Plate Heat Exchanger
User Guide
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The first condition of innovation is to question. And the first condition of sustainable innovation is to question constantly.

The journey of innovation has started with a question for us too: “How can we develop value-added technologies in Turkey?”. First turning point in this long journey was the birth of MIT (Made in Turkey) brand. MIT made us the first plate heat exchanger producer of Turkey and it’s founding vision was not to become a local alternative, it was to build a high-quality brand that can compete on a global level.

While we are working towards this goal in the past 15 years, our products and processes deemed worthy for documentation by many national and international quality assessment institutions such as ISO, TSE, CE, GOST and many more. This was the natural outcome of our constant questioning of the status-quo and our desire to outperform ourselves.

New Generation Engineering

With our engineering approach that focuses on the process, not the problem, we do not just specialize in a product, we consider the entire ecosystem of that product. Ergo, we produce all the other components of a system in addition to plate heat exchangers and we focus on the constant development of engineering staff required to provide an end-to-end application.

We provide a “solution” rather than a product with our business development, presales, sales and after sales services provided by our expert engineers.

In our 15th year, we continue to grow as a solution partner for projects that need high technology in more than 60 countries with our internationally approved high-quality plate heat exchangers; components such as accumulation tanks, boilers, industrial pumps and installation materials that completes these exchangers to form a system; and complementary services provided by our expert engineer staff.
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIT Plate Heat Exchanger Connection Schema</td>
<td>1</td>
</tr>
<tr>
<td>Construction and Function</td>
<td>2</td>
</tr>
<tr>
<td>Construction</td>
<td>2</td>
</tr>
<tr>
<td>Function</td>
<td>2</td>
</tr>
<tr>
<td>Mounting Instruction</td>
<td>3</td>
</tr>
<tr>
<td>Lifting Instruction</td>
<td>3</td>
</tr>
<tr>
<td>Space Required</td>
<td>4</td>
</tr>
<tr>
<td>Pipe Connections</td>
<td>5</td>
</tr>
<tr>
<td>Correct Pipe Mounting</td>
<td>5</td>
</tr>
<tr>
<td>Pressure Strains</td>
<td>6</td>
</tr>
<tr>
<td>Allowable Pressure</td>
<td>6</td>
</tr>
<tr>
<td>Safety Valve Usage</td>
<td>6</td>
</tr>
<tr>
<td>Pressure Impacts</td>
<td>6</td>
</tr>
<tr>
<td>Shielding</td>
<td>6</td>
</tr>
<tr>
<td>Insulation</td>
<td>6</td>
</tr>
<tr>
<td>Start-Up and Operation</td>
<td>7</td>
</tr>
<tr>
<td>Clamping Bolt Checking</td>
<td>7</td>
</tr>
<tr>
<td>Start-Up</td>
<td>7</td>
</tr>
<tr>
<td>Shut Down and Start-Up Again</td>
<td>7</td>
</tr>
<tr>
<td>Leakage During Start-Up</td>
<td>7</td>
</tr>
<tr>
<td>Venting</td>
<td>7</td>
</tr>
<tr>
<td>Operating</td>
<td>7</td>
</tr>
<tr>
<td>Rapid Cooling</td>
<td>7</td>
</tr>
<tr>
<td>Sedimentation Inside of PHE</td>
<td>7</td>
</tr>
<tr>
<td>Out Operation Longtime</td>
<td>8</td>
</tr>
<tr>
<td>Probable Faults</td>
<td>8</td>
</tr>
<tr>
<td>Capacity Gradients</td>
<td>8</td>
</tr>
<tr>
<td>Leakage</td>
<td>8</td>
</tr>
<tr>
<td>Non Visible Leakage</td>
<td>8</td>
</tr>
<tr>
<td>Cleaning</td>
<td>9</td>
</tr>
<tr>
<td>Impurity of Plate</td>
<td>9</td>
</tr>
<tr>
<td>Chemicals</td>
<td>9</td>
</tr>
<tr>
<td>Cleaning in Place</td>
<td>9</td>
</tr>
<tr>
<td>Manual Cleaning</td>
<td>11</td>
</tr>
<tr>
<td>Assembly</td>
<td>12</td>
</tr>
<tr>
<td>Clamping</td>
<td>12</td>
</tr>
<tr>
<td>Spare Parts</td>
<td>13</td>
</tr>
<tr>
<td>Ordering Procedure</td>
<td>13</td>
</tr>
</tbody>
</table>
MIT PLATE HEAT EXCHANGER CONNECTION SCHEMA

Standard Heat Exchangers

- **M1**: Heater Fluid Inlet
- **M2**: Heater Fluid Outlet
- **M3**: Heated Fluid Inlet
- **M4**: Heated Fluid Outlet

Multipass Heat Exchangers

- **M1**: Cooled Fluid Inlet
- **M2**: Cooled Fluid Outlet
- **M3**: Cooler Fluid Inlet
- **M4**: Cooler Fluid Outlet

**Heating System**

- M1: Heater Fluid Inlet
- M2: Heater Fluid Outlet
- M3: Heated Fluid Inlet
- M4: Heated Fluid Outlet

**Cooling System**

- M1: Cooled Fluid Inlet
- M2: Cooled Fluid Outlet
- M3: Cooler Fluid Inlet
- M4: Cooler Fluid Outlet
CONSTRUCTION AND FUNCTION

Construction

A plate heat exchanger consists of an edge clamped frame within which a number of cold pressed plates are compressed. These are made with special corrugations which ensure turbulent flow and high heat transfer coefficients.

Function

After clamping of the plate pack, the plates (which are fitted with gasket) ensure an effective seal between fluids and atmosphere. In addition, intermixing of the fluids is eliminated by a double gasket seal around the inlet ports. Every second plate is turned through 180 degrees. This means that the double gasket seal occurs around every second inlet to the channels between the plates. The plate pack now forms a series of parallel flow channels in which the fluids flow in a counter current regime.

Figure 1.1

Figure 1.2

Figure 1.3

Figure 1.4
MOUNTING INSTRUCTION

Lifting Instruction
Lifting By Using Lifting Holes

Figure 2.1

Figure 2.2

Figure 2.3
Lifting By Unusing Lifting Holes

**Space Required**

On at least one side of the plate heat exchanger there must be sufficient space to unhook the plates from the top bar by a slight tilt away from the vertical. At the same time it must be possible to tighten or remove the tie bolts and inspect the plate heat exchanger. It must be possible to take off the spray screen or insulating jacket, if any, without having necessarily to remove the connecting pipes. This must be considered when installing the unit. All engagements are carried in a straight pipe section without thermometer, manometer or draw off taps at a distance of 100 mm from the unit (more in case of increased insulating thickness). The distance to finish insulated pipes should be 100 mm from the insulating jacket/spray screen. The follower must be free to move along the full length of the top bar. See dimensions for exactly your plate heat exchanger at the back of this manual.
Pipe Connections

The plate heat exchanger must be connected up according to the enclosed assembly drawing. Threaded connections should be mounted with unions or flanges with plane tightening to facilitate removal—alternatively with conical tightening connected to bends. Flanged connections must be removable. Figure 12 shows a correctly connected unit. If necessary, a suitable filter should be installed on the fluid inlet. Insulating valves are also recommended on all connections. Thermometers, pressure gauges etc. should be used as required for monitoring the plate heat exchanger performance.

Correct Pipe Mounting

To prevent undue strain on the plate heat exchanger frame, all pipes must be unloaded by suitable pipe holders. The pipe joints on the follower (FOLL.) 1 and 2 must be removable in order to enable the plate heat exchanger to be opened for cleaning and inspection. For re-tightening of the plate pack, the pipes onto the follower and any connector grids must be flexible. This can be achieved by the use of expansion joints. During opening, it must be possible to move the follower 3, without hindrance, along the full length of the top bar. For CIP (cleaning in place), without opening, piping material and layout must be chosen accordingly.
Pressure Strains

Piston pumps, gear pumps, dosing devices etc. must not be able to transfer pressure pulsations/vibrations to the plate heat exchanger as this may cause fatigue fracture in the plates.

Allowable Pressure

Working, and testing pressures are given on the machine plate.

Safety Valve Usage

Excess pressure protector must always be mounted, if the plant is likely to develop a higher pressure than that stated on the machine plate. This condition may arise during pump start up, expansion or valve change-over etc.

Pressure Impacts

The plate heat exchanger is sensitive to pressure impact. This can occur during regulation, change over, pump start-up etc., In order to avoid this situation, the use of throttling of air-operated valves, damping relays in electrical control gear, automatic pump start with closed valves etc. is recommended.

Shielding

The plate pack must be shielded, when:
- Possible splashes may cause damage
- Corrosive media are being used
- The working temperature may cause scalding
- Required by the local authorities

Insulation

If heat insulation is required, insulation jacket is able to use. This jacket surfaces completely on heat exchanger. It is able to set up without needed of pipelines removing.
START-UP AND OPERATION

Clamping Bolt Checking
Before the initial start-up check that the clamped plate pack dimensions is as specified on the machine plate on the plate heat exchanger.

Start-Up
Sudden surges and drops in pressure and temperature must be avoided, as these may damage the plates and gaskets thereby causing leakage. Pumps should be started against closed valves which can then be gradually opened until the desired flow rate is achieved. In a plate heat exchanger using steam as the heating media, the cold fluid should be introduced to plate heat exchanger before the steam is turned on. The potential damage possible due to the incorrect start up increases proportionally with increased liquid flows and the length of connecting pipework.

The initial start-up of plate heat exchangers with new EPDM gaskets must be effected by increasing the temperature slowly, max. 25 °C (77 °F) per hour.

Shut Down and Start-Up Again
During stopping and starting up, the situations below should been considered. Pressure drops and pressure increases should not be more than 10 bar per minutes. Temperature drops and increases should not be more than 10 °C per minutes

Leakage During Start-Up
During the initial start-up, minor leaks may occur until the plates and gaskets have reached their design working temperature and all sections are correctly pressurised.

Venting
When correct working temperature and working pressure have been reached, the system must be vented. The air in the plate heat exchanger is driven out by the liquid flow, provided that the capacity is as stated in the diagram. Air in a plate heat exchanger reduces the heat transmission and increases the pressure drop, thus increasing the risk of corrosion.

Operating
During operation, temperatures and pressure drops must be regularly checked. Increased pressure drop and/or failing temperatures indicate that there are coatings on the plates. The plate heat exchanger now needs cleaning. During operation, the same precautions against rises of pressure must be observed as during start-up.

Rapid Cooling
Rapid cooling of system should be avoided. Cooling and pressure should be dropped together.

Sedimentation Inside of PHE
Sedimentation (limestone, fouling etc.) reduce heat transfer and increase pressure drop. Under the pressure fluid in cooling side able to leakage. Meanwhile grit, welding burs and similar particles are able to damage gaskets.
Out Operation Longtime

If the plate heat exchanger is out of operation for a long time, it is advisable to empty it, separate the plates, and clean the unit. Clamp the plate heat exchanger lightly together, and leave it covered in order to protect the gaskets against dirt and the effect of light.

PROBABLE FAULTS

Capacity Gradients

During operation, temperatures and pressure drops must be regularly checked. Increased pressure drop and/or failing temperatures indicate that there are coatings on the plates. The plate heat exchanger now needs cleaning.

Leakage

- If the pressure is too high, reduce the pressure to the correct working pressure, which can be found on the machine plate.
- If insufficient tightening occurs, tighten up the plate heat exchanger. However, not below the minimum dimensions and never, when the plate heat exchanger is under pressure or over 40 °C.
- If fouled or deformed plates inelastic or deformed gaskets occurs, separate the plate heat exchanger and check if the plates are deformed or fouled. Check that the gaskets are elastic and nondeformed and that the faces of the joints are clean. Replace deformed plates and gaskets, before assembling, clean all plates and gaskets very carefully. Assemble the plate heat exchanger and start it up again. Even tiny impurities such as sand grains may cause leakage.
- If leakage occurs even after tightening of the plate heat exchanger to minimum dimension, separate the plate heat exchanger. Clean the plates very carefully, replace the gaskets, assemble the plate heat exchanger and start it up again.
- If leakage occurs through drain holes of the gaskets, reason could be defective gasket or badly corroded plate. Then separate the plate heat exchanger, replace defective plates and gaskets, if any, and assemble the plate heat exchanger and start it up again.

Non Visible Leakage

If holes occur in plates, corrosion or fatigue fracture, fluids get mixed. A suspected leakage can be localised in the following way:

- Remove one of the lower pipe connections.
- Then put the opposite side under pressure.
- If the medium continues to run out of the lower pipe connections after the pressure has stabilised.
- One or several plates are leaking.
- Close down the plate heat exchanger.
- Separate the plate heat exchanger and check the plates very carefully.

*For the tightening dimensions, please contact with our company.*
• Check suspected plates with a dye penetrant.
• Check defective plates and gaskets, see ordering.

Procedure

• Before assembling, clean all plates and gaskets.
• Assemble the plate heat exchanger and check to find more defective plates, if any, by putting one side under pressure.
• Start-up again.

CLEANING

Impurity of Plate

The capacities and resistance to corrosion of plate heat exchangers depend on the plate pack being kept clean. Fouling on the plates can be removed manually or by CIP (cleaning in place).

Chemicals

The definition of a suitable detergent is brief and to the point. Coatings on the plates must be removed without damaging plates and gaskets. It is important not to decompose the passivating (protective) film of stainless steel—the film contributes to preserving the resistance of the steel to corrosion. Do not use chlorine-containing agents such as hydrochloric acid (HCl).

Examples: Oil and fats are removed with a water emulsifying oil solvent, e.g. mobisol 778 or Castrol Solvex Ice 1130, organic and greasy coatings are removed with sodium hydroxide (NaOH) max. concentration 1.5% - max. temperature 85 °C (185 °F). 1.5% concentration corresponds to 3.75 litre 30% NaOH per 100 litre water. Furrings and scale deposits are removed with nitric acid (HNO₃) - max. concentration 1.5% - max. temperature 65 °C (149 °F). 1.5% concentration corresponds to 1.75 litre 62% HNO₃ per 100 litres water. Nitric acid has an important constructive effect on the passivating film of stainless steel.

Cleaning in Place

A circulation system, in which a suitable detergent can be circulated is established. If the product to be flushed out has a high viscosity, the circulating quantity must be big enough to reach a sufficient speed for flushing out the product. If the product pump is volumetric, it may be necessary to insert a pump for the detergent parallel to the former. It is assumed that the fouling on the plates are soluble in a detergent which does not attack plates and gaskets.
Example of CIP Cleaning:

- Drain off product residues and cooling and heating media.
- Rinse with cold or lukewarm water.
- Circulate with warm cleaning fluid solution.
- Rinse with warm water. Rinse with warm water with softener added to it.
- Rinse with cold or lukewarm water.

Cleaning can also be effected without circulation by pouring a cleaning fluid solution into the system. After some time of standing, wash out the detergent with clean water.
Manual Cleaning

Disassembling of Heat Exchanger
Before opening the plate heat exchanger, it must be cooled down to below 40 °C (104 °F), and it must not be pressurised. Cooling must not exceed 10 °C per minute (the pressure drop must not exceed 10 bar per minute. On completion of the procedure, separate the frame by keeping two, perhaps four diagonally placed tie bolts clamped. Dismount the rest of the tie bolts.

Cleaning
Clean the plates with a soft brush and a suitable detergent. In case of thick layers of scale or organic materials, the plates must be put in a bath of detergent. Never use steel brush, metal scraper or the like. A high-pressure cleaner can be used with care—however, never with sand or other abrasives added.

Maintenance
- The all metallic parts should be sent for recycling of material.
- The all wear parts, which are not oil and metallic, should be produced in accordance with local regulations.

Separating
At the end of usage, the equipment will be recycled according to the relevant local regulations. Any hazardous residues from the process liquid, as well as it should be cared. If in doubt or in the absence of local regulations, please contact with Ekin Endüstriyel. 444 35 46 (EKİN)
ASSEMBLING

Every each one of plates and gaskets must be contoled against fails and foulings. All plates and gaskets must be clean for mounting. plates and gaskets which contacted oil, must be degreased. Any small particle is able to cause leakage. Every gaskets must be cleaned and glued carefully. paraclip gaskets must remove during cleaning.

Plate Procedure

If the plates have been dismounted, they must be correctly inserted. Every second plate is turned through 180 degrees. This means that the double gasket seal occurs around every second inlet to the channels between the plates. The plates of multi pass heat exchangers have serial number. If plates are mounted correctly they will have honeycomb appearance. If one plate or more than one plate is mounted uncorrectly, appearance will be like.

Clamping

The maximum and minimum dimension for clamping is stated on the machine plate, which is placed on the head. The plate heat exchanger must be clamped to dimension between max. and min. dimension. The final clamping to minimum dimension is recommended after a prox. one month’s operation—alternatively, immediately after installing new plate heat exchangers/new gaskets.

For Example: If the distance between front body and rear body is 400 mm; \[400 \times (1/100) = 4 \text{ mm}\] Minimum level tightening is recommended after one month’s work. Alternatively it can be tightened after heat exchanger installation.
SPARE PARTS

Ordering Procedure

When ordering plates, please state the serial numbers of the plates and the type and serial number of the plate heat exchanger. The type and serial number of the plate heat exchanger can be taken from the machine plate.

Gasket Colors

<table>
<thead>
<tr>
<th>NBR (Nitrile)</th>
<th>EPDM</th>
<th>VITON</th>
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<tbody>
<tr>
<td>Yellow</td>
<td>Grey</td>
<td>White</td>
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Figure 7.1

Figure 7.2
CERTIFICATES
CERTIFICATE OF WARRANTY

The Document’s Confirmation Date And Number: The use of this document has been authorized by T.C. Sanayi Ticaret Bakanlığı İİ Müdürlüğü in accordance with the Law No 4077 on the Protection of Consumers and the Communiqué on the Implementation of the Guarantee Certificate put into effect based on this Law.

WARRANTY CONDITIONS:
1. Warranty period starts from the delivery date of the goods.
2. All parts of the goods are covered by our company’s warranty.
3. In case of malfunction of the goods within the warranty period, the time spent in the repair is added to the warranty period. The repair period of the goods is maximum 30 working days. This period starts from the date of notification to the service station of the defect goods. In the absence of service station, this period starts from the date of notification to the seller, dealer, agent, representative, importer, or manufacturer of the goods.
4. In case of malfunction of the goods within the warranty period due to material, workmanship or assembly defects, the goods will be repaired at no cost and no additional cost will be asked from the buyer under the name of changed part price or any other name.
5. Malfunctions arising from the use of the product in contravention of the provisions in the user manual are not covered by the warranty.
6. For the problems that may arise in relation to the warranty certificate can be applied to the Sanayi ve Ticaret Bakanlığı Tüketicinin ve Rekabetin Korunması Genel Müdürlüğü.

For the product that was sold to ................. LTD. ŞTİ. / AŞ / Legal Entity on ....../...../20..... with stated model, brand and serial number, all kinds of manufacturing and material defects are covered by the warranty of our company for two years.

Brand: ____________________________
Model: ____________________________
Type: ______________________________
Quantity: __________________________
Production No: ______________________
Number of Plates: ____________________
Gasket Type: ________________________

NOT: User mistakes are not covered by warranty.
www.ekinendustriyel.com
It is vital for your system to be designed and implemented correctly in the first installation in order to be able to operate at the desired capacity, smoothness and long life. For this reason, you can get first-hand the technical support you need during the installation phase of your system and the problems that may arise in the business; You can reach us 24 hours +90 (216) 232 24 12 in 7 days.

We would like to reiterate that we will be happy to share our knowledge accumulated over many years with our valued customers in order for your system to work correctly and performance. Ekin will continue to be the best solution partner for you in all applications with all kinds of heating and cooling applications.
Today; 135 points in the world.