with an alkaline degreaser. Deposits from Electroless Nickel type solutions are removed with nitric acid.
- For internal tube cleaning back flushing as regularly as required should be satisfactory. A mild acetic acid solution may be used.

In the event of tube damage, the unit should be returned to the manufacturers for repair. In emergency, damaged tubes can be temporarily by-passed by sealing off both the inlet and outlet side by hot air heating and crimping after severing the tube near the terminal ends and cleaning the section to be sealed. Our technical staff will supply instructions.

6. REMOVAL AND CLEANING

- When removing the Impervio NAUTILUS from the tank care must be taken to prevent damage by scraping or scuffing on the tank sides.
- Do not lift the unit by the element or flexible risers as damage could be caused through unnecessary stresses. Lift by the frame and/or the clearly marked lifting holes.

IMPORTANT

Please ensure that the Warranty Registration form supplied is completed and returned to the manufacturer. In order to safeguard the warranty any change of duty or application should be notified to the manufacturer who will confirm suitability.

The manufacturer assumes no obligation or liability for any advice furnished or for results obtained with respect to the equipment supplied. All such advice is given in good faith and accepted at the buyers risk.



LIBERTA HOUSE, SANDHURST, BERKS. ENGLAND GU47 8JR
Telephone: 01252 876123 Fax 01252 875281
Website: www.braude.co.uk email: sales@braude.co.uk