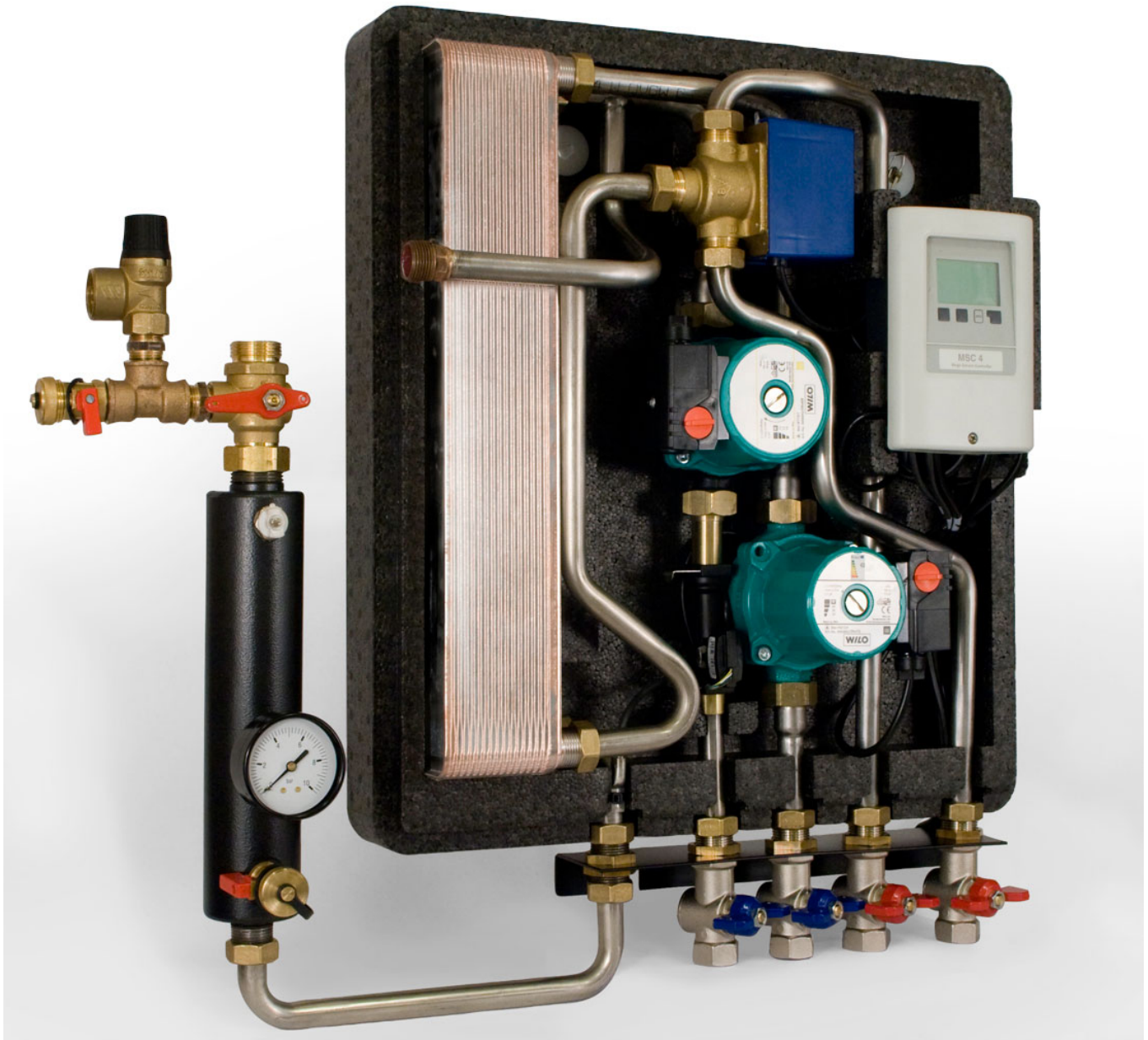


FL 71 MEGASPHERE LIGHT

Storage charging station – Two charging circuits



INSTALLATION, OPERATION AND MAINTENANCE MANUAL

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1. IMPORTANT INFORMATION AND SAFETY NOTICES

1.1 Information on use of this manual

Navigation

A table of contents is provided at the start of this manual. It shows the hierarchical chapter headings and their corresponding page numbers.

Pictograms and symbols



Safety notice



Legal note



Important information



Please read the safety notices and the installation, operation and maintenance manual fully and carefully before starting installation, and comply with all instructions for your own safety and for the safety of other persons. This manual must be permanently stored at the installation site.

If you do not understand the safety notices or the individual installation, operation and maintenance instructions or if you find them unclear, please consult your partner wholesaler.

Further details regarding the MegaSphere products, including important notes on planning, are available in the MegaSphere technical information sheet. For your own safety and for correct use of our products, please check at regular intervals whether this information is already available in a more recent version. The issue date of your technical information sheet is always printed in the bottom right corner of the cover page. The latest technical information sheet is available from your partner wholesaler and on the Internet under www.taconova.com.

In addition, please also observe the appropriate instructions for the systems or system components available at or intended for the installation site, particularly concerning solar-thermal installation, heating systems and buffer storage.

1.2 Correct Usage

The solar charging station is only permitted to be planned, installed and operated as described in this manual and in the corresponding technical information sheet. All other use is not compliant with the conditions stated here and is therefore impermissible.

The MegaSphere solar charging station is intended for use only in combination with a solar-thermal system for heating a buffer storage unit in closed-circuit heating plants. Direct connection to a heating system without buffering of a heat consumer (e.g., underfloor heating or other systems without adequate heat transmission volume) is impermissible.

Correct use of the station includes compliance with all notices given in this installation, operation and maintenance manual and in the technical information sheet. The maximum operating limits stated in Section 3.3 must be observed.

No liability shall be assumed in the case of incorrect use or impermissible modification of the product nor for any ensuing consequences.

The device is not permitted to be used in the following cases:
outdoors
in damp rooms
in rooms in which the use of electrical appliances is prohibited
in rooms subject to frost.

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1.3 Safety Notices

Laws, specifications, standards and guidelines

For planning, transportation, installation, operation and control, as well as maintenance work please observe

the applicable laws

the generally applicable accident prevention and safety guidelines

the requirements of the statutory accident insurance institutions

the requirements for environmental protection

the applicable standards, guidelines and specifications

the specifications of the local power supply companies.

General

Keep your workplace clean and free of obstructing objects. Ensure that your workplace is appropriately illuminated. Do not allow children, animals or unauthorized persons to have access to tools and installation sites. This applies particularly in the case of renovation work in the residential area and to maintenance work on the plant. Store hazardous materials and liquids securely against access by children. Before carrying out installation, maintenance, repair or conversion work, or before altering the installation site, unplug the power plug from electrical systems and tools or secure them against inadvertent activation.

Only use components intended for the MegaSphere system. The use of third-party components or unsuitable tools may cause accidents or lead to other dangers.

Only original spare parts are permitted to be used as replacements. Materials and components used in the construction must be suitable without restrictions for the intended purpose. They must also be inspected and approved by the manufacturer and comply with the applicable laws, standards, guidelines and specifications. Individual changes to and customizations of MegaSphere products are not permitted since these may lead to risk to the health and life of persons and damages to the system. If the system suffers any damage, it must not be operated any longer. Designations and labels on the product applied at the factory must not be changed, removed or obscured.

Working on the system

Before commencing work on the system, the power must be disconnected, and the system checked for absence of power and secured against further connection of power.

Risks in handling the product

The controller of the solar charging station and the circulation pumps are operated under electrical power. Never touch electrical components under voltage.

Improper installation or repair attempts can imperil life by electric shock. Opening of the device and accessory parts, except for the clamping room cover of the controller, are generally prohibited. Repairs are only permitted to be carried out by the manufacturer.

Fire prevention

Please strictly follow the relevant fire protection regulations and the applicable construction rules and regulations, particularly in regard to: penetration of ceilings and walls, rooms with specific/stricter requirements in terms of preventive fire protection measures (observe the national regulations).

Personal requirements

Assembly, installation, maintenance and repair work are only permitted to be carried out by qualified agencies and trained staff. Work on electrical systems or power line components is only permitted to be performed by specially trained electrical technicians.

1.4 Disposal



The product contains parts in compliance with the European ROHS Guideline 2002/95/EG for limiting the use of specific hazardous materials in electrical and electronic devices. The device must never be disposed of as household waste. Dispose of the device only at the relevant collection points or return it to the vendor or manufacturer.

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2. Scope of delivery

Before beginning work, check the delivery for completeness.

Model with two storage charging circuits:

Article no.: 271.5350.000

Pos.	Quantity	Description
1.	1 unit	FL 71 Mega Sphere storage charging station with 2 storage charging circuits
2.	4 units	Screws and dowels (security elements for wall mounting)
3.	1 unit	Replacement fuses: 2 AT for controller (integrated into the controller housing)
4.	1 unit	MegaSphere installation, operation and maintenance manual
5.	1 unit	WILO operation and service manual for circulating pumps

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3. Product description and technical data

3.1 Product Description

3.1.1 General

The electronically controlled storage charging station is used for economic heating of storage buffers for heating systems. The structure and functionality of the storage charging station ensure optimum heat transmission, and allow stable stratified charging of one or two storage buffers.

At the factory, the storage charging station is fully assembled, prepared and wired ready to be plugged in. A plate heat exchanger is connected with the circulating pumps by pipes. The primary side of the plate heat exchanger is connected with a solar thermal system, the secondary side with buffer or heating water. The interface to the installation on the construction side are the safety and shut-off valves, which are components in the station. To continuously measure the collector and storage temperatures the corresponding sensors with the bleeder safety unit must be installed.

The solar energy gained in this way is transferred via a high-efficiency stainless steel plate heat exchanger to the stratified storage tank(s). The preset, innovative MSC (MegaSphere Controller) here undertakes this task by regulating the speed of the primary pump to ensure the optimum temperature differences for charging the stratified storage tank(s). The parameters required for this are recorded, in part by the VFS direct sensor. The MSC actuates the three-way switching valve to operate either storage inflow I or II. In this way, optimum stratification is achieved in the storage tank.



CAUTION

Danger of material damage!

Requirements for the buffer and heating water (secondary) and for the solar-thermal medium (primary) are stated in the technical information. These requirements must be observed in order to prevent damage to the storage charging station (through corrosion, for example).



A system diagram illustrating the functionality of the MegaSphere solar station, including the solar and heating circuits, can be found in the MegaSphere technical information, Section 3.1.3 Hydraulic Variants.

3.1.2 Controller

The controller for the storage charging station enables efficient use and functional control of the storage charging station. It impresses in particular through its functionality and user-friendly, intuitive operation. The individual input buttons are assigned to useful functions in each particular step and are self-explanatory. In addition to the keywords for the measurement values and settings, the controller menu offers help text and clearly-drawn graphics.



Important characteristics of the controller

Presentation of graphics and text in the illuminated display

Simple querying of the current measurement values

Analysis and monitoring of the system – including use of graphical statistics

Comprehensive setting menus with explanations

Menu locking function against inadvertent changes

Resetting to previously selected values or factory settings.

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3.1.3 Hydraulic Variants

The following figures provide a simplified presentation of the possible system hydraulics. The figures make no claim to completeness. System planning and layout of the safety components must be carried out in accordance with applicable standards and specifications.



The hydraulic variant with the two charging circuits is the factory default setting.

The following figures are intended to illustrate the principle of the corresponding system hydraulics and make no claim to completeness. The controller is in no way a substitute for safety equipment. Depending on the application, other system and safety components, such as shut-off valves, check valves, safety temperature limiters, scald protection, etc. are specified and must therefore be included.

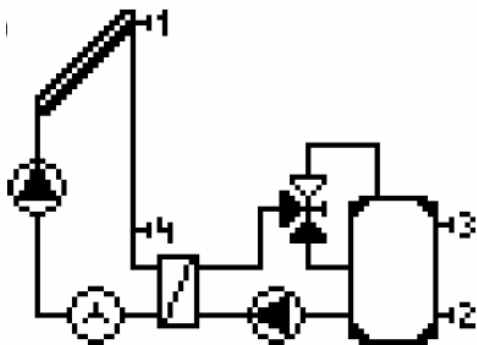


Fig. 3-1: Hydraulic principle of the MegaSphere storage charging station in simplified form – model for charging one buffer storage unit

Switching direction of valve:
R2 on / valve on = charge to sensor 3 (storage unit on top)

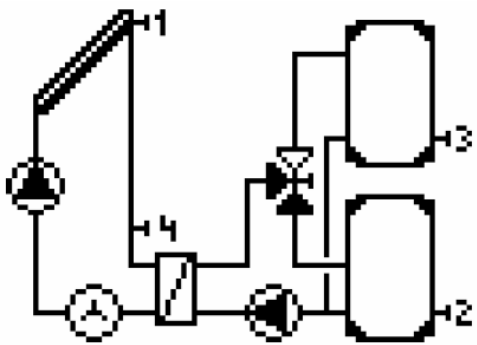


Fig. 3-2: Hydraulic principle of the MegaSphere storage charging station in simplified form – model for charging two buffer storage units

Switching direction of valve:
R2 on / valve on = charge to sensor 3 (storage unit 2)

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3.2 Mechanical Design of the Storage Charging Station



The MegaSphere storage charging station is fully preassembled and pressure-tested on delivery.

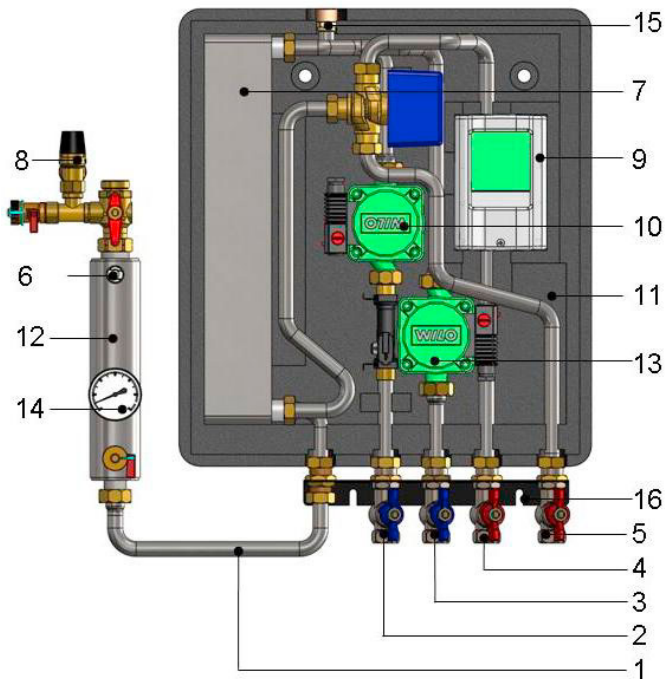


Fig. 3-3: Mechanical design and components of the MegaSphere storage charging station

Element	Name
1.	Solar flow pipe (primary side)
2.	Solar return pipe (primary side)
3.	Heating/buffer water return pipe (secondary side)
4.	Heating/buffer water flow pipe 2 (secondary side)
5.	Heating/buffer water flow pipe 1 (secondary side)
6.	Bleeder
7.	Plate heat exchanger
8.	Safety unit (primary side)
9.	Controller
10.	Primary circuit pump
11.	Insulation (rear)
12.	Bleeder container (primary side)
13.	Secondary circuit pump
14.	Manometer
15.	Expansion connection (expansion vessel connection on the intake side compliant with DIN, 3/4" AG)
16.	Connection rail

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3.3 Technical Data

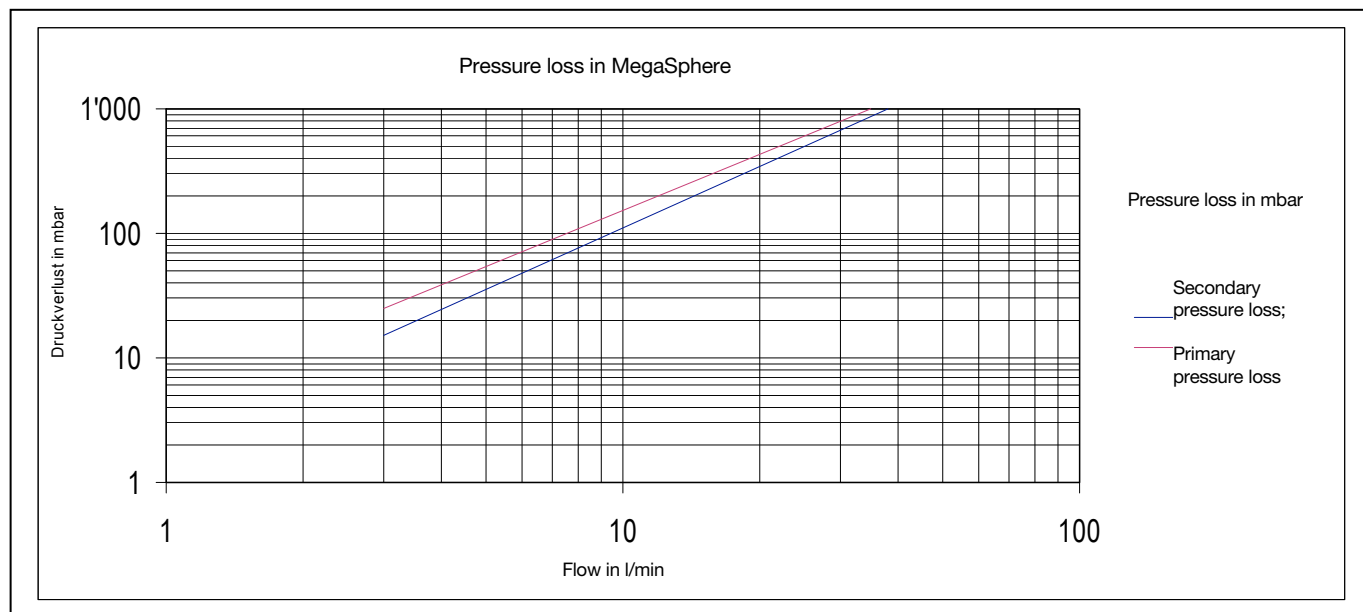
Size / type	FF 71 Two charging circuits
Collector surface	approx. 50 m ²
Max. operating temperature (primary)	110 °C / briefly 160 °C
Max. operating temperature (secondary)	110 °C
Max. operating overpressure (primary)	6 bar
Max. operating overpressure (secondary)	3 bar
K _{vs} value (primary)	2.2
K _{vs} value (secondary)	2.3
Plate heat exchanger	Stainless steel 1,440 1, copper-brazed
Primary circuit pump	WILO ST 16/7-3
Secondary circuit pump	WILO RS 15/4-3
3-way valve	230 V
Safety valve	½" / 6 bar
Bleeder container	1" AG

Dimensions and insulation	
Max. W x H x D insulated	490 x 637 x 171 mm / including bleeder container 595 x 637 x 171 mm
Weight	14.0 kg
Insulation	EPP, removable upper section
Fire protection class of insulation	B 2

Connections ¹⁾	
Solar flow pipe	DN20 IG
Solar return pipe	DN20 IG
Heating / buffer water flow pipe 1	DN20 IG
Heating / buffer water flow pipe 2	DN20 IG
Heating / buffer water return pipe	DN20 IG

¹⁾ Shut-off valves can be sealed

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Controller

Power supply	230 VAC +/- 10 %
Mains frequency	50...60 Hz
Power consumption	2 VA
Switching power	
- Electronic relay R1	min. 20 W ... max. 120 W for AC3
- Mechanical relay R2	460 VA for AC1 / 185 W for AC3
Internal fuse	2A (slow) 250 V
Protection class	IP40
Protection class	II
Sensor inputs (not included for specific deliveries)	4xPt1000, 2xTacoFlowSensor(TFS)
Collector sensor	Pt1000, insertion sensor TT/S2 to 180 °C
Storage sensor	Pt1000, insertion sensor TT/S4 to 180 °C
Pipe-mounted sensor	Pt1000, pipe-mounted sensor TR/S0.5 to 180 °C
Sensor lines for temperature sensor	2 x 0.75 mm ² , extendable to max. 30 m

Temperature resistance table for temperature sensor

°C	0	10	20	30	40	50	60	70	80	90	100
	1.000	1.039	1.077	1.116	1.155	1.194	1.232	1.270	1.308	1.347	1.385

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Permissible ambient conditions for the controller

Ambient temperature
- during controller operation - 0 °C ... 40 °C
- for transport/storage - 0 °C ... 60 °C

Humidity
- during controller operation - max. 85 % rel. humidity at 25 °C
- for transport/storage - Condensation not permitted

Miscellaneous data for controller

Housing design 2 parts, ABS plastic

Display Full-graphic display: 128 x 64 dots

Control 4 input switches

Light emitting diode Multicolored

CE marking¹⁾

Controller and pumps CE conformance according to the following EU directives:
- 2006/95/EG (low-voltage directive)
- 2004/108/EG (EMC directive)

Heat exchanger CE conformance according to the following EU directive:
- 97/23/EG (pressure equipment directive)

¹⁾ The CE marking indicates that the relevant system components of the storage charging station comply with the basic requirements of the stated European directives.

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4. On-site installation

4.1. Requirements for the Installation Site

The following information regarding the selection of the installation site must be considered before commencing the installation work: the installation must be carried out in a dry, frost-free room and the unit must be installed in an upright position with the connections facing down.

The wall on which the storage charging station is to be mounted must be capable of bearing the load and suitable for mounting of the station in an operable state.

If the supplied mounting components (screws and dowels) are not suitable for the supporting material (of which the wall is made), appropriate components must be selected and used by the installation staff.

Select an installation location where possible in the direct vicinity of the solar heat generator and buffer storage unit in order to obtain minimum heat loss. In addition, care should be taken when choosing an installation site that all connections at the site can be properly made without difficulty.

The storage charging station requires a power supply (power outlet) of 230 V. The connecting cable included in the delivery is 1.5 m long. The power supply outlet should be positioned to the right of the storage charging station.

The installation site must provide a drain line for the safety valve.

4.2. Installation

Remove the storage charging station carefully from its packaging and place it on a suitable flat surface with the controller facing up. Carefully remove the upper section of the insulation by smoothly pulling upwards. Install the supplied bleeder group and connecting pipe to the solar flow pipe.

Drill the holes required for wall installation as shown in Fig. 4-2 and insert the dowels in the holes (diameter: 10 mm). All 4 mounting points must be used to securely fasten the storage charging station on the wall.

Insert the two lower screws in such a way that they protrude about 15 mm from the wall.

Carefully mount the storage charge station (without the upper section of the insulation) with the connecting rail on the two lower screws and hold it in position.

Insert the two upper screws. Screw in all four screws securely.

When placing the upper section of the insulation on the station ensure that the upper and lower sections are exactly on top of each other so that they can then be carefully pressed together. Both parts "snap" into place.

4.3. Dimensions

The dimensions of the storage charging station are shown in Fig. 4-1. Fig. 4-2 shows the drilling hole diagram for the mounting points on the wall.

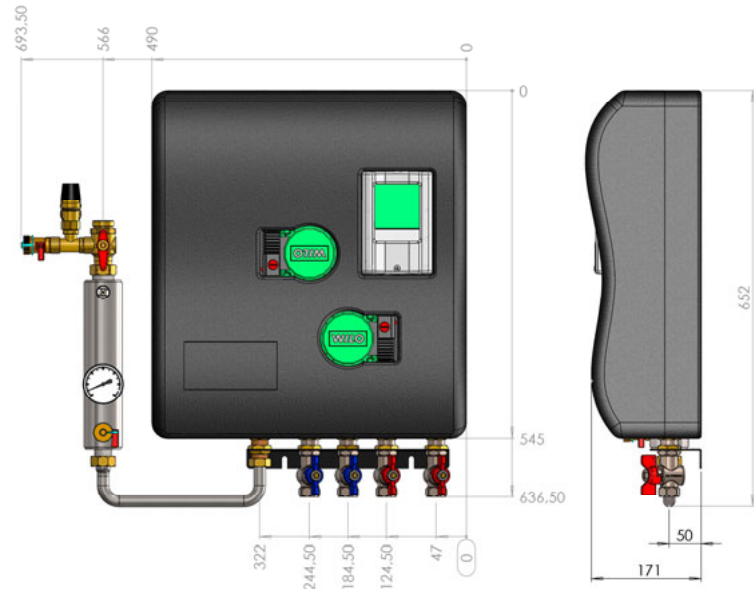


Fig. 4-1: Dimensions of the storage charging station

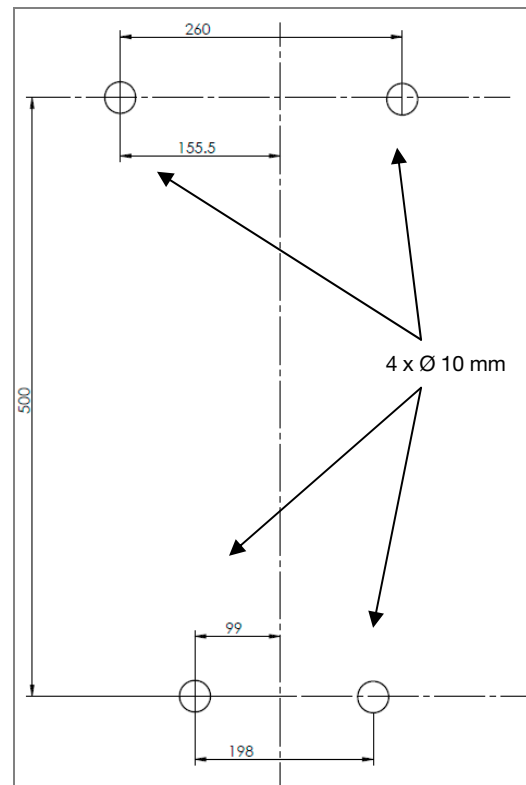


Fig. 4-2: Drilling hole diagram for mounting points of the storage charging station

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5. INSTALLATION

5.1 Requirements for Pipe Installation



CAUTION

Danger of material damage!

All connection lines must be installed on the storage charging station with the power disconnected. Suitable tools, such as open-end wrenches, must always be used. When tightening connections, the part being tightened must be held firmly in order not to damage the connections.



CAUTION

Danger of material damage!

In cases in which temperature spikes are expected that will cause the maximum permissible operating temperatures to be exceeded by more than 10 %, the installation site must provide monitoring of the system and/or protect the system by limiting the collector surface to the rated power.



CAUTION

Danger of material damage!

Closing and opening filling and draining valves too quickly can lead to sudden changes in pressure (so-called water hammers) that could damage the storage charging station or other parts of the heating system. The installation site must provide water hammer dampers in accordance with the manufacturer's specifications in order to protect against water hammer effects.

The storage charging station must be integrated into the general system according to the assigned connections.



A system diagram for integrating the MegaSphere storage charging station, including the solar and heating circuits, can be found in the MegaSphere technical information, Section 3.1.3 Hydraulic Variants.



A safety valve is integrated into the storage charging station. The valve is used only for protection of the storage charging station on the primary side and is not a substitute for the safety valve to be installed on the secondary side of the system by the installation site. Activation of the safety valve can be avoided by installation of a suitable expansion vessel in the area of the storage charging station by the installation site.

The following information must be observed when installing pipes: before connecting the storage charging station to the other solar and buffer or heating components, these components must be carefully and sufficiently rinsed (with at least three times the system volume for each of the solar and heating circuits).

Ensure that flexible connections are neither twisted nor bent.

Check all connections and pipes for watertightness.

All lines must be insulated in compliance with the applicable standards and specifications.



Depending on the exact composition of the water and the actual operating conditions, increased levels of deposits – and subsequent maintenance – must be taken into account.

5.2 Solar System Connection



The solar circuit must be connected in accordance with DIN 4757, Part 1: Solar heating systems with water or water mixtures as heat carriers, requirements for the safety design.

The following information must be observed when installing the solar connections:

The supplied safety group of the storage charging station must be connected to the solar pipe in compliance with the applicable standards and specifications. The outlet of the exhaust pipe of the safety valve must be positioned in the area protected against freezing. A label with the following text must be attached to the safety valve: During heating, water may issue from the exhaust pipe for safety reasons. Do not close the valve!

No cut-off valves, constrictions or filters are permitted between the storage charging station and the safety valve.

The exhaust pipe must be designed in such a way that pressure cannot rise when actuating the safety valve. Emerging water must be able to be safely and securely drained off.

5.3 Heating Water Connection



CAUTION

Danger of material damage!

No (zinc-plated) steel pipes are permitted to be present in the flow direction behind the storage charging station. Copper ions dissolved in water due to the copper solder used for the stainless steel plate heat exchanger could cause corrosion if precipitated onto steel.

A suitable exhaust pipe must be installed on the safety valve integrated into the hot water section. The requirements stated in Section 5.2 apply.

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5.4 Primary Circuit Connection

The following information must be observed when connecting the primary circuit:

A bleeder must be installed at the highest position in the primary circuit (solar water mixture).

The solar water mixture (on the primary side) must be connected using siphons in order to prevent gravity-driven circulation.

5.5 Secondary Circuit

The following information must be observed when connecting the secondary circuit:

A bleeder must be installed at the highest position in the primary circuit (heating / buffer water side).

The heating / buffer water flow pipe (on the secondary side) must be connected using siphons in order to prevent gravity-driven circulation and subsequent cooling of the buffer storage.

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6. ELECTRICAL CONNECTION



CAUTION

Danger to life by electric shock!
Before commencing work on the system, the power must be disconnected, and the system checked for absence of power and secured against further connection of power.



CAUTION

Danger of material damage!

An all-pole isolator – for example, an emergency heating switch, must be provided by the installation site in the power supply system for the controller/storage charging station.
The relay R1 is only suitable for standard pumps (20 - 120 VA), which are then revolution-controlled by the controller.



The MegaSphere storage charging station is fully preassembled and ready-for-insertion on delivery. The work described here for the electrical connection is only required in individual cases.

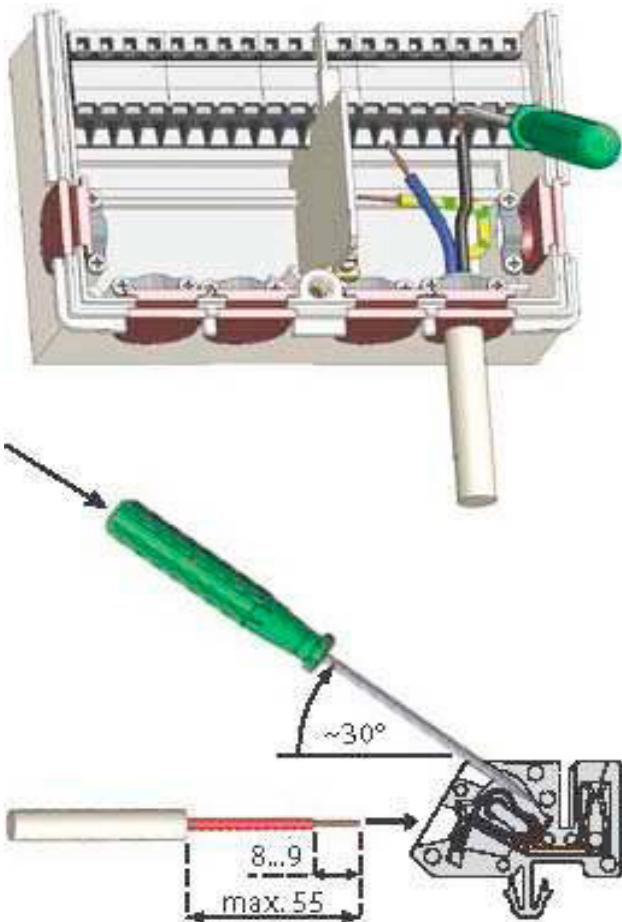


Fig. 6-1: Cable connection on controller terminal strips

6.1 Connection of Wires

Fully unscrew the cover screw and carefully remove the upper section of the housing, including the electronic components, from the lower section.

Carefully place the upper housing section on a clean surface. Do not touch the electronic parts.

All wires must be installed in compliance with the connection diagram or terminal assignment chart (Fig. 6.2).

The left side of the connection plane is intended only for sensor lines (e.g., for the temperature sensor), while the right side is reserved exclusively for wires carrying mains voltage.

Sensor wires must be laid separately from lines carrying mains voltage and must be routed into the controller housing.

6.1.1 Temperature Sensors

Only temperature sensors of the type Pt 1000 are permitted to be used (→ optional accessory for MegaSphere).

The polarity of the sensor wires is irrelevant.

Always position temperature sensors precisely in the area to be measured and protect them against slipping.

Use heat conducting paste to improve heat exchange.



Unconnected or improperly connected temperature sensors cause the controller to issue an error message indicating an interruption in the circuit.

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CAUTION

Danger of material damage!

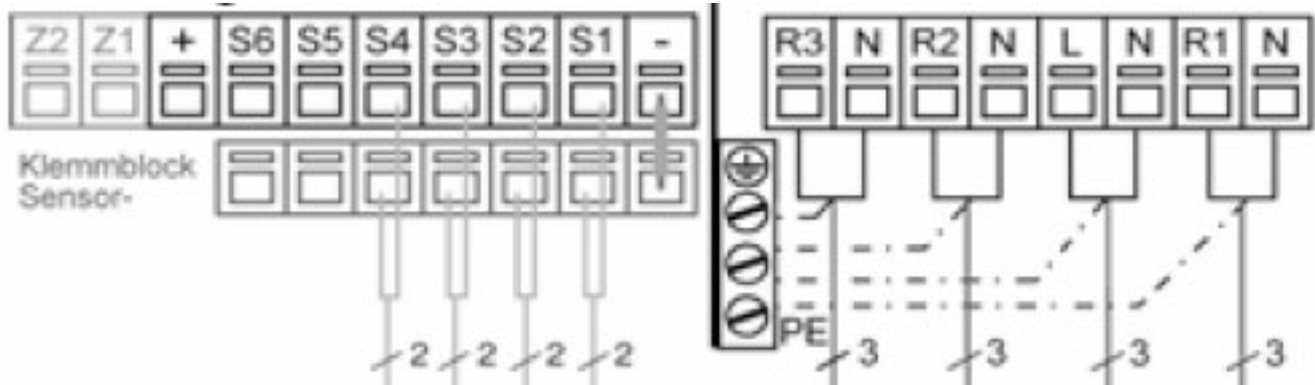
Connection terminals on the left side of the controller housing exclusively for sensor wires with a maximum permissible voltage of 12 V.



CAUTION

Danger to life by electric shock!

Terminal connections on the right side of the controller housing exclusively for wires carrying main voltage of 230 V.



The sensor ground (S1-S4) and the TFS (green wire) are connected on the sensor terminal block. The polarity of S1 to S4 is irrelevant.

The protective earth/ground (PE) is connected at the "PE" metal terminal block.

- S1 Sensor 1 collector
- S2 Sensor 1 storage unit (bottom)
- S3 Sensor 2 storage unit (top)
- S4 Sensor 4 solar flow pipe
- S5 TFS solar return pipe °C (yellow wire)
- S6 TFS flow l/min (white wire)
- + TFS +5V DC (brown wire)
- bridge sensor -

- L Mains outer conductor L
- N Mains neutral conductor N
- R1 Pump L (revolutions)
- N Pump N
- R2 Zone valve L
- N Zone valve N
- R3 Secondary pump
- N Secondary pump
- Switching direction to valve:
- R2 on / valve on = charge to sensor
- 3 (storage unit top or storage unit 2)

Fig. 6-2: Connection chart / terminal assignment for controller

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7. Commissioning

7.1 Requirements for Commissioning



CAUTION

Danger of material damage!

Upon completion of the installation work and before filling and flushing of the system, the entire system must be checked for watertightness.

Before commencing commissioning, the following points must be checked:

Complete and correct piping of the storage charging station with the installation site mounting and correct installation of the safety-relevant components, such as the membrane safety valve and water expansion vessel or water hammer damper.

Correct implementation of the wiring carried out by the installation site on the controller and the electrical connections.

7.2 Filling the Primary Circuit



CAUTION

Danger of material damage!

The water used in the primary circuit (buffer/heating water) must comply fully with the requirements stipulated in the VDI directive 2035 Parts 1 and 2.

On the primary side "fill" and extensively "flush" (observing the backflow preventer in the solar flow and return pipes installed at the factory). This ensures that the air trapped in the valves and heat exchanger is dragged along, making fault-free operation possible. Ensure that the buffer storage unit is also fully bled of air so that no air can be sucked in by the storage charging station from the buffer storage unit during operation. The bleeding option of the pump should also be used for bleeding.

Bleeding the primary circuit using the primary circuit at the highest point should ensure proper operation.

The bleeding option of the pump can also be used for bleeding if required.

7.3 Filling the Secondary Circuit



CAUTION

Danger of material damage!

The water used in the primary circuit (buffer/heating water) must comply fully with the requirements stipulated in the VDI directive 2035 Parts 1 and 2.

On the secondary side, before taking the storage charging station into operation, the heating system must be cleaned and bled by intensive flushing.

7.4 Commissioning the Controller



CAUTION

Danger of material damage!

Cut-off valves between the storage charging station and safety valves are not permitted to be closed during operation.

Set up the power supply and wait until the hydraulic schematic appears in the display. The controller is then ready to operate (Fig. 7-1).

The controller is preset at the factor for immediate use and can be deployed. These presettings must be checked for matching with the on-site requirements. The corresponding legal requirements and other specifications must also be met. The presettings can be changed as described in Section 8.

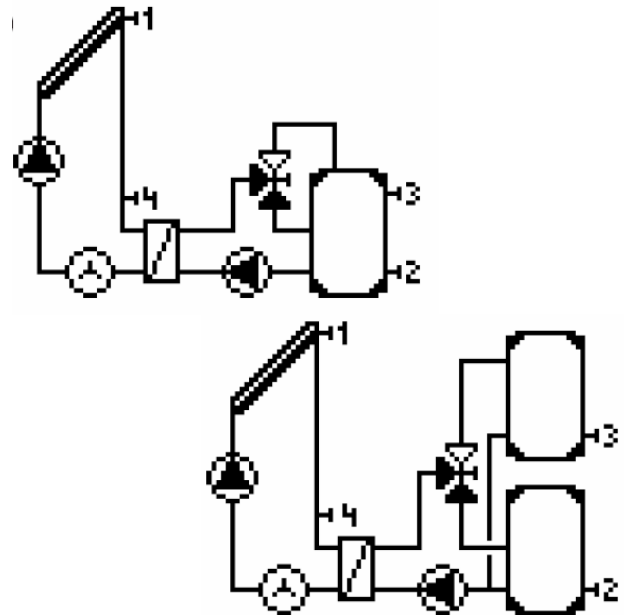


Fig. 7-1: Display of readiness to operate

7.5 Function Test Storage Charging Station

After being taken into operation, a function test should be carried out within the limits of operability of the storage charging station in order to confirm the correct function before transfer to the operator.



The primary circuit pump must be set to the highest performance level to ensure maximum performance of the storage charging station during operation.

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8. DESIGN AND CONTROL OF THE CONTROLLER

8.1 Mechanical Design of the Controller

8.1.1 Display and Input

The display (1) with comprehensive text and graphics modes allows fast and simply self-explanatory operation of the controller.

The LED (2) lights green when a relay is activated. The LED (2) lights red when the operating mode "off" is set. The LED (2) slowly flashes red in the operating mode "manual". The LED (2) rapidly flashes red when a fault is detected.

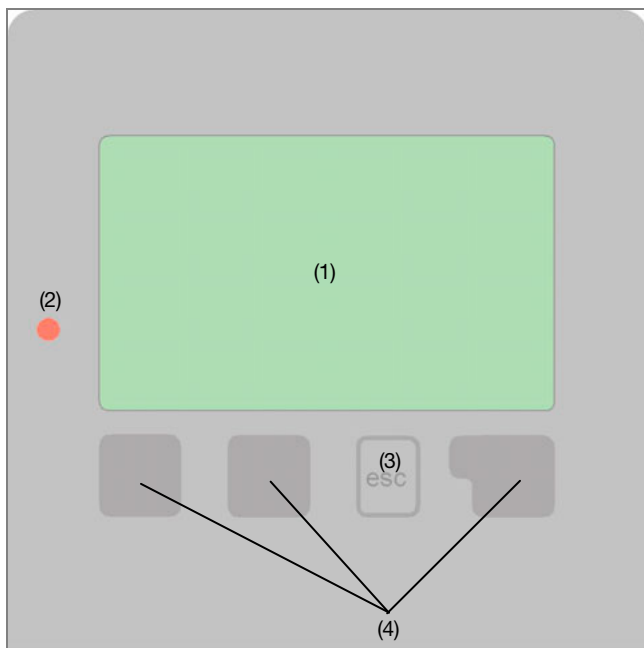










Fig. 8-1: Display of the controller with control keys

Inputs are made by use of 4 key (3) & (4), which are assigned to different functions depending on the situation. The "esc" key (3) is used to cancel an input or to exit a menu. A system security query is issued for confirmation as to whether the implemented changes are to be saved. The function of the other three keys (4) is explained in each case on the display line directly above the keys, whereby the right key generally assumes a confirmation and selection function.

Key functions

- ▼ / ▲ = Increase/decrease values
- + / - = Scroll up/down in menu
- Yes/No = Accept/reject
- Info = Further information
- Back = Return to previous display
- ok = Confirm selection
- Confirm = Confirm settings

Display symbols:

-  Pump is rotating in operation
-  Valve (flow direction in black)
-  Collector
-  Storage unit
-  Heat exchanger
-  Temperature sensor
-  Warning/error message
-  New information available

8.1.2 Menu Structure

The graphic or overview menu appears if no key is pressed for 2 minutes or if the main menu is closed with the "esc" key.

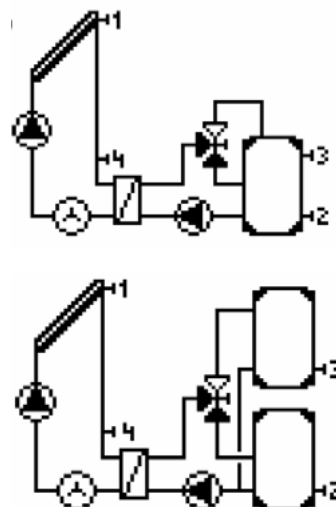


Fig. 8-2: Hydraulic schematic on the controller display

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Pressing a key in the graphic or overview mode directly activates the main menu. The following items are then presented for selection:



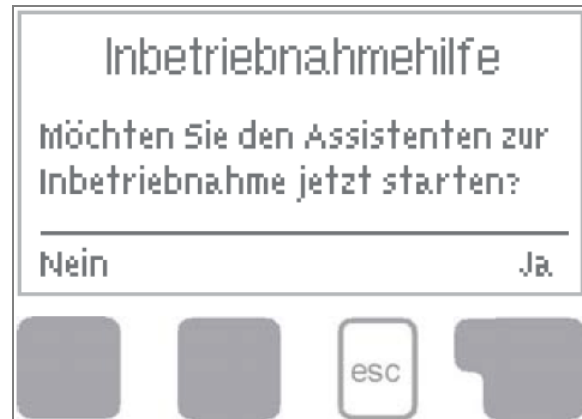
Exit menu – 1. Measurement values – 2. Evaluation

Fig. 8-3: Display of "Main menu – Selection"

Main menu item	Description
1. Measurement values	Current temperature values with explanations (see Section 8.2.1)
2. Analysis	Functional check of the system with operating hours, etc. (see Section 8.2.2)
3. Display mode	Select graphic or overview mode (see Section 8.2.3)
4. Operating mode	Automatic or manual operation, or switch off device (see Section 8.2.4)
5. Settings	Set parameters for routine operation (see Section 8.2.5)
6. Protection function	Solar and frost protection, recooling, anti-blocking protection (see Section 8.2.6)
7. Special function	Program selection, sensor adjustment, timer, additional sensors, etc. (see Section 8.2.7)
8. Menu lock	Lock against inadvertent changes at critical points (see Section 8.2.8)
9. Service values	For diagnostics in error cases

8.1.3 Commissioning Assistant

When switching on the controller for the first time and after setting the language and clock, the system asks whether the controller is to be parameterized with the commissioning assistant or not.



Commissioning Assistant

Do you want to start the commissioning assistant now? No Yes

Fig. 8-4: Display of "Commissioning Assistant"

The commissioning assistant can also be stopped at any time or restarted later in the Special functions menu (Section 8.2.6). The commissioning assistant guides the user in the correct sequence through the required basic settings. The corresponding parameters are briefly explained on the display. You can call up the previous value by pressing the "esc" key to view the selected setting again or to adjust it. Repeated pressing of the "esc" key brings the user back to the selection mode in steps to cancel the commissioning assistant.

After ending the commissioning assistant, the switching outputs with connected consumers (pumps) should be tested in the submenu 4.2 (see Section 8.2.4) in the manual operating mode, and the sensor values should be tested for plausibility. The automatic operating mode should be activated in conclusion.



Please observe the explanations of the individual parameters given on the following pages. The user must check whether additional settings for the corresponding application are to be made using the commissioning assistant.

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8.2 Operation of the Controller

8.2.1 Measurement Values (Menu 1)

The "1. Measurement values" menu item is used to display the currently measured temperatures. The menu item is ended by pressing "esc" or by selecting "Exit measurement values".



- 1. Exit measurement values
- 1.1. Collector
- 1.2. Storage unit

Fig. 8-5: Display of "Measurement values"

The measurement values are explained with a short text if Info is selected. The info(rmation) mode is exited by selecting "Overview" or "esc".



- 1.1. Collector
- Current temperature measured with sensor S1 in the solar collector
- Overview

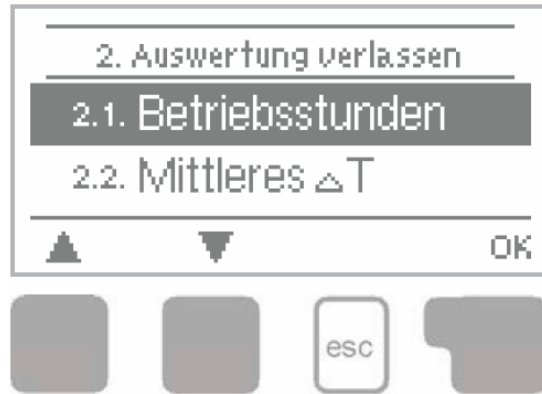
Fig. 8-6: Display of selected measurement value for solar collector temperature



Appears in place of the measurement value "Error" in the display. It indicates a defective or wrong temperature sensor. Cables that are too long or sensors that are not optimally positioned can cause minor deviations in the measurement values. In this case, the display values can be corrected by input on the controller (Section 8.2.6). What measurement values are displayed depend on the program that is selected, the connected sensors and the corresponding device model.

8.2.2 Analysis (Menu 2)

The "2. Analysis" menu item is used for functional checks and long-term monitoring of the system. The submenus described below are provided. The menu item is ended by pressing "esc" or by selecting "Exit Analysis".



- 2. Exit Analysis
- 2.1. Operating hours
- 2.2. Average T

Fig. 8-7: Display of "Analysis" menu



The time must be correctly set in order to correctly analyze the system data. Note that the clock continues to run for about 24 hours if the power is disconnected, and must be reset after this time. Improper operation or the wrong time can cause data to be deleted, incorrectly recorded or overwritten. The manufacturer accepts no liability for the recorded data.

Submenu 2.1 – Operating hours

Display of operating hours of the solar pump connected to the controller. Different time ranges (day to years) are available.

Submenu 2.2 – Average temperature difference ΔT

Display of the average temperature difference (delta) between the reference sensors in the solar system with an activated consumer.

Submenu 2.3 – Heat yield

Display of the heat yield of the system.



The evaluated and displayed heat yield values are purely guideline values for functional checking of the system.

Submenu 2.4 – Graphical overview

The data output in the submenus 2.1 to 2.3 is clearly presented in bar charts. Different time ranges are provided for comparison of the data. The two keys on the left can be used for scrolling.

Submenu 2.5 – Error messages

Display of the last 3 errors in the system with indication of the date and time.

Submenu 2.6 – Reset / Clear

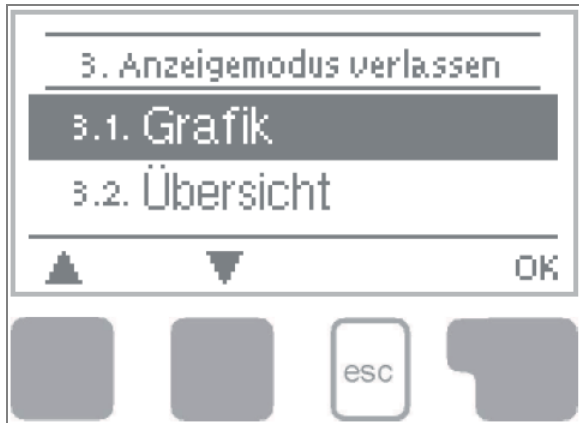
Resets and clears the individual analyses. If the "all analyses" item is selected, everything is deleted apart from the error list.

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8.2.3 Display Mode (Menu 3)

The display settings for the controller are made in the menu item "3. Display mode". This display appears after two minutes if no key is pressed. After pressing a key, the main menu reappears.

The menu item is ended by pressing "esc" or by selecting "Exit display mode".



3. Exit display mode

3.1. Graphical

3.2. Overview

Fig. 8-8: Display of "Display mode" menu

Submenu 3.1 – Graphical

In the graphical mode, the selected system hydraulics are displayed with the measured temperatures and operating states of the connected consumers.

Submenu 3.2 - Overview

In the overview mode, the measured temperatures and operating states of the connected consumers are displayed in text form.

Submenu 3.3 – Alternating

In the "alternating" mode, the graphical mode and then the overview mode are each active for five seconds.

8.2.4 Operating Mode (Menu 4)

In menu 4, "Operating mode", in addition to automatic operation the controller can also be switched off or set to the manual operating mode.

Setting range: Automatic, manual, off

Factory setting: Automatic

The menu item is ended by pressing "esc" or by selecting "Exit operating mode".



4. Exit operating mode

4.1. Automatic (active)

4.2. Manual

Fig. 8-9: Display of "Operating mode" menu

Submenu 4.1 – Automatic



The automatic mode is the standard operating mode for the controller. Correct controller functionality under consideration of the current temperatures and configured parameters is only possible in automatic operating mode. After an interruption in the power supply, the controller automatically returns to the previously selected operating mode.

Submenu 4.2 – Manual



CAUTION

Danger of personal harm and material damage!

The "manual" operating mode is only to be used by expert users for brief function tests or during commissioning. There is a danger of scalding or major damage to the system.



If the manual operating mode is enabled, the current temperatures and selected parameters have no effect. The relay, and therefore the connected consumer, are activated or disabled by means of a key without consideration of the current temperatures and the specified parameters. The measured temperatures are also displayed as overview values and for functional checks.

Submenu 4.3 - Off



If the operating mode "off" is enabled, all controller functions are disabled. This can cause overheating at the solar collector or in other system components, for example.

8.2.5 Settings (Menu 5)



CAUTION

Danger of personal harm and material damage!

The settings that are implemented in no way replace safety requirements needed at the installation site.

The basic settings required for the controller function are made in the menu item "5. Settings".

The menu item is ended by pressing "esc" or by selecting "Exit Settings".

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5. Exit Settings

Fig. 8-10: Display of "Settings" menu

Submenu 5.1 – T_{min} S1 = release/start temperature at sensor 1
 Setting range: 0 °C to 99 °C
 Factory setting: 20 °C
 If this value is exceeded at sensor 1 and if the other conditions are also satisfied, the controller activates the associated pump or valve. If the temperature at sensor 1 falls by 5 °C below this value, the pump or valve is again disabled.

Submenu 5.2 – T_{Max} S2 – deactivation temperature at sensor 2
 Setting range: 0 °C to 99 °C
 Factory setting: 60 °C
 If this value is exceeded on sensor 2, the controller disables the corresponding pump or valve. If this value is again undershot at sensor 2 and if the other conditions are also satisfied, the controller reactivates the associated pump or valve.

Submenu 5.3 – T_{Max} S3 – deactivation temperature at sensor 3
 Setting range: 0 °C to 99 °C
 Factory setting: 60 °C



Temperature values that are set too high can cause scalding or damage to the system. Provide scalding protection at the installation site.

Submenu 5.4 – ΔT R1 = activation and deactivation temperature difference (delta) for relay R1
 Setting range: 4 °C to 20 °C
 Factory setting: 6/12 °C
 If this temperature difference between the reference sensors is exceeded and if the other conditions are also satisfied, the controller activates the pump. If the temperature difference falls to ΔT R1 Off, the pump is switched off again.



A configured temperature difference that is too small can cause ineffective operation depending on the system and sensor position. Specific switching conditions apply in the case of speed control (see submenu 7.9.1).



The secondary pump (R3) starts if the flow pipe sensor S4 is warmer than the reference sensor in the storage unit.



The setting values as specified in submenus 5.7 to 5.8 appear upon selection of "Time" or "Request", but in the submenus 5.9 to 5.11 only for the selection "Time".

Submenu 5.5 – preferred sensor = charging priority in 2-storage systems
 Setting range: S2 or S3
 Factory setting: S2
 The storage unit (storage sensor) that is to be preferentially charged must be set. The charging of the lower-privilege storage unit is interrupted at regular intervals to check whether the temperature rise at the collector can enable charging of the preferred storage unit.

Submenu 5.6 – T-preference = temperature threshold for absolute preference
 Setting range: 0 °C to 90 °C
 Factory setting: 40 °C
 In 2-storage systems there is never charging in the lower-privilege storage unit until the configured temperature reference value on the storage sensor of the preferred storage unit is exceeded.

Submenu 5.7 – charging delay = interruption in the charging
 Setting range: 5 to 90 mins.
 Factory setting: 10 mins.
 The charging of the lower-privilege storage unit is interrupted after the time that can be set here in order to check whether the collector can reach a temperature level that will soon allow charging in the preferred storage unit. If the conditions for charging the preferred storage unit or for further interruption are not satisfied, the charging of the lower-privilege storage unit is enabled again, and is again interrupted after the configured time in order to consider the current temperature rise in the collector.

Submenu 5.8 – rise = temperature rise during the charging delay
 Setting range: 1 °C to 10 °C
 Factory setting: 3 °C
 For precise setting of the charging priorities in systems with multiple storage units, the required temperature rise in the collector is set at which the interruption in the charging of the lower-privilege storage unit is extended by one minute. The interruption is extended because the temperature rise in the collector can probably soon enable charging of the preferred storage unit. If the temperature rise is lower than the set value, the charging of the lower-privilege storage unit is again enabled.

8.2.6 Protection Functions (Menu 6)

Different protective functions can be activated and set in the menu item "6. Protection functions". The menu item is ended by pressing "esc" or by selecting "Exit Settings".



The safety provisions to be established at the installation site are not in any way replaced by these functions.



6. Exit protection functions
 6.1. Anti-blocking protection
 6.2. Frost protection

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Submenu 6.1.1 - 6.1.2 – Anti-blocking protection

Setting values for R1: daily, weekly, off
Factory setting: daily
Setting values for R2: daily, weekly, off
Factory setting: daily
Setting values for R3: daily, weekly, off
Factory setting: daily

If anti-blocking protection is activated, the controller switches on the corresponding relay and the connected consumer daily at 12 o'clock or on Sundays at 12 o'clock for 5 seconds to prevent the pump or valve from becoming stuck after lengthy periods of standstill.

Submenus 6.2.1 - 6.2.2 – Frost protection

Frost protection – setting values: on, off
Factory setting: off
Frost protection level 1 – setting range: 25 °C to 10 °C or off
Factory setting: 7 °C
Frost protection level 2 – setting range: 25 °C to 8 °C
Factory setting: 5 °C



Energy is lost through the collector with this function. The function is not normally activated in solar systems with anti-freeze agents. Please observe the operating instructions for the other system components.

Submenus 6.3.1 - 6.3.5 – Solar protection

Two solar protection variants (V1+V2) and an alarm function with advanced settings are available for the system hydraulics. These are explained in greater detail below.

A 2-level frost protection function can be activated. In level 1, the controller switches on the pump for 1 minute every hour if the collector temperature falls below the set value of "frost protection level 1". If the collector temperature falls further to the set value "frost protection level 2", the controller switches the pump without interruption. If the collector temperature then exceeds the value "frost protection level 2" by 2 °C, the pump switches off again.



The solar protection function is switched off ex works. Whether and what solar protection variant the system requires can be determined from the operating instructions for the system components.



In the variant V1, the storage unit or the pool is heated to above the Tmax value set under 10., which can cause scalding and damage to the system. In the variant V2, increased standstill temperatures and corresponding system pressure occur, which could lead to damage in certain systems.

Collector alarm

If this temperature at the collector sensor is exceeded when the solar pump is switched on, a warning or error message is triggered. The red light flashes and a corresponding warning is issued on the display.

Collector alarm – setting range: off / 60 °C to 300 °C
Preset value: off

SSF variant V1

If the value "SSF T.ein" is exceeded at the collector, the pump is switched on to cool the collector. The pump is switched off if the value "SSF T.aus" is undershot at the collector or if the value "SSF Tmax Sp." on the storage unit or pool is exceeded. In 2-storage unit systems, only the lower privilege storage unit or pool is used for emitting heat.

SSF variant V2

If the value "SSF T.ein" is exceeded at the collector, the pump is switched off and is no longer switched on in order to protect the collector, for example, against water hammer effects. The pump is not switched on again until the temperature at the collector falls below the value "SSF T.aus".

SSF variant – setting range: V1, V2, off
Presetting: V2

SSF Tein (Ton) – setting range: 60 °C to 150 °C
Preset value: 110 °C

SSF Taus (Toff) – setting range: 50 °C to 145 °C
Preset value: 100 °C

SSF Tmax Sp. (Tmax for storage unit) – setting range: 0 °C to 140 °C
Preset value: 90 °C



Energy is lost through the collector with this function. Recooling should only be activated in exceptional cases. This is the case, for example, for the solar protection variant V1 since the storage unit is overheated in this case, or during the holiday period if no heat is dissipated.

Submenu 6.4.1 - 6.4.2 – Recooling

Recooling – setting values: on, off
Preset value: off
Recooling Tsoll (Tref.) setting range: 0 °C to 99 °C
Preset value: 70 °C

For hydraulics with a solar system, excess energy is returned to the collector from the storage unit if the recooling function is activated. This only happens if the temperature in the storage unit is greater than the value "Recooling Tref." and if the collector is at least 20 °C cooler than the storage unit, and continues until the storage unit temperature has fallen below the value "Recooling Tref.". In 2-storage unit systems, the recooling applies to both storage units.



Energy is lost through the collector with this function. Recooling should only be activated in exceptional cases. This is the case, for example, for the solar protection variant V1 since the storage unit is overheated in this case, or during the holiday period if no heat is dissipated.

Submenus 6.5.1 - 6.5.3 – Legionella protection

Legionella protection function – setting range: on or off
Preset value: Off
Legionella protection function Tsoll (Tref.) S2 – setting range: 60 °C to 99 °C
Preset value: 70 °C

Legionella protection function frequency – setting range: 1 to 28 days
Preset value: 7 days

Legionella protection heating: shows the last successful heating to Tsoll (Tref.) S2.

With the Legionella protection function activated, the MSC4 enables the storage unit to be heated once at specific intervals (Legionella protection frequency) to a higher temperature "Legionella protection Tsoll (Tref.) S2" provided the energy source permits this.



The Legionella protection function is switched off ex works. The function only affects the storage unit in which the sensor 2 is installed. Once heating has taken place with the activated Legionella protection function, the display shows this information with indication of the date.



While the Legionella protection function is running, the storage unit is heated above the configured value "Tmax S2", which can cause scalding and damage to the system.

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Legionella because the controller is reliant on sufficient amounts of supplied energy, and the temperatures cannot be monitored in the entire storage area and the connected piping system. For comprehensive protection against Legionella, heating to the required temperature and simultaneous water circulation in the storage unit and piping system must be ensured by additional other energy sources and control devices.

8.2.7 Special Functions (Menu 7)

Basic aspects and advanced functions are set in the menu item "7. Special functions".



Settings in the Special functions menu should only be made by experts, with the exception of the date and time.

The menu item is ended by pressing "esc" or by selecting "Exit Special functions".



- 7. Exit Special functions
- 7.1. Program selection
- 7.2. Date & time

Fig. 8-11: Display of "Special functions" menu

Submenu 7.1 – Program selection

Setting range: 1 to 2
Factory setting: 2

The appropriate hydraulic variant is selected and set for the corresponding application (see 2.5 Hydraulic variants). The corresponding schematic is displayed by pressing "Info".

Setting range: - 10 °C ... + 10 °C
Factory setting: 0 °C

Submenu 7.2 – Date & time

This menu is used to set the current date and time.



The date and time must be correctly set on the controller in order to correctly analyze the system data and for proper functionality of the controller. Note that the clock continues to run for about 24 hours if the power is disconnected, and must be reset after this time.

Submenus 7.3.1 - 7.3.3 – Sensor adjustment



Settings are only needed by a technical expert in special cases during initial commissioning. Incorrect measurement values can cause malfunction.

Offset S1 to S6 for each setting range: - 100 to + 100
Factory setting: 0

Deviations in the displayed temperature values that could be due, for example, to long cables or sensors that are not positioned optimally, can be manually corrected here. The settings are made individually for each sensor.

Submenu 7.4 – Commissioning

The commissioning assistant guides the user in the correct sequence through the required basic settings. The corresponding parameters are briefly explained on the display. You can call up the previous value by pressing the "esc" key to view the selected setting again or to adjust it. Repeated pressing of the "esc" key brings the user back to the selection mode to cancel the commissioning assistant. (See also Section 8.1.3 for further details.)



Note the explanations given for each of the parameters and settings in this manual and check whether further settings are needed for your application.

Submenu 7.5 – Factory settings

All settings can be reset and the controller can be returned to the status it had upon leaving the factory.



When selecting and confirming the resetting of all settings to the factory status, all settings made by the user are irretrievable. After a reset, the controller has to be commissioned once again.

Submenu 7.6 – Additional options

This menu item can only be selected and used provided additional options or extensions are integrated into the controller. The associated supplementary installation, assembly and operating instructions are included with the corresponding extension.



CAUTION

Danger of material damage!

This function is only permitted to be called by expert users. Depending on the pump that is used and the pump level, the minimum number of revolutions should not be set to a value that is too small since the pump or system can be otherwise damaged. The specifications of the relevant manufacturer must be observed in this regard. If you are uncertain, it is better to set the minimum number of revolutions and the pump level too high than too low.

Submenus 7.7.1 - 7.7.5 – Heat quantity measurement

Glycol type – setting values: ethylene, propylene
Preset value: ethylene
Glycol component – setting values: 0...60 %
Preset value: 40 %
TFS type – setting values: 20 , 40, 100 l/min
Preset value: 40 l/min

The setting of the TFS position specifies the position of the two sensors for the heat quantity measurement. If the sensor position has been selected as the flow direction, it is assumed that the sensor 4 is mounted in the return flow pipe. If the TFS position has been selected as the return flow direction, it is assumed that the sensor 4 is mounted in the flow pipe.

TFS position – setting values: return flow, flow
Preset value: return flow

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To avoid damage to the Taco flow sensor you are strongly recommended to position it in the return flow. If, in contrast to this recommendation, it is positioned in the flow pipe, the maximum permitted temperature must be observed. (0 °C to 100 °C in continuous operation and -25 °C to 120 °C temporarily)

Submenus 7.8.1 - 7.8.3 – Assistant

Assistant – setting values: on, off
Preset value: off
Flushing time – setting range: 2 ... 30 s
Preset value: 5 s
Rise – setting range: 1 °C...10 °C/min.
Preset value: 3 °C/min.



This function should only be activated by an expert if problems occur during recording of measurement values. Please pay particular attention to the instructions of the collector manufacturer.

It may be the case for some solar systems, particularly vacuum tube collectors, that the recording of measurement values at the collector sensor is too slow or imprecise since the sensor is often not positioned at the warmest location. The following sequence is used for the activated assistant:

if the temperature at the collector sensor rises within a minute by the value specified under "rise", the solar pump is activated for the set "flushing time" so that the medium to be measured is transported to the collector sensor. If there is still no normal activation condition as a result of this sequence, a blocking period of 5 minutes applies to the assistant.

Submenu 7.9 – Speed control

If speed control is activated, the MSC4 offers the option of changing the number of revolutions of standard pumps at the relay R1 according to the process. The current flow is shown on the display.



This function is only permitted to be called by expert users. Depending on the pump that is used and the pump level, the minimum number of revolutions should not be set to a value that is too small since the pump or system can be otherwise damaged. The specifications of the relevant manufacturer must be observed in this regard. If you are uncertain, it is better to set the minimum number of revolutions and the pump level too high than too low.

Submenu 7.9.1 – Variant

Setting values: V1, V2, V3, off
Factory setting: V1

The following revolution variants are available:

Off: No speed control takes place. The connected pump is switched on or off only with the full number of revolutions.

Variant V1: The controller switches to the specified maximum number of revolutions after the preflush time. If the temperature difference ΔT between the reference sensors (collector and storage unit) is below the set value, the number of revolutions is reduced by one level after the control time has expired. If the temperature difference value between the reference sensors is above the set value, the number of revolutions is increased by one level after the control time has expired. If the controller has adjusted the revolutions of the pump downward to the smallest level, and if the ΔT between the reference sensors is only 1/3 of the set value, the pump is switched off.

Variant V2: The controller switches to the specified minimum number of revolutions after the preflush time. If the temperature difference ΔT between the reference sensors (collector and storage unit) is above the set value, the number of revolutions is increased by one level after the control time has expired. If the temperature difference value between the reference sensors is below the set value, the number of revolutions is reduced by one level after the control time has expired. If the controller has adjusted the revolutions of the pump downward to the smallest level, and if the ΔT between the reference sensors is only 1/3 of the set value, the pump is switched off.

Variant V3: The controller switches to the specified minimum number of revolutions after the preflush time. If the temperature at the reference sensor (collector) is above the setpoint value to be subsequently set, the number of revolutions is increased by one level after the control time has expired. If the temperature at the reference sensor (collector) is below the setpoint value to be subsequently set, the number of revolutions is reduced by one level after the control time has expired.

Submenu 7.9.2 – Preflush time

Setting range: 5 to 600 s
Factory setting: 8 s
During this time, the pump runs with its full number of revolutions (100 %) to ensure proper startup. Once this preflush time has elapsed, the pump is controlled by the revolutions and switches to the maximum or minimum number of revolutions, depending on the configured variant.

Submenu 7.9.3 – Control time

Setting range: 1 to 15 mins.
Factory setting: 4 mins.
The control time specifies the inertia of the speed control in order to best prevent strong variations in temperature. Here the time frame is entered that is necessary for a complete control cycle from the minimum to the maximum number of revolutions.

Submenu 7.9.4 – Max. number of revolutions

Setting range: 70 to 100 %
Factory setting: 100 %
The maximum number of revolutions of the pump (its speed) at relay R1 is set here. During the setting, the pump runs using the corresponding speed and the flow is displayed.

Submenu 7.9.5 – Min. speed

Setting range: 30 to max. number of revolutions (speed) 5%
Factory setting: 50 %
The minimum number of revolutions of the pump (its speed) at relay R1 is set here. During the setting, the pump runs using the corresponding speed and the flow is displayed.



The stated percentage values are guideline values that may vary to different degrees depending on the system, pump and pump level.

Submenu 7.9.6 – Setpoint value

Setting range: 0 to 90 °C
Factory setting: 60 °C
This is the control setpoint value for the variant 3. If the temperature falls below this value at the collector sensor, the speed is reduced. If the value is exceeded, the speed is increased.

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8.2.8 Menu Lock (Menu 8)

By activating "menu lock on" in the menu "8. Menu lock", important menu areas can be protected from having their settings changed inadvertently. Select "Menu lock on" to activate the locking function. To enable the menu to be changed, select "Menu lock off". The menu item is ended by pressing "esc" or by selecting "Exit Menu lock".



8. Exit menu lock
8.1. Menu lock off

Fig. 8-12: Display of "Menu lock" menu

The following menu functions remain fully accessible even if the menu lock has been activated, and changes can be made if required:

- 1. Measurement values
- 2. Analysis
- 3. Display mode
- 7.2. Date & time
- 8. Menu lock
- 9. Service values



To lock the other menus, select "Menu lock on". To enable the menus again, select "Menu lock off".

Setting values: on, off
Factory setting: off

8.2.9 Service Values (Menu 9)

The menu "9. Service values" is used in the case of errors, for example, for remote diagnostics by expert users or the manufacturer. The menu can be exited at any time by pressing "esc".



9.2. Collector
9.3. Storage unit
9.4. Sensor 3

Fig. 8-13: Display of "Service values" menu

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Enter the values at the time of occurrence of an error, for example, in the table.

No.	Description
9.1	
9.2	
9.3	
9.4	
9.5	
9.6	
9.7	
9.8	
9.9	
9.10	
9.11	
9.12	
9.13	
9.14	
9.15	
9.16	
9.17	
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9.40	
9.41	
9.42	
9.43	
9.44	
9.45	
9.46	
9.47	
9.48	
9.49	
9.50	

8.2.10 Language (Menu 10)

The language used in the menus can be selected with the menu item "10. Language". When commissioning the system for the first time, a prompt for the language to use is displayed automatically. The language choice offered may vary according to device model. A language selection is not available in all device models.



- 10. Exit Language
- 10.1. German
- 10.2. English

The two following languages are presented for selection:
 German
 English

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9. HANDOVER TO THE OPERATOR

The operator of the system must be instructed on proper use of the system by an expert. Reference must be made in particular to safety-related aspects and to the maintenance intervals that are required for correct operation and that are critical to the lifetime of the system. In the interest of both parties (installation technician and operator), the most important set parameters should be documented in the form of a short protocol when handing over the storage station to the operator. The template shown below can be used for this purpose.



The installation, operation and maintenance manual must be permanently available at the installation site of the storage station or must be given to the operator of the system for retention in the vicinity of the station.

Useful information / tips and tricks

Instead of setting the flow for the system using a volume current limiter, the **flow** can be better adjusted using the stepping switch on the pump and the setting "max. speed" on the controller; the flow can be comfortably read in this case (see 12.9.4/6.1). This saves electrical energy.

The **service values** (see 15.) contain, in addition to the latest measurement values and operating states, all settings of the controller. Please note the service values once the commissioning has been successfully completed.

The service values are a tried and proven method of remote diagnostics to deal with aspects that are unclear regarding the controller behavior and for resolving malfunctions. Document the service values (see 15.) at the time of the assumed malfunction. Send the **service value table** by fax or e-mail with a brief description of the error to an expert or to the manufacturer.

The **operating hours** displayed in the analysis menu refer to solar operating hours. Only hours are considered in which the solar pump is active.

Log the **analyses** and data that are particularly important to you (see 7.) at regular intervals to protect against data losses.

We recommend that you compensate for measurement inaccuracy that can occur as a result of using a pipe-mounted sensor by means of manual offset adjustment. You can do so by briefly mounting the flow sensor close to the measurement point of the return flow sensor in order to then adjust both sensors to the same measurement value using manual offset adjustment (see 12.3).

10. MAINTENANCE



CAUTION

Danger of personal harm and material damage!

Work on the system may only be carried out by qualified experts and trained technicians.



CAUTION

Danger to life by electric shock!

Before commencing work on the system, the power must be disconnected, and the system checked for absence of power and secured against further connection of power.



The storage charging station or entire system for buffer storage unit charging must be serviced once every year. As part of the maintenance/service work, the watertightness of all parts and connections must be particularly inspected, as well as examining for possible deposits in the heat exchanger. In addition, the controller must be checked for error messages. Adjustments or optimization of setting values should be noted in the commissioning protocol as part of the maintenance work (see Section 9). Only original spare parts are permitted to be used as replacements.

10.1 Preparations for Maintenance Work

Before commencing maintenance work, check whether the heat exchanger needs to be cleaned. Deposits or silting in the heat exchanger varies according to the exact composition of the water and the actual operating conditions. A high level of total hardness of the water may contribute to possible limitations in the performance of the heat exchanger. Possible signs of deposits in the heat exchanger are as follows:

a reduction in the maximum flow volume (compared to the flow volume at the time of commissioning).
the heating water temperature can no longer be significantly raised.
the return flow temperature of the primary circuit is significantly closer to the flow temperature (compared to the value at the time of commissioning).

Before carrying out maintenance work on the storage charging station, carefully remove the upper section of the insulation by pulling it off smoothly. Ensure during installation after completion of the maintenance work that the upper and lower sections of the insulation are exactly on top of each other so that they can then be carefully pressed together. Both parts "snap" into place.

10.2 Maintenance of the Controller

The controller must be checked for the following points:

- verify the date and time (→ see Section 8.12.2)
 - plausibility check of the analysis data (→ see Section 8.7.4)
 - check of the error memory (→ see Section 8.7.5)
 - plausibility check of the current measurement values (→ see Section 8.6)
 - check of the switching outputs/consumers in manual operation (→ see Section 8.9.2)
- Optimization of the set parameters if required.

10.3 Cleaning the Heat Exchanger

The heat exchanger can be cleaned by flushing when it is installed provided appropriate flush faucets are installed at the site. If no flush faucets are installed, the heat exchanger must be removed from the storage charging station and cleaned outside of the station. The heating system must be separated from the storage charging station before beginning the cleaning work by blocking the corresponding valves.

10.4 Restarting the System

After completing the maintenance work, the system must be restarted in compliance with the instructions given in Section 7.

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11. Faults / error messages and solutions



CAUTION

Danger to life by electric shock!

Before commencing work on the system, the power must be disconnected, and the system checked for absence of power and secured against further connection of power.



CAUTION

Danger of personal harm and material damage!

Work on the system may only be carried out by qualified experts and trained technicians.



The measures described here for clearing faults and resolving error messages only provide brief information. The appropriate safety measures and steps required must also be observed and implemented as necessary.

11.1 General Faults / Error Messages

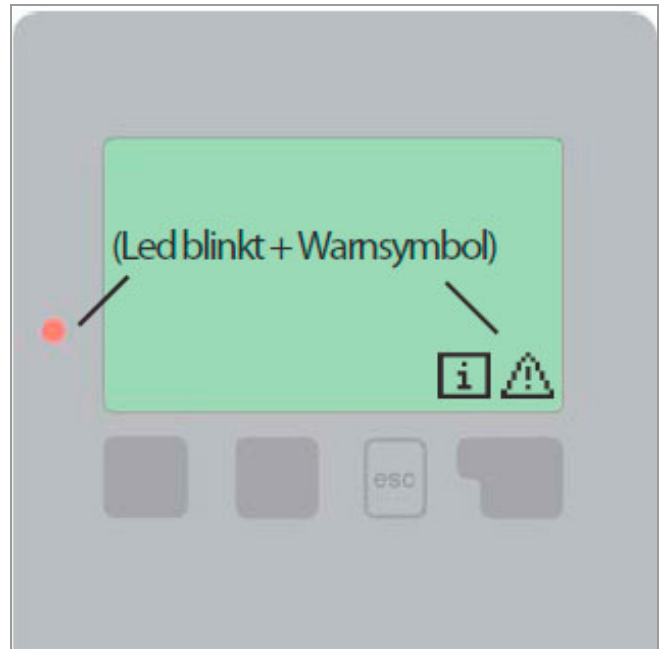
No.	Fault / error message	Possible cause
1	Sensor x faulty	Either the sensor, the sensor input on the controller or the connection is/was faulty (resistance table on page 5)
2	Collector alarm	The temperature on the collector set in menu 6.3.1 is/was exceeded.
3	Nighttime pumping	The solar pump is/was in operation between 11 pm and 4 am. (For exceptions, see 11.4)
4	Restart	The controller was restarted – for example, because of a power failure. Check the date and time.
5	Date & time	This is displayed automatically after an interruption in the power supply because the date and time are to be checked and adjusted if necessary.
6	Sensor x faulty	Either the sensor, the sensor input on the controller or the connection is/was faulty (resistance table on page 5)
		The temperature on the collector set in menu 6.3.1 is/was exceeded.
		The solar pump is/was in operation between 11 pm and 4 am. (For exceptions, see 11.4)
7	System circulation	This error is indicated if a flow has been measured for a minute without one of the pumps switched on.

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11.2 Faults / Error Messages on the Controller



If the controller detects a malfunction, the red light (LED) lights and the warning symbol is shown on the display. If the fault no longer applies, the warning symbol changes to an information symbol and the red light stops flashing. Further information on the fault can be obtained by pressing the key under the warning or information symbol.



LED flashes + warning symbol

Fig. 11-1: Display of the controller showing the warning symbols

No.	Description	Possible cause	Countermeasures
1.	Red LED flashes Sensor 1 ... 3 is displayed	Sensor / temperature sensor is not correctly installed or is faulty	Check if the sensor is correctly installed in the terminal strip of the controller and has sufficient contact → Section 6. Check if the sensor is correctly installed on the corresponding pipe and has sufficient contact → Section 6. Check if the sensor is displaying plausible values (→ cf. temperature resistance table in Section 3.3). Replace the sensor if necessary → Section 6.
3.	Red LED flashes Sensor is faulty: 5 is displayed	Impermissibly high volume flow. If the maximum permissible volume flow of 40 l/min. is exceeded, the volume flow temperature sensor may be damaged.	Check whether the maximum permissible volume flow can be exceeded. Protect the station against impermissible excess volume flow.
3.	Red LED flashes Sensor is faulty: 5 is displayed	Impermissibly high volume flow. If the maximum permissible volume flow of 40 l/min. is exceeded, the volume flow temperature sensor may be damaged.	Check whether the maximum permissible volume flow can be exceeded. Protect the station against impermissible excess volume flow.

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11.3 Replacement of Fuse on the Controller



CAUTION

Danger of material damage!

Only the spare fuse provided in the controller housing or a similar fuse compliant with the specification T2A 250V is permitted to be used. The information stated in Section 6 must be observed.



A broken fuse is generally caused by an external source such as a faulty pump. The controller must not be taken into operation again until the source of the fault has been resolved (e.g., by replacing the pump). The requirement for restarting the controller is an examination for the correct function of the switching outputs in manual mode (see Section 8.2.4).

If the controller has no function or display although mains power is available, it is possible that the internal device fuse is broken. In this case, open the device, remove the old fuse, check it and replace the broken fuse by a new one.

Sicherung / Fuse

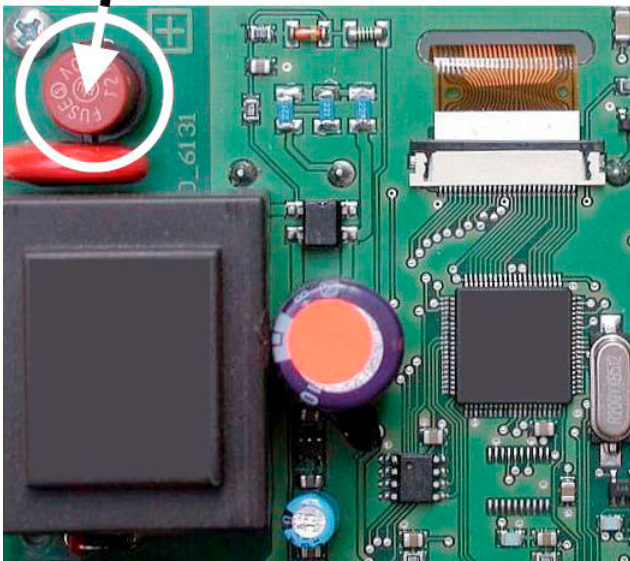


Fig. 11-2: Position of the fuse in the controller

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12. Standards

A list of applicable standards can be found in the FL 71 MegaSphere Technical Information.

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