THERMITAL MODEX SOL 50

DESCRIPTION

The **SOL 50** is a separation module incorporating a plate heat exchanger, used in systems where energy is supplied to two hot water buffer storage cylinders — or at two different heights to a single buffer cylinder — by a solar heating system equipped with arrays of collectors. The electronic control system governs the revolutions (0-10 V speed control function) of the high efficiency pump on the primary circuit so as to ensure optimum exploitation and management of the energy produced. The secondary circuit is equipped with an electronic flow meter displaying the flow rate and allowing computation of the amount of heat exchanged. Supplied complete with thermal insulation, the **SOL 50** is prewired, tested and ready for use.

CONTENTS OF THE KIT

	Description	Qty
1	Solar module with packing	1
2	Instruction manual	1

GENERAL SAFETY INFORMATION AND PRECAUTIONS

READ THIS MANUAL WITH CARE BEFORE COMMENCING ANY OPERATION ON THE PRODUCT.
The manufacturer reserves the right to make changes to the product at any time and without notice, in the interests of reflecting technological progress and responding to specific production, installation and positioning requirements. Accordingly, whilst the illustrations published in this manual may differ slightly from the product in your possession, all aspects of safety and information regarding the product remain guaranteed.
This manual is an integral part of the product and should be kept in such way as to ensure that it stays intact and can continue to be consulted throughout the service life of the module. It should always accompany the product and be preserved with care to enable further consultation, even in the event that the module may be sold or transferred to another owner, or left in place when moving away from the property where it is installed, so as to remain available to the new owner of the property or to service technicians.

GENERAL SAFETY INFORMATION

INSTALLATION

Before commencing any work on the product, make certain it is isolated from the mains power supply.
The product must be installed in conformity with the laws and standards applicable in the country of installation.
The liability of the manufacturer is limited to the supply of the product. The product must be installed in accordance with industry standards and with these instructions, adopting best professional practices, by suitably qualified persons working for a company that will assume full responsibility for the completed installation

The manufacturer cannot be held responsible for consequences deriving from the unauthorised modification of the product or from the use of non-original spare parts.

⚠ Do not expose the product to the elements. It is not designed for use outdoors

ELECTRICAL CONNECTIONS

The system must be installed and connected by persons qualified under current statutory regulations.
Connect the power cable of the system to a two pole switch complete with fuses (power supply 230Vac 50Hz).
It is indispensable that the system be properly connected to earth.

⚠ The control unit must be connected on the upstream side to the mains supply by way of a main differential switch in accordance with current regulations. The correct operation of the control unit is guaranteed only when used in conjunction with the motor for which it was designed and built. The manufacturer acknowledges no liability for improper use of the control unit.

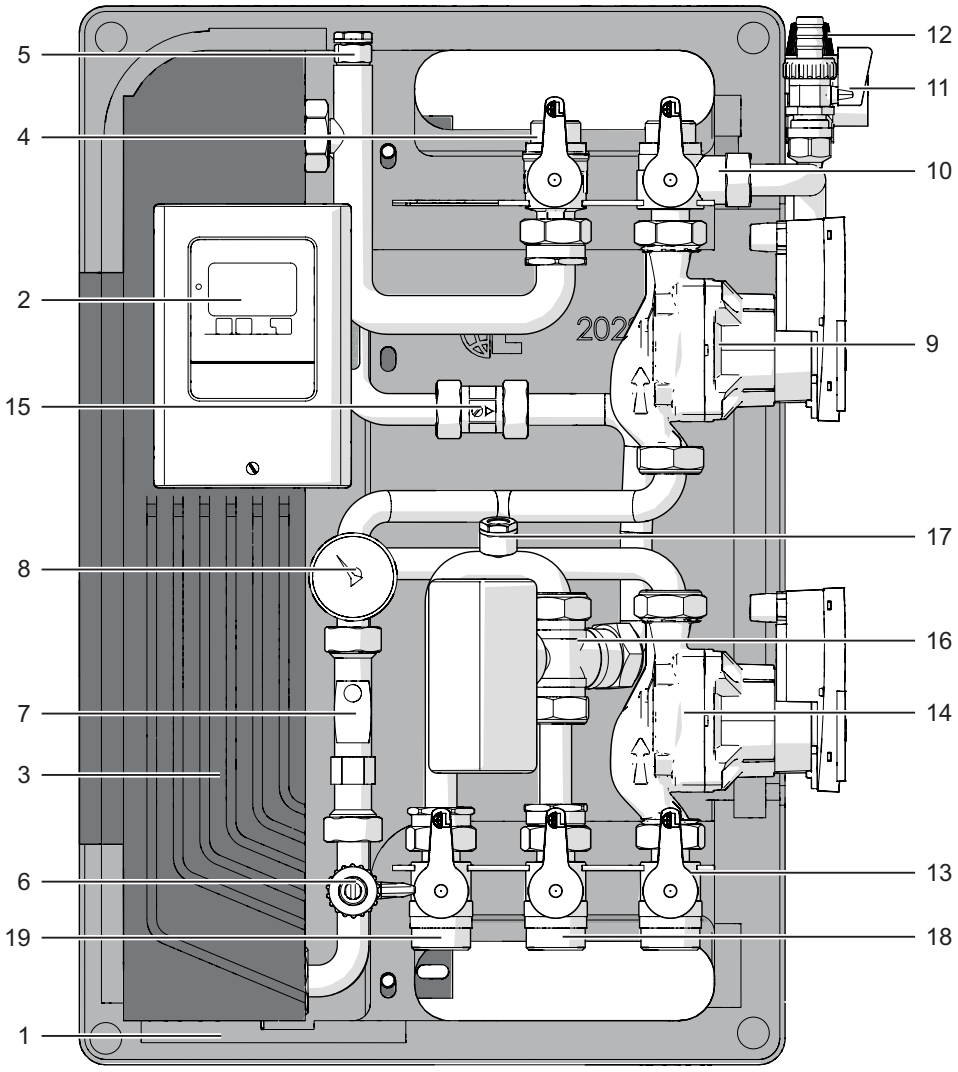
WATER CONNECTIONS

Having transported/handled the module into position, proceed to tighten all the ring nuts of the various pipe fittings.

Take particular care when connecting the module to the water system: during the step of tightening the pipe that connects the water supply, the torque applied to the ring nut must be counteracted by applying a second wrench to the fitting, so that the copper pipes of the module will not be strained and damaged.

⚠ All installation, connection and testing operations must be entrusted to skilled professionals who can be relied upon to observe current standards and follow the instructions given in the accompanying manual. **N.B. All pipelines must be insulated in accordance with statutory regulations.**

In any event, it is fundamentally important to observe certain general rules when using the product:
- Do not touch hot parts of the equipment, such as water inlet and outlet pipelines. Any contact with these parts could result in serious scalding.
- Do not splash the module with water and other liquids.
- Do not stand or place any extraneous object on the module.
- Do not expose the module to steam rising from a cooker or hob.
- Do not allow children and inexpert persons to use the module.
- Do not touch the module with wet or damp body parts and/or bare feet.
- Do not tug or pull electrical cables.



1 EPP insulation
2 Electronic controller
3 Heat exchanger

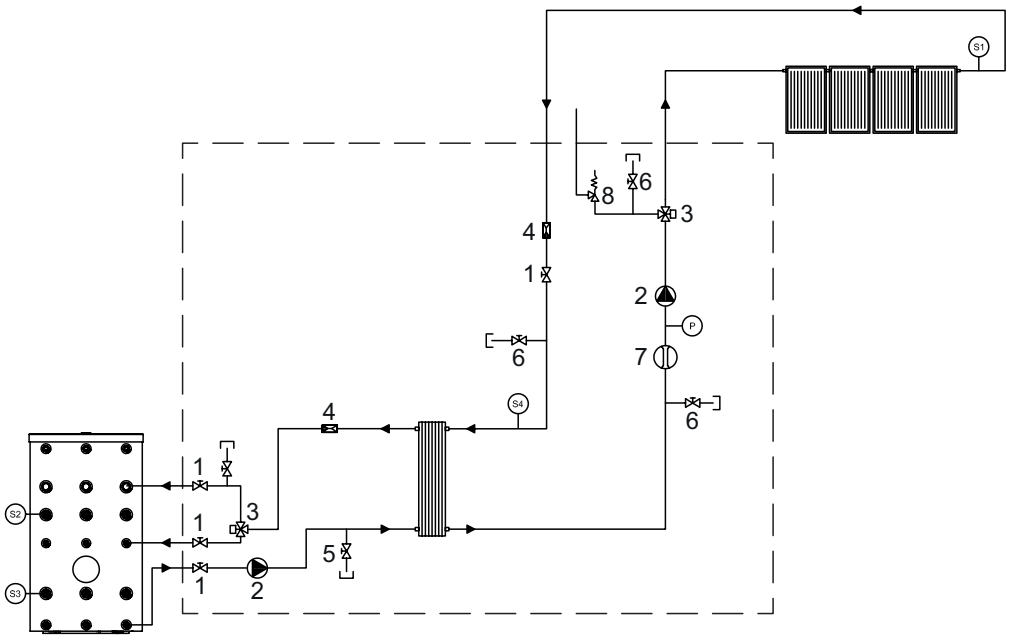
PRIMARY SIDE

4 Ball valve, primary circuit flow
5 Vent valve
6 Filling/drain cock
7 Flow meter with temperature gauge
8 Pressure gauge
9 Pump
10 3-way valve, primary circuit return
11 Solar circuit filling/drain cock
12 Safety valve

SECONDARY SIDE

13 Secondary circuit flow valve
14 Pump
15 Non-return valve
16 Motorised diverter valve
17 Vent valve
18 Return valve, storage 1
19 Return valve, storage 2

WATER CIRCUIT

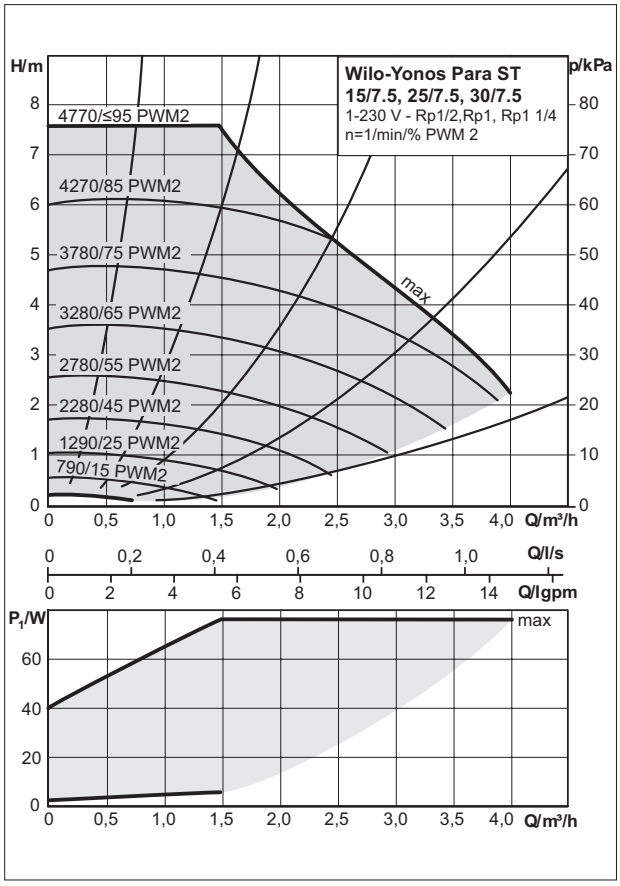


1 Two way valve
2 Pump
3 Three way diverter valve
4 Non-return valve
5 Cock with cap
6 Manual vent valve
7 Flow meter with temperature gauge
8 Solar circuit safety valve

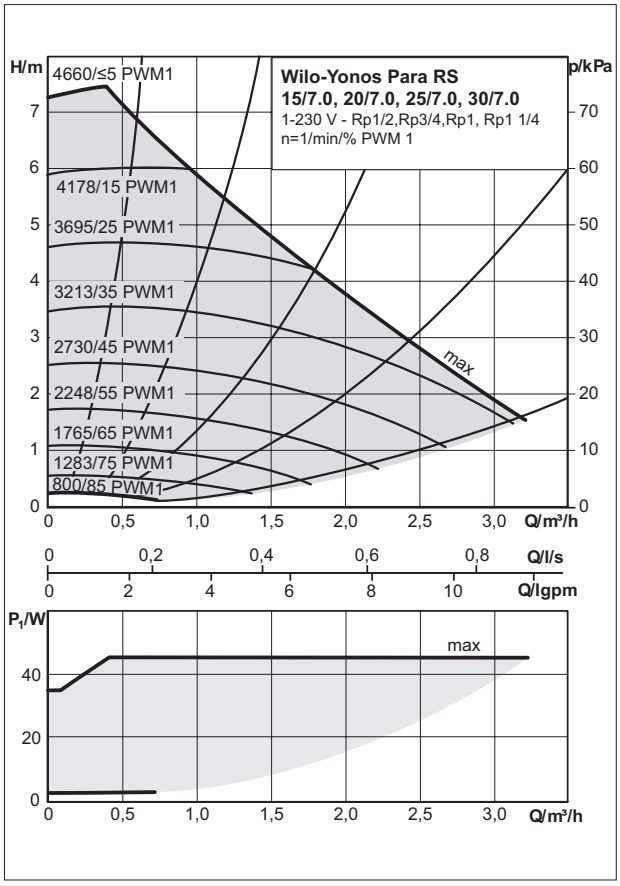
TECHNICAL SPECIFICATIONS

DESCRIPTION	SOL 50	
Thermal power exchanged	32	kW
Maximum flow rate, primary circuit	1500	l/h
Maximum flow rate, secondary circuit	19,2	l/min
Primary circuit ΔT	20,0	°C
Primary circuit in/Secondary circuit out ΔT	4,0	°C
Surface area of panels	50	m^2
Minimum permissible temperature	2	°C
Maximum operating temperature	110	°C
Maximum operating pressure, primary side	10	bar
Non-return valve opening pressure, primary circuit	45	mbar
Non-return valve opening pressure, secondary circuit	20	mbar
Absorbed electric power, primary circulator (max/stand-by)	38 / 1	W
Absorbed electric power, second circulator (max/stand-by)	23 / 1	W
Absorbed electric power, solar controller (stand-by)	0,5	W
Energy efficiency, solar controller	1	%
Power supply voltage	230	V
Power supply frequency	50-60	Hz
Ingress protection	40	IP
Net weight	22,8	kg
Water volume	6,8	l

PRIMARY CIRCUIT

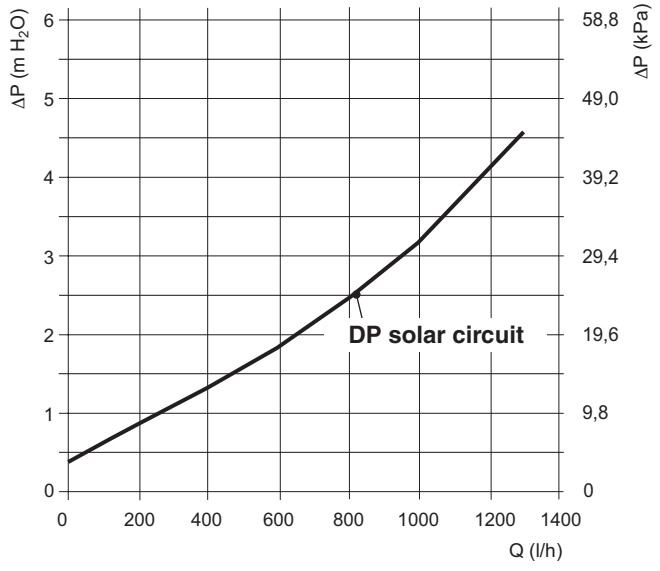


SECONDARY CIRCUIT

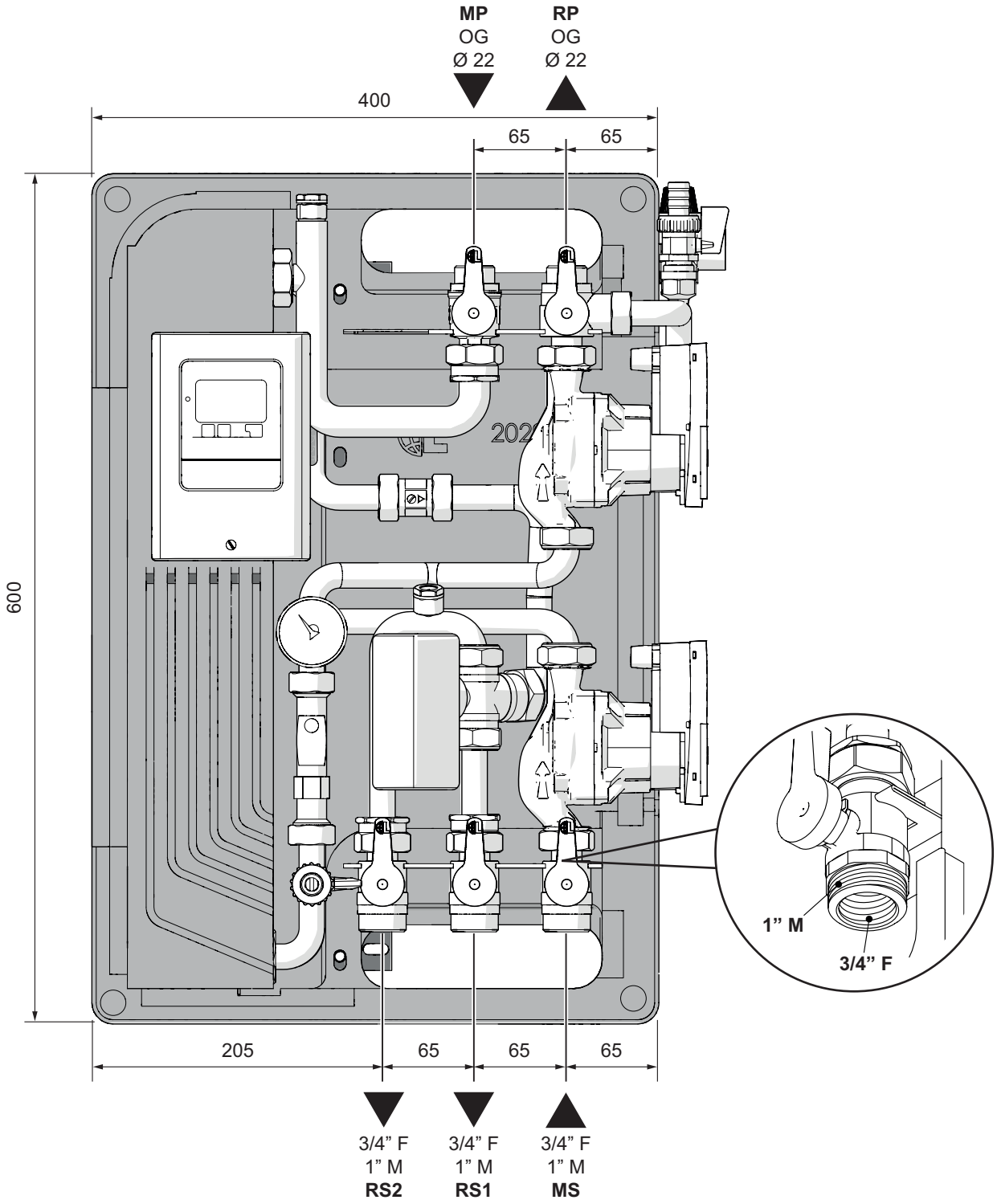


NB: The correct operation of the module is guaranteed only if the flow temperature of the primary circuit is at least 5 °C higher than the selected DHW temperature set point.

Primary circuit pressure drop



DIMENSIONS AND FITTINGS



MP - Primary circuit flow	compression fitting, Ø 22 mm pipe
RP - Primary circuit return	compression fitting, Ø 22 mm pipe
MS - Secondary circuit flow	1" M - 3/4" F
RS1 - Secondary circuit return 1	1" M - 3/4" F
RS2 - Secondary circuit return 2	1" M - 3/4" F

WIRING DIAGRAM

The controller operates with Pt1000 temperature sensors guaranteeing precision measurement and consequently optimum use of the functions provided by the system.

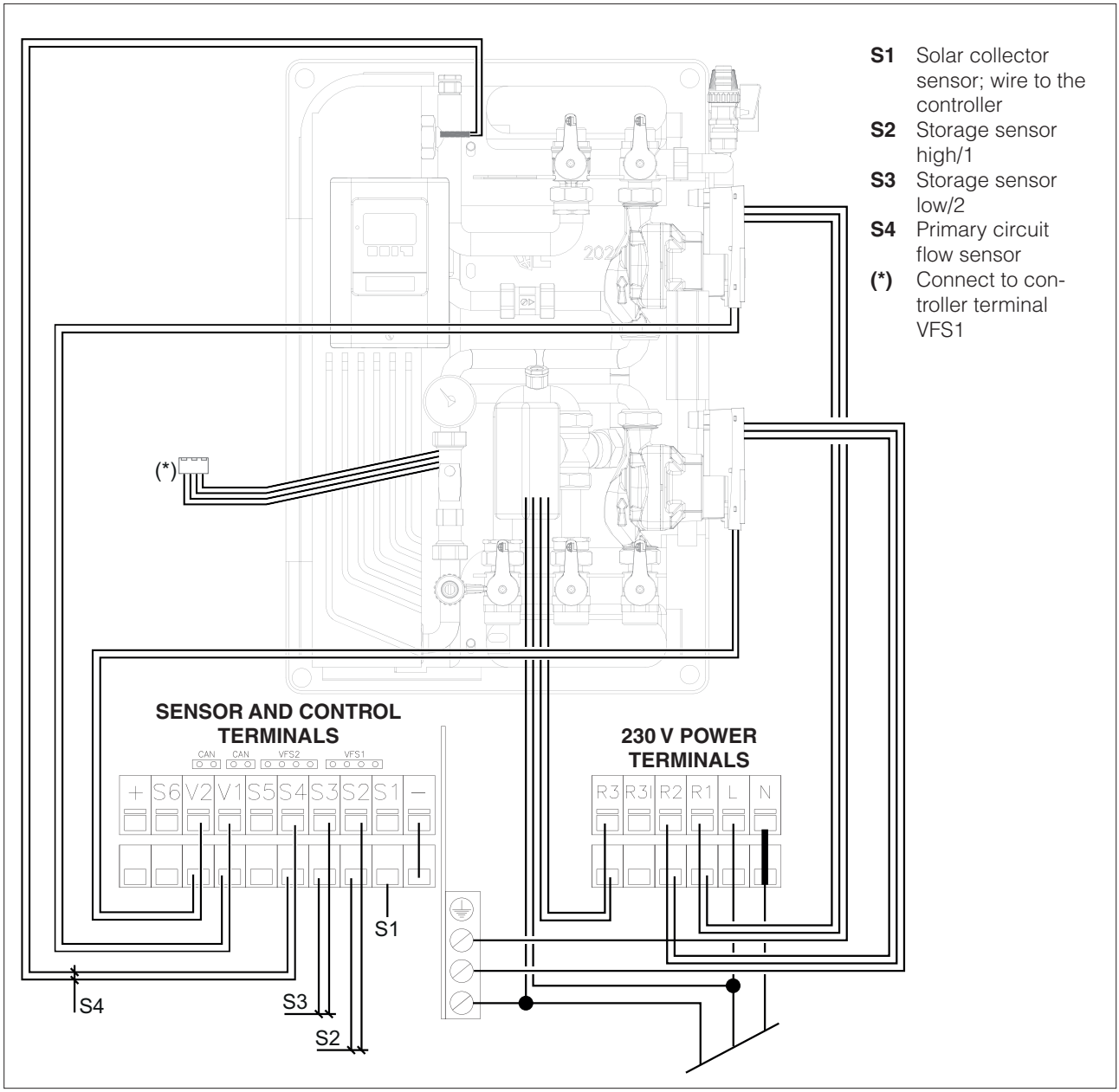
⚠ The cables of temperature sensors must be routed separately from the electrical power cables — for example, not through the same conduit.

⚠ The cable of sensor S1 is supplied as standard measuring 2 metres in length. In the event that the sensor cable needs to be longer, observe the following directions.

⚠ The cables of sensors S1 and S5 can be extended to a maximum length of 30 m, using a conductor of at least 2x1 mm2 section. The cables of sensors S2, S3, S4 and S6 can be extended to a maximum length of 10 m, using a conductor of at least 2x0.75 mm2 section. Make certain there is no contact resistance!

⚠ Position the sensor exactly in the area where the measurement is required! Use only immersion, pipe mounted or flat mounted sensors suitable for the specific area of application and compatible with the permissible temperature range.

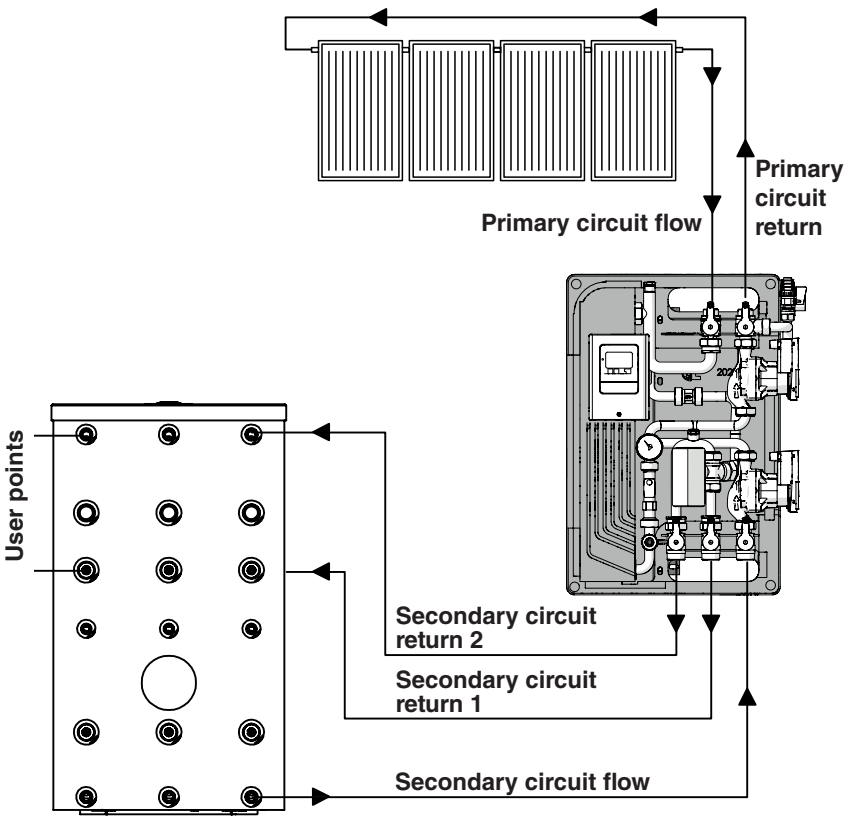
⚠ Connect the Vortex Flow Sensor with the matching jacks. It is advisable to install the flow sensor on the return line, as the component could otherwise be damaged. When installing the VFS, check that the correct flow direction is observed!



S1 Solar collector sensor; wire to the controller
S2 Storage sensor high/1
S3 Storage sensor low/2
S4 Primary circuit flow sensor
(*) Connect to controller terminal VFS1

ENGLISH

SYSTEM LAYOUT



INSTALLATION

PRELIMINARY CHECKS

Before commencing any operation, remove the product from the packing with care and check that it is perfectly intact. If the product is found to be defective or damaged, do not install or attempt to repair it, but contact the dealer immediately. Dispose of discarded packaging materials in accordance with current statutory regulations.

⚠ Ensure that safety valves are clearly visible and easily accessible.

⚠ The drain line serving the safety valves must be designed and installed in compliance with current standards.

⚠ The module must be positioned in close proximity to the storage cylinder. The system is sized assuming that the length of the pipelines connecting the module and storage cylinder will be 4 metres (flow + return)

⚠ Disconnect the product from the mains power supply before commencing any work on it.

⚠ The product must be installed in conformity with the laws and standards applicable in the country of installation

⚠ The liability of the manufacturer is limited to the supply of the product. The product must be installed in accordance with industry standards by suitably qualified persons working for a company that will assume full responsibility for the completed installation

ASSEMBLY AND START-UP

Bear in mind the following before installing the product:
- Read through the instructions for use in their entirety, paying particular attention to the section on safety and precautions.
- The product is not designed to be operated by children or persons with limited physical, psychological, sensorial or mental capacities
- The installation must comply with all applicable laws and standards.

⚠ Installation and connection of the product must be performed by an authorised, specialist company. The company installing the product assumes all responsibility for ensuring that the installation and functioning of the product conform to applicable standards.

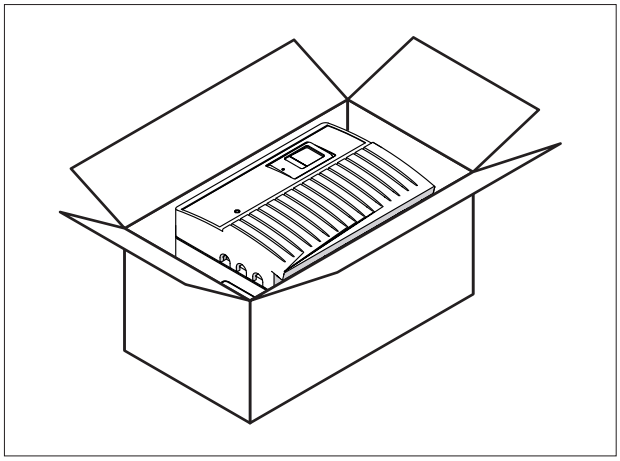
⚠ The product must be stored in a dry place, protected from frost. The product must be installed where it is protected against water splash. Ambient temperature in the place of installation must not exceed 40 °C during operation of the product.

⚠ It is advisable to install the product as near as practically possible to the storage cylinder, in order to avoid unnecessary heat loss from the connecting pipes. The product must be placed a surface that is flat and stable, as far as possible, and levelled up by means of the adjustable feet provided.

WALL MOUNTING

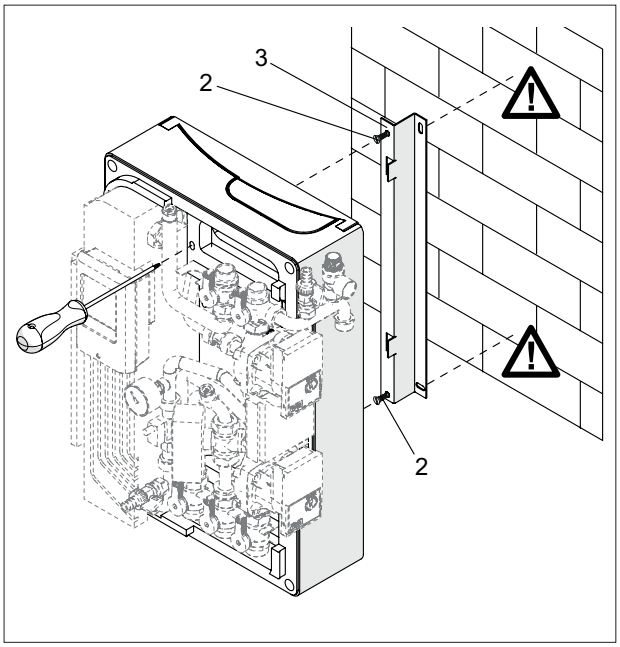
⚠ Handle with care!

Remove the product from its packing and remove the polypropylene cover.

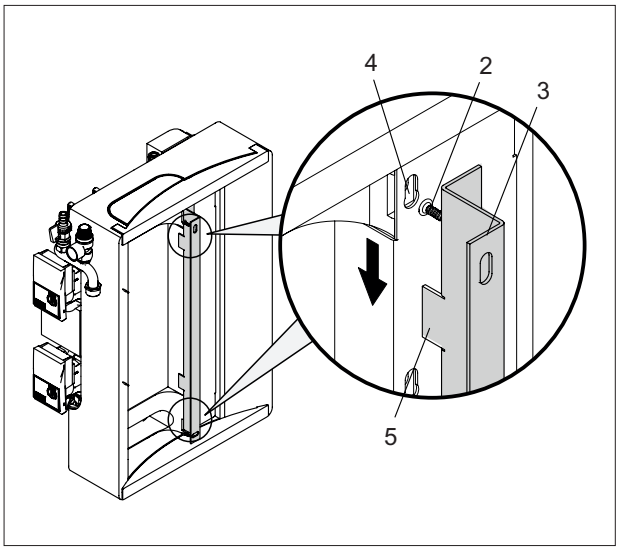


- Loosen the screws (2) and remove the mounting bracket (3) from the rear of the module.
- Fix the bracket (3) to the wall with two 12 mm masonry plugs (not provided).

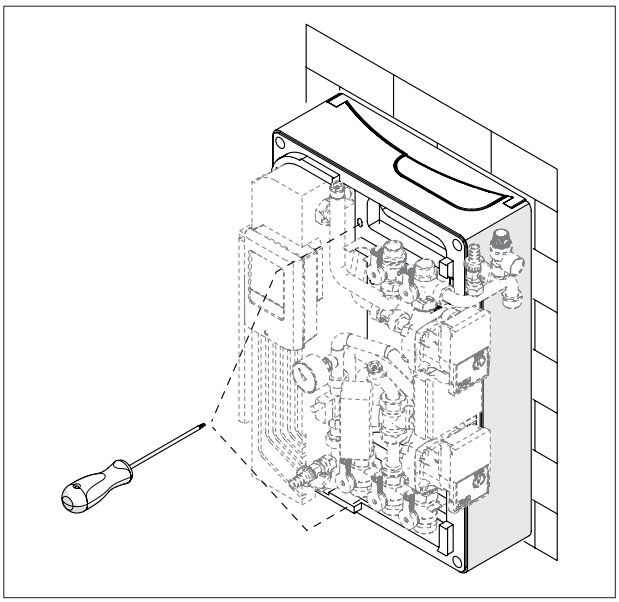
⚠ Check that the bracket (3) is positioned perfectly upright.



- Hang the module on the bracket (3), inserting the screws (2) through the slots (4) in the rear, and using the lateral guides (5) to assist positioning.
- Allow the module to slide downwards until the screws engage the top ends of the slots.



- Tighten the screws (3), accessing the heads from the front of the module.



WATER CONNECTIONS

- The pipelines connecting with the storage cylinder must be as short as possible!
- The recommended pipe material is steel or copper. When assembling pipelines and fittings, always observe the installation sequence indicated, so as to avoid electrochemical corrosion.
- The collector circuit expansion vessel must be installed using a direct connection.
- Tighten the fittings only when the pipelines are hermetically tight. In any event, be careful not to tighten or apply any forcing action to preassembled components and couplings of the module!

⚠ The product must not be installed in natural circulation heating systems!

⚠ The installation of isolating valves (except for pressure regulators such as sealable closure valves) is not permitted!

It is also important to check that all screw-threaded connections are secured at the correct tightening torque (fittings can work loose during transport!)

ELECTRICAL CONNECTIONS

Internal electrical components of the module are factory wired. The connection to the a.c. mains supply (230 VAC, 50 Hz) is made from the ready-wired power terminals.
The storage sensors are positioned at the selected measuring points in the cylinder and, similarly to the solar collector sensor supplied with the product, connected to the corresponding terminals at the controller.
More detailed information on the controller incorporated into the module will be found in the instructions accompanying the device.
Any work on current-carrying components of the module must be carried out strictly in compliance with the directions of the energy utility and with statutory regulations currently in force.

START-UP

⚠ Use only water that has been treated in accordance with current regulations. All pipelines must be made condensation-proof.

The system must be filled and started up by a specialist company and by an approved service technician. With these conditions met, proceed to check the operation and leak-tightness of the entire system, factory-assembled components included. The operation of the safety valve must be tested at regular intervals. It is recommended that the system be serviced annually by a specialist company. When flushing the system, the ball valves on the inlets and outlets of the module should be opened slowly to avoid pressure surges. When filling the collector circuit, use the fittings provided for flushing purposes.

Having completed the filling operation, close the collector return line and set the system pressure to 3 bar approx (the level specified for expansion vessels precharged at 2.5 bar; the static height of the system must also be taken into account).

⚠ Make certain that mains power is safely disconnected before opening the cover of the controller!

⚠ Do not fill the system in strong sunlight as this could trigger vapour explosions!

FILLING PROCEDURE

Filling and flushing must continue until it is certain that the system has been completely purged of air!
If flow noises are audible during operation of the collector pump, this indicates that there is residual air in the system, which must be bled out manually by operating the relative vent valve.

⚠ Before commencing the fill and flush procedure, read the following directions carefully.

SOLAR (COLLECTOR) SIDE

- The solar circuit must be filled using only a mixture of water and suitable glycol (freeze-resistant down to at least -25 °C).
- Before flushing and filling the system, make certain that all fittings (solar circuit flow/return, etc.) are equipped with the

requisite seals and correctly fastened.
- Open the flow valve of the primary circuit.
- Open the 3-way valve of the primary circuit return in the direction of the fill cock.
- Open the drain cock.
- Begin filling/flushing the primary circuit using an external pump connected to the fill cock.
- Close the drain cock when liquid begins to emerge from the circuit.
- Position the 3-way valve at 45°.
- Set the controller for operation in manual mode (see parameter 3.2), activate the pump on the primary circuit side, and purge the system of air once again using the manual vent valve, until the liquid emerges free of bubbles.
- Position the 3-way valve open to the solar circuit.
- Set the controller for operation in automatic mode (see parameter 3.1).
- Disconnect the external filling pump.

STORAGE SIDE

- When filling the storage cylinder circuit and the cylinder itself, use only water for heating purposes, as specified by current standards.
- Before connecting the pipelines from the solar module, close the ball valves of the solar circuit (positioning the lever in the direction opposite to the arrow).
- Before commencing the filling procedure, make certain that all fittings are equipped with the requisite seals and correctly fastened.
- First, open all cocks on the storage cylinder connection pipelines.
- Now open the cocks on the solar module.
- When flow noises can no longer be heard, switch on the pump of the storage circuit by hand.
- Allow the pump to run for a few minutes. Switch the pump off again.
- Bleed the storage cylinder of air and fill with heating water.
- The storage circuit is now full and ready for operation.

USE AND FUNCTIONS OF THE CONTROLLER



CE Declaration of conformity
Applying the CE mark to the controller, the manufacturer guarantees that the LTDC4 is in conformity with the following directives:
- Low Voltage Directive2006/95/EC
- Electromagnetic Compatibility Directive 2004/108/EC

The conformity of the product has been tested and the pertinent documentation and CE declaration of conformity are conserved by the manufacturer.

General instructions. Be certain to read the following!
This technical documentation and the accompanying installation and operating instructions contain basic information and important indications regarding safety, installation, setting, maintenance and optimum use of the controller. Accordingly, the following instructions must be read and understood by the technician and by the user of the system before installing, setting and operating the controller. All accident prevention directives, IEC standards, local power utility regulations, pertinent EN standards and installation and operating instructions accompanying system components must also be observed. The controller must on no account be seen as a substitute for safety measures that must be taken by the user!
Installation, electrical connection, setting and maintenance of the controller must be carried out only by expert service technicians in possession of the requisite knowledge. Always keep these instructions in the vicinity of the controller.

Changes to the controller
If changes are made to the controller, the safety and functionality both of the controller and of the entire system may be adversely affected:
- Changes, additions to or conversion of the unit are forbidden unless written permission is obtained from the manufacturer
- It is also forbidden to install additional components that have not been tested in conjunction with the controller
- If safe operation of the controller cannot be guaranteed, for example by reason of damage to any component part, then switch it off immediately and have it repaired/replaced
- Any component or accessory of the controller that is not in perfect condition must be replaced immediately
- Use only original parts and accessories supplied by the manufacturer.
- The manufacturer's name plate and other factory marks applied to the controller must not be altered, removed or made illegible
- Only the settings described in these instructions are able to guarantee the correct operation of the controller.

DESCRIPTION OF THE CONTROLLER

About the controller
The LTDC4 Temperature Difference Controller enables efficient use and operational control of a solar or heating system. For each of the single setting procedures, the keys are assigned to specific functions and explained.
The controller menu contains key words for the measured values and settings, as well as help texts and graphs.
The LTDC4 can be used as a temperature difference controller for a number of system variants.
At the time of the product being supplied, all the above parameters are factory set at default values; these can be reprogrammed, by an expert service technician, according to the demand at the point of use. The controller menu contains key words for the measured values and settings, as well as help texts and graphs.
Main features of the LTDC4:
- Backlit display showing text and graphic content
- Simple viewing of current measurement values
- Analysis and monitoring of the system by means of statistical graphs, etc.
- Extensive setting menus with explanations
- PWM and 010V output
- Menu lock: activated to prevent unintentional alteration of settings
- Function allowing restoration of previously selected values or factory settings
- Wide range of additional functions.

Disposal
The controller conforms to the European RoHS directive 2002/95/EC regarding restrictions on the use of certain hazardous substances in electrical and electronic equipment.

⚠ Never under any circumstances dispose of the controller with ordinary household refuse. Dispose of the controller only at designated collection points or return it to the dealer or manufacturer.

TECHNICAL SPECIFICATIONS

Electrical specifications

Voltage.....230VAC +/- 10%
Frequency .....50...60Hz
Current draw.....2VA

Contact capacity

- electronic relay R1 . . . . . min.20W / max.120W for AC3
- electronic relay R2 . . . . . min. 5W / max. 120W for AC3
- mechanical relay R3 . . . . . 460VA for AC1 / 185W for AC3
- PMV output . . . . . for 10 kΩ load

Internal fuse. . . . . 2A slow-blow 250V
Ingress protection IP40
Protection class II
Sensor inputs. . . . . 6 x Pt1000 + 2 x Vortex Flow Sensor (VFS)
Measuring range . . . . . PT 1000 -40°C up to 300°C
Vortex sensor. . . . . 0°C to 100°C (-25°C /120°C short term)
. . . . . 1 l/min - 12 l/min (VFS1-12)
. . . . . 2 l/min - 40 l/min (VFS2-40)
. . . . . 5 l/min - 100 l/min (VFS5-100)
. . . . . 10 l/min – 200 l/min (VFS10-200)

Permissible ambient conditions

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

Air humidity:
- for controller operation . . . . . max. 85% relative humidity at 25 °C
- for transport/storage . . . . . no moisture condensation permitted

Other specifications and dimensions

Housing . . . . . 3-part, ABS plastic
Overall dimensions . . . . . 163mm x110mm x 52mm
Installation aperture dimensions . . . . . 157mm x 106mm x 31mm
Display. . . . . Full graphic display, 128 x 128 pixels
Led . . . . . Multicolour red/green
Programming. . . . . 4 entry keys

Temperature sensors

Collector or boiler sensor .....Pt1000, e.g. TT/S2 up to 180°C
Storage cylinder sensor .....Pt1000, e.g. TR/P4 up to 95°C
Pipe-mounted sensor .....Pt1000, e.g. pipe-mounted sensor TR/P4 up to 95 °C
Sensor distance.....Pt1000: 2x1mm^2 up to 30m max.

Temperature–resistance table for Pt1000 sensors

°C	0	10	20	30	40	50	60	70	80	90	100
Ω	1000	1039	1077	1116	1155	1194	1232	1270	1308	1347	1385

SYSTEM VARIANTS

⚠ The following layout drawings are provided purely as a guideline to the various water systems possible, and in no way intended as complete.

⚠ Never replace the controller if there is no need.

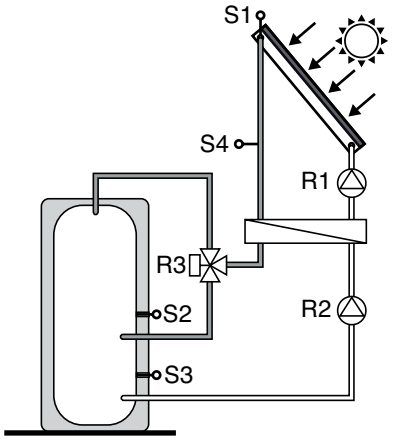
⚠ Certain specific applications may require the inclusion of additional system components for operational and/or

safety purposes, such as, for example, shut-off valves, non-return valves, temperature control devices, anti-scald devices, etc., and these must therefore be provided.

The layouts that can be adopted in the case of the SOL 50 are number 26 and number 27, illustrated in the figures below.

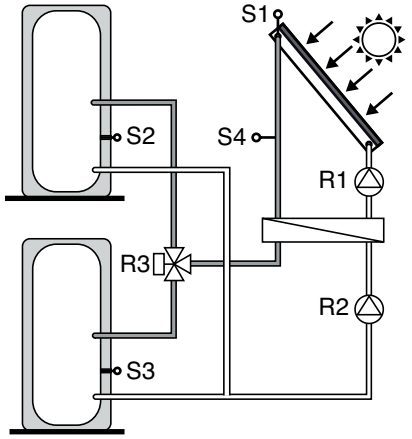
Layout 26

S1 Collector
S2 Storage high
S3 Storage low
S4 Heat exchanger
R1 Solar circuit pump
R2 Secondary circuit pump
R3 Three way valve



Layout 27

S1 Collector
S2 Storage 1
S3 Storage 2
S4 Heat exchanger
R1 Solar circuit pump
R2 Secondary circuit pump
R3 Three way valve



DISPLAY AND PROGRAMMING

Display
The display (1), with full text and graphics mode, is self-explanatory to all intents and purposes, making the controller easy to use.

The LED (2) lights up green when a relay is activated.

The LED (2) lights up red when the operating mode is "Off".

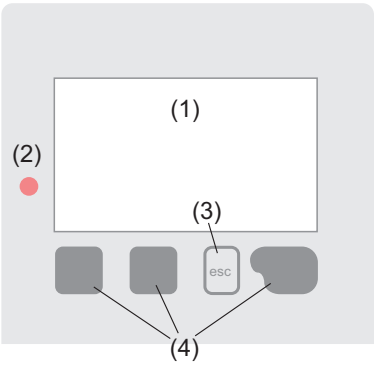
The LED (2) blinks red slowly when the operating mode is “Manual”.

The LED (2) blinks red fast when an error occurs.

Commands are entered using four keys (3) and (4), which are assigned context-sensitive functions. The “esc” key (3) is used to cancel a command or exit the current menu. When changes have been made and are applicable, the controller will prompt for confirmation to save.

The function of each of the other three keys (4) is shown in the display line immediately above; the right-hand key is generally used to confirm and select input data.

Examples of key functions
+/- = increase/decrease values
▼/▲ = scroll menu up/down
yes/no = confirm/cancel
Info = additional information
Back = return to previous screen
ok = confirm selection
Confirm = confirm setting

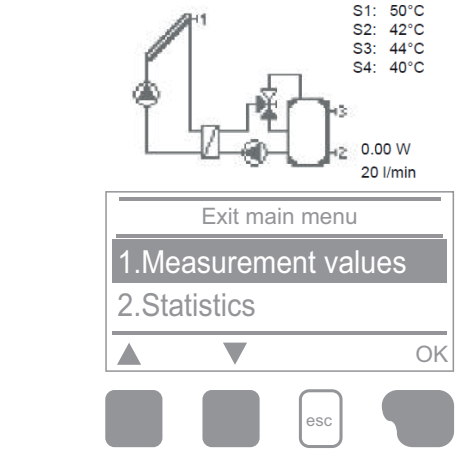


Meaning of symbols in the display:

- Pump (revolves with pump in operation)
- Valve (black indicates flow)
- Collector
- Storage
- Pool
- Temperature sensor
- Heat exchanger
- Buffering pause (buffering time)
- Warning / error message
- New info available
- Data saving active

Other symbols ca be found on “Special functions” chapter

Menu sequence and menu structure
Graphics or "overview” mode will appear if no key is pressed for a period of 2 minutes, or if "esc" is pressed to exit the main menu.



Pressing any key in graphics or overview mode, the main menu reappears. The following menus are available:

1. Measurements	Current temperature values with explanations
2. Statistics	General system control information, including hours operation, etc.
3. Operating mode	Automatic mode, manual mode, or controller Off
4. Settings	Management of parameters required for normal operation
5. Protections	Protection against solar radiation and frost, recooling, seizing, etc.
6. Special functions	Program selection, sensor calibration, clock, additional sensor, etc.
7. Menu lock	Protection against unintentional setting changes at critical points
8. Service data	For diagnosis in the event of errors occurring
9. Language	Language selection

SETUP WIZARD



The first time the controller is switched on, once the language and the clock are set, a prompt will appear asking whether or not the setup wizard is required. The wizard can be called up again at a later time if needed, from the special functions menu. The wizard will guide the user through the basic settings in the correct sequence, providing a brief description of each parameter displayed. Pressing “esc” once, the screen returns to the previous value, so that it is always possible to go back or make changes. Pressing “esc“ repeatedly, the steps of the selection procedure can be undone one by one, without confirming the wizard input. Finally, accessing menu 4.2 and selecting “Manual” mode, the installer can test the various outputs with the components connected, and verify whether or not the readings from the sensors are reliable. Thereafter, automatic mode is activated.

⚠ Observe the indications for individual parameters given on the following pages, and check whether or not further settings are needed for the particular application.

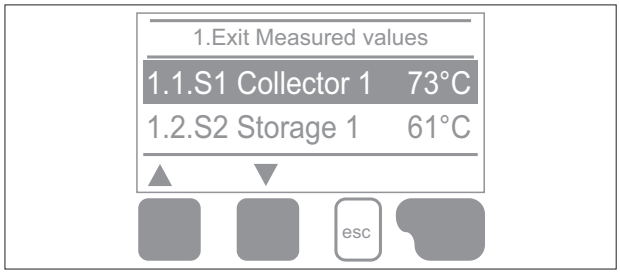
FREE PROGRAMMING

If the intention is not to use the setup wizard, be sure to observe the following sequence when making the settings:
- Menu 9. Language
- Menu 6.15. Time and date
- Menu 6.1 Program selection
- Menu 4. Settings
- Menu 5. Protection functions, if necessary
- Menu 6. Special functions, if necessary

Finally, accessing menu 3.2 and selecting “Manual” mode, proceed to test the various outputs with the components connected, and verify whether or not the readings from the sensors are reliable. This done, automatic mode can be activated.

⚠ Observe the indications for individual parameters given on the following pages, and check whether or not further settings are needed for the particular application.

1. MEASUREMENT VALUES

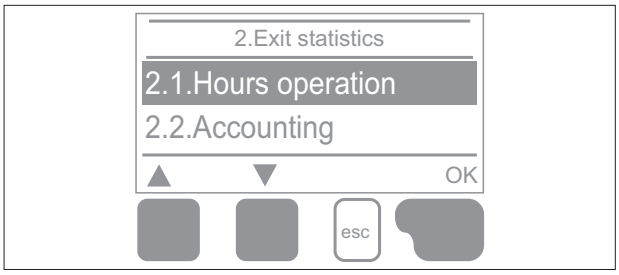


Menu “1. Measurement values” indicates the current temperatures measured. Quit the menu by pressing “esc” or selecting “Exit Measurements”. Selecting “Info”, a short message will appear explaining the measurement values. To quit the Info menu, select “Overview” or press “esc”.

⚠ If “Error” appears in the display instead of the measurement value, this could mean that there is a temperature sensor either faulty or not connected properly.

If the cables are too long or the sensors not positioned correctly, there could be minor deviations in the measurement values. In this instance, the values displayed can be compensated by making adjustments via the controller. The temperature measured is the temperature at the outlet of the heat exchanger, which could differ from that measured at the user points. Small fluctuations in temperature at the user points are compensated generally by mixing water from the main.

2. STATISTICS



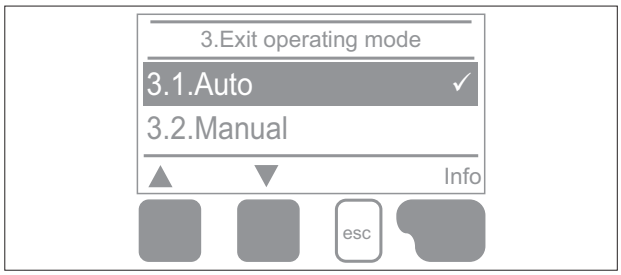
Use menu “2. Statistics” for function control and long-term monitoring of the system.
To quit the Statistics menu, press “esc” or select “Exit statistics”.

⚠ To run analyses on system data, the time must be set correctly at the controller.

⚠ Remember that in the event of a power failure occurring, the clock must be reset. An unsuitable setting or a clock error can cause data to be deleted, recorded incorrectly, or overwritten. The manufacturer acknowledges no liability for recorded data.

2.1 Hours operation
Shows the total hours that the solar circuit pump connected to the controller has been in operation; various time ranges are available (day…year).
2.2 Accounting
Metering of heat produced by the system. See also “6.9. - Heat output”.
2.3 Graphic overview
Provides a clear overview of the data listed under heading 2.1-2.2 in the form of a bar graph. Various time ranges are available to allow comparison. Use the two keys on the left to scroll through the data.
2.4 Message log
Shows the last 20 events recorded by the system, indicating the date and time.
2.5 Reset/clear
Resets and deletes single analyses. The “all statistics” function clears all information except for error messages.

3. OPERATING MODES



Menu “3. Operating mode” allows selection of the desired mode of operation: automatic, off, or manual.
To quit the menu, press “esc” or select “Exit operating mode”.

3.1 Automatic
Automatic is the normal operating mode of the controller. Only automatic mode guarantees correct operation of the system, taking account of the current temperatures and the selected parameter settings! When restarted following a mains power failure, the controller will revert automatically to the operating mode last selected!
3.2 Manual
The relay — and the component connected to the relay contacts — are switched on or off by pressing a key, regardless of current temperatures and parameter settings. Measured temperatures are also displayed on the screen, for monitoring and control purposes.

⚠ When “Manual" mode is activated, current temperatures and parameter settings are ignored by the controller. In this situation, the system is liable to overheat and suffer serious damage. “Manual” operating mode must be used only by an expert for conducting functional tests of short duration, or when setting up the controller!

3.3 Off

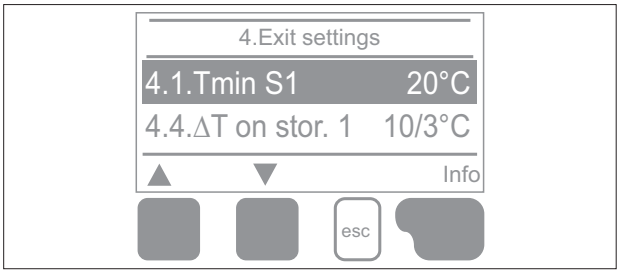
⚠ Selecting “Off” mode, all functions of the controller will be deactivated. This should be avoided normally, as it could cause the solar collector or other system components to overheat, for example. Measured temperatures continue to be displayed so that the overview remains available.

4. SETTINGS

The parameters essential to normal operation of the controller are presented in menu 4. “Settings”.

To quit the menu, press “esc” or select “Exit settings”.

⚠ The descriptions given on the following pages are applicable in general to all settings. The numbering may vary in practice.



4.1 Tmin sensor S1 = Enable/start temperature at sensor S1:
If the temperature registering at sensor S1 exceeds this value and other conditions are met, the controller will activate the associated pump and/or valve. If the temperature registering at the sensor drops by 5 °C below the setting, the controller will shut off the pump and/or valve again.
Settings range: 0 °C – 99 °C / Default: See table.

4.3 Storage priority 1
This determines the order in which the storage targets are filled. If the same priority is set for both targets, flow will not be switched until the moment when the active target can no longer be buffered.
Settings range: 1 - 2 / Default: See table.

4.4 ΔT On, storage 1 = Temperature difference for buffering storage 1
If the temperature between the reference sensors is exceeded and other conditions are also met, the controller will activate the connected relay. If the temperature drops below ΔT Off, the relay deactivates.
Settings range: ΔT On, 8 °C to 50 °C / ΔT Off, 2 °C to 14 °C / Default: See table.

⚠ If the selected temperature difference is too small, the operational effectiveness of the controller might be affected, depending on the system layout and the positioning of the sensors. Special switching functions can be introduced for speed control (see “6.3. - Speed control R1 / R2”).

4.5 Tmax sensor S2 = Shutoff temperature at sensor S2
If the temperature registering at sensor S2 exceeds this value, the controller will shut off the associated pump and/or valve. If the temperature returns below this value and other conditions are met, the controller will activate the associated pump and/or valve again.
Settings range: 0 °C - 99 °C / Default: See table.

⚠ If temperature settings are too high, this could cause scalding or damage to the system. Scalding protection must be provided by the user!

4.6 Storage priority 2
This determines the order in which the storage targets are filled. If the same priority is set for both targets, flow will not be switched until the moment when the active target can no longer be buffered.
Settings range: 1 - 2 / Default: See table.

4.7 ΔT On, storage 2 = Temperature difference for buffering storage 2
If the temperature between the reference sensors is exceeded and other conditions are also met, the controller will activate the connected relay. If the temperature drops below ΔT Off, the relay deactivates.
Settings range: ΔT On, 8 °C to 50 °C / ΔT Off, 2 °C to 14 °C / Default: See table.

⚠ If the selected temperature difference is too small, the operational effectiveness of the controller might be affected, depending on the system layout and the positioning of the sensors.

4.8 Tmax sensor S3 = Shutoff temperature at sensor S3
If the temperature registering at sensor S3 exceeds this value, the controller will shut off the associated pump and/or valve. If the temperature returns below this value and other conditions are met, the controller will activate the associated pump and/or valve again.
Settings range: 0°C - 99 °C / Default: See table.

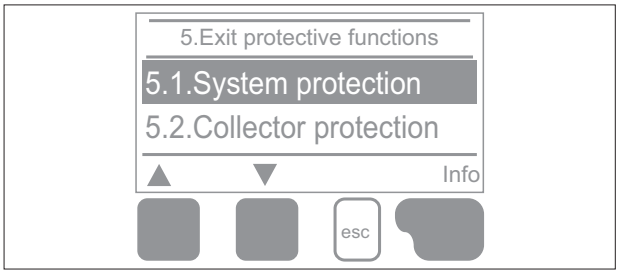
4.14 T-priority = Temperature threshold giving absolute priority
In systems with multiple buffer cylinders, the storage having the lower priority will be buffered only when the temperature threshold set at the sensor associated with the higher priority storage has been exceeded.
Settings range: 0 °C to 90 °C / Default: See table.

4.15 Buffer time = Interruption of flow to lower priority storage
The flow of water to the storage target with lower priority is shut off after a certain duration (settable), in order to establish whether or not the temperature level in the collector has increased sufficiently to begin buffering the higher priority target. If the conditions are right, the priority storage will be buffered. If not, the increase is measured (see “4.16. - Increase”) in order to establish how soon it will be possible to begin buffering the priority storage target. Settings range: 1 to 90 minutes / Default: See table.

4.16 Increase = Extension of buffering pause due to temperature increase in the collector
To allow an accurate setting of the buffering priority in systems with multiple storage targets, this menu is used to set the increase in temperature of the collector needed to ensure that the interruption of the flow supplied to the lower priority storage is prolonged by one minute.
The interruption is prolonged because it is expected that the temperature rise at the collector will allow the lower priority storage to be buffered sooner.
Once the requisite Δt conditions are established, heat will be directed to the priority storage. If the increase in temperature is less than the set value, then buffering of the lower priority storage will be enabled again.
Settings range: 1 °C to 10 °C / Default: See table.

5. PROTECTIONS / PROTECTIVE FUNCTIONS

Menu “5. - Protection / Protective functions” can be used to set and activate a number of protective functions. To quit the menu, press “esc” or select “Exit protections”.



5.1 System protection
The protection function prevents system components from overheating by shutting off the solar pump automatically. If the “SProt Ton” value is exceeded at the collector for 1 minute, the pump shuts off and stays deactivated. The pump will be reactivated when the temperature drops below the “SProt Toff” setting.
System protection - Settings range: ON, OFF / Default: See table.
SP T on – Settings range: 60 °C to 150 °C / Default: See table.
SP T off – Settings range: 50 °C to T on minus 5 °C / Default: See table.

⚠ If system protection is activated, the temperature in the collector when idle becomes particularly high; consequently there will be a rise in system pressure, accompanied by a risk of damage to the system. Pay close attention to the directions provided by the manufacturer.

5.2 Collector protection
The collector is protected against overheating. The pump switches on to transfer heat from the collector to the storage cylinder.
If “CP Ton” is exceeded at the collector sensor, the pump will be activated and continue to operate until the temperature reaches “CP Toff" or the “CP Tmax Storage” setting is exceeded at the storage or in the pool.
Collector protection - Settings range: On, Off / Default: See table.
CP T on - Settings range: 60 °C to 150 °C / Default: See table.
CP T off - Settings range: 50 °C to T on minus 5 °C / Default: See table.
CP Storage S(x) Max - Settings range: 30 °C to 140 °C / Default: See table.

⚠ If collector protection is active and the system includes both buffer storage and pool, the storage will be heated to the level “CP Storage S(x) Max” beyond Tmax S2 (see “4.2. - Tmax sensor (X)”),and this could cause scalding or damage to the system. If only a pool is connected, the pool is not used for collector protection purposes.

⚠ Protection of the system takes priority over protection of the collector. Even if the conditions for activation of the collector protection are in place, the solar circuit pump will be deactivated when the “SP T on” is reached.

5.3 Recooling
In system variants with solar panels, when the cooling function is activated, excess thermal energy in the storage cylinder is returned to the collector. This will occur only if the temperature in the cylinder is higher than the “Recool Tsetpoint” setting and the temperature at the collector is at least 20 °C lower than in the cylinder, and before the storage temperature

has dropped below the “Recool Tsetpoint” setting. In systems with two storage cylinders, the setting is applied to both cylinders.
Recooling - Settings range: On, Off / Default: See table.
Recooling Tref - Settings range: 0 °C to 99 °C / Default: See table.

⚠ Whenever the Recooling function is active, energy will be lost through the collector! Recooling should become active only when the demand for heat is low, for example during prolonged absences / holidays.

5.4 Frost protection
A two-stage frost protection function can be activated. In stage 1 the controller activates the pump for one minute every hour if the collector temperature falls below the setting “Frost stage 1”. If the collector temperature drops further to “Frost stage 2”, the pump will be activated and kept running continuously by the controller. If the collector temperature then returns to a level 2 °C higher than “Frost stage 2”, the pump will shut off again.
Frost protection: Settings range: On, Off / Default: See table.
Frost stage 1: Settings range: -25 °C to 10 °C or off / Default: See table.
Frost stage 2: Settings range: -25 °C to 8 °C / Default: See table.

⚠ When frost protection is active, energy will be lost through the collector! The function is normally not activated for systems with antifreeze. Observe the directions regarding the operation of other system components!

5.5 Seizing protection
If seizing protection is active, the controller switches on the relay and the connected components for 5 seconds every day at 12:00 (“daily” setting), or every Sunday at 12:00 (“weekly” setting), in order to prevent the pump and/or the valve from sticking after a lengthy idle period.
Settings range R1: daily, weekly, off / Default: See table.
Settings range R2: daily, weekly, off / Default: See table.
Settings range R3: daily, weekly, off / Default: See table.

5.6 Collector alarm
If the temperature registering at the collector sensor exceeds this value when the solar pump is in operation, a warning or error message will appear in the display.
Collector alarm - Settings range: On, Off / Default: See table.
Collector Tmax - Settings range: 60 °C to 299 °C / Default: See table.
Delay - Settings range: 1 to 60 minutes / Default: See table.

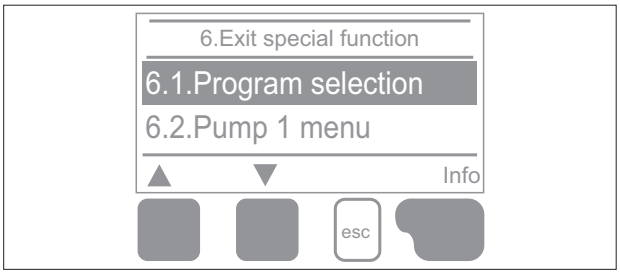
6. SPECIAL FUNCTIONS

Menu “6. Special functions” is used to set basic values and expanded functions.

⚠ With the exception of the clock, all settings must be entrusted solely to expert service technicians.

To quit the menu, press “esc” or select “Exit special functions”.

⚠ The numbering of the menu items may change from one system to another.



6.1 Program selection
It is via this menu that the system variant required for the particular application is selected and set up. Settings range: 1-37 / Default: See table

⚠ The program will be selected as a rule only once, during the start-up procedure, by an expert service technician. An incorrect program selection could lead to error and serious damage.

⚠ If the program is changed, the controller will revert to factory settings.

6.2 Pump 1 menu
This menu contains the settings for 0-10V or PWM pump control.

⚠ The power supply for high efficiency pumps using 0-10V / PWM control can be connected to the corresponding relay (V1 -> R1, R2 ->V2), since the relays are activated and deactivated with the signal.

6.2.1 Type of pump
This menu is used to set the type of pump and the relative speed control.
Standard: speed control for standard pumps;
0-10V: speed control using 0-10V signal;
PWM: speed control using PWM signal.
6.2.2 Pump
This menu allows the selection of preconfigured profiles for different pumps. In practice, the single settings remain accessible even when a profile has been selected.
For manual setting, see “J. Appendix”.
6.3 Speed control R1
With the speed control provided by the LTDC4, the rpm of pumps connected to the unit can be selectively varied.

⚠ The speed control function should be activated only by an expert service technician. Depending on the pump and the pump stage used, the minimum speed should not be set too low, otherwise the pump or the system could be damaged. Always follow the instructions provided by the manufacturer! If in doubt, it is preferable that the minimum speed and the pump stage should be set conservatively high rather than too low.

6.3.1 Modes
The following speed modes can be set:
Off: no speed control whatever. The connected pump is activated or deactivated at full speed.
Mode M1: following the purge time, the controller activates the maximum speed setting. If the difference in temperature ΔT between the reference sensors (collector and storage cylinder) is less than the setting, the speed will be reduced by one stage once the control time has elapsed. In the event that the controller reduces the speed of the pump to the smallest stage with the ΔT between the reference sensors registering currently at ΔT off, the pump will be shut off.
Mode M2: following the purge time, the controller activates the minimum speed setting. If the difference in temperature ΔT between the reference sensors (collector and storage cylinder) is greater than the setting, the speed will be increased by one stage once the control time has elapsed. In the event that the controller reduces the speed of the pump to the smallest stage with the ΔT between the reference sensors registering currently at ΔT off, the pump will be shut off.
Mode M3: following the purge time, the controller activates the minimum speed setting. If the temperature at the reference sensor (collector) is higher than the set point to be selected subsequently, the speed will increase by one stage once the control time has elapsed. If the temperature at the reference sensor (collector) is lower than the set point to be selected subsequently, the speed will be reduced by one stage once the control time has elapsed.
Mode M4: when the primary storage cylinder is buffering, the speed control operates in M3. When the secondary storage cylinder is buffering, the speed control operates in M2. Settings range: M1, M2, M3, M4, Off / Default see table.
6.3.2 Purge time
During this period, the pump will turn at full speed (100%) to ensure a troublefree start. Once the purge time has elapsed, the pump is set to maximum or minimum speed, depending on the type of speed control selected under “6.3.1 - Modes”. The purge time function cannot be applied with PWM or 0-10V output.
Settings range: 5 to 600 seconds / Default: see table.
6.3.3 Sweep time
This determines the inertia of the speed control, in order to prevent significant fluctuations in temperature. The sweep time is the time taken for the speed of the pump to progress from minimum to maximum rpm.
Settings range: 1 to 15 minutes / Default: see table.
6.3.4 Maximum speed
This is where the maximum speed of the pump is set. During the setting procedure, the pump runs at the selected speed so that the flow rate can be determined.
Settings range: 70% to 100% / Default: see table.

⚠ The percentages indicated are guideline only, and could be higher or lower depending on the particular system.

6.3.5 Minimum speed
This is where the minimum speed of the pump at relay R1 is set. During the setting procedure, the pump runs at the selected speed so that the flow rate can be determined.
Settings range: from “J.14.6 – Speed when On” to maximum speed minus 5% / Default: see table.
6.3.6 Setpoint
This value is the control setpoint for modes M3 and M4 (see “6.3.1 – Modes”). If the temperature at the collector drops below this threshold, pump speed is reduced. If it rises above the threshold, pump speed increases.
Settings range: 0 °C - 90 °C / Default: see table.
6.3.7 Frequency
Power supply frequency.
Settings range: 50Hz, 60Hz / Default: see table.
6.4 Speed control R2
See heading 6.2

6.5 Speed control, pump 2
See heading 6.3.
6.9 Heat output
6.9.1.1 Constant flow
When the heat meter is set to operate in “flow rate” mode, the system calculates an approximate quantity on the basis of values entered by the user: type of glycol/antifreeze, concentration of glycol and flow rate. These values are correlated with the temperatures registering at the collector sensor and the storage sensor. If necessary, a temperature difference correction value can be set: given that the collector and the storage are used to meter the amount of heat produced, a difference between flow and return temperatures can be compensated by adjusting the Offset ΔT as appropriate.

⚠ The amount of heat measured in “Constant flow” mode is an approximation calculated for the purposes of controlling the operation of the system, or the functions of the system.

6.9.1.2 Flow temperature sensor
This identifies the sensor used to measure the temperature on the flow line.
Settings range: S1-S6, VFS1-2, active collector, active storage / Default: see table.
6.9.1.4 Return temperature sensor
This identifies the sensor used to measure the temperature on the return line.
Settings range: S1-S6, VFS1-2, active collector, active storage / Default: see table.
6.9.1.5 Type of antifreeze
Selection of the type of antifreeze adopted. If no antifreeze is used, select 0. Settings range: ethylene-propylene / Default: see table.
6.1.9.6 Percentage of glycol
Quantity of antifreeze in the system.
Settings range: 0-100% / Default: see table.
6.1.9.7 Flow rate (X) = Nominal system flow rate
Determines flow rate in litres per minute, used to calculate the quantity of heat produced. Settings range: 0-100 l/min / Default: see table.
6.1.9.9 Offset ΔT = heat meter temperature difference correction factor
Given that the collector and the storage are used to meter the amount of heat produced, a difference between flow and return temperatures can be compensated by adjusting Offset ΔT as appropriate.
Example: Displayed collector temperature 40 °C, Measured flow temperature 39 °C, Displayed storage temperature 30 °C, Measured return temperature 31 °C = correction value -20% (displayed ΔT 10K, actual ΔT 8K = -20% correction).
Settings range: -50 to +50% / Default: see table.
6.9.2 VFS 1
6.9.2.1 VFS type
This menu is used to set the type of Vortex Flow Sensor installed.
Settings range: Off, 1-12, 1-20, 2-40, 5-100, 10-200, 20-400 / Default: see table.
6.9.2.2 VFS position
This menu determines the position of the Vortex Flow Sensor. Settings range: flow, return / Default: see table

⚠ To prevent the risk of damaging the vortex flow sensor, installation on the return line is strongly advisable. If installation on the flow line is unavoidable, make certain that the maximum temperatures of the sensor are not exceeded! (0 °C to 100 °C and -25 °C to 100 °C short term).

6.9.2.3 Reference sensor
This menu is used to set the reference sensor for heat metering.
Settings range: S1-S6, VFS1-2, active collector, active storage / Default: see table.
6.9.2.4 Type of antifreeze
Selection of the type of antifreeze adopted. If no antifreeze is used, select 0. Settings range: ethylene-propylene / Default: see table.
6.9.2.5 Percentage of glycol
Quantity of antifreeze in the system.
Settings range: 0-100% / Default: see table.
6.9.2.6 Offset ΔT = heat meter temperature difference correction factor
Given that the collector and the storage are used to meter the amount of heat produced, a difference between flow and return temperatures can be compensated by adjusting Offset ΔT as appropriate.
Settings range: -50 to +50% / Default: see table.
6.9.3 VFS 2
See heading 6.9.2.
6.10 Pressure monitor
This menu allows activation of a circuit that monitors system pressure by way of a direct sensor. If the selected pressure parameters are exceeded, a message is displayed and the warning Led blinks red.
6.10.1 Pressure monitor

Whenever pressure falls below the minimum or rises above the maximum, a message is displayed and the warning Led blinks red. Settings range: On, Off / Default: see table.

6.10.2 RPS1 = type of pressure sensor

This menu identifies the type of pressure sensor that will be used.

⚠ When the VFS1 is connected, for example, the RPS1 option does not appear.

Settings range: Off, 0-0.6 bar, 0-1 bar, 0-1.6 bar, 0-2.5 bar, 0-4 bar, 0-6 bar, 0-10 bar / Default: see table.

6.10.2.1 Minimum pressure

If pressure falls below this threshold, a message is displayed and the relay will be activated. Settings range: Off, 0.0-1.6 bar / Default: see table.

6.10.2.2 Maximum pressure

If this threshold is exceeded, a message is displayed and the relay will be activated. Settings range: Off, 0.0-10bar / Default: see table.

6.10.3 RPS2 = type of pressure sensor

This menu identifies the type of pressure sensor that will be used.
Settings range: Off, 0-0.6 bar, 0-1 bar, 0-1.6 bar, 0-2.5 bar, 0-4 bar, 0-6 bar, 0-10 bar / Default: see table.

6.10.3.1 Minimum pressure

If pressure falls below this threshold, a message is displayed and the relay will be activated. Settings range: Off, 0.0-1.6 bar / Default: see table.

6.10.3.2 Maximum pressure

If this threshold is exceeded, a message is displayed and the relay will be activated. Settings range: Off, 0.0-10bar / Default: see table.

6.11 Sensor calibration

Deviations from set temperatures, for example as a result of over-long cables or badly positioned sensors, can be compensated manually by way of this menu. Settings can be made for each individual sensor in steps of 0.8 °C (temperature), or 0.2% per step of the measuring range in the case of the VFS/RPS sensor (flow/pressure).
Offset sensor settings range: -100 to +100 / Default: see table.

⚠ Settings are necessary only in exceptional cases, when the system is first started up, and must be made by an expert service technician. Wrong values can cause the system to malfunction.

6.12 Start-up

The setup wizard guides the user through the settings needed to render the system operational, indicating the correct sequence and providing a brief description of each parameter in the display.
Press “esc” to go back to the previous value, which may need to be checked or changed. Press “esc” repeatedly to return to the selection mode and exit the wizard.

⚠ Settings can be activated only by an expert service technician during the start-up procedure! Follow the instructions given in this manual for the single parameters, and check whether or not further settings are required for the particular system.

6.13 Factory settings

All settings introduced can be reset if desired; this will have the effect of restoring the factory-set parameters of the controller.

⚠ A reset will permanently erase all parameterization, analytical and other user-entered data from the controller. Following a reset, the controller must be restarted. .

6.14 Setup wizard

With certain solar systems, especially those using vacuum tube collectors, it can happen that the acquisition of values at the collector sensor occurs too slowly or with insufficient accuracy, as the sensor is often not located in the hottest part of the collector.
When the setup wizard is active, the following sequence of steps will be set in motion:
If the temperature at the collector sensor rises by the value specified under “increase” within one minute, then the solar pump will be activated for the set "purge time”, thereby ensuring that the medium to be measured can fill the collector properly. If the purge also fails to establish a normal start condition, then the setup wizard will go into lockout status for 5 minutes.
Setup wizard - Settings range: On, Off / Default: see table.
Purge time – Settings range: 2-30 seconds / Default: see table.
Increase - settings range: 1-10 °C / Default: see table.

⚠ This function must be activated only by an expert service technician, when there are problems with the acquisition of measurement values. Follow the directions provided by the collector manufacturer.

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

⚠ To run analyses on system data, the time must be set correctly at the controller. Remember that the clock will stop if the power supply to the controller is cut off, and must then be reset.

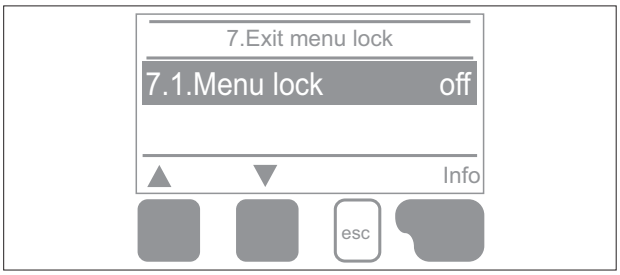
6.16 Daylight saving time
When this function is active, the clock updates automatically when Daylight Saving Time (DST) commences and finishes. Factory setting: see table.

6.17 Sleep mode
When sleep mode is selected, the display goes blank after two minutes of inactivity. Factory setting: see table.

6.18 Temperature unit
This menu is used to select the unit of measure in which temperature is displayed. Settings range: °F, °C / Default: see table.

7. MENU LOCK

Menu “7. Menu lock” can be used to safeguard the controller against unintentional changes to selected settings. To quit the menu, press “esc” or select “Exit menu lock”.

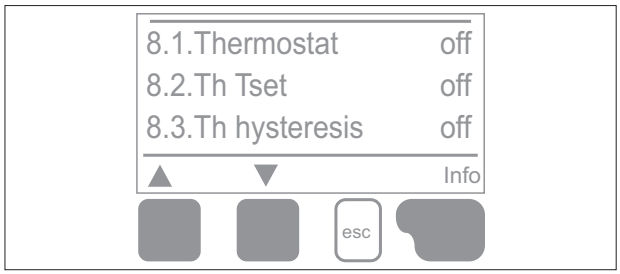


The menus listed below remain fully accessible even when the menu lock is active, and can be used to make changes if necessary:
1. Measurement values
2. Statistics
6.15 Time and date
7. Menu lock
8. Service data

To lock the other menus, select “Menu lock ON”.
To re-enable the menus, select “Menu lock OFF”.
Settings range: On, Off / Factory setting: Off.

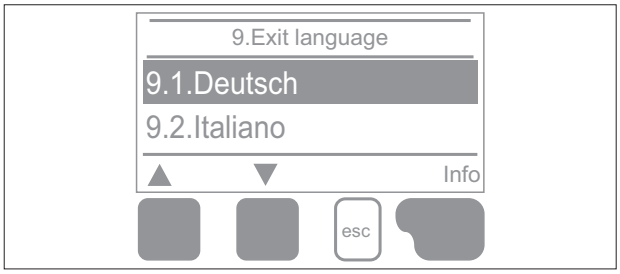
8. SERVICE DATA

Menu “8. Service data” can be used for the purposes of remote diagnosis by the manufacturer or a technician when investigating errors, etc.



9. LANGUAGE

Menu “9. Languages” can be used to select the language in which menus are displayed and navigated. Selection is prompted automatically at start-up.
The choice of languages may differ, depending on the controller model.

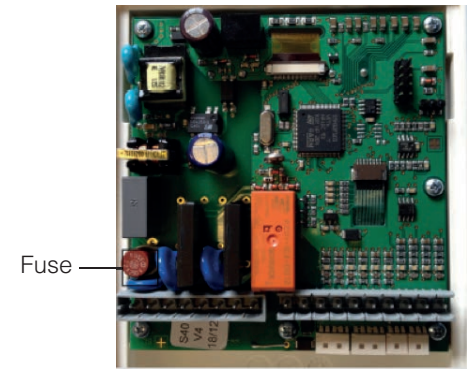


REPLACING THE FUSE

⚠ Repairs and maintenance must be entrusted exclusively to an expert service technician.

⚠ Before working on the controller, isolate it from the power supply!

⚠ Use only the spare fuse supplied, or select a similar fuse with the following specifications: T2A 250V.



If the controller is connected to the power supply and does not come into operation, or the display remains blank, the internal fuse could be defective. In this situation, open up the controller, remove the fuse and inspect it. If the fuse is defective, replace it with a new one. Once the controller is powered up, make the settings and check the operation of the outputs in manual mode as described in heading “3.2. - Manual”.

MAINTENANCE

⚠ During the course of general maintenance on the heating system every year, it is important that the functions of the controller are checked by an expert service technician, and the parameters optimised if necessary.

Maintenance operations:
- Check the time and date (see “6.15 Time and date”)
- Assess/check the reliability of analytical data (see “2. Statistics”)
- Check the error messages (see “2.4. Message log”)
- Check the reliability of current measurement values (see “1. Measurement values”)
- Check outputs/components in manual mode (see “3.2. Manual”)
- If necessary, optimise the setting parameters.

J. APPENDIX

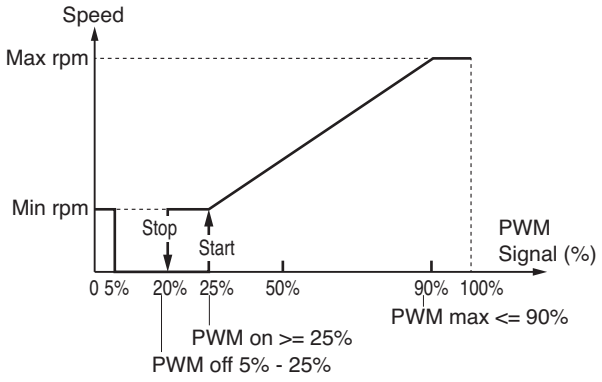
J.14.1 Pump
This menu allows the selection of preconfigured pump profiles. Remember that single/custom settings remain accessible even when a profile has been selected.
J.14.2 Output signal
This menu determines the type of pump in use: heating pumps operate at their maximum power rating when the control signal is at its lowest, whereas conversely, solar pumps deliver low power with a low control signal. Solar = normal, heating = inverted.
Settings range: normal, inverted / Factory setting: normal.
J.14.3 PWM Off
This signal is deactivated when the pump shuts off. (Pumps capable of detecting a cable break require a minimum signal)
Settings range:
(solar) 0-50% / Factory setting: 0%
Settings range: (heating) 50-100% / Factory setting: 100%
J.14.4 PWM on
This signal is needed to switch on the pump at minimum speed.
Settings range: (solar) 0-50% / Factory setting: 10%
Settings range: (heating) 50-100% / Default setting: 90%
J.14.5 PWM Max
This determines the output signal for operation of the pump at maximum speed, used for example when purging the system or in manual mode.
Settings range: (solar) 50-100% / Factory setting: 100%
Settings range: (heating) 0-50% / Factory setting: 0%
J.14.6 Speed when On
This menu determines the speed of the pump as calculated and displayed on screen. For example, if the speed setting selected here is 30% and the signal set to “PWM On/0-10V On”, the display will show “speed 30%”.
When the signal is “PWM max/0-10V On”, the display will show “speed 100%”. Everything in between is calculated accordingly.
Settings range: 10-90% / Factory setting: 30%

⚠ This function has no influence on actual regulation; it only changes the speed displayed on the screen.

J.14.7 Show signal
The signal setting is displayed in graph and text format.
J.17.3 0-10V Off
This voltage is disabled when the pump is off (pumps capable of detecting a cable break require a minimum voltage). Settings range: (solar) 0.0-5.0V / Factory setting: 1.0V Settings range: (heating) 5.0-10.0V / Factory setting: 4.0V
J.17.4 0-10V On
This voltage is needed to switch on the pump at minimum speed. Settings range: (solar) 0.0-5.0V / Factory setting: 1.0V Settings range: (heating) 5.0-10.0V / Factory setting: 9.0V
J.17.5 0-10V Max
This determines the output voltage for operation of the pump at maximum speed, used when purging the system or in manual mode. Settings range: (solar) 5.0-10.0V / Factory setting: 10.0V
Settings range: (heating) 0.0-5.0V / Factory setting: 0.0V

J.2.3a Example for pump settings

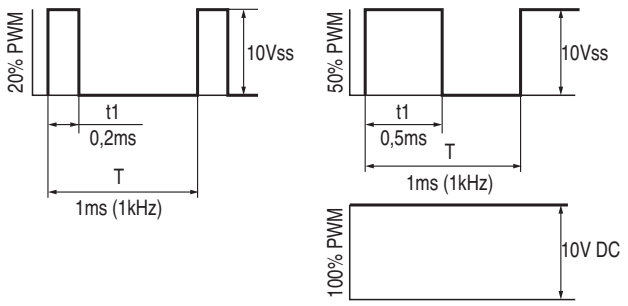
0-5% Cable break detection
5-20% Stop
25% Start
25-90% Area of control



J.2.3b Technical data PWM and 0-10V

PWM: 20% to 100%, 1kHz
Designed for a load of 10K Ohm

10V = 100% speed
5V = 50% speed
2V = 20% speed
0V = Off



USEFUL NOTES / TIPS

- Rather than controlling system flow rate using a flow limiter, it is better to adjust the flow rate using the selector switch on the pump and the maximum speed setting at the controller (see “6.3.4. – maximum speed”). This will save energy!
- Service data (see “8. - Service data”) include not only current measurement values and operating status, but all the controller settings as well. Once programming has been completed successfully, make a note of these service values.
- If there is any doubt as to control response or concerning malfunctions, items of service data are of real help when diagnosing system trouble from a remote location. Make a note of service values (see “8. - Service data”) whenever a suspected malfunction occurs. Send the table with the service data to the supplier or manufacturer by fax or e-mail, including a brief description of the trouble.

Given the particular importance of service data, analyses should be run on the system at regular intervals, and recorded so that the information will not be lost.

CONTROLLER PARAMETERS TABLE

Menu	Description	Settings range	Default	User setting
4. SETTINGS				
4.1	Tmin S1	0°C ÷ 99°C	20°C	
4.3	Storage priority 1	1 / 2	1	
4.4	ΔT on storage 1 ΔT off storage 1	8°C ÷ 50°C 2°C ÷ 14°C	15°C 7°C	
4.5	Tmax S2	0°C ÷ 99°C	60°C	
4.6	Storage priority 2	1 / 2	2	
4.7	ΔT on storage 2 ΔT off storage 2	8°C ÷ 50°C 2°C ÷ 14°C	15°C 7°C	
4.8	Tmax S3	0°C ÷ 99°C	60°C	
4.14	T-priority	0°C ÷ 90°C	40°C	
4.15	Buffer time	1min ÷ 90min	20min	
4.16	Increase	1°C ÷ 10°C	3°C	
5. PROTECTIONS / PROTECTIVE FUNCTIONS				
5.1	System protection SP T on SP T off	On/off 60°C ÷ 150°C 50°C ÷ -5°C T on	On 120°C 115°C	
5.2	Collector protection CP T on CP T off CP Storage Tmax	On/off 60°C ÷ 150°C 50°C ÷ -5°C T on 30°C ÷ 140°C	Off 110°C 100°C 90°C	
5.3	Recooling Tref	On/off 0°C ÷ 99°C	Off 70°C	
5.4	Frost protection Frost stage 1 Frost stage 2	On /off -25°C ÷ 10°C -25°C ÷ 8°C	Off 7°C 5°C	
5.5	Seizing protection R1 Seizing protection R2 Seizing protection R3	Daily / weekly / off	Off Off Off	
5.6	Collector alarm Collector Tmax Delay	On/off 60°C ÷ 299°C 1min ÷ 60min	Off 115°C 1min	
6. SPECIAL FUNCTIONS				
6.1	Program selection	1-37	26	
6.2	Pump 1 data	-	-	
6.2.1	Type of pump 1	Standard / 0-10V / PWM	PWM	
6.2.2	Pump	Manual / Solar / Heating / Profile 1-11	Solar	
6.2.3	Output signal	Normal / Inverted	Normal	
6.2.4	PWM Off signal %	0-13%	2%	
6.2.5	PWM On signal %	0-50%	13%	
6.2.6	PWM Max signal %	50-100%	93%	
6.2.7	Speed when On %	10-90%	30%	
6.3	Speed control R1	-	-	
6.3.1	Modes	M1,M2,M3,M4,off	M4	
6.3.2	Purge time	5sec ÷ 600sec	8sec	
6.3.3	Sweep time	1min ÷ 15 min	4min	
6.3.4	Maximum speed	70% ÷ 100%	100%	
6.3.5	Minimum speed	Speed when ON – Max speed minus 5%	30%	
6.3.6	Setpoint	0°C ÷ 90°C	60°C	
6.3.7	Frequency	50Hz / 60Hz	50Hz	
6.4	Pump 2 data	-	-	
6.4.1	Type of pump 2	Standard / 0-10V / PWM	PWM	
6.4.2	Pump	Manual / Solar / Heating / Profile 1-11	Heating	
6.4.3	Output signal	Normal / Inverted	Inverted	

Menu	Description	Settings range	Default	User setting
6.4.4	PWM Off signal %	87-100%	98%	
6.4.5	PWM On signal %	50-100%	87%	
6.4.6	PWM Max signal %	0-50%	7%	
6.4.7	Speed when On %	10-90%	30%	
6.5	Speed control R2	-	-	
6.5.1	Modes	M1,M2,M3,M4,off	M4	
6.5.2	Purge time	5sec ÷ 600sec	8sec	
6.5.3	Sweep time	1min ÷ 15 min	4min	
6.5.4	Maximum speed	70% ÷ 100%	100%	
6.5.5	Minimum speed	Speed when ON – Max speed minus 5%	30%	
6.5.6	Setpoint	0°C ÷ 90°C	60°C	
6.5.7	Frequency	50Hz / 60Hz	50Hz	
6.9.1	Constant flow	-	-	
6.9.1.1	Metering	On / off	off	
6.9.2.1	VFS type	Off / 1-12 / 2-40 / 5-100 / 10-200 / 20-400	2-40 l/min	
6.9.2.2	VFS position	Flow / return	Return	
6.9.2.3	Reference sensor	S1-S6, VFS1-2, active collector / active storage	S1	
6.9.2.4	Type of antifreeze	Ethylene / propylene	Propylene	
6.9.2.5	Percentage of glycol	0% ÷ 100%	30%	
6.9.2.6	Offset ΔT	-50% ÷ +50%	0%	
6.14	Setup wizard Purge time Increase	On / off 2sec ÷ 30 sec 1°C ÷ 10°C	Off 5sec 3°C/min	
6.16	Daylight saving time	On / off	On	
6.17	Sleep mode	On / off	Off	
6.18	Temperature unit	°C ÷ °F	°C	

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