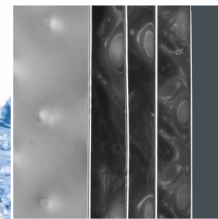
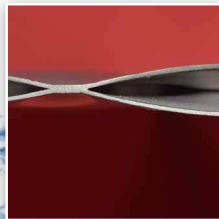
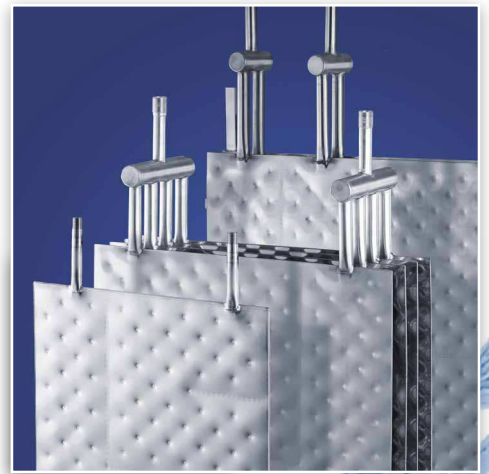
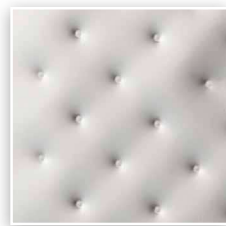


Pillow Plate Heat Exchanger SYNOTHERM®



MAZURCZAK
THERMOPROZESSE

Functional principle of Pillow Plate Heat Exchangers SYNOTHERM®

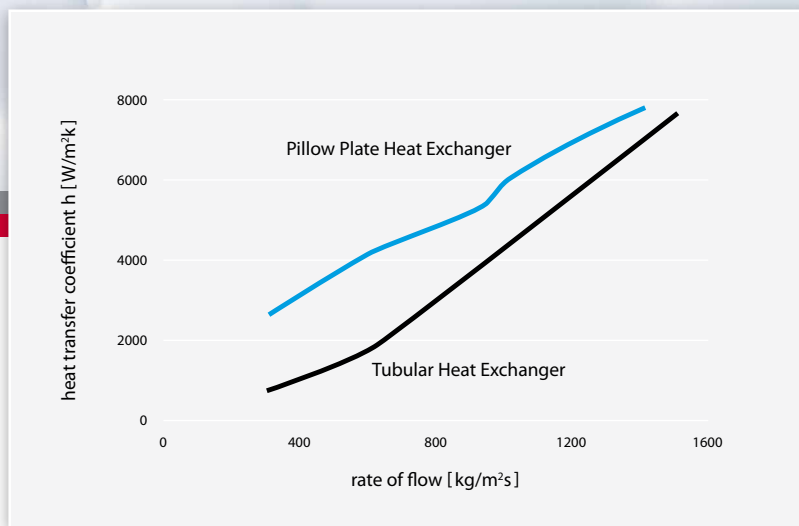


Figure 1:
Adapted from J. M. Tran, M. Piper und E. Y. Kenig (2014), Experimental Investigation of Convective Heat Transfer and Pressure Drop in Pillow Plates under Single-Phase Through-Flow Conditions, Chem. Ing. Tech. 2015, 87, No. 3, 226–234; <http://dx.doi.org/10.1016/j.cherd.2015.03.031>

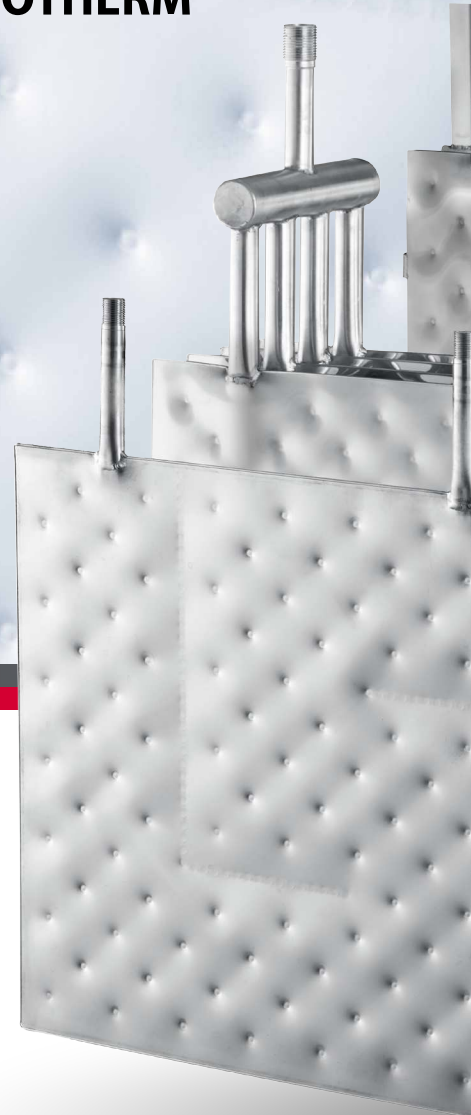
Working Principle

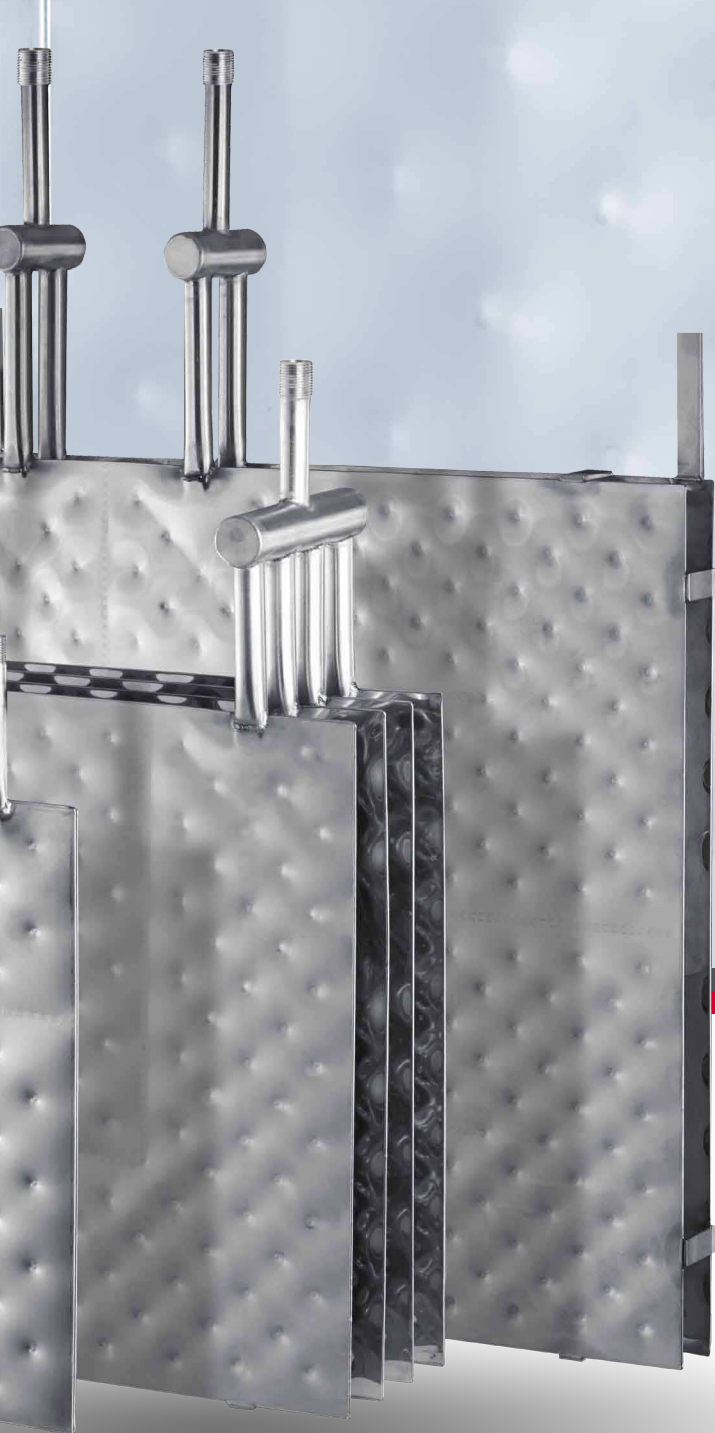
The SYNOTHERM® plate heat exchangers are made of titanium or stainless steel and are ideal for the indirect heating and cooling of process liquids in plants or tanks. They are manufactured to the specific requirements of each customer. They transfer the thermal energy between the heat exchanger medium that flows through the heat exchanger and the process liquid.

The process liquid in the container circulates around the plate heat exchanger and is heated up to the desired working temperature and maintained.

If heat is generated in a process (for example by a rectifier or an exothermic reaction), this can be cooled down by the heat exchangers.

For heating applications hot water, steam, saturated steam and thermal oil can be used as a heat exchanger medium. Water, salt solutions and glycol are suitable for cooling.





The characteristic pillow structure of the SYNOTHERM® plate heat exchanger allows for a strong flow of the medium through the exchanger and leads to a high heat transfer coefficient h .

As Figure 1 shows, Pillow Plate heat exchangers have a higher heat transfer coefficient $x_1 h$ (in W/m^2K) depending on the flow rate (in kg/m^2s) than tube coil heat exchangers. This causes a higher heat transfer coefficient.

The VDI heat atlas ^[2] indicates a x_2 an overall heat transfer coefficient of $150 - 1200 W/m^2K$ for tube bundle heat exchangers.

For double-tube heat exchangers, this coefficient is only between $300 - 1400 W/m^2K$, whereas plate heat exchangers have a x_3 an overall heat transfer coefficient of $1000 - 4000 W/m^2K$!

As the following basic formula ^[3] shows, less heat transfer area A is required to transfer the same power Q . Consequently, the SYNOTHERM® plate heat exchangers save space, weight, material and costs.

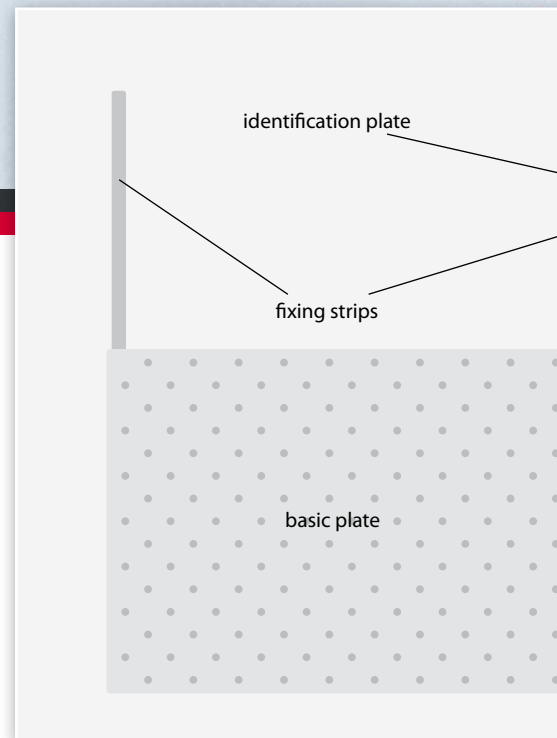
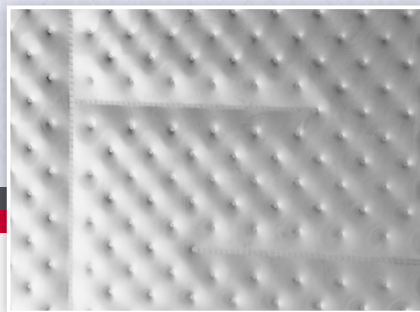
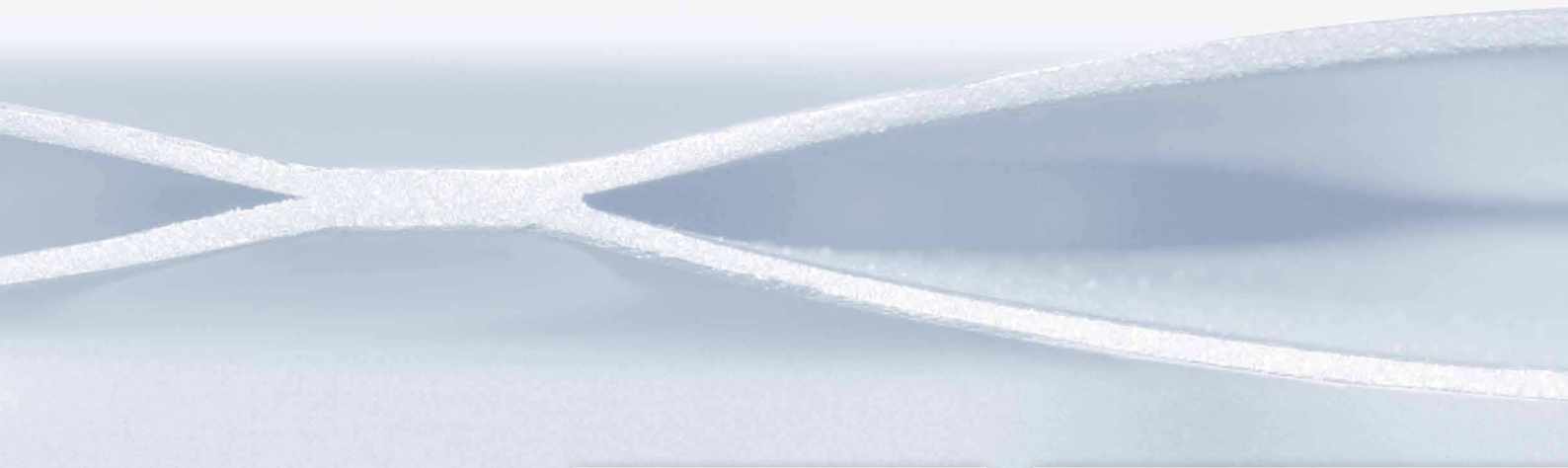
$$Q = k \times A \times \Delta\vartheta_{in}$$

In the engineering of tanks and GMF-plants, the space requirement of the components plays an important role.

The main advantage of the Pillow Plate heat exchangers compared to conventional coil heat exchangers is that there can be a space saving of up to one third. This reduces the sizes and costs of your tanks and provides more space for the working process.

In addition, plate heat exchangers are lighter and stronger than coil heat exchangers, allowing for easier handling and cleaning!

Manufacturing Process and Construction



Standard working materials specification

code letter

KA	Stainless steel (Material no. 1.4301 / AISI 304)
KI	Stainless steel (Material no. 1.4404 / AISI 316L)
KB	Stainless steel (Material no. 1.4571 / AISI 316Ti)
TI	Titanium (Material no. 3.7035 / grade 2)

Production Process and Setup

We manufacture the SYNOTHERM® plate heat exchangers at our premises in Schwabach, Germany, and monitor the production process within the scope of DIN EN ISO 9001.

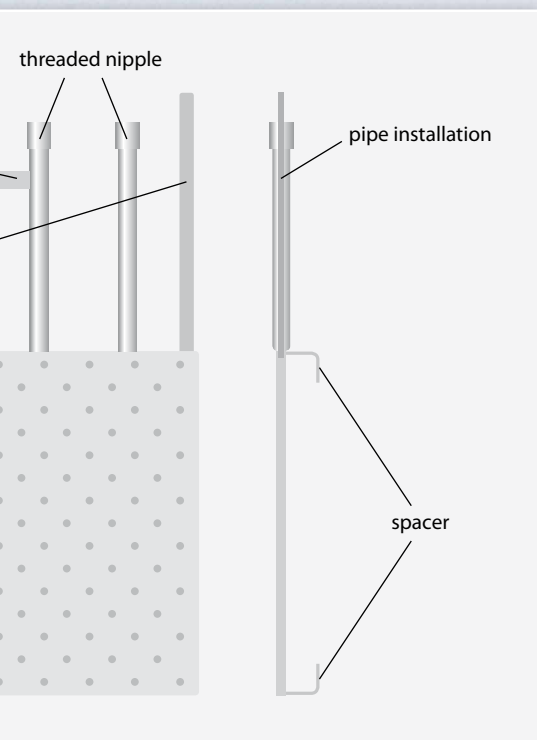
The latest welding technologies produce nearly no annealing colors to the surface during the welding process and pickling of the surface is not necessary. The surface is smooth and can be electroplated for applications with high hygiene requirements.

The SYNOTHERM® plate heat exchangers are manufactured using two metal sheets to form the basic plate.

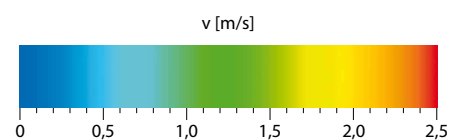
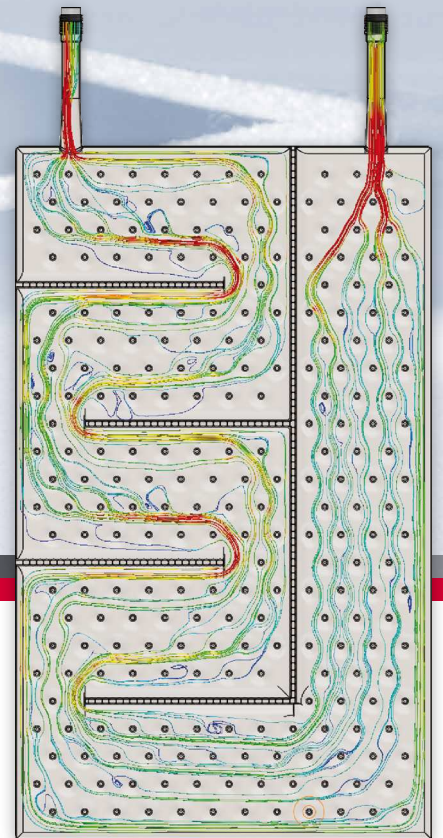
The substantial quality of the metal sheets used ensures the high quality of our plate heat exchangers.

The metal sheets are cut to the required dimensions by a sheet shear, then a fully automatic spot and edge welding is achieved by a retraceable welding process. The inlet and outlet consists of piping with the appropriate quality connection technology.

As a connection technique, either a flange or a threaded nipple can be welded onto the pipes. This allows us to easily solve your complicated installation situations.



Setup and components of plate heat exchanger SYNOTHERM®



This reduces the risk of a line breakdown with the associated costs. The plate heat exchangers are fixed to the tanks by the fixing strips.

The spacers guarantee a defined distance to the tank wall, that the entire heat exchanger surface is immersed and the process liquid is able to flow round the exchanger. This ensures optimum heat transfer.

The type designation (article number and device number) and technical data are engraved on an identification plate, which is permanently legible.

The pillow structure of the plate heat exchangers is generated by high pressure forming. The expansion is effected with an inflation pressure, which is far above the working or operating pressure.

The compact, lightweight and pressure-tight design ensures a long and safe working life of your line. The strength of SYNOTHERM® plate heat exchangers significantly reduces the risk of mechanical damage or misshaping compared to coil heat exchangers.

Design, Safety and Quality



Design and Conception

For an efficient and bespoke design for your application, we offer our computer-aided heat demand calculation. With this information, we can determine the energy requirements. With our own, in-house heat exchanger software, we can provide the most suitable SYNOTHERM® plate heat exchanger for your application, giving you the exact information on the required flow rate and the pressure loss.

The SYNOTHERM® plate heat exchangers are individually designed and made according to your requirements. The numerous dimensions and the various connection possibilities provide a variety of installation options, resulting in a solution to even the most difficult installation situation. Our 3D-CAD-drawings illustrate precisely the position of the exchanger in the tank. After ordering, you will receive the production drawings for

approval, which are available in various CAD formats. Based on this information, you can design and construct your line and tank.

Due to our extensive experience in using high-quality metallic materials in aggressive liquids, we are able to select the best material for your application. This guarantees a long life of the heat exchanger as well as a trouble free and safe operation.

To find the best and most cost effective plate heat exchanger solution for you, please use the questionnaires you find on our homepage.

Maintenance and Handling

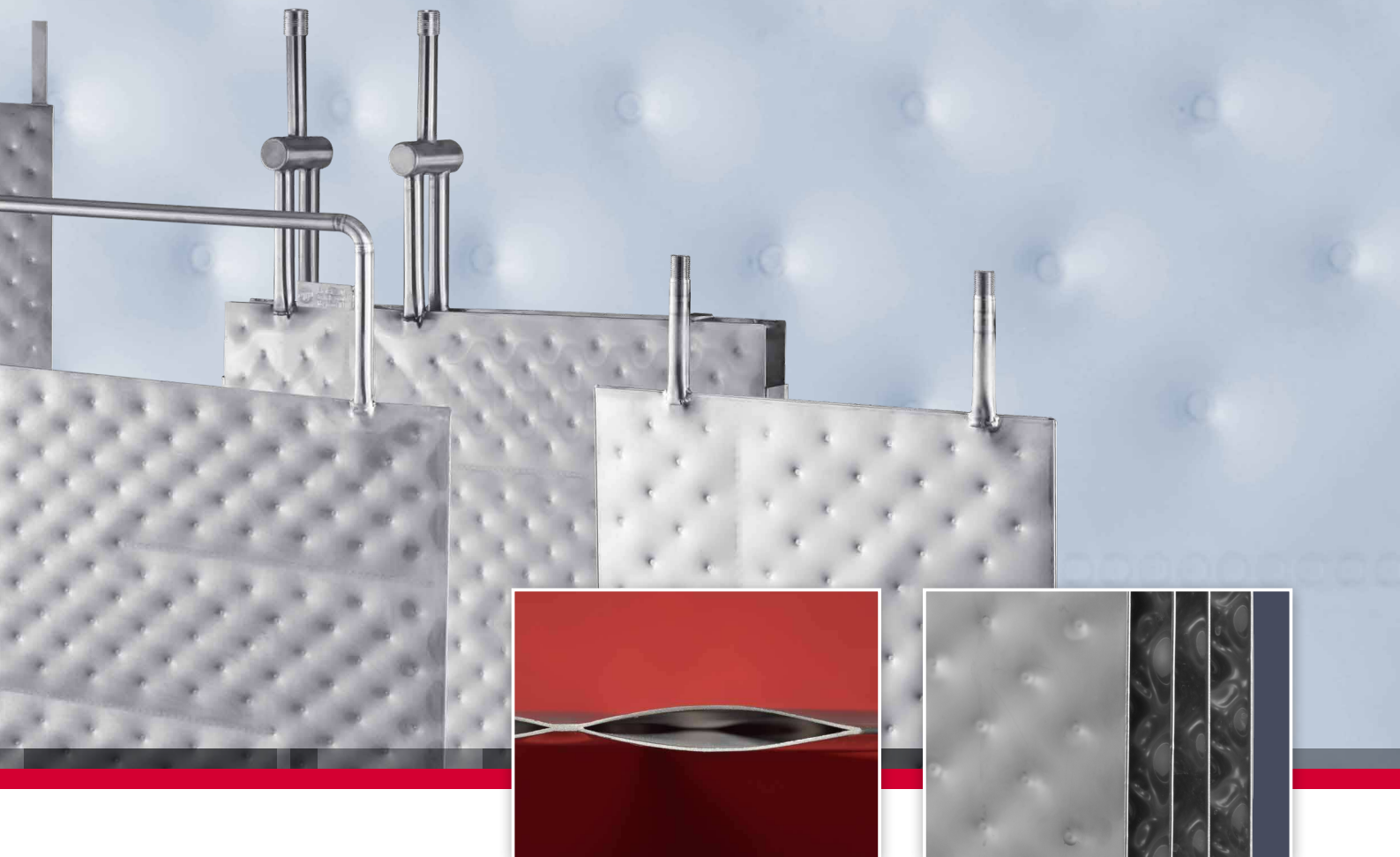
The maintenance costs for SYNOTHERM® plate heat exchangers are significantly lower compared to tube heat exchangers. The flat and smooth surface can be cleaned easily and quickly with a steam jet or high-pressure cleaners, resulting in your process being back in operation quickly.

Another advantage is the simple assembly and easy handling of the SYNOTHERM® plate heat exchangers. The fixing strips

easily attach the plate heat exchangers to the tank. In addition, it is possible to design special fasteners to fix the heat exchangers to converters, goods carriers or trolleys, enabling the plate heat exchangers to be lifted in or out of the tank.

Monitoring Equipment

The temperature and level monitoring of the process liquid can be realized with our temperature sensors, conductive level sensors and level switches with the associated electronics. Level measurement technology control ensures the efficient running of the heat exchanger and avoids any damage due to dry running. By using temperature sensors, you can control the temperature and adjust the flow rate of the heat exchanger medium according to the required solution temperature. With our monitoring technology, the use of SYNOTHERM® plate heat exchangers is even safer and more efficient.



Safety and Quality

All plate heat exchangers are designed, manufactured and final-tested in compliance with the Pressure Equipment Directive 2014/68/EU. Accordingly, we perform the overpressure test and the leakage test. The test pressure is determined according to DIN EN 13445-5. We ensure that your SYNOTHERM® plate heat exchanger is properly classified and designed in accordance with the pressure equipment directive. For pressure vessels of category 1 and 2, CE conformity is ensured. Our welding specialists are certified according to EN ISO 9606.

Please note that all the details in this brochure are up to date with current technology requirements. We cannot take responsibility or liability for any incorrect or incomplete information in this brochure. We reserve the right to make alterations should they be of a technical advantage or necessity. We are not liable for any problems resulting from improper use by the customer. Trust our high quality products and have a chat with us!

Visit our heat exchanger homepage:
www.pillowplate-heat-exchanger-synotherm.com

Literature

- [1] J. M. Tran, M. Piper und E. Y. Kenig (2014), Experimental Investigation of Convective Heat Transfer and Pressure Drop in Pillow Plates under Single-Phase Through-Flow Conditions, Chem. Ing. Tech. 2015, 87, No. 3, 226–234; <http://dx.doi.org/10.1016/j.cherd.2015.03.031>
- [2] Gesellschaft, VDI (2013), VDI-Wärmeatlas. 11. Aufl. Wiesbaden: Springer Berlin Heidelberg, S. 85-87
- [3] von Böckh, P./Wetzel T. (Hrsg.) (2015): Wärmeübertragung, Grundlagen und Praxis, 6. Auflage, Karlsruhe, S.9



The long-lasting use and high quality of our products is our aim from development to production to distribution.

We are international

Albania • Armenia • Austria • Azerbaijan • Belarus • Belgium • Bosnia-Herzegovina • Brazil • Bulgaria • Chile • China
Croatia • Czech Republic • Denmark • Estonia • Finland • France • Georgia • Germany • Greece • Hungary • India • Iran • Ireland • Israel
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Romania • Russia • Serbia • Singapore • Slovakia • Slovenia • South Africa • South Korea • Spain • Sweden
Switzerland • Taiwan • Thailand • Turkey • U. K. • Ukraine • USA

Have confidence in our tested, high-quality products and contact us.

You can also find us at www.pillowplate-heat-exchanger-synotherm.com – We look forward to hearing you.

