logic.ip

Laying electricity & heat lines

1 Terms of Service

All information and notes in this document have been compiled taking into account applicable standards and regulations and the state of the art.

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2 About this context

2.1 Purpose of this document

The purpose of this document is to ensure the safe and proper use of hero. systems. The project manager must ensure that the operating personnel have read and understood the document. The document must be kept within easy reach.

2.2 Target group

The project manager is responsible for the required qualification of the specialist personnel. The project manager must ensure that only personnel commissioned by the manager work on the hero. system.

Qualified personnel

Persons working on hero. systems must be competent and:

- be sufficiently trained for the respective tasks,
- know and follow the applicable technical rules and safety regulations,
- have read and understood the operating instructions.

An expert is someone who has sufficient knowledge in the field of solar technology due to professional training and experience and who is familiar with the applicable occupational safety and accident prevention regulations, the guidelines and generally accepted rules of technology and the standards to such an extent that the person is able to assess the safe working condition on the roof and of the hero. system.

2.3 Representation conventions

Symbols and text markings

This document contains various symbols and text markings.

Symbol	Name	Function
•	List	The bullet point marks a list.
✓ ▶	Prerequisite Action	The green checkmark marks a prerequisite that must be met for the subsequent action marked by a black triangle.
▶ ⇨	Action Reaction	The black triangle marks actions that must be performed in the appropriate order. The white arrow marks the reaction to an action.
(1)	Item numbers	The number in brackets refers to the corresponding item in the image.
Address [▸ page 5]	Cross-reference	Cross-references are used to refer to a chapter within the document. They are linked and can be executed in the PDF by a mouse click.

Tips are used to assist the reader in using the product.

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2.4 Intended use

hero. systems generate electricity and heat on sloped or flat roofs and facades and can be installed on the roofs of residential as well as commercial buildings (product selection depending on individual building).

Misuse

Any use of the product beyond the intended use or any other use is considered misuse and can lead to dangerous situations. Claims of any kind for damage due to misuse are excluded.

2.5 Related documents

For more information about the hero. system please refer to the following documents:

ID	Document name	Contents
01	hero. system manual Basics	• System Overview • Technical data • Project Phases
02	hero.flat module installation	• System description • Interfaces • Installation • Technical data
03	hero.wind module installation	• System description • Interfaces • Installation • Technical data
04	Roof and roof sheet metal	In the context of a detailed offer
05	**Laying of electricity and heat lines**	• **Heat utilization by solar thermal heating** • **Piping, wiring, connections**
06	Biological thermal transfer fluid Basics	• Technical data • Filling
07	Design variants	In the context of a detailed offer
08	Suggestions for the building services	• Air-to-water heat pump • Ground source heat pump
09	Planning aids	In the context of a detailed offer

You can download the documents from the download area at https://www.logic.swiss or contact us directly:

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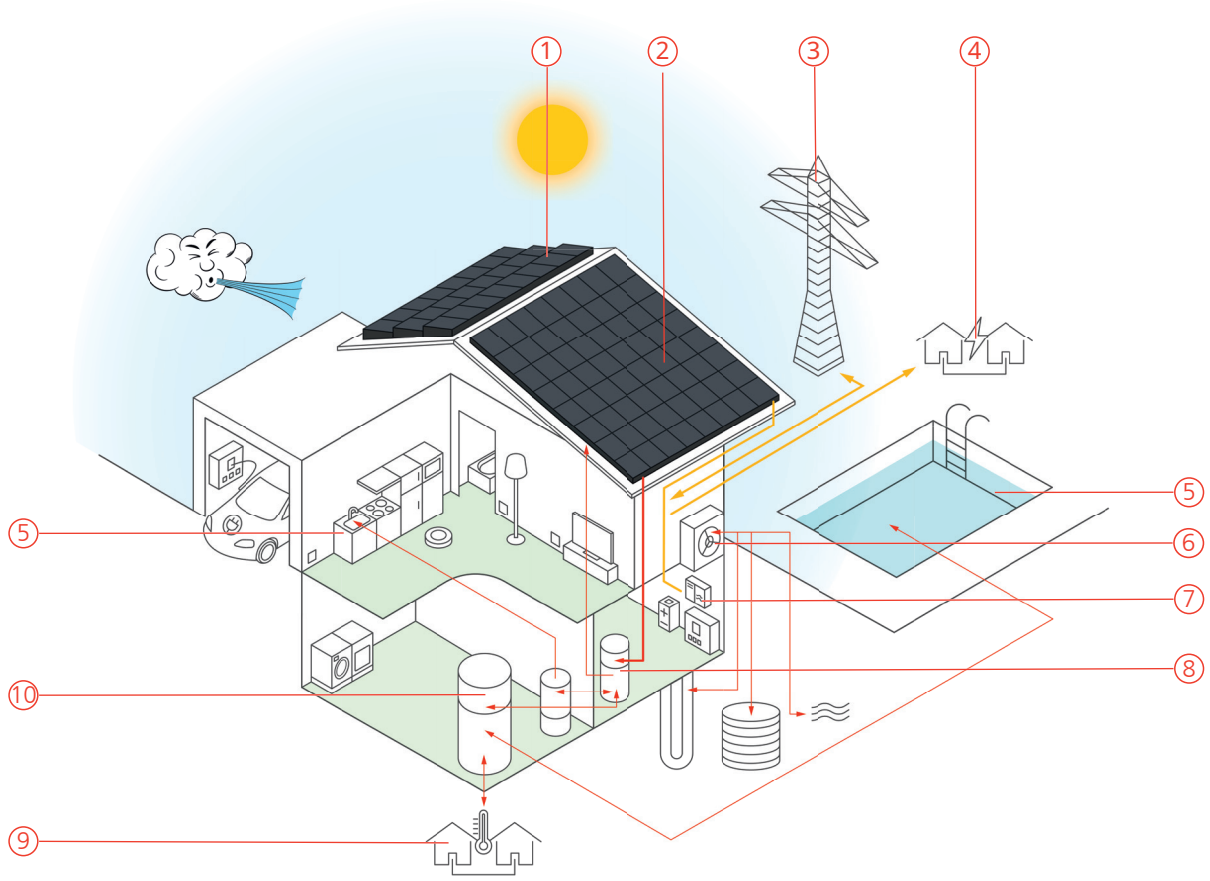
3 The entire system at a glance



1 hero.wind modules
2 hero.flat modules
3 Electricity grid
4 Electricity interconnections
5 Hot water use
6 Heat pump
7 Inverter Wind / PV
8 Drainback system
9 Local heating network
10 Combination hot-water tank

- The electricity from your own roof is fed into the building net by means of the wind inverters and photovoltaic inverters (7).
- Hot water can be used by means of a combination hot-water tank (10) both as heating support and as hot water supply.
- If a heat pump (6) is available, it can be easily integrated into the system.

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4 Heat utilization by solar thermal heating

4.1 Heat removal from the modules - piping for thermal utilization

Function of the biological thermal transfer fluid (Bio-TTF)

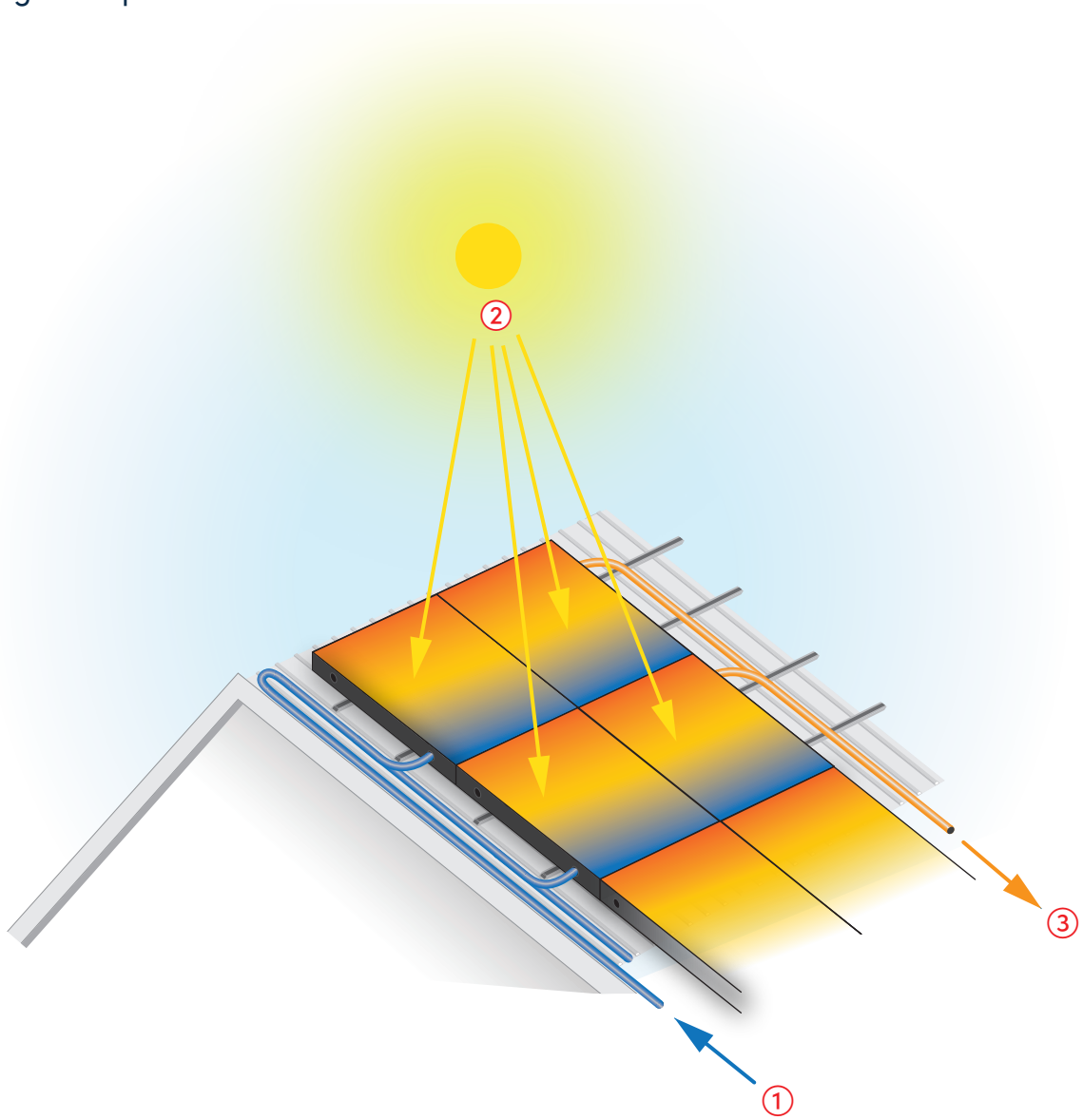
Heat recovery and heat dissipation is realized by a low-pressure water circuit through all modules.
The working pressure in the modules is less than 0.25 bar.

The Bio-TTF is based on water with an additive of natural ingredients preventing lime deposits and biofilm formation. It also significantly reduces germ formation.

For more information, please refer to our Bio-TTF technical documentation, see Related documents.

To optimize line laying, aesthetics or space utilization, the modules can be piped in different ways.

Laying concept



1 Bio-TTF cold
2 Heating of the fluid by the sun
3 Bio-TTF warm

Specifications

- Standard working circulation temperature: 40 °C
- Calculated cold-water temperature: 20 °C
- Piping with plastic pipes (preferably PVC or PE. PP may also be used)
- Maximum temperature (short-term, when filled): 70 °C
- Closed-loop system
- Modified drainback system with pressure and suction pump
- Filling volume of one hero.flat module (approx. 1.4 liter)
- System is drained at temperatures < +5 °C to protect it against frost (safety)
- Optional: Feeding of warm Bio-TTF in winter/frost/rime conditions for de-icing

Functional principle of heat dissipation

Due to the system's geometry, the Bio-TTF circulates at low pressure, cooling the system while providing hot water to be used by the building services.

Due to the drainback system, the system can be completely drained in case of overheating or subzero cooling.

The operating temperature is between 5 and 70 °C

In case of minus temperatures, the solar system can be de-iced with warm Bio-TTF.

4.2 Laying instructions for risers and downpipes

In order to avoid pressures, the riser pipe is fitted with a pressure pump supported by the suction pipe. It is installed on the downpipe.

During the installation it must be observed that the highest point of the water is in the supply pipe.

All pipes to the pump must be installed at an angle to avoid stagnant water.

After the modules are installed, the PV/wind DC cables are routed to the defined interconnection point. The same is done with the ICU cooling pipes.

The defined interconnection point can be located at the edge of the roof or near the inverters or heat consumers/storage tanks.

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4.3 Possible variants of Bio-TTF routing (strings)

Benefits:

- Standard parts
- Very easy to install
- Easy handling of repairs

Important

- The inlet must be the lowest point in the string.
- The outlet must be the highest point in the string.
- The inlet and outlet of the string determines the position of the modules, whether they are piped horizontally or vertically.

Principles of laying

- The system must be a closed circuit.
- String layout (recommended 30 piece., maximum 75 piece.)
- Modified drainback system
- Linear string valves
- Automatic leakage protection
- Bidirectional flow
- Sensors (temperature, pressure and flow)
- Pipe width of the drain must be adapted to the system.
- Lightning protection must be connected on site according to legal basis.

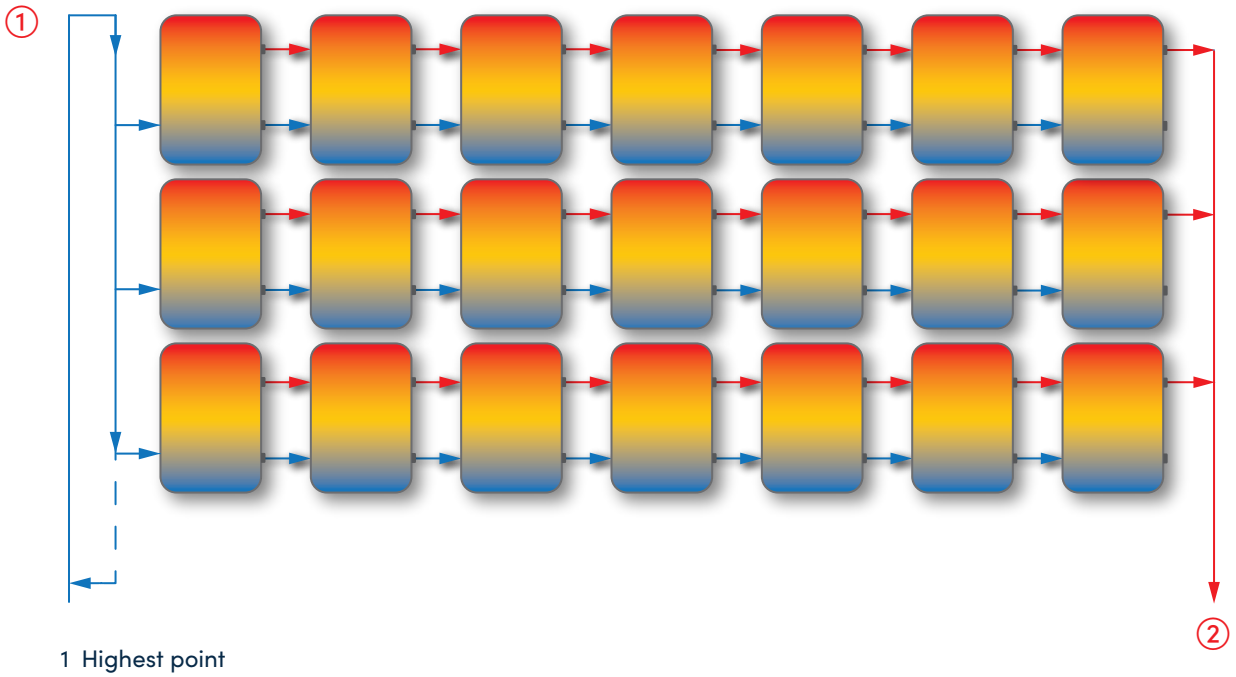
Optional add-ons – as required

- Heat pump
- Solar stratified tank
- Cooling storage tank

The following variants of the Bio-TTF routing must generally be observed to ensure that the hero. modules can dissipate heat properly and that the system functions properly.

4.3.1 String variant A (preferred)

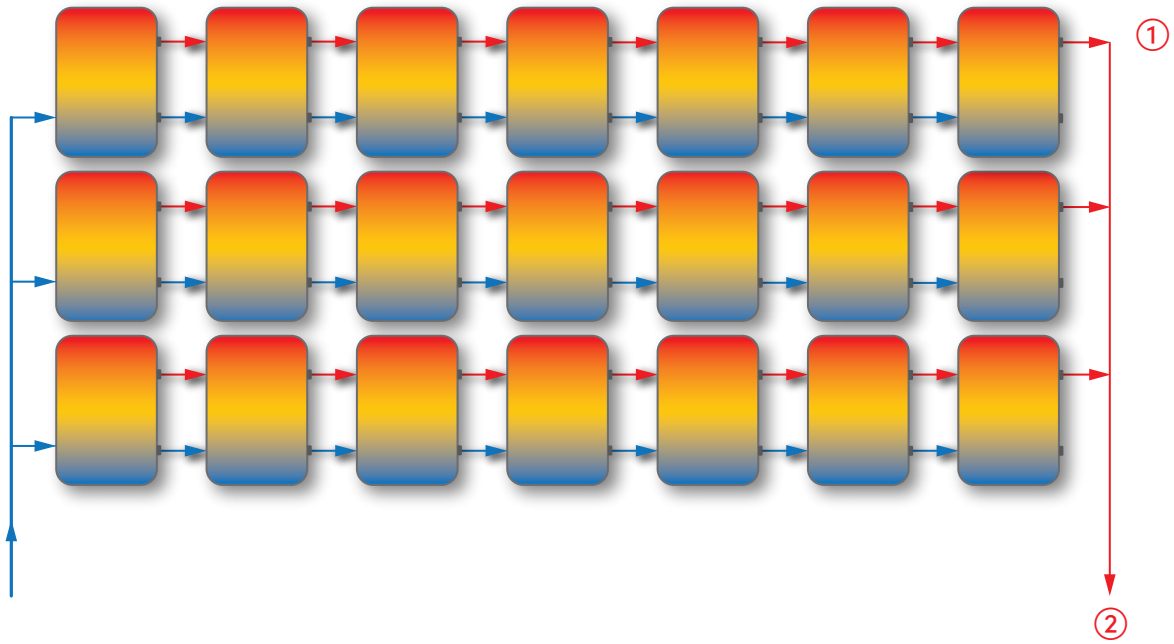
Temperature curve in module strings



1 Highest point
2 Lowest point

4.3.2 String variant B

Temperature curve in module strings



1 Highest point
2 Lowest point

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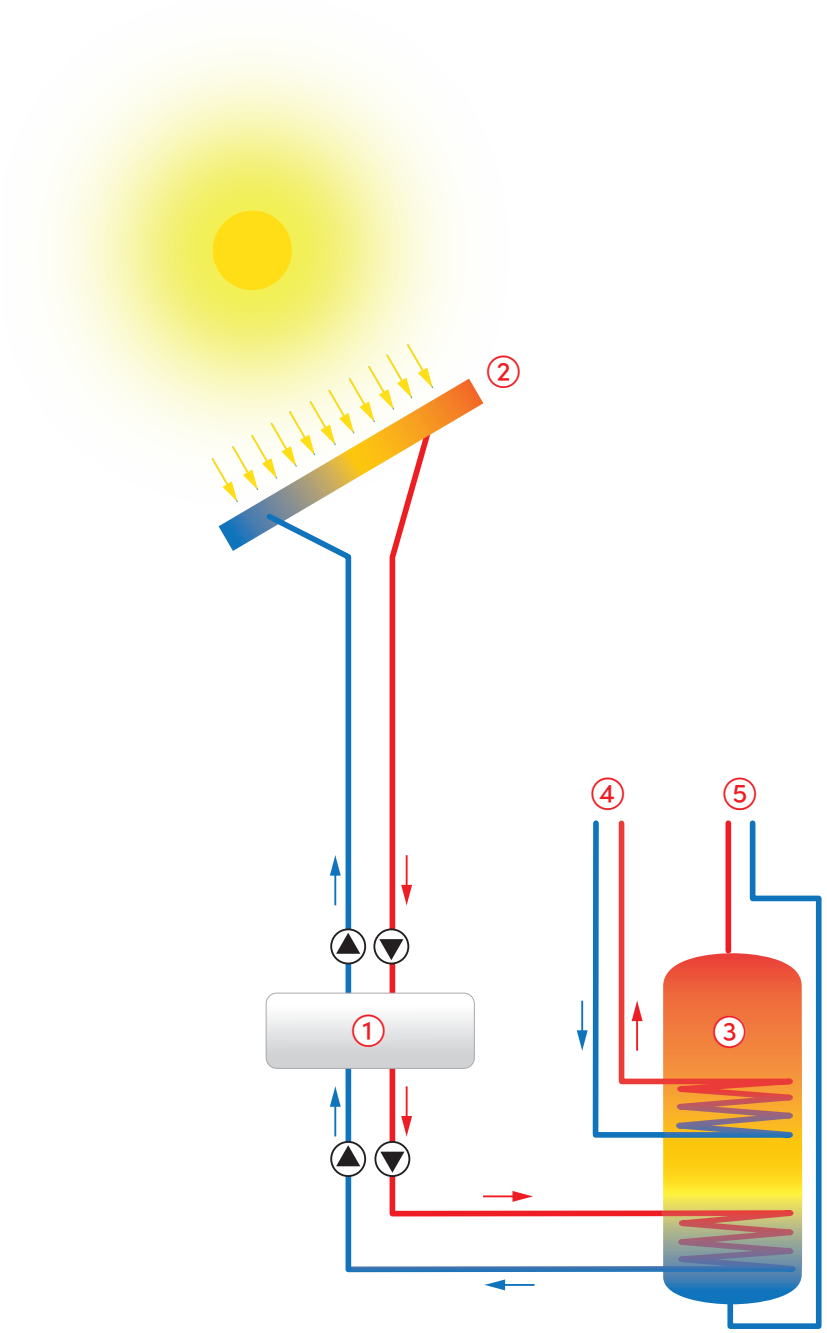
4.4 hero. system drainback plant



1 Drainback tank with Bio-TTF
2 hero.flat
3 hero. system solar thermal storage tank
4 Heating circuit
5 Domestic hot water

The drainback system is used to drain the system, either for frost protection or for maintenance.
The drainback system consists of standard components that are available in specialist shops.
The very low flow rates of 3 to 10 l/h per installed module in the string are particularly gentle on the material.

5 Safety

5.1 Warnhinweise

Warnings are marked by symbols and introduced by signal words indicating the extent of the hazard.

⚠ HAZARD

Danger

This safety warning applies in the event of a hazard that can directly lead to serious physical injury or death.

- ▶ Measures to avoid the hazard.

⚠ WARNING

Warning

is safety warning applies in the event of a hazard that can possibly lead to serious physical injury or death.

- ▶ Measures to avoid the hazard.

NOTICE

Note

Signal word for a possibly harmful situation that can possibly damage the machine or an object in its environment.

- ▶ Measures to avoid the harmful situation.

5.2 Residual risks

hero. systems are built in accordance with applicable standards and recognized safety rules. They correspond to the state of the art. Nevertheless, danger to life and limb of the user or third parties or damage to the components and other material assets may occur during use.

Danger from electricity
Electricity implies many dangers. There is a danger to life when coming into contact with live components. The entire system is constantly live. Damage to the insulation or individual components can be life-threatening.

- Do not touch live parts.
- Disconnect or short-circuit current-producing parts.
- Work on the electricity supply must only be carried out by authorized specialists.

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Danger due to arcing

The hero. system implies the risk of arcing which can lead to internal and external burns, heart problems or blinding. There is also a risk of fire to the neighboring parts.

- Do not disconnect live connections.
- Replace damaged cables, connectors and connections.
- Switch off the system before working on live parts.

Danger from hot fluids

The heated fluids in the hero. system imply a risk of burns to the skin and eyes.

- Drain fluids before opening any connections.

Danger from high pressures

After commissioning, the entire system is under pressure. Fluids spraying at high pressures from defective lines can cause injuries. There is also a risk of material damage to the modules or plant.

- Drain fluids before opening any connections.
- Work on the system must only be carried out by authorized specialists.

6 Piping, wiring, connections

6.1 Field connection

The field connection describes the field piping for the integrated cooling system of the solar panel as well as the field cabling of the PV and wind components up to the interconnection point to the building services.

The field piping and cabling is carried out according to the installation plan.

6.1.1 Field piping

✓ Qualified personnel: HVACS (heating, ventilation, air-conditioning, sanitation technology) installer, solar engineer

▶ Install the field piping according to the installation plan.

6.1.2 Field cabling

Cabling the PV string

✓ Qualified personnel: Solar engineer

PV strings are wired in the same way as conventional PV modules.

▶ Carry out PV string cabling according to the installation plan.

▶ Carry out the cabling of the hero.wind roof to the inverters according to the string wiring plan.

Cabling the wind string

✓ Qualified personnel: Solar engineer

▶ Connect the wind string cabling in the same way as for PV string cabling.

▶ In addition, screw on the fastening nut on the wind generator cable.

⇨ The fastening nut prevents water ingress.

▶ Carry out the wind string cabling according to the installation plan.

Since the wind generators are all connected in parallel and two-core cables are available, the connection on one string side is sufficient.
For the cabling from the roof to the inverter, a standard PV cable can be used.

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6.2 Connection work

The following points only describe the general further procedure. The following steps are not exhaustive and some may not be suitable for implementation at the customer‘s site, the scope of the work and how the corresponding steps are carried out must be determined by the corresponding specialists.

6.2.1 Integration into the building services

Any additional building services required for the integration differ according to use, total energy yield and already existing building services.

In building services, a distinction must be made between heat utilization, storage, feed-in and electricity utilization, storage, supply. The functions here and below should be known to specialists.

6.2.2 Heat utilization

The integration of the building services for heat and domestic hot water is usually realized by a heat pump. Related components can be e. g. geothermal probes, storage tanks or pumps. Since the use depends on the building and the respective utilization, a building services engineer should be consulted.

6.2.3 Electricity use

Electricity is supplied to the building services via the inverters (PV). Self-use, supply and storage are carried out in accordance with local legislation.

6.2.4 Commissioning

- Commissioning takes place after successful integration of the hero. roof into the building services.
- For each trade, the correct execution of the work is verified by checklists (this falls into the responsibility of the respective trade associations – please contact them).
- A copy of the signed commissioning protocols should be provided to the skilled craftsman, the person commissioning the work, the overall project manager as well as Hero Renewable Energy GmbH in order to ensure and prove the proper operation of the system. This procedure can be helpful in case of any warranty issues.
- An approval by an independent external body can be arranged by Hero Renewable Energy GmbH. This service must be booked separately against extra charge.

6.2.5 Maintenance and optimization

Maintenance of the plant should be carried out at regular intervals in accordance with applicable legal regulations and the standards of the industry. During maintenance, possible optimizations can also be worked out and implemented. Maintenance is not part of the service offer.

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7 Glossary

Modules	
hero.wind module	Solar panel, cooling unit, wind chassis with generators
hero.flat module	Solar panel with cooling unit

Integration / installation	
Biofilm	Slime layers formed by microorganisms embedded in this slime layer.
Drainback system	The English term ‚drainback' means reverse flow, causing the automatic emptying of the collectors by force of gravity when the pump is at standstill.
Field connection	Connection of a module field
Field cabling	Wiring of the module fields
Field piping	Piping of the module fields
Bio-TTF	Biological thermal transfer fluid (heat transfer fluid)
HVACS	Heating, ventilation, air-conditioning, sanitation technology
Local heating network	An association of heat consumers jointly using a heat generation plant.
Photovoltaics (PV)	Photovoltaics (PV) is the direct conversion of the sun's radiant energy into electrical energy using solar cells.
Solar inverter	Device for converting solar energy (direct current) into alternating current
Solar engineer	Solar engineers or solar technology specialists discuss, plan and build solar systems for water heating and electricity generation.
Solar heat	Conversion of solar radiation into thermal energy
Storage tank	Accumulator for storing energy
String	Type of interconnection in strings
Thermal inverter	Pump for cooling thermally heated water
Inverter	An inverter is an electrical device that converts DC voltage into AC voltage.
Wind inverter	Device for converting wind energy (direct current) into alternating current

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