Installation manual
Operating manual
Maintenance manual

for HEAT EXCHANGERS



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1 General information

Dear operating personnel, we are happy that you chose a heat exchanger from KÜHNER Wärmetauscher GmbH & Co. KG. You are using a heat exchanger that meets all safety-related requirements and was developed according to the state of the art.

1.1 Intended use

The heat exchanger serves to transfer thermal energy (temperature) from one element (heat exchanger) to another element (e.g. circulating air). A heat exchanger is specified for a defined temperature range + defined pressure range and for a defined medium (water, oil, thermal oil, steam). If available, the instructions in the respective safety data sheet (e.g. for thermal oil) have to be applied.

The heat exchanger may only be operated with the specified medium (type, detail designation, detail specification) and with the specified pressure and temperature.

No operation is necessary at the heat exchanger while it is running.

The intended use of the heat exchanger also includes adherence to the installation, operating and maintenance instructions.

Improper use can result in the endangerment of persons and damage to the heat exchanger.

The manufacturer is not liable for any damage resulting from any other use.

Conversions or changes on the heat exchanger are not permitted and may have consequences under product liability law.

A heat exchanger (without additional parts) does not fall under 2023/1230 (Machinery Directive) and therefore bears the CE marking according to the Pressure Equipment Directive 2014/68/EU.

1.2 Target group and previous knowledge

The installation manual is intended for the installation personnel. The operating and maintenance manual is intended for the operating and maintenance personnel. The installation and maintenance personnel are to be determined by the operating company. The installation and maintenance personnel have to meet the following prerequisites:

- Basic technical understanding
- Reading and understanding this installation/maintenance manual
- The installation personnel must be strong enough to complete the necessary manual work.

In order to obtain the necessary knowledge required for the installation and maintenance of the heat exchanger, the following measures have to be undertaken by the operating company:

- Product training (written confirmation by the trained persons)
- Regular safety instruction

1.3 Requirements for the qualification of the personnel

- The heat exchanger may only be operated by trained personnel, who have also read and understood the available installation manual. Such activities may not be carried out by untrained personnel.
- The installation and maintenance personnel must be willing to wear the prescribed protective equipment.
- Maintenance, cleaning and repair may only be carried out by technical specialists with product specific training, as well as mechanical and/or electrical basic training.
- Specialists with product specific training must be assigned to the planning and monitoring of the work and should be made accountable.
- The legal minimum age is to be adhered to.
- Apprentices or people being trained in handling the heat exchanger may perform work on the heat exchanger only after instruction and under supervision of experienced personnel.

1.4 Contents and purpose of this document

This documentation contains the relevant information for installation, operation, maintenance and disposal of the heat exchanger.

Using this documentation should make it possible for people to work safely with the heat exchanger.

Observing the instructions provided in this document should serve to avoid hazards and to prevent damage to the heat exchanger.

1.5 Getting help if something is not clear

For problems, which cannot be solved with the assistance of this technical documentation, the technical personnel of KÜHNER Wärmetauscher GmbH & Co. KG are there to assist you. It is essential that you submit a precise description of the problem situation.

1.6 Limitations of use

The area of application for a heat exchanger is limited as follows:

- Medium (water, oil, thermal oil, steam) according to the data on the identification plate
- Application of the instructions in the respective safety data sheet (if available)
- Medium temperature and operating pressure: according to the data on the identification plate and the detail specification with the customer
- The supporting construction must be suitable for the weight of the heat exchanger
- Not in an area with there is a potentially explosive atmosphere
- Consider the danger of frost for the medium

1.7 Used signal words in safety instructions

	**DANGER!**	A safety instruction with the signal word **DANGER** indicates an **immediate threatening danger** for the life and the health of persons! *Immediate threatening danger for the life of persons.*
	**WARNING!**	A safety instruction with the signal word **WARNING** indicates a **dangerous situation**, which can have effects on the health of persons! *Risk of personal injuries (severe injuries) and possible damage to property.*
	**CAUTION!**	A safety instruction with the signal word **CAUTION** indicates a **possibly dangerous situation** that can primarily entail damage to property *Risk of damage to property and possibly a small additional risk of injury.*

1.8 Used symbols in safety instructions

	**DANGER!**	This safety instruction indicates a **possible danger through electrical current**. *Disregarding this warning can result in lethal injuries and damage.*
	**WARNING!**	This safety instruction indicates a **possible danger of being crushed**! *Danger of personal injuries and possibly additional damage to property.*
	**WARNING!**	This safety instruction indicates a possible **danger of being crushed** against fixed objects! *Disregarding this warning can result in personal injuries.*
	**WARNING!**	This safety instruction indicates a **danger of falling**! *Disregarding this warning can result in personal injuries.*
	**WARNING!**	This safety instruction indicates a **danger of stumbling**! *Disregarding this warning can result in serious injuries.*
	**WARNING!**	This safety instruction indicates a **general dangerous situation**! *Disregarding this warning can result in serious injuries.*

	**WARNING!**	This safety instruction indicates a **danger of being cut** (e.g. on sharp edges)! *Disregarding this warning can result in serious injuries.*
	**WARNING!**	This safety instruction indicates a **danger of burns** (on hot surfaces)! *Disregarding this warning can result in serious injuries.*
	**WARNING!**	This safety instruction indicates a possible **danger of explosion**! *Disregarding this warning can result in lethal injuries and damage.*
	**WARNING!**	This safety instruction indicates **dangers from fork-lift trucks**! *Disregarding this warning can result in serious injuries.*
	**WARNING!**	This safety instruction indicates a **danger from falling objects** (e.g. from a crane)! *Disregarding this warning can result in serious injuries.*
	**WARNING!**	**Access to this area is denied to unauthorized persons** (the operating company specifies who is authorized)! *Disregarding this warning can result in serious injuries*
	**WARNING!**	A reference to the obligation to wear **protective gloves**! *Disregarding this warning can result in personal injuries.*
	**WARNING!**	Reference to the obligation to wear **protective footwear**! *Disregarding this warning can result in personal injuries.*
	**WARNING!**	Reference to the obligation to **wear hearing protection**! *Disregarding this warning can result in injuries and hearing impairment.*
	**WARNING!**	Reference to the obligation to read the **operating manual**! *Disregarding this warning can result in the personnel making mistakes.*
	**NOTICE**	Designates **important information**.

	**IMPORTANT!**	Reference to **environmentally friendly disposal** of packaging material and other waste.
	**IMPORTANT!**	Reference to **environmentally friendly disposal** of electrical and electronic waste.

2 Installation procedure

Dear installation personnel, we are happy that you chose a heat exchanger from KÜHNER Wärmetauscher GmbH & Co. KG. You are using a heat exchanger that meets all safety-related requirements and was developed according to the state of the art.

2.1 Residual hazards during transportation and installation

Even with maximum care during the design, construction and packing of a heat exchanger and with consideration of all circumstances relevant for safety, residual hazards may exist that were evaluated by means of risk assessment.

	**WARNING!**	Make sure while transporting the heat exchanger by means of fork-lift truck that it does not fall on the floor (select the correct distance between the forks and the correct speed).
	**CAUTION!**	Wearing protective footwear is prescribed for all persons involved in the transportation and installation of the heat exchanger.
	**WARNING!**	Pay attention to the danger of being crushed between the heat exchanger and the floor when unloading the heat exchanger. Wearing protective footwear is prescribed for all persons involved in the transportation and installation of the heat exchanger.
	**WARNING!**	Pay attention to the danger of being crushed between the heat exchanger and the fork-lift truck and other fixed objects (e.g. walls, columns, machines).
	**WARNING!**	Unauthorized personnel are not allowed to be anywhere near the fork-lift truck (particularly during the transport of a heat exchanger)!
	**WARNING!**	Pay attention to the danger of cuts from wood splinters when unpacking the heat exchanger. Pay attention to the possible danger of cuts from the sharp-edged ribs of the heat exchanger.
	**NOTICE**	Wearing protective gloves is prescribed when unpacking the heat exchanger.
	**CAUTION!**	Pay attention to the possible danger of stumbling over packing material that is lying about.

	**NOTICE**	Dispose of the packing material (wood) immediately in an environmentally friendly manner.
	**WARNING!**	It is strongly forbidden to fasten the hoist of the crane to the wood packing. If the heat exchanger is transported by means of a crane, the heat exchanger must always be fastened to all retaining eyes by means of a stop-rope.
	**WARNING!**	Make sure that when fixing the holding devices (e.g. shackles, hooks, carabiner, cables) to never put a hand or fingers between the holding device and the retaining eyes as there is a danger of crushing them.
	**WARNING!**	Taking along passengers while transporting the heat exchanger using a fork-lift truck or overhead crane is strictly forbidden - there is a danger of falling.
	**WARNING!**	Pay attention to the danger of being crushed between the heat exchanger and the floor when setting down the heat exchanger with the overhead crane.
	**WARNING!**	Pay attention to the tipping risk of the heat exchanger (dependent on the design). A heat exchanger at risk of tipping should be immediately fixed to the floor at the place of installation (or secured against tipping)
	**WARNING!**	Pay attention to the danger by falling articles during the transport of the heat exchanger by means of the overhead crane. Do not leave any articles (tools, packing materials) lying around on the heat exchanger.
	**WARNING!**	For all the people who are directly or indirectly involved in the transport by means of a hangar crane, a safety helmet is prescribed.
	**WARNING**	In the context of the installation, the heat exchanger must be fixed firmly to the ground or construction (by bolting). Also consider the load-carrying capacity of the floor or construction.
	**WARNING!**	Pay attention to having sufficient safety distances at the place of installation: at least. 2.5 metres to walls, columns, machines, and other heat exchangers.
	**WARNING!**	With outdoor installation of the heat exchanger, operation is permitted only if a suitable lightning protection system is installed.

	**WARNING!**	Pipes with no risk of breaking must be used for the input and output of the medium to/from the heat exchanger.

Outdoor operation

Sufficient antifreeze must be used if the heat exchanger is operated outdoors (the quantity and type of antifreeze depend on the medium).

A suitable lightning protection system must be installed if the heat exchanger is operated outdoors.

Installation considerations

With the installation of the heat exchanger, the ability to vent it at any time must be ensured (access to the air vent ports). If no air vent ports are present, ventilation must be realised over the pipeline network. Air in the system is to be avoided.

The legal safety requirements in case of leakage are to be considered with the installation of a heat exchanger (dependent on the country of operation).

Steam-driven heat exchangers are usually installed vertically – means with vertically arranged pipes. Steam heat exchangers with horizontally arranged pipes are to be installed with the inclination of 3° to 5° to the condensate side. If this was not already planned by the manufacturer, the inclination must be carried out by the customer.

Ribbed heat exchangers are to be installed with perpendicularly arranged ribs. Note: that the ribs have sharp edges.

2.2 Installation procedure

The following procedure is necessary for the installation of the heat exchanger, depending on the type of packing (e.g. on pallet, in a wooden crate):

1. Transport the heat exchanger to the area of operation.
2. Unpack the heat exchanger - depending on the type of packing.
3. Dispose of the packing material (wood, plastic, metal) in an environmentally friendly manner.
4. Move the heat exchanger to the final place of use with a fork-lift truck/overhead crane (to do so, attach the transport hooks/transport cables to the retaining eyes (if any) on the heat exchanger.
5. Lower the heat exchanger into place and remove the transport hooks/transport cables.
6. Remove the remaining packing material (wood) and dispose of it in an environmentally friendly manner.
7. Attach the medium pipes to the heat exchanger (consider the flow direction) and check for any leaks.
8. Perform a final inspection and commence operation of the heat exchanger.

	**WARNING**	The lifting devices may not be fastened to the connections and pipes! The medium pipes must be installed in such a way that they are unstressed and vibration-free during operation.





Transport and installation of the heat exchanger (sample photos)

	**NOTICE**	Make sure that you dispose the packing material in an environmentally friendly manner!

3 Normal operation

In normal operation the heat exchanger runs fully automatically or operator controlled. No operation is necessary directly on the heat exchanger.

3.1 Residual hazards during normal operation

Even with maximum care during the design, constructing and assembly of a heat exchanger and with consideration of all circumstances relevant for safety, residual hazards may exist during normal operation, that were evaluated by means of risk assessment.

	**DANGER!**	The operation of the heat exchanger in potential explosive atmospheres (explosion zones) is forbidden!
	**WARNING!**	Ensure sufficient antifreeze protection when the heat exchanger is operating outdoors.
	**WARNING!**	Pay attention to the possible danger of stumbling within the area of the pipes leading to and from the heat exchanger.
	**WARNING!**	Climbing the heat exchanger is prohibited - there is a danger of falling.
	**IMPORTANT!**	If a safety data sheet was provided for the medium being (e.g. thermal oil), the information in the safety data sheet must be observed. Reading the safety data sheet is mandatory.

4 Service/maintenance

	**IMPORTANT!**	Service and maintenance work may only be carried out by well-informed, trained personnel, who have read and understand the installation, operating and maintenance manual.

5 Operator safety

This installation, operating and maintenance manual has been produced in accordance with the regulations applicable in the European Union and contains safety instructions. The operating company of the heat exchanger is responsible for ensuring that the installation and maintenance personnel receive the necessary safety-relevant information and that they also read the installation, operating and maintenance manual. The individuals themselves are responsible for adhering to the safety instructions.

5.1 Safety instructions for the operator

	**IMPORTANT!**	Ensure that each person, who comes into contact with the heat exchanger for the first time, has read and understood this installation, operating and maintenance manual. In particular, instruct them to pay attention to the safety instructions in this manual and on the heat exchanger itself. Keep this manual in the vicinity of the heat exchanger and pass the manual on to new personnel. Make sure that nobody works on the heat exchanger without corresponding expertise.
	**NOTICE!**	The personnel is to be instructed about working safely with the heat exchanger at regular intervals! Observe the applicable national occupational safety provisions!
	**WARNING!**	Make sure that the instructions on the heat exchanger remain easily legible! Missing and damaged instructions have to be replaced immediately!
	**DANGER!**	Transport, setup, modifications and installation may be carried out exclusively by trained, qualified personnel!
	**CAUTION!**	Use only original spare parts! Otherwise, product liability risks may be affected!
	**DANGER!**	Changes to the heat exchanger and the subsequent installation of additional equipment are only permissible with the consent of KÜHNER Wärmetauscher GmbH & Co. KG!
	**NOTICE**	The operating company of the heat exchanger is obliged to define who is responsible for operation, maintenance, repair and upkeep!

5.2 Basic principles

The heat exchanger was designed with highest safety consciousness and ensures a high standard of technical safety.

The heat exchanger complies with the state of the art and the prevailing safety and health regulations. Nevertheless, the following hazards may arise in case of improper operation or misuse:

- For the life and limb of the operator or third persons
- For the plant and other material assets of the operating company
- For the efficient operation of the heat exchanger

5.3 Design characteristics

	**NOTICE**	Kühner heat exchangers are designed according to the state of the art and common engineering practices. Reasonably foreseeable wear mechanisms (corrosion, creeping, fatigue), were taken into account as far as possible according to the intended use of the product.

5.4 Safety instructions on the heat exchanger

There are also safety instructions on the heat exchanger itself, which draw attention to the possible or residual hazards. The instructions of the safety markings on the heat exchanger are to be obeyed under all circumstances. The marking of the heat exchanger in the system is under responsibility of the installation company. It the safety markings fade or get damaged during the life span of the heat exchanger, they must be replaced with new ones immediately. The legibility and the completeness must be monitored at regular intervals.

Pictograms for warnings, prohibitions and requirements on the heat exchanger with their meanings:

Used pictograms	Description
	Warning of dangers by fork-lift trucks
	Warning of falling loads
	Warning of hot surfaces (risk of burns)
	Wearing a hard that is mandatory
	Wearing protective gloves is mandatory
	Wearing safety footwear is mandatory
	Reading the operating manual is mandatory
	Admission for unauthorized personnel is forbidden

5.5 General safety regulations and obligations

Generally, the following safety regulations and obligations apply when using the heat exchanger:

- The heat exchanger may be only operated in a perfect and clean condition.
- With repairs, only original spare parts may be used.
- The safety instructions and operating instructions from the operating manual for the components used have to be adhered to at all times.
- Only instructed, trained or qualified personnel is permitted to carry out work on the heat exchanger.
- The maintenance work is to be carried out and documented according maintenance plan.
- National occupational safety regulations as well as national safety and accident prevention regulations apply for the operation of the heat exchanger.

5.6 Safety instructions

- Cleanliness and purity within the heat exchanger is to be paid attention to. All objects which are not necessary for the production are to be removed from the area of the machine.
- It may be necessary to equip the work area with an additional light source for maintenance work, repairs and adjustments.
- Spilt liquids and oils are to be immediately removed, since there is a risk of slipping and to injuries due to falling.
- No articles or tools may be put down on the heat exchanger.
- Climbing onto the heat exchanger and the associated constructions (from the operating company) is forbidden for unauthorized personnel.

6 Description of the heat exchanger

A heat exchanger consists in principle of the following components:

Heat exchanger ①

Flange for the medium inlet ②
The medium supply line is connected here.

Flange for the medium outlet ③
The medium discharge line is connected here.



Components of the heat exchanger (symbol photo)

7 Commissioning

	**WARNING!**	Commissioning may only be carried out by qualified personnel (prerequisites are appropriate training, safety instruction, reading and understanding of the installation, operating and maintenance manual).

Before the initial operation, the following points need to be examined:

- Has the heat exchanger been bolted to the supporting structure (e.g. floor of the hall)?
- Has the heat exchanger been bolted to the duct system?
- Were the medium lines attached correctly to the heat exchanger?
- Are all safety and warning labels installed on the heat exchanger?
- Have all articles (e.g. tools, installation material etc.) been removed from the area of the heat exchanger?
- Is the operating personnel been trained?

The heat exchanger may only be put into service if all functions were tested and function correctly.

Instructions for start-up and operation:

- When starting up, it has to be ensured that there is uniform heating (e.g. no intermittent steam supply, in order to avoid unequal thermal stresses.
- Heat exchangers may be only operated, if both media (piping inside and piping exterior) flow in sufficient quantity.
- Heat exchangers are to be protected against aggressive media.
- With fresh air inlet temperature lower than 3°C the heat exchanger must become secured against freezing by air and water monitoring (also condensation from medium steam). Use certified antifreeze in the appropriate concentration. In downtimes in the winter the heat exchanger should be emptied, in order to prevent frost damage.
- For the prevention of corrosion, treatment of the feed water for steam-production is essential. In particular it is to be made certain that during a shutdown of the heat exchanger, that no oxygen (O_2) or carbon dioxide (CO_2) can get into it.
- With the shutdown of the machine the heat exchanger must be completely emptied, i.e. no more condensation may be in the heat exchanger.
- Per condensation connection on the heat exchanger there must be a suitable condensation drain installed directly near the heat exchanger at its deepest point.

8 Maintenance, troubleshooting, repairs

	**NOTICE**	Maintenance, repairs and troubleshooting may only be carried out by technical specialists with product-specific training as well as mechanical and electrical basic training and professional experience.
	**WARNING!**	Always switch off the energy source for cleaning, maintenance or repair and secure yourself against unauthorized restarting of operation.
	**NOTICE**	Dispose of components that have been removed during maintenance or repairs in an environmentally friendly manner!

8.1 Residual hazards during service / maintenance

Even with maximum care during the design, construction and installation of a heat exchanger and with consideration of all circumstances relevant for safety, residual hazards may exist that were evaluated by means of risk assessment.

	**WARNING!**	If maintenance work has to be carried out on the heat exchanger, the heat exchanger first has to cool down (cooling time depends on the operating temperature).
	**WARNING!**	Opening the medium supply lines is prohibited during normal operation. In case of maintenance or repair, the medium supply lines may be only opened after the medium has cooled down to a temperature below 35°C.
	**WARNING!**	When draining the heat exchanger, it must be ensured that no one is endangered and that there will be no environmental damage.

8.2 Necessary protective clothing for service / maintenance / cleaning

People who perform service, maintenance or cleaning, are obliged to wear the following protective equipment:

	**CAUTION!**	Wearing protective gloves is prescribed for service and maintenance work!
	**CAUTION!**	Wearing protective footwear is prescribed for service and maintenance work!
	**CAUTION!**	Wearing a hard hat is prescribed for service and maintenance work!

8.2.1 Maintenance and cleaning activities and intervals (recommended)

Activity	Interval
Clean the entire heat exchanger (e.g. sweep/vacuum)	At least semi-annually
Wipe up liquids/medium under the heat exchanger	At least semi-annually
Inspect the heat exchanger/lines for leaks	At least semi-annually

8.3 Repairs

If a repair should become necessary, the following instructions must be observed:

	**WARNING!**	If you carry out repairs independently, you become the manufacturer and assume full responsibility for the legal conformity of the heat exchanger. The manufacturer Kühner Wärmetauscher GmbH & Co. KG is no longer liable in this case.

1. Observe the safety instructions.
2. Never carry out welding or soldering work, while the equipment under pressure or there are residues of the fluid in the heat exchanger.
3. Ensure that the equipment is no longer connected to the system and is separated from all pressure and energy sources.
4. You as the operating company are legally responsible for collecting the heating and cooling fluids and not allowing these to enter the sewer system or the groundwater. Safety devices are to be provided.
5. Welding or soldering work may be carried out only by especially trained, qualified personnel.
6. Corresponding personal protective equipment must be worn.

After the repair, the heat exchanger is to be cleaned thoroughly and inspected for loose parts before reconnecting.

	**WARNING!**	Functionality can only be guaranteed if original parts are used.

8.4 Identification plate

The identification plate depends on the product version, the used medium and on the design.

You can find the identification plate in a clearly visible place on the heat exchanger.

The specified values for the permissible operating pressure and operating temperature - the reference is always the medium in the pipes - must not be exceeded.

Kommentiert [F1]: D: Die benannten Werte für den zulässigen Betriebsdruck und Betriebstemperatur -Bezug ist immer das Medium in den Rohren- dürfen nicht überschritten werden.

9 Shutting down the heat exchanger

9.1 Basic principles

	**NOTICE**	Dispose of the components in the context of the final shutdown in an environmentally compatible way and sorted (metal to the respective metal scrap, plastic to the plastic garbage, waste oils and fluids according to the legal requirements etc.).

	**NOTICE**	Dispose of electronic waste in an environmentally friendly manner (according to Directive 2012/19/EU on waste electrical and electronic equipment).

Properly dispose of the raw materials contained in this system. Before disposing of materials and machine parts, examine their recyclability. Recycle as much as possible.

Negligent or improper disposal can result in unforeseeable damage. Take care of yourself and us, our descendants, nature, the environment and the economy. Ensure that materials and components are disposed of in a manner that is friendly to humans, nature and the environment.

Adhere to the instructions of the manufacturer and to the applicable laws and regulations in doing so.

During temporary shutdown e.g. in the winter, pay attention to the danger of frost!

9.2 Materials and components

Dispose the materials and components separately according to materials:

- Aluminium and other metals
- Copper in electrical parts and conductors
- Plastics
- Oil (medium) according to the legal requirements

Recycle as much as possible.