Plate Heat Exchanger
HAVE YOUR PLATE HEAT EXCHANGERS MADE BY SPECIALISTS!

For three decades, HRSFUNKE has been specialising in the field of development and manufacture of plate heat exchangers with an exchange surface of up to 2000 m² for all standard industrial & food applications as well as for use in the field of district coding, heating, air-conditioning and ventilation.

HRSFUNKE SUPPLIES FROM ONE SOURCE:

- Plate heat exchangers
  - Gasketed Plate heat exchangers
  - Brazed heat exchangers
  - Semi Welded heat exchangers
  - Welded Plate heat exchangers
- Shell and tube heat exchangers (Food, Industrial & oil/gas)
- Food Process System
- Calorifiers
- Hot / Cold Water Systems
- Scraped surface heat exchanger
- Brazed Plate Heat exchanger
- Piston pump
- Electrical Oil preheaters
- Pasteurizer

In the field of plate heat exchangers HRSFUNKE offers a broad range of products able to meet almost any requirement in machine and plant engineering. HRSFUNKE’s special “off-set” system with asymmetrical flow gaps creates highly efficient and cost-effective units with performance (depending on design) is up to 17% higher compared with conventional plate exchangers. Furthermore, the “HRSFUNKE” brand stands for highest quality standards and customer-oriented solutions.

ADVANTAGES OF HRSFUNKE PLATE HEAT EXCHANGERS (PHE):

- low investment, operation and maintenance costs
- highly efficient heat transfer (K-values on average 3-5 times higher than in the case of bare-tube heat exchangers)
- asymmetrical flow gap available for the most cost-effective solutions
- use of smallest temperature differences \( \leq 1 \) K
- up to 75% less space required
- self-cleaning effect due to highly turbulent flow behaviour
- subsequent capacity adjustment
- high safety with regard to media mixing
- easy to open/clean
- low operating weight/low liquid content
## TECHNICAL KEY DATA
(DEPENDING ON DESIGN)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Capacity</td>
<td>1 KW - 30 MW</td>
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<tr>
<td>Volume flow</td>
<td>5 m³ - 4500 m³</td>
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<tr>
<td>Surface/plate</td>
<td>0.04 m² - 3.0 m²</td>
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<tr>
<td>Nominal connection</td>
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<tr>
<td>Diameter</td>
<td>DN 25 - 500</td>
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<tr>
<td>Working pressure</td>
<td>max. 30 bar</td>
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<td>Series</td>
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<tr>
<td>FP</td>
<td>- Sealed / bolted PHE (standard design)</td>
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<tr>
<td>FPDW</td>
<td>- Safety PHE (double-plate design)</td>
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<tr>
<td>FPG</td>
<td>- Partially welded PHE (welded cassettes for aggressive media)</td>
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<tr>
<td>FPSF</td>
<td>- Free-flow PHE (wide and free flow gap for liquids with suspended solids)</td>
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## SET-UP AND FUNCTION OF HRSFUNKE PHE

The PHE consists of a pack with linked up embossed plates with passage openings. Every second plate is staggered by 180°, creating a flow gap in each case. All plates are provided with gaskets, which completely seal the various flow gaps from the outside and separate the second media involved in heat exchange.

The plate pack is mounted in a rack and is pressed between the fixed plate and pressure plate by means of clamping bolts.

Warm and cold media are normally led through the PHE in one-pass or multipass counterflows in order to guarantee a maximum heat transfer.

Connections are on the fixed plate, in case of multi-pass flow they can also be on the pressure plate (see basic scheme below).

## DESIGN OF A PLATE HEAT EXCHANGER

1. Fixed plate
2. Pressure plate
3. Support
4. Carrying beam
5. Lower plate guide
6. Carrier roller
7. Tightening bolt
8. Fixing screws
9. Rubber liner
10. Gaskets
11. Heat exchanger plates

## CONNECTION POSITIONS

- Single-Pass
- Two-Pass
- Three-Pass
"OFF-SET"- EMBOSSING ALLOWS FOR ASYMMETRICAL FLOW GAPS

At first glance, the plate heat exchangers of the different providers seem to be very similar. However, the secret of an efficient heat transfer is inside the plate pack whose performance depends on a whole range of factors apart from plate size and number. Ultimately, these factors determine the size of the device and the operating costs.

For example, plates with different plate corrugation angles (in relation to the flow direction) can be used.

Obtuse corrugation angles result in longer thermal paths and higher heat transfer rates which in turn lead to a high pressure drop.

Acute corrugation angles are chosen if the required pressure drop is lower.

Not only do HRSFUNKE plate heat exchangers make it possible to combine different plate corrugations. The "off-set" profile also allows for the formation of asymmetrical flow gaps.

The advantage is that the cross sectional areas of the "warm" and the "cold" side of the PHE may be approximately one third larger or smaller (see figure below and adjacent graphics).

For HRS FUNKE, the "off-set" profile represents an additional control element for cost-effective PHE solutions. An oil cooler, for example, is significantly smaller and cheaper if the volume flow on the cooling water side can be increased. Compared to symmetrical plates, up to 17 percent less exchange surface is required.

Whether symmetrical or asymmetrical, the configuration of the plate pack is always calculated by state-of-the-art design software. The first priority is always to find the most cost-effective solution for the customer.

WELDED CASSETTES

Welded cassettes (welded plate pairs) are used for special media, such as ammonia, in cooling systems.

The conventional seals are used for sealing on the "water side" (between the cassettes).
SHORT OVERVIEW OF PLATE AND GASKET:

- Very high heat transfer rates due to thermodynamically optimised design
- Corrugation fields with “Off-Set” embossing allow for symmetrical and asymmetrical flow gaps (1)
- Specially embossed entry fields to allow for an optimum distribution of media (2)
- Gaskets fastened in a maintenance-friendly manner by means of “Clip-System” gaskets with a special ribbed surface to improve the centering and stabilisation of the entire plate pack (3)
- Double gasket with leak groove between two media prevents them from mixing in the area of the passage opening (4)
- Special plate profile at the edges to reinforce the plate pack and ensure that the gasket is highly pressure-resistant during operation (5)

FREE-FLOW PLATES

For thermal treatment of high viscosity liquids and liquids with suspended solids. Due to their great embossing depth, their flow gaps are three times as big as those of standard plates. They allow suspended particles and fibres to pass freely.

DOUBLE-WALL PLATES

Provide maximum protection against the mixing of media involved in the heat exchange process. Two plates embossed together are laser welded at the passage openings. Leaks may occur at the edge of the plate pair.
QUALITY WITHOUT COMPROMISE

TECHNICAL DATA

PLATE MATERIAL

HRSFUNKE heat transfer plates are always produced in 1.4401/AISI 316L as this material is generally more corrosion-resistant and more resistant to chloride damage than 1.4301/AISI 304. Depending on the design, titanium is also available in serial production.

As an option, the following additional materials may be used:

- 1.4301/AISI 304 (cost-effective in the case of uncritical media)
- 11.4539/AISI 904L (with high nickel content against stress corrosion cracking, good price/performance ratio in the case of media with a low acid and chloride content)
- 1.4529/254 SMO (higher chloride and acid-resistance than 1.4401/AISI 316L)
- Hastelloy (highly resistant against acids and chlorides, e.g. for concentrated sulphuric acid)
- Titanium ASTM B 265
- Titanium-Palladium (highest material quality, suitable e.g. for chlorides at higher temperatures)

CONNECTIONS

HRSFUNKE plate heat exchangers can be supplied with all of the usual connections for all fields of application (Industry, building services, chemicals, food). Alternate materials and welded designs may also be available.

RANGES OF APPL.

max. design pressure: 30 bar
max. design temperature: 180 °C

ACCESSORIES

As an option, we can equip your plate heat exchanger with the following accessories:

- insulations (e.g. mineral insulating material covered with galvanised sheet)
- inline filters
- special coats of lacquer (e.g. sea air-resistant lacquer)
- splash guard/drip tray
- grounding clips
- CIP cleaning system

GASKETS

All gaskets are installed twice in the entry and exit area, creating a safety room which is open to the outside. It prevents the two media from mixing if the gasket leaks. Depending on the design and the type, adhesive or non-adhesive (Clip-System) gaskets may be used. As sealing materials, we use well-known and tried and tested materials such as

- NBR (nitrile-butadiene rubber): Universal use for aqueous and unctuous media e. g. water/oil applications
- EPDM (ethylene-propylene rubber): Wide range of applications for many chemical compounds which do not contain mineral oil and grease, and for water and steam application
- Fluororubber (Viton): Extremely resistant to chemicals and organic solvents as well as sulphuric acid and vegetable oils at high temperatures

SPECIAL EQUIPMENT

- frames made of stainless steel or in stainless steel cladding
- PHE as twin cooler with changeover valve and thermostat

Gaskets are not available. - + not available other connection or bolts on request
## Dimensions

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<th>B (mm)</th>
<th>C (mm)</th>
<th>D (mm)</th>
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HF gasketed / bolted PHE (standard design). FPDW safety PHE (double-wall plate design). HFSW semi welded PHE (welded cassettes). More types and sizes on request. Technical changes reserved. Pcs. = number of plates.
The design and the high quality standards of HRSFUNK plate heat exchangers keep the amount of maintenance work to a minimum, provided that the conditions of use for which the PHE has been designed are adhered to. However, during service life, the gaskets of a PHE are subject to a normal fatigue process.

Depending on the conditions of use, the plate pack can be tightened several times until "PP"min. is reached. Once the plates are provided with new gaskets, the PHE can return to its full capacity.

Normally, maintenance and servicing can be carried out by adequately trained personnel of the operator. If necessary, contact our local service technicians or service partners who can provide the services specified in the adjacent list.

- cleaning service: CIP (Cleaning in Place) or mechanical cleaning on site or chemical cleaning (immersion bath) at the factory
- on request, CIP systems (incl. the required cleaning chemicals) can be provided by HRSFUNK
- provision of plates with new gaskets: always includes cleaning, optional hair crack test
- spare parts service: supply of original parts throughout the world
- overhaul of complete devices the world
- subsequent performance optimization: extension of plate pack/modification of plate configuration

The required performance of the PHE can be achieved by means of very different configurations. Users often do not specify parameters (e.g. maximum pressure drops, pump capacity, temperature of cooling water inlet or available volume flow) precisely or not at all. It is our objective to offer our customers highly efficient and cost-effective PHE. You can support us by providing a complete list of planned operational data, if possible.

We have marked the most important design data on the adjacent request form, which you can find on our website. Out of the seven specifications in this area, at least five are required for a professional PHE design (at least two on each page). Always specify the permissible pressure drops. In case of special media, to indicate the physical properties is also of importance.
BRAZED PLATE HEAT EXCHANGER

HRSFUNKE brazed plate heat exchangers are made of corrugated stainless steel plates. The plates are assembled in a 180° angle to each other. Depending on the requirements of the application, the plates are vacuum brazed to a pressure-resistant unit using either copper or nickel. This results in separate flow gaps with counter-flow of the media involved in the heat exchange (standard).

ADVANTAGES

The series GPL, GPLK und TPL provide for a well balanced ratio of high heat transfer rates with low pressure losses. The thermodynamically optimized corrugation of the embossed plates and the inserted turbulators (TPL) allow for high turbulent flow even at low volumetric flow rates. This allows for efficient use of the heat exchange area available and leads to a perfectly optimized heat transfer. The highturbulent flow also results in an efficient self cleaning effect, which greatly reduces maintenance and time out. HRSFUNKE brazed plate heat exchangers have a compact design and are used for high pressures and temperatures.

APPLICATIONS

Typical applications for brazed plate heat exchangers are:
- Heating, cooling, condensing
- System separation
- Heat extraction and heat recovery in domestic and process technology
- Refrigeration engineering
- Mechanical engineering
- Oil cooling
- Hot water / Process water
- Heating engineering (solar thermal systems, central heating, floor heating)
- Evaporation / Condensing in cooling systems
- Air drying
- Hydraulic oil cooling
- Cooling of machines and motors
- Mold machine temperature control
- Economizing

MEDIA

Copper brazed plate heat exchangers are mainly used for media such as:
- Oil and oil containing fluids
- Glycol mixtures
- Alcohols
- Refrigerants
- Gas / Air
- Water
- many more (according to media properties and its viscosity)

INFORMATION

Copper brazed plate heat exchangers GPLK should not be used for the following media:
- Seawater
- Ammonia
- Deionates
- Silicone oils
- high chloride media

FOR APPLICATIONS WITH

- Ammonia
- Deionates
- Silicone oils

The nickel brazed plate heat exchangers NPL are recommended.
The series GPL, GPLK und TPL provide for a well balanced ratio of high heat transfer rates with low pressure losses. The thermodynamically optimized corrugation of the embossed plates and the inserted turbulators (TPL) allow for high turbulent flow even at low volumetric flow rates. This allows for efficient use of the heat exchange area available and leads to a perfectly optimized heat transfer. The high-turbulent flow also results in an efficient self cleaning effect, which greatly reduces maintenance and time out. HRSFUNKE brazed plate heat exchangers have a compact design and are used for high pressures and temperatures.

The media used in the heat exchange process are supplied and drained through nozzles installed on the covers (FPF) or casing plates (FPB). The media flow through the plate assembly in a cross-flow / cross-counter-flow pattern, with heat from the hotter medium being transferred to the cooler medium. On account of the turbulent thin-layer flow present, this heat transfer is substantially more effective than for other heat transfer models. Baffles can also be employed to ensure that the media pass through the heat transfer process repeatedly.

**HRSFUNKE FLEX FPF**

**Design and Function**

The HRSFUNKE Flex FPF is a welded, seal-free plate heat exchanger, whose core consists of a welded plate assembly made of stainless steel. A number of parameters, such as design, dimensions, connections, internals, etc. can be freely selected, or are available as options. This heat exchanger can be used in nearly all sectors of thermal process engineering, thanks to the flexible selection of flow path, or different types of plates (Tubular, Chevron and Dimple). With its maximum heat exchange area of 8 000 m² the HRSFunkeFlex satisfies all the demands for an absolutely versatile heat exchanger.

**HRSFUNKE BLOCK FPB**

**Design and Function**

The HRSFUNKE Block is a welded plate-type heat exchanger with removable, sealed covers whose core consists of a welded plate assembly. Like all items that come into contact with the media, this core is made of stainless steel and, in contrast to the standard casing, can be tailored to meet specific demands. The standardized design of the compact HRSFUNKE Block stands out thanks to its flat cover, its extremely efficient heat transfer and its high, specific heat surface density m² / m³ of free space. A main feature of the HFB is also its ability to be easily cleaned.

Using the types of plates available for welded plate assemblies (Tubular, Chevron and Dimple), the demands dictated by the flow paths and properties of various media and applications can always be satisfied. Seals can be selected as appropriate, based on their resistance against media or temperatures.
QUALITY CERTIFICATES

Quality must be checked. Each unit is designed and pressure tested. Further tests can be performed according to rules and corresponding inspection requirements if requested, such as:

- Pressure equipment directive 97/23 EC
- AD 2000-Merkblatt, AHRI/ARI (USA)
- TEMA (International)
- API (USA)
- GOST (Russia)
- Australian Standard
- ISCR (Romania)
- ILloyd’s Register
as well as in accordance with customer’s requirements.

Quality must be checked. Each unit is signed and pressure tested. Further tests can be performed according to rules and corresponding inspection requirements if requested, such as: