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Operating and maintenance instruction

Shell-and-tube heat exchangers

for **heat exchangers with non-removable bundles**

FUNKE-Types: BCF, CCF, SSCF, CCFA, SSCFA, C200, CX200, C210, WRA200

for **heat exchangers with U-tube bundles**

FUNKE-Types: BCU, CCU, CCUG, CCUT, SSCU, C300, CX300, C320, TDW, SSW

for **safety type heat exchangers**

FUNKE-Types: SWF, SWP

for **heat exchangers with removable floating tubesheets**

FUNKE-Types: BCP, CCP, SSCP, CP, CXP, A100, C100, CX100, C101,

UNIVEX

for **heat exchangers with removable floating heads**

FUNKE-Types: C400, CX400, C500, CX500

Contents:

1 General

1.1 Identification of heat exchangers / series

This operating and maintenance instruction is to inform the operators of structure and function of FUNKE heat exchangers and shall be a guidance for proper operation.
Applicable safety regulations to be observed.

FUNKE-Fail-Safe heat exchangers:
The FUNKE Fail-Safe Heat Exchanger may be described as „two Heat Exchangers in one“. Instead of one tube wall the two kinds of fluid will be separated by two tube walls. Between the tube walls a separating liquid – also suited for the food sector – is contained. The separating liquid which is transferring the heat is connected to a compensation device and a pressure control. At a break-through of a tube wall the fluid pressure is self-propagating immediately over the separating liquid to the pressure control through which the electrical switch will be actuated. By this the leakage is announced and – depending on the system - alarm will be initiated or the heat exchanger will be stopped.

The FUNKE Fail-Safe Heat Exchanger is allowed to be operated only with media, suitable for used material.

All FUNKE heat exchangers are provided with name plate with all fundamental data, describing the heat exchanger.

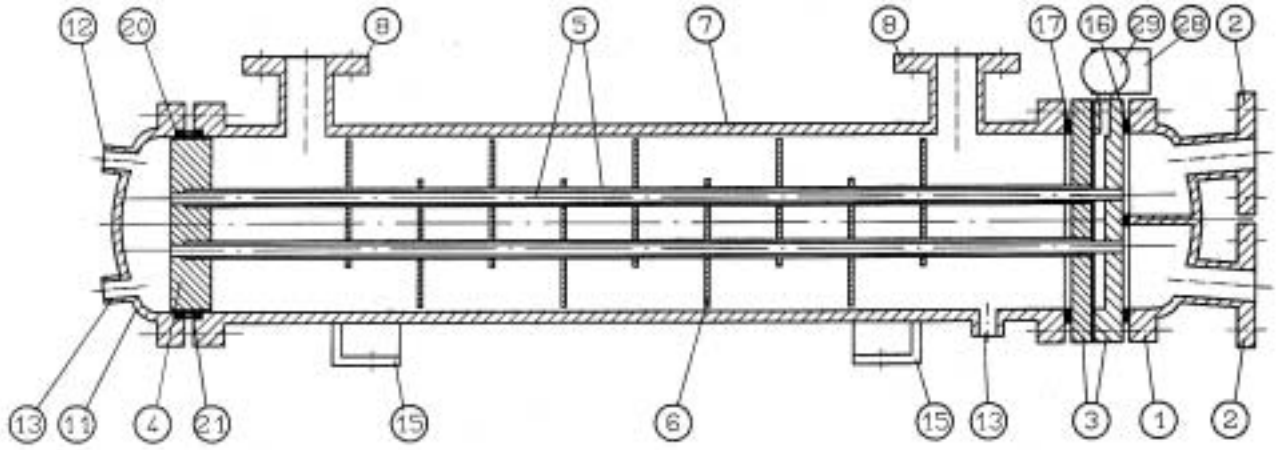
The FUNKE-heat exchanger is a pressure vessel and is governed by pressure vessel rules 97/23/EG of 29th May, 1997 or other international rules.

To answer you any question regarding heat exchangers, we need to know the following data: type, drawing number, serial number and number of order confirmation.

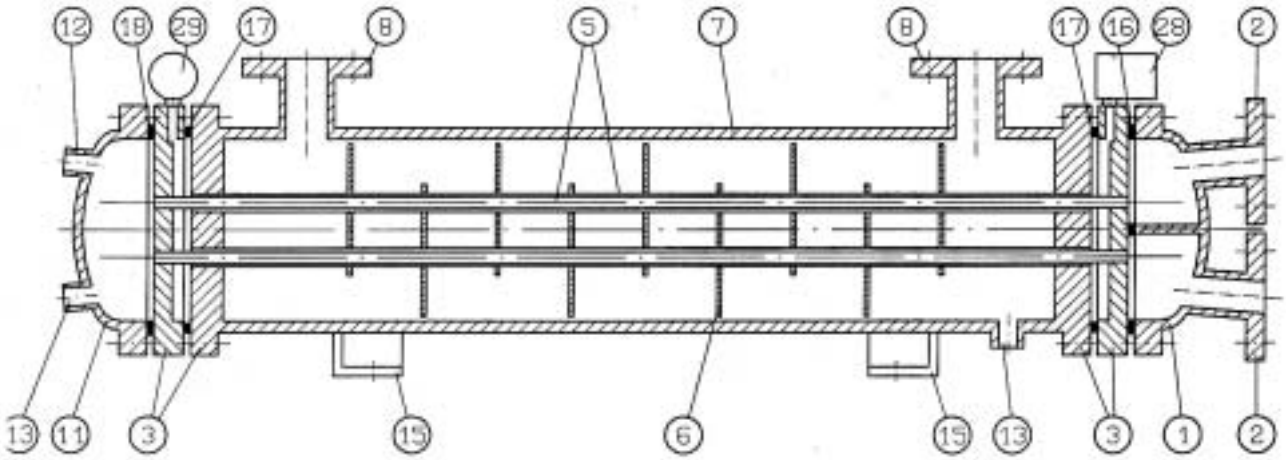
Description of items:

1	bonnet	16	flat gasket connection bonnet
2	connection flange bonnet	17	flat gasket fixed tubesheet shell
3	fixed tubesheet	18	flat gasket bonnet
4	floating tubesheet	19	flat gasket shell cover
5	tube	20	packing ring
6	baffle	21	lantern ring
7	**shell**	22	packing gland
8	connection flange shellside	23	plate
9	expansion bellow	24	plate
10	shell cover	25	channel cover
11	bonnet	26	flange cast iron bonnet
12	vent	27	gasket - cast iron bonnet
13	drain	28	pressure control
14	backing ring	29	expansion tank
15	saddle	30	zinc anode

Fail-Safe Heat Exchanger
SWF

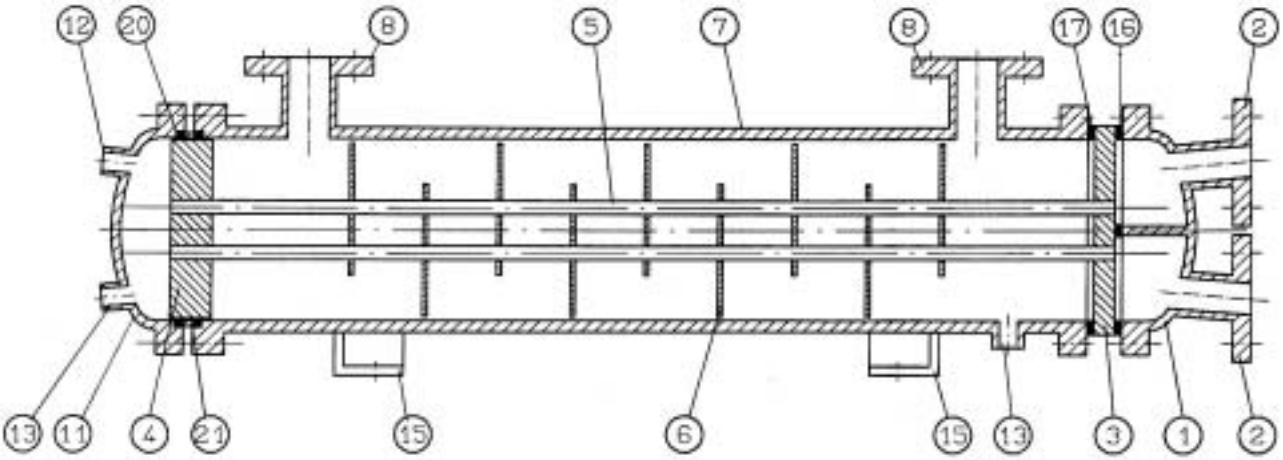


SWP

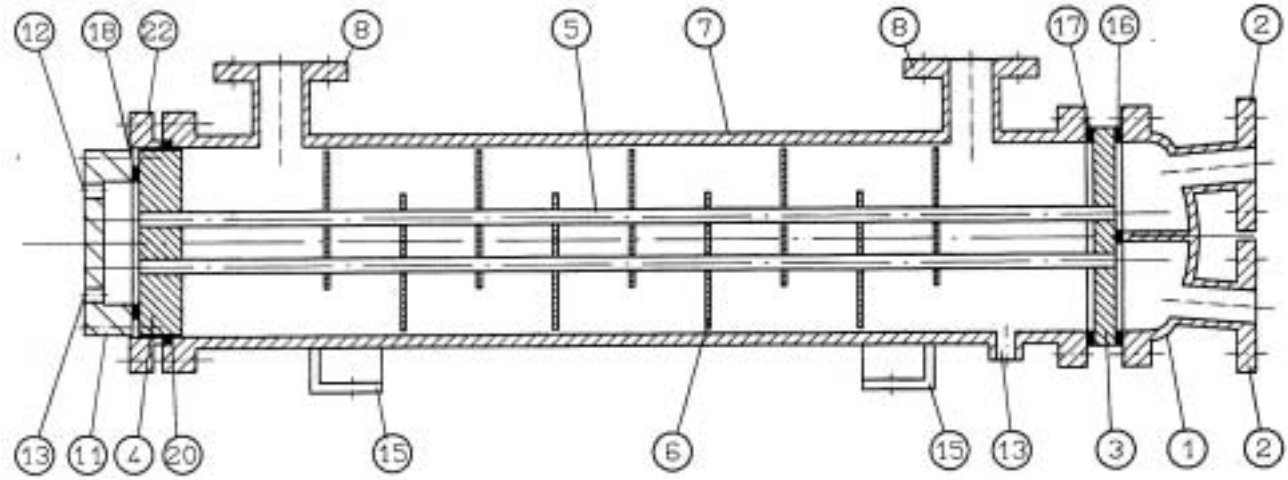


Heat Exchanger removable, with floating tubesheet

CP

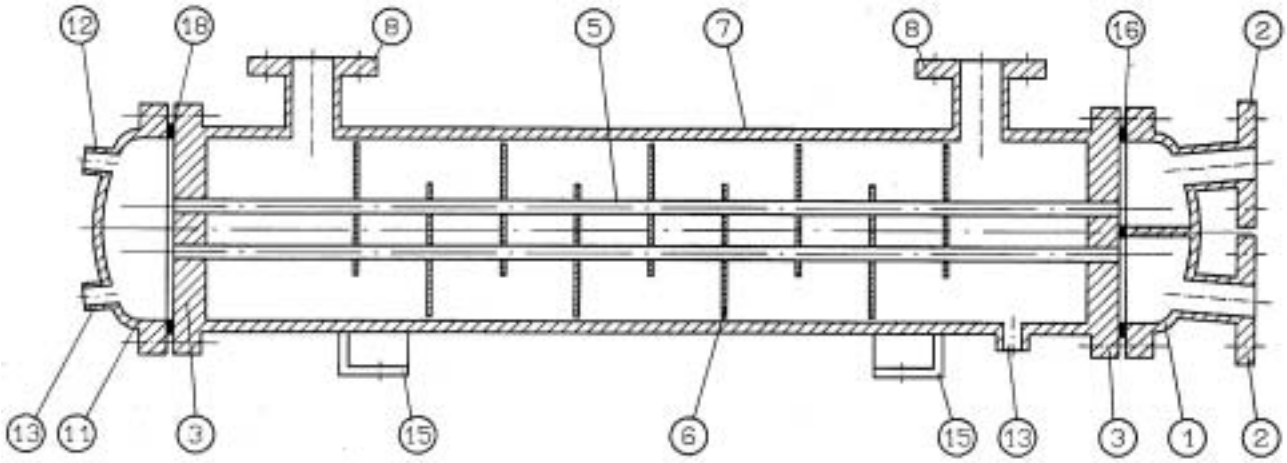


C100



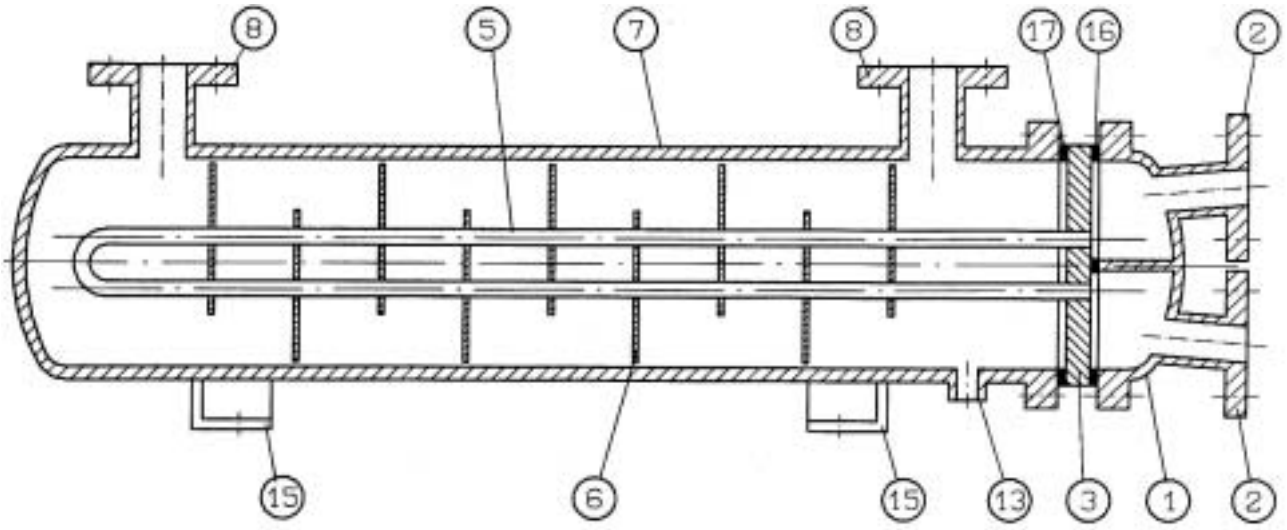
Heat Exchanger with fixed tubesheet

C200

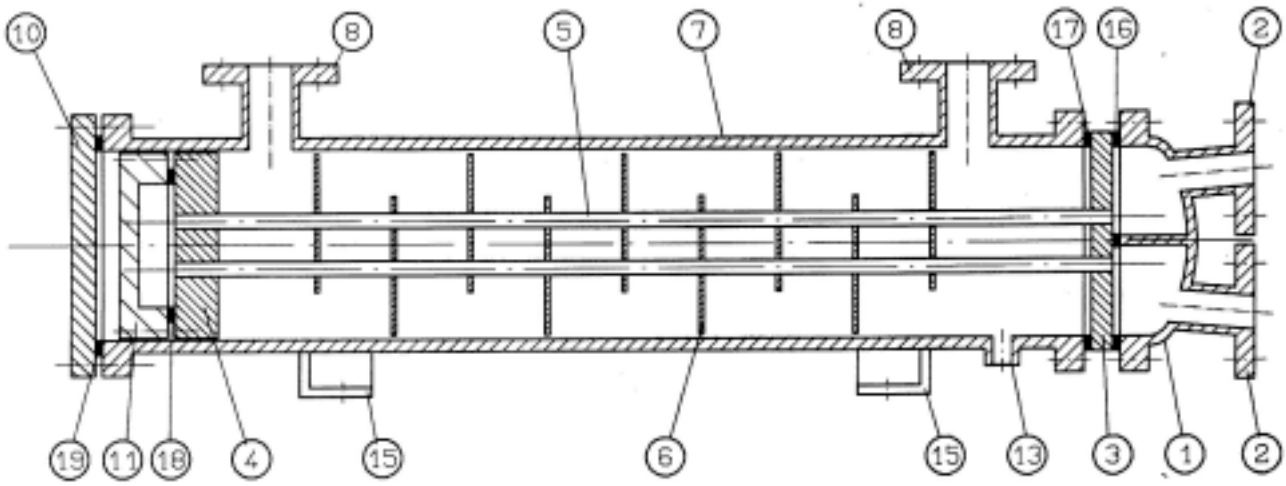


Heat Exchanger with U-tube bundle

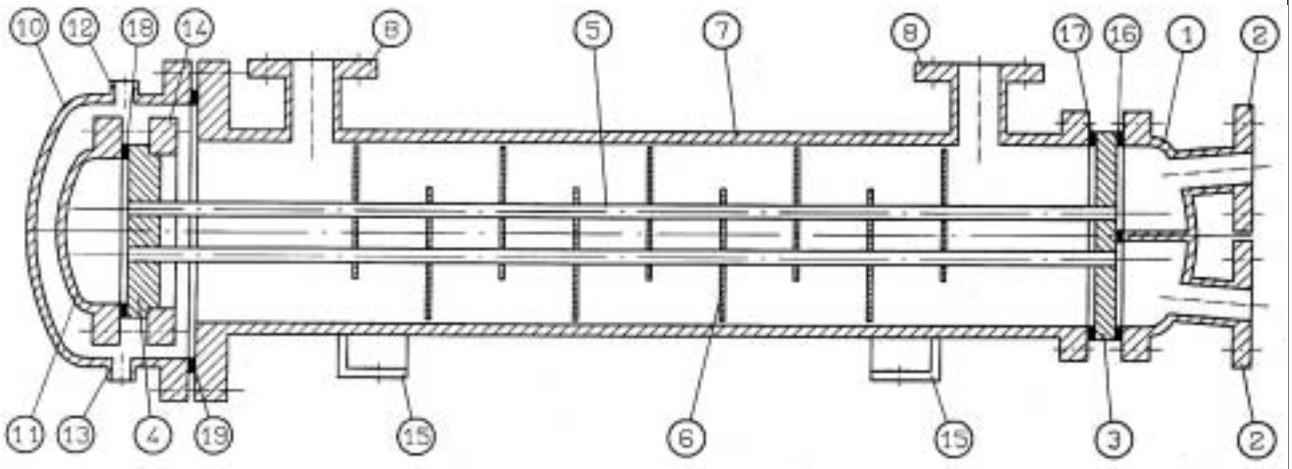
C300



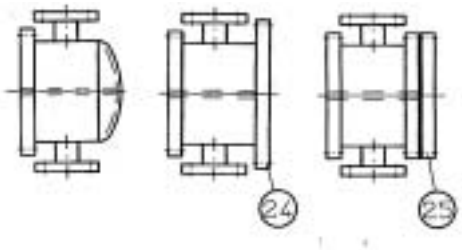
Heat Exchanger with floating head
C400

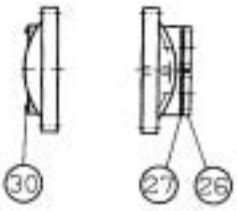


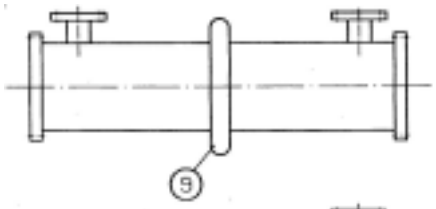
C500

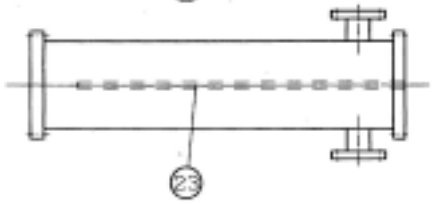


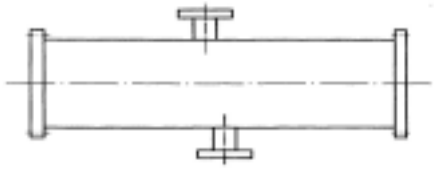
Further types











1.2 Application

FUNKE-heat exchangers are transferring heat from one media to another without mixing of both media.

A tube bundle is used. One medium flows through the tubes.
The second medium flows around the tube bundle. Therefore, we also say tubeside and shellside.
To ensure an optimum efficiency of the FUNKE-heat exchangers, segmental baffles are arranged shellside, by which the shellside medium is flowing in different directions crosswise to the tube bundle.
The heat exchanger type TDW has no segmental baffles but spirals instead.

FUNKE-Safety Type Heat Exchanger:
The FUNKE-safety type heat exchanger is used in such cases where an intermixing of the two media, flowing through the heat exchanger shall be avoided in any case.
The media may be gaseous or liquid.

1.3 Technical Data

Technical data are shown on the specification sheet or the corresponding heat exchanger brochure.

Funke-Safety Type Heat Exchanger:
To ensure the function of the FUNKE Safety Type Heat Exchanger, the fluid pressure at all points within the heat exchanger has to be at least 0,6 bar and the pressure control must be adjusted to a value of at least 30 % below the min. fluid pressure. By the manufacturer the pressure control has been adjusted to 0,5 bar. An adjustment below 0,4 bar may initiate alert.

In case of a vacuum the safety zone can be controlled by a safety unit with special pressure control. Further control possibilities on request.
Separating liquid is suited for the food sector and frost-proof to –20°C. In this case the indicated operating pressure shall be checked regularly.
The pressure state as supplied must be permanently kept.

2 Structural design

2.1 Structural design of a heat exchanger

Structural design of the heat exchanger is shown on the corresponding drawing or brochure.

3 Transport

3.1 Loading and unloading

For loading and unloading always use suitable lifting devices
If heat exchangers dispose of lifting lugs, please use them for lifting.

For transport of the FUNKE heat exchangers a clamping belt is recommended to avoid any damage.

The surface area of the FUNKE-heat exchanger shall not be damaged.

Furthermore, please check if all openings are tightly locked.

3.2 Completeness

On receipt of FUNKE heat exchanger please check if the consignment is complete and in faultless condition. The delivery scope is shown on the delivery note. Any transport damage to be noted down on the delivery note of the corresponding forwarder immediately after receipt of goods.

3.3 Temporary storage

For temporary storage of the FUNKE heat exchangers care for a levelled ground with soil stability to ensure a safe storage of the heat exchanger. FUNKE heat exchangers have to be protected against weathering influence.

4 Operation

4.1 Installation of the heat exchanger

Before installing the FUNKE-heat exchanger please check if operating data correspond with the data shown on the name plate and if the heat exchanger shows visible damages.
It is very important to check the tubes, i.e. to check if all plugs, applied for transport, are removed, etc. Furthermore, guidance of the media must be observed.

To ensure stability of the FUNKE heat exchangers, anchor bolts should be fixed to the saddle.

Piping to be connected strainless to resist any leakage.

It is supposed that only proper bolts and gaskets will be used for flange connection and that piping to be connected is without pressure during assembly.

Before the FUNKE-heat exchanger will be loaded with pressure, all connection bolts shall be tightened or retightened (possibly gaskets have settled).

Torsional moments shown on the drawings shall be complied with.

4.2 Putting into operation

Now the FUNKE heat exchanger can be filled with chosen media and afterwards shall be vented. Otherwise heat transfer may be diminished.

Pressurising must be continuously and not suddenly to avoid any risk to damage the FUNKE heat exchanger internally.

First the cold medium and then the hot medium shall be connected.

Then all flange connections and screwed joints shall be checked for tightness.

After starting operation connection bolts shall be etightened again.

FUNKE-Fail-Safe Heat Exchanger:
Pressure control to be connected according to circuit diagram (in pressure control or on operation instruction).

5 Maintenance

5.1 Works to be carried out

Legal rules shall be met as regards test periods.

Maintenance works on FUNKE-heat exchangers only to be done in pressureless condition of the heat exchanger.

Unit to be serviced periodically, depending on fouling conditions. Cleaning recommended every 500 to 2000 operating hours.

If efficiency is dropping, the heat exchanger should be vented or cleaned.

If heat exchangers consist of zinc corrosion arresters, replace these if a marked corrosion visible. If insulated with scale, remove scale. Zinc anodes are equipped with signal-bore. Replacement of zinc anodes necessary, if water leaks through.

Clean all dirt traps/filters in the respective circuit.

Unscrew and remove bonnets, carefully inspect tubes for corrosion or erosion as well as for foreign matters and clean if required.

FUNKE-Fail-safe heat exchanger:
The fail-safe system with pressure control and compensation device is a closed system and requires no maintenance. If in case as result of an improper opening the separating liquid escapes, it becomes necessary to refill the separating liquid in any case.
Small quantities of separating liquid are available at FUNKE and can be refilled on the spot. It must be taken care that the compensation device will be refilled to the middle without air.
In order to refill the compensation device open closing cap of lateral nozzle. Refill only to max. 50 % of the volume of the compensation device. The filler neck in horizontal position delimits the max. filler level limits the max. filling level. If large quantities of separating liquid escaped, the unit must be sent to FUNKE for repair.

5.2 Cleaning

FUNKE heat exchangers can be cleaned manually or chemically.

Manual cleaning through the tubes with focused beam of water. Remove obstinate residues by means of nylon brush.

Around the tubes, only chemical cleaning possible (depending on tube pitch).

Decalcify chemically through and around the tubes with proper cleaning agent, depending on material. The system shall be open, as gases become free. It must be ensured that these gases will not be inhaled.

For the purpose of neutralisation flush with a 5 % sodium carbonate solution. Oil residues can be removed with P 3.

5.3 Spare parts list

For each FUNKE heat exchanger a spare parts list is available on request.

To guarantee serviceability, only FUNKE ORIGINAL spare parts are allowed to be used.

Only FUNKE ORIGINAL wearing parts like zinc anodes and gaskets are allowed to be used.)

6 Stoppage

Before stoppage of the FUNKE heat exchanger the plant user must ensure that operational safety of the plant will not be affected.

Close all shut-off fittings before and behind the heat exchanger. Pressure must be discharged without danger. Check if the operating pressure gauge shows pressureless state. Furthermore, check if the temperature cooled down is lower than 40°C.

If explosive and toxic or ecologically damaging media are used, it must be ensured that they will not escape when loosening the tube joints.

In case of explosive or toxic gases or gas mixtures, the FUNKE heat exchanger is always to be purged before opening.

When opening the FUNKE heat exchanger face masks should be put on, depending on media.

7 Miscellaneous

7.1 Disposal of FUNKE-heat exchangers

Disposal of FUNKE-heat exchangers shall be the duty of the plant operator. He must ensure that current legal requirements, effective when disposing the heat exchanger, will be complied with.

7.2 Safety instructions

The plant operator has to ensure that the operating- and maintenance staff disposes of sufficient knowledge necessary to operate and maintain the heat exchanger.
He especially must ensure that all safety regulations will be complied with.

FUNKE-Fail-Safe heat exchangers:
By no means the fail-safe system shall be opened. Otherwise the function of the heat exchanger and thus safety would be affected.(Just unscrew cover bolts and not shell bolts.)

7.3 Adress for after-sales-service

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7.4 Guarantee

Within the scope of our “General Sales Conditions” we shall not be liable for corrosion, vibration and oscillation, for fouling or for failure and defects, caused by improper maintenance and installation/application.