



## Shell & Tube Heat Exchangers

# Installation, Operation and Maintenance Manual

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## 1. INSTALLATION

The coolers may be mounted either horizontally or vertically but the pipe work should always be designed such that the water inlet is adjacent to the oil outlet, i.e. with flow of water and oil in opposite directions (counter flow). When mounting horizontally, venting is assisted if the water outlet positioned facing upwards.

Long lengths of unsupported pipe work should be avoided and if the installation is subject to severe vibration, flexible hoses should be used or alternatively a flexible compensator flange (also available from Thermex Ltd). The cooler should ideally be installed in the return line to the tank, however where large fluctuations in flow or pressure are likely, we recommend that the cooler is mounted off-line with a separate re-circulating pump.

In cold weather, a check valve to bypass oil around the cooler is recommended for oils with a high viscosity. Care should be taken to prevent the cooling water from freezing if the cooler is exposed to harsh winter conditions.

If cooling with seawater, we strongly recommend that the specified water flow rates are observed. Both too little and too much seawater flow can cause erosion within the cooler. In addition, we recommend that the sea water is filter to 2.0mm to prolong the life of the exchanger.

If fitting a temperature control valve, make sure it is installed on the water side and on the inlet to the cooler.

Provision is made for mounting the cooler using the following bolt sizes:

2300 Series = M6

2500 Series = M8

2700 & 2800 series = M12.

Double seals and witness rings are provided on all 2700 & 2800 series units, and as an optional fitment on other products, with a small leak detection hole in the witness ring so that, in the unlikely event of a seal failure, the second seal will protect from cross contamination whilst the small leak from the detection hole will alert the user to conduct repairs.

## 2. OPERATING CONDITIONS

Maximum operating pressure:

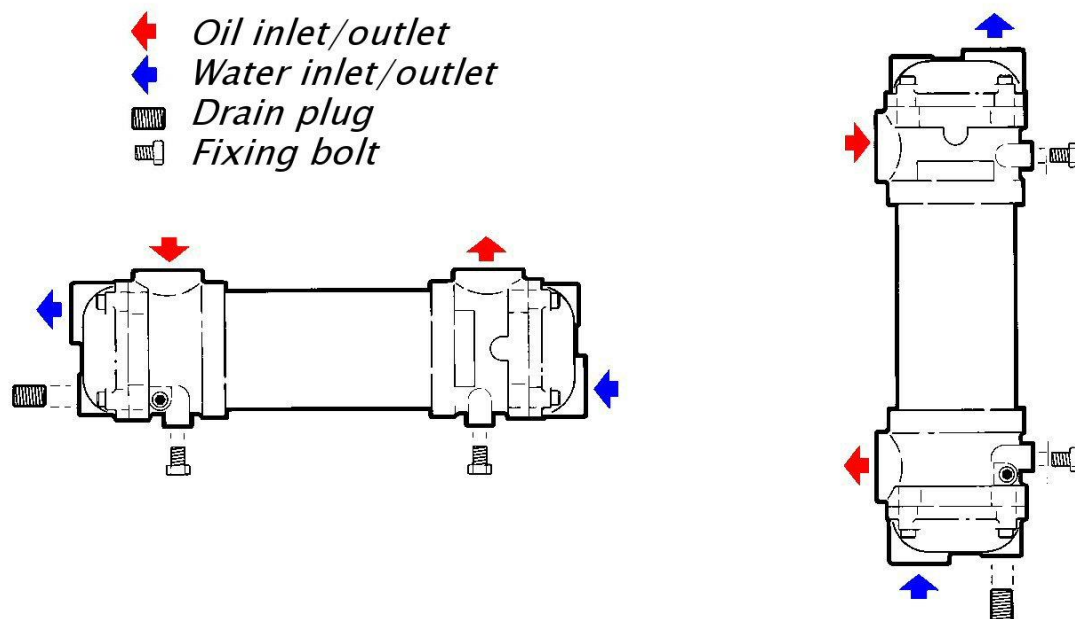
Through Tubes (Water) = 10 Bar

Over Tubes (Oil) 2300 & 2500 Series = 30 Bar

2700 & 2800 Series = 20 bar

Maximum operation temperatures: 100°C (Nitrile seals)

120°C (Viton seals)



## 3. DISMANTLING

- Prior to dismantling, ensure that the new replacement seals are available for re-assembly.
- Isolate, drain and remove any pipe work connected to the header boxes.
- Wipe clean the exterior of the unit.
- Note the position and orientation of the headers.
- Remove the cap screws securing both of the header boxes to the body.
- Carefully remove both of the header boxes (and witness rings where fitted).
- Remove the O-ring seals from both ends of the unit and discard.
- Note the orientation of the stack in the shell.
- The tube stack should now be free to be removed from the shell.

- Care should be taken to support the stack as it is removed to prevent damage to the baffles, tube plates and tubes.
  - Should the stack not be free due to fouling etc then a blow from a soft faced hammer should break the bond and allow the stack to be removed.
  - The face of the tube plate must be protected if the above action is taken.
- Refer to the ‘Servicing’ and ‘Inspection’ sections of this manual.

#### **4. SERVICING**

##### Tube stack

- The tubestack should first be degreased using a suitable solvent.
- Any heavy contamination on the oil side can be removed using a high pressure water wash.
  - On no account should any sharp object be used for removing contamination due to danger of piercing the tubes.
  - Any contamination inside the tubes can also be removed with a high pressure water wash or for more stubborn deposits by using a special cleaning rod (available from Thermex Ltd.).

##### Shell & header boxes

- Conventional cleaning methods should be applied to the boxes and shell

## 5. INSPECTION

It is recommended that heat exchangers be inspected as part of the routine maintenance program of the system into which they are installed. However, it is suggested that heat exchangers operating within their design conditions are inspected on an annual basis as a minimum. Any loss of performance related to the heat exchanger should also be investigated and the unit, where necessary, dismantled and serviced.

### General overview

- The heat exchanger should be visually inspected for leaks and damage on a daily basis and witness rings, where fitted, should be checked for any evidence of seal failure.

### Tubestack

- Check for signs of erosion and/or corrosion on the face of the tube plates.
  - Any evidence of either of the above conditions would indicate poor conditioning of the tube side fluid.
- Check for any fouling across the face of the tube plate and in the bore of the tubes.
  - This must be removed.
- Check for signs of erosion and/or corrosion on the periphery of the tube plates.
  - Any evidence of either of the above condition require replacement of the tube stack.
- Check for any fouling on the periphery of the tube plate.
  - This must be carefully removed as this peripheral face forms the sealing face.
- Check the condition of the baffles.
  - Slightly bent baffles can be carefully straightened; otherwise the complete stack must be discarded and replaced.

### Shell/housing

- Check for signs of erosion and/or corrosion in the bore of the shell.
  - Any evidence of either of the above conditions would indicate poor conditioning of the shell side fluid.
- Check for cleanliness and condition of the O-ring sealing chamfer.
  - This must be clean and free from damage.
- General checks for cleanliness & good integrity.

### Header boxes.

- General checks for cleanliness & good integrity.

## 6. REASSEMBLY

### Tube stack

- The tube stack should be inserted into the body with the arrow on the face of the tube plate aligned with the arrow on the end of the body.
  - This ensures that the baffles are correctly positioned relative to the ports.

### Seals

- New seals, including header bypass seals on multi-pass units, should be fitted throughout.
- Before fitting new O-rings they should be lubricated with a lubricant that is compatible with both the O-ring material and the working process/fluids.
- Fit the O-rings over the tube plate and gently push into the corresponding chamfer.

### Headers (and witness rings where applicable)

The cap screws should be fully tightened in sequence to avoid distortion.

#### Plastic Headers:

M6 = 7Nm

M8 = TBA Nm

M10=TBA Nm

#### Metallic Headers:

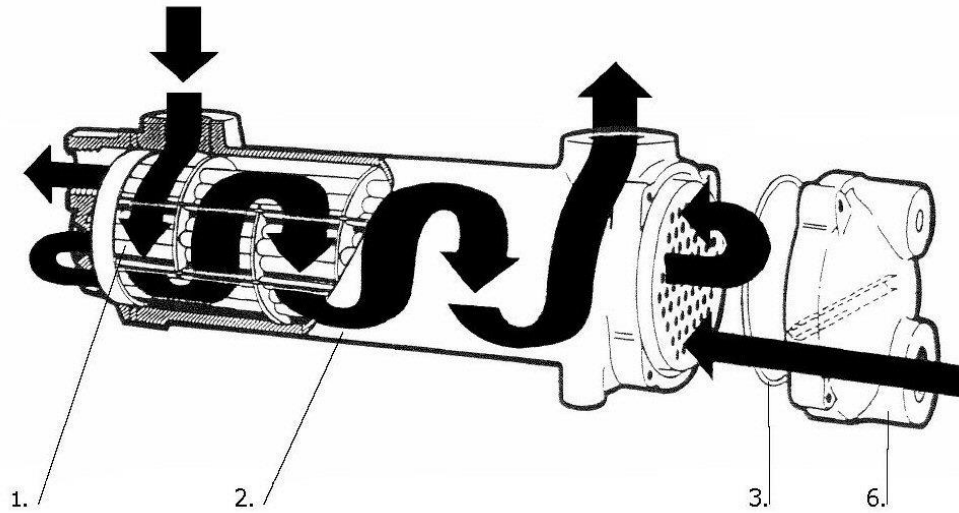
M6 = 10Nm

M8 = 25Nm

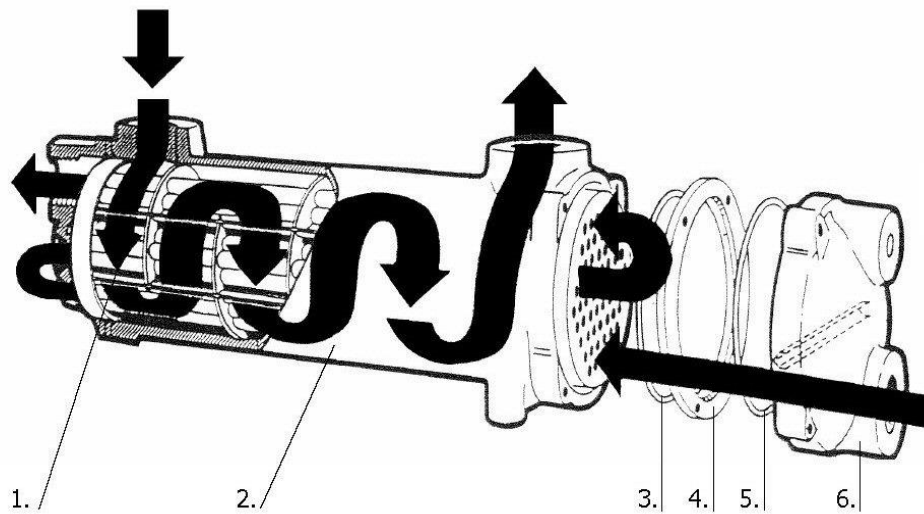
M10=55Nm

## 7. UNIT CONSTRUCTION & FLOW DETAILS

### 2300 & 2500 Series



### 2700 & 2800 Series



1. Tubestack
2. Body
3. Seal
4. Witness ring (where applicable)
5. Seal (where applicable)
6. Header



## 8 AFTER SALES SERVICE

### 8.1 Ordering parts

When ordering parts it is important that the correct details are given. At least the following should be quoted:

- Unit serial number
- Exchanger series type
- Required parts

### 8.2 Modifications to the heat exchanger

The heat exchanger is built up to a specific design and therefore is not flexible with respect to enlargements or reductions. If the operating conditions of the unit change we would be pleased to advise you as to the continued suitability of the heat exchanger, or recommend an alternative unit where applicable.

### 8.3 Contacts

You can contact the factory as follows:

thermex Ltd  
Merse Road,  
North Moons Moat,  
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Telephone +44(0)1527 62210  
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International customers can also locate a local distributor via our website at [www.thermex.co.uk](http://www.thermex.co.uk)