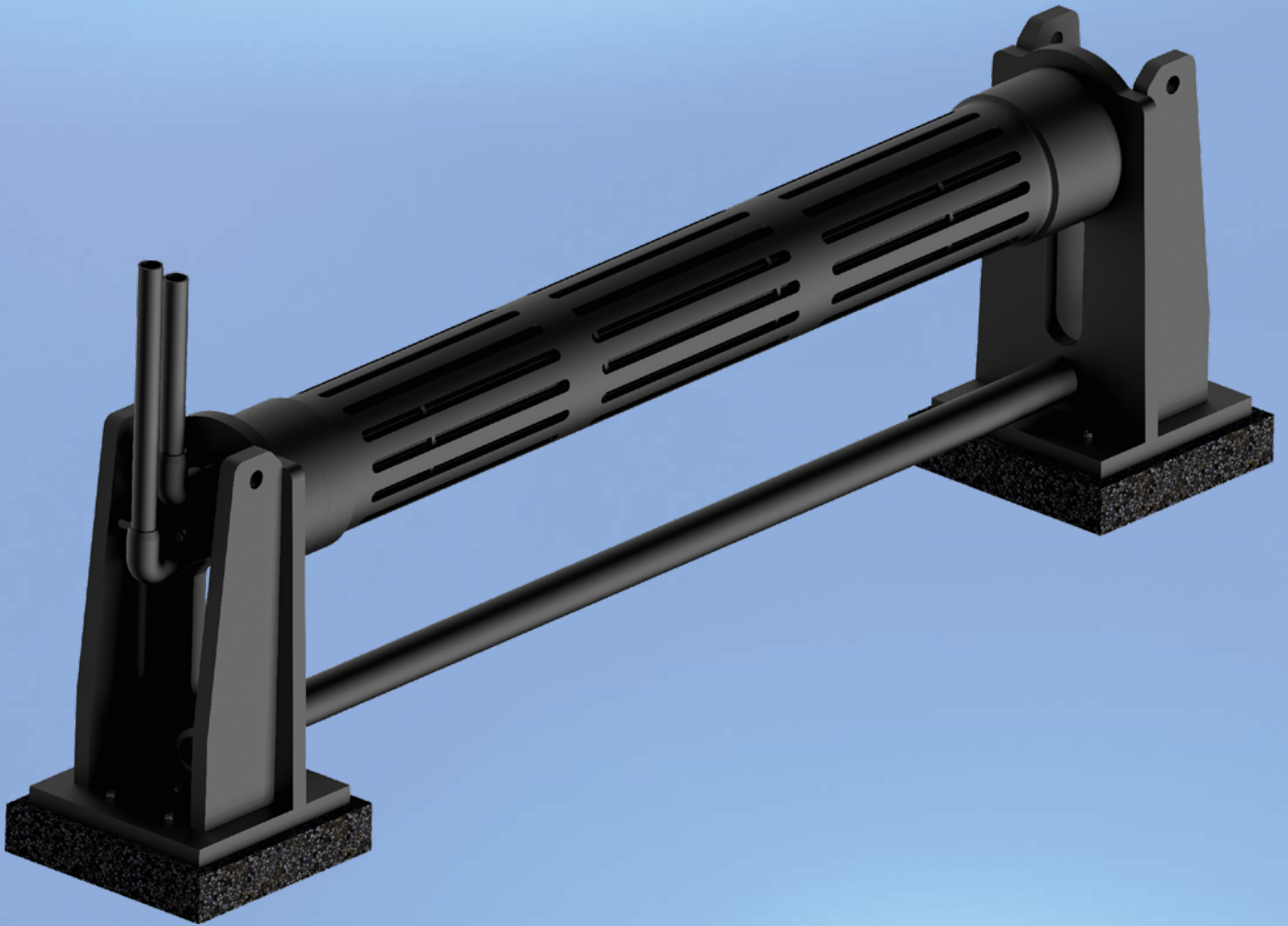


ThermoGenius™ Water F – Service Instruction Manual



Liability exclusion:

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1 Contents

- 1.1 List of figures 4
- 2 Safety..... 5
 - 2.1 Observing instructions..... 5
 - 2.2 General safety concept 5
 - 2.3 Intended use..... 5
 - 2.4 Target group 5
 - 2.5 Qualified personnel only 5
 - 2.6 General warning signs 6
- 3 Performance specification..... 7
 - 3.1 Technical data 8
- 4 Parts and function 9
 - 4.1 Package contents 10
- 5 Set up 11
 - 5.1 Unpacking of the heat exchanger..... 11
 - 5.2 Attaching the cooling/heating media inlet and outlet pipes..... 11
 - 5.2.1 Options for connecting the pipework..... 12
 - 5.3 Transportation of the heat exchanger 13
 - 5.3.1 Transport on land 13
 - 5.3.2 Installation into water 14
 - 5.3.3 Transportation in water..... 15
 - 5.4 Securing the heat exchanger 15
 - 5.4.1 Using weights 15
 - 5.4.2 Attaching the heat exchanger to a foundation 15
 - 5.4.3 Attaching the heat exchanger using flanges (without supporting feet)..... 16
 - 5.4.4 Recommended installation depth and clearance from bottom and surface 17
 - 5.5 Marking in water 17
 - 5.6 Requirements regarding the installation site 18
 - 5.7 Removal..... 20
 - 5.8 Disposal 20
 - 5.9 Maintenance schedule 20
 - 5.10 Troubleshooting 21
- 6 Operation 22
- 7 Technical documentation..... 24
 - 7.1 Technical drawings 24


7.2	Pressure loss diagram.....	25
7.3	Performance curves as example	26
7.4	Spare parts list.....	29

1.1 List of figures

Figure 1: ThermoGenius™ Water F	7
Figure 2: Side view of the ThermoGenius™ Water F heat exchanger	9
Figure 3: Top view of the ThermoGenius™ Water F heat exchanger	9
Figure 4: Front view of the ThermoGenius™ Water F heat exchanger	10
Figure 5: Back view of the ThermoGenius™ Water F heat exchanger	10
Figure 6: Heat exchanger in shipping box	11
Figure 7: Inlet/Outlet pipes of the heat exchanger	11
Figure 8: Connection with a 90 °C angle (upwards)	12
Figure 9: Connection with a 90 °C angle (upwards)	12
Figure 10: Connection of pipe directly on outlet	12
Figure 11: Transport of the heat exchanger using a transport bar	13
Figure 12: Transport of the heat exchanger using a lifting device	13
Figure 13: Transportation of the heat exchanger into the water.....	14
Figure 14: Filling of the heat exchanger with heat transfer media	14
Figure 15: Transport in water.....	15
Figure 16: Heat exchanger with attached weights.....	15
Figure 17: Heat exchanger attached to a foundation	16
Figure 18: Attaching the heat exchanger using flanges (not included in delivery)	16
Figure 19: Recommended installation with water temperature above 4°C.....	17
Figure 20: Recommended installation with water temperature below 4°C	17
Figure 21: Marking of heat exchanger using buoy	17
Figure 22: Flow direction of water body and corresponding positioning of the heat exchanger	18
Figure 23: Impact of tide range on heat exchanger	18
Figure 24: Protected installation site	19
Figure 25: Avoiding driftwood damage	19
Figure 26: Functional principle heating application	22
Figure 27: Functional principle cooling application.....	23
Figure 28: Pressure loss curve with water medium	25
Figure 29: Pressure loss curve with propylene glycol medium	25
Figure 30: Output range at water temperature of 4°C and brine inlet temperature at -3°C.....	26
Figure 31: Output range at water temperature of 4°C and brine inlet temperature at -2°C.....	26
Figure 32: Output range at water temperature of 4°C and brine inlet temperature at -1°C.....	27
Figure 33: Output range at water temperature of 5°C and brine inlet temperature at -3°C.....	27
Figure 34: Output range at water temperature of 5°C and brine inlet temperature at -2°C.....	27
Figure 35: Output range at water temperature of 5°C and brine inlet temperature at -1°C.....	28
Figure 36: Output range at water temperature of 7°C and water inlet temperature at 1°C.....	28
Figure 37: Output range at water temperature of 25°C and water inlet temperature at 30°C.....	28

2 Safety

2.1 Observing instructions

 A circular blue icon with a white border. Inside the circle, a white silhouette of a person is shown from the side, sitting and reading a document or manual.	<p>Follow the operating manual</p> <p>For the proper installation of the heat exchanger in its intended location, it is essential that the service instruction manual is read, understood, and followed.</p>
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2.2 General safety concept

The ThermoGenius™ heat exchange is designed and manufactured according to the latest technical standards and does not pose any danger to humans or the environment during normal use.

However, improper transportation, installation, or maintenance may cause damage to the heat exchanger, which could endanger people and/or the environment.

2.3 Intended use

The ThermoGenius™ heat exchanger is designed for use in lakes, watercourses and rivers, and forms part of a cooling/heating circuit that can be used to transfer a heat flow. It can also be operated safely in salt water. This heat exchanger is temperature resistant between -10°C and +40°C. However, please note that to prevent the heat exchanger from freezing, it should not be operated with an inlet temperature lower than -3°C.

2.4 Target group

This Service Handbook is designed for personnel who is familiar with setting up, installing, commissioning and operating heat pump circuits that include an integrated heat exchanger.

To understand the individual work steps, detailed specialist knowledge is required.




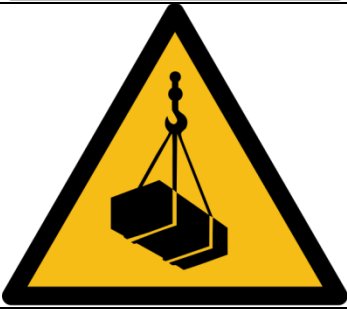
2.5 Qualified personnel only

The ThermoGenius™ heat exchanger must only be installed, removed and maintained by qualified and trained personnel.

- *Required qualifications for working under water: diving certificate conforming to at least **ISO 24801-2/DIN EN 14153-2** (two people) with fitness certificate*
- *Required qualifications for welding work: valid welder's certificate conforming to local regulations (e.g.: **DVS 2281 with examination**)*

conforming to DVS 2207-1 with electrofusion welded moulded parts or heating elements socket welding)

2.6 General warning signs

	<p>Danger of slipping</p> <p>The ground may become slippery due to leaking cooling/heating medium.</p> <p>Wear slip-resistant footwear!</p>
	<p>General warning</p> <p>Leaking cooling/heating medium may cause injuries to the skin, eyes or airways. Please observe the manufacturer's safety instructions for usage of the product!</p> <p>Personal protective equipment (PPE) must be worn!</p>
	<p>Warning about flammable substances</p> <p>Leaking cooling/heating medium can cause a fire hazard. Please observe the manufacturer's safety instructions for usage of the product!</p>
	<p>Warning about suspended loads</p> <p>To transport the heat exchanger during installation, maintenance or removal, stabilize the heat exchanger using the lugs provided (see chapter 5.2). Do not stand underneath the heat exchanger!</p> <p>Wear a helmet when working with suspended loads!</p>

3 Performance specification

ThermoGenius™ Water F

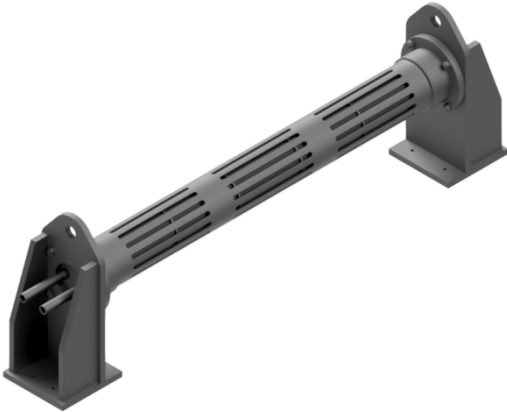


Figure 1: ThermoGenius™ Water F

Houseboats and boathouses as well as holiday homes and apartments that are located close to water generally use conventional energy sources such as gas, water and oil. This gives rise to high energy costs and unnecessary greenhouse gas emissions. Even “lake loops”, which are supposedly the green alternative, require a large space that may cause animals to become trapped and, depending on the applicable water conservation legislation, may not even be available.

*The **ThermoGenius™ Water F** is a geothermal heat exchanger that takes advantage of heat energy from natural and freely available resources. Compared with lake loops, the compact design of the heat exchanger means that only a tiny fraction of the space is needed. In addition, the heat exchanger’s outer shell can protect it from external influences at the same time.*

*The **ThermoGenius™ Water F** can be used for both heating and cooling applications.*

*In deeper water, the temperature is almost constant regardless of the time of day or season. At these depths, the **ThermoGenius™ Water F** can either extract the heat from the water for heating applications or transfer heat into the water for cooling applications.*

*The **ThermoGenius™ Water F** is available in the performance category of 6kW and several modules can be linked together to increase the transferred heat output.*

3.1 Technical data

	ThermoGenius™ Water F
Dimensions <i>in mm</i>	Ø 200x2600
Length of connecting pipework <i>in mm</i>	Ø40x360
Material	PE-HD
Operating temperature range <i>in °C</i>	-10 to +40
Max. operating pressure at -10°C <i>in bar</i>	2.2
Max. operating pressure at 0°C <i>in bar</i>	3.0
Max. operating pressure at +20°C <i>in bar</i>	3.0
Max. operating pressure at +40°C <i>in bar</i>	2.3
Net weight <i>in kg</i>	58
Filling volume <i>in l</i>	12
Exchange area <i>in m²</i>	8.0
max. flow rate <i>in m³/h</i>	12.0

4 Parts and function

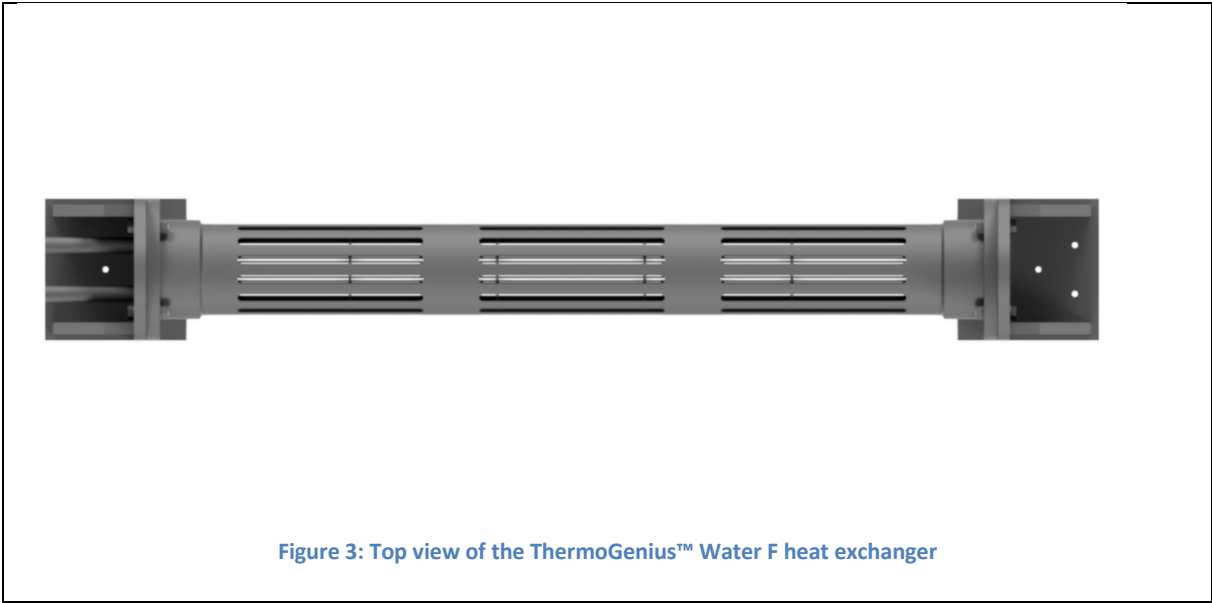
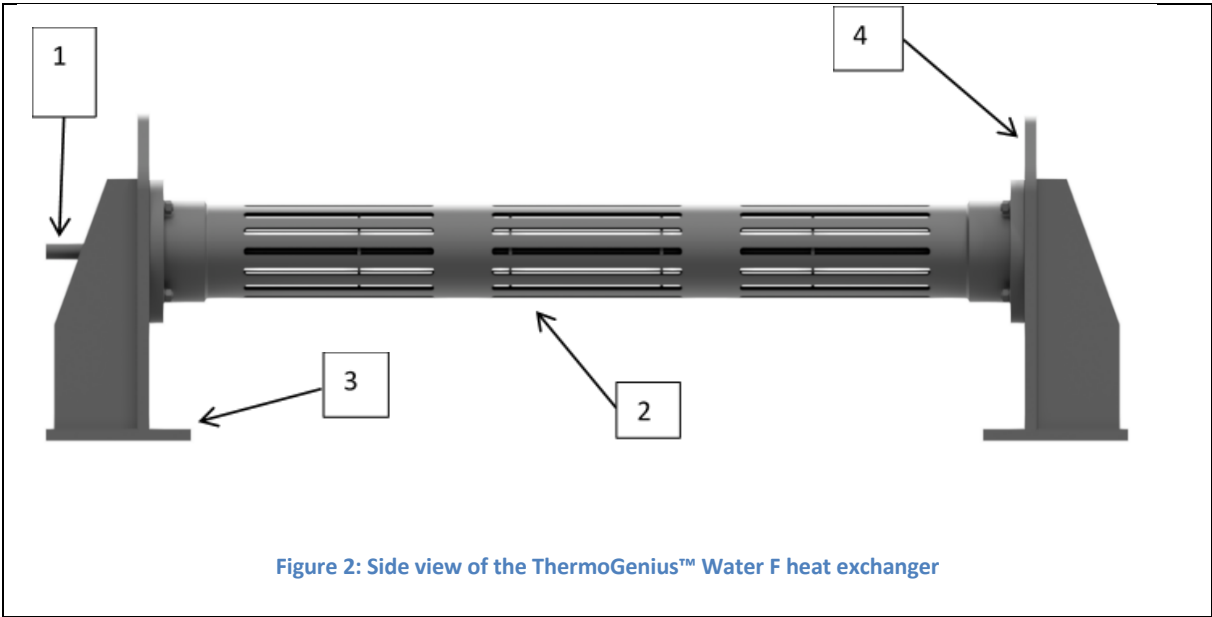




Figure 4: Front view of the ThermoGenius™ Water F heat exchanger



Figure 5: Back view of the ThermoGenius™ Water F heat exchanger

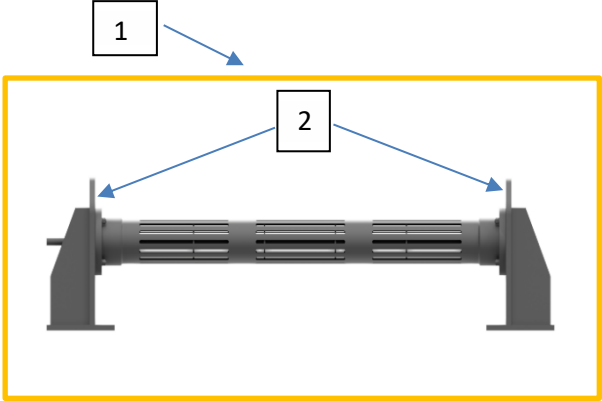
No.	Description	Function
1	Inlet/outlet for heat transfer media	Connects to the pipes carrying the media
2	Cover	Protects the heat exchanger
3	Support foot	For attachment of the heat exchanger to foundations
4	Lugs	Used for transportation and securing

4.1 Package contents


No.	Description	Quantity
1	ThermoGenius™ Water F with support feet	1
2	ThermoGenius™ Water F Service Manual	1
3	Elbow 90° made from PE D40 DN32 for electrofusion welding	2

5 Set up

5.1 Unpacking of the heat exchanger

 <p>Figure 6: Heat exchanger in shipping box</p>	<ul style="list-style-type: none">• The ThermoGenius™ Water F heat exchanger is delivered in a vertical position in its shipping box.• [1] Open the lid (see description top side) and cut the sides open if necessary.• [2] Attach transportation cable or crane hooks to the lugs on the casing• Remove the heat exchanger from the box <p>Caution: Take care not to damage the inlet/outlet pipes!</p>
---	---

5.2 Attaching the cooling/heating media inlet and outlet pipes

 <p>Figure 7: Inlet/Outlet pipes of the heat exchanger</p>	<ul style="list-style-type: none">• The heat exchanger must be in a vertical position and secured to prevent any movement• The connecting pipework can be found on one side and points sideways• Weld the pipework to the inlet and outlet on the heat exchanger <p>Caution: Welding must not be carried out in water! Welding or connection is not possible in water!</p>
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5.2.1 Options for connecting the pipework

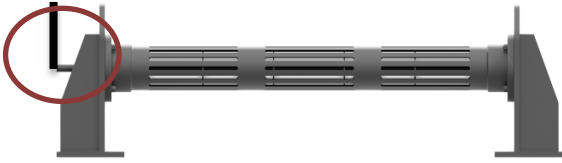


Figure 8: Connection with a 90 °C angle (upwards)

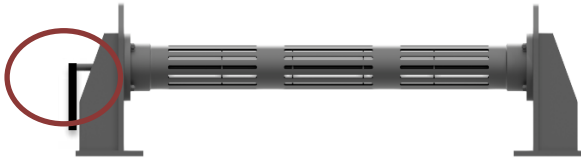


Figure 9: Connection with a 90 °C angle (downwards)

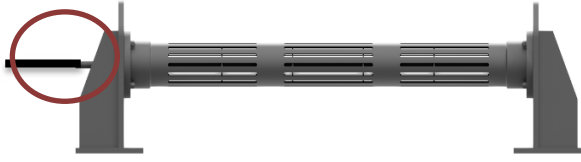
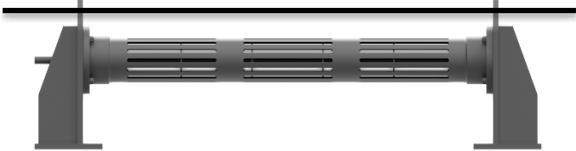
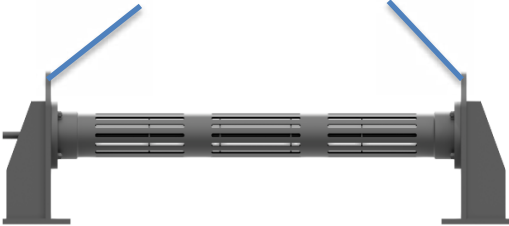


Figure 10: Connection of pipe directly on outlet

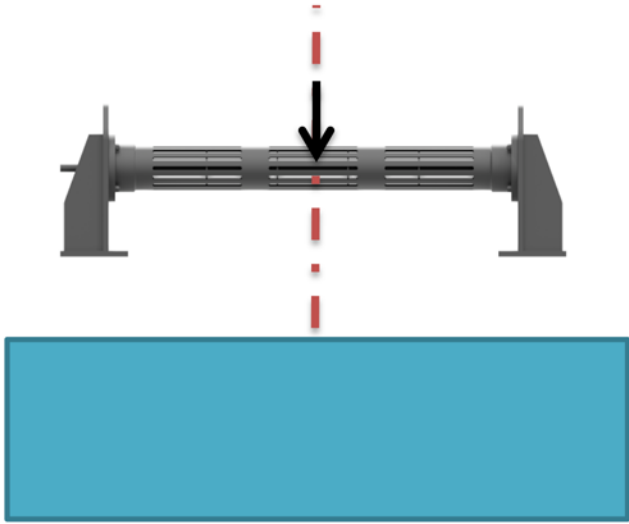
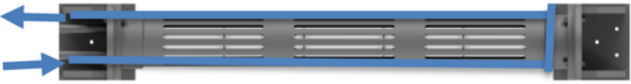
5.3 Transportation of the heat exchanger

5.3.1 Transport on land

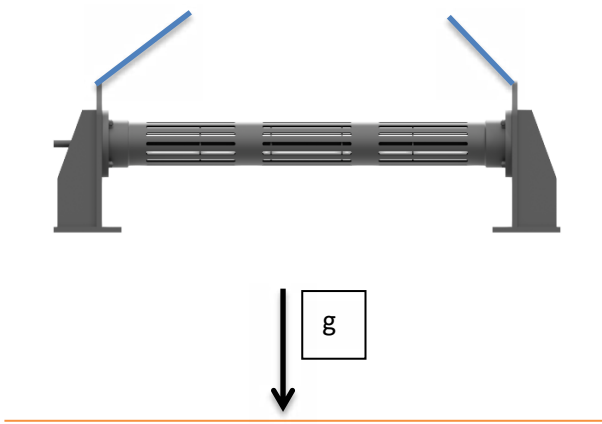
<p>a.) With transport bar</p>  <p>Figure 11: Transport of the heat exchanger using a transport bar</p>	<ul style="list-style-type: none">• The heat exchanger must be in a vertical position• Transport bar is pushed through the lugs• Transport of the heat exchanger using the transport bar• Transport to be carried out by <u>at least two people</u>
<p>b.) Via suspension on a crane</p>  <p>Figure 12: Transport of the heat exchanger using a lifting device</p>	<ul style="list-style-type: none">• The heat exchanger must be in a vertical position• Heat exchanger is connected to a lifting device by cables that are connected to the lugs on the cover• Transport of the heat exchanger using the lifting device• During transportation, nobody should stand beneath the heat exchanger!• During transportation, one person must guide the heat exchanger from one side!

5.3.2 Installation into water

Note: The user is responsible for filling the heat exchanger with the heat transfer media


 <p>Figure 13: Transportation of the heat exchanger into the water</p>	<ul style="list-style-type: none">• Position the heat exchanger vertically in the water• The connecting pipework points sideways.
 <p>Figure 14: Filling of the heat exchanger with heat transfer media</p>	<ul style="list-style-type: none">• Next, fill the heat exchanger with the heat transfer media

5.3.3 Transportation in water


 <p>Figure 15: Transport in water</p>	<ul style="list-style-type: none">• Installation can be carried out without underwater work• If installation/removal work needs to be carried out under water, this requires two people, each with a valid diving license!• [1] Transport of heat exchanger to intended location (e.g. by crane, boat or using divers).• [2] Secure the weights on the support feet.• Lower the heat exchanger gradually (via cable or using a diver) and prevent it from dropping too rapidly!• Allow the heat exchanger to sink to the specified depth.• Heat exchanger must be attached to the bottom if necessary. <p>Caution: Heat exchanger must be guided while being lowered!</p>
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5.4 Securing the heat exchanger

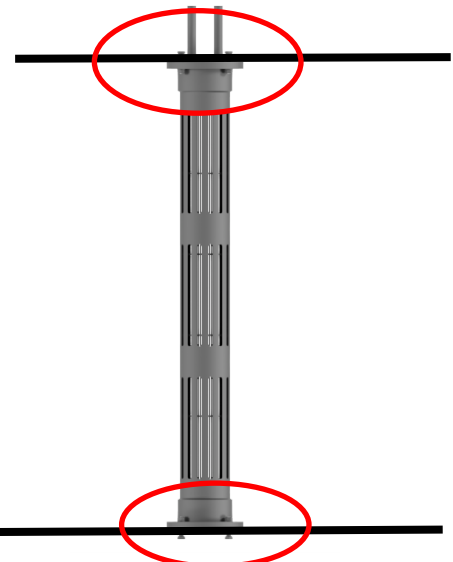
5.4.1 Using weights

 <p>Figure 16: Heat exchanger with attached weights</p>	<ul style="list-style-type: none">• On land, attach the weights to the heat exchanger• Navigate the heat exchanger to its specified location• The heat exchanger is cautiously placed on its supports on the bottom of the body of water.• Recommended minimum weights: 35 kg / density >1,200 kg/m³
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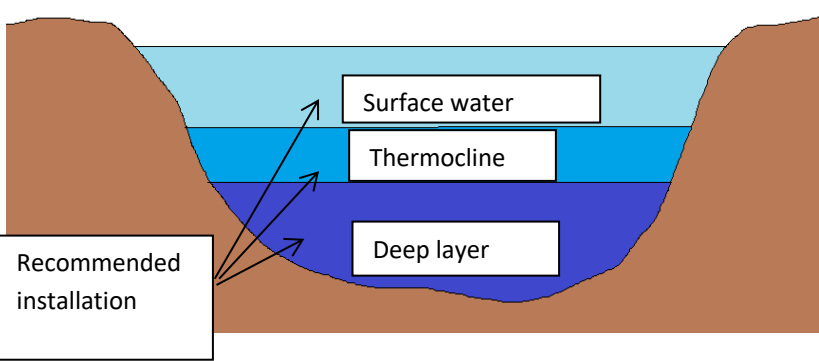
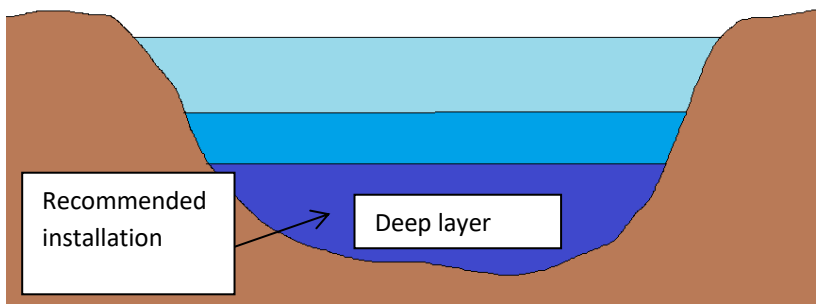
5.4.2 Attaching the heat exchanger to a foundation

 <p>Figure 17: Heat exchanger attached to a foundation</p>	<ul style="list-style-type: none"> • Navigate the heat exchanger to its specified position • Next, lower the heat exchanger cautiously to the ground and connect the heat exchanger to the foundation • Depending on the water depth, 2 people with diving licence are needed • Recommended minimum weights/ density: 35 kg / density >1,200 kg/m³
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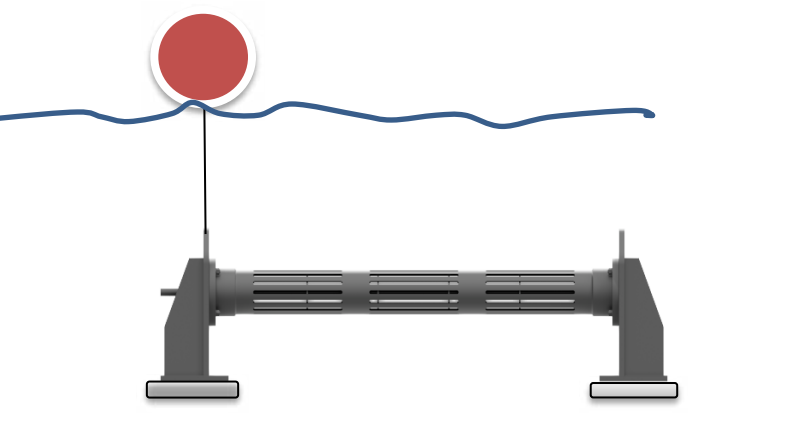
5.4.3 Attaching the heat exchanger using flanges (without supporting feet)

 <p>Figure 18: Attaching the heat exchanger using flanges (not included in delivery)</p>	<ul style="list-style-type: none"> • Heat exchanger without supporting feet • Navigate the heat exchanger to its specified position • Next, lower the heat exchanger cautiously to the defined depth and attach it using the flanges • Linear expansion of the flange connection should be considered! • Depending on the water depth, 2 people with diving licence are needed
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5.4.4 Recommended installation depth and clearance from bottom and surface

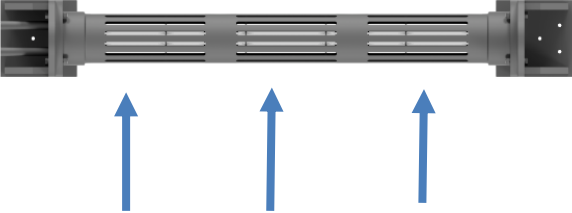
 <p>Figure 19: Recommended installation with water temperature above 4°C</p>	<ul style="list-style-type: none"> • Water temperature remains above 4°C throughout the year (no freezing possible) → Heat exchanger can be installed in all layers. • Installation depends on required mean temperature
 <p>Figure 20: Recommended installation with water temperature below 4°C</p>	<ul style="list-style-type: none"> • Water temperature falls below 4°C during the year (freezing possible) → Installation of the heat exchanger is recommended only in deep layer (constantly 4°C during the year)
<p>The following minimum distances are recommended:</p>	<ul style="list-style-type: none"> • 0.5 m from the water surface • 1 m from the side

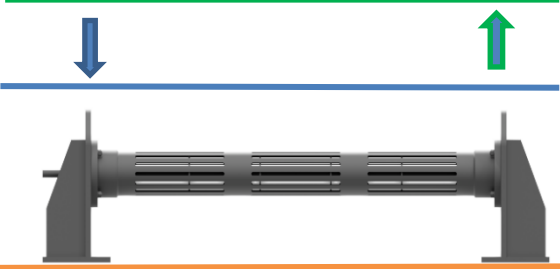
5.5 Marking in water

 <p>Figure 21: Marking of heat exchanger using buoy</p>	<p>Please inform yourself about the relevant rules for the installation site and a possible marking obligation in the water. The of the rules is the responsibility of the installer!</p>
---	--

5.6 Requirements regarding the installation site

In order for the heat exchanger and thus the entire climate system to work optimally, a suitable location for the heat exchanger is required. The following rules should be met when selecting a location:

 <p>Figure 22: Flow direction of water body and corresponding positioning of the heat exchanger</p>	<p>Alignment with the flow velocity</p> <p>The heat exchanger should be installed crosswise to the flow. The flow velocity of the water body should be in the range between 0.25 m/s and 1.2 m/s (1 to 4 km/h).</p>
--	--

 <p>Figure 23: Impact of tide range on heat exchanger</p>	<p>Consider tide range</p> <p>The tidal rise and fall of a body of water should also be considered when selecting a site so that there is always sufficient water above the heat exchanger.</p>
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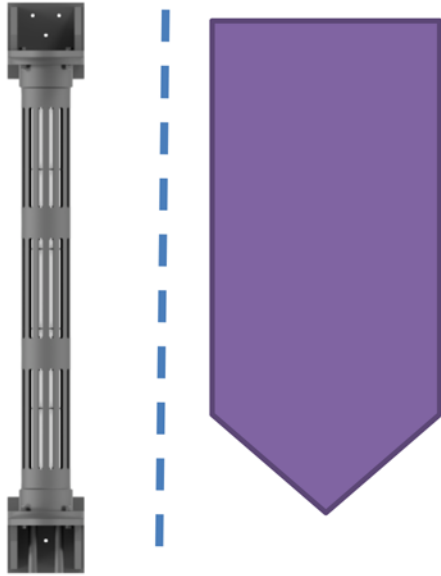


Figure 24: Protected installation site

Avoidance of watercraft

Watercraft can pose a serious hazard if the wrong location is chosen. The heat exchanger must be protected from both collisions and excessive wave action from large watercraft. A location without traffic is ideal.

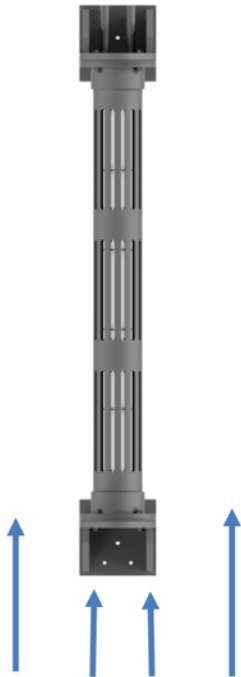


Figure 25: Avoiding driftwood damage

Consider the amount of driftwood

Almost every watercourse carries flotsam in the form of e.g. sticks or branches. This must be considered when installing the heat exchanger in the watercourse. The heat exchanger itself has a protective cover that withstands certain forces. The service life of the heat exchanger can be considerably increased by avoiding possible collisions in advance. For example, it may be advisable to install the heat exchanger in the direction of the flow in order to reduce the surface area under attack.

This is in contrast to the alignment according to Fig. 22. Depending on the water body, however, a compromise must be found according to the conditions.

5.7 Removal

Removal should be carried out according to the following steps:

- Loosen the connection between the heat exchanger and (a) the flanges or (b) the foundation.
- Transport the heat exchanger to the water surface.
- Secure using (a) a transportation cable or (b) crane suspension.
- Transport the heat exchanger to land using (a) a transportation cable or (b) crane suspension.
- First emptying of the heat exchanger
- Disconnect the pipework from the inlet and outlet.
- Empty completely the heat exchanger.

Note: Removal under water is only to be carried out by specialised personnel (**at least two people with valid diving certificates required!**).

5.8 Disposal

The heat exchanger must be disposed in accordance with local regulations.

5.9 Maintenance schedule

Description of maintenance activity	Actions to be carried out	Activity frequency
Check for leaks (in the entire system circuit, including heat pump, pipework, and heat exchanger)	Check the system operating pressure against the reference range specified by the heat pump manufacturer	Annually
Check for proper functioning	Check the process parameters for heat transfer through verification and validation testing	Annually
Replace the heat transfer media	Empty the old media from the circuit. Fill the circuit with new medium	For the replacement interval, see the instructions on the manufacturer's data sheet.
Check the marking at the installation site	Visually inspect the indicated water area for compliance with regard to applicable regulations	Annually

5.10 Troubleshooting

Description of fault	Reason for fault	Actions to be carried out
Insufficient heat transfer	Flow rate too low	Increase flow rate
	Filled with unapproved heat transfer media	Empty the circuit and refill with approved processing medium
	Leakage in system circuit (heat pump, pipework, heat	Check for leaks; repair if necessary
	Heat exchanger is not installed at specified depth	Install heat exchanger at specified depth
	Substantial deposits on the heat exchanger due to insufficient maintenance	Carry out maintenance according to the schedule
Heat transfer above required level	Flow rate too high	Reduce flow rate
Pressure difference above standard state	Deposits in the heat exchanger	Carry out maintenance according to the schedule
	Heat exchanger leaks	Check for leaks; repair if necessary

6 Operation

Heating application

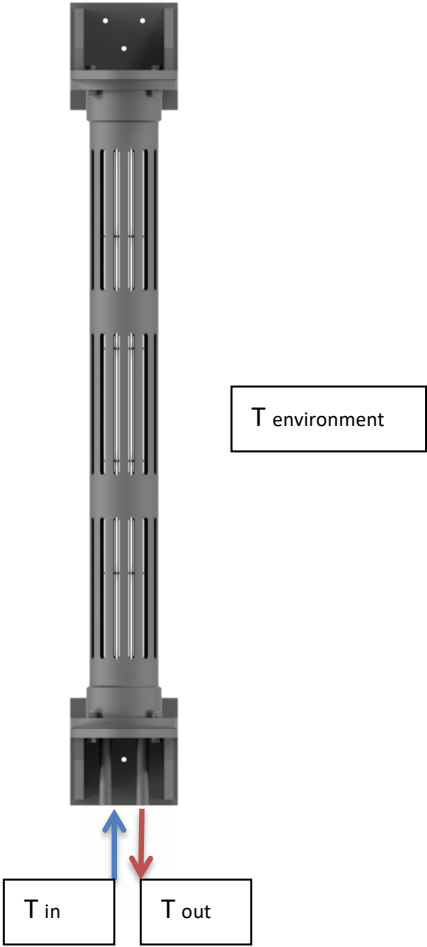


Figure 26: Functional principle heating application

Conditions for heating application:
 $T_{in} < T_{out} < T_{environment}$

Cooling application

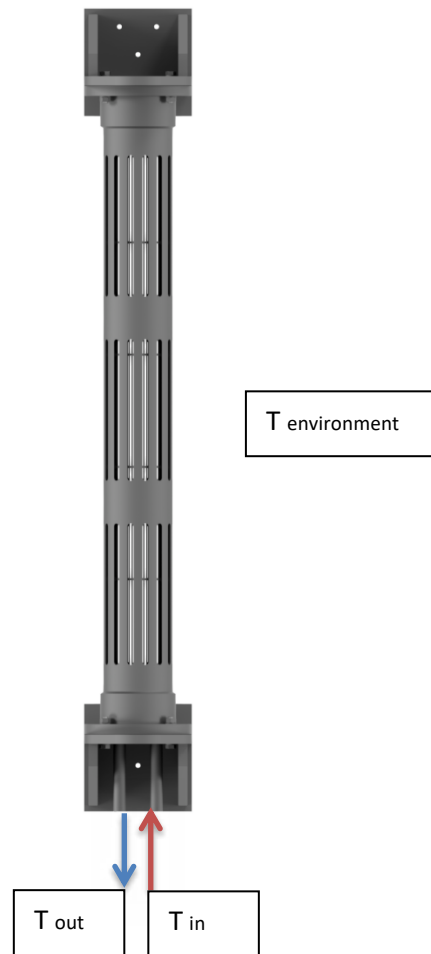
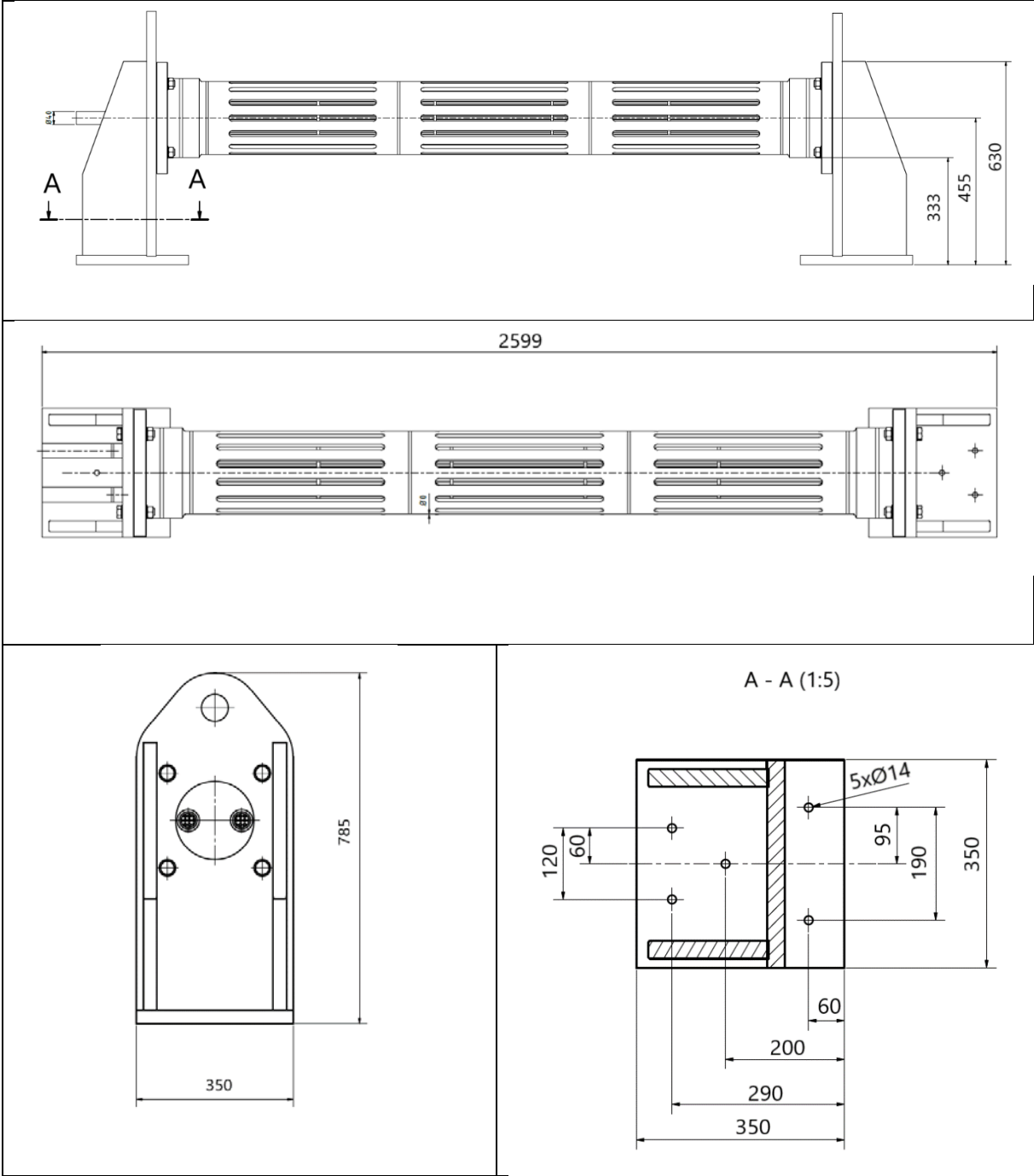


Figure 27: Functional principle cooling application

Conditions for cooling application:
 $T_{in} > T_{out} > T_{environment}$

7 Technical documentation

7.1 Technical drawings



7.2 Pressure loss diagram

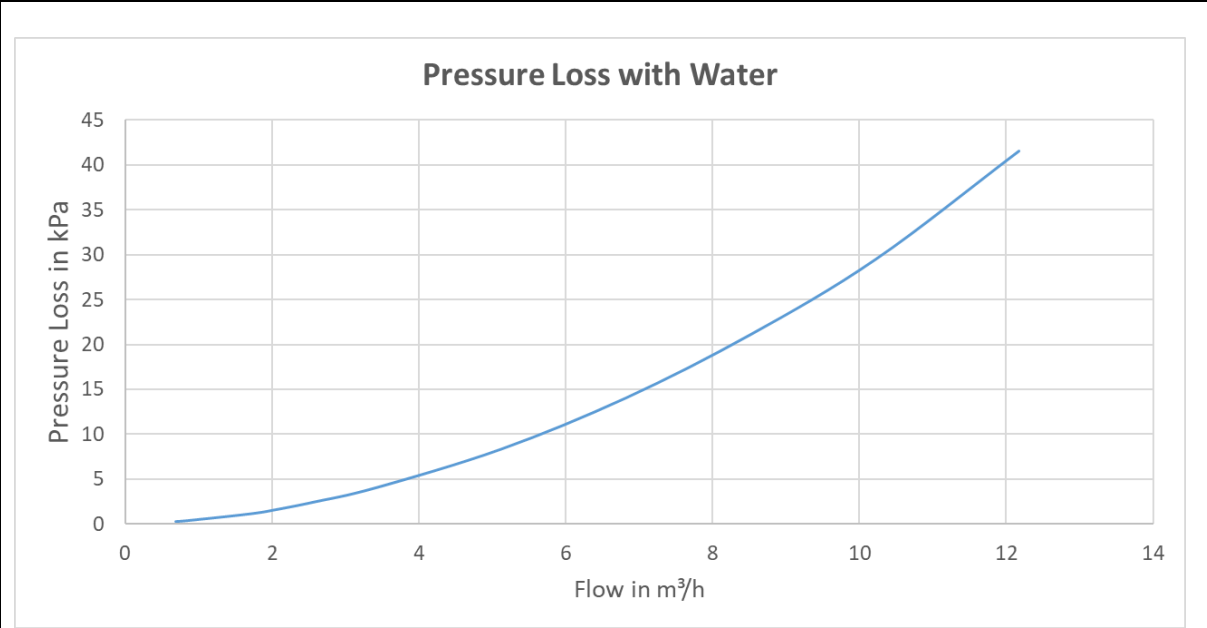


Figure 28: Pressure loss curve with water medium

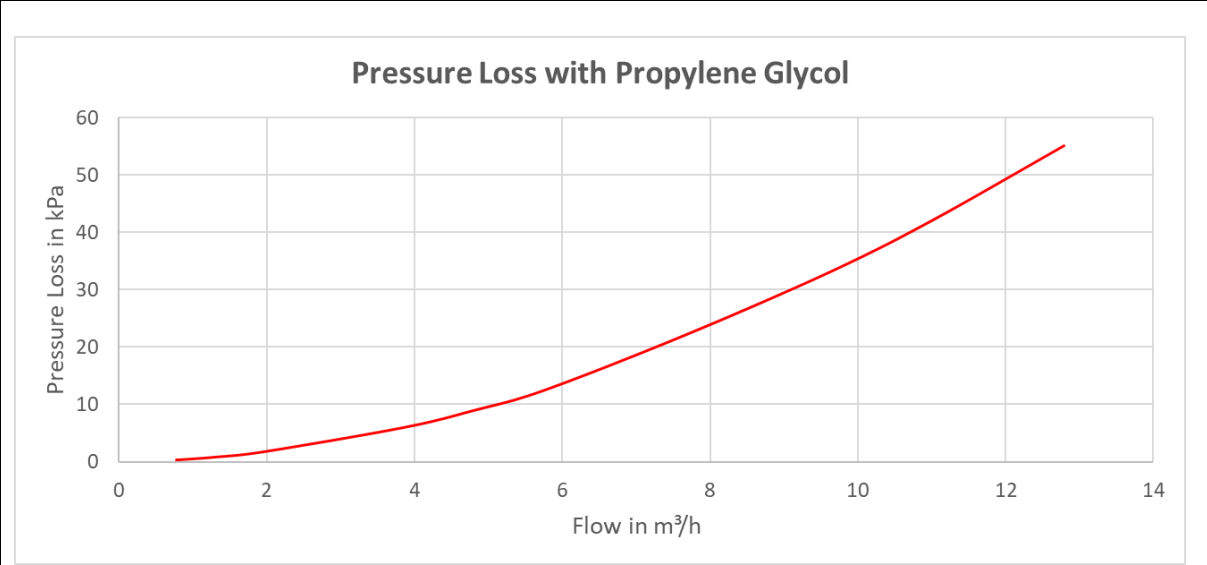


Figure 29: Pressure loss curve with propylene glycol medium

7.3 Performance curves as example

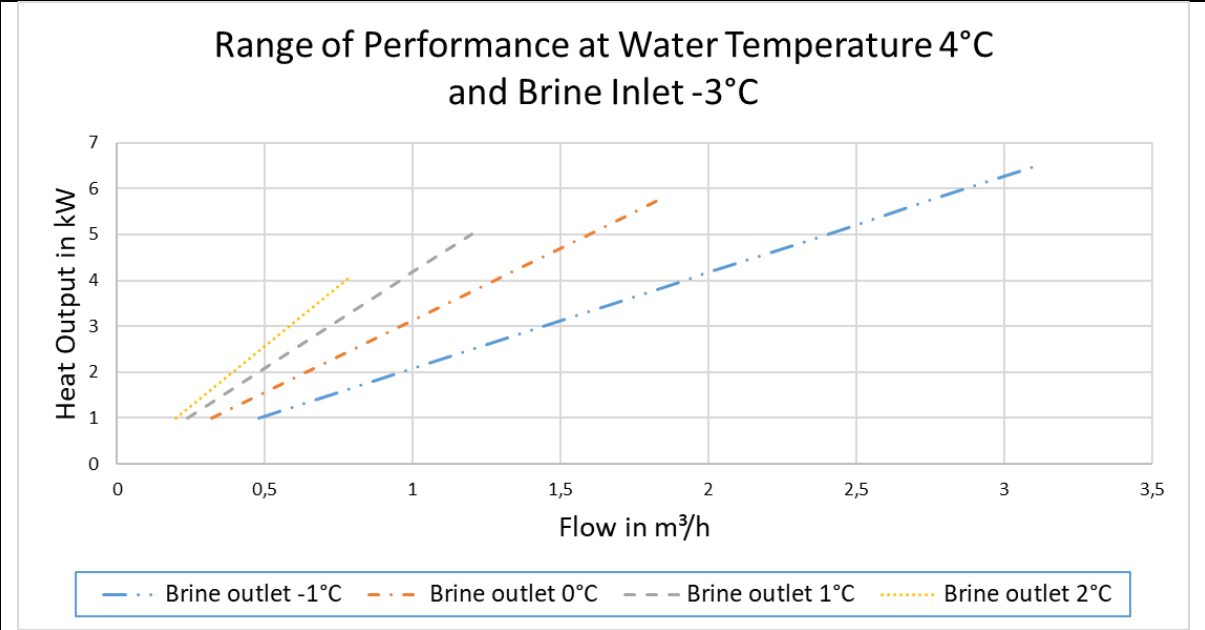


Figure 30: Output range at water temperature of 4°C and brine inlet temperature at -3°C

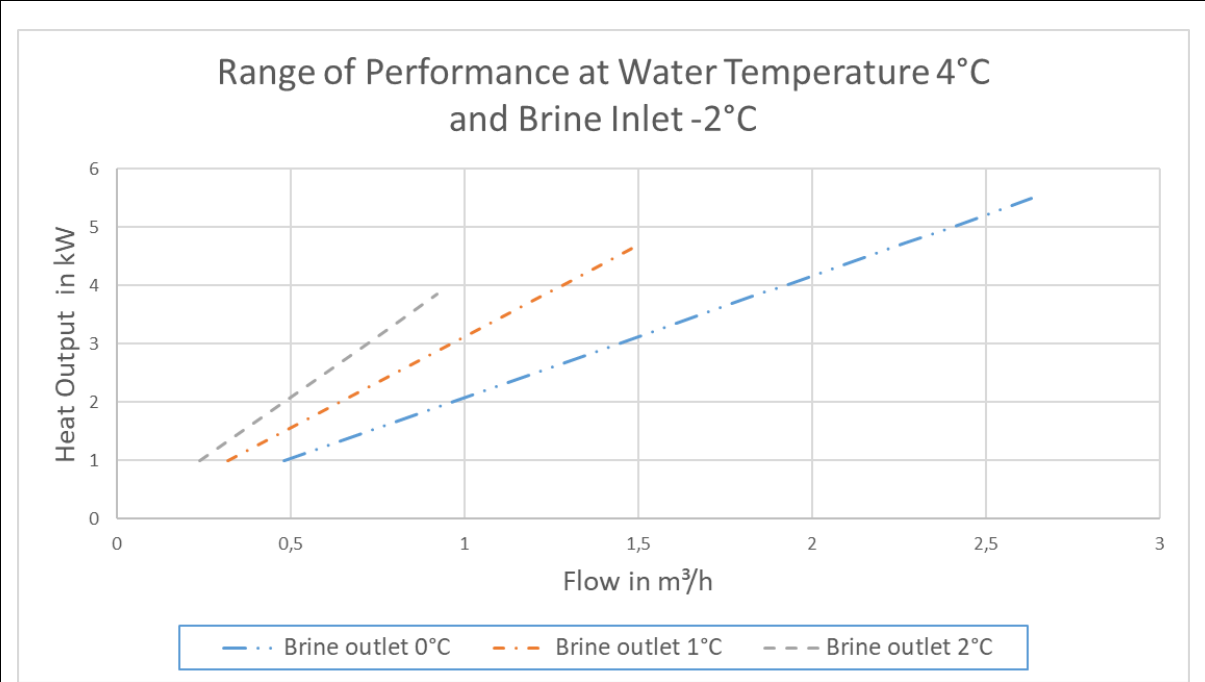


Figure 31: Output range at water temperature of 4°C and brine inlet temperature at -2°C

Range of Performance at Water Temperature 4°C and Brine Inlet -1°C

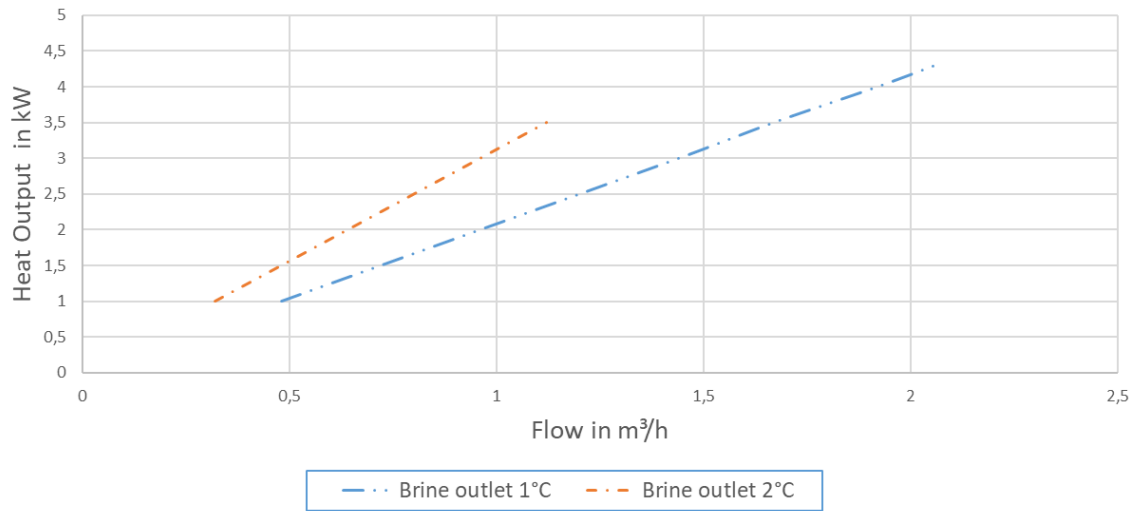


Figure 32: Output range at water temperature of 4°C and brine inlet temperature at -1°C

Range of Performance at Water Temperature 5°C and Brine Inlet -3°C

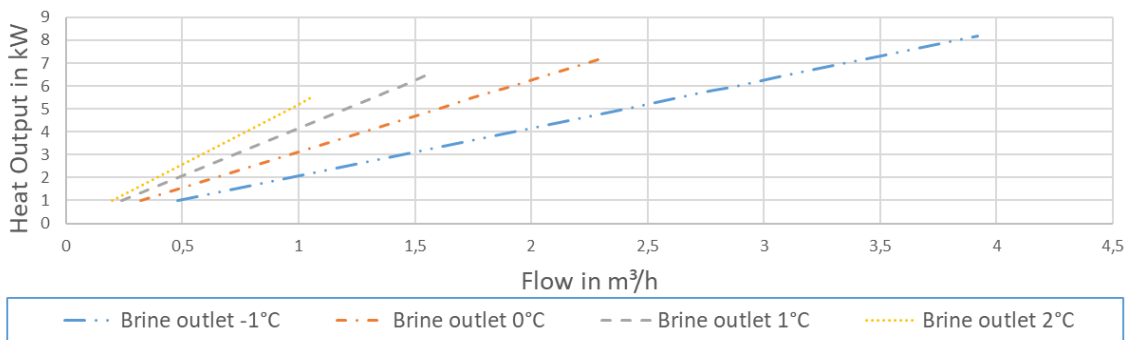


Figure 33: Output range at water temperature of 5°C and brine inlet temperature at -3°C

Range of Performance at Water Temperature 5°C and Brine Inlet -2°C

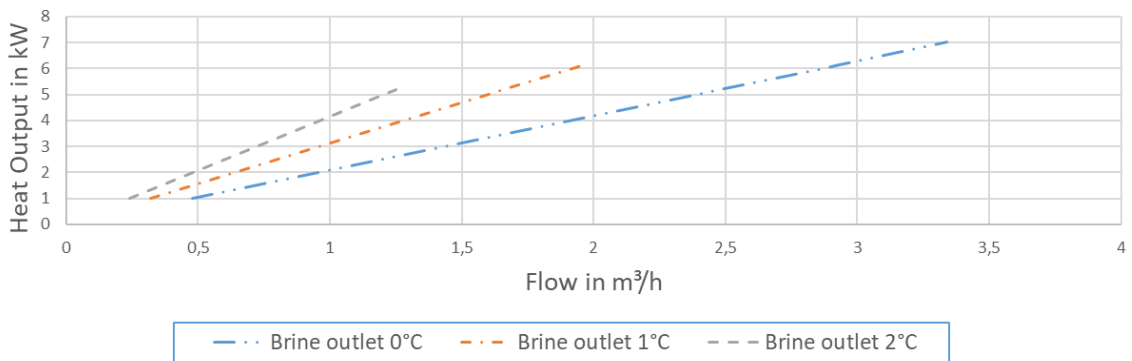


Figure 34: Output range at water temperature of 5°C and brine inlet temperature at -2°C

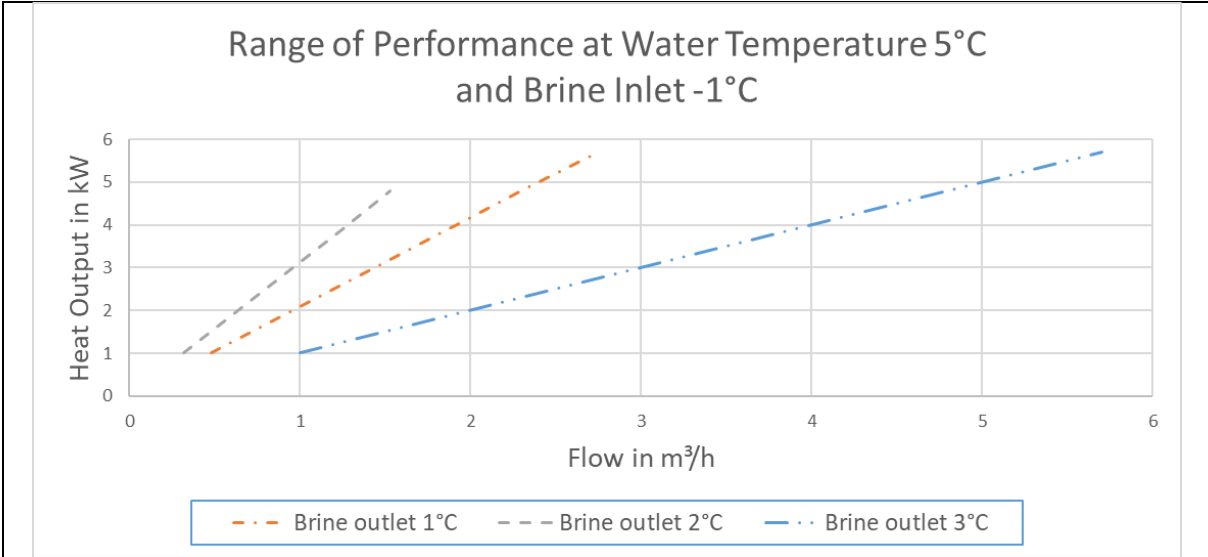


Figure 35: Output range at water temperature of 5°C and brine inlet temperature at -1°C

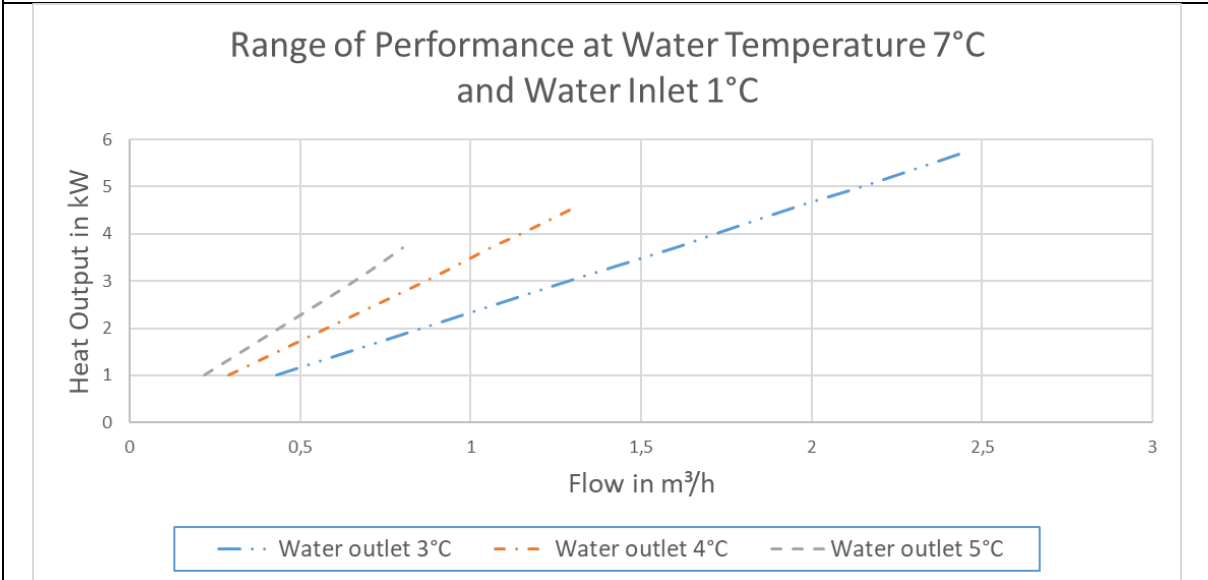


Figure 36: Output range at water temperature of 7°C and water inlet temperature at 1°C

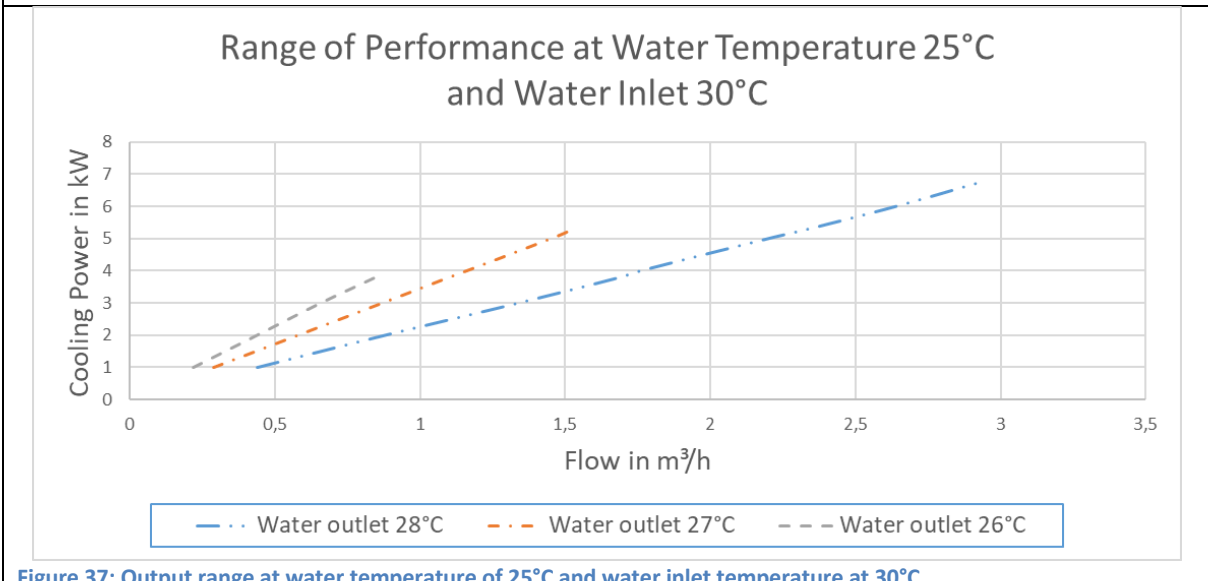


Figure 37: Output range at water temperature of 25°C and water inlet temperature at 30°C

7.4 Spare parts list

The ThermoGenius™ is supplied as a complete unit. There are no wear parts that need to be replaced at regular intervals during the life cycle of the product. There is therefore no requirement for spare parts.

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DQS certified according to ISO/TS 16949 (Reg. no. 002504 TS2/003) | DIN EN ISO 14001 (Reg. no. 002504 UM)



DNV-GL certified according to GMP for Equipment with Food Contact Surfaces (Reg.-Nr. 201043-2016-FSMS-ITA-DNV)



DQS MED certified according to DIN EN ISO 13485:2012

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