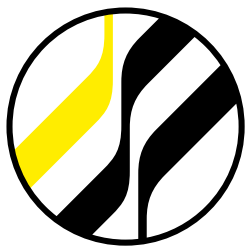


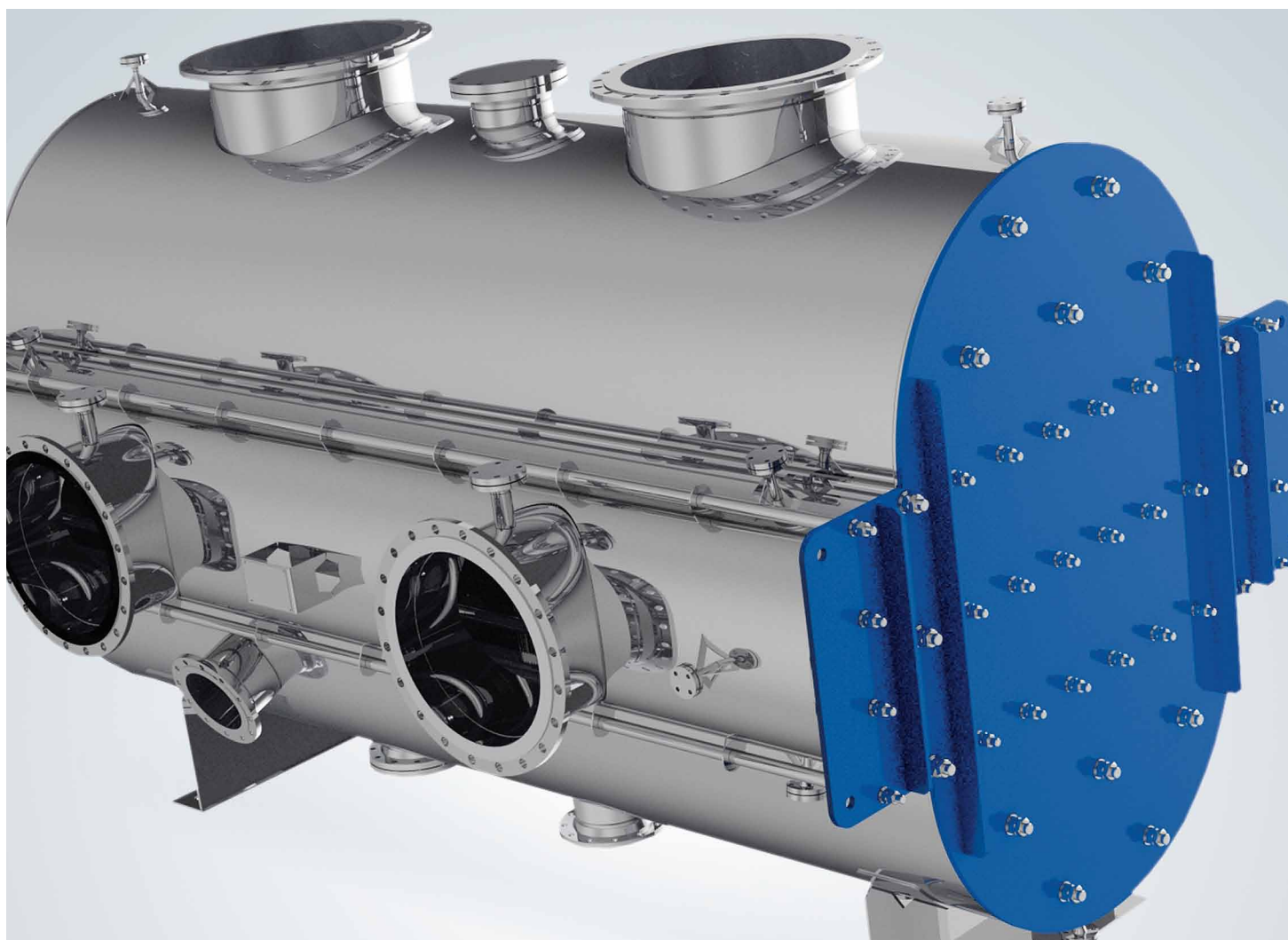
Kelvion



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K°Flex

# A NEW DIMENSION OF EFFICIENCY AND FLEXIBILITY

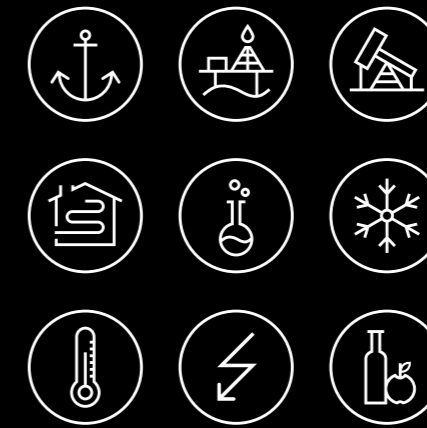




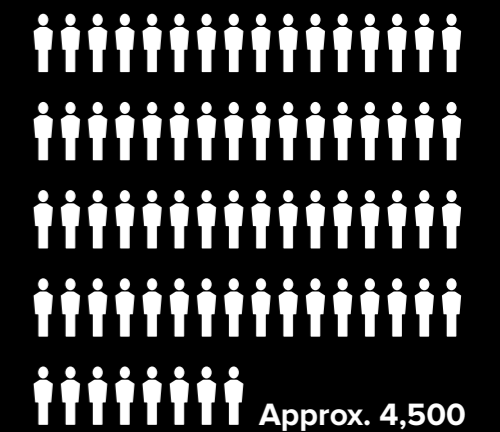
## Kelvion – a tribute to Lord Kelvin

Lord Kelvin (1824 – 1907) formulated the laws of thermodynamics

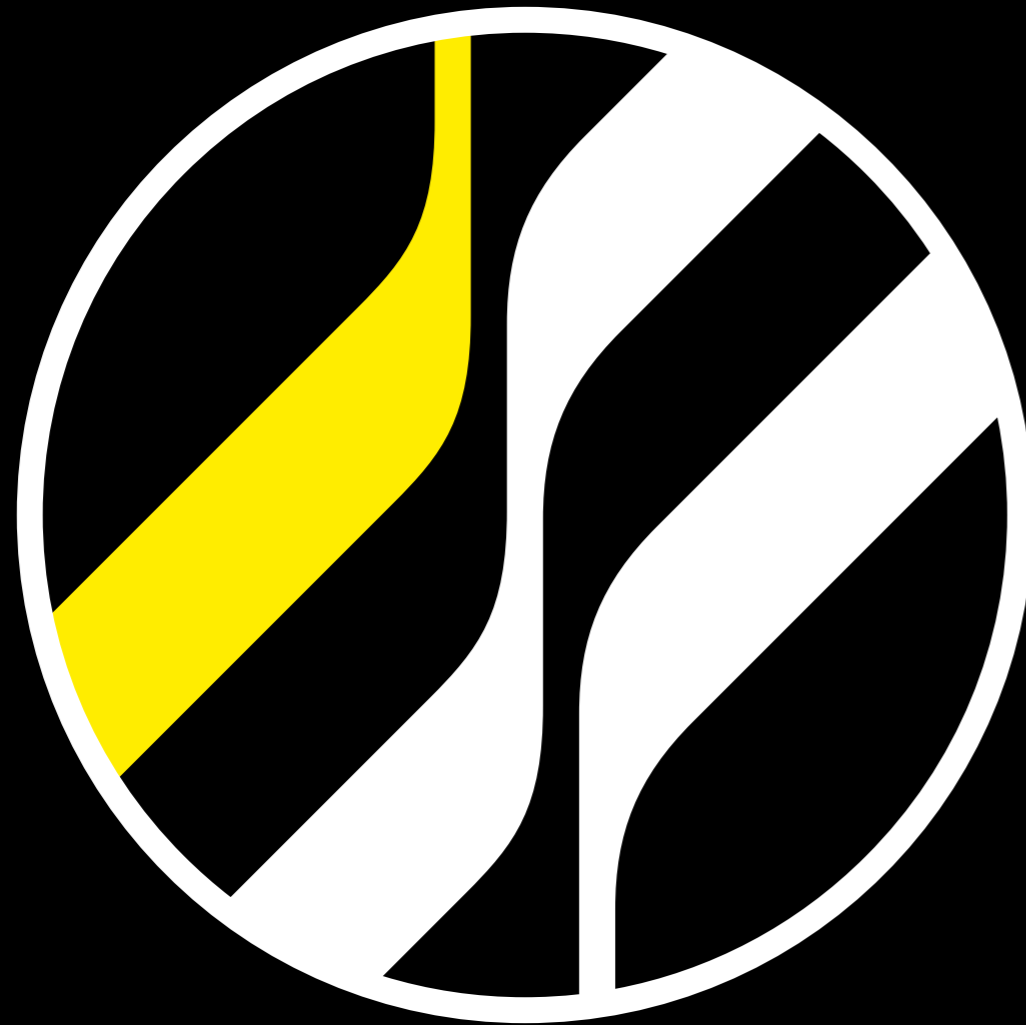
Our markets:



Our employees:



Approx. 4,500



# YOU'VE ARRIVED – AT THE GLOBAL EXPERT IN HEAT EXCHANGE

Welcome to Kelvion. As successor to the GEA Heat Exchangers Group, we continue to break new ground, making discerning customers more successful than ever with our integrated heat exchanger solutions.

**Our solutions for your applications:**

We offer our customers one of the world's largest product portfolios in the field of heat exchangers. It includes individual solutions for practically all conceivable applications and complex environmental conditions: plate heat exchangers, shell and tube heat exchangers, finned tube heat exchangers, modular cooling tower systems, and refrigeration heat exchangers.

**Your markets are our markets, too:**

The markets in which you and we together operate are among the most important in the world: energy, the oil and gas industry, the chemical industry, marine applications, food and beverages, climate and environment. We provide every single market segment with solutions of outstanding efficiency, safety, and sustainability.

**We are highly committed to earning your trust:**

We want to win your trust with everything we do and convince you with the solutions we offer. With this high aim in mind, we invest our extensive know-how, our great precision, and our passion in everything we do: including product development, manufacturing, installation, and after-sales support.

**Seeing things from the customer perspective:**

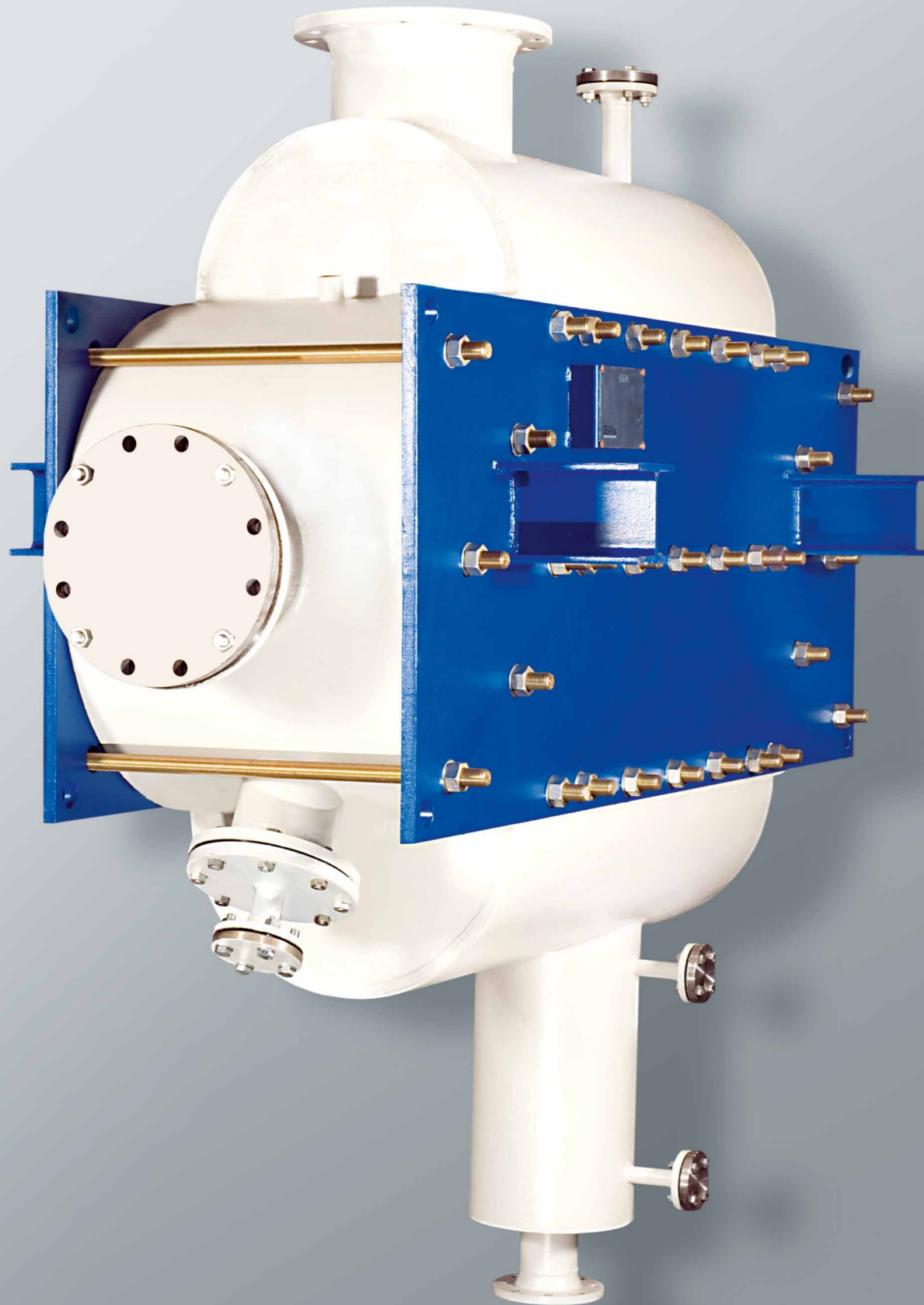
Your specific requirements count – and nothing else. Whatever we offer you, it must meet these requirements. Our entire way of thinking and working is geared towards this aim. Our customers truly appreciate this: after all, this is how we make their companies more efficient.

**We are at your service.**

Kelvion – Experts in Heat Exchange.

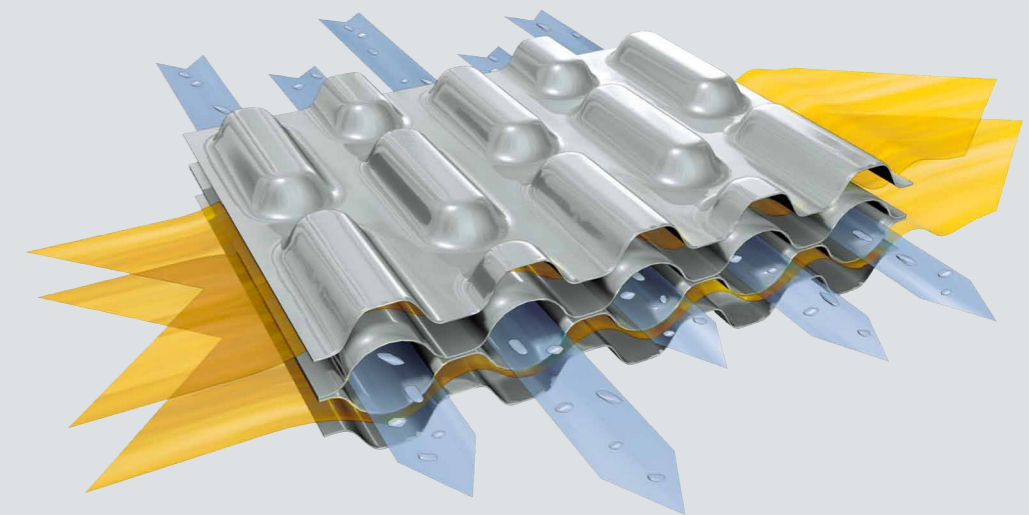
# A NEW DIMENSION OF EFFICIENCY AND FLEXIBILITY

**Plate with tubes: K°Flex combines the advantage of both plate-type and shell-and-tube heat exchangers in a single unit.**



Our K°Flex plate with tubular and wavelike channels stands pressures of up to 100 bar and has a long tradition in several industries. This plate has been successfully working as plate falling film evaporator for more than 20 years. We are dedicated to design cost efficient plate heat exchangers with excellent thermal performance and maximum mechanical stability.

The tubular side of K°Flex allows high flow rates with a minimum pressure drop. The wave side stands for high turbulence and outstanding heat transfer coefficients – all this within a pressure range from vacuum up to 100 bar.



Kelvion's K°Flex design is based on standardized modules and plate packs for different pressure ratings. Each size is optimized to enable reliable and long-term operations.

The asymmetrical flow gap (tube/wave) makes it a strong player as condenser, evaporator and heat exchanger for thermal treatment of two-phase mixtures in chemistry, petrochemical plants and in the oil and gas industry.

With tube diameters of 6 or 9 mm fluids with particles and high fouling risk can be handled. The wide and open

cross section of the tubular side is most advantageous for condensation under vacuum, large gas volume flow rates and two-phase applications like gas heating or gas cooling with partial condensation (gas drying).

Various design options are available for different requirements. Depending on the operating pressure, headers in adequate shape or round vessels are used. Longtime experience, e.g. in power plants since 1992, and proven reliability of the mechanical design ensure carefree and long-standing operation of the K°Flex.

# TOP PRIORITY FOR RELIABILITY AND SAFETY

We have long time experience and extensive know-how in pressing and welding of thin plate materials.

K°Flex Plate Heat Exchangers are fully welded and have been well proven for many years. Safe operation for the people and the environment with a long and carefree service life is supported by the fully welded and gas-proof design without using any gaskets. Our aim is the economical solution with a strong technical performance and attractive lead times for our clients.

Kelvion's K°Flex standard series offers a robust and compact design with outstanding heat transfer.

- Up to 100 bar operating pressure on the wave side
- A safe operation due to fully welded design (gas-proof design)
- Standardized modules and housings for economic solutions
- Know-how and longtime experience lead to reliable product quality

### Inside K°Flex

K°Flex plates are alternately welded to build a plate pack. The inlet and outlet sides of the plate pack are closed with distribution headers. Pressure plates are bolted with the fully welded housing and ensure mechanical stability. The basic flowmode is crossflow. Cross- and counterflow can be set up with internal baffle plates.

### Cleaning

CIP is the standard cleaning method. Additional provisions for mechanical cleaning of tube and wave side can be integrated.

### Certification

Design and fabrication is according to international codes such as EN13445 / ASME / AD2000.

### K°Flex plates

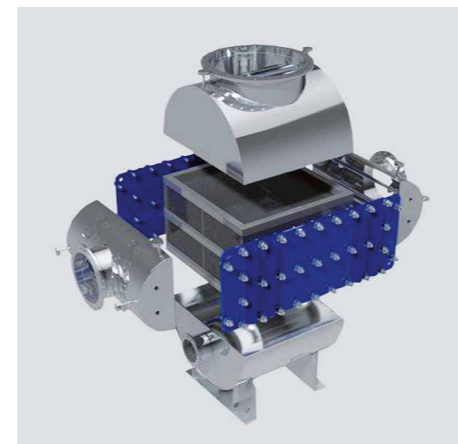
- Asymmetrical corrugation: one side is formed like tubes with a diameter of 6 or 9 mm, the other side is shaped like waves.
- Volume flow rates between the hot and cold side can be remarkably different.
- Tube and wave sides can be arranged as single- or multipass and allows for crossflow or cross- and counterflow.

### K°Flex standard series

- Modular concept of plate packs and housing for different pressure ratings
- Heat transfer areas of up to 2,500 m<sup>2</sup> in standard units and up to 12,000 m<sup>2</sup> on special request
- Connections of up to 3,000 mm in diameter
- Condensation capacities of 200 MW in a single unit



K°Flex Plate



Explosion view



LP

MP-H

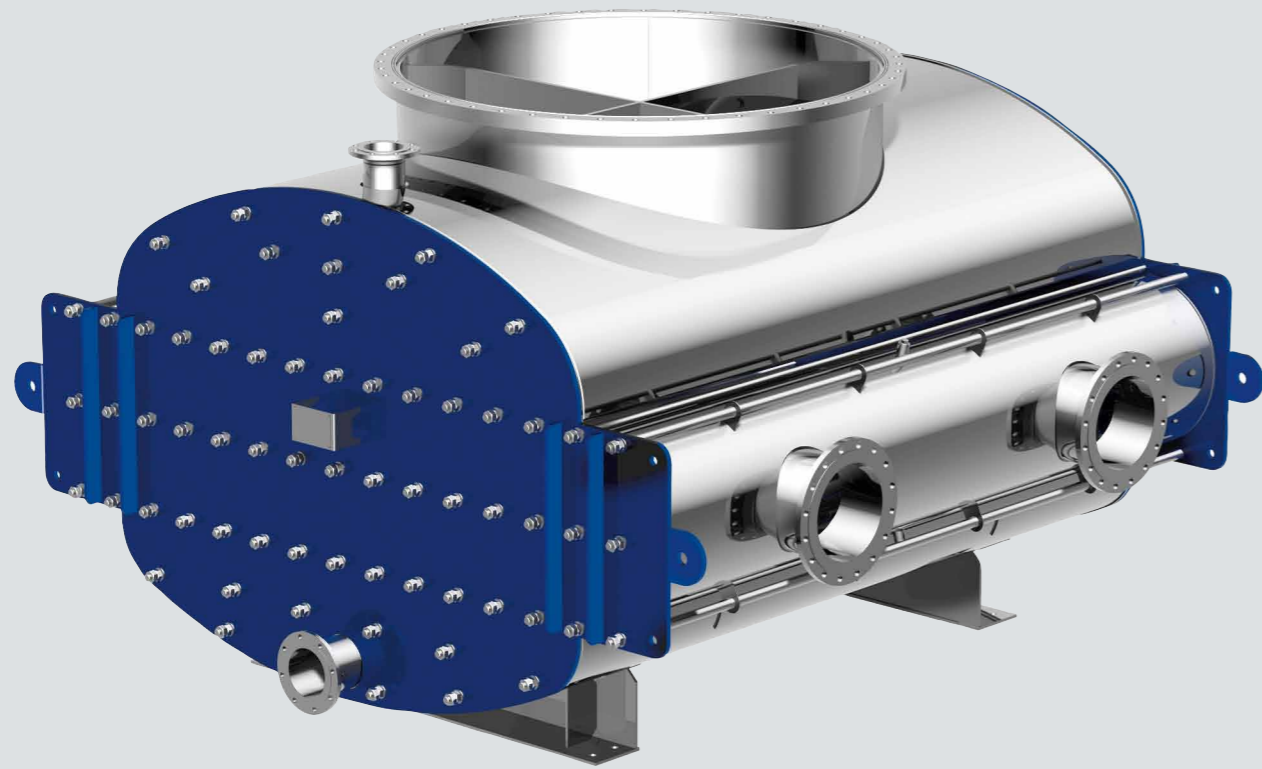
MP-V

HP-H

HP-V

### K°Flex series – Technical data and standard features

Pressure rating	DS1	DS2-3	DS4	DS5-7	
<b>Plate &amp; plate pack design</b>					
Plate corrugation	wave-tube	wave-tube	wave-tube	wave-tube	
Tube diameter	mm	6.0 / 9.0	6.0 / 9.0	6.0 / 9.0	
Plate thickness	mm	0.8	0.8	1.5	
Plate width	mm	330	330	330	
Plate length	mm	1,000 - 3,600	1,000 - 3,600	800 - 10,300	
Number of plate packs/unit		1	1 - 4	1 - 2	
Max. dimensions of plate pack in one unit (length x width x height)	mm	0 3,600 x 4,600 x 110	0 3,600 x 3,600 x 170	6 3,441 x 3,586 x 168	10,300 x 750 x 750
Maximum heat transfer area/unit	m <sup>2</sup>	2,500	2,540	2,540	1,040
<b>Casing &amp; connections</b>					
Casing type	LP	MP-H	MP-V	HP-H/V	
Connections	DN100 - DN3000	DN100 - DN1000	DN100 - DN1000	DN100 - DN800	
<b>Design conditions</b>					
Max. operating pressure on tube side	-1 / 0.5	-1 / 16	25	16	
Max. operating pressure on wave side	10	25	45	60 / 80 / 100	
Max. operating temperature	110	300	300	150	
<b>Materials EN (ASTM)</b>					
Plate pack	1.4301 (304) / 1.4404 (316L)	1.4301 (304) / 1.4404 (316L)	1.4301 (304) / 1.4404 (316L)	1.4301 (304) / 1.4404 (316L)	
Casing	1.4541 (321) / 1.4571 (316Ti)	1.4541 (321) / 1.4571 (316Ti)	1.4541 (321) / 1.4571 (316Ti)	1.4541 (321) / 1.4571 (316Ti)	
Materials on request (extract)	1.4539 (904L)	1.4547 (31254)	1.4462 (31803)	Nickel-alloys	



## K°Flex – Vacuum condenser

# LOW WEIGHT AND HIGH PERFORMANCE

### Applications examples

- Vacuum steam condensation in incineration plants to provide low temperature heat for greenhouses and district heating networks
- Condensers in vacuum crystallization
- Condensation of process media from vacuum distillation columns

Condensation processes in vacuum need low pressure drops at high volume flow rates. The tubular side of the K°Flex plate pack shows ideal suitability for this purpose because of the short flow path and the free and wide cross section. The cooling fluid is passing through the wave like channels with high turbulence. All of these improve significantly the heat transfer and hydraulic performance in the condensing media as well as on the cooling side.

The K°Flex vacuum condenser fulfills the requirements for minimum space and weight. A special design for a fully welded and compact housing has been developed. This allows the installation under the most difficult conditions and on top levels,

where size and weight are an important issue. Large diameters for the steam inlet connection according to process requirements can be provided. All connections are adjusted to client's requirements. Non-condensable gases will be removed through appropriate devices.

- **Compact design with small footprint and low weight**
- **Minimum pressure loss at high volume flow rates**
- **Connection sizes up to DN3000**
- **Excellent heat transfer under vacuum conditions**

## K°Flex – Condenser for pressures up to 25 bar

# FIRST CLASS IN POWER GENERATION AND PROCESS INDUSTRIES

K°Flex condensers have been working successfully in the water-steam-cycle of power plants since 1992. They withstand severe operating conditions due to enhanced pressure resistance of the K°Flex plates.

The unique three dimensional and solid design of the plate pack corners ensures a strong connection between plate pack and housing. Both plate pack and housing are based on a modular configuration. A combination with a condensate collector (hotwell) is possible.

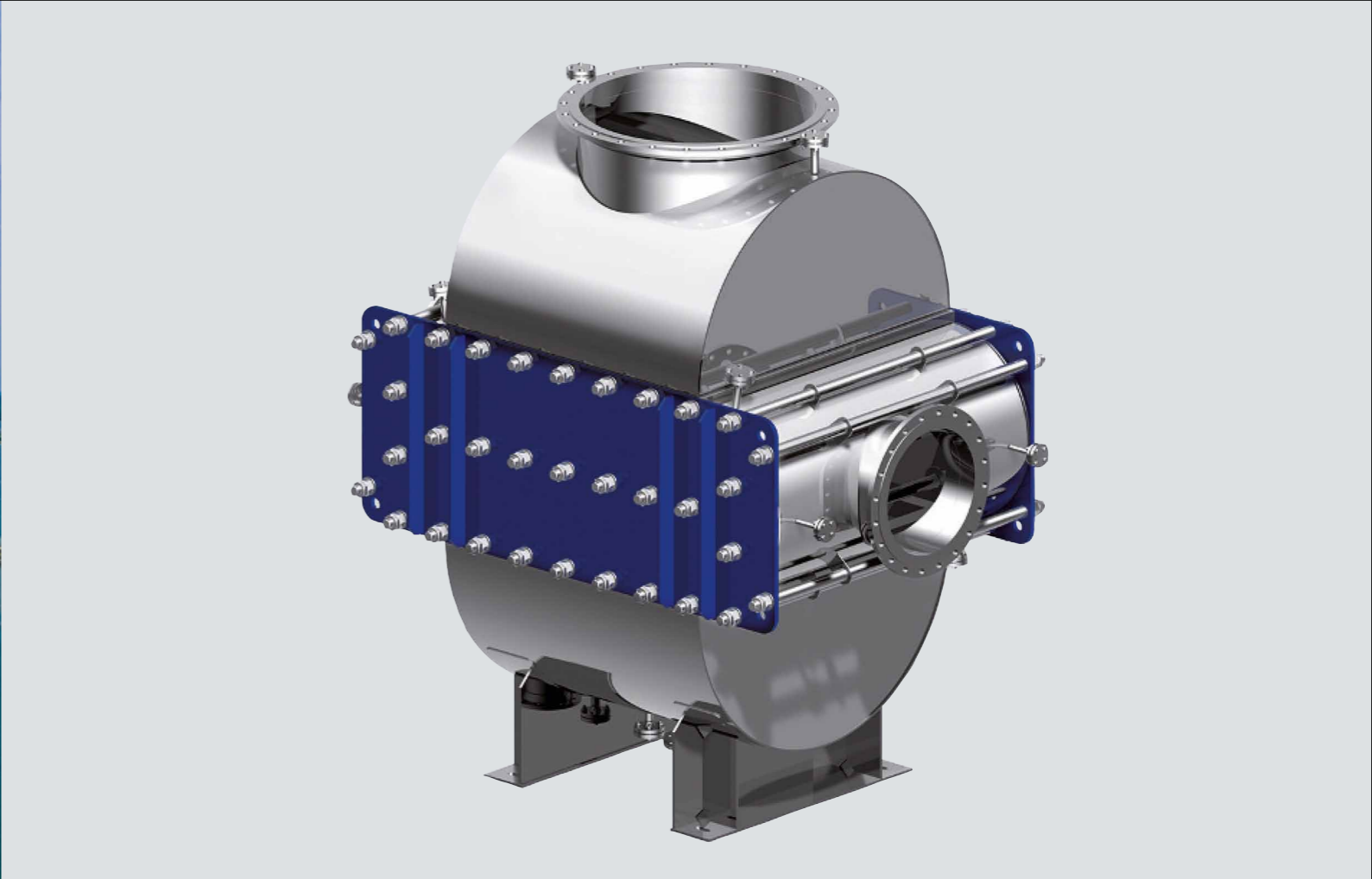
In typical installations the K°Flex condenser supplies the required energy to district heating systems. Although the best efficiency is reached with condensation

of saturated steam it is also possible to use superheated steam. After total condensation the condensate can be led through several passes within the plate pack which provides further subcooling of the condensate.

- **More than 20 years of experience in the turbine cycles of power plants**
- **Unique three dimensional and solid design of the plate pack corners**
- **Integrated condensate subcooling zone**



Modular design of a K°Flex overpressure condenser: In two parallel modules steam will be condensed and the condensate subcooled further. Total heat load: 170 MW.



## K°Flex HP – High pressure

# FREE FLOW CHANNELS WITH A PRESSURE RESISTANCE OF UP TO 100 BAR



The K°Flex plates are further improved to match pressure levels of up to 100 bar on the wave side. The tube side as the service side is designed for 16 bar. A newly developed and unique three dimensional stabilization is welded to all plate edges and builds a strong connection between plate pack and housing. The plate packs are installed in a round vessel. The K°Flex plates and housing are extremely robust and durable. They withstand the full differential pressure. Plate packs and vessels can be manufactured from different materials.

The compact design of K°Flex with low weight and space required makes the unit appropriate for all kinds of offshore

applications, e.g. LNG liquefaction and regasification. K°Flex heat exchangers comply with international safety standards.

- **Operating pressure of up to 100 bar**
- **Lowest pressure drops even with high flow rates**
- **Fluids with particles can be handled**
- **Unique three dimensional stabilization of plate pack edges**
- **More than 1,000 m<sup>2</sup> of heat transfer area in one vessel**
- **High flow rates with minimum pressure drops**
- **Very good thermal performance for single phase and two phase applications**

## K°Flex – Evaporator

# EFFICIENT PHASE CHANGE IN AN ASYMMETRICAL PLATE DESIGN

The special corrugation of K°Flex plates with open tubes on one side and the compact wave on the other side makes this plate most suitable for evaporation applications.

Liquids can pass the tube channels of the plate pack either from bottom to top as rising film or with natural or forced circulation or in reverse direction following the principle of falling-film evaporation. Liquids, steam, vapor or two phase mixtures (evaporative condenser) can be used as heating medium. Add-ons are required to adjust the K°Flex evaporator to natural or falling-film evaporation.

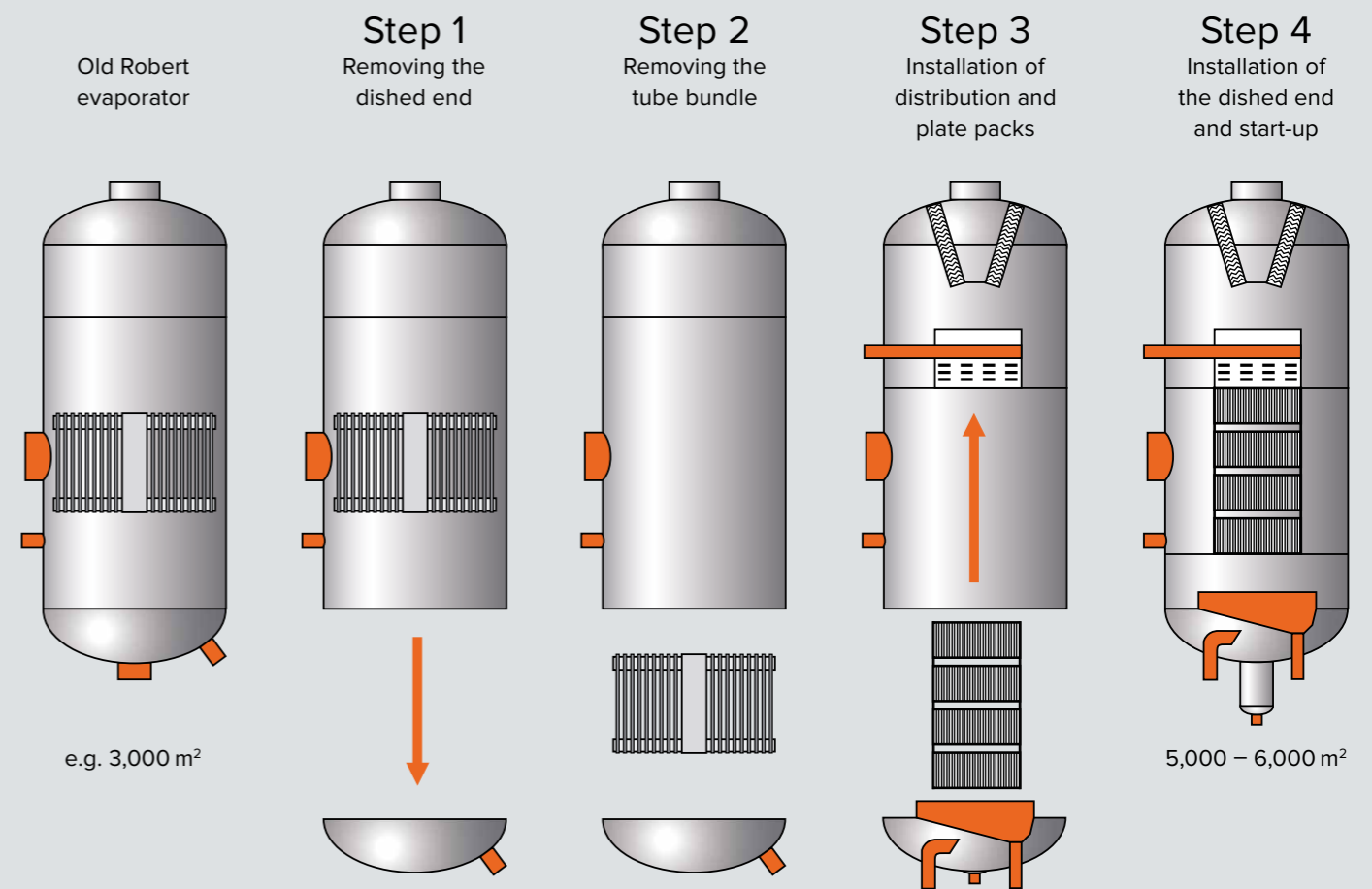
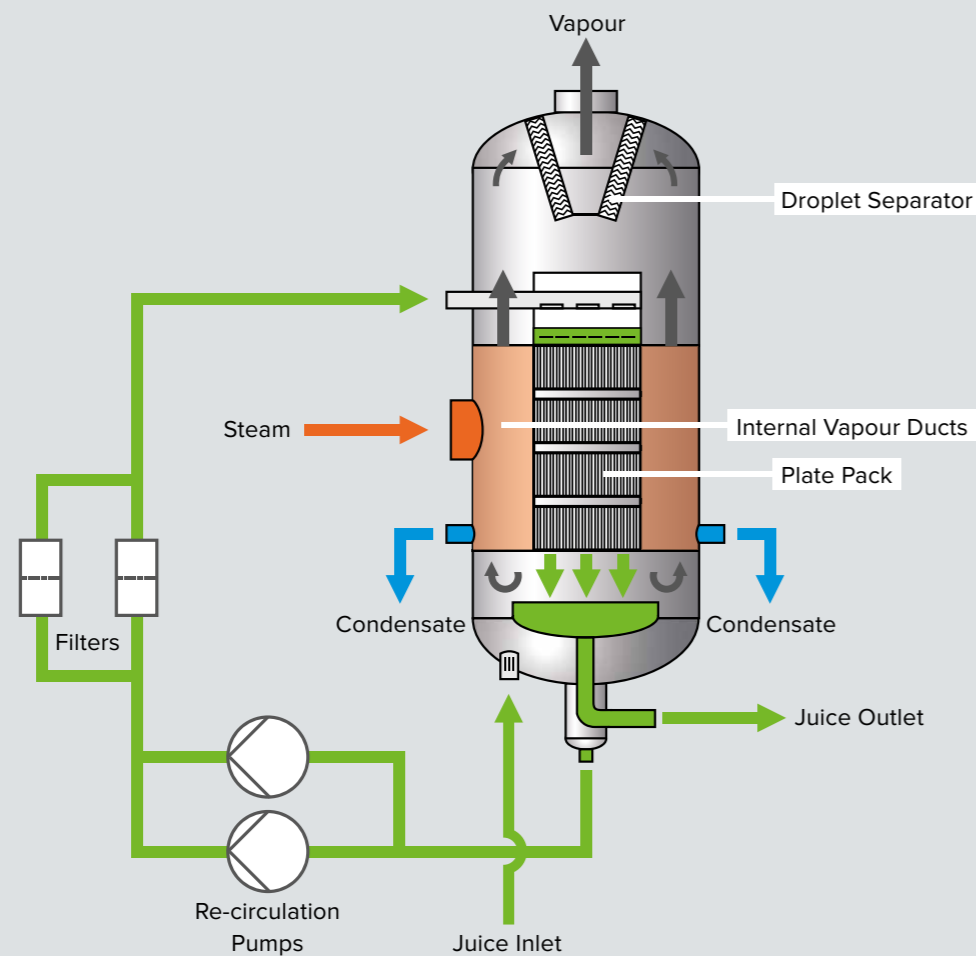
### Natural circulation evaporator

- Liquid circulation through internal or external channels.
- The distributor on top of the plate pack can be equipped with a demister.

### Plate falling-film evaporator

- Installation of plate packs in a round shell
- Our patented liquid distribution unit ensures even distribution of the evaporating liquid in the vertical tubes.
- Internal or external droplet separators achieve the required grades of vapor purity.
- Liquids can be evaporated in the open and short tube channels of the K°Flex evaporator under severe vacuum conditions.

- **Low pressure drops in the tube channels allow for extreme volume changes and improve the evaporation process**
- **Modular design of K°Flex plates and housing with add-ons allow “natural circulation” and “plate falling-film evaporation”**
- **Connections up to DN4000 can be welded to the housing**
- **Operation under high differential pressure is possible**



## K°Flex – Plate falling-film evaporator EVAPplus®

# OUTSTANDING PERFORMANCE WAY BEYOND TUBULAR LIMITS



More than 20 years of experience from more than 160 installed units worldwide stand for sophisticated design in all details.

Heat exchange areas of up to 12,000 m<sup>2</sup> in one vessel have been built already. Outstanding heat transfer values and the most compact design lead to the least specific weight and volume related to the heating surface and the capacity of the evaporator.

Compared to tube falling-film evaporators, this saves investment costs for buildings, foundations, steel structure and insulation as well as for operating costs of the re-circulation pumps because of the considerably lower pumping head.

The shortest retention time of all evaporator types results in the least possible colour formation and sugar loss.

Many available options for the installation, in one piece, in parts or as a retrofit of an existing evaporator body. All make allowance to your special, local situation.

- Highest heat transfer rates
- Minimal temperature differences
- Shortest retention time
- Minimal juice colourisation
- Most heating surface per volume
- Retrofit possibility of your old Robert type evaporator

# IMPROVE YOUR ECONOMY WITH EVAPplus® AND RETROFIT

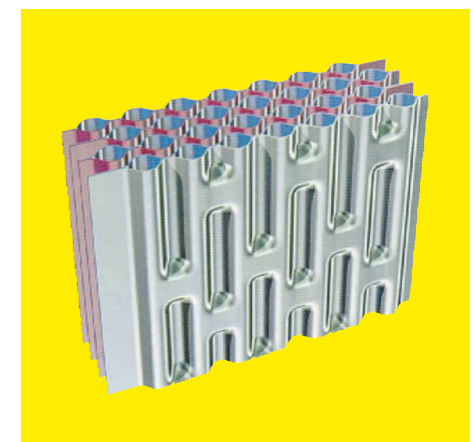
Besides installing complete new evaporators very often it makes sense to re-use the existing vessel shell. About 50 % of all installed EVAPplus® solutions proved to be more economic with retrofit.

No new location or foundation is needed, no new pipeline route. Retrofit can be done from the top or from the bottom – depending on the given structural conditions.

More heating surface with better heat transfer values is the result.

No matter if retrofit or complete new evaporators turn out to be the best option for your needs. EVAPplus® is the key to improve your heat and mass balance best.

- Increase your capacity
- Minimize your investment costs
- Decrease your steam pressure
- Utilize your full co-generation potential
- Save steam with more effects and shifting of vapour bleedings



3D-Model of the plate pack



Plate pack after final inspection



# HEAT EXCHANGE IS OUR PASSION

## Comprehensive engineering and production knowledge

Kelvion plate heat exchangers are designed with efficiency as the top priority. In figures: our plate heat exchangers are capable of recovering more than 90 % of the input energy. The extremely high operational reliability is an additional benefit; guaranteed by the combined plate engineering expertise and plate production know-how of the Kelvion engineers, by the high quality of the materials and their processing, coupled with comprehensive project management. The plate shapes developed for the various applications and the wide range of materials constitute the basis for the extremely high heat transfer coefficients of our plate heat exchangers. Fully automatic pressing lines ensure consistent product quality.

## We ensure perfect connections

Whether roller seam welding, spot welding or laser welding, either manual or partially mechanised GTAW, manual FCAW or microplasma: the art of welding is very diverse at Kelvion.

Performed by highly qualified employees with an extraordinary level of expertise, skills and experience in every area – for example in the welding of housings, vessels and pressure parts. And this know-how is continuously expanded by further training and experience. This is also guaranteed by a consistent quality management system to ensure that both our expertise and our products continue to reliably achieve the highest quality level.

Accurate service quality is the result of precise workmanship.



## Quality for ultimate process reliability

Kelvion quality gets your projects on the path to success. State-of-the-art production facilities ensure that the production sites achieve high productivity. But quantity is nothing without quality. High-precision plate heat exchangers are produced here that have proved their worth thousands of times over, particularly with regard to their excellent quality features.

This quality standard begins in the careful selection of the raw materials used in manufacturing the plate heat exchangers. The pronounced awareness of the materials used is a central factor in the extremely high service life of our products.

## Our service close-by

Good products need good service to fully satisfy customers. With Kelvion you can rely on a comprehensive service network staffed by highly trained technicians – throughout the world!

You always have the full spectrum from a single source – repair, servicing, spare parts, etc. at short notice, on time and with technical expertise, even for products or components made by other manufacturers. We use only high-quality original spare parts to guarantee a perfect fit, efficient functioning and a long service life.



Service from A to Z

# FROM PROJECT PLANNING TO AFTER SALES SERVICE



Perfect engineering is not enough and this is why Kelvion matches its pioneering qualities in plate heat exchanger production with an equally outstanding service. This includes all standard and specialised after-sales and service packages: from erection, servicing and spare parts supply right up to preventative maintenance checks. A global network of service locations ensures immediate availability.

But any service is only as good as the people behind it. And this is where quality is paramount for Kelvion: All of our employees are experts, experienced, creative and fast. They work in the interests of our customers, independent of manufacturer, and reliability is guaranteed in every single case. Kelvion customers benefit from permanent functionality, reliable efficiency and sustainable system availability. Making cost factors transparent and eliminating stress factors.

## Pro-active perfection

Kelvion Service emphasises prevention – and this begins as early as with careful planning, component selection and precise erection, a fundamental prerequisite for longterm functionality and reliability of the system. Pro-active checks such as our innovative leakage tightness testing or visual inspections of the heat exchangers detect any soiling or wear in good time. Our Kelvion experts rectify minor faults such as these on the spot. They also prepare individual maintenance schedules, adapted to match the specific heat exchanger loading and offer expert consulting with regard to the condition of the heat exchanger

and make recommendations for replacements before a defect has occurred. A complete all-round service. Throughout the world.

## All-inclusive: Spare parts supply and accessories

Good service is essentially a question of time: Kelvion places great emphasis on being able to supply every spare part for plate heat exchangers of all series quickly, reliably and on time to any location in the world. Highest product quality and absolute fitting accuracy are self-evident.

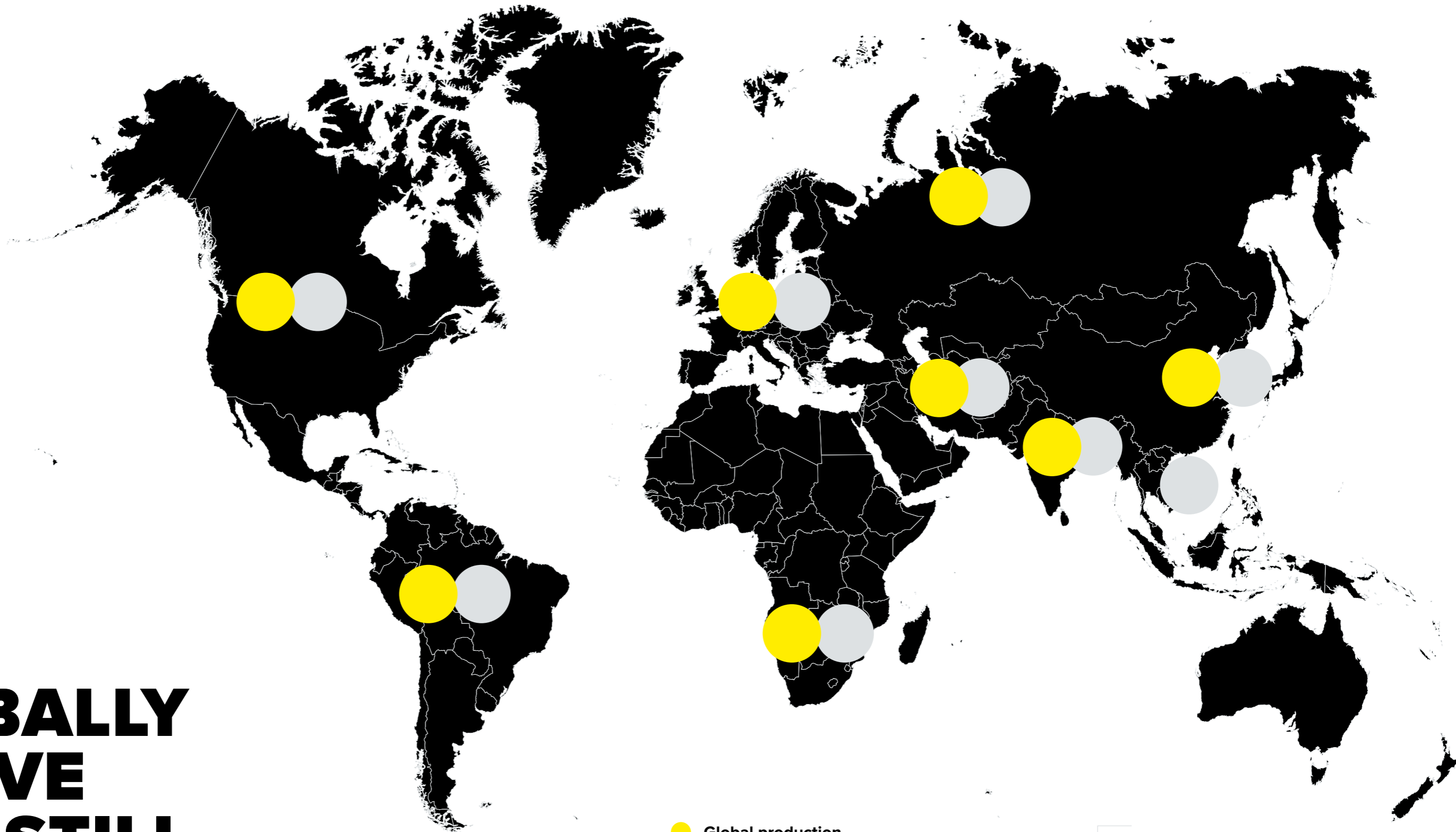
## High-quality extras:

- Primer coat
- Measuring nozzles
- Manholes
- Insulation spikes
- Heat insulation
- Steel structures
- Stairs and platforms
- Channels
- Reactor housing
- Fan
- Flaps
- Stationary soot-blowers
- Manual cleaning jets
- High-temperature/high-pressure tubular heat exchangers for heat extraction
- Vapour preheaters

## All from a single source

Kelvion supports you throughout the complete process – from initial start-up through to detailed service agreements.

- Consulting and planning
- Flow calculations
- Model tests
- Erection supervision
- Erection
- Maintenance
- Tests, measurements and investigations
- Repairs
- Supervision of manual cleaning work
- Manual cleaning work



# GLOBALLY ACTIVE AND STILL CLOSE BY

No matter where your market is, regardless of country, we are never far away. We are always happy to answer any questions you may have and meet your requirements. Even the largest, most successful project begins with an initial, profitable conversation. We look forward to hearing from you.

- Global production footprint
- Global sales and service