



#### Contact

##### **C+C servis, s.r.o.**

Za Škardou 949 - Srubec  
CZ - 370 06 České Budějovice

Phone: +420 387 203 788

+420 387 204 281

Fax: +420 387 200 190

GSM: +420 723 986 720

+420 728 707 912

Service: +420 606 043 158

VAT: CZ26106159

E-mail: [info@ccservis.eu](mailto:info@ccservis.eu)

[www.ccservis.eu](http://www.ccservis.eu)





*... your reliable partner  
for dismountable plate heat exchangers*





The company was founded in 2006 as a specifically Czech company, located in České Budějovice, based on many years of previous operations in the same area. The company began to deliver spare parts for plate heat exchangers, used in the following industrial areas: Brewing, Dairy farming, Heat generation, Pharmaceuticals, Sugar industry, Chemicals industry, Petrochemicals industry, Power generation, Wastewater treatment plants.

**As standard, we deliver seal gaskets and plates for heat exchangers of the following types:**

- |                               |              |
|-------------------------------|--------------|
| ✚ Alfa laval                  | ✚ Swep       |
| ✚ APV                         | ✚ Cetetherm  |
| ✚ API Schmidt Bretten (Sigma) | ✚ Vicarb     |
| ✚ Fischer                     | ✚ Sondex     |
| ✚ GEA                         | ✚ Zilmet     |
| ✚ Reheat                      | ✚ Funke      |
| ✚ Tranter                     | ✚ Nagema     |
| ✚ Tetra Pack                  | ✚ Thermowave |

We deliver straight from OEM manufacture. The basic idea is to deliver materials “on-line” directly from the manufacturer, which enables us to maintain the highest possible quality standard, not only thanks to the high flexibility supported by our professionalism, but particularly thanks to providing extraordinary delivery conditions. The expert personnel in the design and development centre will offer you, through our professional sales representatives, the optimization of materials for specific applications. As standard in the food-processing industry, we provide the “FDA” certificate for foodstuff usage for all our components. Based on the requirements of our customers, warranty and post-warranty services, including pressure tests, are offered by our team, which is certified for such operations.



When applying various types of chemicals, including alkalis (ammonia), we have facilities to exhaust the chemicals/acids from heat exchangers. Cleaning of the plates is performed mechanically, in combination with pressurized water, or in a bath for chemical cleaning of the plates, if such procedure is necessary. The service can be provided either on site at the customer's location, or the plates can be transported to our service center for further processing (chemical cleaning).

The material of the supplied seal gaskets and plates complies with the application and requirements of the customer, in order to attain the longest possible lifetime. The mechanical gaskets or bonded gaskets directly from OEM manufacture are delivered made of the following materials: NBR, HT-NBR, EPDM-STD, HT-EPDM, IND FKM, BUTYL, CR, etc., including a certificate on contact with foodstuff. In case of damaged plates, we replace these with new, made of all the materials used for plate heat exchangers: AISI 316, AISI 317, AISI 304, Titanium, Hasteloy, Tantalum, Nickel, etc. A list of our partners will be provided on request.

#### Thermal resistance of conventional gasket plate heat exchangers:

Chemical designation	Marking	Temperature °C		Temperature °F	
BUTADIENE - ACRILONITRILE	NBR STD FOOD	-20	+120	-4	+248
BUTADIENE - ACRILONITRILE	NBR HT FOOD	-20	+140	-4	+284
BUTADIENE - ACRILONITRILE	NBR HT IND	-20	+140	-4	+284
BUTADIENE - ACRILONITRILE - IDROGENATA	H-NBR	-40	+150	-40	+302
CLOROPRENE	CR	-40	+100	-40	+212
ISOBUTILENE - ISOPRENE	IIR	-40	+110	-40	+230
ETILENE - PROPILENE - DIENE	EPDM STD	-40	+120	-40	+248
ETILENE - PROPILENE - DIENE	EPDM STD FOOD	-40	+120	-40	+248
ETILENE - PROPILENE - DIENE	EPDM HT FOOD	-40	+150	-40	+302
FLUORURATA	FKM „A“ STD	-15	+220	-5	+428
FLUORURATA	FKM „A“ FOOD	-15	+220	-5	+428
FLUORURATA	FKM „GF“	-8	+200	-17,6	+392
FLUORURATA	FKM „GLT“	-30	+200	-22	+392

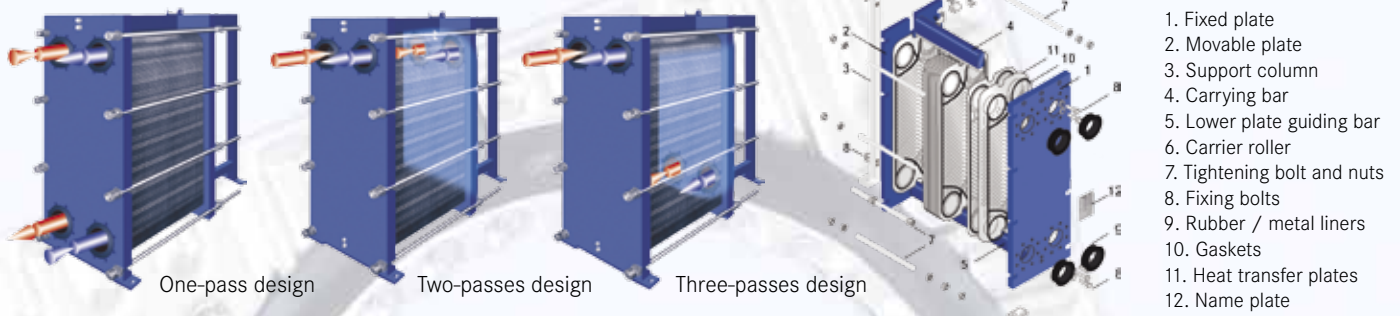
Some standard seal gaskets are kept in stock at a regulated temperature, protected against UV radiation.  
Other types may be stored as based on agreement with the customer.

Since 2008, the company C+C servis has been cooperating with domestic and foreign partners to supply complete dismountable heat exchangers, including proposals for optimization, calculations, and provision of the final project. The following warranty and post-warranty service is commonplace. Under our consultations service, we are able to propose modifications for your present plate heat exchanger, in order to optimize the required parameters and to save costs. Our testing laboratories and development center look forward to resolving your inquiries related to the suitability of seal gasket material usage, etc.





## Functional description / graphical presentation Plate Heat Exchangers



The plate heat exchanger consists of a package with linked up embossed plates with passage openings. Every second plate is staggered by 180°, creating a flow gap at any given time. All plates are provided with tied up or glued gaskets, which completely seal the various flow gaps from the outside and separate the media involved in heat exchange.

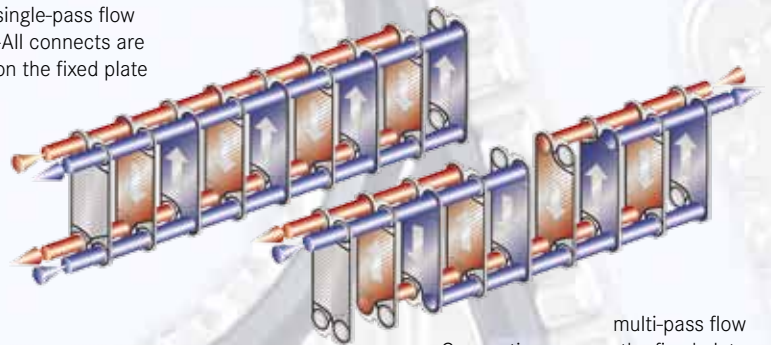
The plate package is mounted in a rack and is pressed between fixed plate and pressure plate by means of clamping bolts. During service life the gaskets of a plate heat exchanger are subject to a normal fatigue process and therefore the plate package can be retightened several times - dependent on conditions of use - until "PP"-min. is reached.

Connections of media involved in heat exchange are on the fixed plate, in case of multi-pass flow also on the pressure plate (see basic scheme below).

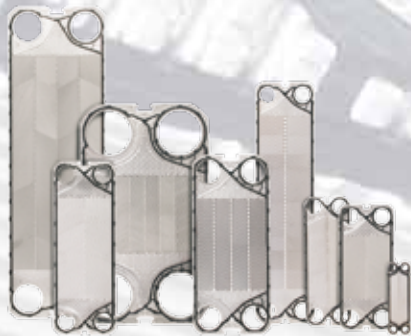
**Special materials:** Plate materials - depending on application - are chromium nickel steels, chromium nickel molybdenum steels, titanium and further materials.

**Gasket materials are:** NBR, EPDM, Viton, silicone and special materials

single-pass flow  
-All connects are on the fixed plate



multi-pass flow  
- Connections are on the fixed plate and on the pressure plate



### Bolted Design (plate & frame)

FUNKE - heat transfer plates are characterised by optimum embossing resulting in high heat transfer coefficients. This permits low-cost and optimum adaption to the respective application conditions. Our product range includes single-pass and multi-pass plate heat exchangers with heat exchange surface up to 2000 m.

### FP/FPS

**Technical data:** Heat exchange surface per plate: 0,04 - 3 m<sup>2</sup>

**Max. design pressure:** 25 bar

**Max. design temperaturer:** 195°C Safety: Our plates are provided with double gaskets at the inlet and outlet, which prevent mix-ing of the two media. If designed as safety heat exchanger, double plates are provided with a special sealing system.

**Plate material:** standard: stainless steel 1.4301/AISI 304, 1.4401/AISI 316 Optionally: 1.4539, 254 SMO, titanium

**Gasket material:** NBR (nitrile-rubber) EPDM (ethylene-propylene-rubber) Viton (fluorine-rubber) Further materials on request Special series: Safety heat exchangers (FPSS) Stainless steel design for food and FDA applications. Compact double PHE-units including cocks and valves Design with welded cassettes (FPG).







## Brazed Plate Heat Exchangers

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. Our supplied brazed plate heat exchangers have a compact design and are used for high pressures and temperatures.

### GPLK (heat transfer plates with V-corrugation)

**Application:** Mainly for heating, air-conditioning, motor cooling, heat recovery. Globally to be used with different media.

**Technical data:**

Max. operating pressure: 30bar  
Max. operating temperature: +200°C

**Material:** Plates: 1.4401 / AISI 316  
Solder: copper nickel (NPLK)



### TPL (turbo-plates in the flow gap)

**Application:** Especially developed for the requirements of plant and mechanical engineering (f. inst. engine/ motor oil cooling). Small sizes by high heat transfer rate at higher viscosity! Globally used with different media.

**Technical data:**

Heat exchange surface per plate: 0.035 – 0.286 m<sup>2</sup>  
Max. operating pressure: 30bar  
Max. operating temperature: -100°C...+200°C

**Material:**

plates: 1.4401 / AISI 316  
solder: copper 99.9%

### GPLB

**Applications:** Applications for GPLB are manifold, they can even be used with highly corrosive media or heat-transfer oil in special applications e.g. in chemical plants or laboratories. In HVACR (heating, ventilation, air conditioning and refrigeration) as system separation in cycles such as distant heating, solar engineering and heat pumps as well as in floor heating or domestic water heating. Due to 100% stainless steel design suitable for drinking water.

**Technical data:**

Operating pressures max.: 25 bar / 30 bar (standard),  
higher pressures available on request  
Operating temperatures max.: -200°C to +350°C (standard)  
CE-certified Material: 100% stainless steel





# System tightness test

## Detection and removal

General requirements for the food industry – requirements of international chain stores pressurize manufacturers often and often into introducing high accreditation standards such as IFS (International Food Standard). The inspection system has to be based on a systematically large depth plan HACCP. HACCP-Plan (Hazard Analysis Critical Control Point) which is based on the hygienic directive 93/94 on the foodstuff hygiene.

### Examples of the use in beverage manufacturers

- search for leakage and tightness test of plate and tubular heat exchangers,
- check-up of feeding valves and tanks of filling devices,
- tightness test of welded pipes.

### 1. Causes of plate exchanger defects

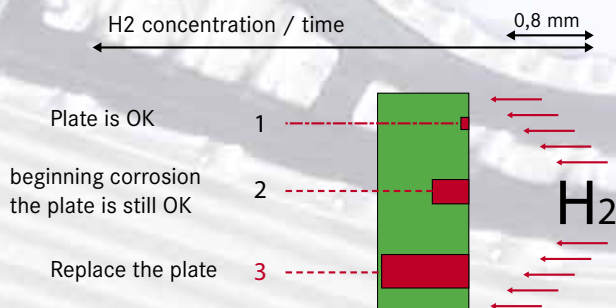
- corrosion, pulsation, pressure surges result in leakage in thin plates made of high-quality steel.

### 2. Test methods for plate heat exchangers

**a) preliminary (probative) tests** – (defect without damage of the plate cannot be distinguished), leakage has been still present tightness test using pressure changes measurement (water or air), tightness test using indicating materials (conductivity), tightness test using penetration of UV indicator

**b) preventive tests** – leakage does not exist yet (a defect can be distinguished the plate is damaged), before tightness test using gas: helium, hydrogen

#### Early recognition of material fatigue by means of the hydrogen method



### 3. Hydrogen method

**What is hydrogen method?** The basis of the method is a test gas (forming gas consists of 10 % of H<sub>2</sub> and 90 % of N<sub>2</sub>) using, which it is possible to detect leakage and perform the tightness test.

**Hydrogen and safety:** hydrogen in proper concentration is totally safe (ISO 101569). Mixture hydrogen/nitrogen can be even used as the protective atmosphere.

**Examples of application:** pharmaceutical industry (bioreactor control), automotive industry (engine block inspection), aviation industry (check-up of fuels and brake pipes), medicine (check-up of artificial hearts and blood pumps), telecommunications (inspection of underground cables), chemical industry (check-up of transport pipelines).

**2a. Preliminary test methods** – tightness test using pressure changes measurement: the primary side is pressurised with water or air while the secondary one remains without any pressure. If the plate is faulty, pressure on the primary side goes down.

**2a. Probative test methods – Conductivity measurement by means of indicative materials:** the primary side is, e.g. filled with water containing sodium sulphate, the secondary one with water. The indication substance driven by the difference in osmotic pressure will penetrate to the water side.

**2a. Preventive test methods** – test of dye penetration using an UV indicator: the plate surface has to be cleaned chemically. Then it is sprayed with phosphorescent paint. After the reaction time each plate is checked in a darkened room with UV light.

#### 2b. Preventive test method by H<sub>2</sub>:

- the lightest molecule
- very low viscosity
- low concentration in the environment (0.5 ppm)
- considerate towards the environment
- the cheapest checking gas (costs about 1 helium)
- it is neither toxic nor corrosive
- it is allowed for food (E 949).

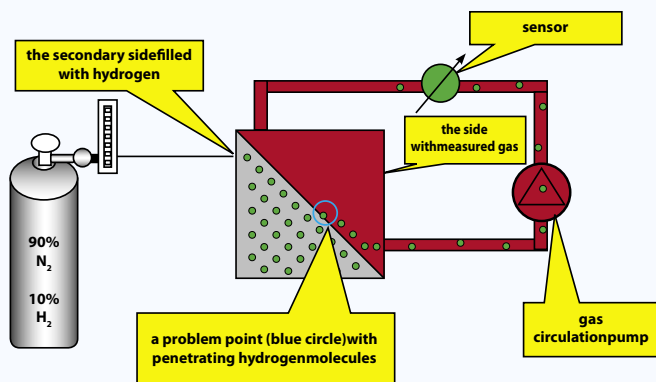
	air	hydrogen	helium
MOLECULAR WEIGHT	29 g/mol	2 g/mol	4 g/mol
DENSITY	1,2 g/l	0,09 g/l	0,18 g/l
VISCOSITY	18,3 10 <sup>-4</sup> Pa s	8,7 10 <sup>-4</sup> Pa s	19,4 10 <sup>-4</sup> Pa s
CONCENTRATION IN THE ENVIRONMENT	100 %	0,5 ppm	5 ppm

#### 2c Comparison of various test methods

Method	
accuracy*	time demand
Inspection using pressure change measurement	- 12 hours +
Conductivity measurement (indication materials)	- 12 hours ++
Inspection using paint penetration	- min. 40 hours +++
Helium	- 4 hours ++
Hydrogen method	- 1 hour +++
*, + bad, ++ good, +++ very good	

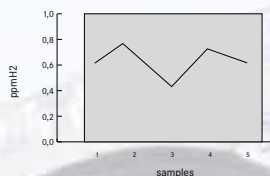
**Hydrogen sensor function** – the sensor is made of an alloy which absorbs hydrogen (metallic hydride). When hydrogen comes to the sensor, a gas molecule adsorbs on the surface, it dissociates into hydrogen ions (protons) and diffuses into the metal. Hydrogen absorption will affect the surface potential of the metal. Only hydrogen ions can diffuse into metal. Thus a false response of media not containing any hydrogen is eliminated.



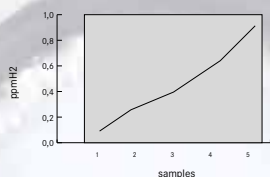


Hydrogen detector

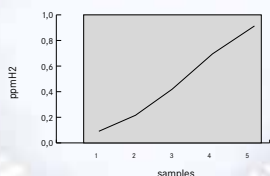
## Diagrammatic representation of H<sub>2</sub> method



5 Five samples with 40-minute increasing of H<sub>2</sub> concentration (ppm) at measurement  $\leq 10$  ppm/min  $\Rightarrow$  plates are OK



Five samples with 40-minute increasing of H<sub>2</sub> concentration (ppm) at measurement approximately 10 ppm/min  $\Rightarrow$  beginning corrosion of the plates



Five samples with 40-minute increasing of H<sub>2</sub> concentration (ppm) at measurement  $> 10$  ppm/min  $\Rightarrow$  hair cracks, failure of the plates



Inspection of plate exchanger packing

## Our competent service team

also perform the following either at the customer's site or in our service centre:

### Exchanger cleaning

#### a) using a non-destructive method:

- mobile CIP exchanger cleaning

#### b) using a destructive method:

- pressure water (plate spraying)
- in a chemical bath (acid, lye)
- installing of new packing on the heat exchanger either at the site or in our service centre
- removal and disposal of the old packing
- mechanical + chemical cleaning of the plates
- detailed inspection of plates using fluorescent paint under UV
- replacement of damaged plates
- professional installation of the new packing
- the adhesive for bonded packing is cured in the furnace at precisely specified temperatures
- assembly of the heat exchanger
- final inspection of both internal and external tightness using the hydrogen method.

Manual searching for leakage in tubular heat exchangers

- bottle washing machine
- pasteurizer
- cooler of water / salt brine
- containers etc.

