

# THERMITAL MODEX ACS 40 E

## DESCRIPTION

The **ACS 40 E** is an instant domestic hot water mixer. It uses a brazed, stainless steel plate heat exchanger and is designed for use in combination with DHW storage cylinders.

The product is equipped with two filling/drain cocks. When the shut-off valves are closed, these can also be used to flush out the heat exchanger.

A domestic hot water recirculation kit is available for further convenience.

The **ACS 40 E** instant hot water mixer comes complete with an insulated frame.

## CONTENTS OF KIT

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1 DHW mixer in packing	1
2 Instruction manual	1

## GENERAL SAFETY INFORMATION AND PRECAUTIONS

READ THIS MANUAL THOROUGHLY BEFORE PERFORMING ANY WORK ON THE PRODUCT.

The manufacturer reserves the right to modify the product without notice for the purpose of introducing technical improvements or to facilitate production, installation and positioning. The illustrations in this manual may therefore differ slightly from the actual product. The safety of the product and the accuracy of the instructions provided are nevertheless guaranteed.

This manual forms an integral part of the product itself and must be kept in a safe place in order to avoid damage and to permit rapid consultation throughout the working life of the product.

Ideally, this manual should be kept with the product where it can be consulted whenever needed. The manual should always accompany the product if sold or transferred to a new owner, or stay with it if the owner moves house and leaves it behind, so that the next user can consult it.

## GENERAL SAFETY INFORMATION

### INSTALLATION

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

The product must be installed in conformity to the laws and standards applicable in the country of installation.

The manufacturer's responsibility ends with the supply of the product. The product must be installed using best professional practices, in conformity to applicable standards, by suitably qualified persons employed by a company that assumes 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 product must be installed and all electrical connections made by suitably qualified personnel in conformity to applicable standards.

The product's mains power cable must be connected to a fused, two-pole switch (power supply 230 VAC, 50 Hz). The product must be correctly connected to ground.



The product must be connected to the mains power supply via an earth leakage breaker in accordance with applicable standards. Correct functioning is only guaranteed provided the product is used with the pump for which it is designed. The manufacturer cannot be held responsible for the consequences of improper uses.

### WATER CONNECTIONS

On completion of all transport or handling operations, always check the tightness of the water fitting ring nuts.

Take particular care when connecting the product to the water supply. When tightening a fitting, always hold the opposite fitting steady with a second tool to avoid twisting the copper pipes.

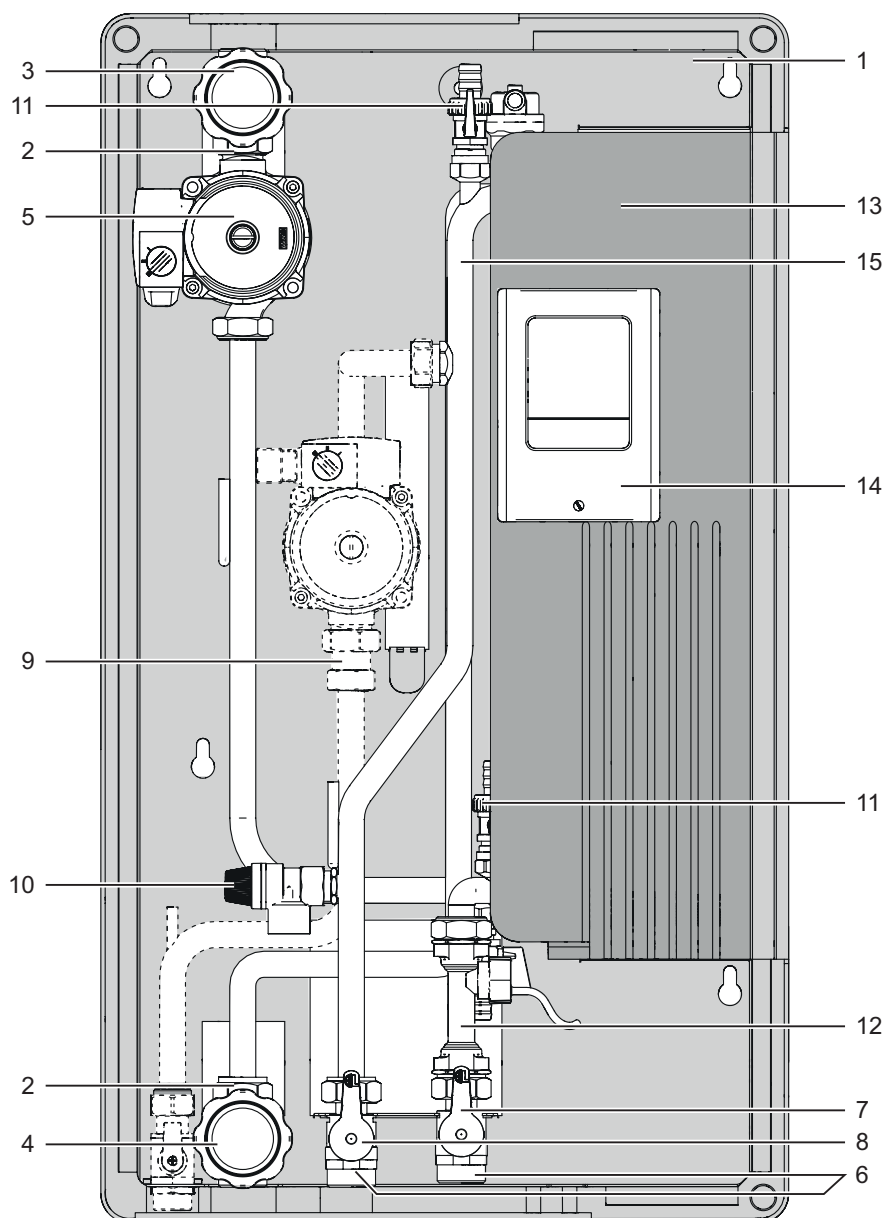


The product must be installed, connected and tested by suitably qualified persons, in conformity to applicable standards and in accordance with the instructions provided in the documentation supplied with it. **N.B. All pipes must be insulated in conformity to applicable standards.**

### It is essential to respect the following precautions when using the product:

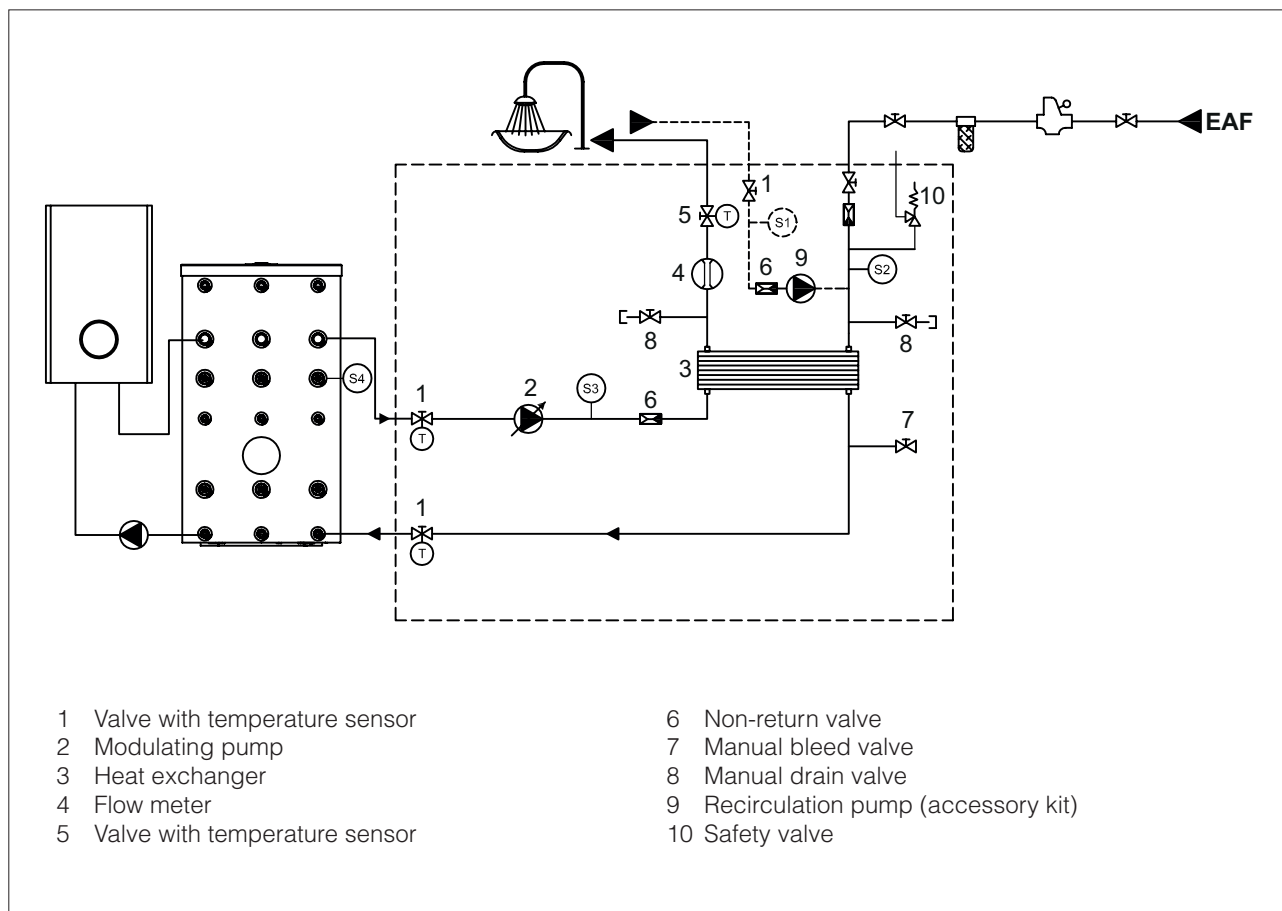
- Do not touch hot parts of the product such as the water inlet and outlet pipes. Contact with hot parts can cause painful burns.
- Do not splash water or any other liquid over the product.
- Do not rest any objects on top of the product.
- Do not expose the product to steam from a cooking hob.
- Do not allow children or inexperienced persons to operate the product.
- Do not touch the product when barefoot or wet.
- Do not pull on the electrical cables.

## MAIN COMPONENTS



- 1 Galvanised and internally insulated backplate
- 2 Ball valve, DN 20 3/4" F – 1" M (primary outlet)
- 3 Red knob for ball valve with temperature sensor (primary inlet)
- 4 Blue knob for ball valve with temperature sensor (primary outlet)
- 5 Pump (primary circuit)
- 6 Ball valves, DN 20 3/4" F - 1" M (secondary circuit)
- 7 Red knob for ball valve (DHW outlet)
- 8 Blue knob for ball valve (cold water inlet)
- 9 Non-return valve (primary and secondary circuits)
- 10 Safety valve, 6 bar (secondary circuit)
- 11 Filling/drain cock, 1/2"
- 12 Flow meter and temperature sensor (secondary circuit)
- 13 Brazed, stainless steel, plate heat exchanger
- 14 Electronic control unit
- 15 Piping

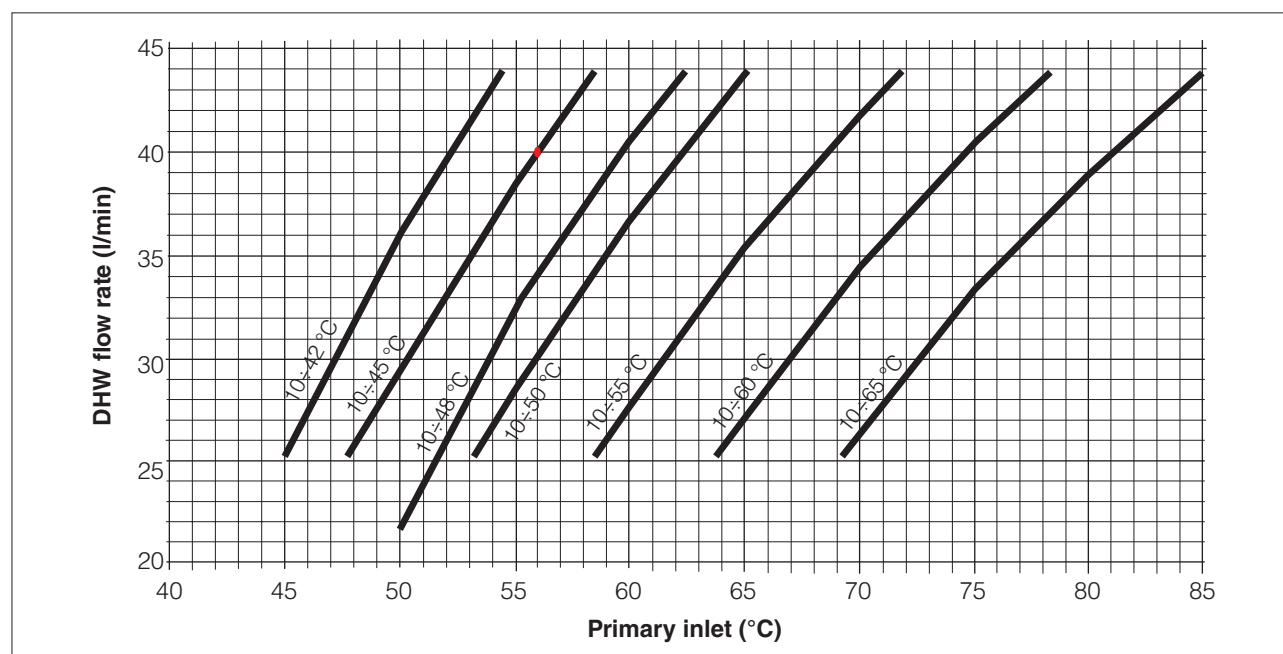
## WATER CIRCUIT



## TECHNICAL SPECIFICATIONS

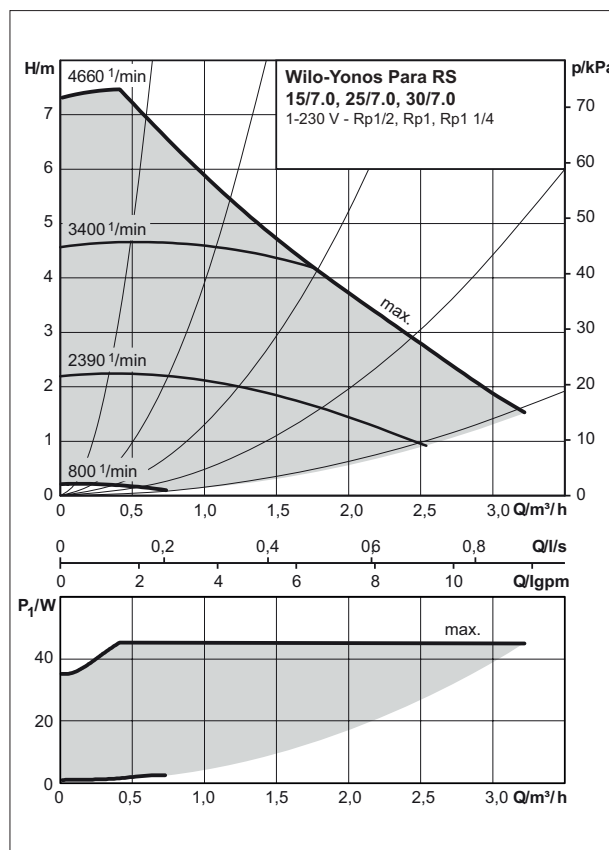
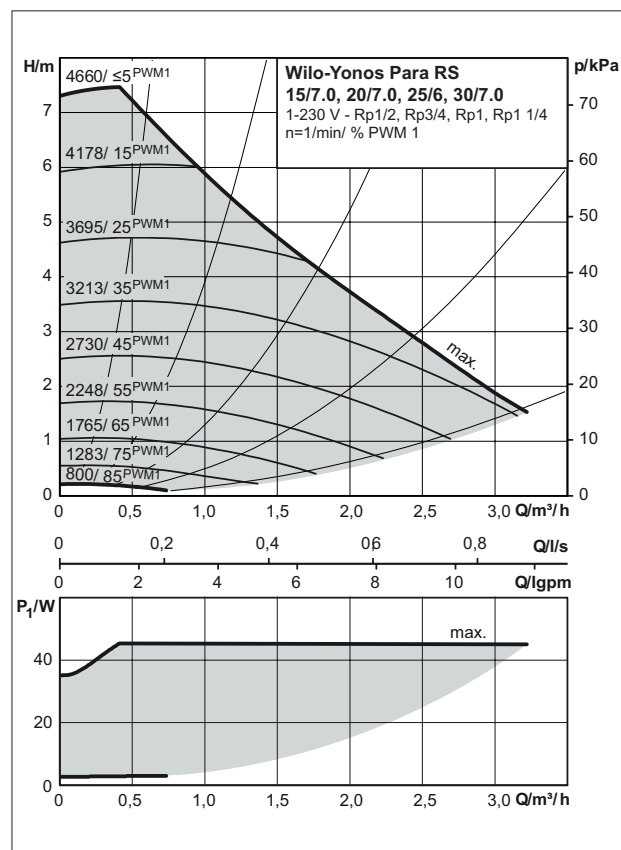
DESCRIPTION	ACS 40 E	
Thermal power absorbed with storage cylinder at 50°C and DHW water delivery at 10-45°C	72	kW
Water draw at 10-45°C with storage cylinder at 50°C	29,5	l/min
Thermal power absorbed with storage cylinder at 55°C and DHW water delivery at 10-45°C	94,0	kW
Water draw at 10-45°C with storage cylinder at 55°C	38.5	l/min
Thermal power absorbed with storage cylinder at 60°C and DHW water delivery at 10-40°C	92	kW
Water draw at 10-40°C with storage cylinder at 60°C	44	l/min
Maximum flow-rate primary	1850	l/h
Minimum permissible temperature, DHW circuit	2	°C
Maximum operating temperature	90	°C
Maximum operating pressure, primary circuit	10	bar
Opening pressure, primary circuit non-return valves	28	mbar
Opening pressure, DHW circuit non-return valves	28	mbar
Consumption	47	W
Power supply voltage	230	V
Power supply frequency	50-60	Hz
Index of protection	40	IP
Net weight	19,2	kg
Water capacity	6,6	l

## Domestic hot water production graph

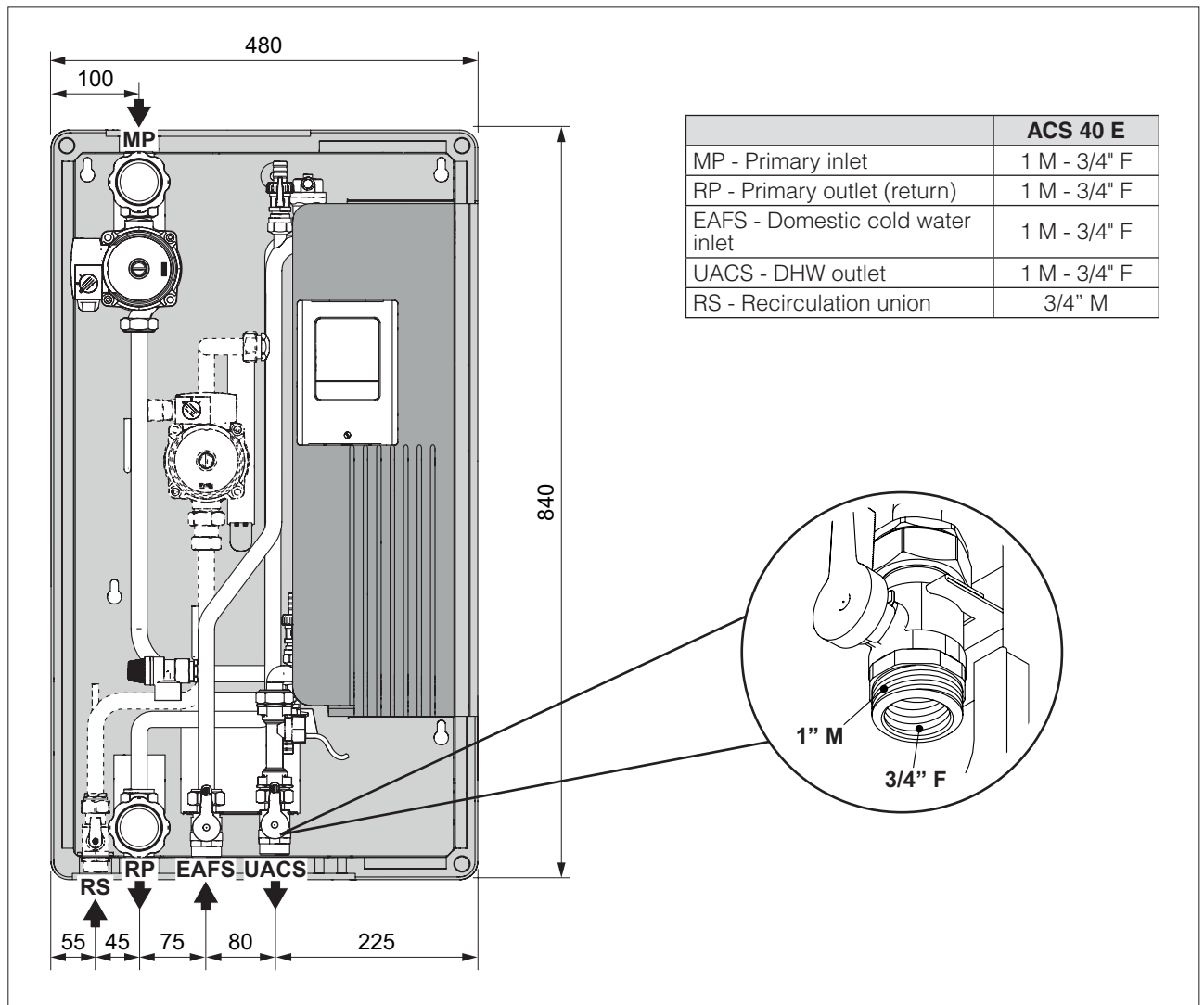


**NB:** Correct functioning of the product is only guaranteed if the primary circuit inlet temperature is at least 5°C higher than the DHW setpoint.

## CHARACTERISTIC CURVES FOR PRIMARY CIRCUIT PUMPS

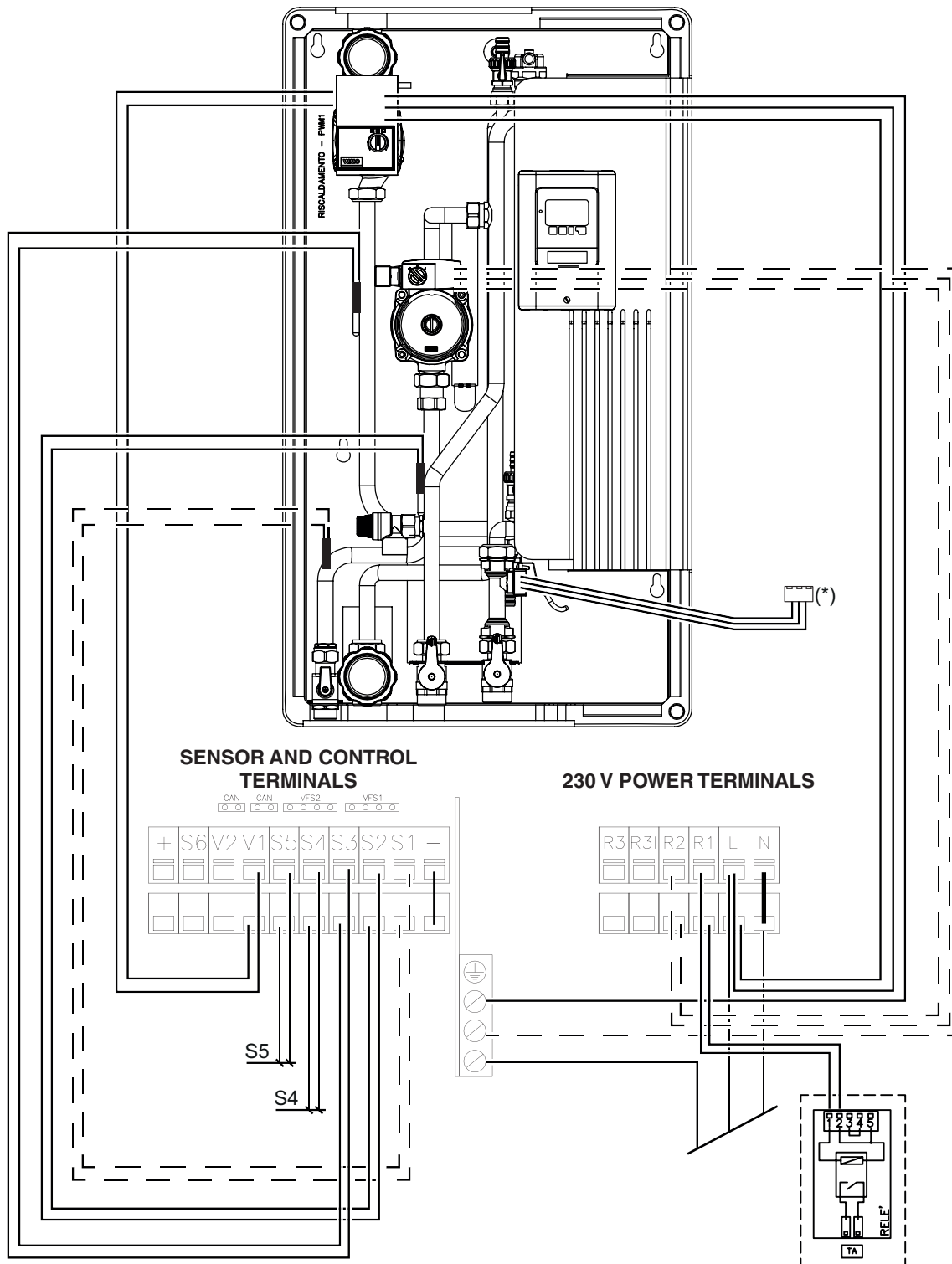


## DIMENSIONS AND FITTINGS



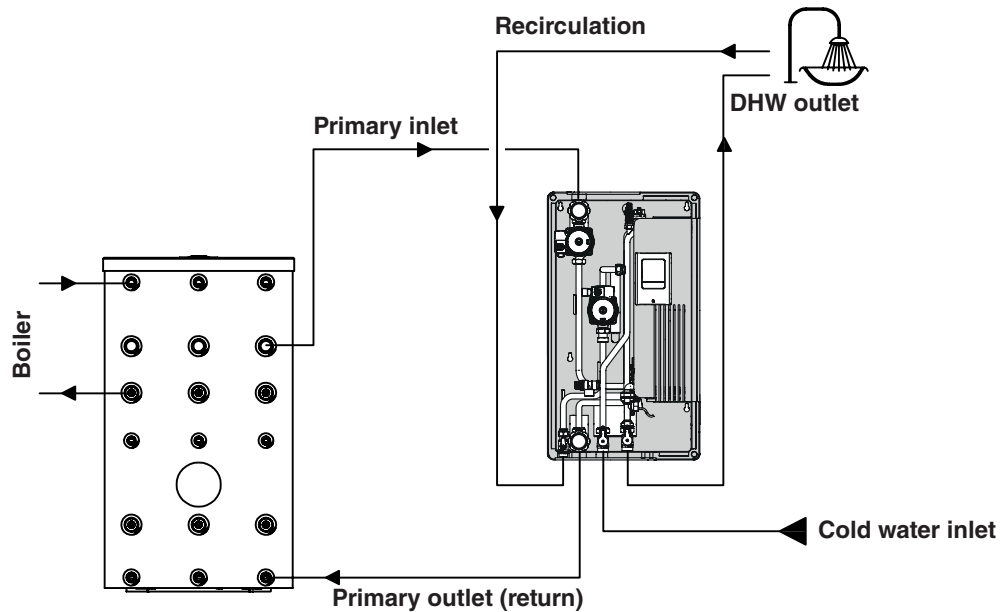
## WIRING DIAGRAM

- S4** Storage cylinder top sensor  
**S5** Storage cylinder bottom sensor  
**(\*)** Connect to controller terminal VFS1



## SYSTEM SCHEMATIC

### Example of wall mounted installation



## INSTALLATION

### PRELIMINARY CHECKS

Carefully remove the packing and check that the product is complete and undamaged. If any defect or damage is detected, do not install or attempt to repair the product but return it to the retailer. Dispose of packaging in compliance with applicable law.

- ⚠ Make sure that the installation position provides easy visibility of and access to the safety valves.
- ⚠ Connect the safety valves to a drain in conformity to applicable standards.
- ⚠ Install the product as near as practical to the storage cylinder. The product is designed to work with a pipe length of 4 metres (inlet and return) between itself and the storage cylinder.
- ⚠ Disconnect the product from the mains power supply before commencing any work on it.
- ⚠ The product must be installed in conformity to the laws and standards applicable in the country of installation.
- ⚠ The manufacturer's responsibility ends with the supply of the product. The product must be installed in conformity to applicable standards by suitably qualified persons employed by a company that assumes full responsibility for the completed installation.

### INSTALLATION AND PUTTING INTO SERVICE

Bear in mind the following before installing the product:

- The product is designed to mix domestic hot water from a storage cylinder. Any other use, or any use incompatible with the product's technical specifications, is considered improper. Do not connect the product directly to a boiler.
- The product is not designed to be operated by children or persons with limited physical, psychological, sensorial or mental capacities.
- If the piping needed to connect the product to the water system is damaged, it must be replaced by a suitably qualified person.
- The installation must comply with all applicable laws and standards.



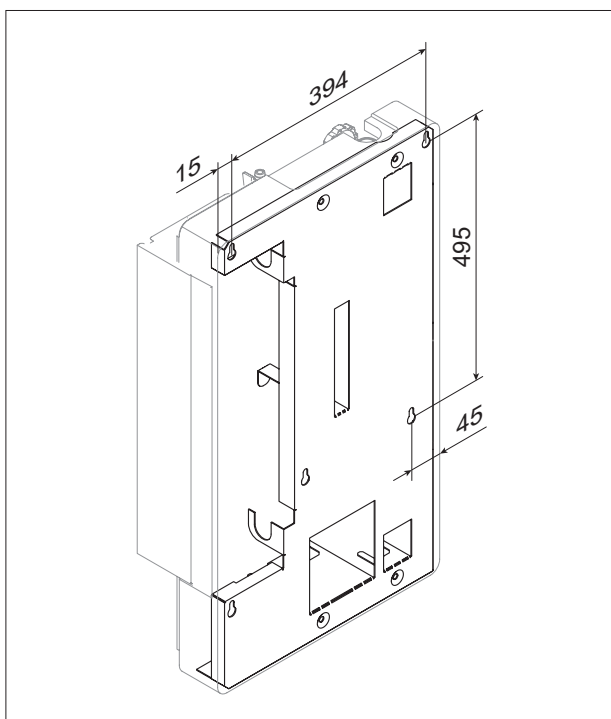
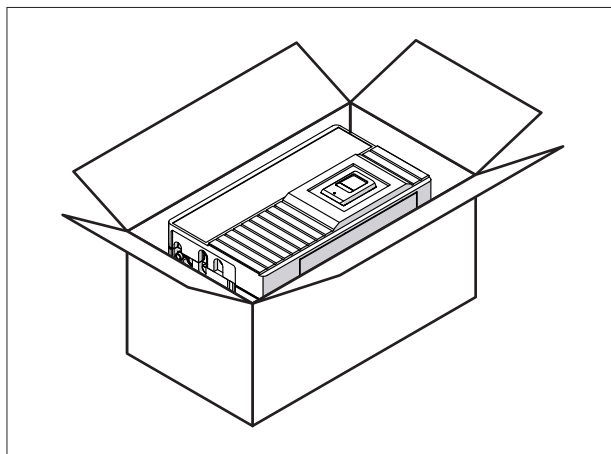
⚠ Installation and connection of the product must be performed by an authorised, specialist company. The company installing the product assumes all responsibility for ensuring that the installation and functioning of the product conform to applicable standards.

⚠ The product must be stored in a dry place where it is not subject to frost. The product must be installed where it is protected against splashes of water. Ambient temperature in the place of installation must not exceed 40°C during functioning of the product.

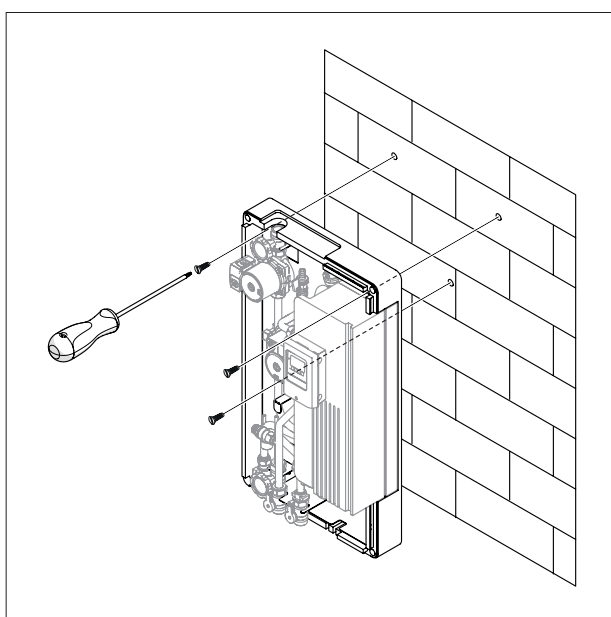
⚠ It is advisable to install the product as near as practically possible to the storage cylinder, in order to avoid unnecessary heat loss from the connecting pipes.

⚠ Handle with care!

- Remove the product from its packaging and remove the polypropylene cover.
- Drill the wall at the positions shown in the figure and fit three 12 mm wall plugs. Mount the product on the wall, inserting the wall plugs through the slots in the rear. Slide the product down until the screws lie at the top of the slots.

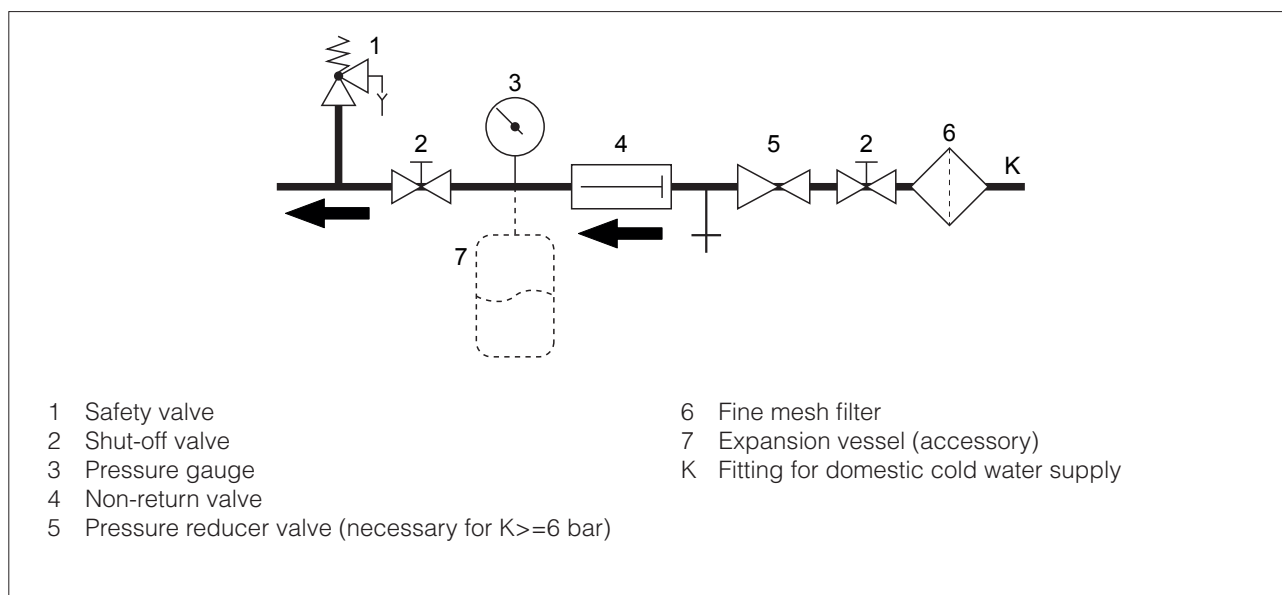


- Tighten the screws on the metal backplate through the holes in the front of the product as shown in the figure.
- Connect the water pipes according to the schematic in "System schematic".
- Check that all connections have been made correctly. Make sure that the entire system is water tight before putting the mixer into service. To ensure maximum efficiency, also make sure that all air has been bled from the system.
- Fit the cover.



## WATER CONNECTIONS

### CONNECTION TO THE WATER CIRCUIT



- The pipes between the product and the storage cylinder should be kept as short as possible.
- Connect the product to the domestic cold water supply as instructed.
- Install a filter in the domestic hot water circuit to capture impurities and protect the circuit. Also install a non-return valve and an expansion vessel along the domestic cold water supply.

If the water supply is harder than 25 to 30 °Fr, a suitable treatment system should be installed upstream from the water heating system to prevent corrosion and the formation of limescale.

Bear in mind that, because of the low thermal conductivity of limescale, even deposits of only a couple of millimetres in thickness can significantly reduce the efficiency of the water heating system.

The ACS 40 E hot water mixer is made from materials that conform to the requirements of Ministerial Decree 174/2004 (Italy) implementing Council Directive 98/83/EC.

All fittings are assembled in the factory. It is nevertheless advisable to check their tightness after installing the product. It is also necessary to test the product for water tightness at operating pressure when putting it into service.

- Values in excess of those specified in the table alongside can damage the product and automatically invalidate the warranty. It is therefore important to analyse the water to ensure that all values are within the limits given in the table.

WATER PARAMETER	UNIT OF MEASURE	MAXIMUM PERMISSIBLE VALUE FOR COPPER-BRAZED HEAT EXCHANGERS
pH		7-9 (indicative of saturation)
Saturation index (PH delta)		$-0.2 < 0 < +0.2$
Total hardness	°Fr	15-30
Conductivity	µS/cm	10...500
Solid substances	mg/l	<30
Free chlorine	mg/l	<0.5
Hydrogen sulphide	mg/l	<0.05
Ammonia	mg/l	<2
Bicarbonate	mg/l	<300
Bicarbonate/Hydrogen sulphide	mg/l	>1.0
Sulphur	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

## **ELECTRICAL CONNECTIONS**

The following instructions are mandatory.

- 1 Use a multi-pole, magnetic thermal, earth leakage breaker and disconnecter that conforms to legislation in the country of installation.
- 2 Respect the L (Phase) - N (Neutral) polarity. Keep the ground wire about 2 cm longer than the power wires.
- 3 Make sure the product is correctly connected to ground.



It is strictly forbidden to use water pipes to ground the product.



Do not route the power cable near hot surfaces (like hot water pipes). Use a suitable class of cable if there is any possibility of contact with parts at temperatures above 50°C.



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

## **FILLING PROCEDURE, PRIMARY CIRCUIT**



Fill and bleed the primary circuit with the water at ambient temperature.

- Open the primary circuit inlet and outlet ball valves.
- Set the controller for operation in manual mode (see parameter 3.2).
- Switch on the primary circuit pump.
- Open the vent valve.
- Pump water around the circuit until all air bubbles have been eliminated.
- Close the vent valve.
- Set the controller for operation in automatic mode (see parameter 3.1).

## **PUTTING INTO SERVICE**



**CAUTION!** Completely fill the water circuit before putting the product into service.

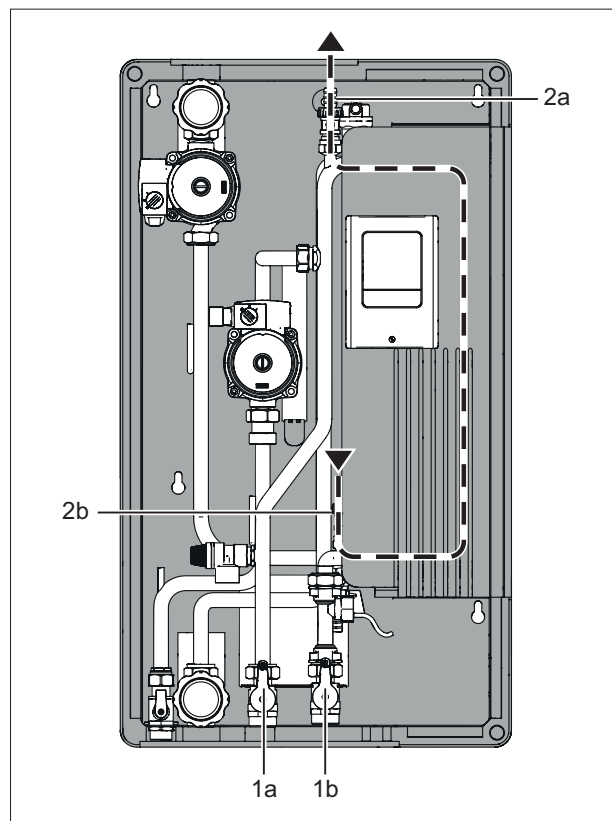
- Check that the non-return valves are in the right position.
- Fill and bleed the primary circuit.
- Fill the secondary (DHW) circuit.
- Check that the mixer is water-tight.
- Power on the mixer.
- Check that the system works correctly.



All fittings are assembled in the factory. It is nevertheless advisable to check their tightness after installing the product. It is also necessary to test the product for water tightness at operating pressure when putting it into service.

## FLUSHING THE HEAT EXCHANGER

- Shut off the DHW flow by closing the ball valves (1a) and (1b) for the cold water inlet and hot water outlet respectively.
- Attach the flushing fluid supply to the cold water inlet valve (2b).
- Attach the flushing fluid drain to the DHW outlet valve (2a). Pump flushing fluid through the heat exchanger until it is clean.



## USE AND FUNCTIONS OF THE CONTROLLER

### CE Declaration of conformity

Applying the CE mark to the controller, the manufacturer guarantees that the MFWC is in conformity with the following directives:

- Low Voltage Directive 2006/95/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.

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.

## **ABOUT THE CONTROLLER**

The MFWC controller enables efficient use and operational control of the mixer 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.

Main features of the MFWC controller:

- 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
- 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	100-230VAC
Frequency	50 - 60Hz
Consumption	0.5W – 2.5W
- electromechanical relays R1-R3	460VA for AC1 / 460W for AC3
- PMV output	for 10 kΩ load
Internal fuse	T2A / 250V slow-blow
Ingress protection	IP40
Protection class	II
Sensors	6 x Pt1000 + 2 x VFS (vortex flow sensors)
Measuring range	PT 1000 -40°C up to 300°C
Vortex flow sensor	0°C to 100°C (-25°C /120°C short term)
1 l/min - 12 l/min (VFS1-12)	0-0.6 bar
1 l/min – 20 l/min (VFS1-20)	0-1 bar
2 l/min - 40 l/min (VFS2-40)	0-1.6 bar
5 l/min - 100 l/min (VFS5-100)	0-2.5 bar
10 l/min – 200 l/min (VFS10-200)	0-4 bar
	0-6 bar
	0-10 bar

### **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 dimen	157mm x 106mm x 31mm
Display	Full graphic display, 128 x 128 pixels
LED	Multicolour red/green
Programming	4 entry 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

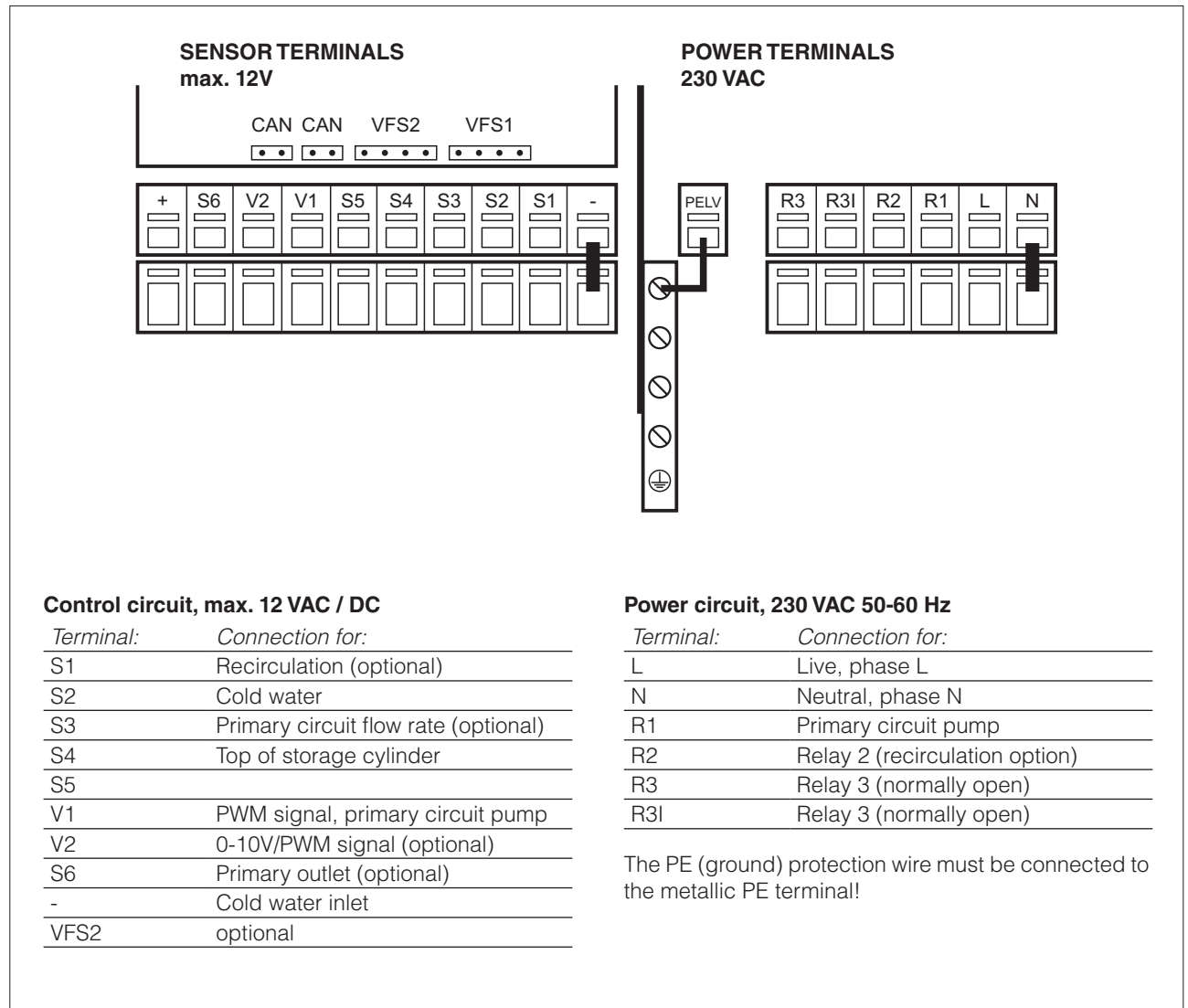
## TERMINAL CONNECTION DIAGRAM

Relay connections will vary depending on what additional functions are selected.

The polarity of the temperature sensors is irrelevant. The common wire should be connected to the bottom (-) terminal strip.

Vortex flow sensors must be connected to the socket on the control panel.

Sensor 2 / cold water: if no sensor is connected, a default temperature of 10 °C is set.



## 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

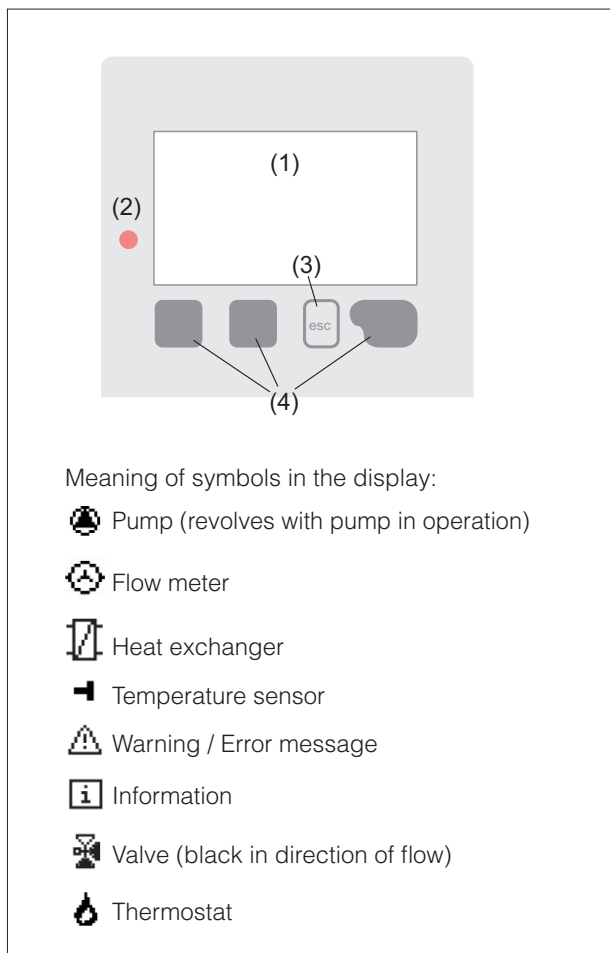
Back = return to previous screen

ok = confirm selection

Confirm = confirm setting

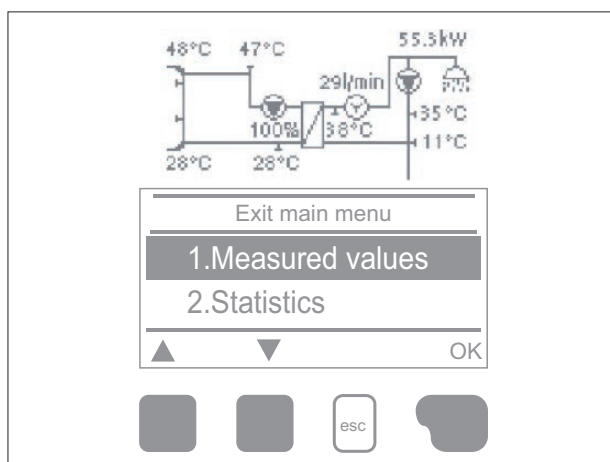
Finally, accessing menu 3.2 and selecting "Manual" mode, the installer can test the various outputs with the components connected, and verify whether or not the readings from the sensors are reliable. This done, automatic mode can be re-activated.

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



### 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.



The following menus are available

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

## 1. MEASURED VALUES

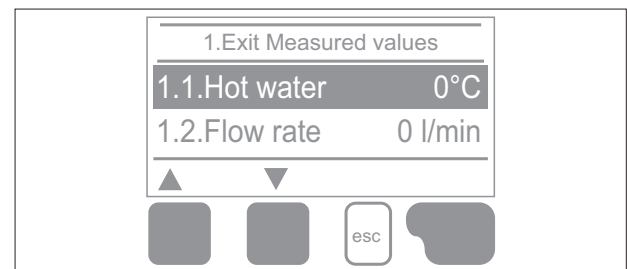
Menu “1. Measured values” indicates the current temperatures measured. Quit the menu by pressing “esc” or selecting “Exit Measured values”.

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 taps. Small fluctuations in temperature at the taps are compensated generally by mixing water from the main.



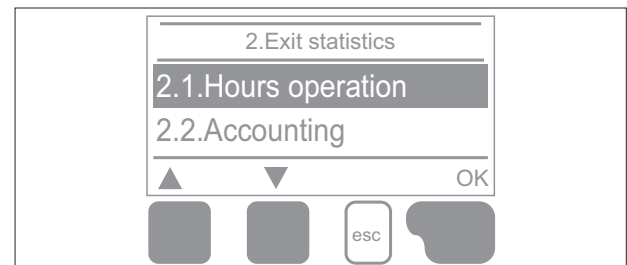
## 2. STATISTICS

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 relays connected to the controller have been in operation.

### 2.2 Accounting

Metering of heat produced by the system, in kWh.



Heat output data are only approximate for control functions

### 2.3 Graphic overview

Provides a clear overview of the data listed under headings 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 15 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 MODE

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!

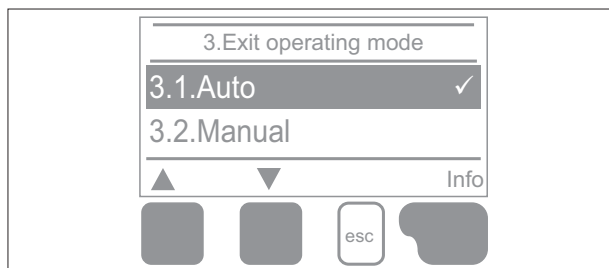
#### 3.2 Manual

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”.

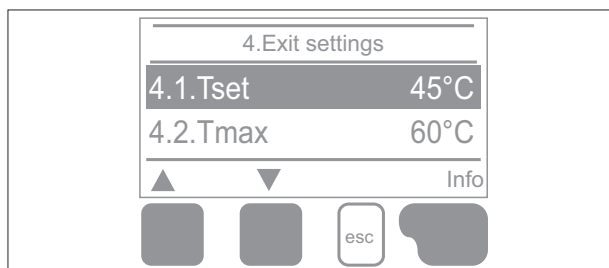
#### 4.1 Tset

The MFWC controller maintains a constant recirculation temperature by controlling the speed of the hot water pump.

#### 4.2 Tmax = Maximum draw-off temperature at the vortex flow sensor

Maximum allowable temperature at the vortex flow sensor. If Tmax is exceeded, the pump is switched off. If the temperature drops below Tmax, the pump is started again.

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



#### 4.3 VFS type

This menu sets the type of vortex flow sensor used.

Settings range: 1-12 l/min, 1-20l/min, 2-40l/min, 5-100l/min, 10-200l/min, 20-400l/min / Default: see table.

#### 4.4 Recirculation

##### 4.4.1 Recirculation

When “Request” mode is active, the recirculation pump starts when water is drawn off and continues to run until the target recirculation temperature (Tmin recirculation + hysteresis) is reached at the recirculation sensor.

In “Periods” mode, the recirculation pump runs during the set times and when temperature is below the minimum recirculation temperature setting and continues to run until the target recirculation temperature (Tmin recirculation + hysteresis) is reached at the recirculation sensor.

Request+Periods: The pump runs during the set times and when temperature is below the minimum recirculation temperature setting or when water is drawn off.

The pump continues to run until the target recirculation temperature (Tmin recirculation + hysteresis) is reached at the recirculation sensor.

Always on: The recirculation pump is always on during the set times.

Settings range: Request, Periods, Request+Periods, Always on / Default: see table.

#### 4.4.2 Tmin recirculation = Minimum recirculation temperature at sensor S1

Provided recirculation is enabled, if temperature drops below Tmin recirculation, the pump is switched on.

Settings range: 10 °C to 85 °C

#### 4.4.3 Recirculation hysteresis = Deactivates recirculation pump switching hysteresis

If temperature exceeds Tmin at S1, the pump is switched off.

Settings range: 1-20K / Default: see table.

#### 4.4.4 Maximum recirculation flow = Maximum delivery of recirculation pump

If the flow rate measured at sensor 6 exceeds this value, the recirculation pump is switched off.

Settings range: 1-50 l/min.



This value is set during system calibration.

#### 4.4.5 Recirculation periods = The time bands during which the recirculation pump is enabled

Three separate time bands can be set for each day of the week. Bands can be copied from one day to another. Settings range: Off/ 00:00-23:59 / Default: see table.



Recirculation is disabled outside these time bands. The time settings are only used in "Periods" recirculation mode.

#### 4.4.6 Draw-off support

To ensure a constant temperature even when small volumes of water are drawn off, the recirculation pump can also be used to assist draw-off.

The pump runs under normal conditions and when small volumes are drawn off.

If a storage cylinder sensor is connected, draw-off support is enabled when this sensor detects Tmin.

Settings range: On, Off / Default: see table.

#### 4.4.7 Minimum storage temperature

Draw-off support is disabled if storage temperature drops below "Minimum storage temperature".

Minimum storage temperature: Settings range: 0 to 80 °C / Default: see table.

#### 4.4.8 Draw-off support measuring

See "F3. - Calibration".

#### 4.6 Storage stratification

The storage stratification function operates a valve that deviates the return to the centre or bottom of the storage cylinder on the basis of temperature. This menu sets the temperature differential between the return and the storage cylinder. If return temperature exceeds storage temperature by the value set here, the central part of the storage cylinder is buffered. If no storage sensor is connected, storage temperature is set at 25 °C.

#### 4.11 Comfort

When this function is active, the primary circuit pump pumps water through the heat exchanger every 15 minutes to ensure that hot water is delivered as rapidly as possible when water is drawn off.

## 5. PROTECTIVE FUNCTIONS

Menu "5. - Protective functions" can be used to set and activate a number of protective functions.

To quit the menu, press "esc" or select "Exit Protective functions".

#### 5.1 Anti-legionella

With the AL function activated, the MFWC controller heats the pipes and the storage cylinder at selectable periods (AL period) for a set time (AL residence time), until the target temperature setpoint (AL Tset) is reached.

AL Tset + 5 °C is taken as the reference for the temperature measured at S4. For the period during which the AL function is active, Tmax is set at AL Tset + 10 °C to prevent shut-down for high temperature. The AL function terminates only when a temperature of at least "AL Tset - 5 °C" is reached at the hot water sensor and at the recirculation sensor (if installed) for the time set in "AL residence time". The "Last AL heat" is shown on the display. If the AL function fails to terminate after 2 hours, the function is cancelled and an error message is displayed.

AL function – Settings range: On, Off / Default: see table.

AL run time

AL Tset

AL Period

AL residence time

Manual start – starts a heating cycle immediately



During the Anti-legionella function the storage cylinder is heated to high temperatures that can lead to scalding and damage to the system.



- ⚠ The user must make sure that the Anti-legionella function terminates successfully at the set periods.
- ⚠ The AL function is switched off by default. A message containing the date is shown as soon as the AL function terminates successfully. The AL start time should be set during a period in which little hot water is drawn off.
- ⚠ The user must make sure that the temperature of the storage cylinder is at AL Tset +5° when starting the AL cycle manually. If sensor S3 is installed, the AL function will not start until a temperature of AL Tset +5° is reached.
- ⚠ The AL function does not provide total protection against legionella because it is not possible to monitor temperatures throughout the storage cylinder and in all connecting pipes.

## 5.2 Limescale protection

To prevent the accumulation of limescale, the pump can be set to continue pumping water through the heat exchanger after a draw-off of between 5 and 30 seconds or until the temperature at the VFS drops below Tset. Settings range: On, Off / Default: see table.

## 5.3 Setpoint auto-regulation

This function is used if the primary circuit does not always reach the required temperature.

With this function active:

If no storage sensor is connected:

If setpoint temperature is not reached after 60 seconds, setpoint temperature minus 3 °C is assumed as a new setpoint. When the primary circuit pump stops, setpoint temperature is returned to the original Tset value.

If a storage sensor is connected:

If the temperature measured by the storage sensor is below Tset - 5 °C, the setpoint is lowered to setpoint minus 5 °C.

In both cases, "Tmin recirculation" is lowered to the new setpoint temperature – recirculation hysteresis minus 5°C, at which "Tmin recirculation" is no lower than 0°C and no higher than the Tmin recirculation setpoint.

Settings range: On, Off / Default: see table.

## 5.4 Seizing protection

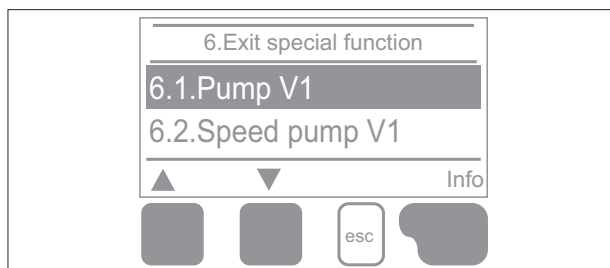
If seizing protection is active, the controller switches on the relay and the connected components for 5 seconds every day at 12:00 ("Daily" setting), or every Sunday at 12:00 ("Weekly" setting), in order to prevent the pump and/or the valve from seizing up after a lengthy idle period.

Settings range: Daily, Weekly, Off / 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 Pump V1

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.

#### 6.1.1 Pump type

This menu is used to set the type of pump and speed control.

0-10V: speed control using 0-10V signal;

PWM: speed control using PWM signal.

#### 6.1.2 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.

#### 6.1.3 Output signal

This menu determines the type of pump in use: solar pumps deliver maximum power with a high control signal, whereas conversely, heating pumps operate at their maximum power rating when the control signal is at its lowest.

Solar = normal, heating = inverted.

Settings range: normal, inverted / Factory setting: see table.

#### 6.1.4. 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 % / Default: See table  
(Heating:) 50 % ... 100 % / Default: See table

#### **6.1.5. PWM on**

This signal is needed to switch on the pump at minimum speed.

Settings range: (Solar:) 0 ...50 % / Default: See table  
(Heating:) 50 % ... 100 % / Default: See table

#### **6.1.6. 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 % / Default: See table  
(Heating:) 0 % ... 50 % / Default: See table

#### **6.1.7. Show signal**

The signal setting is displayed in graph and text format.

### **6.2 Speed control, pump V1**

This menu makes it possible to limit the speed of connected pumps.

#### **6.2.1 Max 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 ... 100 % / Default: see table.



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

#### **6.2.2 Min speed**

This is where the minimum speed of the pump connected to 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: 10 % to max. speed minus 5 % / Default: see table.



The percentages indicated are guideline only, and could be higher or lower depending on the particular system, pump and pump phase. 100 % is the maximum possible voltage/frequency of the controller.

### **6.5 Relay functions for voltage-free contacts 1-3**

The special functions described here can be assigned to non-connected relays. Each additional function can only be assigned once.

All the special functions for which variable values can be set are listed in menu "4. Settings" as soon as they are activated or assigned.

The default setting for Relay 1 is "Always on".

The default setting for Relay 2 is "Recirculation".

Bear in mind that recirculation settings only appear in the settings menu if the recirculation function is activated for a relay. Before you can change the assignment of a relay, you must first deactivate the previous assignment. Pay attention to relay technical specifications.

#### **6.5.1 Recirculation**

This selects recirculation as the relay function. This is the default function for Relay 2.

#### **6.5.2 Storage heating**

This function heats the storage cylinder when necessary.

##### **6.5.2.1 Storage heating**

Settings range: On-Off.

##### **6.5.2.2 Minimum storage temperature**

Storage cylinder heating is switched on if temperature as measured at the storage sensor drops below this value outside the periods set for storage heating.

##### **6.5.2.3. Temperature setpoint**

Storage heating is switched on if temperature as measured at the storage sensor drops below this value during the periods set for storage heating.

##### **6.5.2.4. Storage hysteresis = Activation of storage switching hysteresis**

The required storage temperature is reached after draw-off, either from minimum storage temperature or from the target temperature plus the hysteresis value set here. Storage heating is switched off when the target storage temperature is reached, as detected by the storage sensor.

##### **6.5.2.5 Heating periods = Storage heating activation times**

The periods during which the storage thermostat is active are set here. Three separate time bands can be set for each day of the week. Bands can be copied from one day to another.

#### **6.5.3. Storage stratification**

The storage stratification function operates a valve that deviates the return to the centre or bottom of the storage cylinder on the basis of temperature. This menu sets the temperature differential between the return and the storage cylinder. If return temperature exceeds storage temperature by the value set here, the central part of the storage cylinder is buffered.

If no storage cylinder sensor is connected, storage temperature is set at 25 °C.

#### 6.5.3.1 Storage stratification

Activates or deactivates stratification.

#### 6.5.3.2. $\Delta T$ storage return = The temperature differential for upper storage stratification

If the temperature of the primary circuit exceeds the difference set here, the valve is activated to buffer the top of the storage cylinder.

If primary circuit temperature drops below this value, the valve is closed again. If no storage sensor is connected, storage temperature is set at 25°C.

#### 6.5.4. V1 parallel functioning

This function activates the selected relay with a 0-10V / PMW V1 output in parallel to V1.



High efficiency pumps with a 0-10V / PWM signal can be powered using the additional function "Always on" or "Parallel functioning V1/V2" via relays 1-3.

##### 6.5.4.1. V1 parallel functioning

Activates, deactivates or inverts parallel functioning.

##### 6.5.4.2. Delay

The assigned relay is activated after V1 by the delay set here.

##### 6.5.4.3. Off delay

The assigned relay remains active after V1 by the delay set here.

#### 6.5.5. V2 parallel functioning

This function activates the selected relay with a 0-10V/PMW V2 output in parallel to V2.

#### 6.5.6. Always on

The selected relay is permanently on.



High efficiency pumps with a 0-10V / PWM signal can be powered using the additional function "Always on" or "Parallel functioning V1/V2" via relays 1-3.

#### 6.6. Relay 2

See the functions for Relay 1.

#### 6.7. Relay 3

See the functions for Relay 1.

#### 6.8. V2 signal

This function allows the PMW / 0-10V V2 output to control an additional high efficiency pump. If a pump function is activated (e.g. recirculation, solar, additional pump, etc.) the additional settings and speed control for pump V2 must also be set.

See the technical specifications for the PMW / 0-10V outputs.

##### 6.8.1. V2 signal

See the functions for Relay 1.

#### 6.9. Pressure control

The relay is active when pressure drops below the minimum setpoint or exceeds the maximum setpoint.

Settings range: On, Off / Default: see table.

##### 6.9.1. Pressure control

This menu is used to activate monitoring of system pressure via a direct sensor. The relay becomes active as soon as the values set here are exceeded.

##### 6.9.2. RPS1 / RPS2 = Type of pressure sensor

This menu sets the type of pressure sensor used.

N.B.: if a VFS1 type sensor is connected, for example, the RPS1 option is not displayed.

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.

##### 6.9.3. Pmin

Minimum pressure. If pressure drops below this value, an error message is displayed and the relay is activated.

Settings range: Off; 0.0 to 1.6 bar

##### 6.9.4. Pmax

Maximum pressure. If pressure exceeds this value, an error message is displayed and the relay is activated.

Settings range: Off; 0.0 to 10 bar

#### 6.10. 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. Adjustments can be made for all sensors in steps of 0.5 °C.




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.

#### 6.11. 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.


### 6.12. 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.

### 6.13. 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 for more than about 24 hours, and must then be reset.

### 6.14. Daylight saving time

When this function is active, the clock updates automatically when Daylight Saving Time (DST) commences and finishes.

### 6.15. Sleep mode

When sleep mode is selected, the display goes blank after two minutes of inactivity.

 If an error message appears, the display backlighting remains on until the message is acknowledged.

### 6.16. Temperature unit

This menu is used to select the unit of measure in which temperature is displayed.

## 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”.

### 7.1 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. Measured values
2. Statistics
3. Functioning modes
7. Menu lock
8. Service data

To lock the other menus, select “Menu lock ON”.

To re-enable the menus, select “Menu lock OFF”.

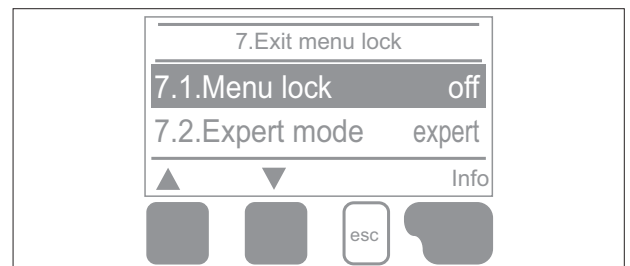
Settings range: On, Off / Default setting: Off.

### 7.2 Expert mode

This menu lets you switch between expert mode, in which all settings are accessible, and simple mode in which only the following menus are available:

1. Measured values
2. Statistics
- 4.3 Tset
- 4.4.1 Recirculation
- 4.4.5 Recirculation periods
- 6.10 Time and date
- 7 Menu lock
- 9 Language

Settings range: Expert-Simple/ Default: see table.



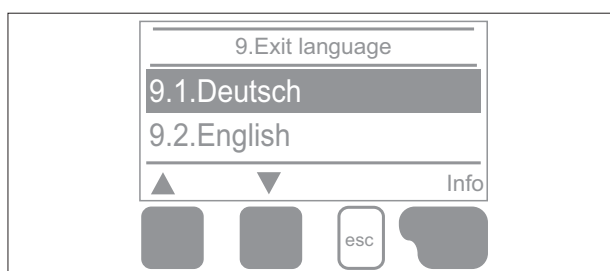
## 8. SERVICE DATA

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. Language" 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.





## MALFUNCTIONS

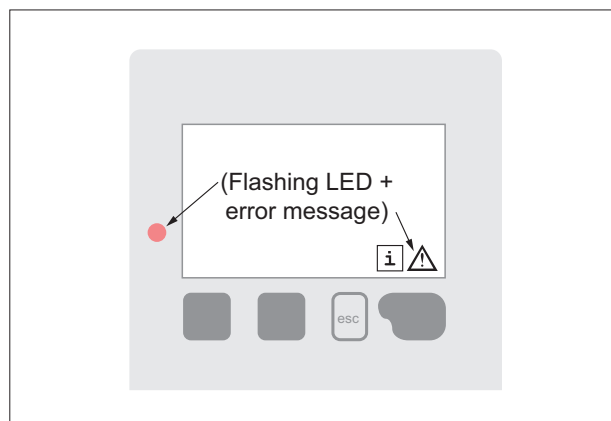
### MALFUNCTIONS AND ERROR MESSAGES

If the controller detects a malfunction, the red LED blinks and the warning symbol appears on the display. If the malfunction resolves itself, the warning symbol becomes an information symbol and the red LED stops blinking.

To view details of the error, press the key under the warning or information symbol.



End users must not attempt to resolve malfunctions in person. Always refer malfunctions to specialist personnel!



Possible error messages	Note for service personnel
Sensor x error	This means that there is/was a fault in the sensor, input to the controller or connecting cable.
Time & date	This message appears automatically after a power failure to indicate that the time and date must be checked and reset if necessary.
Temperature < 50	The temperature measured by the optional sensor S3 has dropped below 50 °C.
Temperature > 70	The temperature measured by the optional sensor S3 has risen above 70 °C. This means that temperature in the primary circuit is too high and could cause limescale to form in the heat exchanger.

### REPLACING THE FUSE



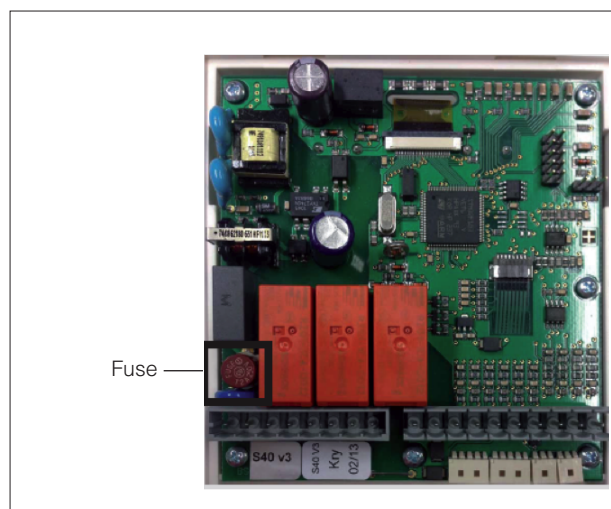
Repairs and maintenance must be entrusted exclusively to an expert service technician. Disconnect the controller from the electricity supply before commencing any work on it, and make sure it cannot be accidentally switched back on! Check that it is not live!



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.

Replace the fuse with a new one of identical characteristics. Ascertain the cause of the fault (e.g. pump) and replace it.



### MAINTENANCE



During the course of general maintenance on the 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
- Assess/check the reliability of analytical data
- Check the error messages
- Check the reliability of current measurement values
- Check the outputs/contacts in manual mode
- If necessary, optimise the setting parameters.



DEFAULT PARAMETER SETTINGS TABLE

Menu	Parameter	Setting range	Default	User setting
<b>4. SETTINGS</b>				
4.1	Tset	30°C ÷ 90°C	45°C	
4.2	Tmax	50°C ÷ 95°C	60°C	
4.3	VFS type	1-12 l/min, 1-20 l/min, 2-40l /min, 5-100 l/min, 10-200 l/min, 20-400l /min	2-40 l/min	
4.4.1	Recirculation	Request / Periods / Request+Periods / Always on	Periods	
4.4.2	Tmin recirculation	10°C ÷ 85°C	35°C	
4.4.3	Recirculation hysteresis	1K ÷ 20K	5K	
4.4.4	Maximum recirculation flow	1 ÷ 50 l/min	15 l/min	
4.4.5	Recirculation periods	00:00 ÷ 23:59	06:00 ÷ 20:00	
4.4.6	Draw-off support	On / Off	On	
4.4.7	Minimum storage temperature	0÷80°C	65°C	
4.11	Comfort	On / Off	Off	
<b>5. PROTECTIVE FUNCTIONS</b>				
5.1	Anti-legionella	On / Off	Off	
5.2	Limescale protection	On / Off	Off	
5.3	Setpoint auto-regulation	On / Off	Off	
5.4	Seizing protection	Daily / Weekly / Off	Off	
<b>6. SPECIAL FUNCTIONS</b>				
6.1.1	Pump type	0-10V / PWM	PWM	
6.1.2	Pump	Solar / Heating Profile 1-11 / Manual	Heating	
6.1.3	Output signal	Normal / inverted	inverted	
6.1.4	PWM off	Solar 0 to 50% Heating 50 to 100%	Off 98%	
6.1.5	PWM on	Solar 0 to 50% Heating 50 to 100%	On 87%	
6.1.6	PWM Max	Solar 0 to 50% Heating 50 to 100%	Max 7%	
6.2.1	Max speed	70 ÷ 100%	100%	
6.2.2	Min speed	10 ÷ 95%	10%	
6.5	Relay1	Always On / Off	Off	
6.5.2.1	Thermostat	On / Off	On	
6.5.2.2	Storage T min	10-85 °C	50 °C	
6.5.2.3	Storage T set	45-95 °C	60 °C	
6.5.2.4	Hysteresis	1-30 °C	5 °C	
6.5.2.5	Thermostat period	00:00 - 23:59	06:00 - 20:00	
6.6	Relay2 Recirculation	On / Off	Off	
6.9	Pressure control	On / off	Off	
6.9.2	RPS1/RPS2	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		
6.9.3	Pmin	Off / 0.0 to 1.6 bar	-	
6.9.4	Pmax	Off / 0.0 to 10 bar	-	
6.14	Daylight saving time	Yes / No	Yes	
6.15	Sleep mode	On / Off	On	
<b>7. MENU LOCK</b>				
7.1	Menu lock	On / Off	Off	
7.2	Expert mode	Simple / Expert	Expert	

## CHECKS

On completion of the installation, perform the checks listed in the table below.

DESCRIPTION	OK
All automatic or manual filling pumps removed.	
Safety valve calibrated to 6 bar, and flow open.	
Drain pipe from safety valve routed suitably.	
Expansion vessel correctly located and pre-charged to 2.5 bar	



# ***THERMITAL***

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