THERMITAL MODEX SOL 300

DESCRIPTION

The **SOL 300** 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 pumps on the primary and secondary circuits so as to ensure optimum exploitation and management of the energy produced. The controller is also designed to allow remote control of the system by way of an Ethernet port, save system-related operating data to an SD card, and report any irregular or abnormal events that may occur.
The primary circuit is equipped with an electronic flow meter (Vortex flow sensor) displaying the flow rate and allowing computation of the amount of heat exchanged.

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 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 and/or the controller must be installed and connected by persons qualified under current statutory regulations. Where an electronic controller is installed, connect the power cable of the device 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 pipes of the module will not be strained and damaged.

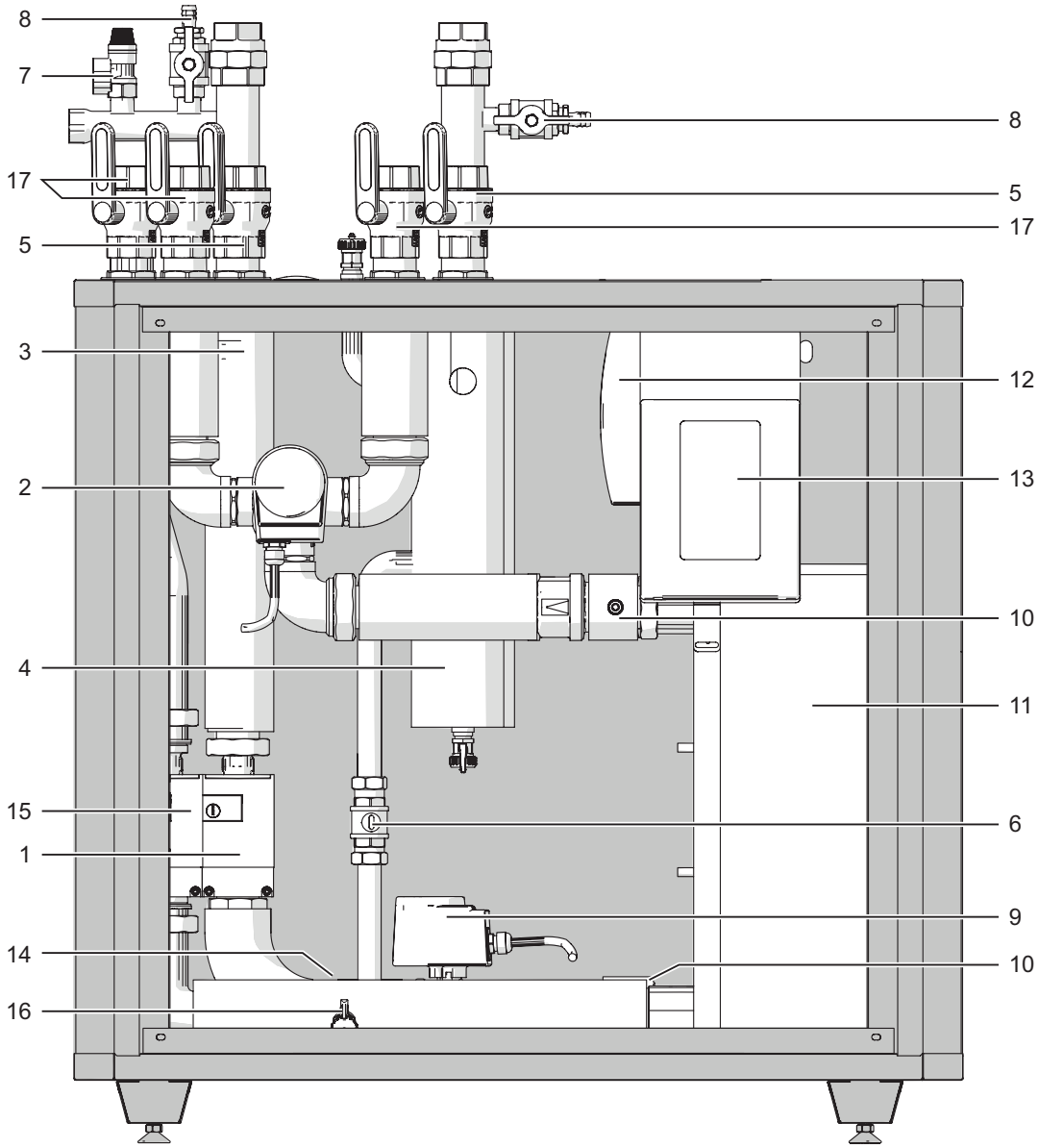
⚠ All installation, connection and testing operations must be entrusted to skilled professionals who can be relied upon to observe current standards and follow the instructions given in the accompanying manual. N.B. All pipelines must be insulated in accordance with statutory regulations.

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.
- Put on protective gloves and safety footwear before handling the product.

PRE-INSTALLATION WARNINGS AND INDICATIONS

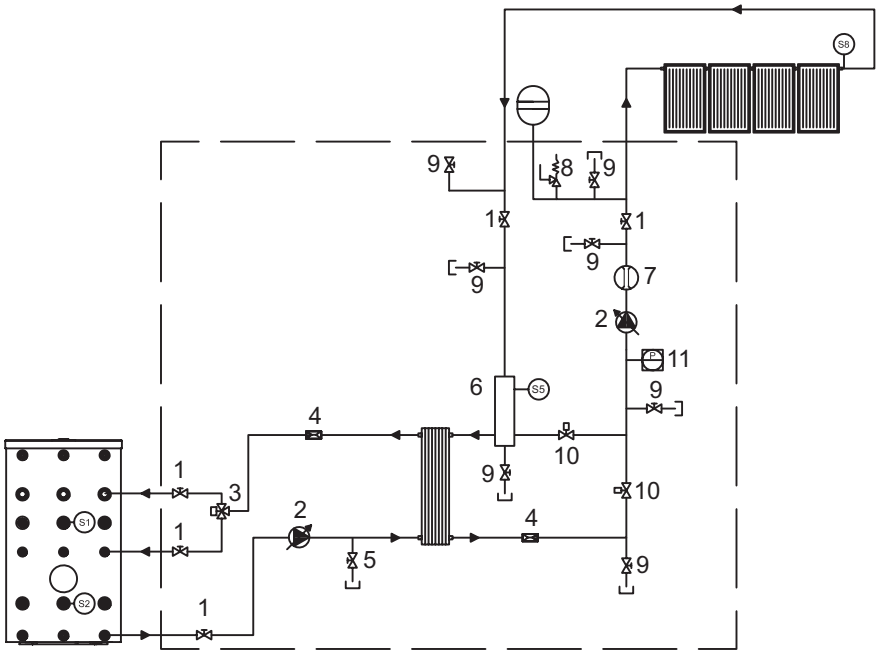
- When electrical power failures occur, the motorised valves are liable to lock up in the open position, causing the **SOL 300** to overheat
- Any work required on electrical connections must be entrusted to an expert service technician.
- Water circulating inside the **SOL 300** module may be very hot and highly pressurised. Before the module is disassembled for whatever reason, the system should be drained of water, and the shut-off valves securely closed.
- Installation and all other work on the system must be carried out in compliance with local regulations.
- In the event of malfunctions occurring, whatever their nature, always contact your regular plumber. Carrying out repairs without authorisation is forbidden, as unforeseen damage can occur

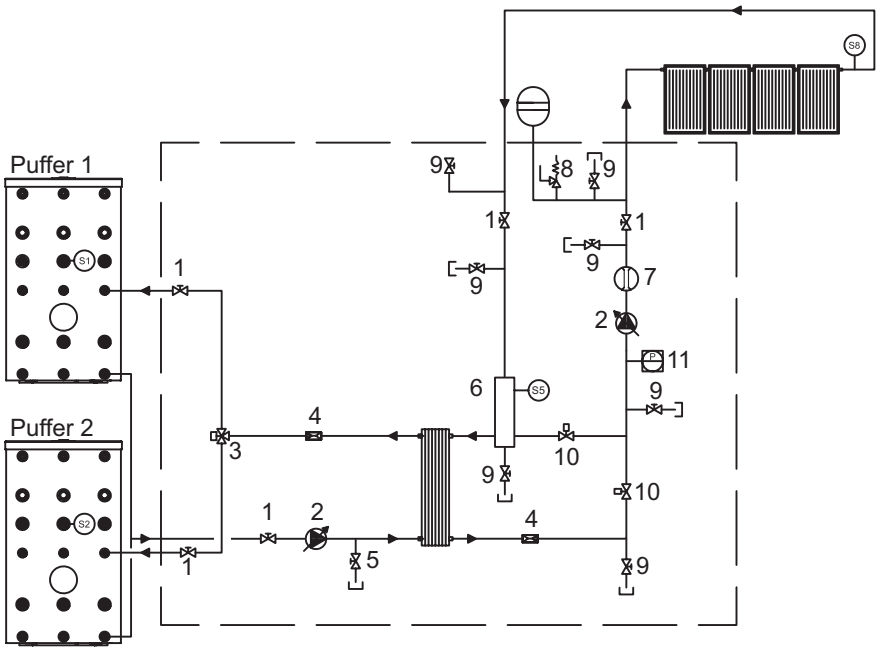
The manufacturer declines responsibility for any damage caused by inappropriate use of the product. The module must not be connected directly to a heat generator.



1 Solar circuit pump
2 Motorised 3-way ball valve F-F-F 1”1/2
3 Vortex Flow Sensor flow rate/temperature gauge 200 l/min 1”1/4
4 Bleed pipe with manual vent valve
5 Solar circuit ball valves, sandblasted brass, F-F 1”1/2
6 Motorised two way bypass valve, primary circuit, M-M 1”
7 Safety valve kit 10 bar
8 Solar circuit filling/drain cock
9 Motorised two-way ball valve, primary circuit return, F-F-F 1”1/2
10 Non-return valve, sandblasted brass, F-F 1”1/2
11 Stainless steel plate heat exchanger
12 Power board with thermal magnetic breaker
13 XTDC electronic controller
14 Pressure-temperature gauge, RPS, 1 - 8 bar
15 Heating circuit pump
16 Filling/drain cock
17 Heating circuit ball valves, sandblasted brass, F-F 1”1/2

WATER CIRCUIT



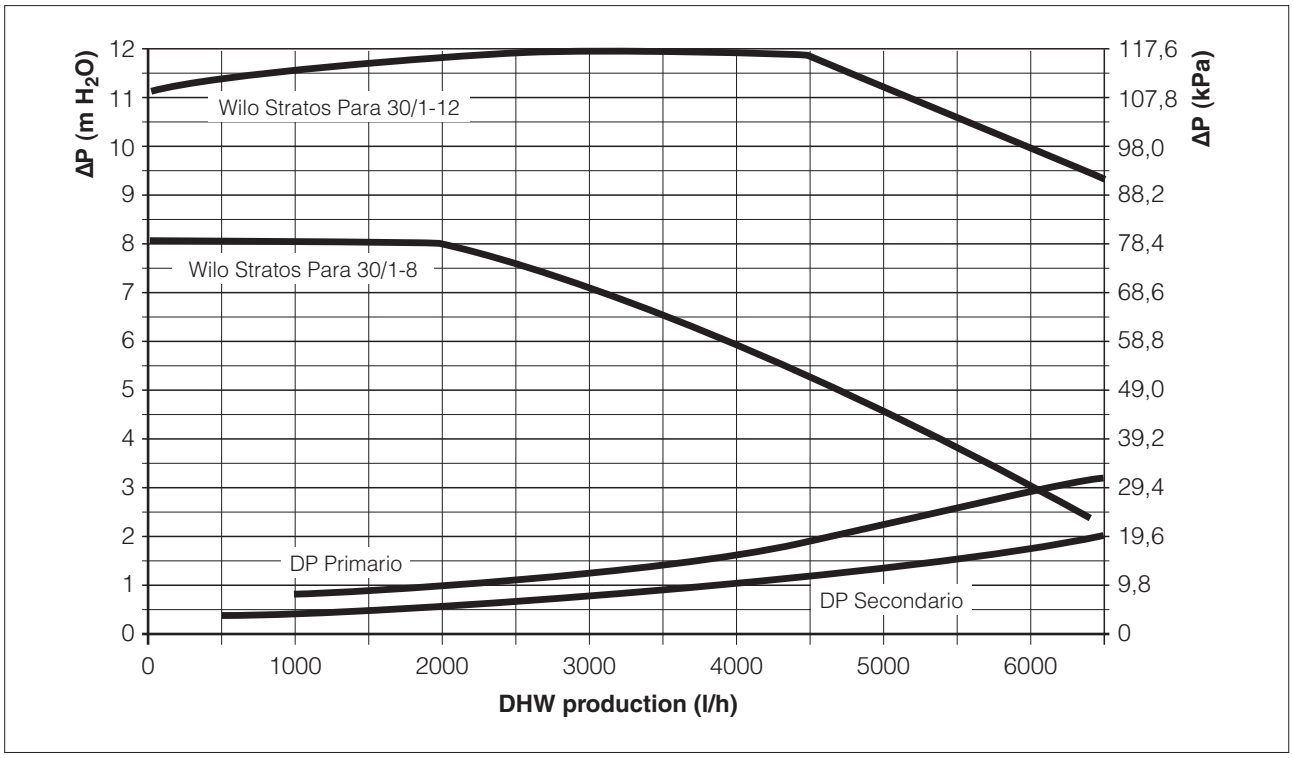


1 Two way valve
2 Modulating pump
3 Three way diverter valve
4 Non-return valve
5 Cock with cap
6 Bleed pipe with manual vent valve
7 Flow meter with temperature gauge
8 Solar circuit safety valve
9 Drain valve
10 Two way valve
11 Pressure transducer

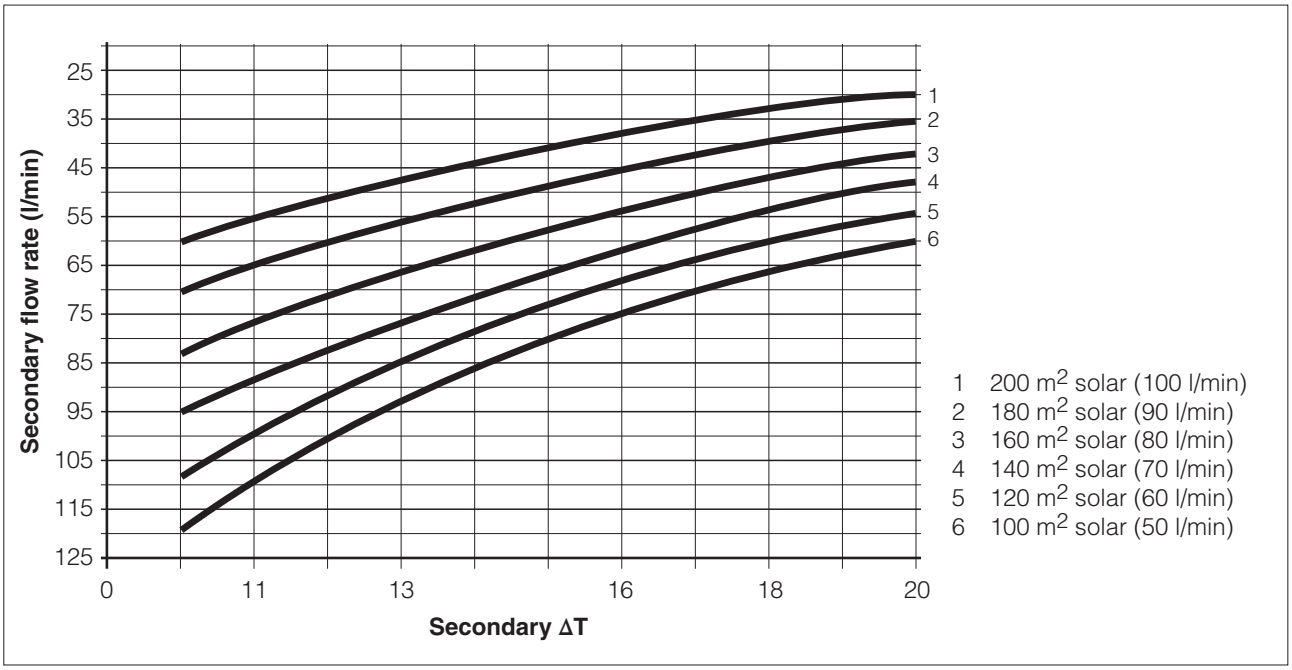
TECHNICAL SPECIFICATIONS

DESCRIPTION	SOL 300	
Thermal power exchanged	129	kW
Maximum flow rate, primary circuit	6000	l/h
Maximum flow rate, secondary circuit	116,7	l/min
Primary circuit ΔT	20	°C
Surface area of panels	200	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	40	mbar
Non-return valve opening pressure, secondary circuit	40	mbar
Absorbed electric power, primary circulator (max/stand-by)	155 / 1,72	W
Absorbed electric power, second circulator (max/stand-by)	70 / 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	155	kg
Water volume	45	l

Heating curves - pressure drop

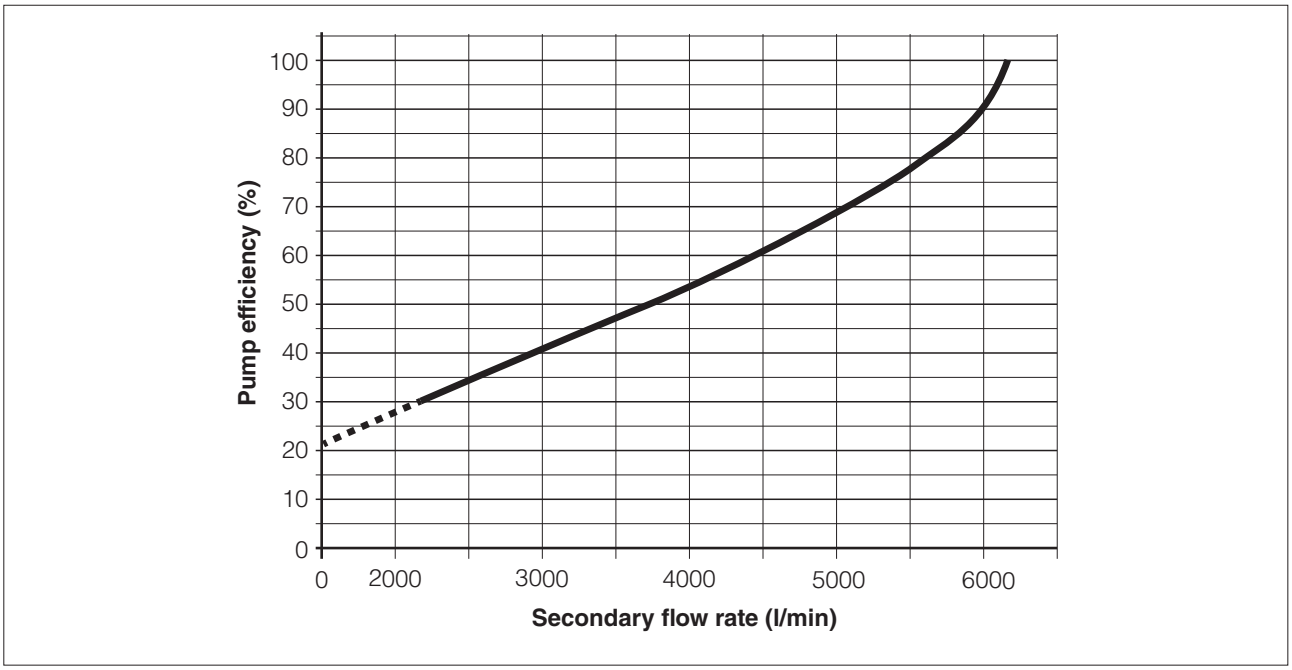


Secondary circuit efficiency

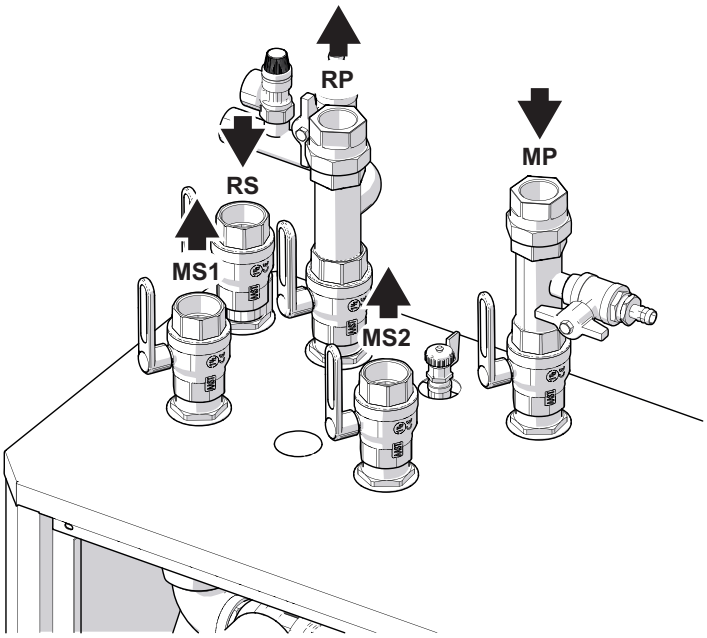


NB: Assuming primary circuit parameters 0.5 l/min*m2 - ΔT 12 °C (95 °C to 83 °C) / Secondary circuit flow 90 °C

Secondary pump efficiency (%)



DIMENSIONS AND FITTINGS



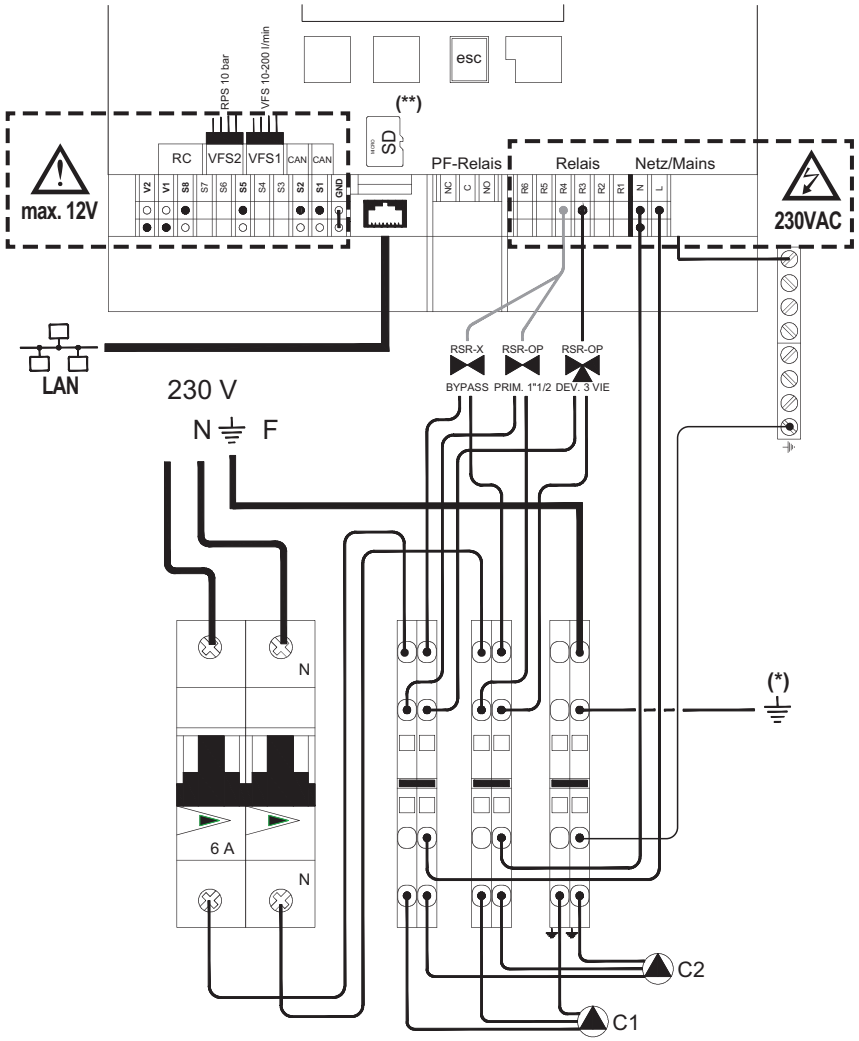
	SOL 300
RP Primary (solar) circuit return	1 1/2" F
MP Primary (solar) circuit flow	1 1/2" F
RS Recirculation, secondary circuit	1 1/2" F
MS1 Secondary circuit flow 1	1 1/2" F
MS2 Secondary circuit flow 2	1 1/2" F

Dimensions:

Height	1140 mm
Width	1000 mm
Depth	500 mm

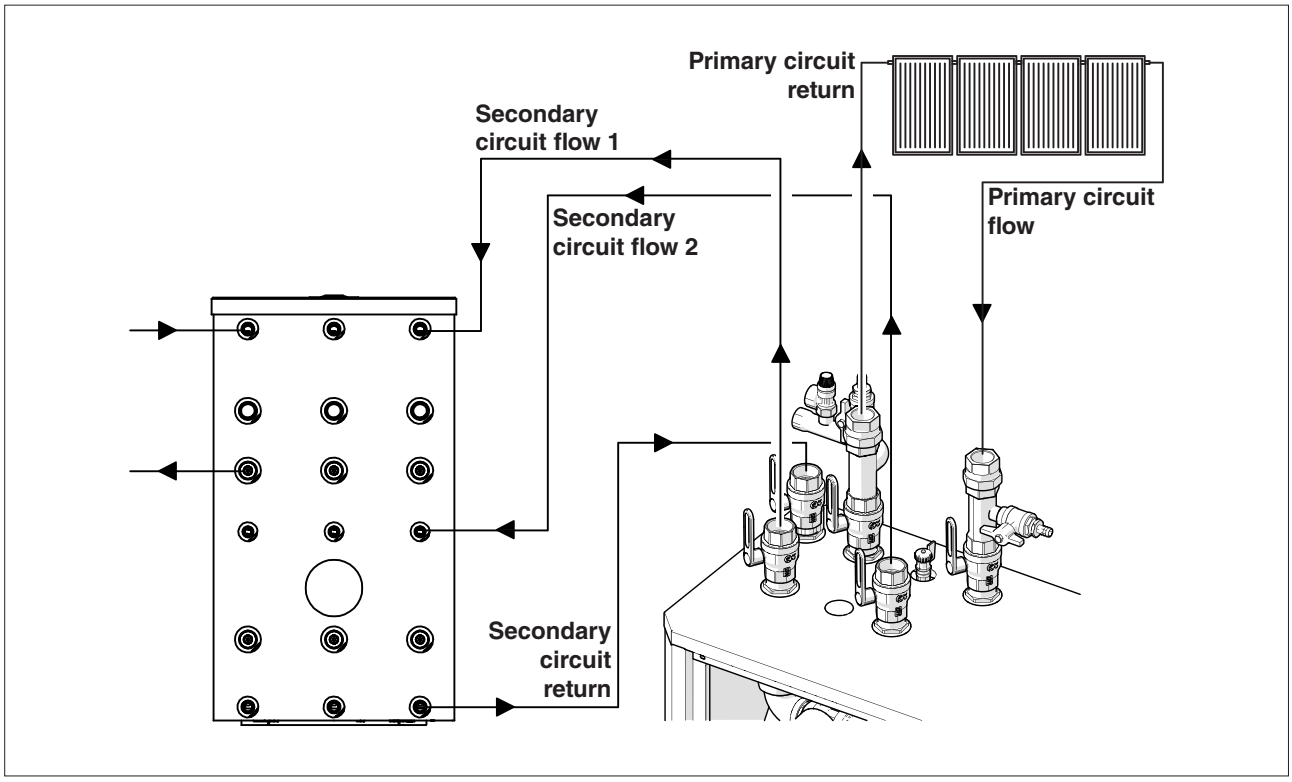
It is recommended that a clearance of at least 50 cm should be maintained on all sides of the module, in order to facilitate inspection and servicing operations.

WIRING DIAGRAM



S1 Storage sensor, high
S2 Storage sensor, low
S5 Heat exchanger sensor
S8 Solar collector sensor
V1 Speed control, pump 1
V2 Speed control, pump 2
C1 Primary circuit pump
C2 Secondary circuit pump
(*) Secured to frame
(**) Slot accepting SD Card for Data logging and firmware updates. Make certain the SD card is fitted the right way round! The card must be inserted without forcing!

SYSTEM LAYOUT



CONTROL PANEL

⚠ Before working on the controller, disconnect the power supply and ensure it cannot be reconnected! Check that there is no power! Electrical connections must be made only by an expert service technician, and in accordance with pertinent regulations and standards.

- Do not use the controller if there are visible signs of damage on the housing.
- Low voltage cables must be routed separately from mains voltage cables. Feed temperature sensor cables only into the left hand side of the controller, and mains voltage cables only into the right hand side.
- The user must install a device capable of disconnecting all poles, such as a thermal magnetic breaker.
- Cables connected to the controller must be stripped by no more than 55 mm, and the cable jacket must extend into the housing to a point just beyond the strain relief gland.
- The controller and the Vortex Flow Sensor must have the same ground potential. The VFS has a functional earth connection (PELV). The PE output of the controller must be connected to the pipe system at a point near the sensor.

INSTALLATION

HANDLING

The responsibilities of the user include providing the equipment needed to handle and unload the module, checking the number of items delivered, and verifying the integrity of the material.
The module is positioned on a pallet; use only a transpallet truck for handling purposes and fix the pallet securely, bearing in mind that the module will be at risk of tipping over if not restrained, given its weight and high centre of gravity.
Take care that the module is not exposed to impact, and remove packing materials only after it has been positioned.

PRELIMINARY CHECKS

Before commencing operations, remove the packing with care:
-remove the box covering the module;
-remove the nylon film;
-remove the protective wooden cage.
Check that the module 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)

⚠ 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 adopting best professional practices 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:
- The module is designed to heat potable water, operating in conjunction with a storage cylinder. Any use deviating from or unrelated to the intended use is considered improper. Do not connect the module directly to the heat generator.
- The product is not designed to be operated by persons (including children) with limited physical, psychological, sensorial or mental capabilities.
- In the event that the conduit for the cable connecting the module to the mains is damaged, it must be replaced only by an expert service technician.
- 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.

⚠ Be certain to adjust the feet of the module as appropriate, so as to avoid stresses.

WATER CONNECTIONS

Connections to the various pipes of the system are made as indicated on the stickers affixed to the module and in accordance with the layout diagram in this manual. 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 product must not be installed in natural circulation heating systems!

The collector circuit expansion vessel must be installed using a direct connection. The installation of isolating valves (except for pressure regulators such as sealable closure valves) is not permitted! 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! Check also that the collars of all screw-threaded flat seal fittings are secured at the correct tightening torque, as these connections can work loose during transport.

ELECTRICAL CONNECTIONS

Electrical connections must be entrusted to persons qualified under current statutory regulations. Connect the power cable of the electronic controller to a two pole switch complete with fuses (power supply 230 Vac 50 Hz). 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 manufacturer acknowledges no liability for improper use of the equipment.

⚠ Electrical connections must be made by a qualified technician.

⚠ 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.

⚠ The manufacturer declines all responsibility for damage caused by failing to ground the appliance adequately or by failure to respect the wiring diagrams provided in this manual.

USE

The **SOL 300** module has stand-alone control capability.
To ensure correct operation of the module, the following parameters must be observed for each of the components indicated:

⚠ Deviation from these specific values could result in the **SOL 300** being damaged, and consequently invalidate the manufacturer's warranty.

COMPONENTS	UNIT OF MEASURE	MAX/MIN PERMISSIBLE VALUE FOR COPPER-BRAZED HEAT EXCHANGERS
pH		7-9 (considering saturation index)
Saturation Index (ΔpH)		-0.2<0<+0.2
Total hardness	°Fr	15-30
Conductivity	µS/cm	10…500
Filterable substances	mg/l	<30
Free chlorine	mg/l	<0.5
Hydrogen Sulphide	mg/l	<0.05
Ammonia	mg/l	<2
Hydrogen Carbonate	mg/l	<300
Hydrogen Carbonate/Sulphide	mg/l	>1.0
Sulphide	mg/l	<1
Nitrate	mg/l	<100
Nitrite	mg/l	<0.1
Sulphate	mg/l	<100
Manganese	mg/l	<0.1
Dissolved iron	mg/l	<0.2
Free aggressive Carbon Dioxide	mg/l	<20

START-UP

The system must be filled and started up by an authorised specialist company. Technicians overseeing the procedure must test the operation and leak-tightness of the entire system, including factory-assembled components. 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 filling/draining 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 only the fill/drain fittings provided for this particular purpose.
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 with a pressure rating of 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.

Storage side:
- First open the storage buffer line slowly, then the two storage return lines.
- Select manual operating mode at the controller and activate the pump (see parameter 3.2)
- Open the manual vent valves
- Allow the liquid to circulate for two minutes
- Open the diverter valve to direct flow to the storage cylinder.
- Continue recirculation until the liquid in the system is entirely free of bubbles
- Close the vent valves
- Set the controller for operation in automatic mode (see parameter 3.1).

Solar side:
- Use the filling/drain cocks to fill the system
- Select manual operating mode at the controller and activate the pump (see controller parameter 3.2)
- Open the vent valves
- Proceed with the filling operation until the liquid in the system is entirely free of bubbles
- Close the vent valves
- Set the controller for operation in automatic mode (see parameter 3.1).

USE AND FUNCTIONS OF THE CONTROLLER

DECLARATION OF CONFORMITY

Applying the CE mark to the controller, the manufacturer guarantees that the XTDC is in conformity with the following directives:
- Low Voltage Directive 73/23/EEC, as amended by 93/68/EEC
- Electromagnetic Compatibility Directive 89/336/EEC version 92/31/EEC, version 93/68/EEC

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

GENERAL INSTRUCTIONS

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 in their entirety by the specialist installer/technician and by the user of the system before installing, starting up and operating the controller. All current safety standards, local power utility directives and pertinent statutory regulations must be observed, likewise the installation and operating instructions accompanying system components. The controller can under no circumstances serve as a substitute for any safety component that the user is obligated to install!

The assembly, electrical connection, start-up and maintenance of the product must be entrusted exclusively to expert service technicians
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.

WARRANTY AND LIABILITY

The controller has been developed and tested giving particular care to matters of quality and safety.
This said, warranty and liability shall not cover any injury or damage to persons or property that may be attributable to one or more of the following causes:
- Failure to observe these installation and operating instructions.
- Improper installation, setting, start-up, maintenance and operation.
- Unsuitable repairs.
- Unauthorised structural changes to the product.
- Installation of additional components that have not been tested in conjunction with the controller.
- Any damage resulting from continued use of the controller even after an obvious defect has been discovered.
- Failure to use original replacement parts and accessories.
- Use of the product for any purpose other than its intended purpose.
- Operation above or below the limit values listed in the specifications.
- Force majeure.

DESCRIPTION OF THE CONTROLLER

About the controller
The XTDC Temperature Difference Controller enables efficient use and operational control of a solar or heating system. The controller stands out above all for its practicality and the simplicity of its operation, which is virtually self-explanatory. Each input produced by pressing one of the keys is assigned a specific function and an accompanying explanation. The items of the controller menu include measurement values and settings, help messages and graphs, all of which easy to read and understand.
Main features of the XTDC:
- 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.
- Individual configuration of special functions
- Extensive setting menus with explanations
- 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	100 - 240VAC
Frequency	50 - 60Hz
Power consumption	0,5 - 3 W
Contact capacity:	
Entire switched power for electronic relays.	460VA for AC1 / 240W for AC3
Electronic relay R1	min 5W…max 120W for AC3
Electronic relay R2	min.5W…max.120W for AC3
Entire switched power for mechanical relays	460VA for AC1 / 185W for AC3
Mechanical rela R3	460VA for AC1 / 460W for AC3
Mechanical rela R4	460VA for AC1 / 460W for AC3
Mechanical rela R5	460VA for AC1 / 460W for AC3
Mechanical rela R6	460VA for AC1 / 460W for AC3
Voltage-free relay R7	460VA for AC1 / 185W for AC3
0..10V output	for working resistance 10Ω
PWM output	Frequency 1kHz, level 10 V
Internal fuse.	3 x T2A / 250V slow blow
Ingress protection	IP40
Protection class	II
Sensor inputs.	8 x Pt1000 temp. sensor, 2 x Grundfos Direct Sensor, 1 x RC21/RC22
Measuring range	
- PT1000	-40°C to 300°C
- Grundfos direct sensor:	0 °C to 100 °C (-25 °C/120 °C short term)
VFS	
1 l/min - 12 l/min (VFS1-12)	RPS 0-0,6 bar
2 l/min - 40 l/min (VFS2-40)	0-1 bar
5 l/min - 100 l/min (VFS5-100)	0-1,6 bar
10 l/min - 200 l/min (VFS10-200)	0-2,5 bar
	0-4 bar
	0-6 bar
	0-10 bar
Network connections	Ethernet (optional)
	CAN Bus
Memory devices	Slot for Micro SD cards
Clock.	Real Time Clock (RTC) with 24 hour battery backup
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
Installation methods	Wall-mounting, option of panel-mounting
Overall dimensions	228 x 180 x 53 mm
Display.	Full graphic display, 128 x 128 pixels
Light diode	2, one red, one green
Programming.	4 keys

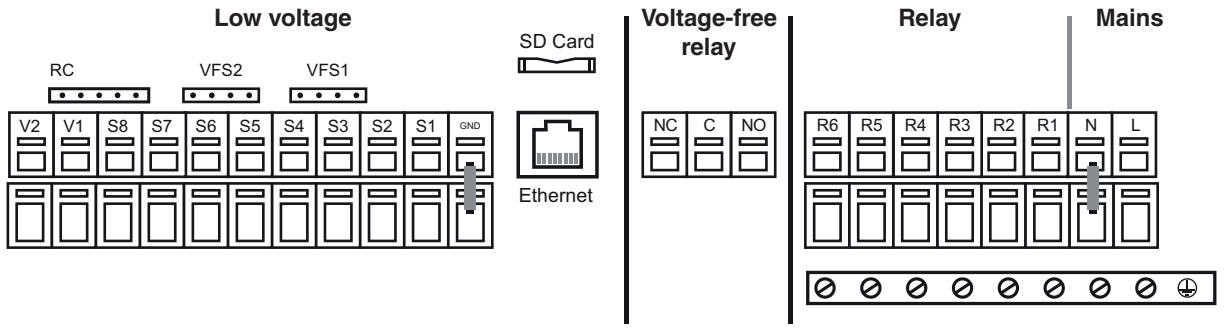
Temperature–resistance table for Pt1000 sensors

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

ELECTRICAL CONNECTIONS

- Before working on the controller, disconnect the power supply and ensure it cannot be reconnected! Check that there is no power!
- Electrical connections must be made only by an expert service technician, and in accordance with pertinent regulations and standards. Do not use the controller if there are visible signs of damage on the housing.
- Low voltage cables must be routed separately from mains voltage cables. Feed temperature sensor cables only into the left hand side of the controller, and mains voltage cables only into the right hand side.
- The user must install a device capable of disconnecting all poles, such as a thermal magnetic breaker.
- Cables connected to the controller must be stripped by no more than 55 mm, and the cable jacket must extend into the housing to a point just beyond the strain relief gland.
- The controller and the Vortex Flow Sensor must have the same ground potential. The VFS has a functional earth connection (PELV). The PE output of the controller must be connected to the pipe system at a point near the sensor.

Connection terminals



Low voltage

⚠ max. 12VAC/DC

Term.	Connection for
S1	Sensor 1
S2	Sensor 2
...	
S8	Sensor 8

V1 optional variable speed control output for high efficiency pumps
V2 optional variable speed control output for high efficiency pumps
VFS1 Grundfos Direct Sensor
VFS2 Grundfos Direct Sensor

SD Card slot
for data logging and firmware updates.

⚠ Make certain the SD card is fitted the right way round! The card must be inserted without forcing!

Ethernet
for connection to Local Area Network (LAN)

Voltage-free relay
NO normally open
C common
NC normally closed

Relay

⚠ Current 230Vac 50-60Hz

Term.	Connection for
R1	Relay1
R2	Relay 2
...	
R6	Relay 6

N neutral conductor N
L live conductor L

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.

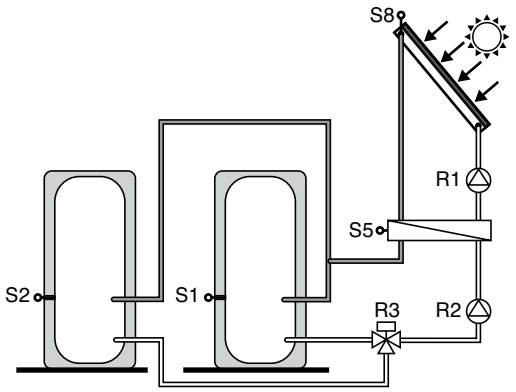
⚠ Never replace the controller if there is no need.

⚠ 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 300** are number 17 and number 18, illustrated in the figures below.

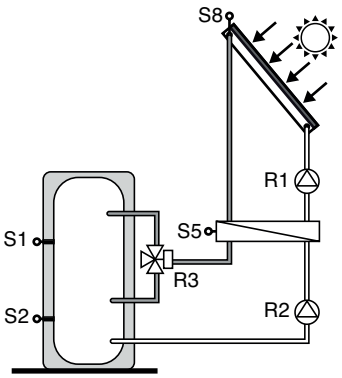
Layout 17

S1 Storage
S2 Storage
S5 Heat exchanger
S8 Collector
V1 Optional selection for R1
V2 Optional selection for R2
R1 Solar circuit pump
R2 Secondary circuit pump
R3 Valve – Storage S1 / Storage S2 (ON = Buffer Storage S2)



Layout 18

S1 Storage high
S2 Storage low
S5 Heat exchanger
S8 Collector
V1 Optional selection for R1
V2 Optional selection for R2
R1 Solar circuit pump
R2 Secondary circuit pump
R3 Valve – Storage high S1 / Storage low S2 (ON = Buffer Storage low S2)



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 3.2 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.



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 6.16 Time and date
- Menu 6.1 Program selection
- Menu 4. Settings, all values
- Menu 5. Protection functions, if necessary
- Menu 6. Special functions, if necessary

Finally, accessing menu 3.2 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. This done, automatic mode can be activated.

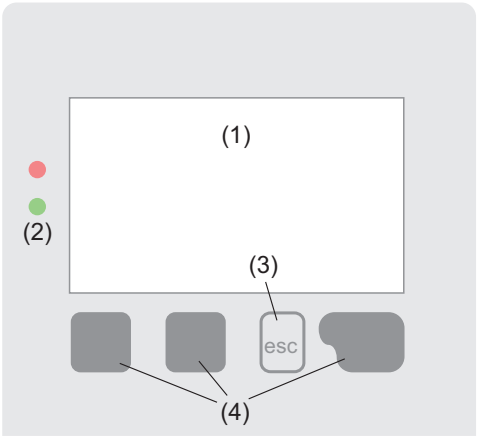
⚠ Observe the indications for individual parameters given on the following pages, and check whether or not further settings are needed for the particular application.

DISPLAY AND INPUT

The display (1), with full text and graphics mode, is self-explanatory to all intents and purposes, making the controller easy to use.
To quit the settings menu, press “esc” (3).
The status LED (2) lights up green when a relay is active, or blinks red when an error occurs.
Commands are entered using four keys (3) and (4), which are assigned context-sensitive functions.
The “esc“ key (3) is always used to cancel a command or exit a 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 the 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
- Heat exchanger
- Buffer pause (see buffer time)
- Warning / error message
- New information available
- Logging currently active

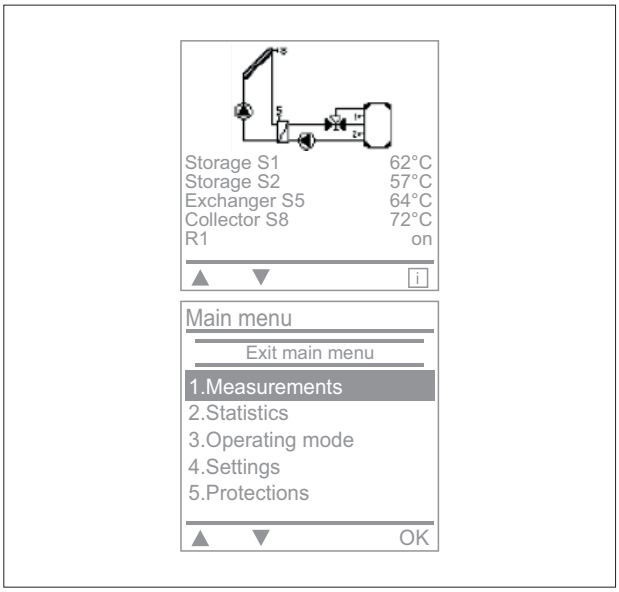
More symbols can be found under the heading "Special functions"

MENU SEQUENCE AND 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.

The “up and down” keys are used to scroll the list of sensors and relays.

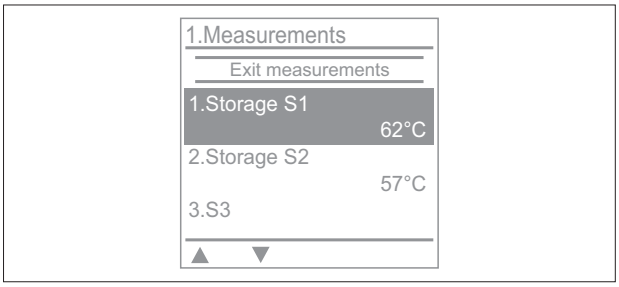
Pressing “esc”, the main menu reappears. The following menus are available



1. Measurements	Current temperature values with explanations
2. Statistics	General system control information, including hours operation
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

1.MEASUREMENT VALUES

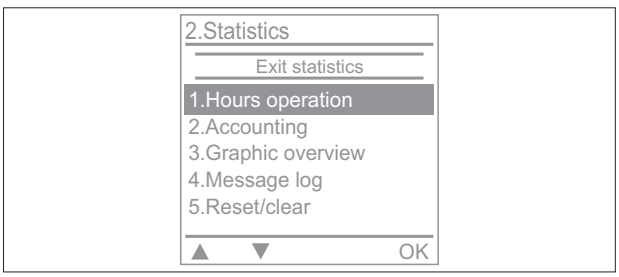
Menu “1. Measurement values” indicates the current temperatures measured.
Quit the menu by pressing “esc” or selecting “Exit Measurements”.
To quit Info mode, select “Overview” or press “esc”.



⚠ 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. Follow the instructions given in heading “6.11. – Sensor calibration”. The types of measurements actually displayed will depend on the selected program, the sensors connected, and the specific design of the controller.

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”.



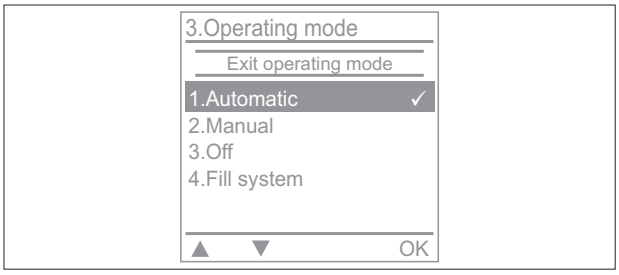
⚠ To run analyses on system data, the time must be set correctly at the controller. Remember that in the

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.

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.
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.

3.4 Fill system

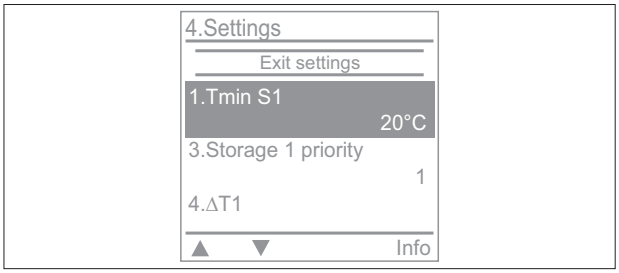
⚠ This special operating mode is intended only for filling purposes when using a special “Drain Master System”, which employs a fill level contact wired in parallel to collector sensor S1. Follow the instructions on the display when filling the system. Be sure to deselect the Drain Master System once the fill is completed!

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 S8
If the temperature registering at sensor S8 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 to 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 storage 1 = Maximum temperature for buffering storage 1
If the temperature registering at sensor S1 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 to 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!

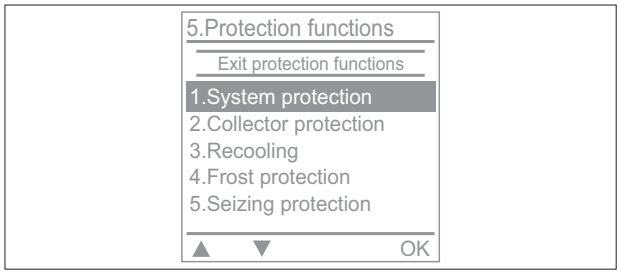
4.6 Storage priority 2
This determines the order in which the storage targets are filled. If the same priority is set for both targets, flow will not be switched until the moment when the active target can no longer be buffered.
Settings range: 1 - 2 / Default: see table.
4.7 ΔT On, storage 2 = Temperature 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 storage 2 = Maximum temperature for buffering storage 2
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 to 99 °C / Default: see table.
4.17 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.
4.18 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 “4.19. - 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.
4.19 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 functions” can be used to set and activate a number of protective functions.
To quit the menu, press “esc” or select “Exit”.



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: 120 °C to 150 °C / Default: see table.
SP T off – Settings range: 50 °C to 115 °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: 105 °C to 150 °C / Default: see table.
CP T off - Settings range: 50 °C to 105 °C / Default: see table.
Tmax storage 1 - Settings range: 30 °C to 140 °C / Default: see table.
Tmax storage 2 - Settings range: 30 °C to 140 °C / Default: see table.

⚠ 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” temperature 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: 6 °C to 10 °C or off / Default: see table.
Frost stage 2: Settings range: -25 °C to 6 °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.
Settings range R4: daily, weekly, off / Default: see table.
Settings range R5: daily, weekly, off / Default: see table.
Settings range R6: daily, weekly, off / Default: see table.
Settings range R7: 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.

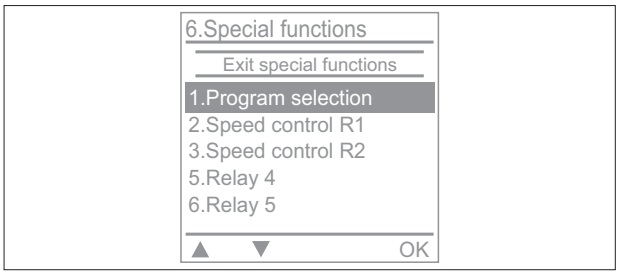
6. SPECIAL FUNCTIONS

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

In questo menù si seleziona e imposta la variante idraulica desiderata per la specifica applicazione.
Intervallo parametri: 1-48 / Default: vedi tabella

⚠ Normalmente la selezione del programma è fatta una volta solo durante l’avviamento da uno specialista. Un programma non corretto potrebbe portare ad errori e danni gravi

⚠ Se il programma viene cambiato, le impostazioni tornano a quelle di fabbrica.

6.2 Controllo velocità R1

With the speed control provided by the XTDC, 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.

6.2.1 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 control unit reduces the speed of the pump to the minimum level 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.

6.2.2 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

6.2.3 Pump menu

6.2.3.1 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.

6.2.3.2 Output signal
This menu determines the type of pump in use: Solar pumps operate at their highest speed when the signal likewise is at maximum strength, whereas conversely, heating pumps operate at their highest speed when the signal is at minimum strength. Solar = normal, heating = inverted.
Settings range: Normal, Inverted / Default: see table.

6.2.3.3 0-10V Off
This voltage is delivered when the pump is off (pumps capable of detecting a cable break require a minimum voltage).
Settings range: (Solar:) 0.0 to 5.0 V / Default: see table.
(Heating:) 5.0 to 0.0 V / Default: see table.

6.2.3.4 0-10V On
This voltage is needed to switch on the pump at minimum speed. Settings range: (Solar:) 0.0 to 5.0 V / Default: see table.

6.2.3.5 0-10V Max
This determines the output voltage for operation of the pump at maximum speed, used for example when purging the system or in manual mode.
Settings range: (Solar:) 5.0 to 10.0 V / Default: see table.

6.2.3.6 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% to 90% / Default: see table.

6.2.4 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 “6.2.1 - Modes”. The purge time function cannot be applied with PWM or 0-10V output.
Settings range: 5 to 600 seconds / Default: see table.

6.2.5 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.

6.2.6 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.

6.2.7 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.

6.2.8 Setpoint
This value is the control setpoint. 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 to 99 °C / Default: see table.

6.3 Speed control R2
With the speed control provided by the XTDC, 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 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

6.3.3 Pump menu

6.3.3.1 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.

6.3.3.2 Output signal
This menu determines the type of pump in use: Solar pumps operate at their highest speed when the signal likewise is at maximum strength, whereas conversely, heating pumps operate at their highest speed when the signal is at minimum strength. Solar = normal, heating = inverted.
Settings range: Normal, Inverted / Default: see table.

6.3.3.3 0-10V Off
This voltage is delivered when the pump is off (pumps capable of detecting a cable break require a minimum voltage).
Settings range: (Solar:) 0.0 to 5.0 V / Default: see table.
(Heating:) 5.0 to 0.0 V / Default: see table.

6.3.3.4 0-10V On
This voltage is needed to switch on the pump at minimum speed. Settings range: (Solar:) 0.0 to 5.0 V / Default: see table.

6.3.3.5 0-10V Max
This determines the output voltage for operation of the pump at maximum speed, used for example when purging the system or in manual mode.
Settings range: (Solar:) 5.0 to 10.0 V / Default: see table.

6.3.3.6 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% to 90% / Default: see table.

6.3.4 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.

6.3.5 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.

6.3.6 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.

6.3.7 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.
6.3.8 Setpoint
This value is the control setpoint. 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 to 99 °C / Default: see table.
6.5 Relay 4
The additional functions described here can be assigned to spare relays, i.e. relays not used in the respective basic systems. Additional functions can be used only one at a time, in conjunction with one relay.
R1 and R2: electronic speed control relays
R3 to R6: mechanical relays
R7: relay with voltage-free contacts
V1 and V2: PWM and 0..10V outputs
Pay particular attention to the technical information on the relays.
A symbol appears in the display when the associated function is active.
6.5.1 Solar bypass
Using the relay to activate a bypass valve or bypass pump.
This can direct flow toward the selected storage target when the flow temperature registering at the bypass sensor is less than that of the storage to be buffered.
Settings range: On, Off
6.5.2 Mode
This menu determines whether the flow is directed through the bypass by a pump or a valve. Settings range: Pump, Valve / Factory setting: Valve.
6.5.3 Bypass (sensor)
This menu is used to select the flow sensor for the bypass function. Do not install on the return line. Settings range: S1-S8, VFS1, VFS2 / Factory setting: none
6.6 Relay 5
See heading 6.5.
6.7 Relay 6
See heading 6.5.
6.8 Relay 7
See heading 6.5.
6.9 Heat output
6.9.1 Fixed flow rate
6.9.1.1 Metering
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. Settings range: On, Off / Default: Off.

⚠ The amount of heat measured in “Constant flow” mode is an approximation calculated for system control purposes.

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-S8, VFS1-2, active collector, active storage / RC temp / Default: see table.
6.9.2.4 Type of antifreeze
Selection of the type of antifreeze adopted.
Settings range: ethylene-propylene / Default: see table.

6.9.2.5 Percentage of glycol
Quantity of antifreeze in the system.
Settings range: 0 to 100% / Default: see table.
6.9.2.6 Offset ΔT = heat meter temperature difference correction factor
Given that the collector and storage circuits 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.
6.10.3 RPS1
6.10.3.1 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.

6.10.2.2 Minimum pressure
If pressure falls below this threshold, a message is displayed and the relay will be activated. Settings range: Off, 0.0 to 1.6 bar / Default: see table.
6.10.2.3 Maximum pressure
If this threshold is exceeded, a message is displayed and the relay will be activated. Settings range: Off, 0.0 to 10 bar / 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. - SD card
Settings for data logging and updating firmware with a Secure Digital memory card.
6.14.1 Logging
Activates the logging function and sets the file format used.
6.14.2. - Free space
Displays the available space on the SD card.
6.14.3. - Load configuration
Used to load settings from the SD card.

⚠ All previous settings will be overwritten.

6.14.4. - Save configuration
All controller settings can be saved to the SD card.
6.14.5. - Firmware update
This menu is used to update the controller firmware by transferring a product saved on the SD card.

⚠ Do not on any account switch off the controller during a firmware update, as this can cause irreversible damage. Settings may be changed by importing an update. Restore the factory settings of the controller after the reset, and commence the start-up procedure.

6.14.6. - Unmount
To prevent damage to the SD card or loss of data, unmount the card before removing it from the controller.
6.15 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.

⚠ 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.

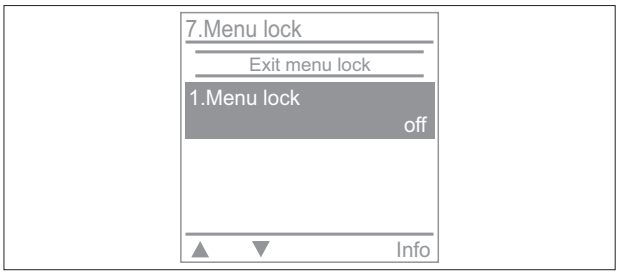
6.16 Time and date
This menu is used to set the current time and date.

⚠ 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.

6.17 Daylight saving time
When this function is active, the clock updates automatically when Daylight Saving Time (DST) commences and finishes. Factory setting: see table.
6.18 Sleep mode
When sleep mode is selected, the display goes blank after two minutes of inactivity. Factory setting: see table.
6.19 Ethernet
This menu is used to enter the necessary settings for the Ethernet connection.
6.20 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”.

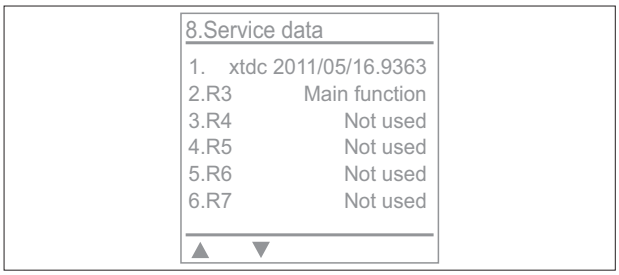


The menus listed below remain fully accessible even when the menu lock is active, and can be used to make changes if necessary:
1. Measurements
2. Statistics
6. Time and date
7. Menu lock
8. Service data

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

This menu can be used for the purposes of remote diagnosis by the manufacturer or by a technician, when investigating errors, etc. Service data values are saved to the SD card when data logging is active.



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

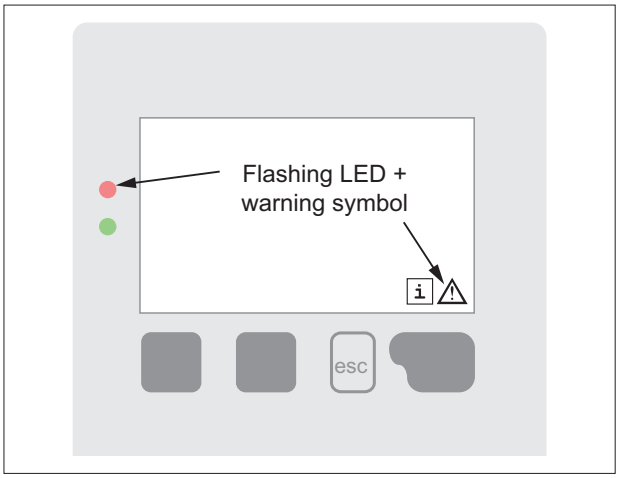


MALFUNCTIONS

MALFUNCTIONS WITH ERROR MESSAGES

The controller indicates a problem by causing the LED to blink red and generating a relative error symbol in the display. If the error is only transient, the error symbol will be replaced by an information symbol and the blinking red light disappears.
To find out more about an error, press the key located below the error or information symbol.

⚠ Do not attempt to solve the problem without assistance. Always call an expert service technician.



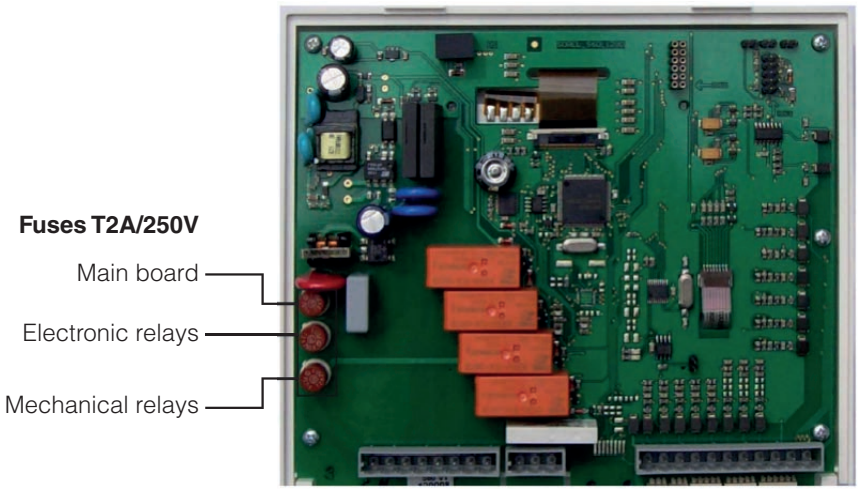
Possible error messages	Notes for service technicians
Sensor x defective	Fault affecting the sensor, the sensor input at the controller, or the cable connecting the sensor.
Collector alarm	This alarm will trip when the collector temperature limit set by way of the menu "5.6. Collector alarm" is exceeded.
Restart	This indicates that the controller has rebooted, e.g. following an electrical power failure. Check the date and time
Time & date	This screen appears automatically following an electrical power failure, since the time and date must be verified, and if necessary reset.
Night-time circulation Check clock	This indicates that the pump is or was in operation between 23:00 and 04:00.
System protection	The collector temperature setting was exceeded at some point, triggering deactivation of the solar pump to prevent damage to the system through overheating.
Collector protection	The collector temperature setting was exceeded at some point, triggering activation of the solar pump to cool the collector circuit with the aid of the heat exchanger.
Recooling	Excess heat was or is being radiated from the collector to protect the system.
Frost protection	The solar pump was switched on to prevent frost damage to the collector
Frequent On / Off	When the solar pump is switched on and off more than 5 times in 5 minutes (i.e. 11 contact changes), this message is displayed.
No flow	Message displayed when the solar pump is running with ΔT >= 50 °C for at least 5 minutes.
Pressure: failure	Displayed when pressure monitoring is activated and the Pmin or Pmax limit is exceeded.
SD-card error	This message is displayed when an SD card has been detected, but the controller is unable to read from or write to the card.

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! Check that there is no power!

⚠ Use only the spare fuse supplied, or select a similar fuse with the following specifications: 250V and 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. Locate the cause of the fault if external (e.g. pump), and repair or replace as necessary.



MAINTENANCE

⚠ During the course of general maintenance on the system every year, have the functions of the controller checked by an expert service technician, and the parameters optimised if necessary.

Maintenance operations:
- Check the time and date (see “6.16. Time and date”)
- Assess/check the reliability of analytical data (see “2. Statistics”)
- Assess/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

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 “6.2.6. 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 logged so that the information will not be lost.
- Firmware updates are published on www.sorel.de and can be uploaded to the controller from the SD card.

CONTROLLER PARAMETERS TABLE

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

Menu	Description	Settings range	Default	User setting
4. SETTINGS				
4.1	Tmin S8	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 storage 1	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 storage 2	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 120°C ÷ 150°C 50°C ÷ 115	On 120°C 115°C	
5.2	Collector protection Collector protection on Collector protection off Tmax storage 1 Tmax storage 2	On/off 105°C ÷ 150°C 50°C ÷ 105 30°C ÷ 140°C 30°C ÷ 140°C	On 110°C 100°C 90°C 90°C	
5.3	Recooling Tref	On/off 0°C ÷ 99°C	On 85°C	
5.4	Frost protection Frost stage 1 Frost stage 2	On /off 6°C ÷ 10°C / off -25°C ÷ 6°C	Off 7°C 5°C	
5.5	Seizing protection R1 Seizing protection R2 Seizing protection R3 Seizing protection R4 Seizing protection R5 Seizing protection R6 Seizing protection R7	Daily / weekly / off	Off Off Off 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	1-48	17	
6.2	Speed control R1	-	-	
6.2.1	Modes	M1,M2,M3,M4,off	M4	
6.2.2	Type of pump 1	Standard / 0-10V / PWM	0-10V	
6.2.3	Pump menu			
6.2.3.1	Pump	Solar / heating / profile 1-11 / manual	Profile 7	
6.2.3.2	Output signal	Normal / inverted	Normal	
6.2.3.3	0-10 V off	0.0V ÷ 5.0V	0,7 V	
6.2.3.4	0-10 V on	0.7V ÷ 5.0V	2,0 V	
6.2.3.5	0-10 V max	5.0V ÷ 10.0V	10,0 V	
6.2.3.6	Speed when On	10% ÷ 90%	30%	
6.2.4	Purge time	5sec ÷ 600sec	8sec	
6.2.5	Sweep time	1min ÷ 15 min	4min	
6.2.6	Maximum speed	70% ÷ 100%	100%	
6.2.7	Minimum speed	30% ÷ 95%	30%	
6.2.8	Setpoint	0°C ÷ 90°C	60°C	
6.3	Speed R1	-	-	
6.3.1	Modes	M1,M2,M3,M4,off	M4	

Menu	Description	Settings range	Default	User setting
6.3.2	Type of pump 1	Standard / 0-10V / PWM	0-10V	
6.3.3	Pump menu			
6.3.3.1	Pump	Solar / heating / profile 1-11 / manual	Profile 7	
6.3.3.2	Output signal	Normal / inverted	Normal	
6.3.3.3	0-10 V off	0.0V ÷ 5.0V	0,7 V	
6.3.3.4	0-10 V on	0.7V ÷ 5.0V	2,0 V	
6.3.3.5	0-10 V max	5.0V ÷ 10.0V	10,0 V	
6.3.4	Purge time	5sec ÷ 600sec	8sec	
6.3.5	Sweep time	1min ÷ 15 min	4min	
6.3.6	Maximum speed	70% ÷ 100%	100%	
6.3.7	Minimum speed	30% ÷ 95%	30%	
6.3.8	Setpoint	0°C ÷ 90°C	60°C	
6.5	Relay 4			
6.5.1	Solar bypass	On / off	Select	
6.6	Relay 5			
6.7	Relay 6			
6.8	Relay 7			
6.9	Heat output			
6.9.1	Fixed flow rate			
6.9.1.1	Metering	On / off	Off	
6.9.2	VFS1			
6.9.2.1	VFS1 type	1-12 l/min - 1-20 l/min - 2-40 l/min - 5-100 l/min - 10-200 l/min - 20-400 l/min - off	10-200 l/min	
6.9.2.2	Installed on	Flow / return	Return	
6.9.2.3	Reference sensor	S1-S8 / VFS1-2 / active collector / active storage / RC temp	S2	
6.9.2.4	Type of antifreeze	Ethylene / propylene	Propylene	
6.9.2.5	Percentage of glycol	0% ÷ 100%	45%	
6.9.2.6	Offset ΔT	-50% ÷ +50%	0%	
6.10	Pressure monitor			
6.10.1	Pressure monitor	On / off	On	
6.10.2	RPS type	Off / 0-0.6bar / 0-1bar /0-1.6bar / 0-2.5bar / 0-4bar / 0-6bar / 0-10bar	0-10bar	
6.10.2.1	Pmin	Off / 0.0 ÷ 10.0 bar	1 bar	
6.10.2.2	Pmax	Off / 0.0 ÷ 10 bar	8bar	
6.11	Sensor calibration	-100 ÷ +100	0	
6.11.1	S1 calibration	-100 ÷ +100	0	
6.11.2	S2 calibration	-100 ÷ +100	0	
6.11.3	S3 calibration	-100 ÷ +100	0	
6.11.4	S4 calibration	-100 ÷ +100	0	
6.11.5	S5 calibration	-100 ÷ +100	0	
6.11.6	S6 calibration	-100 ÷ +100	0	
6.11.7	S7 calibration	-100 ÷ +100	0	
6.11.8	S8 calibration	-100 ÷ +100	0	
6.11.9	VFS 1 temp	-100 ÷ +100	0	
6.11.10	VFS 1 flow rate	-100 ÷ +100	0	
6.11.11	VFS 2 temp	-100 ÷ +100	0	
6.11.12	VFS 2 flow rate	-100 ÷ +100	0	
6.12	Programming wizard	On/ off	off	
6.13	Factory settings	On / off	off	
6.14	SD Card			

Menu	Description	Settings range	Default	User setting
6.14.1	Logging		on	
6.14.2	Free space			
6.14.3	Load configuration			
6.14.4	Save configuration			
6.14.5	Firmware update			
6.14.6	Eject			
6.15	Setup wizard	On / off	off	
6.16	Time and date			
6.17	Daylight saving time	On / off	On	
6.18	Sleep mode	On / off	On	
6.19	Ethernet			
6.19.3	DHCP*		On*	
6.19.4	TCP/IP		Enter manually	
6.20	Temperature unit	°C ÷ °F	°C	

⚠ * DHCP (Dynamic Host Configuration Protocol): with the network protocol active (default setting), the IP configuration needed in order to establish a network connection can be received by the XTDC electronic controller dynamically. In effect, the controller can be managed and piloted remotely once this connection is established. However, certain networks do not support DHCP (this will depend on the network settings). In the event that DHCP cannot be handled by the system, the protocol must be established by entering a static IP address (obtained from the internet service provider). This operation may require the assistance of a computer technician.

⚠ The XTDC electronic controller comes with a Micro SD memory card containing the complete set of manuals needed for installation and operation purposes. The same card can also be used for importing firmware updates, or saving operating data logged by the system. This data storage function, especially, used in combination with Sorel Connect supervision software (see below for more details), is of key importance for the purposes of monitoring and controlling smooth operation of the system.

⚠ Connecting the controller to a network with an Ethernet cable, data can be read, updated and corrected from a remote location using a PC or other smart device.

SOREL CONNECT SUPERVISION SOFTWARE

The controller comes complete with a software application used to read system operating data and allowing supervision of the system from a remote station. The program requires no installation (simply copy the relative folder from the controller SD card into any directory of the PC) and will run with recent Windows operating systems (XP up to Windows 8).

Key to software functions:

1 Initial screen showing connection details and access credentials
2 IP address allocated by service provider for connection to local area network
3 Username and password authorising connection to the required system
4 Upload settings, or import firmware updates
5 Save settings and system events
6 Display system status
7 Remote control; with connection established, allows configuration of system parameters from a remote location
8 Event viewer, listing all system events, measurement values and operating errors/abnormalities. Data can be saved using function 5
9 Creation of chart reflecting events and data obtained from function 8



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