

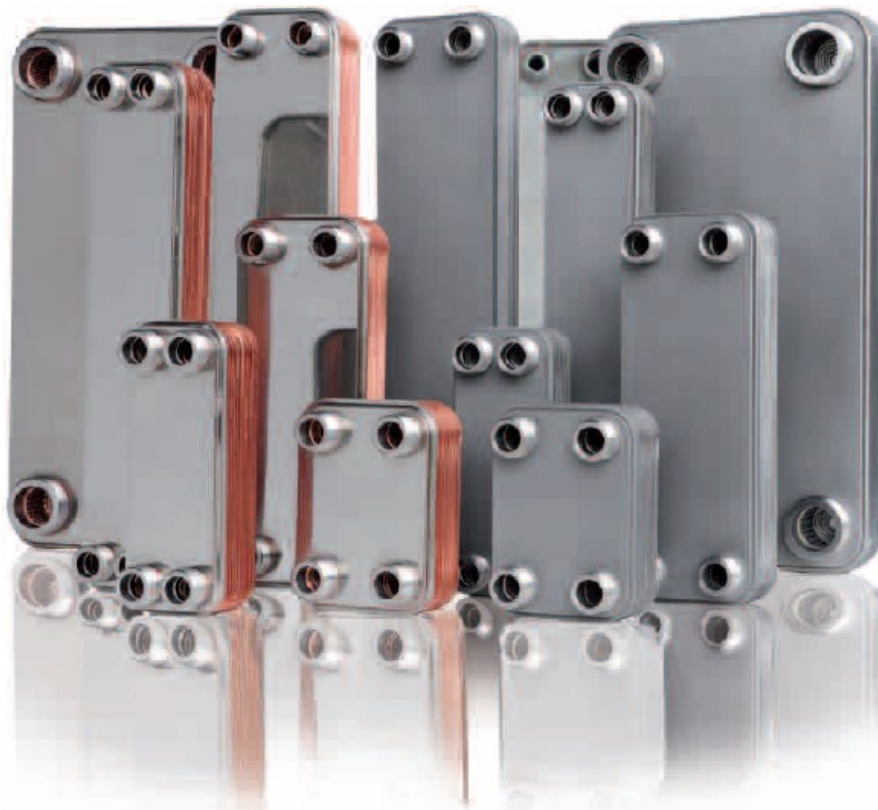
THERMOTECHNIKZESEN



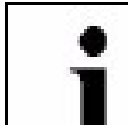
# Operating Instructions

for

Brazed Plate Heat Exchangers



### **NOTE**



Please read these instructions carefully prior to installation and start up. Failure to comply with installation, operating and maintenance instructions rescinds the right to warranty claims.

On delivery, check the product for damage and whether any parts are missing. Make a note accordingly on the shipping papers.

### **CAUTION**



Bear in mind when handling plate heat exchangers that they have sharp edges. Wearing cut-resistance protective gloves is recommended for this.

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## Important information on product safety

### Safety information

This data sheet contains information on the installation, startup, operation, and maintenance of heat exchangers from TTZ GmbH & Co. KG. All those working with this heat exchanger must have read and understood this data sheet. If questions arise that these operating instructions are unable to resolve, seek further information from the supplier or manufacturer.

The warranty may become void if the product is not used in accordance with these operating instructions. Conformance with the relevant specifications and guidelines is required for installation and use of the instrument.

Assembly, installation, and startup work on the devices may only be carried out by qualified specialists. Specialists are those who are able to leverage their professional training, knowledge, experience and knowledge of pertinent standards to assess the work assigned to them and to identify potential risks.

### Meaning of symbols



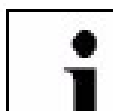
#### **CAUTION**

Denotes a hazard with a low level of risk that could result in minor or semi-serious injury if not averted.



#### **WARNING**

Denotes a hazard that could result in material damage or malfunction if not averted.



#### **NOTE**

Denotes additional information to assist you in working with the product.

## Description

### General:

These heat exchangers are brazed plate heat exchangers representing the most compact variation of the traditional heat exchangers. They consist of a number of stamped high-grade steel plates joined together with soldering metal (high-grade steel) and a special soldering process. The structural design of the instruments gives rise to at least two separate flow channels, differentiated into primary and secondary circuit(s). The primary side is located inside and has one less channel.

### Materials:

Soldering metal: free of non-ferrous metal for the 221/222 models

Plate material: High-grade steel 1.4404/AISI 316L

For further information, please refer to the nameplate affixed to every heat exchanger. Please read this information.

### Directive:

All plate heat exchangers fall under the category of pressure equipment as defined by the Pressure Equipment Directive (2014/68/EU). EC type testing and controlling of the manufacturing (module A2/C2) are carried out by appointed body:

*TÜV Thüringen e.V. Melchendorfer Straße 64, 99096 Erfurt, Germany; Registry No. CE 0090*

### High efficiency:

The design of the plates means there is highly turbulent flow-through in the heat exchanger, thereby enabling very effective heat transfer even with low volume flows.

### Corrosion resistance:

The use of high-grade materials gives rise to a high resistivity to corrosion.

### Self-cleaning:

The highly turbulent flow-through in the heat exchanger, even with low speeds, generates a self-cleaning effect that reduces considerably the calcification and contamination tendency in conjunction with the special plate designs.

### General application areas:

Thermal engineering	<ul style="list-style-type: none"><li>• District heating transfer stations</li><li>• Hot water generation</li><li>• Solar heating</li><li>• Floor heating</li><li>• Combination systems</li><li>• ...</li></ul>
Refrigeration and air-conditioning	<ul style="list-style-type: none"><li>• Evaporators</li><li>• Condensers</li><li>• Sub coolers</li><li>• Desuperheaters, economisers</li><li>• ...</li></ul>
Oil cooling	<ul style="list-style-type: none"><li>• Hydraulic oil cooling</li><li>• Motor cooling</li><li>• Machine cooling</li><li>• ...</li></ul>
Industrial processes	<ul style="list-style-type: none"><li>• Process cooling</li><li>• Heat recovery</li><li>• Air drying</li><li>• ...</li></ul>

## Installation

### CAUTION

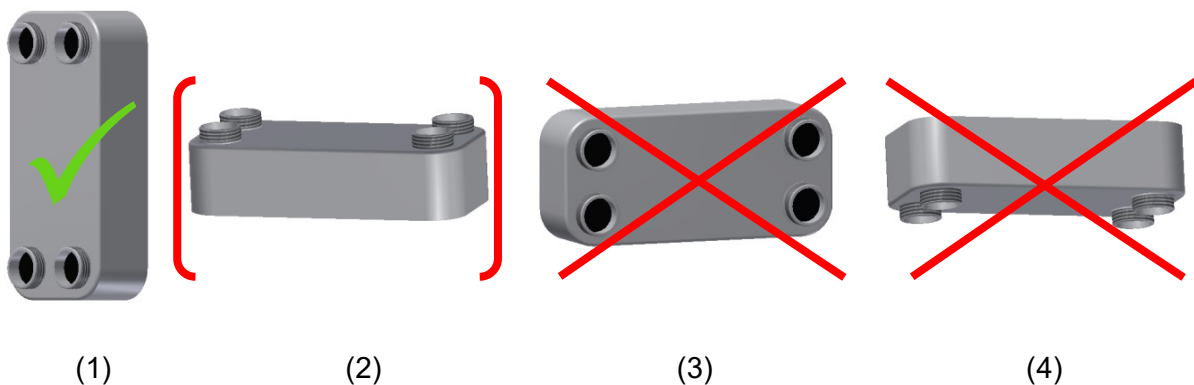


Please note that brazed plate heat exchangers have sharp edges. We recommend wearing appropriate gloves and protective work boots.

### WARNING



The following installation positions are suitable/unsuitable for the plate heat exchanger.



**Figure 1: Recommended instrument installation position**

### Installation position:

- Remember during installation to leave enough room for any potential maintenance work.
- During installation, select an installation position enabling venting and draining (see *Figure 1.1*). Figure 1.2 is only recommended up to a point because draining is not possible.
- Installation positions 3 and 4 are not recommended. Venting cannot be fully guaranteed and may result in a drop in performance.

## Connection to the pipework:

The instruments are generally connected in the counterflow.

Please make sure to install the exchanger without mechanical tension or vibrations.

To prevent pipe forces, we recommend the use of fixed points in the direct vicinity of the connection pieces.

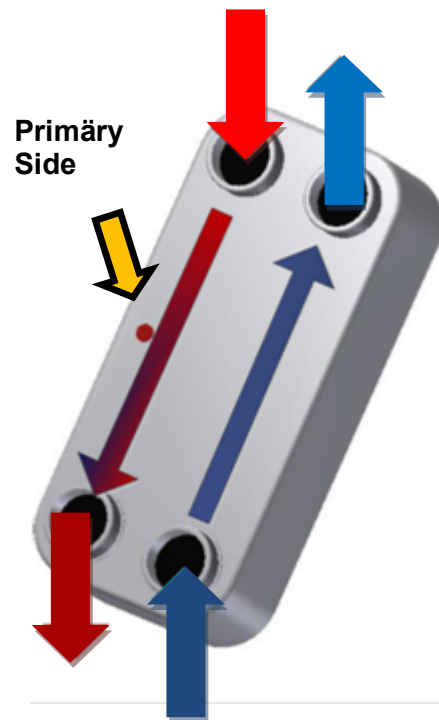
Compensators can be used to lower the level of vibration.

The brackets provided must be used for larger heat exchangers.

During installation, please ensure to earth the device adequately to prevent corrosion due to no potential equalisation.

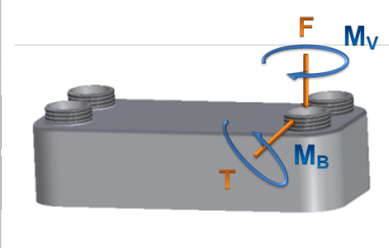
Please observe the stipulated installation position of the instruments for applications with a phase change.

- The direction of flow of fluids to be condensed is top to bottom (red).
- The direction of flow of fluids to be evaporated is generally bottom to top (blue).



**Figure 2:** General directions of flow recommended for plate heat exchangers. Red or blue dot shows the primary side

Model	T [kN]	F [kN]	M <sub>B</sub> [Nm]	M <sub>V</sub> [Nm]
221,222	11.5	30	740	1000



**Table 1:** Maximum connection forces and moments



Note for the use of flammable and toxic media, e.g. refrigerants:

Please note that only brazed and welded joints may be used with flammable and toxic media and especially refrigerants. No threaded or soft solder connections are permitted. Non-compliance will void our warranty as well as any required certifications.

The flammable or toxic medium may only be used on the primary side using the welded or brazed connections.

The primary or refrigerant side is marked with a red or blue dot (see Figure 2). The secondary side (processing side) has no mark.

Different connectors can be used to link with the pipes:

#### Screwed connection

Please note here that, a suitable seal is used and that the permissible torque for the respective seal (*see  $M_v$  in Table 1*) is not exceeded when tightening the joint.

#### Brazed connection

Clean, remove any grease from and sand the surface of the connector and the copper pipe to remove oxides. The heat exchanger must be flushed with nitrogen from the inside to prevent oxidation. Do not direct the flame in the direction of the exchanger. Use a wet cloth to protect the heat exchanger from overheating. Hold the pipe in a fixed position when brazing.



### **WARNING**



Excessive heating can result in melting of the brazed joints and damaging of the instrument beyond repair.

### **Welded connection**

TIG welding lends itself to the welding of thin-sided pipework to the connectors of the instruments. Please note that the exchanger should be protected from overheating using wet cloths. The heat exchanger must be flushed with nitrogen from the inside to prevent oxidation.

### **Flanged connection**

Flanged connections are used for high volume flows and high connector diameters. The use of a frictional connection also means they are easy to exchange. Ensure the connection is free of tension when connecting to existing pipework.

## Startup

### **WARNING**



The exchanger may only be installed by qualified specialists. Observe the following in addition to the generally applicable installation guidelines:

- The working data on the nameplate must be checked prior to startup and may not be exceeded.
- The connectors on the exchanger leading to the pumps must be fitted with cut-off valves.
- Pumps or systems with higher operating pressures than the exchanger itself must be fitted with safety valves.
- The leak tightness of the system must be guaranteed (i.e. the drawing in of air must be prevented) because otherwise water surges may result that could damage the exchanger.
- After the lines are connected, they must be tested to check they are secure.
- The permitted torque must be checked for the screwed joints (*see  $M_v$  in Table 1*).
- The feeding pumps must be moved against the closed locking valves so as to prevent a pressure rise on initial use. Then the two locking valves are opened slowly by the same amount. During the filling process, the instrument must be vented via the bleed valves in the pipe.
- Drain and clean the system if it is not likely to be used for some time. This prevents frost and corrosion damage occurring. Plate-out on the surface of the heat exchanger plates drastically reduces transmission capacity.

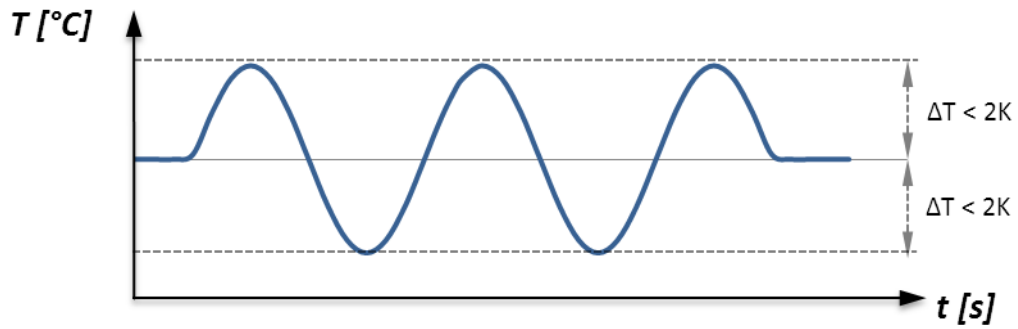
## Usage

### **WARNING**

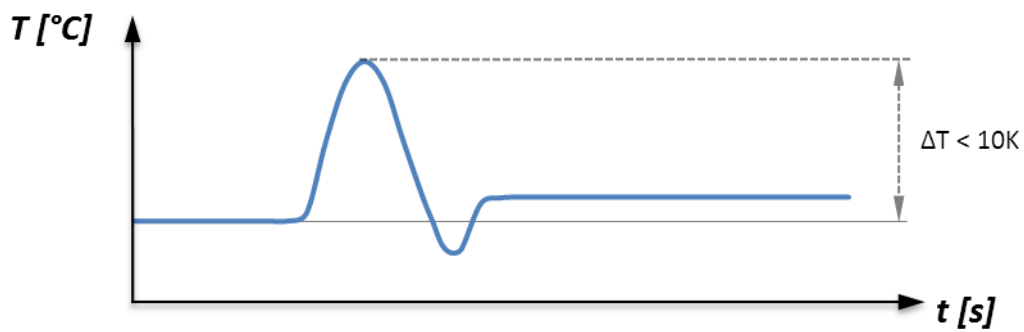


The following operating instructions must be observed.

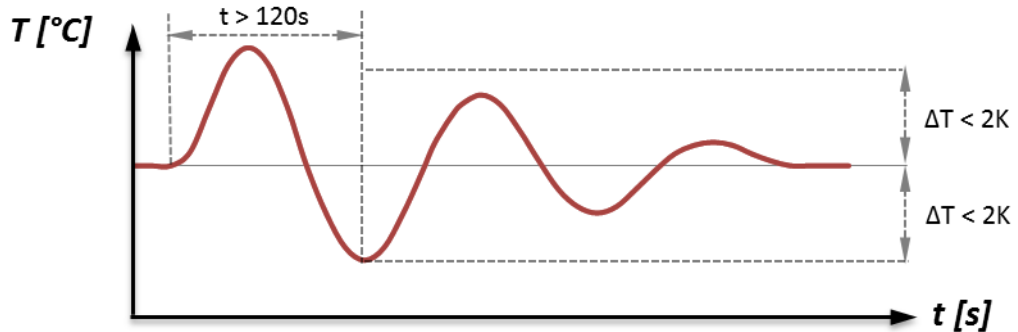
- During operation, ensure that the exchanger is not exposed to any high, rapid pressure and temperature fluctuations. They must remain within the normal control characteristics of the controller. The controller may not vibrate under any circumstances (see Figure 3-6).
- When connecting up to the district heating system, ensure that the secondary-side pressure increase is designed for the maximum primary-side temperature because otherwise serious vapour shocks can occur. If the exchanger is installed between the control valve and a differential pressure regulator, ensure to prevent both from closing simultaneously and enabling vapour shocks due to a pressure drop.
- Please ensure that the fluids used in the exchanger are not operated near their freezing points. Freezing may damage the instrument beyond repair. The use of an anti-freeze agent (such as glycol) is recommended in such cases, as is the installation of flow and pressure monitors in heat pumps.
- The water quality is of prime importance when operating the exchanger (see Table 2).
- Note that the flow cross-sections can be clogged as a result of contamination and that the probability of corrosion is increased. We recommend a max. 50µm filter.
- Bear in mind that calcium deposits can reduce the performance of exchanger and increase susceptibility to corrosion.



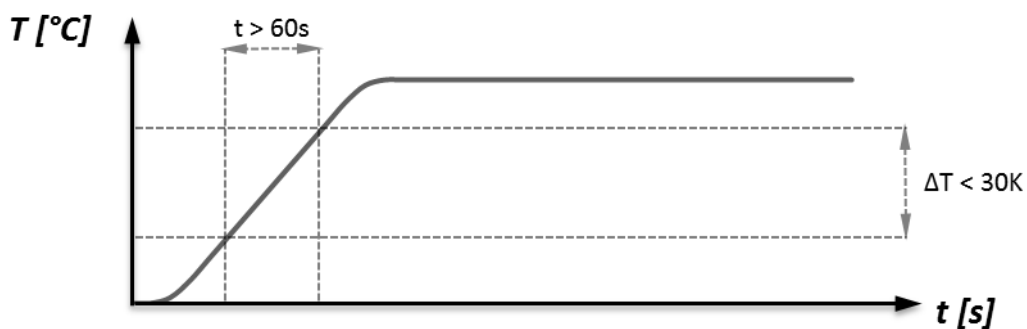
**Figure 3:** Maximum continual temperature deviations occurring ( $\pm 2\text{K}$ )



**Figure 4:** Maximum transient overshoot following a load cycle ( $< 10\text{K}$ )



**Figure 5:** Transient time following a load cycle ( $< \pm 2\text{K}$  within 120 seconds)



**Figure 6:** Maximum temperature change on startup to reach the steady state to prevent thermally induced tension ( $< 0.5\text{K/s}$ )

### **WARNING**



Factors having a negative effect on service life that are to be prevented:

- Oversized control valves
- Excessive pressure fluctuations
- Poor quality control valves
- Inadequate controller adjustments
- Incorrect positioning of the probes

Control valves should be between 20% and 100% of the Kvs-Value. A Value under 20% can cause control problems and temperature fluctuations. The result could be a thermal overloading of the heat exchanger. A control with "Heat exchanger-Protector-Function" is recommended. ([www.ener.de](http://www.ener.de))

When designing and operating a heat exchanger with large temperature differences, care must be taken to avoid operation in the laminar flow form in the low-load range. With a frequent turnover between the laminar and turbulent flow shapes, the heat exchanger is heated unevenly, subjected to heavy stress due to changing temperatures and its service life is shortened

## **Cleaning**

### **NOTE:**



Cleaning at regular intervals is required if plate-out as a result of low water quality (e.g. high hardness grades or severe dirtying) is anticipated.

The best way to clean is to flush the exchanger. The exchanger should be flushed in the opposite direction to the normal flow direction with a suitable cleaning solution. Ensure that no incompatibilities arise between the cleaning solution and the material used in the exchanger. The cleaning solution must be chosen according to the nature of the contamination and the resistance of the exchanger plates and soldering metal. Please refer to the cleaning agent specifications for this compatibility information. The safety regulations and recommendations of the cleaning agent manufacturers must also be observed. Before refitting the cleaned instrument, flush it with clear water.

**WARNING**

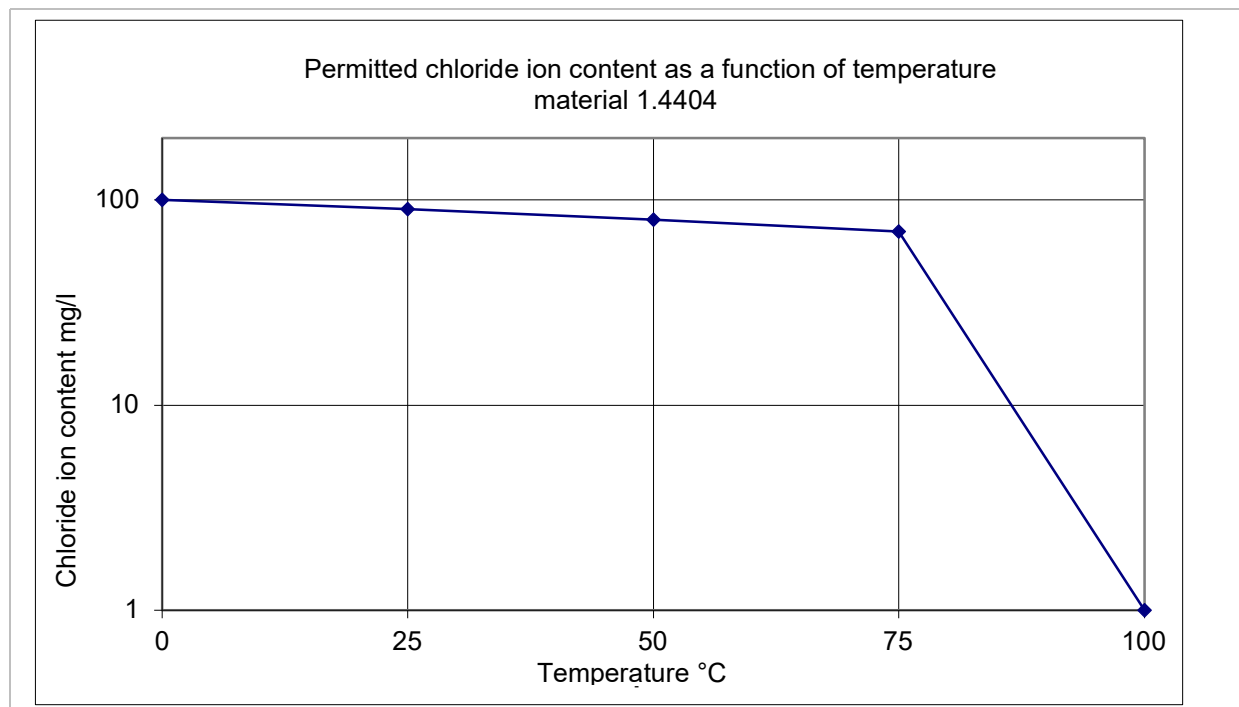


The cleaning agents must be approved for high-grade steel.

## List of dissolved elements to be tested

Dissolved elements	Unit	Thresholds	
		221 / 222	Non-ferrous metal solder
pH value	-		6 - 10
Filterable compounds	mg/l		< 30
Ammonia (NH <sub>3</sub> /NH <sub>4</sub> <sup>+</sup> )	mg/l		No limit
Chloride	mg/l		See table
Iron solute	mg/l		No limit
Free (aggressive) carbon dioxide	mg/l		No limit
Free chlorine	mg/l		< 0.5
Total hardness	°dH		6 - 15
Hydrocarbonate	mg/l		No limit
Conductivity	µS/cm		No limit
Manganese	mg/l		No limit
Nitrate	mg/l		No limit
Nitrite	mg/l		No limit
Saturation index SI/ΔpH value	-		No limit
Hydrogen sulphide (H <sub>2</sub> S)	mg/l		No limit
Sulphate	mg/l		< 300
Sulphide	mg/l		< 5
Ratio of hydrocarbonate/sulphate	(mg/l)		No limit

**Table 2:** List of dissolved elements to be tested



**Figure 1:** Permitted chloride ion content as a function of temperature

### **Special features when operating with disinfectants or media containing halides:**

When using disinfectants containing chloride and bromide, it must be ensured that the permissible concentrations are not exceeded, especially with open cooling systems.

Please, take into account the permissible thickening of the cooling medium in your consideration.



## Content volume

221 / 222

L/Channel	0,254	
Nbr of plates	Pri. [dm³]	Sek. [dm³]
10	1,02	1,27
20	2,29	2,54
30	3,56	3,81
40	4,83	5,08
50	6,10	6,35
60	7,37	7,62
70	8,64	8,89
80	9,91	10,16
90	11,18	11,43
100	12,45	12,70
110	13,72	13,97
120	14,99	15,24
130	16,26	16,51
140	17,53	17,78
150	18,80	19,05

**Table 3:** Overview of the excahngers content volume in litres [dm³]

Pri = Primary side

Sek = Secondary side

### Action in the event of transportation damage or problematic situations

The quality management system of TTZ makes provision for 100% checks of all the plate heat exchangers supplied by our company. Damage during transit may occur nevertheless. Please highlight this immediately to the freight company and TZZ.

221 and 222 are produced by TTZ for SWEP. In the event you are not satisfied with the products you are asked to in first place contact SWEP. Please contact your regional sales representative or use the below contact details:

Contact: Phone: +46 418 40 04 00  
Email: [info@swep.net](mailto:info@swep.net)  
Address: <https://www.swep.net/company/contacts/>