



# **Titanium Plate Heat Exchanger Installation & Operating Manual**



## CONTENTS

<b>IMPORTANT INSTRUCTIONS</b> .....	<b>4</b>
<b>1. PRIOR TO INSTALLATION</b> .....	<b>4</b>
<b>2. INSTALLATION CLEARANCES</b> .....	<b>4</b>
<b>3. MAIN COMPONENTS</b> .....	<b>6</b>
<b>4. FLOW PATTERN</b> .....	<b>7</b>
<b>5. OPERATION AND MAINTENANCE</b> .....	<b>9</b>
5.1 Plate heat exchanger utilization.....	9
5.2 Maintenance .....	9
5.3 Plate cleaning .....	9
5.4 Manual cleaning .....	9
5.5 Cleaning in place (cip) cleaning.....	9
5.6 Materials for cleaning .....	10
5.7 Specific materials for cleaning .....	10
5.8 Cleaning check.....	10
5.9 Plate replacing.....	10
5.10 Gasket cleaning.....	10
<b>6. ROHS COMPLIANCE STATEMENT</b> .....	<b>11</b>
<b>7. WARRANTY</b> .....	<b>11</b>

## IMPORTANT INSTRUCTIONS

Thank you for purchasing the Electro Titanium Plate Heat Exchanger manufactured to the highest standards in England.

Titanium has been specifically chosen as the plate material for units being used to heat or cool swimming pools, as its non-reactive / inert state will provide many years of trouble-free operation and reduced maintenance intervals.

### 1. PRIOR TO INSTALLATION

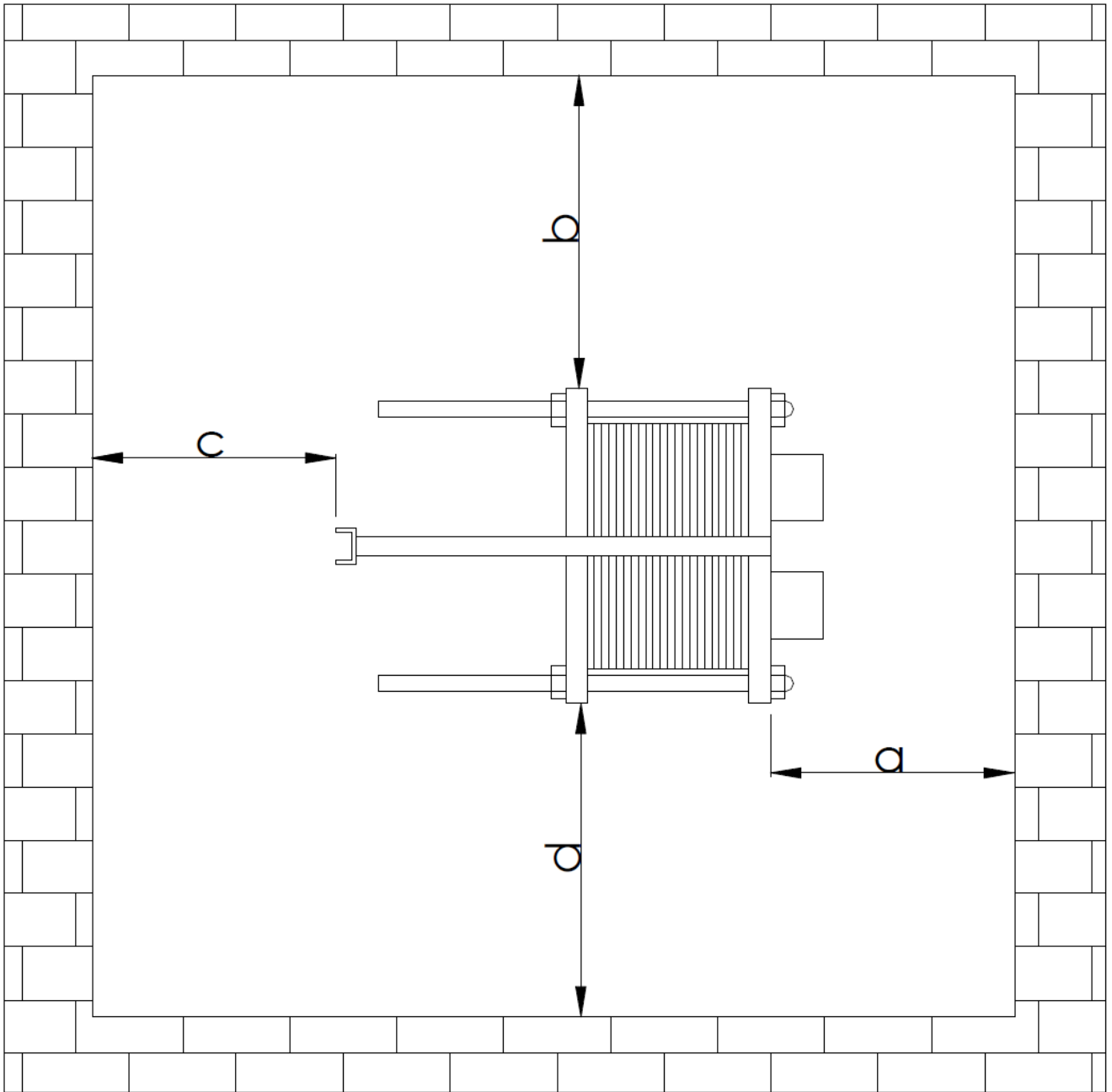
Prior to connecting any piping, make sure all foreign objects have been flushed out of the piping system that should be connected to the Plate Heat Exchanger (PHE). Before start-up check that all tightening bolts are firmly tightened and that the correct measurements of the plate pack, refer to PHE drawing.

When connecting the piping system make sure the pipes do not subject the PHE to stress or strain. To avoid water hammer, do not use fast-closing valves. In automated installations, the stopping and starting of pumps and actuation of valves should be programmed so that the resulting amplitude and frequency of the pressure variation will be as low as possible.

- If pressure variance is expected install efficient dampers.
- Make sure that no air remains within the PHE.
- Safety valves shall be installed according to current pressure vessel regulations.
- It is recommended that protective sheets are used to cover the plate pack. Protect against leakage of hot or aggressive fluids and the hot plate pack. For each model, design pressures and temperatures are marked on the identification plate. These shall not be exceeded.

### 2. INSTALLATION CLEARANCES

Model	Dimensions (mm)			
	a	b	c	b
PHE100-Ti	300	500	300	500
PHE140-Ti	300	500	300	500
PHE180-Ti	300	500	300	500
PHE240-Ti	300	500	300	500
PHE290-Ti	300	500	300	500
PHE330-Ti	300	500	300	500
PHE370-Ti	300	500	300	500
PHE410-Ti	300	500	300	500
PHE450-Ti	900	900	900	900
Model	Dimensions (mm)			
	a	b	c	b
PHE500-Ti	900	900	900	900
PHE550-Ti	900	900	900	900
PHE610-Ti	900	900	900	900
PHE670-Ti	900	900	900	900
PHE730-Ti	900	900	900	900
PHE780-Ti	900	900	900	900
PHE820-Ti	900	900	900	900



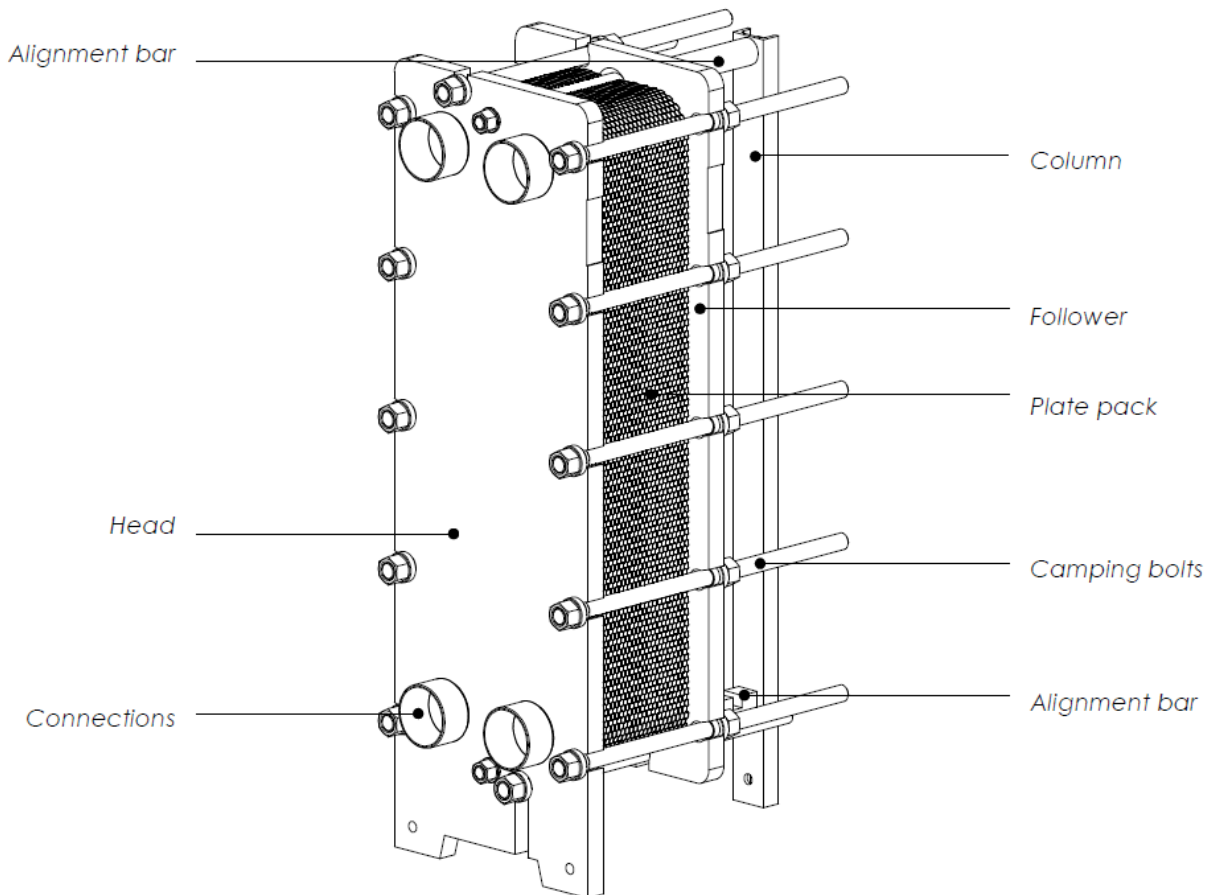
### 3. MAIN COMPONENTS

The corrugated Plate Heat Exchanger consists of a structure based on a fixed head plate (or frame), a moveable head plate, a support column, an upper and lower alignment bar, clamping bolts and exchange plates put together in the plate pack between the head plates.

Each plate is provided with a gasket, so the complete set of plates builds a closed double channel system in which the fluids flow separately without coming in contact.

Gaskets are not glued on the plates. The mixing impossibility between the two fluids is assured by a double seal around the holes of the exchange plates, provided with proper intermediate drain areas.

Each plate in the pack is rotated by 180° regarding the adjacent ones, allowing the fluids to flow alternatively between plate and plate. (See Fig 1.). When the Plate Heat Exchanger must work contemporarily with more than two fluids, it is necessary to insert other intermediate structure plates (with connections) in the plate pack.

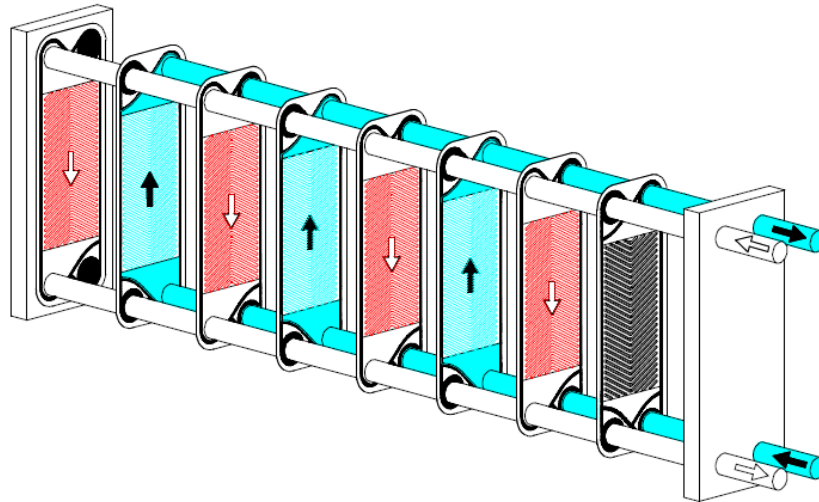


**Fig. 1 – Plate exchanger**

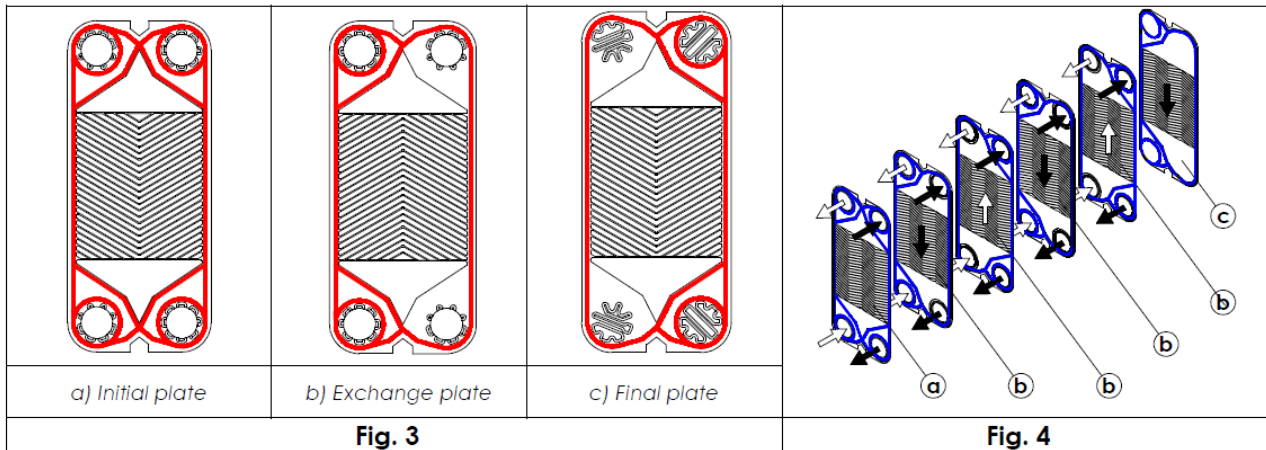
#### 4. Flow Pattern

In parallel flow arrangement, primary fluid enters at the top nozzle connection and flows through the parallel channels, dividing the flowrate in equal parts for each channel (Fig 2.). The fluid leaves the exchanger from the nozzle at the bottom. Secondary fluid, on the other hand, enters through the nozzle at the bottom and flows out through the one at the top. Primary and secondary fluids are thus moving in counter-flow, in order to maximize heat transfer.

**Fig. 2 - PARALLEL FLOW PATTERN**



#### CORRUGATED PLATES



Corrugated plates are designed to be used either as “right” then “left” plate: you have only to rotate them by 180°.

Right and left plates are defined in the following way:

- On the right plate the fluid flows from connection 2 to 3, or from 3 to 2 (Fig 5.).
- On the left plate the flow is from 1 to 4 or from 4 to 1 (Fig 5.).

The 4 corner holes of the plates are open and closed according to the flux diagram which must be obtained.

**Note:** The four holes are identified by numbers, starting from the upper left one of the plates, which must be seen by the gasket side.

This hole is the number 1, and the others are clockwise 2, 3 and 4.

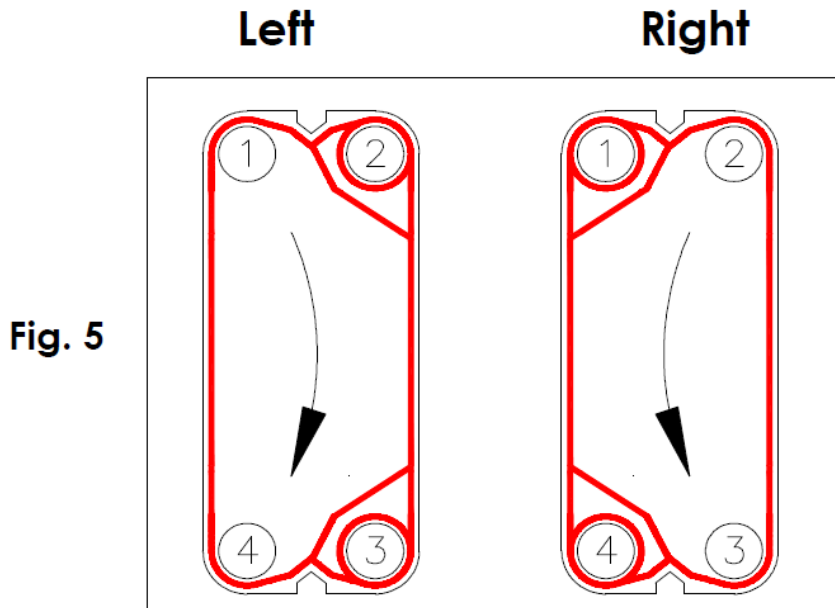


Fig. 5

**RESIDUAL RISK**

❗	<p><b>WARNING DANGER OF BURNING:</b> In the case that there is no insulation and depending on the operating conditions, the external surface of the Plate Heat Exchangers can be at high temperature.</p>
❗	<p><b>WOUNDING DANGER:</b> If, voluntarily or involuntarily, the heat exchanger is locked in exasperated way, boltings could be broken off with danger for operators and bystanders. Therefore, do not stand in front of boltings during locking. Be careful while handling parts of the heat exchangers (turbulators, plates, gaskets, etc.), wear idoneous protection equipment, like gloves, accident-prevention shoes, overalls, etc.</p>
❗	<p><b>DANGER CAUSED BY CONTAMINATION BETWEEN THE TWO FLUIDS:</b> In case of corrosion breaking of the plates, contamination of one of the fluids might occur. Please contact immediately the assistance service, do not using the contaminated fluid.</p>
❗	<p><b>TOXIC GAS INHALATION DANGER:</b> In case of toxic fluids, pay attention not to inhale their exhalations.</p>
❗	<p><b>FLAMMABLE GAS DANGER:</b> In case of flammable fluids take appropriate precautions.</p>
❗	<p><b>WOUNDING AND/OR BURNING DANGER:</b> If the connections (mainly if in PTFE or PP) are voluntarily or involuntarily tightened more than allowed, they could brake causing danger for the operators and the bystanders.</p>
❗	<p><b>DANGER OF GASKET ACCIDENTAL BREAKING:</b> To avoid risks, in case of accidental breakage of the gaskets, and use of hazardous fluids (acids or similar, hot liquids or steam), provide a containment casing for the exchanger</p>
❗	<p><b>DANGER OF LEAKAGES OF THE GASKETS:</b> Avoid thermal shocks and then slowly increase or decrease the temperatures.</p>

## 5. OPERATION AND MAINTENANCE

### 5.1 Plate heat exchanger utilization

The Plate Heat Exchanger does not require any particular care during operation. It is in any case advisable to check periodically that the operating variables do not exceed the design figure and that there is not any leakage, mainly cold-leakage, during the shut-down. In case of remarkable leaks, close the isolation valves and report as soon as possible to skilled personnel. Ensure that, during their lifetime, surfaces of pressure parts (boltings and frames) will not be corroded by humidity or atmospheric agents.

### 5.2 Maintenance

By opening and assembling the Plate Heat Exchanger the following must be observed:

- Without pressure and cooled
- Before opening the Plate Heat Exchanger be sure that there is no pressure in it and that temperature is cooled down to 35°C.
- Opening and dismounting

When opening the Plate Heat Exchanger bolts ensure they are loosened equally (i.e. that the follower shall have a straight moving by opening). The last distance of the opening can be made by two bolts. After that, the follower is pulled back towards the column. If the Plate Heat Exchanger is installed onboard a ship the follower must be fastened to the column.

### 5.3 Plate cleaning

Remove internal heat exchanging plates. If there is dirt or scale proceed as follows:

- Without removing gaskets or turbulators (where present) leave plates to soak in a cleansing solution. Then rinse thoroughly in running water. Do not leave plates in the solution any longer than is strictly necessary to dissolve dirt and scale.

**ⓘ ATTENTION:** To be cleaned with acid or other solutions. Caution must be used wear safety glasses, gloves, mask, etc.,

### 5.4 Manual cleaning

The Plate Heat Exchanger is opened, and the plates are separated, use a soft brush and a quality cleaning product for the plates. In case of organic material, the plates must be put in a basin with a quality cleaning product. Avoid using metal brushes, abrasive papers, scrapers, etc. Neither the plates nor the gaskets support heavy and energetic treatments.

The use of a polishing machine to be executed carefully and without adding abrasive agents.

### 5.5 Cleaning in place (cip) cleaning

For the Cleaning in Place it is necessary that the dirt on the plates must be soluble. Moreover, all the materials of the circuit must be resistant to the product used for cleaning.

Cleaning can also be made without circulation, by filling the Plate Heat Exchanger with a quality cleaning product. After a certain time, the cleaning product is washed away by plenty of clean water.

CIP cleaning cycle example:

- Product residuals and heating / cooling fluids are drained
- Cleaning with hot or warm water
- Hot Circulation of the cleaning product
- Washing with cold or warm water
- Cleaning with water added with chemicals
- Washing with cold or warm water



## 5.6 Materials for cleaning

A quality product for cleaning can be defined as capable of removing the deposits on the plates without damaging the plates and the gaskets.

Stainless steel is covered by a passivation film, which must not be destroyed because it protects the steel material from corrosion.

## 5.7 Specific materials for cleaning

Oils and fat are removed with emulsifier oil – water solvent.

Organic materials and fat substances are removed by NaOH with maximum concentration of 3% and maximum temperature of 85°C. The concentration is corresponding to 10 l NaOH 30% solved in 100 l water. Chalk deposits are removed with HNO<sub>3</sub> at max. 6 % and max. temperature of 65 °C. Concentration of 9.6 l HNO<sub>3</sub> 62 % solved in 100 l water. The nitric acid has an important aid function for the forming of the passivation film on stainless steel.

## 5.8 Cleaning check

Cleaning is an important factor for efficiency and performance of the Plate Heat Exchanger. Therefore, plates must be separated for a careful inspection, especially when there have been some problems during the start-up operations. You will get important knowledge and experience about circulation times, temperatures and cleaning product concentrations.

Reasons for a no effective cleaning can be found in the following ones:

- Insufficient circulation flowrate
- Insufficient cleaning time
- Insufficient cleaning product consumption compared with the dirt on the plates Insufficient cleaning frequency between two duties

## 5.9 Plate replacing

Replacing and mounting of new plates can be done after disconnecting the circuits and the removal of the clamping bolts. Before mounting the new plates, verify that they are identical to the ones to be substituted. A reduction of the number of plates is possible, but only on the condition that you remove couples of plates, so that the Plate Heat Exchanger, after the removal of the plates, has the same arrangement of left and right plates. The removed plates must have 4 open holes. After removing it is necessary to define the new tightening dimension according to the new total amount of plates.

**NOTE:** A reduction of the amount of plates involves a reduction of the exchanging surface of the Plate Heat Exchanger, exactly proportional to the number of plates which have been removed. There will also be an increase of the pressure drops in the exchanger, because the flow rate is divided in less channels, and therefore it is higher with greater velocities.

## 5.10 Gasket cleaning

For gasket and their seat cleaning use “ACETONE” (nail varnish remover). It is very important that the cleaning product has completely evaporated before remounting the gaskets on the plates.

**ⓘ ATTENTION: INHALATING SOLVENT SUBSTANCES IS DANGEROUS**

## **6. RoHS COMPLIANCE STATEMENT**

Elecro Engineering Limited certify that our Electric Swimming Pool Heater Range/Heat Exchanger Range complies in accordance with RoHS Directive 2011/65/EU on the restriction of hazardous substances.

## **7. WARRANTY**

**This product is guaranteed from the date of purchase against faulty workmanship and materials for:**

- **two years within Europe**
- **one year outside Europe**
  
- The manufacturer will replace or repair, at its discretion, any faulty units or components returned to the Company for inspection.
- Proof of purchase may be required.
- The manufacturer will not be liable in cases of incorrect installation of the heater, inappropriate use or neglect of the heater.
- Any damages occurred due to shipping must be reported within 48 hours of receipt of the product. Any claims after this time will be considered as misuse or abuse of the product and will not be covered by the warranty.
- Any glass parts, seals and water connections are considered as consumables and are not covered by the warranty.



11 Gunnels Wood Park, Stevenage, Herts SG1 2BH  
[Sales@elecro.co.uk](mailto:Sales@elecro.co.uk) [www.elecro.co.uk](http://www.elecro.co.uk) +44 (0) 1438 749474

© Copyright MANE276-EN-Plate Heat Exchanger Manual V1-01.01.2020-Elecro