For the installer / owner

Start-up, maintenance and troubleshooting manual, notes for the operator

Solar System and auroSTOR unvented solar cylinder

Solar hot water systems

GB

Contents

1 Notes on the documentation

Your solar system is a quality product from Vaillant. This manual describes the entire system, all of its components and the cylinder and provides you with information on start-up, maintenance and trouble-shooting. It is a supplement to the operating, installation and assembly manuals of the individual components.
Observe the manuals for each individual system component in conjunction with this manual.
Look after this manual and pass it on to the next owner.

Note!
The "Start-up" and "Maintenance and troubleshooting" chapters of this manual are intended only for approved specialists.

Vaillant accepts no liability for any damage caused by failure to observe this manual.

Other applicable documents
- Assembly manual of the collectors
- Operating and installation manual of the controller
- Operating and installation manual of the boiler (if used)
- Assembly, operating and installation manuals of all accessories used
- Warranty card

1.1 Storage of documents

Store this manual and all other applicable documents where they are readily available.
Pass the documents on to the next owner if you move or sell the unit.

1.2 Symbols used

Please observe the safety instructions in this manual when operating and installing the solar system and the auroSTOR solar cylinder.
The symbols used in the manual are explained below:

Danger!
Immediate risk of serious injury or death!

Danger!
Danger of death from electric shock!

Danger!
Risk of burns or scalding!

Caution!
Potentially dangerous situation for the product and environment.

Note!
Application recommendation.

- Symbol for a required task

1.3 Validity of the manual

This manual is valid exclusively for units with the following article numbers:

Appliance type	Cylinder volume	Article number
VIH S GB 200 S	200 litres	307206
VIH S GB 250 S	250 litres	307207
VIH S GB 300 S	300 litres	307208

Table 1.1 Validity of the manual

To find out the article number of your unit refer to the identification plate.

2 Overview of standards, safety instructions

2.1 Overview of EU standards

Solar system in general

EN ISO 9488
Thermal solar system and components, terminology (ISO/DIS 9488; 1995)

EN 12975-1
Thermal solar systems and components; Collectors, Part 1: General requirements

EN 12975-2
Thermal solar systems and components; Collectors; Part 2: Test methods

EN 1991-2-3
Eurocode 1 – Basis of design and actions on structures, Part 2-3: Actions on structures - Snow loads

EN 12976-1
Thermal solar systems and components;
Factory made systems - Part 1: General requirements

EN 12976-2
Thermal solar systems and components;
Factory made systems - Part 2: Testing methods

ENV 12977-1
Thermal solar systems and components;
Custom built systems,
Part 1: General requirements

ENV 12977-2
Thermal solar systems and components;
Factory made systems,
Part 2: Testing methods

ISO 9459-1: 1993
Solar heating – Domestic water heating systems – Part 1: Performance rating procedure using indoor test methods

ISO/TR 10217
Solar energy – Water heating systems – Guide to material selection with regard to internal corrosion

Collectors and collector assembly

EN 1991-2-4
Eurocode 1 – Basis of design and actions on structures - Part 2–4: Actions on structures - Wind actions

Solar cylinder and cylinder installation

Pressure equipment directive 97/23/EC
Directive of the European Parliament and Council from 29th May, 1997 for the approximation of the laws on pressure equipment of the Member States

EN 12977-3
Thermal solar systems and components;
Custom built systems,
Part 3: Performance characterisation of stores for solar heating systems

EN 12897
Water supply - specification for indirectly heated unvented (closed) storage water heaters

EN 806-1
Specifications for installations inside buildings conveying water for human consumption - Part 1: General

EN 1717
Protection against pollution of potable water installations and general requirements of devices to prevent pollution by backflow

EN 60335-2-21
Safety of household and similar electrical appliances;
Part 2: Particular requirements for storage water heaters (hot water cylinders and hot water boilers)
(IEC 335-2-21: 1989 and supplements 1; 1990 and 2; 1990, modified)

Lightning protection

ENV 61024-1
Protection of structures against lightning – Part 1: General principles (IEC 1024-1: 1990; modified)

BS 6651 Code of practice for protection of structures against lightning

2.2 Regulations in Great Britain

2.2.1 Technical Guidance

The system must be installed in accordance with all relevant and applicable national regulations, and must be installed to suit site conditions.
Observe all national regulations, including:
- Working at Heights Regulations 2005
- Health and Safety at Work Act 1974
- Electricity at Work Regulations 1989
- IEE Wiring Regulations BS 7671
- Lightning protection requirements
- Equipotential bonding of electrical installations.

2.2.2 Related documents

The installation of the solar system must be in accordance with the relevant requirements of Health and Safety Document No. 635 (The Electricity at Work Regulations 1989), BS7671 (IEE Wiring Regulations) and the Water Supply (Water Fitting) Regulations 1999, or The Water Bylaws 2000 (Scotland). It should also be in accordance with the relevant requirements of the Local Authority, Building Regulations, The Building Regulations (Scotland), The Building Regulations (Northern Ireland) and the relevant recommendations of the following British Standards:

BS EN 806: Specification for installations inside buildings conveying water for human consumption

BS 6700: Services supplying water for domestic use within buildings and their curtilages.

BS. 5449 Forced circulation hot water central heating systems for domestic premises. Note: only up to 45 kW.

BS. 6880 Low temperature hot water heating systems of output greater than 45 kW.
Part 1 Fundamental and design considerations.
Part 2 Selection of equipment.
Part 3 Installation, commissioning and maintenance.

BS 6114: Expansion vessels using an internal diaphragm for unvented hot water supply systems
BS. 4814 Specification for: Expansion vessels using an internal diaphragm, for sealed hot water heating systems.

Unvented hot water systems must comply with building regulation G section 3.

2.2.3 Regulations for the prevention of accidents

When carrying out works such as solar installation work it is necessary to do so in a safe and workman like manner, taking due care of any aspects of the works that could result in injuries to person in or about the building

as well as workers, passers by and the general public at large. To that end these works must conform, but not be limited to, the current regulations in force such as the following
Health and Safety at Work act 1974
Work at Height Regulations 2005.
Electricity at Work Regulations 1989
All necessary Building Regulations.

Work should be preceded by a risk assessment covering all aspects of health and safety risks, or training requirements that can reasonably be foreseen to be associated with the work. All scaffolding in the UK, other than prefabricated (zip-up) scaffold towers, must be designed and constructed by a vetted contractor, and have suitable kick boards, hand rails and where appropriate netting. Areas around the scaffolding should be zoned off and marked with suitable warning signs to a suitable distance to protect persons from falling objects. Workers should have available and use personal protective equipment as necessary. This would include equipment such as fall protection systems, safety gloves, goggles, dust masks as well as any specialised equipment that may be in use such as lifting and handling equipment.
The completed works shall comply with all necessary BS EN Standards and Codes of practice as well as Building control or planning requirements and be confirmed where necessary by notification to building control or the appropriate competence based notification body.

2.3 Safety instructions

The entire solar system must always be installed and operated in accordance with recognised technical standards.

Danger!
Risk of falling!
Make sure you adhere to the valid work protection regulations, in particular when working on the roof. Make absolutely sure you wear anti-fall devices whenever there is a risk of falling. (We recommend Vaillant fall protection systems, item no. 302 066.) Observe the accident prevention regulations of the trade associations.

Danger!
Risk of being burned or scalded by hot components! Install and replace collectors or collector parts on very cloudy days. Perform installation work on sunny days only in the morning or evening or with the collector covered.

Danger!
Risk of being burned or scalded by hot solar fluid or components! Fill and flush the solar system when the collectors are cold. Cover the collectors while doing so.

Danger!
Risk of being burned or scalded by escaping hot steam!
Steam can escape from the expansion relief valve of the solar pump unit if the system is shut down. To avoid injuries, you must connect the expansion relief valve to a collecting container with a hose line.

Danger!
Risk of being scalded by hot water!
With the Vaillant auroSTOR cylinder, the outlet temperatures could be up to 75 °C. To provide effective protection against scalding, integrate a hot water thermostatic mixer in the system. Vaillant supply a suitable valve with all of our solar sets.

Danger!
Risk of being burned or scalded by escaping hot steam! Steam can escape from unblocked automatic bleeders if the system is shut down. After bleeding, you should therefore always shut off automatic bleeders or install them in a location where vapour cannot escape.

For air removal from the solar system pipe work use the Vaillant automatic air separator system (item no. 302 418).
It works fully automatically and does not need to be subsequently capped off. It must however be installed in the pipe work where no steam can occur, preferably in the return pipe nearby the solar cylinder.

Danger!
Danger of death by electric shock!
All live parts of the system may be installed, serviced and repaired only by a qualified servicing company!

Danger!
Risk of overvoltage!
Earth the solar circuit as potential equalisation and protection against overvoltage! Attach earthing pipe clips to the solar circuit pipes and connect the clips to a potential rail with a 16 mm² copper cable.

3 System description

3.1 Intended use

The Valliant solar system has been constructed using state-of-the-art technology in accordance with recognised safety regulations.
However, if the system is not used correctly, or as intended, this could physically endanger or result in the death of the user or third parties, or damage the unit and other property.
These components of the Vaillant solar system are not intended to be used by persons (including children) with limited physical, sensory or mental capabilities or insufficient experience and/or knowledge, unless they are supervised by a person who is responsible for their safety or have been instructed by this person on how to use the unit.
Children must be supervised to ensure they do not play with the unit.
The purpose of the Vaillant solar system is to provide a solar-supported hot water supply.
Any other use or extended use is considered to be improper. The manufacturer/supplier is not liable for any resulting damage. The user alone bears the risk.
Intended use also includes observance of the operating and installation instructions as well as all other applicable documents, and also compliance with the inspection and maintenance requirements.

Caution!
Improper use of any kind is prohibited!

You will find a start-up report at the end of this manual. This should be filled in by the installer and/or start-up engineer and handed over to the operator.
All CORGI-approved installers have a CORGI ID card and a registration number. Both of them should be entered on the start-up checklist. You can check the details of your installer at CORGI under the telephone number +49 (0)1256 372300.

3.2 Design and function of the solar system

The solar system consists of four main components:
- The collectors, which absorb the solar radiation and utilise it (refer to Section 4.1, Collectors).
- The solar control, which monitors, displays and controls all functions of the system (refer to Section 4.8, Solar control).
- The solar pump unit, which transports the solar heat (refer to Section 4.2, Solar pump unit).
- The solar cylinder (refer to Section 5.1, Installation of the solar cylinder).

On days on which the solar radiation is insufficient to heat the drinking water in the cylinder, the stored water must be reheated by a heating system. This can be done with boilers or electrically with an immersion heater.

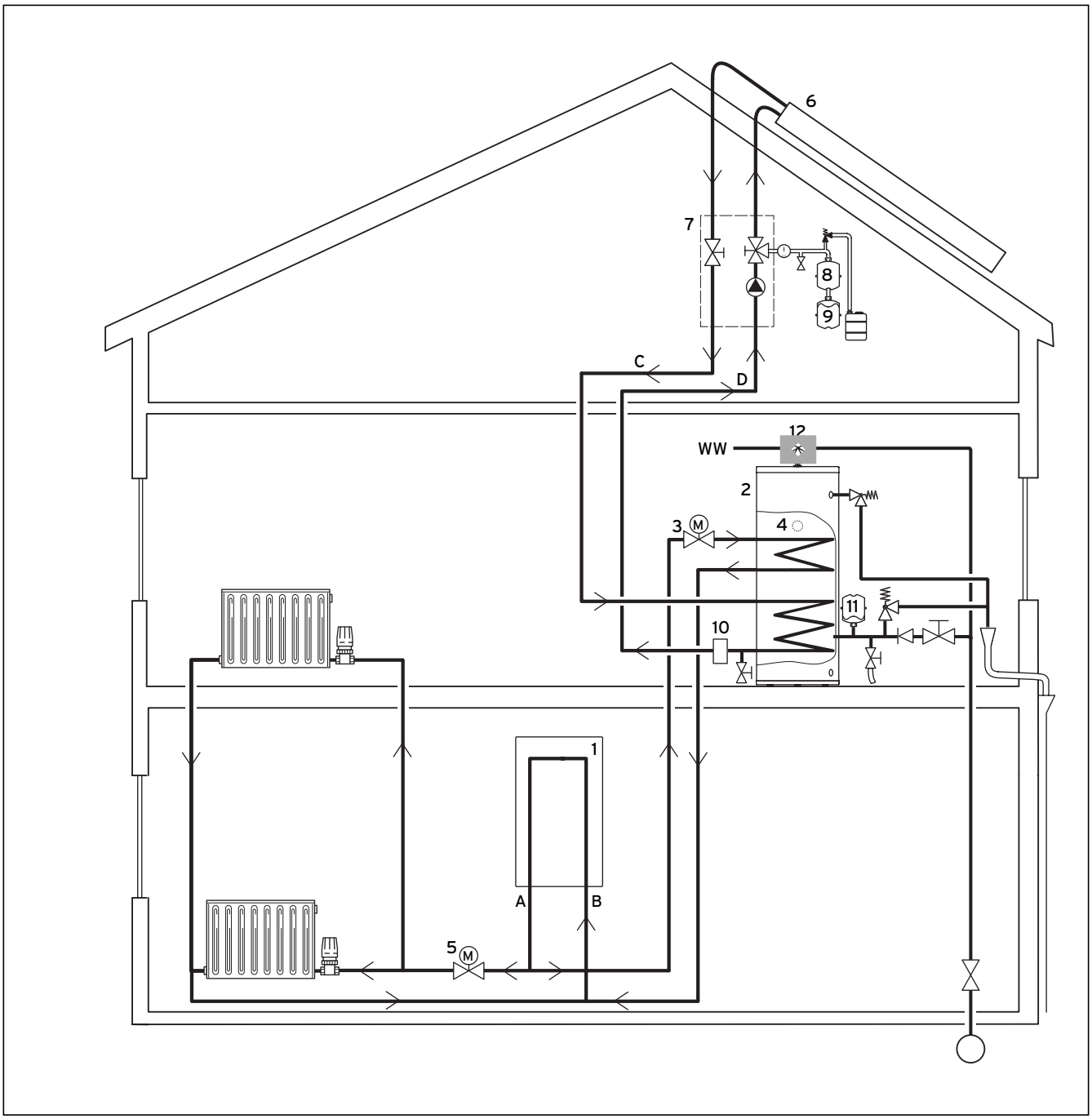

Fig. 3.1 System for solar heating of drinking water

Key

1 Boiler
2 auroSTOR solar cylinder
3 230 V~motorised 2 port valve (supplied together with the solar cylinder)
4 Immersion heater
5 230 V~ motorised 2 port valve
6 auroTHERM collector
7 Solar pump unit
8 Protection vessel
9 Solar expansion vessel
10 Automatic air separator system
11 Drinking water expansion vessel
12 Thermostat mixing valve
A Boiler flow
B Boiler return
C Solar circuit flow
D Solar circuit return

The Vaillant auroTHERM exclusive VTK 570 tube collector, or auroTHERM VFK 900 and VFK 990/1 (6) flat collector, transforms solar energy into heat and transfers this thermal energy to a frost-protected solar fluid. The solar pump of the solar pump unit (**7**) ensures the heat is transported from the collector to the bivalent solar cylinder (**2**) via a pipe system. The solar pump unit is controlled by the solar control.

The solar control switches the solar pump on or off as soon as the difference in temperature between the collector and solar cylinder falls below or exceeds the preset value. If the solar energy is insufficient, the control system switches on the boiler (**1**) so that the upper third of the cylinder is reheated to the set value for the hot drinking water temperature. In addition the solar cylinder can be reheated by the immersion heater installed by the manufacturer.

The solar expansion vessel (**9**) compensates pressure fluctuations in the solar circuit.
The in-line vessel (8) protects the expansion vessel from increased temperatures in the solar circuit. We recommend installing a protection vessel.

The Vaillant solar system enables various system configurations and control concepts:

Electrical wiring
The Vaillant Control Center VR 65 can be used to wire up the system if an eBUS-capable Vaillant boiler is used. A standard wiring box can be used if a Vaillant boiler which is not eBUS-capable or an external boiler is used.

Control of the hot water temperature
The hot water temperature in the upper third of the cylinder can be controlled by the VRS 560 or by a separate hot water programmer.

Danger!
Risk of being scalded by hot water to provide effective protection against scalding, install a thermostat mixer in the hot water pipe as described in Section 5.5, Installation of the hot drinking water pipework. Set the thermostat mixer to below 60 °C and check the temperature at a hot water tap.

Heating control
The heating can be regulated by means of a programmable Vaillant VRT room thermostat or VRC weather compensator if an eBUS-capable Vaillant boiler is used.
The Vaillant VRT 30 room thermostat or a standard room thermostat can be used if a non-eBUS Vaillant boiler or an external boiler is used.

The solar system is a closed system and must be bled carefully. We recommend the automatic Vaillant air separator system for this purpose (item no. 302 418). It works fully automatically and does not need to be subsequently blocked.
The automatic air separator system must be installed in an area in which no steam can enter, preferably in the return pipe between the solar pump unit and the solar cylinder.

4 Description of the components

4.1 Collectors

Danger!
Danger of burning!
To avoid injuries due to hot parts of the collectors, all work on the collectors should be carried out on cloudy days. Alternatively, work can be carried out in the morning or evening of sunny days or with the collector covered..

4.1.1 auroTHERM exclusive tube collector

The VTK 570 tube collector has six tubes that are connected hydraulically in parallel (Fig. 4.1).
The CPC mirror increases the solar yield by reflecting the solar energy and focussing it on the tubes.

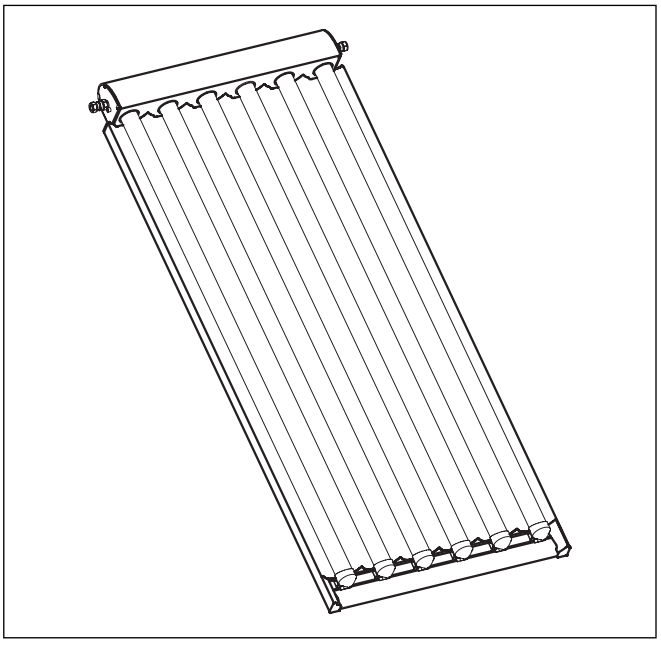

Fig. 4.1 auroTHERM exclusive VTK 570 tube collector

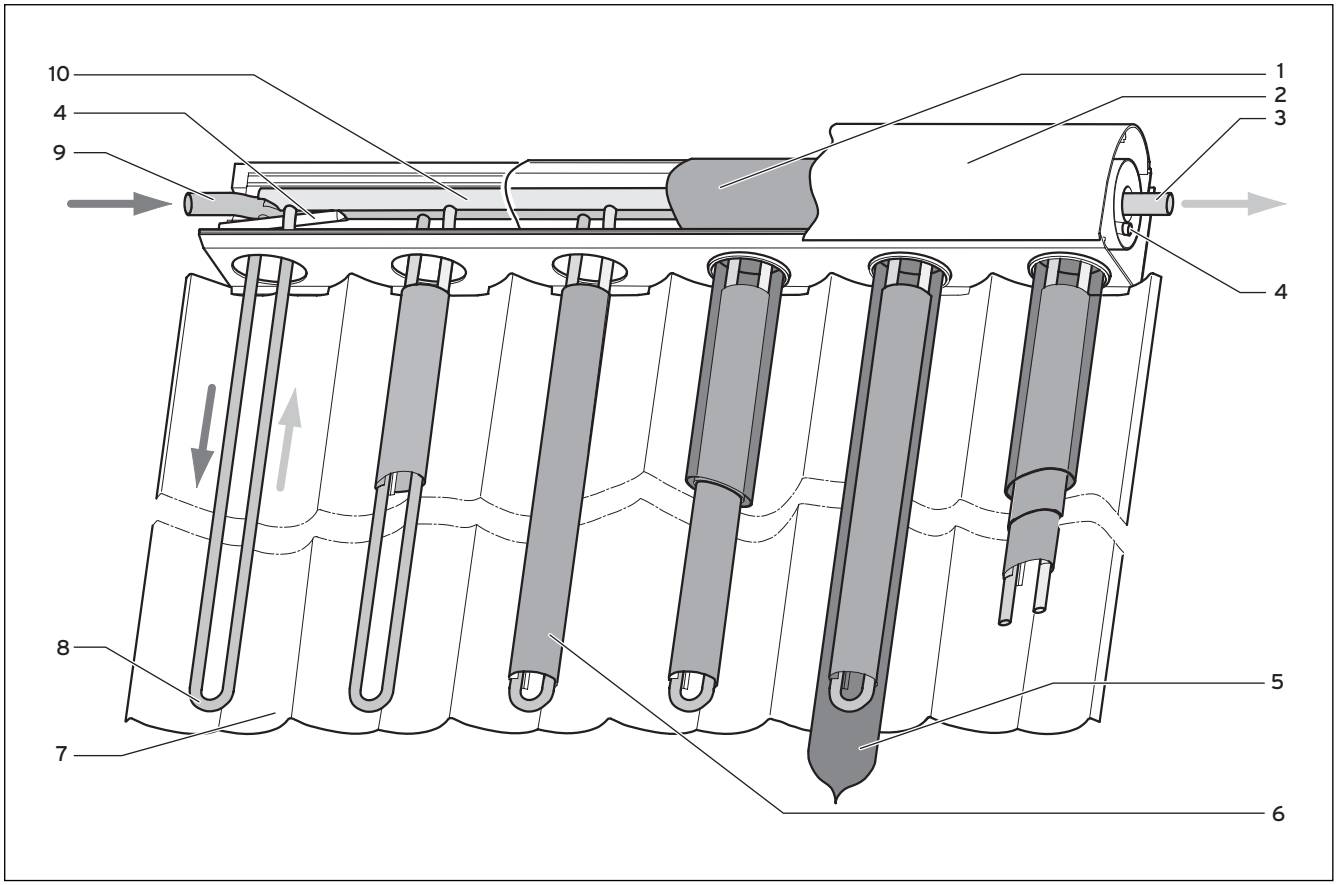

Fig. 4.2 Section through auroTHERM exclusive VTK 570 showing direction of flow

Key
1 Thermal insulation
2 Receiving tank
3 Supply or return connection
4 Temperature sensor pocket
5 Vacuum tubes
6 Thermal baffle plate
7 CPC mirror
8 U-tube
9 Supply or return connection
10 Energy collector tube or distributor pipe

Technical data, tube collectors

Appliance designation	Units	auroTHERM exclusive VTK 570
Surface area (gross, aperture/net)	m^2	1,28 / 0,82
Height	mm	1695
Width	mm	790
Depth	mm	100
Weight	kg	20
Collector capacity	l	3,56
Copper pipe connection, flat-face	Thread	3/4“
Insulation: high-vacuum	bar	10^{-6}
Max. operating pressure	bar	6
Spiegel Reinsilber, Reflexionsgrad ρ	%	94 ± 1
Absorber emission ε	%	5 ± 2
Absorber absorption α	%	95 ± 1,0
Solar sensor sleeve	∅ mm	6
CE label		0036
Shutdown temperature (according to prEN 12975-2, c < 1 m/s) in the glass tube	°C	250
Shutdown temperature (according to prEN 12975-2, c < 1 m/s) at the collector connection	°C	180
Efficiency η_0 (according to 12975)	%	78 ± 3%
Efficiency coefficient k_1	$W/(m^2 \cdot K)$	1,09 ± 0,2
Efficiency coefficient k_2	$W/(m^2 \cdot K^2)$	0,01 ± 0,002

Table 4.1 Technical data, auroTHERM exclusive tube collectors

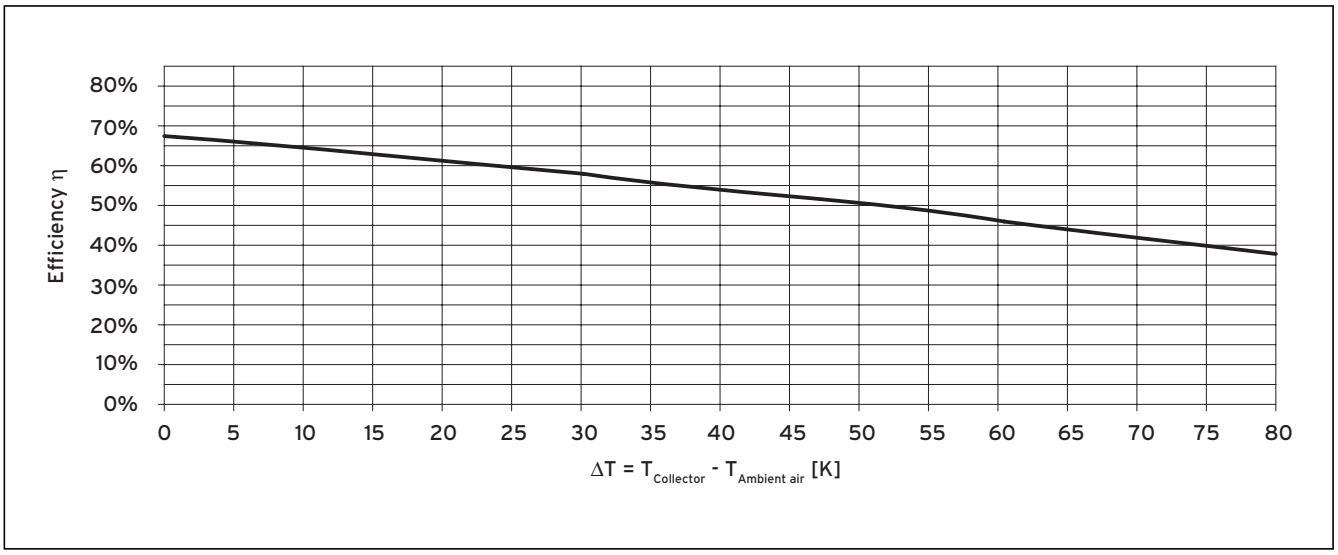

Fig. 4.3 Efficiency of auroTHERM collector with radiation energy content of 300 W/m²

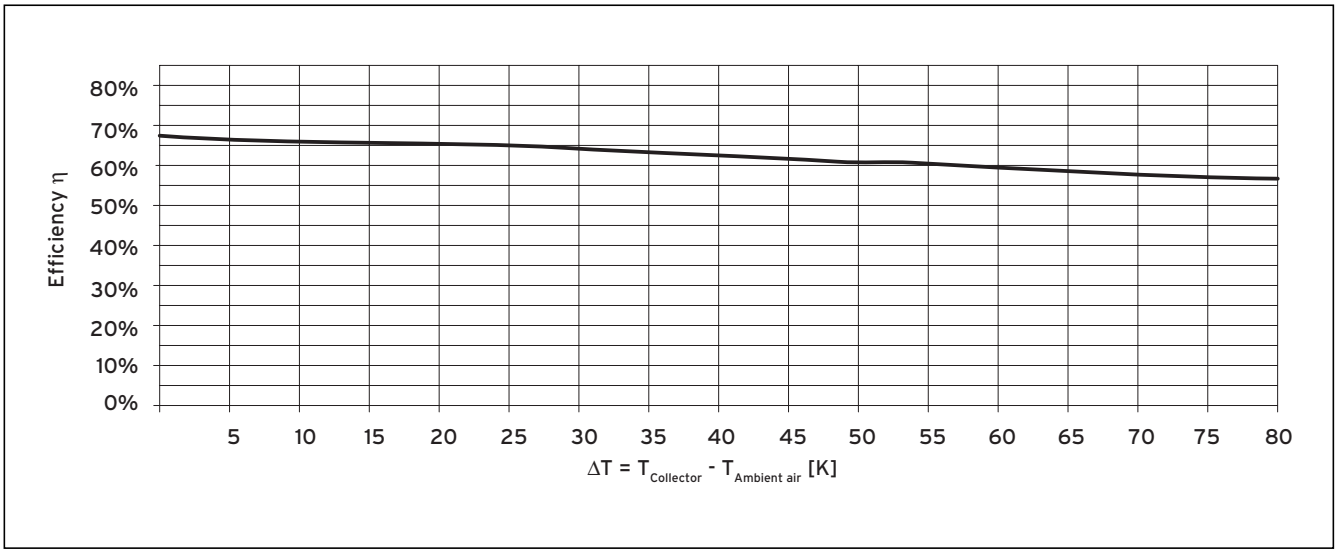

Fig. 4.4 Efficiency of auroTHERM collector with radiation energy content of 800 W/m²

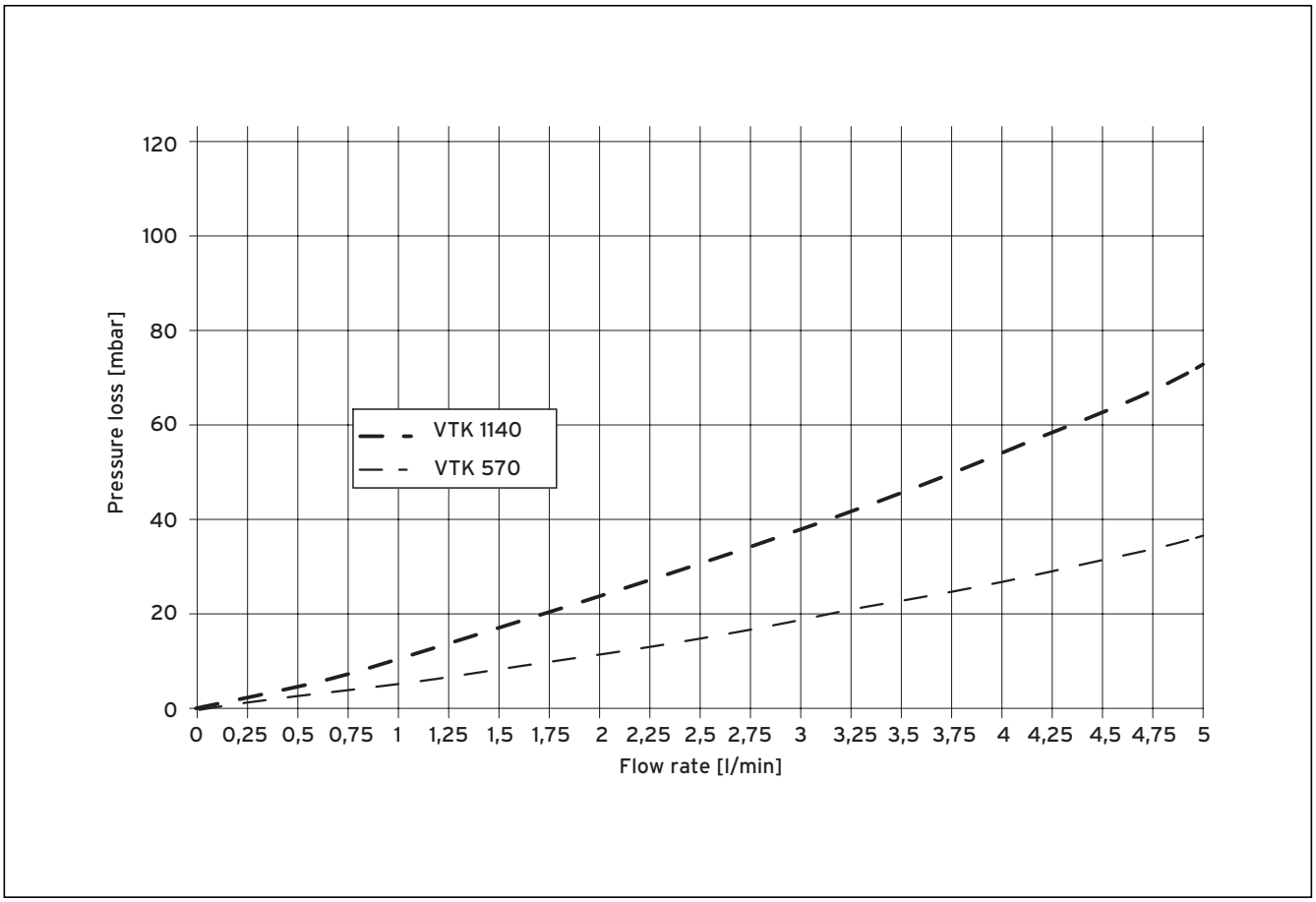

Fig. 4.5 Pressure loss of the auroTHERM exclusive collector

4.1.3 Disposal

All Vaillant solar collectors meet the requirements for the German "Blauer Engel" (Blue Angel) environmental mark.

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4.2 Solar pump unit

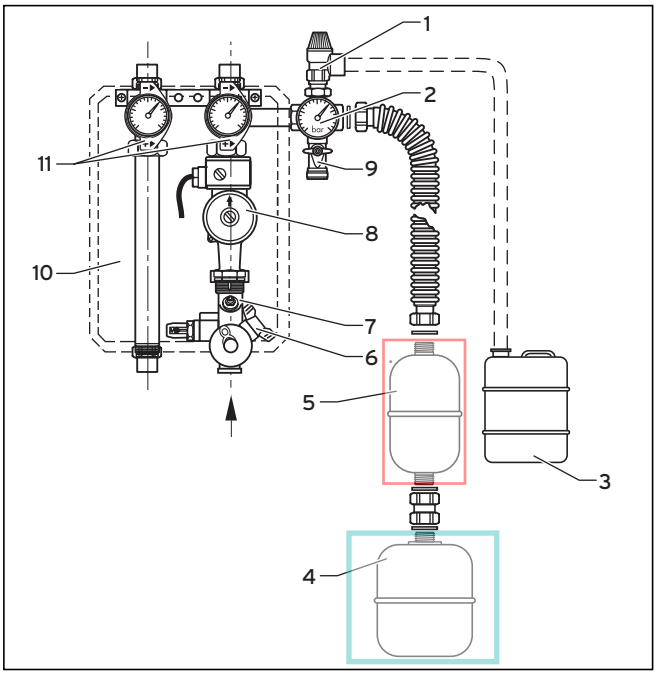


Fig. 4.9 Design of the solar pump unit

Key

1 Expansion relief valve
2 Pressure gauge
3 Pressure release pipe with collecting container
4 Combined Solar expansion/protection vessel will be supplied with Vaillant pre defined sets.
5 Protection vessel NOT required when above vessel supplied and fitted(optional for bespoke systems)
6 Fill/vent valve (for filling and draining the solar circuit)
7 Flow rate meter
8 Three-speed solar pump
9 Fill/vent valve (for filling the solar circuit)
10 Group of pipes with insulation
11 Stop valves with gravity brakes

4.2.1 Design

The solar pump unit transports heat from the collector to the consumer safely and efficiently.
The solar pump unit mainly consists of:

- The group of pipes of the solar pump unit with insulation (**10**)
- Two stop valves with gravity brakes (**11**) to prevent heat diversion. (The gravity brakes are ineffective if the stop valves are in the 45° position.)
- The water control pack with an expansion relief valve (**1**) with 6 bar blow-off pressure and a pressure gauge (**2**) for visual inspection
- Two fill/vent valves for filling and draining the solar circuit (**6** and **9**)
- A three-speed solar pump (**8**)
- A flow rate meter to optimally adjust the required flow rate (**7**)
- A solar expansion vessel (**4**) (separate accessory)
- A protection vessel (**5**) (separate accessory)

4.2.2 Water control pack

The solar pump unit is delivered with a water control pack, consisting of an expansion relief valve (**1**) and a pressure gauge (**2**) for visual inspections.

4.2.3 Solar expansion vessel

The solar expansion vessel (**4**), is used to equalise the pressure while the pressure relief valve (**1**) blows off the solar fluid into the collecting container via the pressure release pipe (**3**) if the operating pressure of 6 bar is exceeded.

Note!
The solar fluid container is of sufficient size and intended as a collecting container. Establish a permanently integrated blow-off line between the expansion relief valve and collection tank.

The size of the solar expansion vessel is based on the collector volume and the expansion volume of the solar system.
The expansion vessel not only accommodates the expansion volume of the solar fluid, but also the entire volume of the collectors in the event of a shutdown. The total volume of the solar system is the total of the individual values of the collector, heat exchanger volume and the volume of the pipeline.
The admission pressure of the solar expansion vessel can be set between 0.5 and 4.0 bar.

4.2.4 Protection vessel

In the event of unfavourable system configurations (e. g. very large collector surface, installation of the solar pump unit under roof), the solar expansion vessel (**4**) may be subjected to excessive temperatures by the solar fluid if the system is shut down. In worst cases, this can cause the membrane of the solar expansion vessel to be overheated and to fail.
The installation of solar protection for the expansion vessel (**5 see Fig 4.9 key**) is recommended in all cases. In the case of Vaillant solar sets a combined expansion and protection vessel is supplied. This incorporates both requirements into one easy fit device.
For bespoke systems the solar expansion vessel is protected from excessive temperatures by 5 l, 12 l or 18 l of solar fluid in front of it. Vaillant recommends the installation of a protection vessel for all solar systems.

4.3 Solar pump

The solar pump unit is equipped with a three-speed solar pump (Fig. 4.9, pos. **8**) for the optimum adaptation of the required circulating volume and the pump capacity in the solar circuit.
Select the pump capacity, depending on the solar system (e. g. collector surface, pipe diameter, length of the solar circuit), so that the actual flow rate is slightly higher than the nominal flow rate. The flow rate meter (Fig. 4.9, pos. **7**) is used for fine adjustment of the flow rate.
Observe the notes in Section 6.2, Setting the flow rate and pump.

4.4 Thermal cut out of the solar pump

In order to comply with the requirements for unvented hot water storage systems (G3) the power supply to the solar pumps(s) must be taken via a manually resetable temperature cut off on the hot water cylinder.
The Vaillant auroSTOR cylinder has such as device factory fitted, and this is wired in series with the power supply to the solar pump.

Note
If an East - West system is being installed then the installation of a relay (to allow independant operation of each pump) may be necessary.

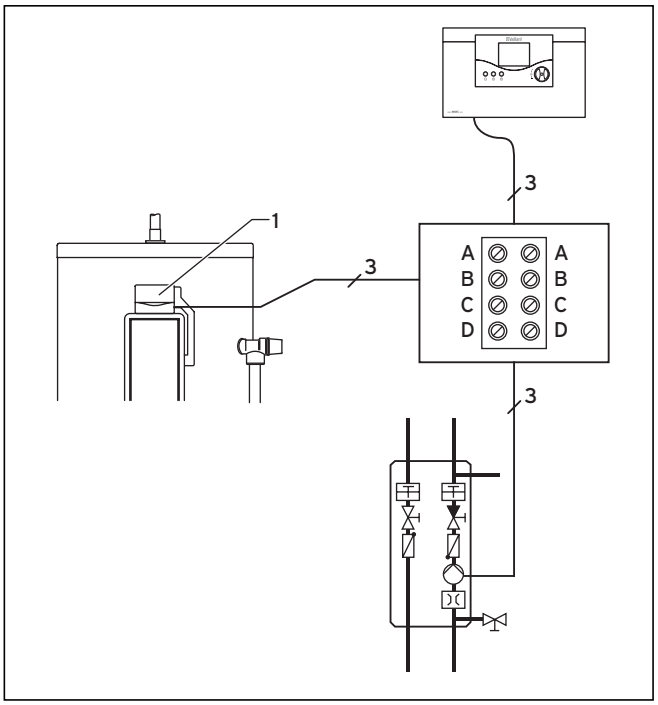


Fig. 4.10 Connection diagram of the solar pump TCO

The solar pump is secured by its own thermal cut out (TCO) (**1**) which is mounted on the solar cylinder (pre-assembled at the factory for the VIH S GB 250 and 300 S). The power supply to the pump is interrupted at cylinder temperatures higher than 90 °C.

4.5 Flow rate meter

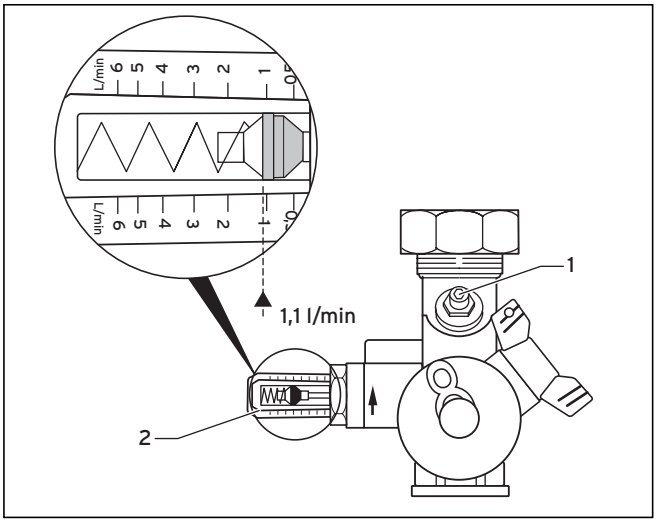


Fig. 4.11 Flow rate meter 0 - 6 l/min

The flow rate meter (pos. **7**, Fig. 4.6) installed in the return pipe is an essential component of the solar system. To achieve optimum heat transfer, you must achieve a certain flow rate, which is referred to as the nominal flow rate (refer to Section 6.2, Setting the flow rate and pump).
Upper deviations are not as serious as lower deviations. Make the rough adjustments with the solar pump first. You can make the fine adjustments with the adjustment valve (**1**) of the flow rate meter. You can view the set value on the display (**2**) of the flow rate meter.
The flow rate meter has a fill/vent valve for filling and draining the solar circuit.

Note
Do not under any circumstances set the flow rate below the calculated flow rate. The collector efficiency will be considerably reduced.

4.6 Solar fluid

4.6.1 Properties of the solar fluid

This information applies to Vaillant solar fluid (20 l canister: item no. 302 429).
Vaillant solar fluid is a ready-mixed antifreeze and anticorrosive, consisting of approximately 45% propylene glycol with anti-corrosion inhibitors and 55% water. It is resistant to high temperatures and can be used both with Vaillant tube collectors and Vaillant flat plate collectors.
Furthermore the solar fluid has a high thermal capacity.

The inhibitors provide reliable corrosion prevention when using different types of metal (mixed installations).

Note!
Do not use any other anti-freeze or inhibitors with Vaillant solar collectors.
Only Vaillant solar fluid is approved.

Caution!
Risk of damage!
Vaillant solar fluid is ready mixed. You may not under any circumstances mix it with water or other fluids. Otherwise it will become ineffective as an antifreeze or anticorrosive, resulting in damage to collectors or other parts of the system.

Vaillant solar fluid is infinitely durable in hermetically sealed containers.
Skin contact is normally not dangerous. Eye contact only causes minor irritations, you should nevertheless immediately wash your eyes.
Observe the safety data sheet (refer to Section 4.6.4).

4.6.2 Protection of the solar circuit against frost and corrosion

To protect the solar system reliably against frost in winter, the entire solar circuit must be filled 100 % with solar fluid (item no. 302429).

Note!
You can achieve frost resistance of about -28 °C by filling the solar system with Vaillant solar fluid.
No damage is caused by frost even at outside temperatures below -28 °C, since the expansive effect of the water is reduced. Check the antifreeze effect after filling the system and then once a year.

Component	Volume (l)
VIH S GB 200 S heat exchanger solar circuit	4.12
VIH S GB 250 S heat exchanger solar circuit	4.12
VIH S GB 300 S heat exchanger solar circuit	4.4
VIH S GB 200 S heat exchanger reheating circuit	3.7
VIH S GB 250 S heat exchanger reheating circuit	3.7
VIH S GB 300 S heat exchanger reheating circuit	3.7
Solar pump unit	0.9
auroTHERM exclusive VTK 570	0,8
auroTHERM VFK 900	1,1
auroTHERM classic VFK 990/1	1,1
Protection vessel	5, 12 or 18 l

Table 4.3 Volume of the individual components

Pipe diameter	Pipeline volume (l/m)
15 mm	0.18
18 mm	0.20
22 mm	0.31
28 mm	0.50
flexible pipe DN 12 mm	0.15
flexible pipe DN 16 mm	0.27
flexible pipe DN 20 mm	0.36

Table 4.4 Pipeline volume

Proceed as follows to check the solar fluid; refer to the operating manual of the solar fluid tester (item no. 0020020155):
- Suck in the amount of fluid for the float to freely float without sticking at the top with the suction ball of the solar fluid tester (item no. 0020020645).
- View the density on the scale. The density must be greater than 1.05 g/cm³. You must otherwise replace the solar fluid.
- Measure the pH value with a pH value measuring strip. You must replace the solar fluid if the pH value is below 7.5.

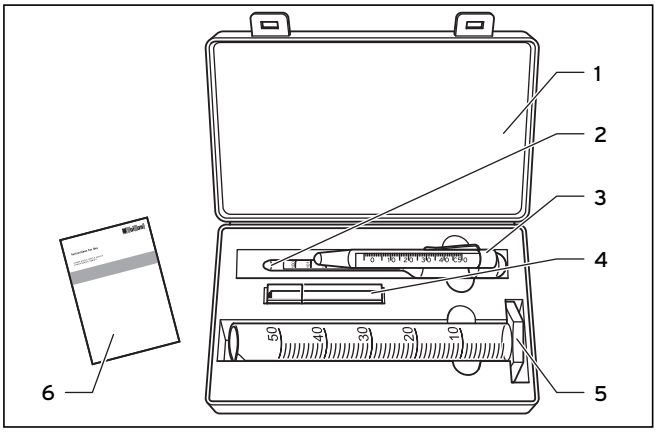


Fig. 4.12 Solar fluid tester

Key
1 Transport case
2 Areometer
3 Thermometer
4 pH indicator rod
5 Standing cylinder
6 Operating manual

Caution!
Risk of damage!
Use only the original Vaillant solar fluid tester (item no. 0020020645). Otherwise an incorrect antifreeze value may be indicated.

4.6.3 Frost protection of the bivalent solar cylinder

You must drain the solar cylinder completely if it is to be shut down in a room prone to frost. It is drained at the cold water inlet with a T-piece with tap to be provided by the installer.

- Also drain all heat exchangers which are not filled with solar fluid.

4.6.4 Safety data sheet

1. Substance/Formulation and company name

1.1 Information on the product:
Trade name of the Vaillant solar fluid
(item no. 302 362)

1.2 Information on the supplier:
Vaillant GmbH, Berghauser Str. 40,
42859 Remscheid, Germany
Telephone +49 (02191) 18 - 0,
fax +49 (02191) 182810,
Emergency information: your local poison information centre
(see directory assistance or telephone directory).

2. Composition/Information on components

2.1 Chemical properties
Watery solution of 1.2 propylene glycol with corrosion inhibitors

3. Possible risks

3.1 No particular risks known

4. First-aid measures

4.1 General notes:
Remove dirty clothes.

4.2 After inhaling:
Discomfort after inhaling fumes/ aerosol: fresh air, help from a doctor.

4.3 After skin contact:
Wash off with water and soap.

4.4 After eye contact:
Wash thoroughly under running water with wide open eyes for at least 15 minutes.

4.5 After swallowing:
Rinse your mouth and then drink plenty of water.

4.6 Notes for the doctor:
Treatment of symptoms (decontamination, vital function), no specific antidote known.

5. Firefighting measures

5.1 Appropriate extinguishing agents:
Spray, solid extinguishing agent, alcohol-fast foam, carbon dioxide (CO_2)

5.2 Particular hazards:
Fumes which are detrimental to health. Formation of smoke/mist. The specified substances/ substance groups may be released in the event of a fire.

5.3 Special protective equipment for fire fighting:
Wear a breathing apparatus which is independent of the circulating air in the event of a fire.

5.4 Further details:
The hazard depends on the combustible substances and the fire conditions. Polluted fire water must be disposed of according to local official regulations.

6. Measures to be taken if substances are released accidentally

6.1 Individual-related measures:
No particular measures required.

6.2 Environmental measures:
The product may not be discharged into waters without pre-treatment (biological sewage plant).

6.3 Cleaning/Collection methods:
Pump out the product in the event of large quantities.
Absorb small quantities with appropriate fluid bonding material. Then dispose of them according to regulations.
Rinse away splashes with plenty of water. Inform the local water authority in the event of large quantities which could flow into the drainage or waters.

7. Handling and storage

7.1 Handling:
Good ventilation of the workplace, no other particular measures required.

7.2 Fire and explosion protection:
No exceptional measures required.
Cool any endangered containers with water.

7.3 Storage:
Close containers tightly and store them at dry places. Do not use any galvanised containers for storage.

8. Limitation of exposure and personal protective equipment

8.1 Personal protective gear:
Hand protection: chemical-resistant protective gloves (EN 374). Suitable materials even in the event of prolonged, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time according to EN 374): flour elastomer (FKM) – 0.7 mm layer thickness. Suitable materials for brief contact or splashes (recommended: at least protection index 2, corresponding to > 30 minutes permeation time according to EN 374): nitrile rubber (NBR) – 0.4 mm layer thickness. Due to the large variety of types, observe the instruction manuals of the manufacturer.

8.2 Eye protection:
Safety glasses with lateral protection (framed glasses) (EN 166)

8.3 General safety and hygiene measures:
Observe the usual protective measures for dealing with chemicals.

9. Physical and chemical properties

Form: fluid
Colour: violet
Odour: product-specific
Solidification temperature: approx. -28 °C (DIN 51583)
Boiling temperature: > 100 °C (ASTM D 1120)
Flash point: none
Lower explosion limit: 2.6 % by vol. (details for
Upper explosion limit: 12.6 % by vol. 1.2 propylene glycol)
Ignition temperature: omitted
vapour pressure (20 °C): 20 mbar
Density (20 °C): approx. 1.030 g/cm3 (DIN 51757)
Water solubility: entirely soluble
Solubility (qualitative) solvent: polar solvents: soluble
pH value (20 °C): 9.0 – 10.5 (ASTM D 1287)
Viscosity, kinematic (20 °C): approx. 5.0 mm2/s (DIN 51562)

10. Stability and reactivity

10.1 Substances to be avoided: Strong oxidants

10.2 Dangerous reactions:
No dangerous reactions if the storage and handling regulations/notes are observed

10.3 Dangerous decomposition products:
No dangerous decomposition products if the storage and handling regulations/notes are observed.

11. Toxicological information

11.1 Acute toxicity:
LD50/oral/rat: > 2000 mg/kg
Primary skin irritation/rabbit: not irritating. (OECD guideline 404)
Primary irritation to the mucous membrane/ rabbit: not irritating.
(OECD guideline 405)

11.2 Additional notes:
The product has not been checked. The statements have been taken from the individual components.

12. Ecological information

12.1 Ecological toxicity:
Fish toxicity: LC50 leuciscus idus (96 h): > 100 mg/l
Aquatic invertebrates: EC50 (48 h): > 100 mg/l
Water plants: EC50 (72 h): > 100 mg/l
Micro-organisms/effect on activated sludge: DEV-L2 > 1000 mg/l. No disturbances to the biodegrading activity of the activated sludge are expected in adapted biological sewage plants if discharged appropriately in low concentrations.

12.2 Assessment of aquamatic toxicity:
The product has not been checked. The statements have been taken from the properties of the individual components.

12.3 Persistence and biodegradability/information on elimination:
OECD 301 A test method (new version)
Analysis method: DOC acceptance
Degree of elimination > 70 % (28 d)
Assessment: easily biodegradable.

13. Note on disposal

13.1 Disposal:
Vaillant solar fluid (item no. 302 363) must de disposed of at an appropriate waste site or waste incineration plant, for example, while observing local regulations. Contact the local municipal sanitation office or the mobile environmental service for quantities under 100 l.

13.2 Uncleaned packings:
Uncontaminated packings can be reused. Dispose of packings which are unable to be cleaned together with the substance.

14. Transport information:

VbF: not subject to the ordinance on combustible fluids.
Mailing permitted. GGVE/RID: -, UN no.: -, GGVS/ADR: -, IATA DGR: -, IMDG code: -, TA air: -.
No dangerous goods according to transport regulations.

15. Regulations

15.1 Labelling in accordance with EC directives/ national regulations:<NewLine/>No labelling obligation

15.2 Other regulations: water hazard class (Germany, Appendix 4 of the VwVwS (administrative regulation on water-pollutant substances) from 17.05.1999): (1), slightly water-pollutant

16. Other information

The safety data sheet is intended to provide essential physical, safety-related, toxicological and ecological data and give recommendations for safe handling or safe storage, handling and safe transport of chemical substances and formulations. No liability is assumed for damage in connection with the usage of this information or the usage, application, adaptation or processing of the products described here. This does not apply as long as we, our statutory agents or assistants are liable in the event of intention or gross negligence. No liability is assumed for indirect damage.
This information has been compiled to the best of our knowledge and conscience according to our current state of knowledge.
No guarantee can be made for product properties.

17. Version

Compiled by Vaillant GmbH on 1/7/2003

4.7 auroSTOR solar cylinder

The auroSTOR solar cylinder is described in detail in Section 5.1, Installation of the solar cylinder, of this manual.

4.8 Solar control

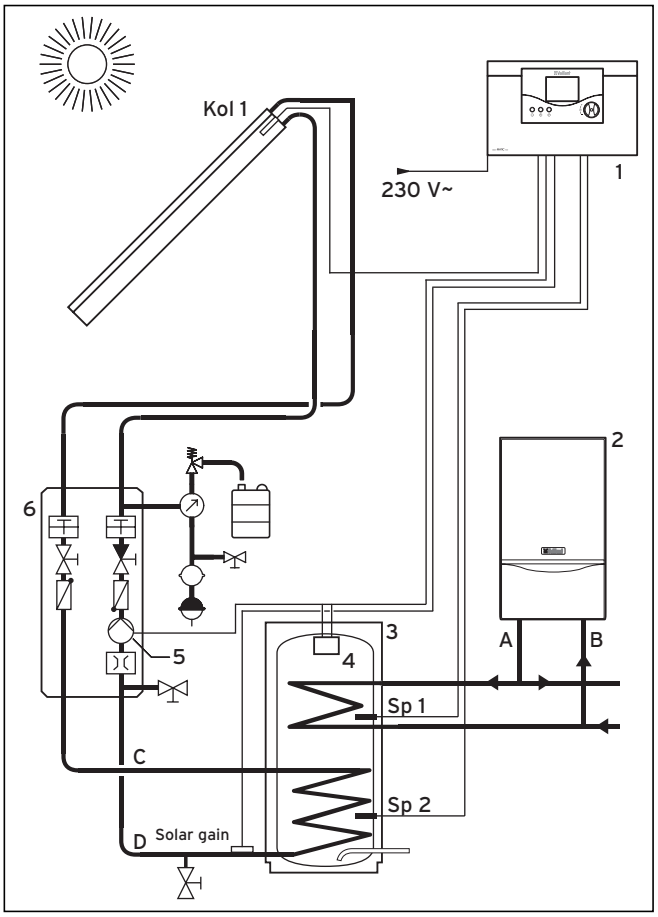


Fig. 4.13 Temperature difference control

Key

1 Solar control
2 Boiler
3 Solar cylinder
4 Thermal cut out of the solar pump
5 Solar pump
6 Solar pump unit
Kol 1 Collector temperature sensor
Sp 1 Upper stored water temperature sensor (reheating circuit/standby part)
Sp 2 Lower stored water temperature sensor (solar circuit)
A Boiler flow
B Boiler return
C Solar flow
D Solar return

Type of solar control

The Vaillant solar system enables various system configurations and control concepts.

Control of the hot water temperature

The hot water temperature in the top half of the cylinder can be controlled by the Vaillant auroMATIC VRS 560 solar control or by using a separate hot water programmer (refer to Section 5.8, Electrical installation).

Wiring

The Vaillant Control Center VR 61 or VR 65 can be used to wire up the system if an eBUS-capable Vaillant boiler is used.
A standard wiring box can be used for all other boilers.

Solar pump control

Temperature differences, not absolute temperature values, are important for the operation of solar systems. That is why solar systems are controlled by what is referred to as temperature difference controllers. Temperature sensors measure the difference between the collector and solar cylinder.
The solar pump is switched on if the difference in temperature (Kol 1 - Sp 2) is greater than 7 K. The solar pump of the solar system is switched off if the difference in temperature (Kol 1 - Sp 2) is lower than 3 K.
Furthermore the solar control constantly measures the cylinder temperature. Reheating is switched on if the value (Sp 1) falls below the set target value.
You can set the difference in temperature on the controller between 2 and 15 K. The default setting of 7 K is sufficient for most solar systems.
Do not set temperature differences too low. This would result in a number of unnecessary and uneconomic switch-on and switch-off procedures.

auroMATIC 560 controller

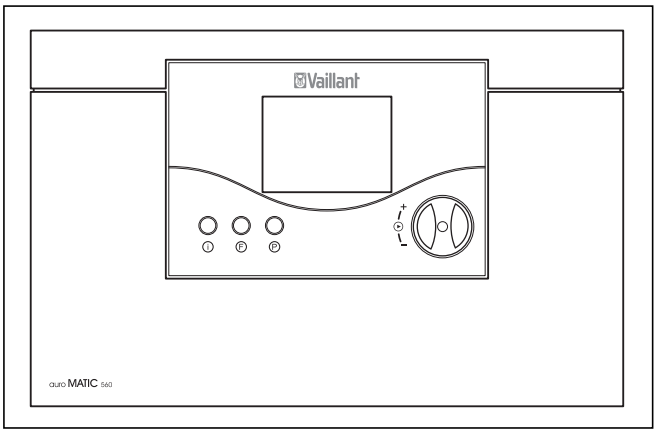


Fig. 4.14 auroMATIC 560

The auroMATIC 560 solar control is a differential temperature-controlled control set for solar-supported hot water supply with a demand driven reheating function for Vaillant boilers.
The control set is a fully-equipped system for solar systems with a collector array and a solar cylinder.
It is possible to determine the solar gain by means of an additional gain sensor (available as an accessory).

Control Center VR 65
The Control Center VR 65 provides a system solution which allows Vaillant low-voltage eBUS controllers to be used in the English market with valves and hot water cylinders with traditional 230 V cylinder thermostats. The information on the heat requirements of the solar cylinder is forwarded to the Vaillant ecoTEC boiler by the Control Center VR 65. The boiler decides whether hot water requirements has to be met and sends the signal to control the 230 V valves via the VR 65.
In this way, the boiler can store different target temperatures for heating and hot water operation. Standard 230 V components can be integrated in the Vaillant eBUS system via the Control Center VR 65. For wiring, refer to Section 5.8, Electrical installation, and the installation manual of the Control Center VR 65 (item no. 0020007476).

VRT 360 programmable room thermostat
The VRT 360 is a programmable room thermostat with a week programme for heating, hot water and circulation pump, which can be connected to Vaillant boilers with With the VRT 360, you can preset the room temperature with a heating programme.
The VRT 360 has additional functions including central heating override and the time control function of an additional circulation pump.
For wiring, refer to Section 5.8, Electrical installation, and the operating and installation manual of the VRT 360 (item no. 838568).

☞ **Note!**
If the VRT 360 is used for central heating control, the Control Center VR 65 is additionally required to measure the solar cylinder temperature and switch from cylinder reheating to heating mode and vice versa as required.

VRC 400 weather compensator
The VRC 400 weather compensator is an external temperature compensator and can be used in conjunction with a Vaillant eBus boiler to provide time and temperature control of the central heating.

5 Installation

- Use the following tables to check the scope of delivery before beginning with the installation.

Installation sequence
Install the solar system in the following order:
- Solar collectors and solar pump unit
- Solar cylinder
- Solar circuit piping
- Reheating circuit piping
- Hot water piping N.B. secondary return not recommended.
- Cold water supply
- Discharge pipe
- Electrical installation

- Assemble the collectors according to the assembly manual (enclosed with collector installation set).
- Install the solar pump unit according to the installation manual (enclosed with solar pump unit).
- Proceed with the installation as described in the following sections.

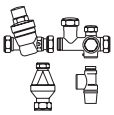
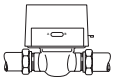
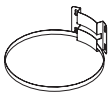
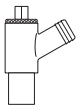
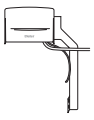
auroSTOR solar cylinders		VIH S GB 200 S	VIH S GB 250 S	VIH S GB 300 S
	Item no.:	307206	307207	307208
Safety group with tundish		1	1	1
Motorised 2 port valve for regulation of reheating circuit		1	1	1
Hot water expansion tank 18 l		1	-	-
Hot water expansion tank 25 l		-	1	1
Wall bracket for hot water expansion tank		1	1	1
Carrier handle		1	1	1
[redacted]connections		1	1	1
Drain valve		1	1	1
Safety thermostat for solar pump (bracket, cable, capillary tube)		pre-assembled	pre-assembled	pre-assembled

Table 5.5 Scope of delivery, auroSTOR

5.1 Installation of the solar cylinder

5.1.1 Description of the solar cylinder

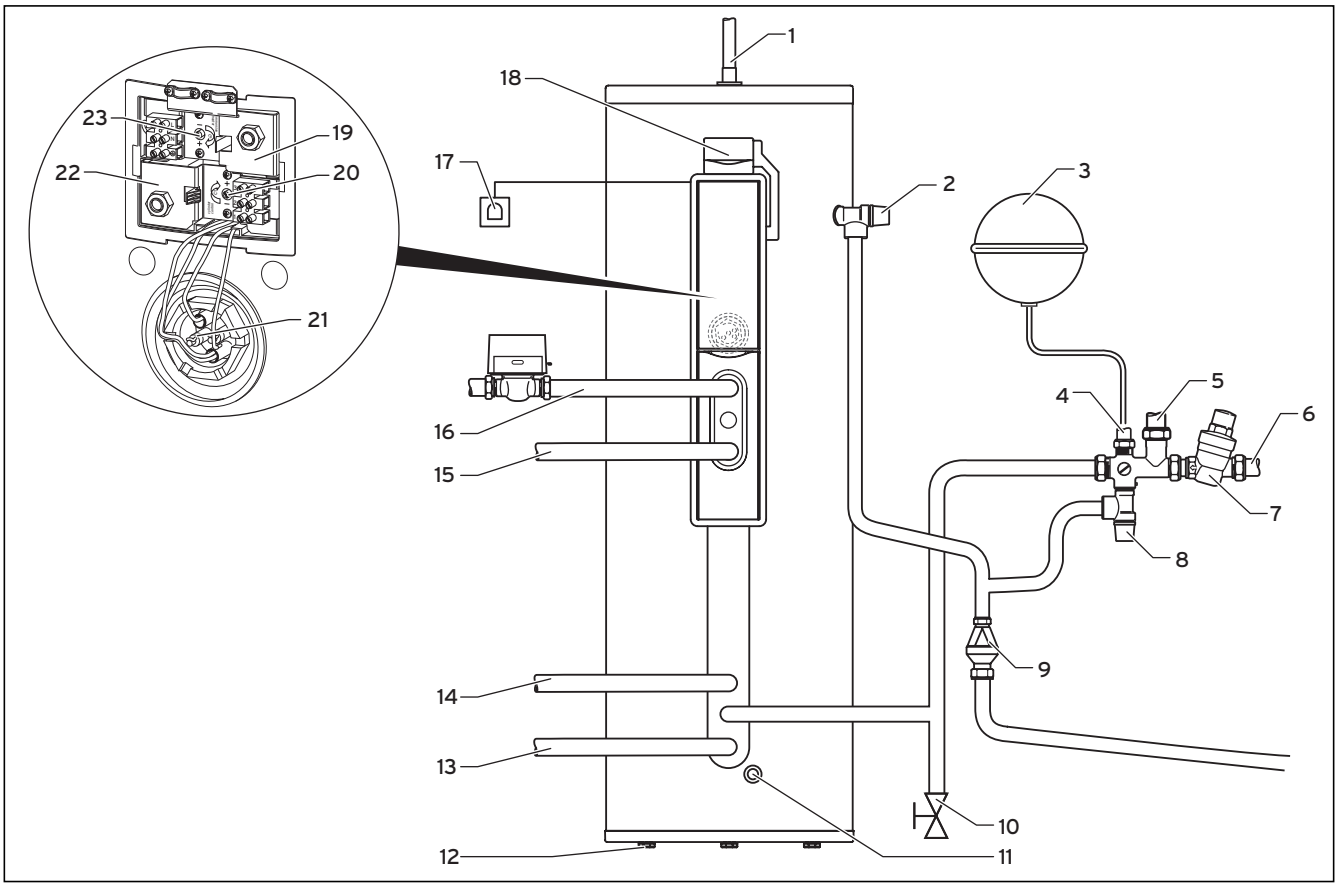


Fig. 5.1 auroSTOR function elements

Key

1 Hot water connection
2 Temperature and pressure relief valve (95 °C, 7 bar)
3 Hot water expansion tank
4 Connection for hot water expansion tank
5 Pressure-controlled cold water outlet
6 Cold water pipe
7 Pressure limiting valve (3.5 bar) with sieve
8 Expansion relief valve (one port valve, 6.0 bar)
9 Tundish
10 Cylinder drain valve
11 Sp 2 temperature sensor immersion pocket
12 Adjustable feet
13 Return (solar circuit)
14 Supply (solar circuit)
15 Return (gas fired wall hung boiler)
16 Supply (gas fired wall hung boiler)
17 Immersion heater switch
18 Safety thermostat for solar pump, set at 90 °C, connected to solar pump; isolates this heat source if the solar control malfunctions
19 Safety thermostat for immersion heater
20 Cylinder thermostat (20 °C - 65 °C)
21 Immersion heater
22 Safety thermostat, set to 90 °C, connected to the motorised 2 port valve; isolates the primary heat source if the domestic hot water thermostat fails.
23 Thermostat, immersion heater

Note!
The [redacted] thermostat can be removed if the solar energy system is operated using a Vaillant auroMATIC VRS 560 in conjunction with a Vaillant eBUS compatible boiler.

auroSTOR solar cylinders are available in three sizes: 200, 250 and 300 litres. The containers are made of stainless steel and insulated with EPS.The cylinders are equipped with all necessary cold and hot water control devices and a motorised 2 port valve.
The auroSTOR cylinders are operated at the pressure of the water supply pipe and do not need a cold water tank for their supply. They have hot and cold water connections of 22 mm diameter.A cold water supply of appropriate pressure and flow rate is required to operate the solar cylinder ideally (refer to Section 5.6.1, Cold water supply pressure).

Control of the hot water temperature
The hot water temperature in the top half of the cylinder can be optionally regulated by the Vaillant auroMATIC VRS 560 solar control by means of the programmable Vaillant VRT 360 room thermostat or a timer.
This will ensure maximum solar gains from your system. If other controls are utilised then the VRS 560/2 can be employed as a solar only controller and wired to work with your chosen hot water control.

The temperature settings for solar water heating and the maximum cylinder temperature are made by means of this solar control, e. g. auroMATIC VRS 560. The auroSTOR must be wired properly in order to adhere to the G3 building regulations.

Note
The solar pump must be connected to the solar control via a safety thermostat (STB) (refer to Section 5.8 "Electrical installation"). This ensures that the solar pump is switched off if the hot water temperature in the cylinder exceeds 90 °C.

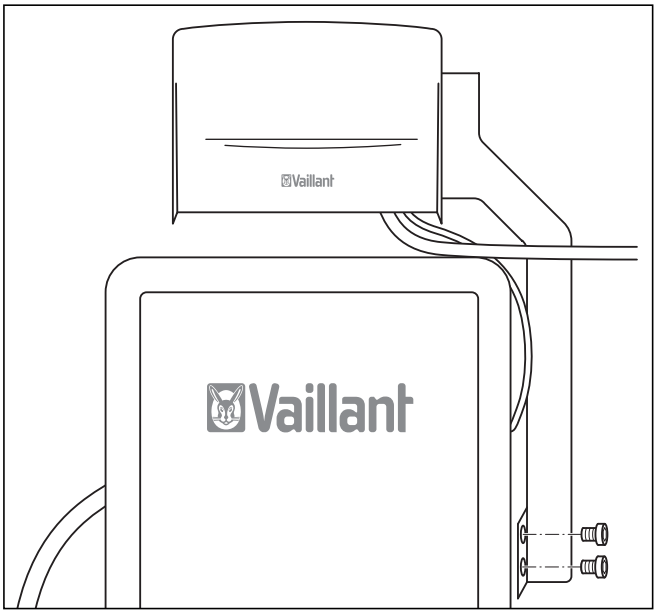


Fig. 5.2 Attachment of the solar pump TCO

VIH S GB 200 S, VIH S GB 250 S and VIH S GB 300 S
The thermal cut out and temperature sensor have been pre-installed by the manufacturer.

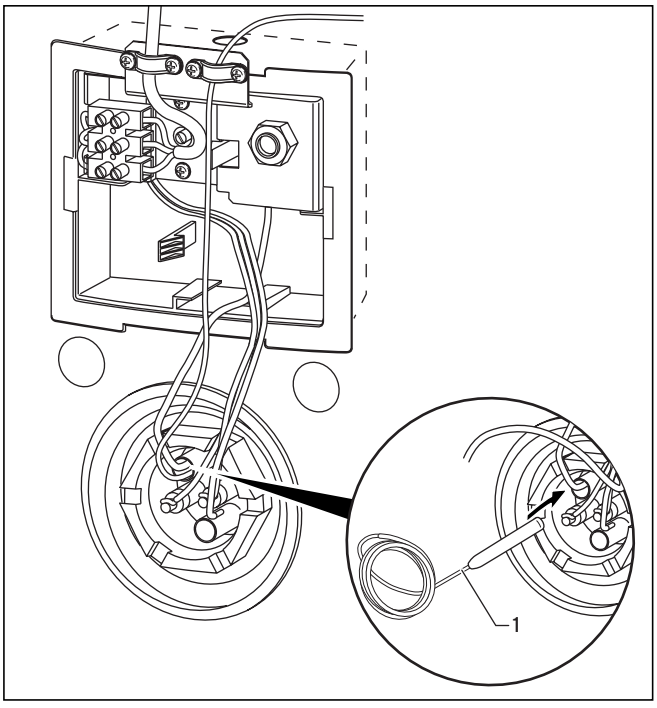


Fig. 5.3 NTC capillary tube guide

A VR 10 temperature sensor (**1**) must be used instead of the installed thermostat if the auroMATIC VRS 560 is used (refer to Section 5.8.2, Electrical connection to the cylinder control device, for the removal of the thermostat).

Immersion heater
The auroSTOR solar cylinders are equipped with an additional immersion heater of 3 kW, including the operating thermostat and energy cut-off device.The immersion heater is situated behind the front plate. It is designed for use in unvented cylinders and includes a thermostat control and thermal cut out for over heat protection.

☞ **Note:**
In the event of a replacement, only the right immersion heater equipped with a thermal cut out for overheating protection may be used.

Secondary return
NOTE
The water control group used is the same as on our uniSTOR cylinders and has a connection that can be used for secondary circulation on those cylinders, it may also be used for the connection of a legionella circulation pump connection.
In solar systems secondary circulation is not recommended as it will waste energy and reduce solar gains. as it heats the cold store area but of course can be used for the connection of a legionella circulation pump.

☞ **Note!**
The heat-up time is based on a primary flow rate of 9 l/min at 80 °C.
Temperature rise from 15 °C to 65 °C

5.1.2 Technical data of the auroSTOR solar cylinder

Entry	Unit	VIH S GB 200 S	VIH S GB 250 S	VIH S GB 300 S
Cylinder:				
Size	l	200	250	300
Maximum water supply pressure	bar	10		
Operating pressure	bar	3.5		
Pressure limiting valve	bar	3.5		
Expansion relief valve	bar	6.0		
Hot water expansion vessel admission pressure	bar	4.0		
Temperature and pressure relief valve	°C/bar	95 / 7.0		
Net weight	kg	39	44	49
Weight (full)	kg	245	310	340
Height	mm	1499	1789	2109
Cylinder connections:				
Cold water supply		22 mm pressure pipe		
Hot water connection		22 mm pressure pipe		
Pressure-controlled cold water outlet		22 mm pressure pipe		
Flow (boiler/solar circuit)		22 mm pressure pipe		
Return (boiler/solar circuit)		22 mm pressure pipe		
Electrical connections:				
3 kW immersion heater (according to ENBS 60335)		230/240 V, 50 Hz		
Length of the immersion heater	mm	430		
Motorised 2 port valve		230/240 V, 50 Hz		
Cylinder thermostat		230/240 V, 50 Hz		
Thermal cut out for solar pump		230/240 V, 50 Hz		
Heating coil:				
Heat loss	kW/24 h	1.9	2.1	2.4
Heat up time (boiler part)	mins	21	26	30
Recovery (boiler part)	mins	13	16	21

Table 5.4 Technical data of the auroSTOR solar cylinder

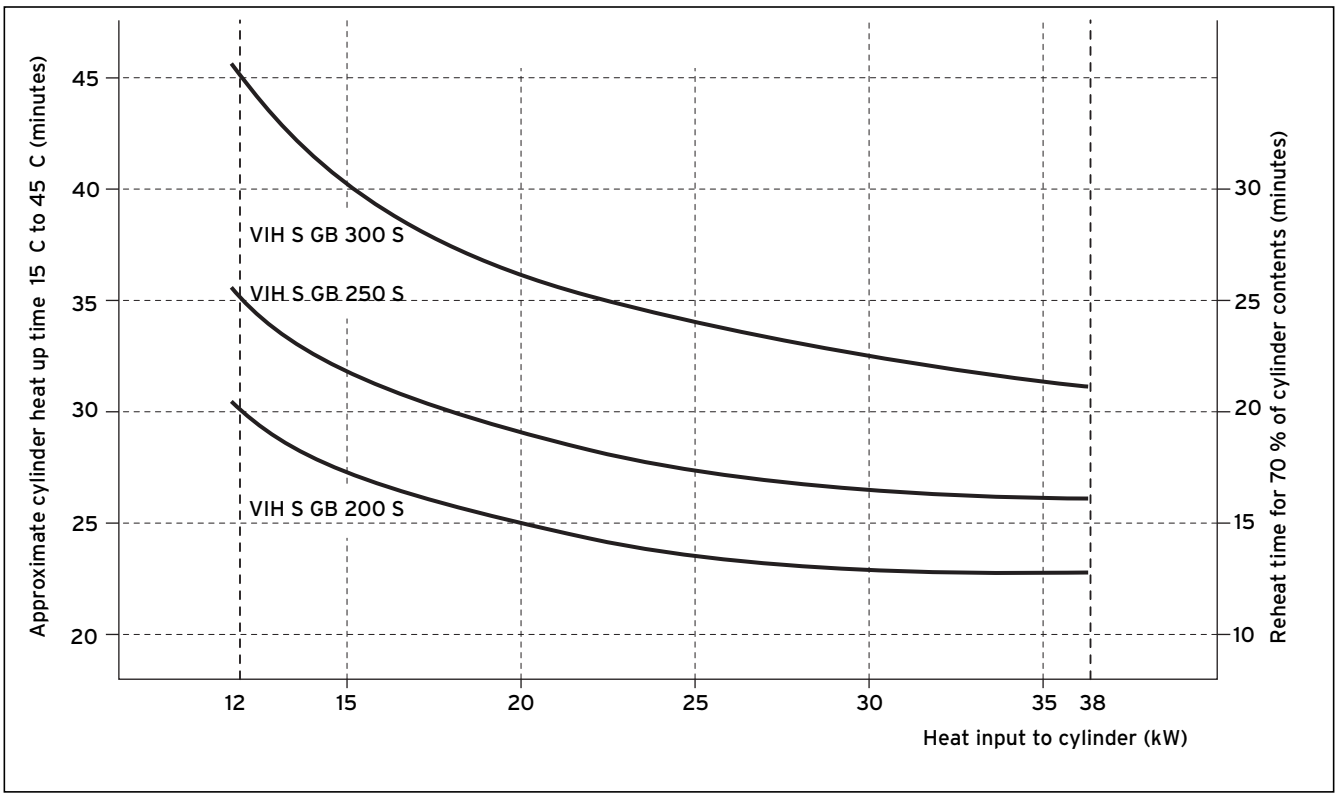


Fig. 5.4 auroSTOR cylinder heat-up times (boiler part)

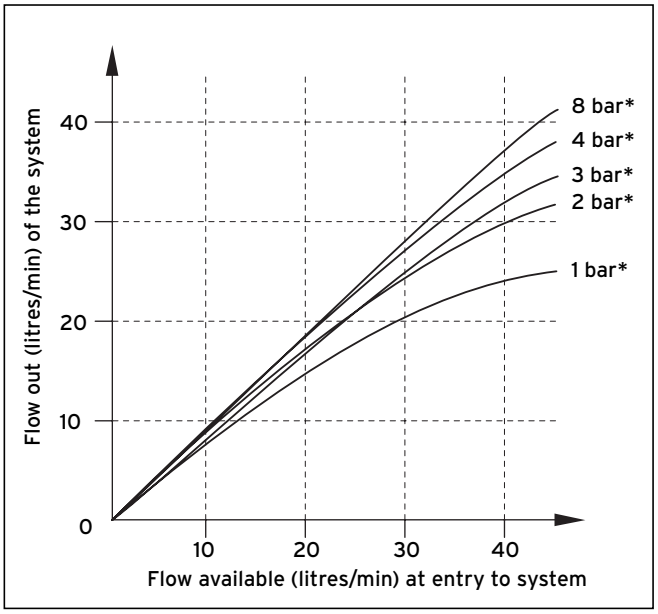


Fig. 5.5 auroSTOR hot water flow rates at 60 °C

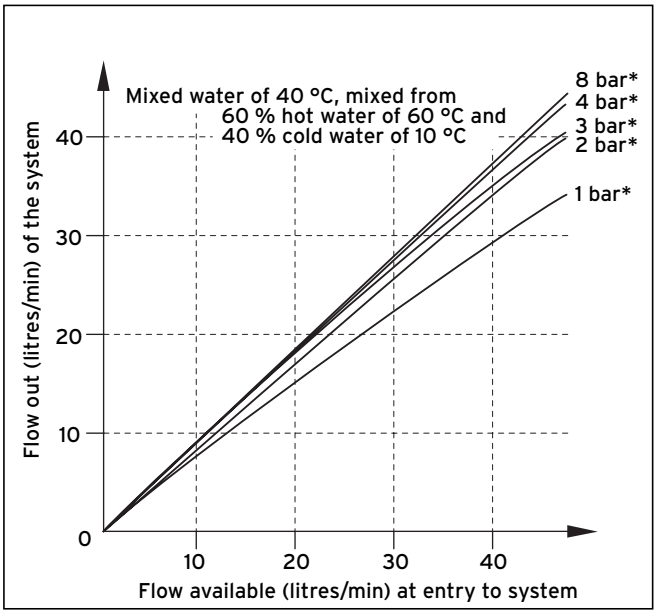


Fig. 5.6 auroSTOR mixed water flow rates

* Static operating pressure of the cold water supply

The displayed flow rates apply to installations in which the cold water supply is of appropriate dynamic pressure.
Please contact Vaillant Ltd if the static water pressure is below 1 bar.

5.1.3 Intended use

The Vaillant solar cylinders auroSTOR VIH S GB 200 S, VIH S GB 250 S and VIH S GB 250 are unvented, indirectly heated hot water cylinders for solar systems designed for usage with boilers in hot water supply systems in accordance with the GB standard.
They are used only to supply potable water heated up to 85 °C in solar systems with a collector array. They may only be used for this purpose. The solar cylinders can be used in combination with a downstream boiler for hot water supply in accordance with the GB standard.

Caution!
Risk of damage!
The appliances may only be used to heat up potable water. Damage to the appliance due to corrosion cannot be excluded if the water does not correspond to the specifications of the water ordinance.

Any other use or extended use is considered to be improper. The manufacturer/supplier is not liable for any resulting damage.The owner alone bears the risk. Intended use includes the observance of the system manual and the adherence to the inspection and maintenance conditions.

Caution!
Any improper use is forbidden.

Valliant solar cylinders are state-of-the-art appliances which have been constructed in accordance with recognised safety regulations. Nevertheless, there is still a risk of injury or death to the user or others or of damage to the equipment and other property in the event of improper use or use for which they are not intended.

5.1.4 Data badge

The data badge has been applied to the top of the solar cylinder by the manufacturer.

5.1.5 Safety devices

The solar cylinder has been provided with all safety and control devices for operation of the unvented domestic hot water supply:
- Temperature and pressure relief valve (95 °C, 7 bar)
- Pressure limiting valve (3.5 bar) with line strainer
- Expansion relief valve (one port valve, 6.0 bar)
- Thermal cut out of the solar pump, set to 90 °C, connected to the solar pump in order to isolate this heat source in the event of failure of the solar control.
- Thermal cut out of the immersion heater
- Thermal cut out of the solar cylinder, set to 90 °C, connected to the motorised 2 port valve, in order to isolate the primary heat source in the event of failure of the domestic water thermostat.

5.1.6 Safety instructions and regulations

This product has been checked for adherence to the building regulations for unvented hot water cylinder systems. It may not be changed or modified in any way whatsoever.
It should be installed by a qualified specialist, who should observe the applicable regulations of the local authorities, the building regulations, the building regulations for Scotland, the building regulations for Northern Ireland and the directives of the local water supply companies.Building approval is required for the installation.The local authority should be notified about the intended installation.Only original spare parts from Vaillant Ltd. may be used for the replacement of parts.

5.1.7 Scope of delivery

- Check the scope of delivery of the cylinder box.
- Water control pack (pressure limiting valve, expansion relief valve; connections for: secondary return (not recommended for solar cylinders) hot water expansion vessel
- Motorised 2 port valve
- Tundish
- Cylinder drain valve
- System description
- Assembly set for hot water expansion vessel
- Hot water expansion vessel:
  - 18 litres for VIH S GB 200 S (max. storage volume at 3.5 bar = 255 l)
  - 25 litres for VIH S GB 250 /300 S (max. storage volume at 3.5 bar = 315 l)
- Thermal cut out for solar pump with holder
- Solar cylinder

Make sure the cylinder is stored in an upright position in a dry environment prior to its installation.

5.1.8 Requirements of the installation site

Place the solar cylinder at an appropriate place in the building, while observing the following:
- The discharge pipe from the tundish must be installed at a minimum slope of 1:200 and end at a safe and visible point (refer to Section 5.7, Installation of the discharge pipe).
- The installation surface must be level and able to bear the weight of the full cylinder (refer to Section 5.1.2, Technical data of the auroSTOR solar cylinder).
- The installation site may not be prone to frost.A frost protection thermostat must be installed if necessary.
- The controller of the installed cylinder thermostat under the front plate must be accessible to the owner.
- There must be sufficient space to install, check and repressurise the expansion vessel.
- Floor unevenness should not be greater than those able to be compensated by the adjustable feet of the solar cylinder.

5.1.9 Transport

A cylinder carrier handle is supplied to make the transport to the installation site easier.

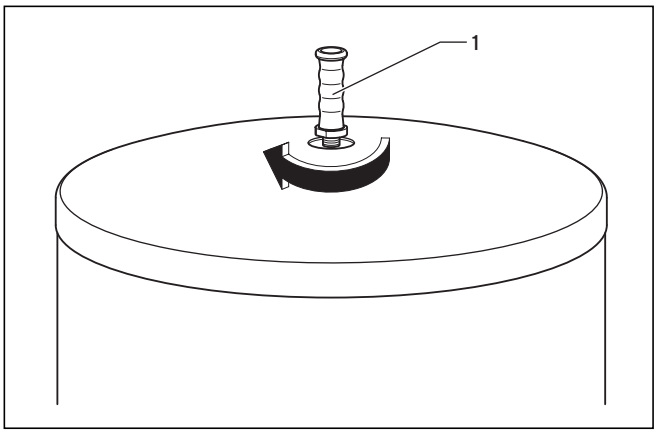


Fig. 5.7 Fastening the cylinder carrier handle

- Fasten the carrier handle (**1**) to the hot water connection of the solar cylinder.

5.1.10 Dimensions

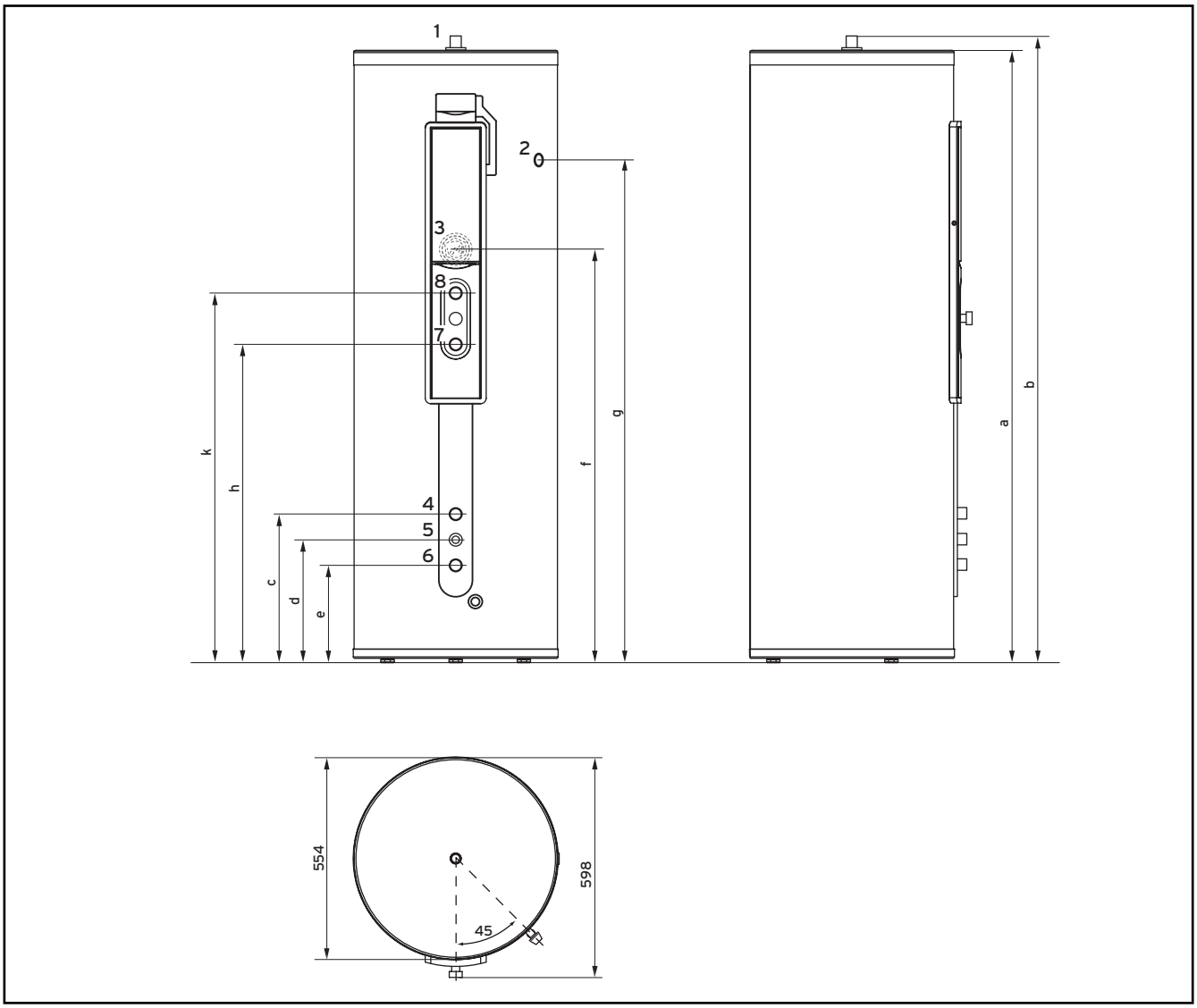


Fig. 5.8 Dimensions of the auroSTOR solar cylinder

Key

1 Hot water connection
2 Temperature and pressure relief valve
3 Immersion heater
4 Solar circuit flow
5 Cold water supply connection
6 Solar circuit return
7 Return (boiler)
8 Boiler flow

Cylinder type	A	B	C	d	A	F	g	h	R
VIH S GB 200 S	1468	1499	454	384	314	589	1118	813	953
VIH S GB 250 S	1758	1789	454	384	314	589	1408	924	1064
VIH S GB 300 S	2078	2109	454	384	314	589	1648	1101	1241

Table 5.5 Dimensions

5.2 Functional diagram

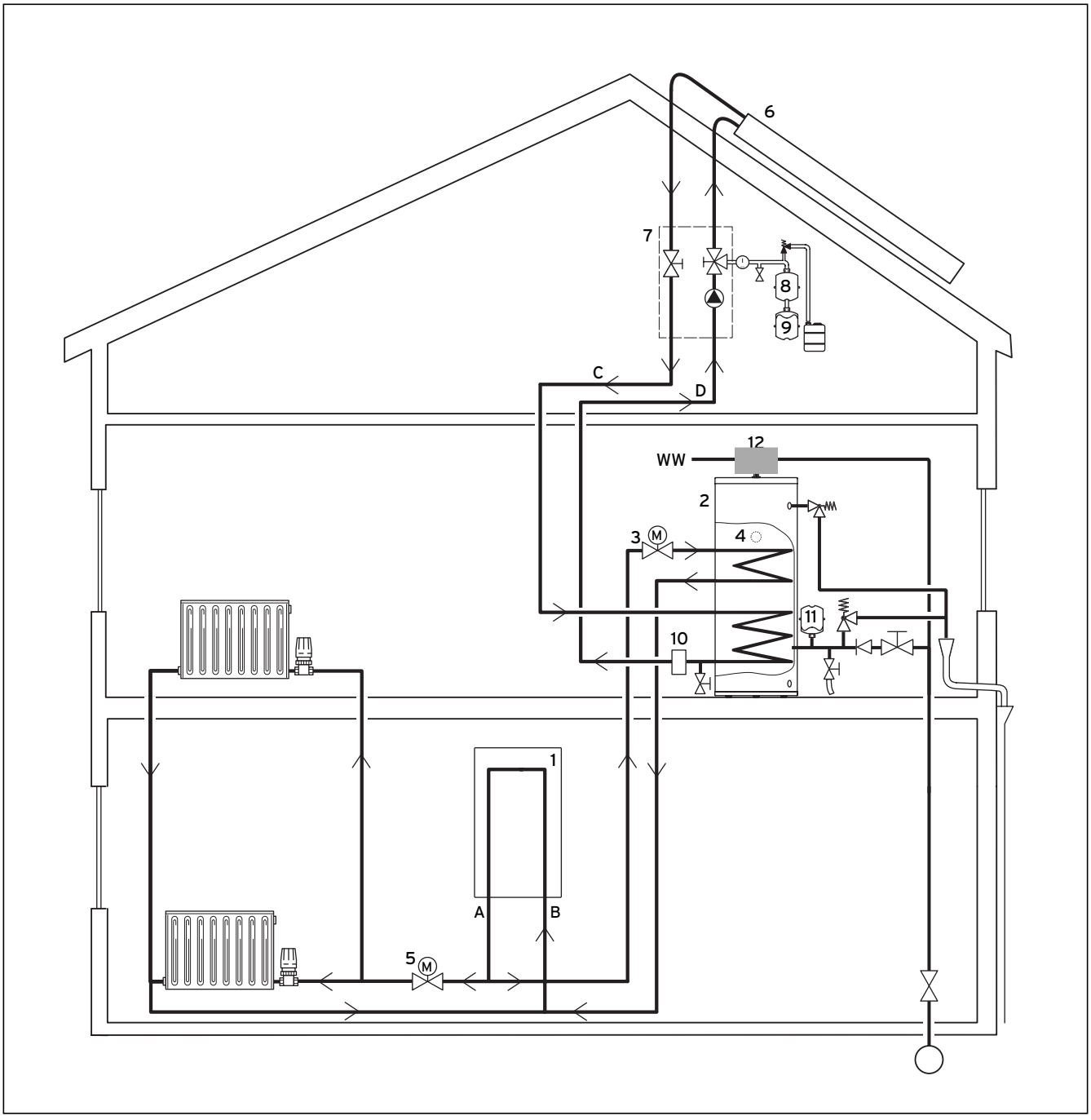


Fig. 5.9 Functional diagram

Key

1 Boiler
2 auroSTOR solar cylinder
3 230 V~ motorised 2 port valve (supplied with the solar cylinder)
4 Immersion heater
5 230 V~ motorised 2 port valve
6 auroTHERM collector
7 Solar pump unit
8 Protection vessel
9 Solar expansion vessel
10 Automatic air separator system
11 Hot water expansion vessel
12 Thermostat mixing valve
A Boiler flow
B Boiler return
C Solar circuit flow
D Solar circuit return

5.3 Installation of the solar circuit piping

5.3.1 General instructions

The Vaillant solar system is a closed hydraulic system in which heat can be transferred to the cylinders only by means of heat exchangers due to the special heat transfer fluid of the solar system.Observe the following points to ensure perfect operation with maximum energy utilisation:

- Bleed the system completely during start-up and maintenance since air in the system has a considerable effect on the efficiency.
- The pipe diameters should not be too large, otherwise the the flow in the solar system will slow down, reducing the efficiency.
- Lay all system components in such a way to ensure an even flow at the required nominal flow rate.
- Provide sufficient thermal insulation of the pipes to prevent excessive heat loss. Select weather and UV resistant insulation which is "bird peck proof" especially for pipes laid outside.
- Use hard solder only.
- Do not use any plastic pipes.
- Do not use any Teflon tape in the solar circuit.
- Use press fittings only if temperatures of up to 200 °C are allowed by the manufacturer.

Caution!
Earth the solar circuit!
The solar pipe work must be earthed in accordance with the requirements of BS 7671 IEE Wiring Regulations. Wiring protection should be provided if there is high risk of lightning strikes. The electronics in the solar system, heating system or in the house could otherwise be destroyed if they were to be hit by lightning. Connect the collectors to an existing lightning protection on the house.

Caution!
Risk of damage to the collectors due to excessive pressure.
The installation of a motorised 2 port valve in the pipes of the solar system is not allowed, since the safety devices in the solar circuit could be overridden by it.

5.3.2 Material

Caution!
Risk of damage because of wrong piping material!
Plastic pipes, such as PE pipes or similar, must not be used because of the high temperatures that solar fluid might reach.

- Use copper pipes preferably as solar circuit pipes. All pipelines in the solar circuit must be hard soldered.

5.3.3 Laying of the solar circuit pipes

The right selection of the pipe diameters plays a significant role in terms of maximum efficiency of the solar system.
To keep the pressure loss in the solar circuit to a minimum, the flow velocity in the copper pipe should not be higher than 1.5 m/s.
A nominal flow of 0.66l/min and 0.4l/min per m^2 of net collector surface in flat collectors and vacuum tube collectors respectively is required to achieve an optimum rate of thermal transfer.
Another decisive criteria for the optimum operation of your solar system is the right layout of the solar pump. The pump must be able to deliver more than the nominal flow rate at the specified operating pressure. The selection of the required pump speed depends on the installed system. Reference value for the pump selection can be found in Section 6.2, Setting the flow rate and pump.

5.3.4 Connection of the collectors to the solar pump unit

Vaillant provides various flexible hose systems for the connection of the collectors to the solar pump unit:
309647: Solar Flexpipe 2 in 1 DN 20 X 15 m
309644: Solar Flexpipe 2 in 1 DN 16 X 15 m
0020023066: single flex pipe DN 16 X 15 m

Instructions for the connection of these flexible hose systems can be found in the corresponding installation manual.

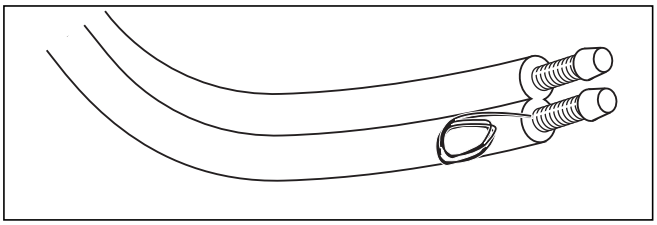


Fig. 5.10 Solar flex pipe

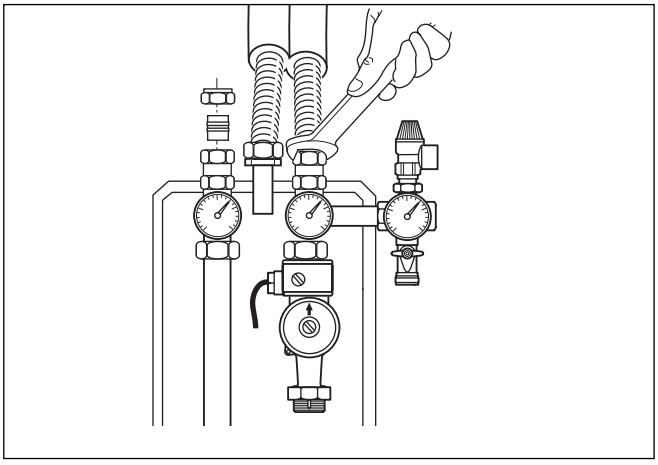


Fig. 5.11 Installation of flex pipes at the solar pump unit

The solar pump includes 22 mm x 18 mm reducer fittings for use with 18mm pipe systems. These can be discarded. The Vaillant fittings pack 0020023067 contains 22 mm x 3/4 BSP fittings for direct connection of the stainless steel flexible pipes to the pump station.

5.3.5 Bleeding of the solar circuit

Air in the system impairs the efficiency of the solar system considerably.Install therefore the automatic Vaillant air separator system (item no. 302 418) in the return of the solar circuit (see Fig. 5.12) between the solar circuit and solar pump unit. High temperature vapour is unlikely in this area.
The Vaillant air separator system works fully automatically and does not need to be subsequently isolated.

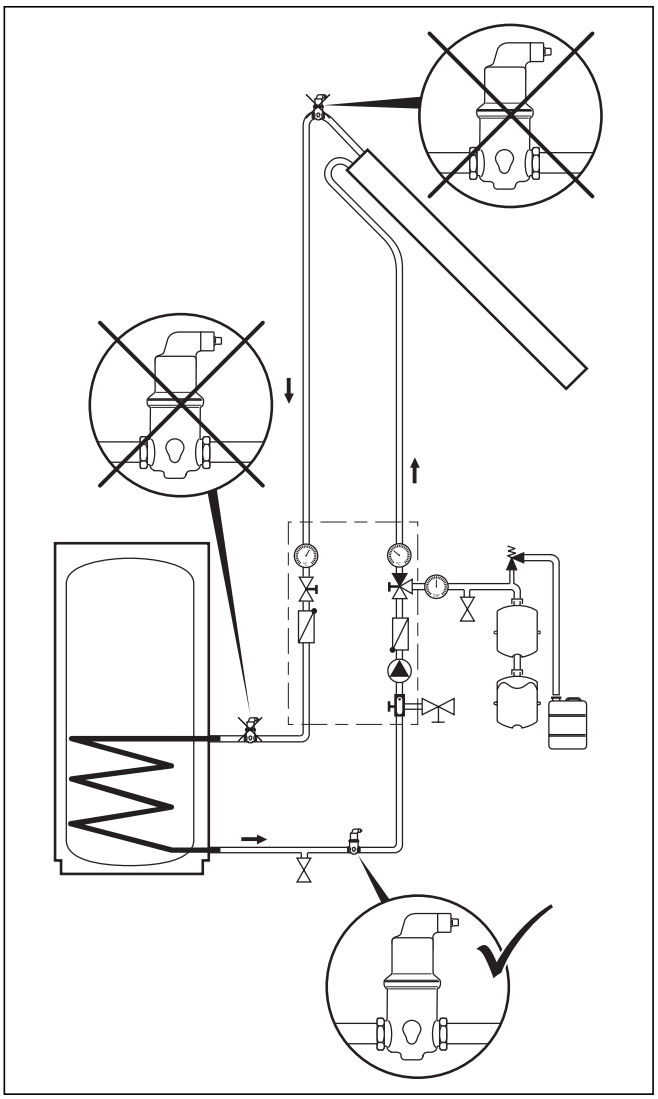


Fig. 5.12 Installation position of the automatic air separator system

The system must be bled whenever it is filled or subjected to maintenance.Bleeding is performed constantly by means of the automatic Vaillant air separator system as long as the solar pump is in operation.

5.4 Installation of the reheating circuit piping

Copper pipes with a minimum diameter of 22 mm should be used for the pipes in the reheating circuit between the Vaillant boiler and the solar cylinder.
Larger pipe diameters may be necessary for relatively large distances between the boiler and the cylinder.
Since all wall-mounted Vaillant boilers (except ecoMAX pro with open ventilation) have an installed circulating pump, it is not necessary to install them.
An appropriate pump must be installed in the reheating circuit if the solar cylinder is used with a different boiler in accordance with the GB standard.

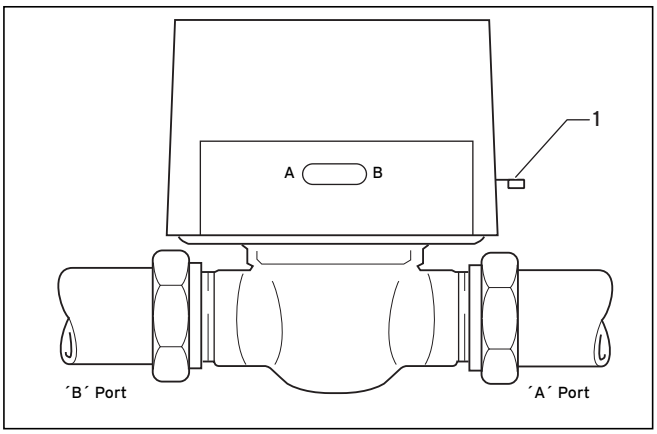


Fig. 5.13 Motorised 2 port valve

To prevent the uniSTOR from overheating the 2 port motorised valve supplied with the boiler must be fitted to the primary flow to the indirect coil.

5.5 Installation of the hot water pipework

- Connect the hot water outlet to the 22 mm hot water connection of the solar cylinder.
- Lay a further 22 mm pipe to the first T-piece.

A pipe of 15 mm diameter should then be sufficient.
If the pipe is very long or several outlets are supplied, continue with another 22 mm pipe.

5.5.1 Hot water thermostatic mixing valve

A hot water thermostatic mixing valve ensures the hot water from the cylinder is mixed with cold water to a desired maximum temperature between 30 and 60° C.

- Set the thermostatic mixing valve to the desired maximum temperature during the solar system start-up.

This maximum temperature is maintained at the hot water taps.

Danger!
Risk of scalding
Set the thermostat mixer to below 60 °C and check the temperature at a hot water tap to ensure effective protection against scalding.

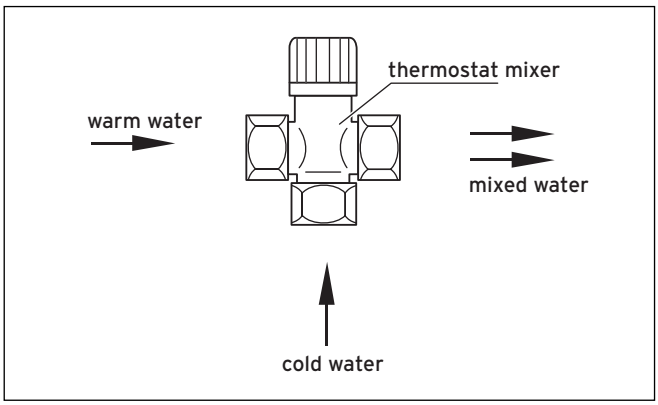


Fig. 5.14 Hot water thermostatic mixing valve

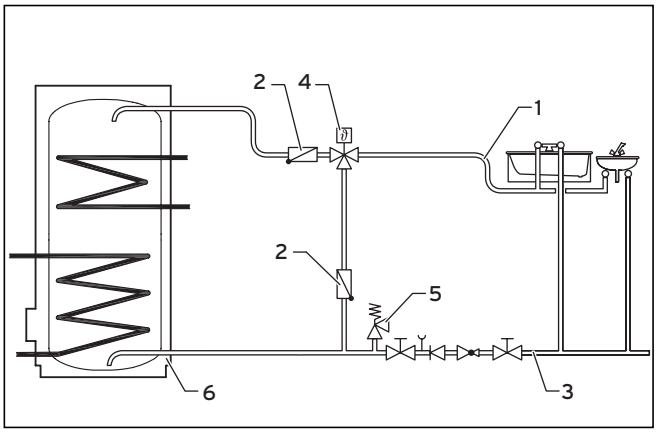


Fig. 5.15 Installation of the hot water thermostatic mixing valve (for systems without secondary return)

Key
1 Hot water pipe
2 check valve
3 Cold mains water supply pipe
4 Hot water thermostatic mixing valve
5 Expansion relief valve
6 Bivalenter solar cylinder

5.6 Installation of the cold water supply pipework

5.6.1 Mains water supply pressure

The performance of unvented cylinders depends on the available mains water pressure and the flow rate.
In order for the performance of the auroSTOR solar cylinder to be ideal, an appropriate cold water supply must be available, i. e. the measured static pressure must be at least 2.0 bar. A corresponding flow rate of at least 20 - 25 l/min should be available.

Note!
The mains water pressure is reduced during periods of high water consumption.Make sure you take measurements during these periods of time.

Example:
The available flow rate of mixed water of 40 °C is 25 l/min (15 l/min hot water of 60 °C from the solar cylinder mixed with 10 l/min cold water of 10 °C) if the measured static cold mains water pressure is 2 bar and the available flow rate 30 l/min.
The solar cylinder operates satisfactorily at a mains water pressure of below 2 bar, but at a reduced flow rate.The unvented solar cylinder should not be installed if the mains water pressure is below 1 bar.You can obtain information on alternative hot water supply systems from Vaillant Ltd.
To keep the friction losses at a minimum, a minimum diameter of 22 mm is recommended for the cold water supply in the building, satisfactory performances can also be achieved with 15 mm pipes however.

5.6.2 Cold water piping

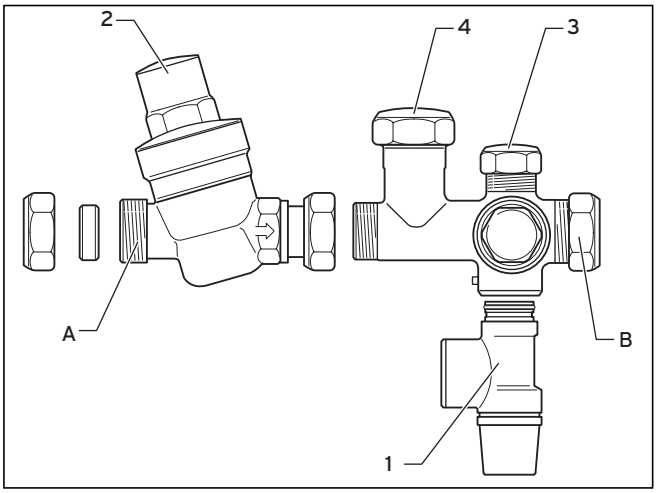


Fig. 5.16 Water control pack

Key
A Cold water connection
B Cylinder connection
1 Expansion relief valve
2 Pressure limiting valve with filter
3 Connection for hot water expansion tank
4 Balanced pressure cold water connection

- Connect both parts of the water control pack as illustrated in Fig. 5.16.
- When installing the valves, make sure they are aligned in such a way that the 15 mm connection of the expansion relief valve (Fig. 5.16, pos. **2**) can be connected to the tundish.
- Install the discharge pipe of the expansion relief valve (Fig. 5.16, pos. **2**) so that it has a constant outward slope and ends at a safe, visible point where there is no risk of freezing.

Danger!
Risk of bursts for the solar cylinder due to overpressure!
The outlet of the expansion relief valve may not be covered or closed.

- Test the expansion relief valve (Fig. 5.16, pos. **2**) regularly to avoid calcification.
- Connect the solar cylinder to the cold water supply (Fig. 5.16, pos. **B**).

To ensure an optimum performance of the solar cylinder, in particular in installations in which the pressure-controlled cold water outlet (Fig. 5.16, pos. **5**) is used, copper pipes with a diameter of at least 22 mm should be used for the pipe from the main stop valve of the building to the solar cylinder.

- Install the drain valve in the cold water supply at the lowest point between the solar cylinder and the water control pack (see Fig. 5.9).
- Install the assembled water control pack in the cold water supply at an appropriate place next to the solar cylinder.Make sure there is sufficient space for maintenance and the connection of the discharge pipe from the expansion relief valve.

If the discharge pipes are all together, the expansion relief valve may not be installed more than 500 mm away from the temperature and pressure relief valve (see **2** and **8**, Fig. 5.1).

Caution!
Risk of bursts for the solar cylinder!
No stop valve may be installed between the cold water control pack and the cylinder.

The Vaillant solar cylinder is supplied with an external hot water expansion vessel (DW EV).
Connect this expansion vessel to the installed water control pack as follows:

- Screw the expansion vessel directly onto the water control pack (Fig. 5.16, pos. **4**) via the connection intended for this purpose or
- Connect the expansion vessel to the water control pack with a copper pipe or an appropriate hose. Make sure the expansion vessel is supported sufficiently.

Use the supplied mounting bracket if the expansion vessel is to be mounted on the wall.

- Establish (if necessary) the connection to the pressure-controlled cold water connection of the water control pack (see **5**, Fig. 5.16).

Note!
In areas with high water pressure (4 bar or more), a bath or shower mixer valve can also be connected to the pressure-controlled cold water connection (4, Fig. 5.16) of the water control pack to ensure the pressure of the hot and cold water supply to the mixer valve is about the same. The cold water supply for all other connections should be installed in front of the water control pack in the cold water supply to the solar cylinder by means of a T-piece.

5.6.3 Drain valve

The drain valve supplied with the auroSTOR must be installed as low as possible in the cold water supply between the solar cylinder and the water control pack (see Fig. 5.1).
We recommend applying a hose which reaches about 1 m under the base of the cylinder to the outlet of the drain valve.

Pipe for the outlet of the expansion relief valve

- Connect the temperature and pressure relief valve and the expansion relief valve to the tundish with a 15 mm pipe and lay the discharge pipe from the tundish as described in Section 5.7.1, Discharge pipework.

5.7 Discharge pipework

5.7.1 Discharge pipework

The outlet connections of both the temperature and pressure relief valve and expansion relief valve should be connected in 15 mm copper tube to the tundish supplied. The tundish should be installed vertically, as close to the uniSTOR as possible and within 500 mm of the temperature and pressure relief outlet. It must be positioned away from any electrical components and installed in the same space as the uniSTOR cylinder, so that it is visible to the user. The D1 discharge pipe from the T&P Valve/Expansion valve can be teed together upstream of the tundish (see fig. 5.1).
The discharge pipework must be installed using minimum 22 mm copper pipework from the 22 mm connection on the tundish to a safe and visible discharge point.
There must be a vertical section of pipe at least 300 mm long, below the tundish before any bends or elbows in the pipework. Increase the diameter of the pipework if the total resistance of the discharge pipework exceeds the figures shown in the table below. The installation of the discharge pipework must be in accordance with G3 (refer to Section 2.2, Regulations in Great Britain).

Minimum diameter of the discharge pipe from the tundish	Maximum permissible total resistance, expressed as straight pipe length (without elbows or bends)	Resistance due to each elbow or bend
22 mm	Up to 9 m	0.8 m
28 mm	Up to 18 m	1.0 m
35 mm	Up to 27 m	1.4 m

Table 5.6 Air resistance

Examples:
22 mm discharge pipe with 4 elbows and of 7 m length from the tundish to the discharge point:

Resistance for 4 elbows per 0.8 m	=	3.2 m
Resistance for discharge pipe	=	7.0 m
Total resistance	=	10.2 m

The total resistance of the discharge pipe is higher than the maximum permissible value for 22 mm pipes (9 m). Base your calculations therefore on the next largest pipe diameter.

28 mm discharge pipe with 4 elbows and of 7 m length from the tundish to the discharge point:

Resistance for 4 elbows per 1.0 m	=	4.0 m
Resistance for discharge pipe	=	7.0 m
Total resistance	=	11.0 m

The total resistance of the discharge pipe is lower than the maximum permissible value for 28 mm pipes (18 m),which means this pipe diameter can be used.

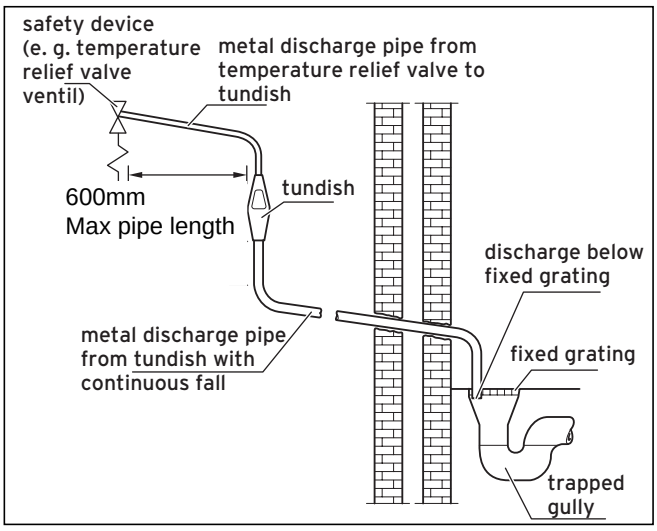


Fig. 5.17 Typical drainage installation

Water which is almost boiling may escape from the discharge pipe in the event of an error.

Danger!
Risk of being scalded by escaping hot water! Make sure the discharge pipe ends at a safe point inside or outside the building (safe and visible), where there is no risk of anyone coming in contact with hot water.

A suitable point is, for example, under a fixed grating above the trap of a trapped gully. Low discharge pipes, for example up to 100 mm above external surfaces, such as parking spaces, grasslands etc., can be used, provided they are secured by a wire fence or something similar to prevent children from coming in contact with the waste water, and the system is visible. No valves or taps may be installed in the discharge pipe.

- Make sure the discharge pipe is at a constant slope of at least 1:200 from the tundish to the discharge point.

The discharge pipe from the pressure relief valve of the Vaillant boiler can be connected to the horizontal discharge pipe of the solar cylinder behind the tundish with a T-piece.

5.7.2 High level termination

Providing that the point of termination is such that persons in or around the building will not be endangered should discharge take place, the method of termination shown in fig. 3.1 is satisfactory. Examples of points to consider when deciding whether a location for the high level of discharge is suitable are:

- The possibility, taking into account wind effect, that someone may be in the path of the water being discharged and if so, whether the temperature of the discharge water will have been sufficiently reduced to not be dangerous. Thermal conductivity of the structure's surface, climatic conditions and location and orientation of the discharge pipe may or may not have an effect on reducing the temperature of the discharge water.
- The location of windows and similar openings.
- The likelihood of a pram being left beneath the point of discharge.
- The ability of structures surface to withstand near boiling water.
- The possibility of ice formation if water is discharged onto pedestrian walkways.

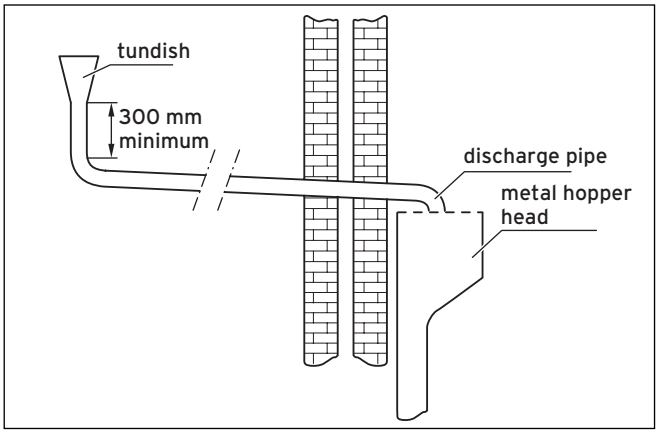


Fig. 5.18 High discharge connection

5.8 Electrical installation

Wiring should be performed by a qualified specialist in accordance with the building regulations, Part P of the current IEE regulations and further applicable regulations and directives.
Commercial standard lines should be used for wiring.
- Minimum cross-section of the wires: 0.75 mm^2

The following line lengths may not be exceeded:
- Bus wires: 300m

230 V connection lines and bus wires should be laid separately if they are longer than 10 m.

The discharge pipes of the tundish, drain valves, motorised valves etc. should be laid at a distance to electrical components.

Danger!
Danger of death from electric shock!
You must earth the solar cylinder for potential equalisation.

5.8.1 Immersion heater

The auroSTOR VIH S GB 200 - 300 S solar cylinders have been equipped with an immersion heater by the manufacturer.

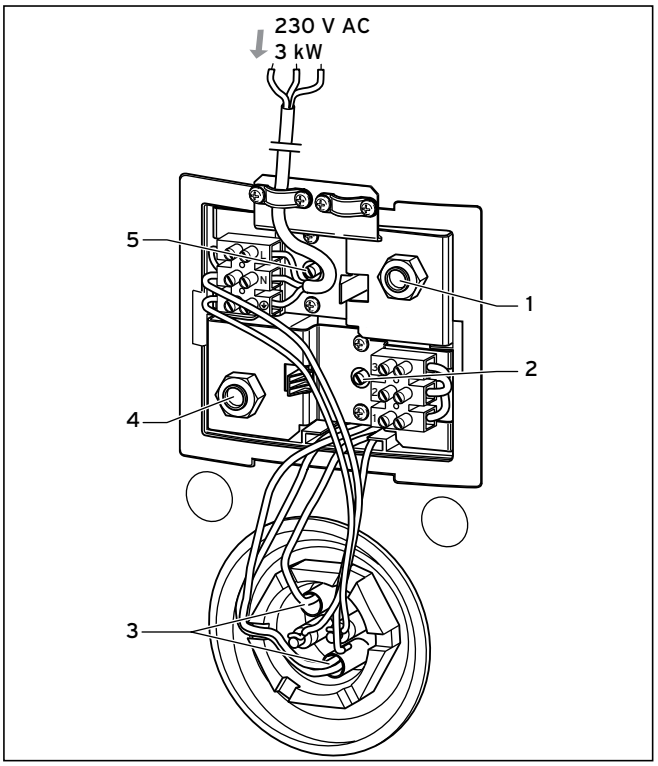


Fig. 5.19 Electrical connection of the immersion heater

Key
1 Immersion heater thermal cut out with reset button
2 Cylinder thermostat (adjustable)
3 Temperature sensors in immersion sleeves
4 Cylinder thermostat thermal cut out with reset button
5 Immersion heater thermostat (adjustable)

Danger!
Danger of death from electric shock!
You must earth the immersion heater for potential equalisation.

- Install a separate electrical power supply line for the immersion heater in accordance with current IEE regulations (BS 7671).

You must lay a heat-resistant line (3 x 2.5 mm2) from a double pole isolating switch for the immersion heater.
The circuit must be protected by a 13 A fuse.
The connection of the immersion heater is illustrated in detail in Fig. 5.19.

Caution!
Risk of damage!
The immersion heater is equipped with a thermal cut out and may under no circumstance be replaced by a standard immersion heater.

Only correct original Vaillant spare parts are allowed.

5.8.2 Electrical connection to the cylinder control device

The Vaillant auroSTOR solar cylinder and an appropriate Vaillant boiler can be controlled by various controllers (refer to Section 4.8, Solar control). An overview of the application options for controllers can be found in Table 5.7 (refer to Section 5.8.3, Combination options of the control components).
The auroSTOR solar cylinder is equipped with appropriate thermal cut outs for the cylinder and solar circuit and with a cylinder thermostat.

The entire inner wiring has been pre-assembled at the factory.
The cylinder thermostat for the regulation of the hot water temperature (**1**, Fig. 5.20) can be set between 20 °C and 65 °C. The installed thermal cut out is activated at 90 °C. If the thermal cut out is triggered, the motorised 2 port valve is actuated, which then blocks the flow to the cylinder.

Caution!
Risk of damage!
Switch off the power supply before resetting the thermal cut out or making any other changes to the temperature setting of the cylinder thermostat.

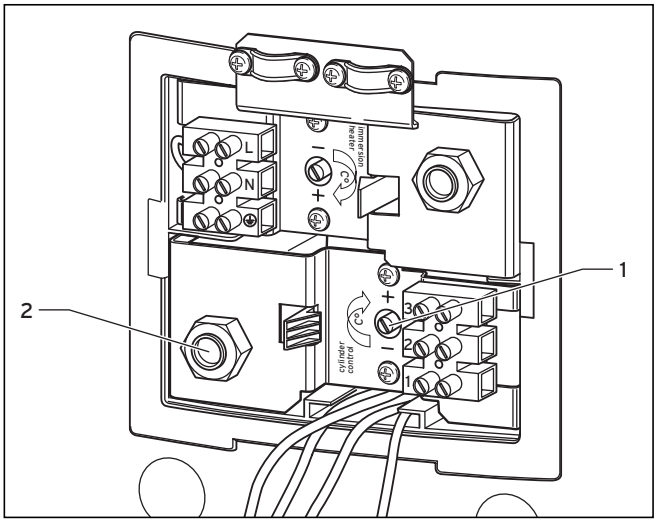


Fig. 5.20 Cylinder control device

- Actuate the reset button (**2**, Fig. 5.20), to reset the thermal cut out and the motorised 2 port valve.

Caution!
Risk of damage!
If the immersion heater is not connected, you must connect the earth wire to terminal E on the terminal strip of the immersion heater. You can find a wiring sheme on the inside of the cylinder cover.

5.8.3 Combination options of the control components

Boiler used
eBUS-capable boiler, such as the Vaillant ecoTEC, or a boiler which is not eBUS-capable, such as the Vaillant turboMAX or ecoMAX, or appliances which are not eBUS-capable from third-party manufacturers.

Wiring
Wiring via the Control Center VR 65 as system solution which allows Vaillant low-voltage eBUS controllers to be used in the English market with valves and hot water cylinders of the traditional 230 V range. Alternatively via a standard wiring box.

Solar circuit control
Control of the solar circuit by means of the temperature difference controlled auroMATIC 560 control set for solar supported hot water supply.

Hot water reheating control
Control of the hot water heating by means of the temperature difference controlled auroMATIC 560 control set for solar-supported hot water supply with demand driven reheating function for Vaillant boilers. Alternatively by means of a timer (from a third-party manufacturer).

Control of the heating circuits
Control of the heating circuits can be via Vaillants range of programmable room thermostats or weather compensators when in conjunction with Vaillants range of ebus capable boilers. Alternatively by means of approved industry standard controls as above.

An overview of the combination options of these control components can be found in Table 5.7.

Note!
The entire wiring must be performed in accordance with BS 7671: Requirements for Electrical Installations (IEE Wiring Regulations, 16th or 17th edition).

An additional terminal strip is required to wire the connections A, B, C, D for the connection of the solar pump, solar control and solar pump thermal cut out at the cylinder (see wiring schemes 1 - 5).

Boiler	Wiring	Solar circuit control	Solar cylinder reheating control	Control of the heating circuits	Wiring scheme
Vaillant, eBUS-capable	Control Center VR 65	VRS 560	VRS 560	Vaillant eBUS control system	1, Fig. 5.25
Vaillant, eBUS-capable or not eBUS-capable	Standard wiring box		VRS 560	Programmer	2, Fig. 5.28
			Device from a third-party manufacturer (DHW timer)		3, Fig. 5.31
Device from a third-party manufacturer, not eBUS-capable	Standard wiring box		VRS 560		4, Fig. 5.34
			Device from a third-party manufacturer (DHW timer)		5, Fig. 5.37

Table 5.7 Combination options of the control components

- Select the correct wiring scheme for the installation, depending on the boiler and control components used, as specified in Table 5.7.

Note!
You must set the controller of the cylinder thermostat (1) to maximum temperature if you use one of the wiring schemes 2 or 4.

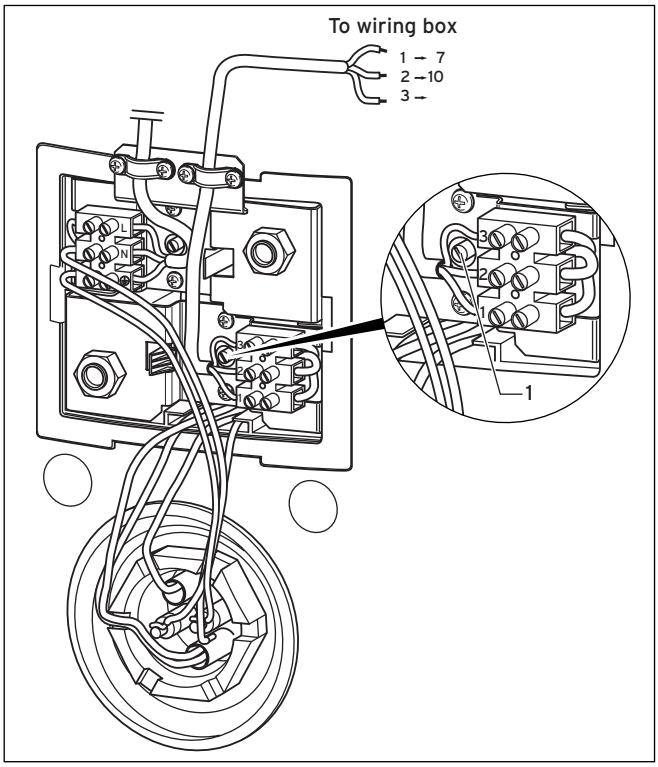


Fig. 5.21 Electrical connection of the cylinder thermostat

Wiring of the control components

Wiring scheme 1
- eBUS-capable Vaillant boiler
- Wiring via VR 65
- Solar circuit control via VRS 560
- Solar circuit reheating control via VRS 560
- Heating circuit control via Vaillant eBUS compatible controller

- Overview removal of the cylinder thermostat, see Fig. 5.22 (if a Vaillant eBUS controller is used)
- Installation of two VR 10 temperature sensors in the solar cylinder (see Fig. 5.23)
- Attachment of the solar gain sensor to the solar circuit return (see Fig. 5.23)
- Connection of the solar pump to the solar control via its own thermal cut out (see Fig. 5.24)

- Fit the Control Center V 65 next to the cylinder for easy electrical connection.

Before the VR 10 temperature sensor can be installed, the cylinder thermostat, the thermal cut out (TCO) and the capillary tubes of the cylinder thermostat and thermal cut out must first be removed.

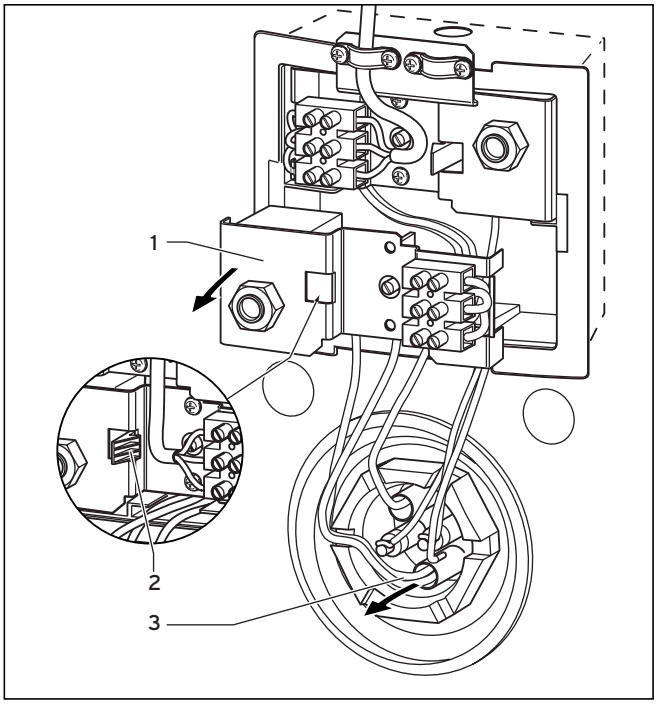


Fig. 5.22 Removal of the cylinder thermostat

Key
1 Cylinder thermostat
2 Lock
3 Capillary tube

- Undo the lock (**2**) of the cylinder thermostat (**1**) and take it out of the terminal box.
- Remove the capillary tubes (**3**) of the cylinder thermostat and thermal cut out from the immersion sleeve of the solar cylinder.
- Make sure the two capillary tubes of the controller for the immersion heater have not been removed.

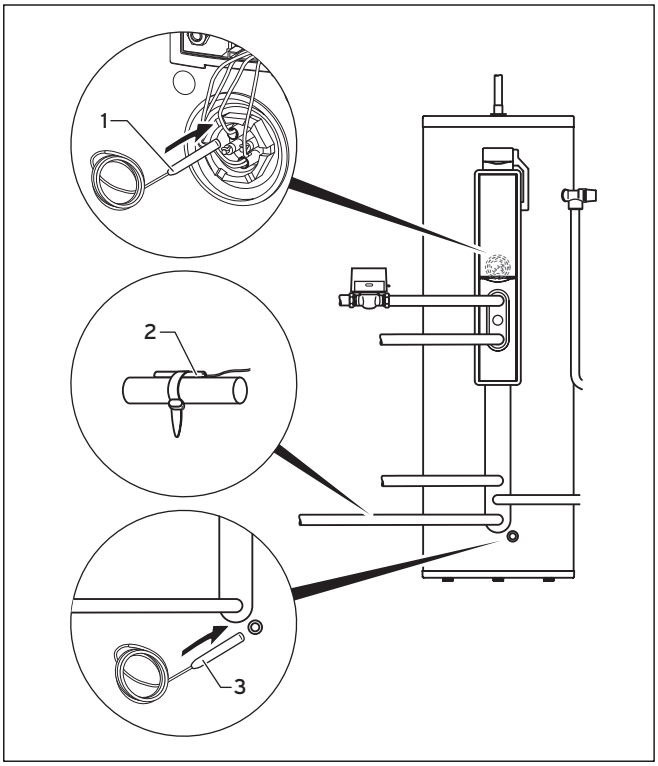


Fig. 5.23 Installation of the VR 10 temperature sensor

- Push one of the VR 10 temperature sensors (**1**) supplied with the solar control in the now vacant immersion sleeve, as illustrated in Fig. 5.23.
- Connect this temperature sensor to terminal "SP 1" in the auroMATIC 560 solar control.
- Push a further VR 10 temperature sensor (**3**) in the immersion sleeve for the bottom cylinder area.
- Connect this temperature sensor to terminal "SP 2" in the auroMATIC 560 solar control.
- Attach the temperature sensor for the gain (**2**) to the return pipe of the solar circuit nearby the solar cylinder.
- Connect this temperature sensor to the terminal "Ertrag" in the auroMATIC 560 solar control.
- Make sure the temperature sensors of the immersion heater, solar cylinder and solar control fit properly in the immersion sleeves.
- Connect the collector temperature sensor to terminal "Kol 1" in the auroMATIC 560 solar control.
- Establish the connection between the terminal "EP" in the auroMATIC 560 solar control and the terminal "Cyl." in the Control Center VR 65.
- Establish the eBUS connections from the boiler and VRT 360 to the Control Center VR 65.

The electrical connection of the VR 65 is described in the VR 65 installation manual (item no. 00 2000 7476), the connection of the VRT 360 in the operating and installation manual of the VRT 360 (item no. 838 568).

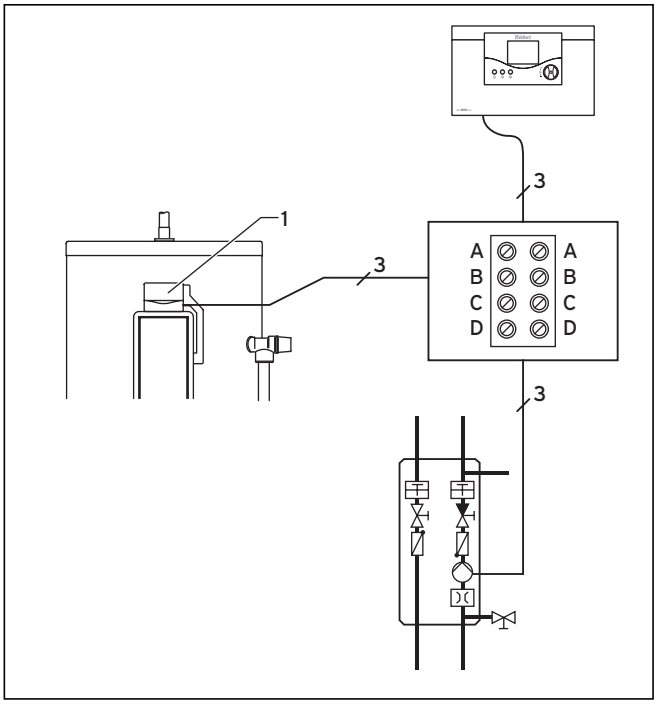


Fig. 5.24 Connection diagram of the solar pump TCO

- Connect the solar pump, the thermal cut out intended for this purpose and terminal "Kol 1-P" of the solar control to each other by means of an additionally protected terminal strip.
- Establish the connections to the mains supply.

Note!
Programme the hot water channel of the Vaillant eBUS controller to constant. Programme the auroMATIC 560 solar control to provide hot water when required by the customer.

Note!
The auroMATIC 560 control will only signal to the boiler if the cylinder is below target temperature, if solar system is not operating and if the programmer is on.

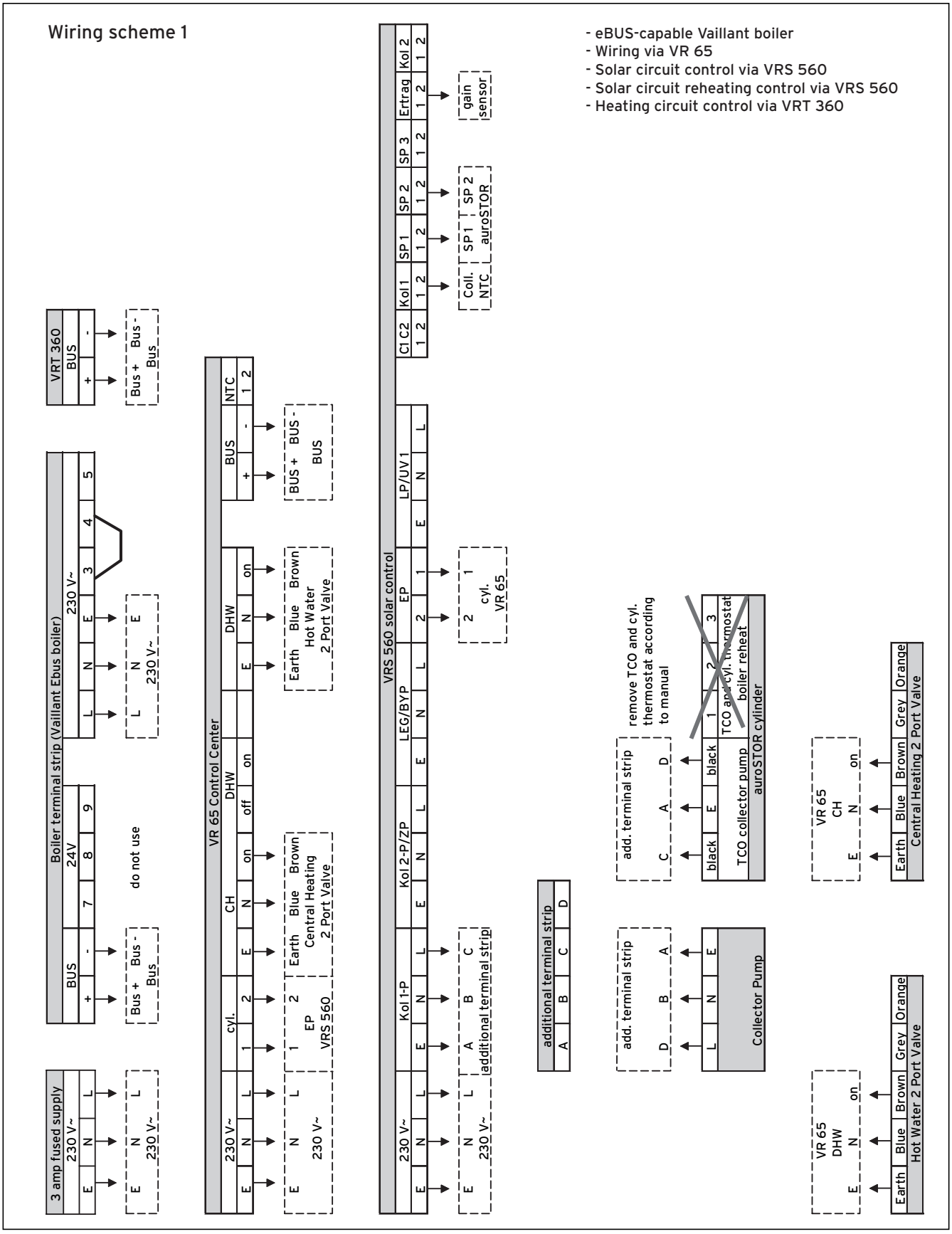


Fig. 5.25 Wiring scheme 1

Wiring plan 2
- Vaillant boiler
- Wiring via standard wiring box
- Solar circuit control via VRS 560
- Solar circuit reheating control via VRS 560
- Heating circuit control via programmer

- Overview connection of the cylinder thermostat to the wiring box
- Installation of two VR 10 temperature sensors in the solar cylinder (see Fig. 5.26)
- Attachment of the the solar gain sensor to the solar circuit return (see Fig. 5.26)
- Connection of the solar pump to the solar control via its own thermal cut out (see Fig. 5.27)

• Fit a wiring box near to the cylinder for easy electrical connection.

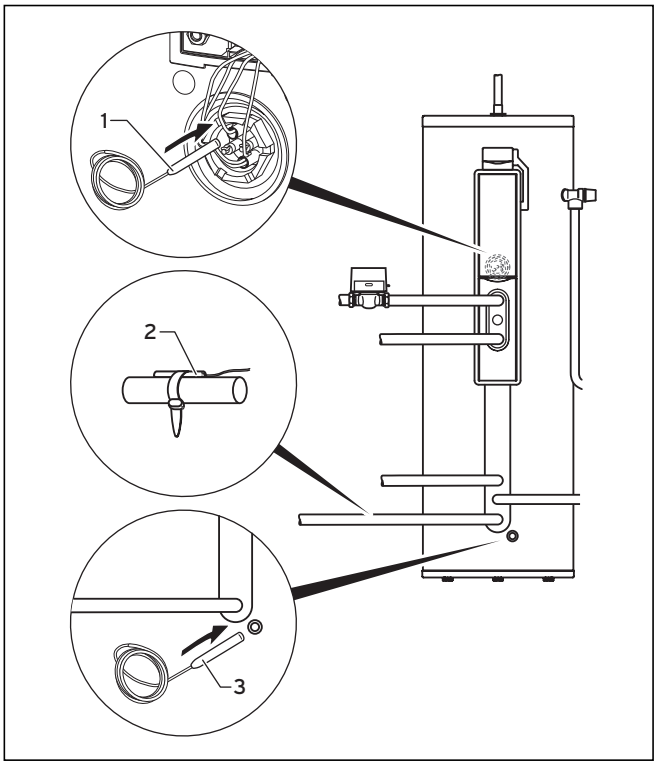


Fig. 5.26 Installation of the VR 10 temperature sensor

• Push one of the VR 10 temperature sensors (**1**) supplied with the solar control in an immersion sleeve where there is still room, as illustrated in Fig. 5.26.
• Connect this temperature sensor to terminal "SP 1" in the auroMATIC 560 solar control.
• Push a VR 10 temperature sensor (**3**) in the immersion sleeve for the bottom cylinder area.
• Connect this temperature sensor to terminal "SP 2" in the auroMATIC 560 solar control.
• Attach the temperature sensor for the gain (**2**) to the return pipe of the solar circuit nearby the solar cylinder.
• Connect this temperature sensor to the terminal "Ertrag" in the auroMATIC 560 solar control.
• Make sure the temperature sensors of the immersion heater, solar cylinder and solar control fit properly in the immersion sleeves.

Note!
Set the controller of the cylinder thermostat to maximum temperature (1, Fig. 5.20).

• Set the maximum temperature (MAXT 1) of the auroMATIC 560 solar control to 70 °C (see auroMATIC 560 manual).
• Connect the collector temperature sensor to terminal "Kol 1" in the auroMATIC 560 solar control.

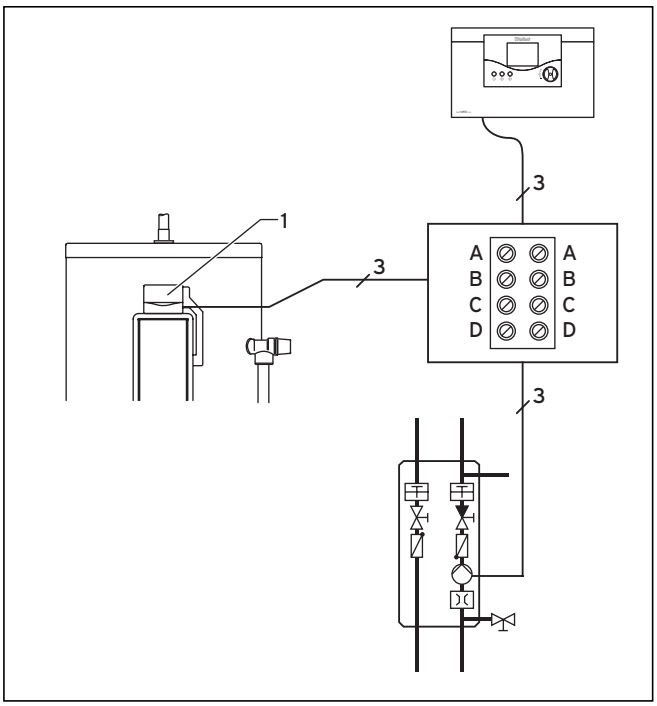


Fig. 5.27 Connection diagram of the solar pump TCO

• Connect the solar pump, the thermal cut out intended for this purpose and terminal "Kol 1-P" of the solar control to each other by means of an additionally protected terminal strip.
• Establish the connections to the mains supply.

Note!
Programme the auroMATIC 560 solar control to provide hot water when required by the customer.
The auroMATIC 560 control will only signal to the boiler if the cylinder is below target temperature, if the solar system is not operating and if the hot water programmer is on.

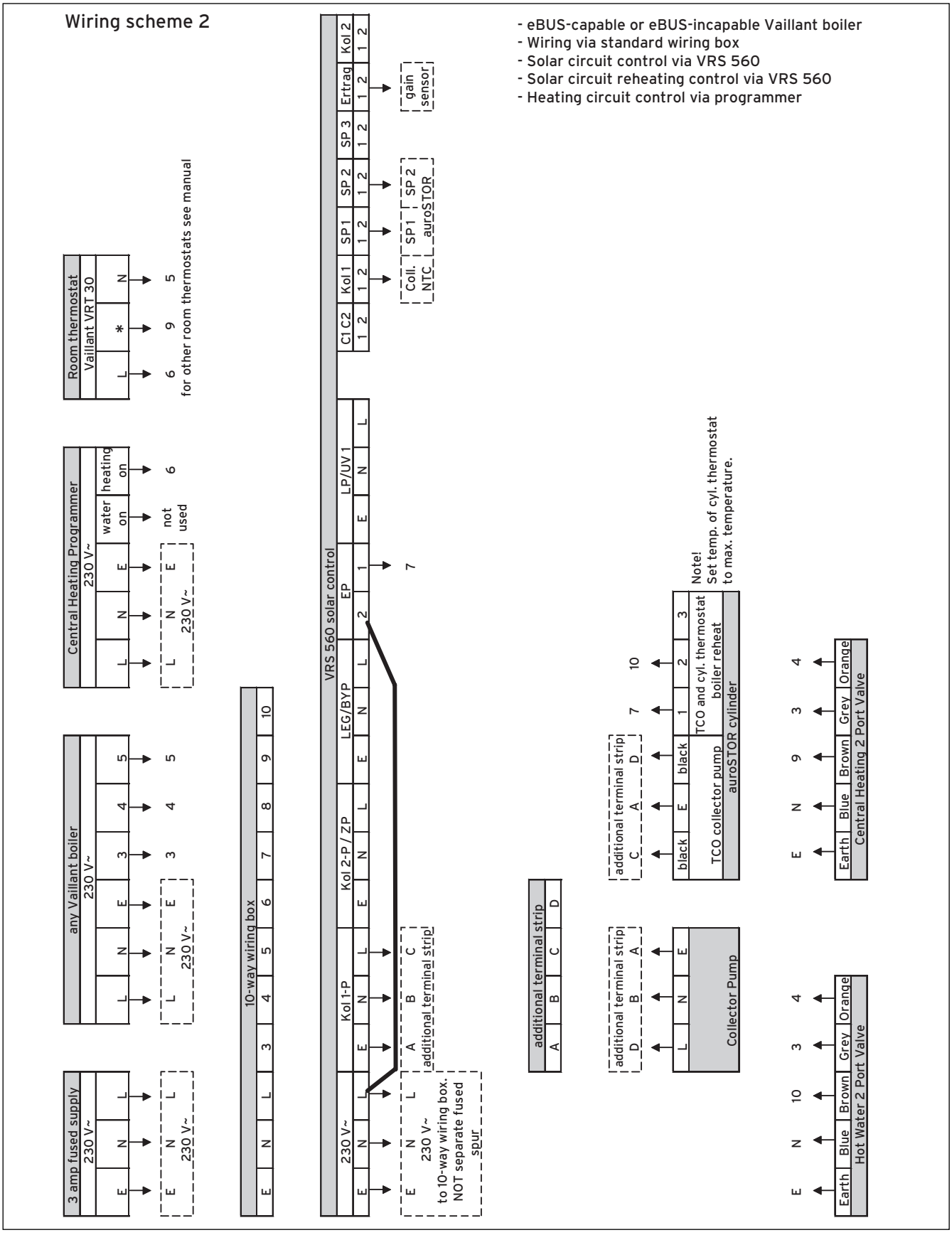


Fig. 5.28 Wiring scheme 2

Wiring plan 3
- Vaillant boiler
- Wiring via standard wiring box
- Solar circuit control via VRS 560
- Solar cylinder reheating control via a separate hot water programmer from a third party manufacturer
- Heating circuit control via a separate programmable timer from a third party manufacturer

- Overview connection of the cylinder thermostat to the wiring box
- Installation of two VR 10 temperature sensors in the solar cylinder (see Fig. 5.29)
- Attachment of the solar gain sensor to the solar circuit return (see Fig. 5.29)
- Connection of the solar pump to the solar control via its own thermal cut out (see Fig. 5.30)

- Fit a wiring box near to the cylinder for easy electrical connection.

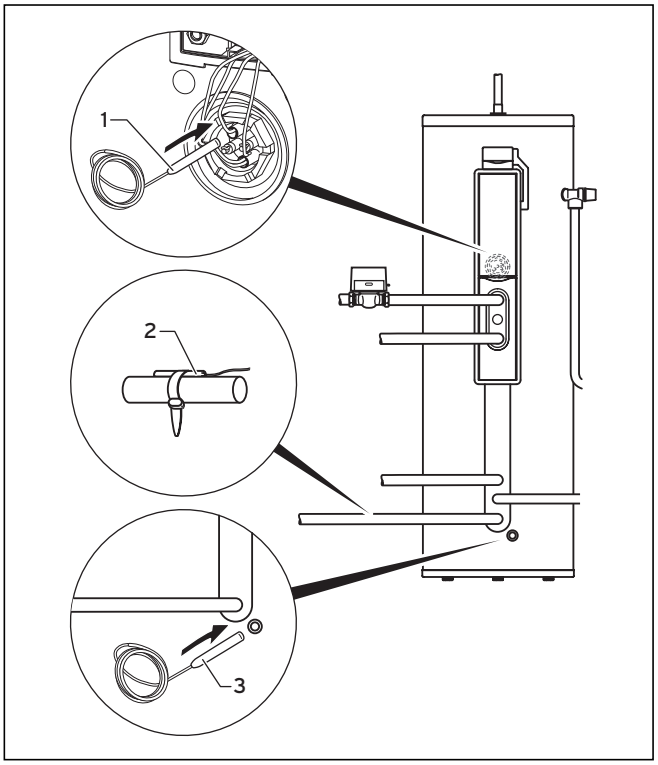


Fig. 5.29 Installation of the VR 10 temperature sensor

- Push one of the VR 10 temperature sensors (**1**) supplied with the solar control in an immersion sleeve where there is still room, as illustrated in Fig. 5.29.
- Connect this temperature sensor to terminal "SP 1" in the auroMATIC 560 solar control.
- Push a VR 10 temperature sensor (**3**) in the immersion sleeve for the bottom cylinder area.
- Connect this temperature sensor to terminal "SP 2" in the auroMATIC 560 solar control.
- Attach the temperature sensor for the gain (**2**) to the return pipe of the solar circuit nearby the solar cylinder.
- Connect this temperature sensor to the terminal "Ertrag" in the auroMATIC 560 solar control.
- Make sure the temperature sensors of the immersion heater, solar cylinder and solar control fit properly in the immersion sleeves.

Note!
Set the controller of the cylinder thermostat to the target temperature (1, Fig. 5.20).

- Set the maximum temperature (MAXT 1) of the auroMATIC 560 solar control to 70 °C (see auroMATIC 560 manual).
- Connect the collector temperature sensor to terminal "Kol 1" in the auroMATIC 560 solar control.

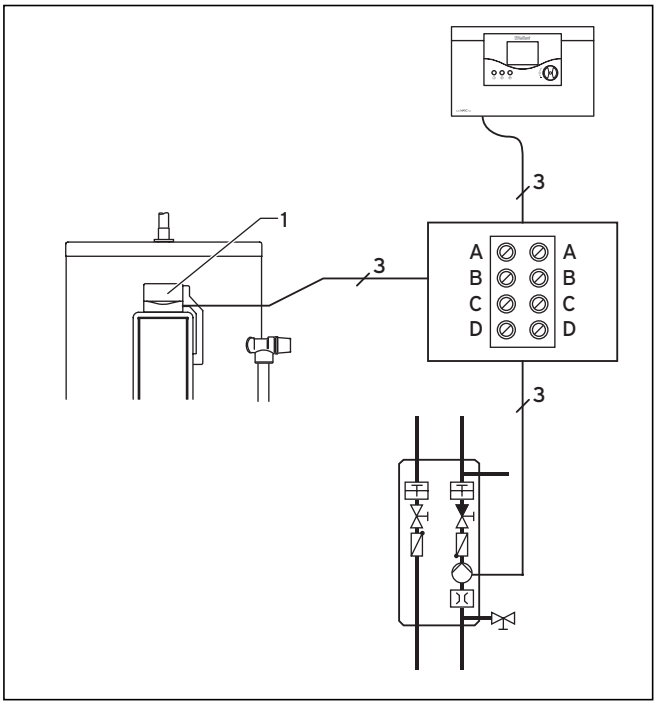


Fig. 5.30 Connection diagram of the solar pump TCO

- Connect the solar pump, the thermal cut out intended for this purpose and terminal "Kol 1-P" of the solar control to each other by means of an additionally protected terminal strip.
- Wire up the Vaillant boiler, the programmer and the room thermostat.
- Establish the connections to the mains supply.

Note!
Programme the separate hot water programmer to provide hot water when required by the customer. Consider carefully when the solar system might be running and try to time to HW programmer to run when there is unlikely to be any solar gain.

Note!
The auroMATIC 560 control will only control the solar system.

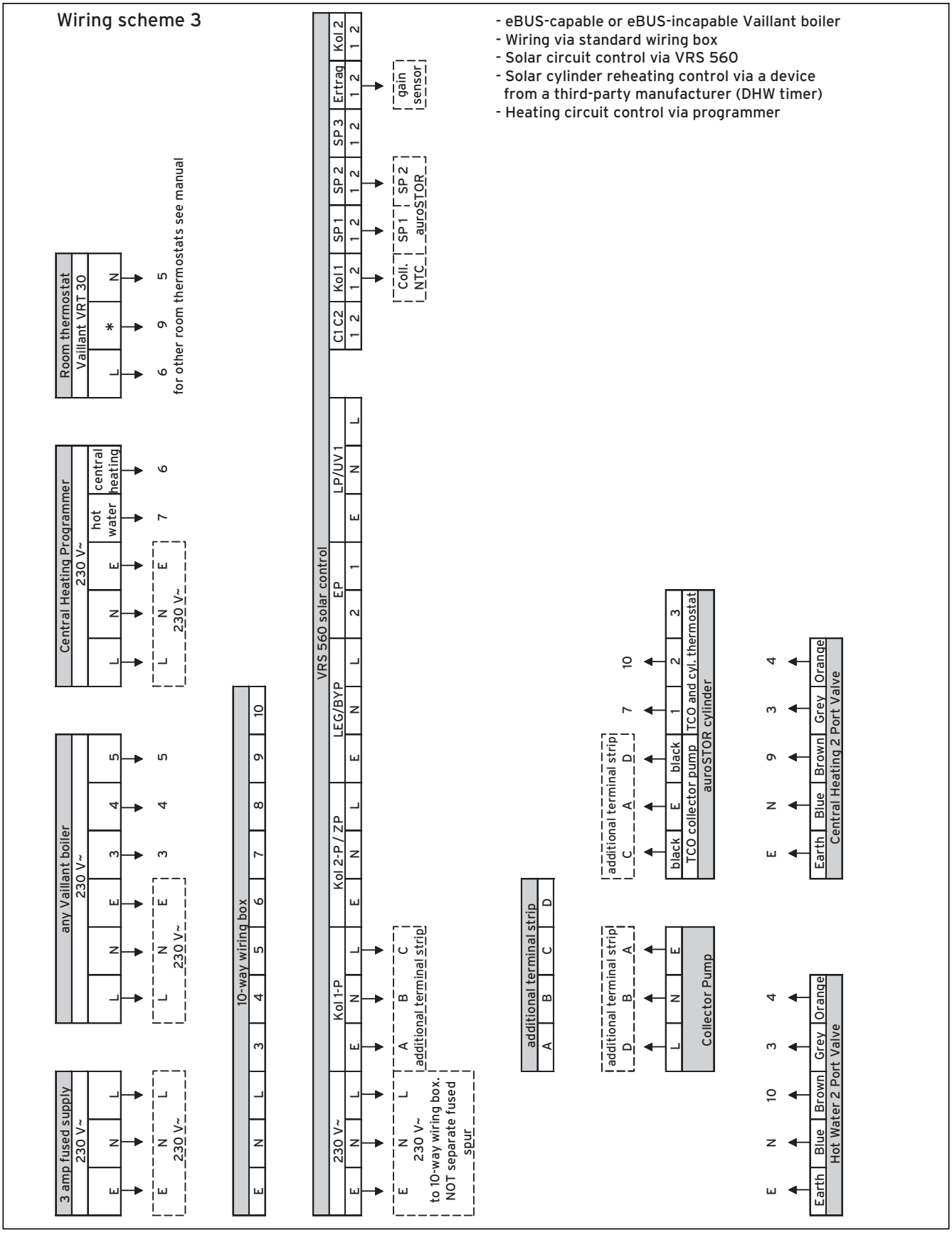


Fig. 5.31 Wiring scheme 3

Wiring plan 4
- Boiler from third party manufacturer
- Wiring via standard wiring box
- Solar circuit control via VRS 560
- Solar circuit reheating control via VRS 560
- Heating circuit control via a separate central heating programmer from a third party manufacturer

- Overview connection of the cylinder thermostat to the wiring box
- Installation of two VR 10 temperature sensors in the solar cylinder (see Fig. 5.32)
- Attachment of the solar gain sensor to the solar circuit return (see Fig. 5.32)
- Connection of the solar pump to the solar control via its own thermal cut out (see Fig. 5.33)

• Fit a wiring box near to the cylinder for easy electrical connection.

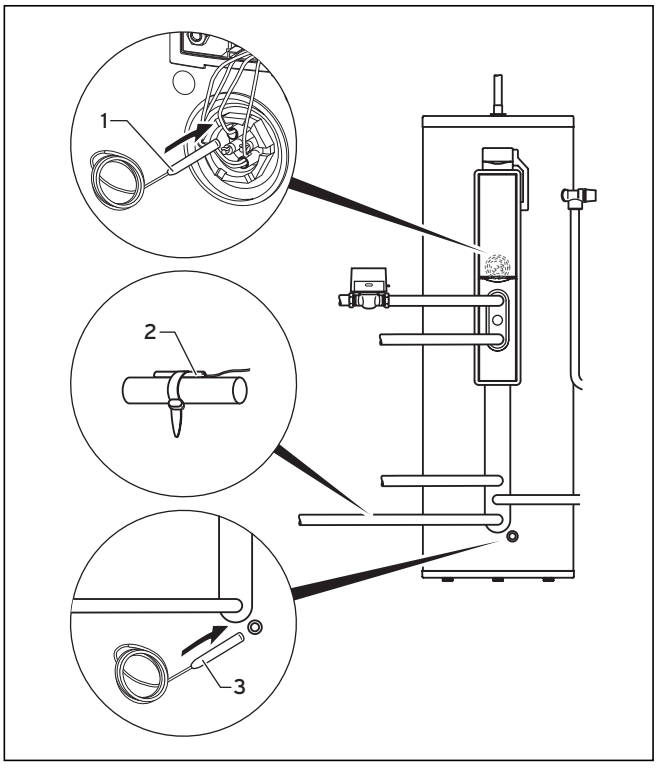


Fig. 5.32 Installation of the VR 10 temperature sensor

• Push one of the VR 10 temperature sensors (**1**) supplied with the solar control in an immersion sleeve where there is still room, as illustrated in Fig. 5.32.
• Connect this temperature sensor to terminal "SP 1" in the auroMATIC 560 solar control.
• Push a VR 10 temperature sensor (**3**) in the immersion sleeve for the bottom cylinder area.
• Connect this temperature sensor to terminal "SP 2" in the auroMATIC 560 solar control.
• Attach the temperature sensor for the gain (**2**) to the return pipe of the solar circuit nearby the solar cylinder.
• Connect this temperature sensor to the terminal "Ertrag" in the auroMATIC 560 solar control.
• Make sure the temperature sensors of the immersion heater, solar cylinder and solar control fit properly in the immersion sleeves.

Note!
Set the controller of the cylinder thermostat to maximum temperature (1, Fig. 5.20).

• Set the maximum temperature (MAXT 1) of the auroMATIC 560 solar control to 70 ºC (see auroMATIC 560 manual).
• Connect the collector temperature sensor to terminal "Kol 1" in the auroMATIC 560 solar control.

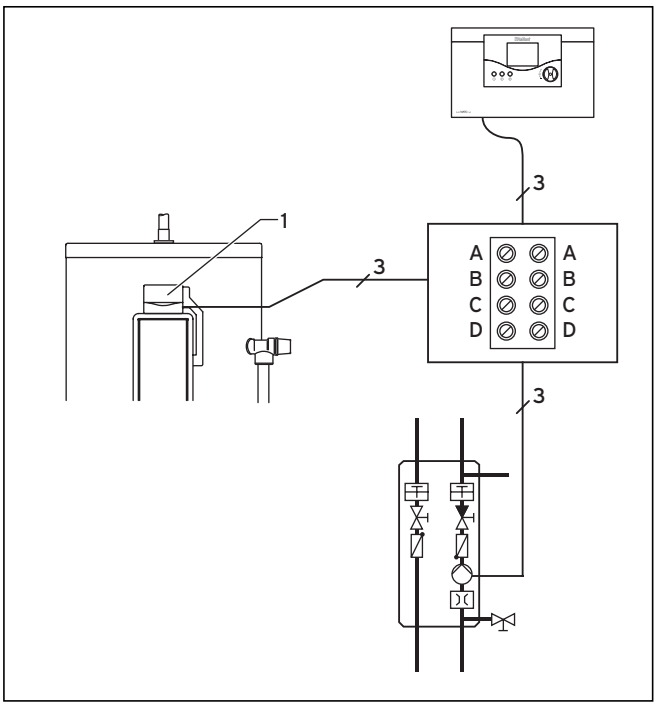


Fig. 5.33 Connection diagram of the solar pump TCO

• Connect the solar pump, the thermal cut out intended for this purpose and terminal "Kol 1-P" of the solar control to each other by means of an additionally protected terminal strip.
• Wire up the boiler of the third-party manufacturer, the programmer and the room thermostat.
• Establish the connections to the mains supply.

Note!
Programme the auroMATIC 560 solar control to provide hot water when required by the customer.

Note!
The auroMATIC 560 control will only signal to the boiler if the cylinder is below target temperature, if the solar system is not operating and if the hot water programmer is on.

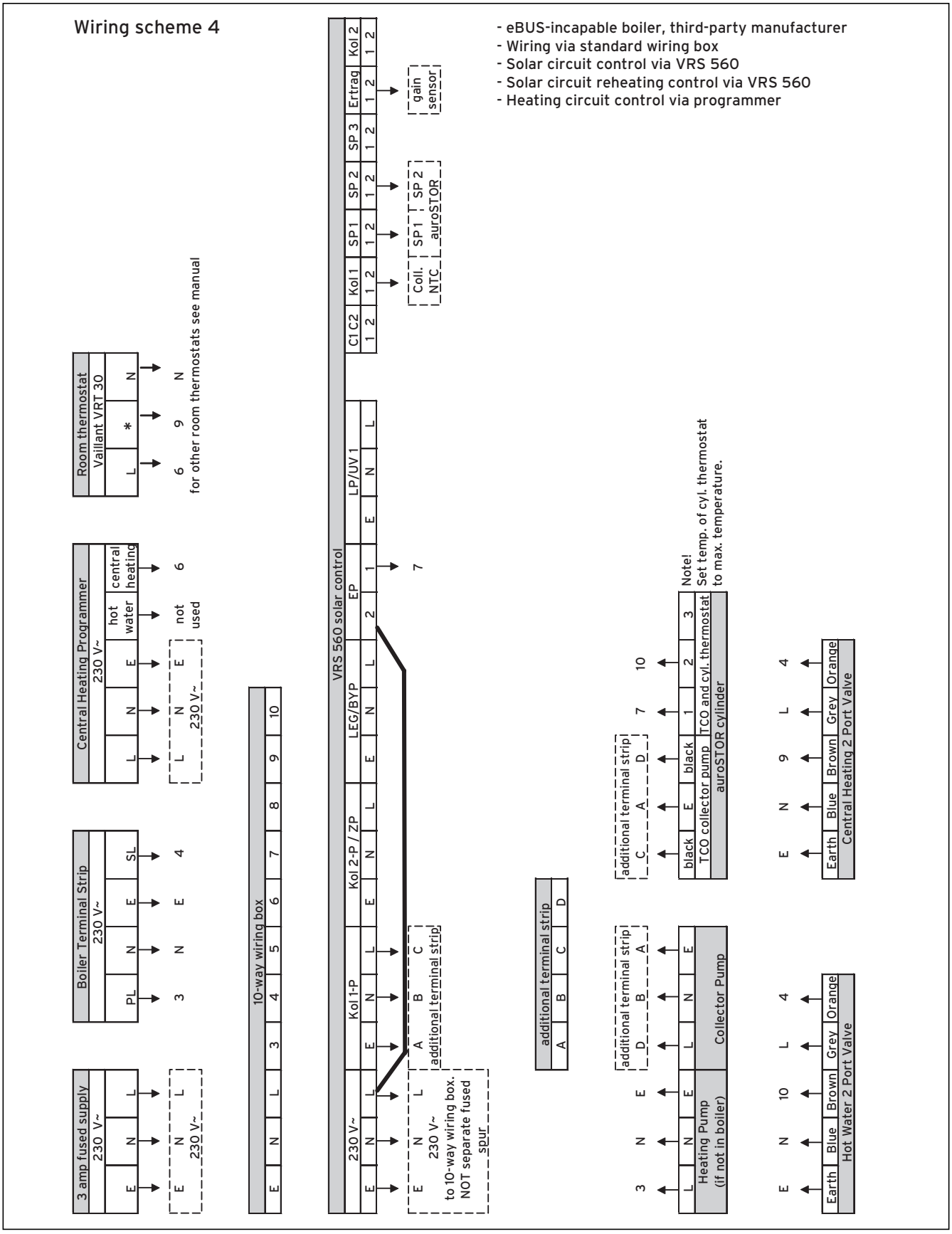


Fig. 5.34 Wiring scheme 4

Wiring plan 5
- Boiler from third party manufacturer
- Wiring via standard wiring box
- Solar circuit control via VRS 560
- Solar cylinder reheating control via a separate hot water programmer from a third party manufacturer
- Heating circuit control via a separate central heating programmer from a third party manufacturer

- Overview of the connection of the cylinder thermostat to the wiring box.
- Installation of two VR 10 temperature sensors in the solar cylinder (see Fig. 5.35)
- Attachment of the solar gain sensor to the solar circuit return (see Fig. 5.35)
- Connection of the solar pump to the solar control via its own thermal cut out (see Fig. 5.36)

• Fit a wiring box near to the cylinder for easy electrical connection.

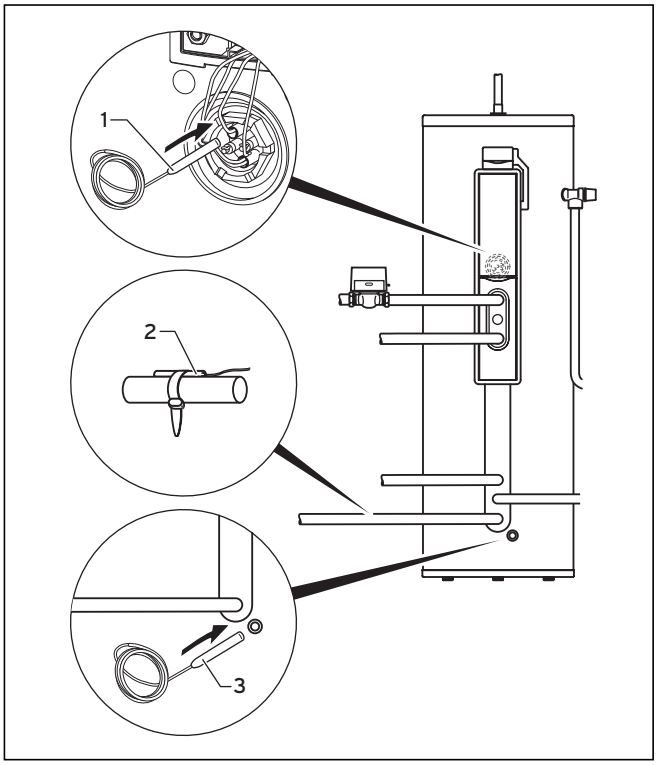


Fig. 5.35 Installation of the VR 10 temperature sensor

• Push one of the VR 10 temperature sensors (**1**) supplied with the solar control in an immersion sleeve where there is still room, as illustrated in Fig. 5.36.
• Connect this temperature sensor to terminal "SP 1" in the auroMATIC 560 solar control.
• Push a VR 10 temperature sensor (**3**) in the immersion sleeve for the bottom cylinder area.
• Connect this temperature sensor to terminal "SP 2" in the auroMATIC 560 solar control.
• Attach the temperature sensor for the gain (**2**) to the return pipe of the solar circuit nearby the solar cylinder.
• Connect this temperature sensor to the terminal "Ertrag" in the auroMATIC 560 solar control.
• Make sure the temperature sensors of the immersion heater, solar cylinder and solar control fit properly in the immersion sleeves.

Note!
Set the controller of the cylinder thermostat to target temperature (1, Fig. 5.20).

• Set the maximum temperature (MAXT 1) of the auroMATIC 560 solar control to 70 °C (see auroMATIC 560 manual).
• Connect the collector temperature sensor to terminal "Kol 1" in the auroMATIC 560 solar control.

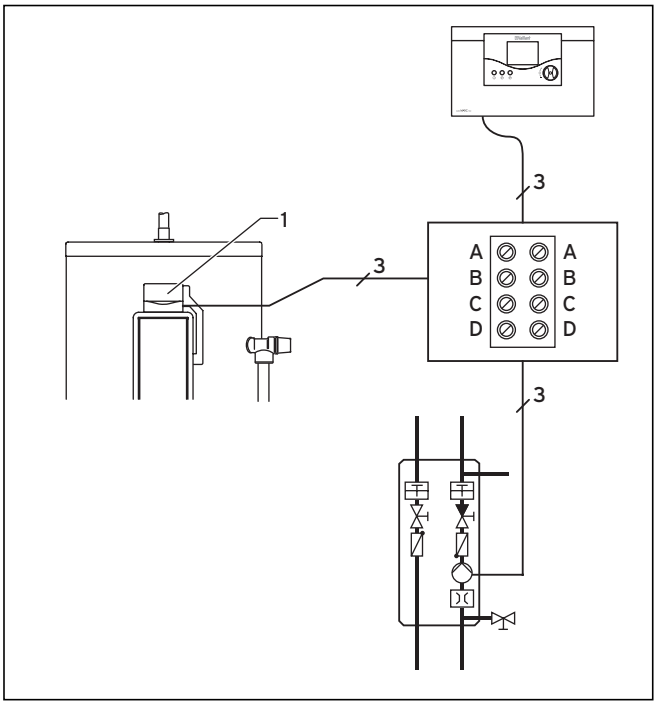


Fig. 5.36 Connection diagram of the solar pump TCO

• Connect the solar pump, the thermal cut out intended for this purpose and terminal "Kol 1-P" of the solar control to each other by means of an additionally protected terminal strip.
• Wire up the boiler of the third-party manufacturer, the programmer and the room thermostat.
• Establish the connections to the mains supply.

Note!
Programme the separate hot water programmer to provide hot water when required by the customer. Consider carefully when the solar system might be running and try to time to HW programmer to run when there is unlikely to be any solar gain.

Note!
The auroMATIC 560 control will only control the solar system.

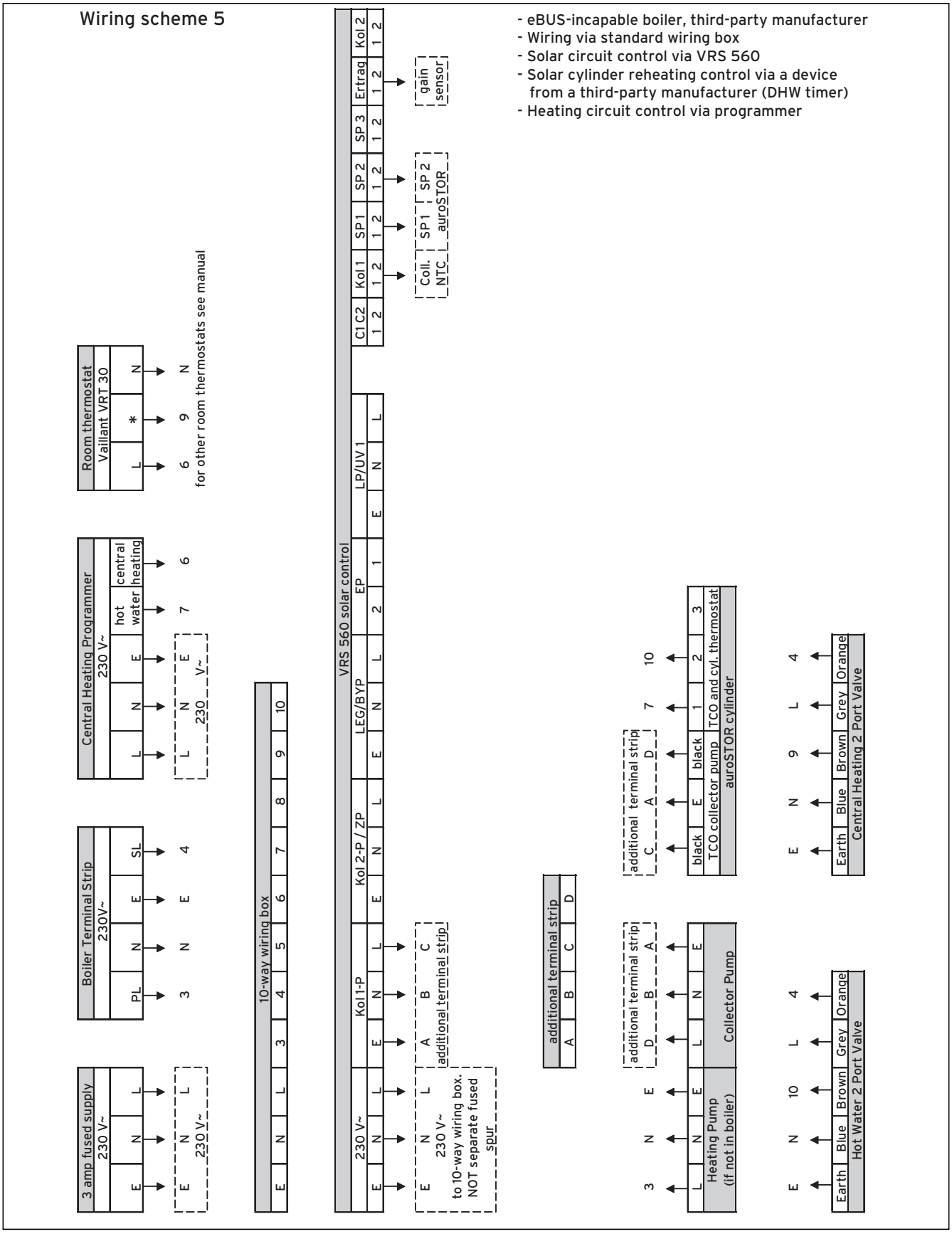


Fig. 5.37 Wiring scheme 5

Alternatively to the Vaillant VRT 30 room thermostat, you can also connect devices from third-party manufacturers.

- Connect the room thermostat as illustrated in Fig. 5.38.

Room thermostat	5	9	6	L	N	E
ACL Drayton Digistat 2, 3, 4		3	1			
ACL Drayton RTS 1, 2	N	3	L			
Danfoss Randall RX-1		3	2	C	B	
Danfoss Randall RMT 230	4	2	1			
Danfoss Randall RET 230	N	3	L			
Tower SS	4	2	1			E
Honeywell T6360	2	3	1			
Horstmann HRT 1	4	2	1			E
Siemens-Landys & Staefa RAD 1		2	1			E
Sunvic TLX 2000 series	4	1	3			E

Fig. 5.38 Connection of room thermostats from third-party manufacturers if the external wiring box is used

6 Start-up

You must adhere to the following procedure for the start-up of the total system:
- Flush and fill the solar circuit with solar fluid (refer to Section 6.1).
- Set the flow rate and pump (refer to Section 6.2).
- Set the flow rate on the controller (refer to Section 6.3).
- Fill the hot water secondary circuit (refer to Section 6.4).
- Set the hot water thermostatic mixing valve (refer to Section 6.5.)
- Fill the reheating circuit (refer to Section 6.6).

Use only Vaillant solar fluid (item no. 302 429) for pressure tests and for flushing and filling the solar circuit.

6.1 Flushing and filling the solar circuit

Vaillant recommends using the Vaillant filling pump to flush and fill the solar circuit. Observe the operating manual when using the Vaillant filling pump. It is not permitted to use manual pumps for filling.

Expansion vessel admission pressure

During the start-up, the gas side admission pressure p_v of the expansion vessel must be adjusted to the equipment height whilst disconnected. The static pressure p_{stat} corresponds, to a certain extent, to the static height h between the collector array and the expansion vessel.

10 m static height correspond to approx. 1 bar.

$$p_v = p_{stat} = h \times 0.1$$

Note!
A deviation from the optimum admission or filling pressure always results in a reduction of the expansion vessel's effective volume. This can cause operational malfunctions.

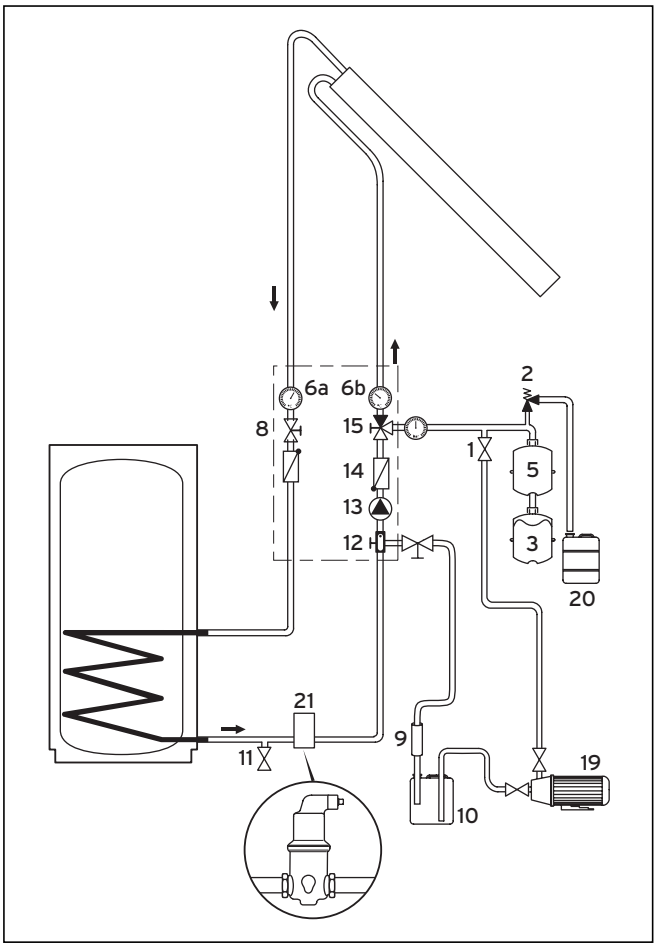


Fig. 6.1 Start-up of the total system
Flushing and filling the solar circuit and subjecting it to a hydraulic pressure test

Flushing is performed from the solar pump unit to the cylinder via the collector. This is how to do it:
- Open the fill/vent valve (**1**) and connect the filling pump to the fill/vent valve (**1**).
- Place the three-way ball valve (**15**) into flush position.
- Connect the drain hose of the Vaillant filling pump or a similar hose with filter (**9**) to the fill/drain valve (**12**). Put the other end into the solar fluid container (**10**).
- Pump in solar fluid from the container by the filling pump (**19**) via the fill/drain valve (**1**), so that the solar fluid from fill/drain valve (**12**) is filtered and flows back into the container.
- To flush and filter the solar circuit, pump circularly for 10 minutes. Monitor the filter and clean it if necessary.

A self-priming pump with a pressure of 2 to 3 bar is required to fill the solar circuit. This is how to do it (see Fig. 6.1):
- After flushing close the fill/drain valve (**12**) and pump in solar fluid once a pressure of 1.7 bar is achieved.
- Close the fill/vent valve (**1**) too and place the three-way ball valve (**15**) into circulation position.
- Switch off the filling pump and switch on the solar pump (**13**) to allow air bubbles to escape via the bleeder.
- Block the gravity brakes (**8** and **14**) (position 45°) to discharge the remaining air.
- When bleeding is completed release the gravity brakes.

Collector circuit filling pressure
The filling pressure Pa should be approx. 0.5 bar over the static pressure Pstat.
Pa = h x 0.1 + 0.5 bar

6.2 Setting the flow rate and pump

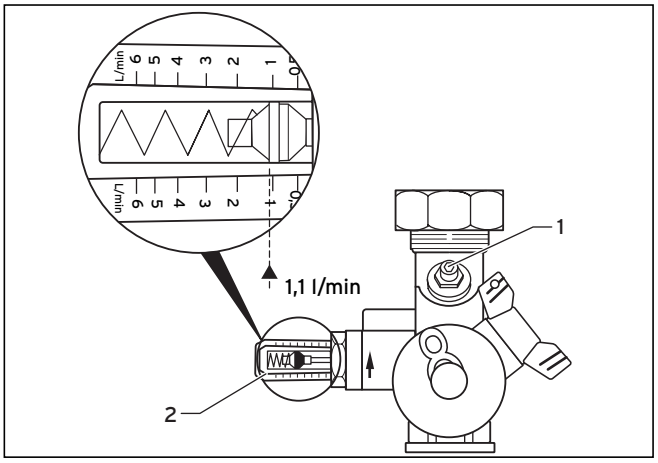


Fig. 6.2 Setting the flow rate

The 3-speed circulating pump can be fine-tuned to adjust the flow rate to the collector's performance.

Note!
We recommend the following values
for flat collectors: 0,66l/min per m²
for vacuum tube collectors: 0,4l/min per m²
of collector surface.

This is how to do it:
- Use Table 6.1 to calculate the volume flow to be set by multiplying the installed collector surface by the value 0.66 l/m²•min (flat collectors) or 0.40 l/m²•min (tube collectors).
- Set the pump speed to roughly set the flow rate.
- Use an Allen key to finely adjust the flow rate at the adjustment valve (see Fig. 6.2 Pos. **1**).

The adjusted flow rate can be viewed on the display (**2**).

Table 6.1 and 6.2 provide reference values for possible pump speeds depending on the collector connection and pipe length and cross-section.

If you use auroMATIC 560 solar control, the flow rate can be used to calculate the gain. To make an accurate calculation, the flow rate must be entered on the controller. You can find further information in the operating and installation manual of the control.

The pump speed is used to achieve a particular flow rate in the collector array. The final flow rate should not be significantly above or below the calculated value. An up to 10 % lower solar gain or unnecessarily high power consumption of the pump can otherwise be the consequence.

Make the pump setting as follows:
Let the pump run first at the lowest speed (minimum power consumption).
Check whether the calculated value is achieved on the flow rate meter.

Example for tube collectors:
The installed (net) collector surface area for 3 VTK 570 units is 3.0 m². When multiplied by the specific volume flow value of 0.4 l/m²•min, this produces a calculated flow rate of 1.2 l/min. This should be displayed at the flow rate meter (see Fig. 6.2).

For the design and function of the flow rate meter, refer to Section 4.5, Flow rate meter.

Select the next pump speed if the calculated flow rate is not achieved on the flow rate meter. Switch to a lower speed if it is exceeded. If the flow rate is unable to be achieved even at the highest pump speed, check whether it is possible to switch fewer collectors in series and resort to a combination of series and parallel connections.

Also check other ways of reducing the pressure loss. Observe here the Vaillant solar planning information.

Number of auroTHERM exclusive VTK 570 tube collectors connected in series	Flow rate		Minimum cross-section of the copper pipe in the collector circuit with a total length of:	
	l/min	l/h	20 m	50 m
1	0,40	24	15	15
2	0,80	48	15	15
3	1,20	72	15	15
4	1,60	95	15	15
5	2,00	120	15	15
6	2,40	144	15	15
7	2,80	168	15	15
8	3,20	192	15	18
9	3,60	216	18	18
10	4,00	240	18	18
11	4,40	264	18	18
12	4,80	288	18	18
13	5,20	312	22	22
14	5,60	336	22	22
Pump speed:			Depends on pressure loss in systemt	Maximum (speed 3)

Tab. 6.1 Layout of the pipe cross-section and pump speed, depending on the collector connection for tube collectors auroTHERM VTK 570

Flat collectors VFK 900/VFK 990/1		Flow rate		Minimum cross-section of the copper pipe in the collector circuit with a total pipe length of:	
Number	In series	l/min	l/h	20 m	50 m
1	1	1,33	80	15	15
2	2	2,66	160	15	15
3	3	4,00	240	15	15
4	4	5,33	320	15	18
Pump speed:				Minimum (speed 1)	Maximum (speed 3)

Tab. 6.2 Layout of the pipe cross-section and pump speed depending on the collector connection for the tube collectors

6.3 Programming the flow rate on the controller

When programming the flow rate on the solar control, refer to Section 6.1, Setting system parameters, of the auroMATIC 560 operating and installation manual.

6.4 Filling the hot water secondary circuit

Caution!
Risk of damage!
Do not manually open the temperature/pressure relief valve or the expansion vessel for venting purposes. Any foreign matter in the pipework may cause damage to the valve seats.

- Make sure the cylinder drain valve (**11**, Fig. 5.1) is closed.
- Open all cold and hot water taps and the corresponding outlets.
- Open the mains water supply to the auroSTOR and fill it with water until it flows freely out of the outlets. Make sure all air bubbles have been removed.
- Close the outlets and check the system for leaks. Check in particular the immersion heater connection for leaks.

The system must now be flushed thoroughly.

- Open the hot water taps at the opposite ends of the systems and let the water flow out for at least 5 minutes.
- Close the hot water taps.

Danger!
Risk of bursts!
Close the pressure control valves in the water, solar and heating circuits in accordance with the Installation chapter. They may under no circumstances be covered or closed.

6.5 Setting the hot water thermostatic mixing valve

The hot water from the solar cylinder can be set to a desired maximum temperature between 30 °C and 70 °C by mixing hot and cold water.

- Set the hot water thermostatic mixing valve with the adjusting knob to maintain your desired temperature at the hot water taps.

Danger!
Risk of being scalded by hot water!
Set the thermostat mixer to below 60 °C and check the temperature at a hot water tap to ensure effective protection against scalding.

6.6 Filling the reheating circuit

Note!
Do not use the pressure relief valve of the boiler for bleeding.

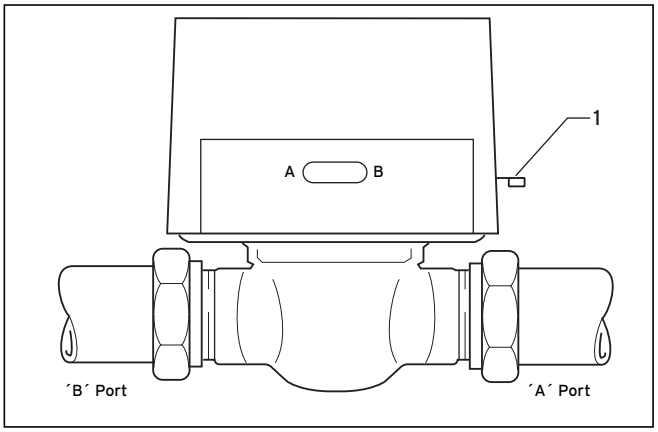


Fig. 6.3 Motorised 2 port valve

- Flush the entire primary central heating system with cold and hot water. Fill and bleed the central heating system according to the installation manual of the boiler.
- Set the lever (**1**) on the motorised 2 port valve to MANUAL and lock it in this position.
- Fill and bleed the central heating system after draining it completely.
- Unlock the lever on the motorised 2 port valve by setting it back to AUTO.

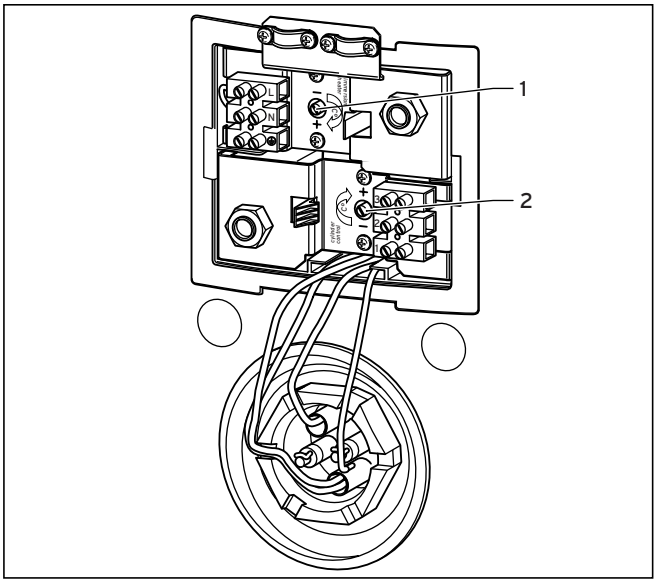


Fig. 6.4 Setting thermostats

- Set the knob of the hot water thermostat of the solar cylinder (**2**, Fig. 6.4) and immersion heater (**1**, Fig. 6.4) to the middle position (about 45 °C) for start-up and to achieve maximum energy efficiency.
- Start up the boiler (refer to Section 6.7) until the solar cylinder is at operating temperature and all radiators in the system are warm. Then drain the entire central heating system again to remove any residue from the pipes. Fill and bleed it again afterwards as described above.

6.7 Starting up the boiler

- Switch on the main switch of the boiler.
- Make sure the control device and the thermostats are set in such a way that heating is necessary.
- Check whether the boiler starts up and the water in the solar cylinder and radiators is heated up according to the hot water and room thermostat settings.
- Perform the commissioning and testing procedures in accordance with the installation manual for the boiler.
- After finished the starting-up set the hot water temperature at the controller (e. g. solar control auroMATIC 560) to 45 °C. This will achieve maximum energy efficiency of the solar system.
  If the hot water temperature is controlled via the build-in cylinder thermostat, set the according knob (**2**, Fig. 6.4) to 45 °C.
  Set the thermostat of the immersion heater (**1**, Fig. 6.4) to the desired temperature.

6.8 Start-up protocol

- Fill in the start-up protocol (see Section 9) of this manual

Fig. 6.5 Benchmark logo

6.9 Handing over the system to the owner

- Hand over the manuals intended for the owner as well as the documents of the auroSTOR.
- Tell the owner to keep the manuals nearby the appliances.
- Draw special attention to the safety instructions which the owner must follow.
- Draw special attention to the safety instructions, which the owner must follow.
- Instruct the owner on how to operate the boiler, solar cylinder and control devices safely.
- Show the owner how to operate the solar control, hot water control and heating control. Tell the owner that the cylinder temperature should be limited to 45 °C to achieve maximum solar gain.

Note!
In areas with hard water the set hot water temperature should not exceed 45 °C to avoid calcification.

- Go through the operating manuals with the owner and answer any questions.
- Point out the required safety precautions to the owner to prevent damage to the system and building in the event of frost if the system is not kept in operation.
- Also tell the owner that the immersion heater is intended as standby device for water heating and should not be used simultaneously with the boiler to heat up the water in the solar cylinder.
- Tell the owner that the settings you have made on the solar system are not allowed to be changed.
- Inform the owner that the boiler and solar cylinder have to be subjected to maintenance by a qualified specialist at least once a year.Recommend making a maintenance agreement with a qualified servicing company to ensure the boiler and solar cylinder are subjected to regular maintenance.

Further information can be obtained from Vaillant service
(+49 (0)870 - 6060777).

7 Inspection and maintenance

To ensure reliability and a long service life, regular inspections and maintenance work must be performed on the solar system by an expert technician.
As the operator, never try to carry out maintenance work on your system yourself. Use an approved qualified servicing company for this work. We recommend making a maintenance agreement with an approved qualified servicing company.
The operational reliability of the solar system may be impaired, or property damage and personal injury may result, if the inspections and maintenance work are not carried out.

The essential maintenance work on the solar system and corresponding maintenance intervals are specified in the following table.

Maintenance	Maintenance interval
Solar circuit	
Check the frost protection of the solar fluid (use the Vaillant 302 064 solar fluid tester)	Annually
Check the system pressure	Annually
Check the pH value of the solar fluid (with litmus paper, pH > 7.5)	Annually
Check the solar pump function	Annually
Bleed the system	Annually
Check the circulating volume in the solar circuit	Annually
Check the hot water thermostat mixer function	Annually
Refill with solar fluid if necessary	Annually
Check the quantity of blow-off liquid	Annually
Release the return flow preventer	Annually
Check the charge pressure of the expansion vessel	Annually
Collector	
Visual inspection of the collector, collector fastenings and connections	Annually
Check whether the brackets and collector components are clean and fitted properly	Annually
Check the pipe insulation for damage	Annually
Solar control	
Check the pump function (on/off, automatic)	Annually
Check the sensor temperature display	Annually
Check the circulation pump	Annually
Check the timer/time programme settings	Annually
Reheating: does it deliver the desired deactivation temperature?	Annually
Solar cylinder	
Bleed the heat exchanger if necessary	Annually
Check the connections for leaks	Annually
Check the temperature and pressure relief valve	Annually
Checking the expansion relief valve	Annually

Table 7.1 Maintenance checklist

Checking the temperature and pressure relief valve and expansion relief valve

- Actuate each valve manually by turning the valve cap and check whether the water flows unhindered to the discharge point via the tundish. Make sure both valves fit properly in idle position.

Checking the charge pressure of the expansion vessel

- Block the water supply and open the nearest hot water tap to reduce the pressure from the secondary water system.
- Check the pressure of the expansion vessel at the measurement point with a pressure gauge. If the pressure is below 3.0 bar, increase it with an appropriate air pressure pump.
- Perform the maintenance part of the start-up protocol.

Note!
Only use original spare parts from Vaillant Ltd. for the replacement of parts.

8 Troubleshooting

The following tables provide information on possible malfunctions during the operation of the solar system as well as their cause and remedy.
All work on the Vaillant solar system (installation, maintenance, repairs etc.) may be performed only by approved specialists.

Danger!
Risk of serious injury or death!
Never try to correct faults in the solar system yourself. Bear in mind that you risk death or serious injury if the work is performed incorrectly. Consult an approved qualified servicing company in the event of malfunctions.

Note!
Only use original spare parts from Vaillant Ltd. for the replacement of parts.
We recommend making a maintenance agreement.

Malfunction	Cause	Remedy
Solar pump		
Pump is not running although the collectoris warmer than the cylinder (neither motor noises can be heard nor vibrations felt).	1. No current available.	Check the power cables and fuses.
	2.Temperature difference set too high or controller is not switching.	• Check the controller.
		• Check the temperature sensor.
		• Reduce the temperature difference.
	3. Maximum temperature reached.	
	4. Pump shaft jammed by deposits in the bearings.	Switch temporarily to max. speed or unblock the rotor, insert a screwdriver in the notch and turn it by hand.
	5. Pump dirty.	Dismantle the pump and clean it. Close the flow rate meter and pump ball valve.
	6. Pump defective.	Replace the pump.
	7. Flow rate set incorrectly	Check the setting and adjust it if necessary.
Pump is running, but no solar fluid is coming from the collector (pump gets hot). Forward- and return flow temperatures are the same or the storage tank temperature not increasing at all or only slowly.	Air is in the pipework.	Check the system pressure. Operate the pump intermittently at maximum power. Open the bleeder at the pump and at the cylinder and bleed. Bleed the back flow prohibition. If there is no improvement, check whether there is a “u pocket” anywhere in the piping (e. g. at beam projections or at the bend of water pipes). Change the pipework or install additional air vents. If the system has already been started up and is refilled again, check the automatic air vent: Unscrew the protective cap and check the floater for mobility with a blunt needle. If the floater is jammed, replace the air vent.
Pump goes on too late and stops running early.	1. The temperature difference between the collector and cylinder has been set too high.	Reduce the temperature difference.
	2. Collector connection pieces not insulated (tube collector).	Insulate the collector connection pieces.

Table 8.1 Troubleshooting

Malfunction	Cause	Remedy
Pump starts up and goes off shortly afterwards.This is repeated several times until the system runs its course. The same occurs in the evening.	The temperature difference of the controller is too low or the pump speed is set too high. The solar radiation is not yet sufficient to heat up the entire pipework.	Check whether the entire pipework is fully insulated.Increase the temperature difference of the controller.
The pump is making noises.	1. Air in the pump	Bleed the pump.
	2. Insufficient system pressure.	Increase the system pressure.
Solar system		
Clocking of the system.	Incorrect position of the collector sensor	Position the collector sensor in the flow. Insulate the collector sensor.
The pressure gauge indicates a drop in pressure.	A drop in pressure is normal shortly after filling the system, since air still escapes from the system.If a pressure drop occurs again later on, the cause may be an air bubble, which has been subsequently released. Furthermore there are fluctuations to the pressure in normal operation mode between 0.2 to 0.3 bar, depending on the system temperature. If the pressure drops continuously, there is a leak in the solar circuit, in particular in the collector array.	First check all screw connections, stuffing boxes at gate valves and threaded connections, then the soldering points. Check the collector array and replace a tube or the collector if necessary.
The water pressure and amount of discharged water decreases at hot water taps.	Pressure in the main cold water supply too low.	Inform the owner and notify the water supply company.
	Line strainer in the pressure limiting valve dirty.	Clean the line strainer in the pressure limiting valve and replace it if necessary.
	Pressure limiting valve defective.	Replace the pressure limiting valve.
	Blockage in the system.	Unblock the blockage and replace any blocked parts.
		Check the system for water leaks at the expansion relief valve and temperature/ pressure limiting valve.
The system is making noises. Normal in the first few days after filling the system. If it occurs later, there are two possible causes:	1. The system pressure is too low. The pump is drawing air via the bleeder.	Increase the system pressure.
	2. Pump power set too high.	Switch to a lower speed.
The solar gain is unusually low.	The pipe insulation is too thin or incorrect. The system may have been designed incorrectly.	Check the insulation. Check the layout of the system (collector size, shading, pipe lengths) and modify the system if necessary.
Solar control		
auroMATIC 560: display example "KOL 1 Err" or similar	Defective sensor (short circuit or interruption).	1. Check the cable connection. 2. Measure the resistance values of the disconnected sensor at known temperatures, and compare these with the manufacturer's specifications. 3. Inspection of the piping for damage.
Solar cylinder		
The cylinder cools down at night. The flow and return temperatures vary after switching off the pump. The collector temperature is higher than the air temperature at night.	1. The gravity brake is blocked.	1. Check the position of the blue handle. 2. Check the gravity brake for tightness (jammed cuttings, particles of dirt in the sealing face). 3. Do not connect the solar heat exchanger directly, rather pull the supply pipes downwards and then upwards to the collector (syphon supports the gravity brake) or install a 2-port valve, which is switched on at the same time as the pump.
	2. One-pipe circulation in the event of short pipe networks with low pressure loss.	Install a gravity brake (as close as possible to the cylinder).

Table 8.1 Troubleshooting (continuation)

Malfunction	Cause	Remedy
Reheating is not working. The boiler runs for a short time, goes off and then back on again. This is repeated until the cylinder is at its target temperature.	1. Air in the reheating heat exchanger	Bleed the reheating heat exchanger.
	2. Heat exchanger surface area too small	Compare the specifications of the boiler manufacturer with those of the cylinder manufacturer. The problem may be able to be solved by a higher setting of the flow temperature at the boiler.
Only cold or lukewarm water comes out of the taps.	1. Cold and hot water connections on the cylinder have been mixed up.	Turn off the cold water supply, then let water flow out via the hot water connection. Only a few litres of water flow out if the connection is laid correctly. The inlet of the hot water draw-off pipe then rests in the air space; no further emptying is possible. If the entire solar cylinder runs empty via the hot water connection, the connections have been laid incorrectly. Change the connections!
	2. Hot water thermostat mixer set too low.	Increase the setting.
	3. Solar heating insufficient; boiler does not reheat. External control device faulty. Air in the reheating heat exchanger Cylinder temperature sensor defective.	Check whether the boiler is working. Check whether the external control device is working. Check whether the two port valve is in the hot water position. Replace the two port valve. Bleed the reheating heat exchanger. Check the thermal cut out and reset it. Replace the cylinder thermostat.
Water flows out of the expansion relief valve (only when heating up).	Dirt on the valve seat of the expansion relief valve.	Check the expansion relief valve and reset it manually.
	Pressure limiting valve defective.	Switch off the boiler and immersion heater and check whether the pressure behind the pressure limiting valve is lower than 3.0 bar if water flows out only when heating up. If so, replace the pressure limiting valve.
	Expansion vessel defective.	Check the pressure in the expansion vessel. If the pressure is insufficient, re-establish the pressure and check whether the equalisation tank maintains the pressure.
	Expansion relief valve defective.	If the pressure is normal, replace the expansion relief valve.
Water comes out of the temperature and pressure relief valve (only when heating up).	Dirt on the valve seat of the temperature and pressure relief valve.	Check the seat of the temperature and pressure relief valve and reset it manually.
	Temperature control of the boiler defective.	Check the temperature control of the boiler if water only comes out when reheating with the boiler. Check whether the two port valve switches to the heating position after reaching the cylinder temperature.
	Cylinder temperature sensor defective.	Check the cylinder temperature sensor and the corresponding thermal cut outs and replace the temperature sensor and reset the thermal cut outs if necessary.
	Two port valve defective.	Check whether the two port valve is working and replace it if necessary.
	Temperature and pressure relief valve defective.	Replace the temperature and pressure relief valve if water only comes out when heating up with the immersion heater.
	Immersion heater defective.	Check the temperature sensor of the immersion heater and the corresponding thermal cut out and replace the immersion heater if necessary.

Table 8.1 Troubleshooting (continuation)

9 Notes for the owner

- Please read this manual thoroughly to ensure optimum utilisation of your Vaillant hot water solar system.

9.1 General notes

We recommend declaring the solar system as an increase in value to the insurance and insuring it explicitly against lightning. It may also make sense to take out an insurance against hailstorms in particularly prone areas.

9.2 Operation of the solar system

The solar system is set once during the start-up and then works automatically. You do not even need to make any adjustments when you go on holiday.

Danger!
Risk of burns!
The collectors and pipes can become very hot – be careful when touching them!

Danger!
Risk of scalding and bursts due to inappropriate alterations!
You must not make any changes to the cylinder or controller, to pipework or to electricity (if available), to the pressure release pipe and to the expansion relief valve for the stored water. Otherwise steam can escape, pipes can burst or the system may be damaged. The system operates automatically after the initial commissioning.

In order for your Vaillant solar system to work perfectly, please observe the following instructions:
- Do not open or close any of the valves.
- Never switch off the solar system – even when you go on holiday or assume an error has occurred.

Only exception:
The tube(s) of a Vaillant tube collector have been damaged, resulting in a pressure drop in the solar system or solar fluid escaping. Observe the notes in Section 9.7, What should be done if ...
Do not take out the fuse or switch off the fuse box.
Do not under any circumstances fill the solar circuit yourself.

9.3 Operation of the solar cylinder

Your boiler and the unvented auroSTOR solar cylinder are provided with connections for a solar system as well as a reheating system.
How to control the solar system is described in the manuals for each controller.

Note!
In the event of leaks in the water pipework close the cold water stop valve at the cylinder immediately to limit any water damage.

The cold water stop valve can be found in the pipe joint from your domestic water connection to the solar cylinder (cold water connection) normally nearby the cylinder.

Danger!
Risk of scalding
The outlet temperature at the taps can be up to 85 °C with Vaillant VIH S GB 200 S, VIH S GB 250 S and VIH S GB 300 S solar cylinders.

Caution!
Risk of frost!
The cylinder must be completely drained if its is to be shut down for a long period of time in an unheated room (e. g. winter holidays etc.). Have the cylinder drained by a specialist.

9.3.1 Setting the standby temperature of the cylinder

You can set the standby temperature of the cylinder, the maximum cylinder temperature and also the minimum temperature for reheating with the boiler on the controller according to the design of your system.
If no controller is used, the standby cylinder temperature is set on the hot water thermostat installed in the solar cylinder.
The hot water thermostat for the boiler for reheating the auroSTOR can be set between 20 and 65 °C. The desired temperature is set by the installer during the start-up of the auroSTOR solar cylinder.
Maximum energy efficiency can be achieved in the 45 °C setting.

- Make sure the boiler is ready for operation in accordance with the operating manual supplied with the appliance.
- Set the standby cylinder temperature on the controller or on the hot water thermostat of the cylinder according to the design of your system.

The setting options can be taken from the operating manual of the corresponding controller.

Note!
In areas with hard water the set hot water temperature should not exceed 45 °C to avoid calcification. The temperature for solar heating can be set up to a maximum of 80 °C. It is controlled by the auroMATIC 560 solar control.

Caution!
Risk of damage!
Do not remove or modify any components of the solar cylinder.

In the unlikely event of a malfunction occurring of the auro STOR, such as hot water flowing out of the temperature and pressure relief valve, switch off the boiler and the immersion heater and contact Vaillant Ltd. or your installer.

Note!
If the auroSTOR has been installed in a cupboard for ventilation purposes, make sure no items of clothing or other objects are placed on the cylinder, control devices, lines or other system components.

Note!
Keep it accessible to allow the operation of the hot water thermostat control and the mixer valve.

9.3.2 Switching off the solar cylinder

To switch off the heating and hot water system temporarily, simply switch off the boiler (refer to the operating manual of the boiler).

9.4 Frost protection

9.4.1 Frost protection of the solar system

- Have the solar system checked for frost protection once a year by a qualified servicing company. This work is usually part of a maintenance agreement with your approved specialist.

Do not refill the solar circuit with fluid. Do not mix the solar fluid with other fluids.

9.4.2 Frost protection of the solar cylinder

Make sure the central heating remains switched on and the temperature in all rooms and the installation room of the auroSTOR solar cylinder are kept above freezing point if you are absent for long periods.

9.5 Care

9.5.1 Care of the collectors

The collectors do not have to be cleaned. Solar collectors become dirty in the same way as roof windows. They are cleaned sufficiently by rain however.

9.5.2 Care of the solar cylinder

You can clean the exterior of the solar cylinder with a damp cloth and a little soap.

Caution!
Risk of damage!
Do not use any abrasives or solvents, since they could damage the exterior or the connections.

9.6 Maintenance

9.6.1 Maintenance of the solar system

The prerequisite for permanent operational readiness, reliability and a long service life is that regular inspections and maintenance work are performed on your Vaillant solar system by the specialist. Never attempt to perform maintenance work or repairs yourself. Assign an approved qualified servicing company with this work. We recommend making a maintenance agreement. Observe our maintenance checklist in Section 7, Inspection and maintenance, for the contents of the maintenance agreement.

Danger!
Risk of damage to the system or personal injury!
The operational reliability of the system can be impaired, resulting in damage to property or personal injury, if the inspections and maintenance work are not carried out.

The solar gain of the system may not meet expectations as a result.

Danger!
Risk of serious injury or death!
Never try to correct faults in the solar system yourself. Bear in mind that you risk death or serious injury if the work is performed incorrectly. Consult an approved qualified servicing company in the event of malfunctions.

9.6.2 Maintenance of the solar cylinder

Just like for the entire solar system, regular inspections and maintenance by a specialist are the best way to ensure reliability and a high service life also for the Vaillant VIH S GB 200 S, VIH S GB 250 S and VIH S GB 300 S cylinders.

It is important that your hot water cylinder is serviced annually. To ensure regular servicing, it is strongly recommended that arrangements are made for a Maintenance Agreement. Please contact Vaillant Service Solutions (0870 6060 777) for further details.

9.7 What should be done if ...

Malfunction	Remedy
... fluid drips out of the system?	Collect it (in a bucket) if possible and notify a qualified servicing company.
... the fluid level rises in the collecting container under the solar pump unit?	Notify a qualified servicing company.
... fluid or steam comes out of the expansion relief valve?	Notify a qualified servicing company.
... " Sensor defective" or "Broken cable" is displayed on the controller?	Notify a qualified servicing company.
... the pressure on the pressure gauge falls below minimum operating pressure?	Notify a qualified servicing company.
... no temperature difference is visible between the flow and return thermometer at the solar pump unit?	Wait five to ten minutes. If the system is then still running, the system may be defective. Notify a qualified servicing company.
... the pane of a flat plate collector has been damaged?	Do not touch the collector interior. Cover the collector with a canvas as protection against rain. Notify a qualified servicing company.
... the tube of a tube collector has been damaged?	Do not touch the collector interior. Notify a qualified servicing company.
... the cylinder does not deliver enough hot water?	Check whether the standby cylinder temperature has been set properly on the controller (approx. 60 °C recommended). Check the hot water thermostat mixer setting (approx. 60 °C recommended). If the settings are correct, the cylinder maybe calcified. In this case notify a qualified servicing company.

Table 9.1 Troubleshooting instructions for the owner

10 Customer service and manufacturer's warranty

10.1 Vaillant service

To ensure regular servicing, it is strongly recommended that arrangements are made for a Maintenance Agreement. Please contact Vaillant Service Solutions (0870 6060 777) for further details.

10.2 Vaillant warranty

Vaillant provide a full parts and labour warranty for this appliance.
The appliance must be installed by a suitably competent person in accordance with the Gas Safety (Installation and Use) Regulations 1998, and the manufacturer's instructions. In the UK 'GORGI' registered installers undertake the work in compliance with safe and satisfactory standards.
All unvented domestic hot water cylinders must be installed by a competent person to the prevailing building regulations at the time of installation (G3).

Terms and conditions apply to the warranty, details of which can be found on the warranty registration card included with this appliance.

Failure to install and commission this appliance in compliance with the manufacturer's instructions may invalidate the warranty (this does not affect the customer's statutory rights).

11 Start-up protocol

The solar system of:

has been started up, while taking the following points into consideration:

1. Assembly	O.K.	Remarks
Roof bracket fixed according to instructions?		
Solar pipework connected to potential equalisation?		
Roof covering refixed according to instructions after laying the roof bracket?		
Roof membrane not damaged?		
All connecting clips pushed in (with tube collectors)?		
Has the protective film been removed from the collectors?		
Pressure release pipe installed at the expansion relief valve of the solar circuit?		
Catch vessel (empty canister) placed under pressure release pipe?		
Pressure release pipe installed at expansion relief valve on hot water side and connected to waste water?		
Thermostat mixer installed, temperature set and checked?		
2. Start-up		
System filled with prescribed solar fluid?		
Solar circuit flushed with solar fluid?		
Line strainer cleaned after flushing the system?		
System bled several times?		
Solar circuit subjected to hydraulic pressure test, including leak inspection of screw connections and soldering points?		
Stuffing boxes at stop valve and fill/vent valve checked for leaks (retighten union nuts if necessary)?		
Temperature and pressure relief valve checked?		
Stop valve for reheating source installed (normally motorised 2 port valve)?		
Flow rate set according to system manual?		
Pump, cylinder heat exchanger and collector bled (gravity brake blocked for bleeding)?		
Gravity brake released?		
Fill/vent valve caps screwed tight?		
Cylinder bled?		
Heating circuit bled?		
Does the system installation meet the requirements of the building regulations?		
Has the system been installed and started up in accordance with the installation manuals of the manufacturer?		
3. Control systems		
Do the temperature sensors display plausible values?		
Solar pump running and circulating (flow rate measuring meter)?		
Solar circuit and cylinder become warm?		
The temperature difference between the flow and return is a max. of 10 to 14 °C at full sunshine?		
Correct hydraulic plan set (auroMATIC 560 only)?		
4. Instruction		
The system owner has been instructed as follows:		
– Basic functions and operation of the solar control?		
– Functions and operation of the reheating system?		
– Frost protection of the system?		
– Maintenance intervals?		
– Manuals/documents (possibly with special circuit plan) handed over to the owner?		

Table 11.1 Start-up protocol

Information	Unit	Value/Detail
Benchmark no.		
Registration no.		
Basic acceptances		
Number of persons:		
Additional hot water equipment:	Washing machine, dish washer etc.	
Circulation	Available/Not available	
Circulation runtime	h/d	
(please tick as appropriate)		
Daily hot water consumption in	l/d	
At a cylinder temperature of	°C	
Estimated solar coverage of the total hot water consumption	%	
Collector array performance data		
Installed effective collector surface area	m^2	
Maximum power at full solar radiation	kW (500–600 W/m^2 collector)	
Solar cylinder		
Appliance type	Vented/Unvented	
Appliance designation		
Capacity	l	
Serial number		
Boiler		
Appliance type		
Appliance designation		
Serial number		
Boiler system type	Open/Closed	
Installation location of pressure limiting valve		
System values		
Hot water temperature at the nearest tap	°C	
Achievable maximum cylinder temperature	°C	
Maximum hot water temperature	°C	
Maximum hot water volume at maximum temperature	l/min.	
Boiler flow temperature	°C	
Operating pressure setting at pressure limiting valve	bar	
Charge pressure in DHW expansion vessel (check before filling)	bar	
Charge pressure in solar expansion vessel (check before filling)	bar	
Cold water system pressure at pressure limiting valve (cold)	bar	
Set flow rate	l/min	
Temperature difference between flow and return at full solar radiation	Kelvin	
Volume of solar expansion vessel	l	
Operating pressure at solar pump unit pressure gauge in cold condition	bar	
Frost protection set to	Density of solar fluid > 1.05 g/cm3	

Table 11.2 Start-up data

Information	Unit	Value/Detail
Controller settings		
Installed controller(s)/timer(s)		
Manufacturer		
Reheating with boiler starts at (TSP1 min. see installation manual of solar control)?	°C	
Switch-on temperature difference:	Kelvin	
Switch-off temperature difference:	Kelvin	
Other settings		
Important activated functions		
Name of the installer (in block letters)		
Corgi ID No.		
Date		
Signature		
Signature of the owner to confirm the receipt of all manuals of the system		

Table 11.2 Start-up data (continuation)

SERVICE INTERVAL RECORD

It is recommended that your water system is serviced regularly
and that you complete the appropriate Service Interval Record Below.

Service Provider. Before completing the appropriate Service Interval Record below, please ensure you have carried out the service as described in the boiler manufacturer's instructions and in compliance with all relevant codes of practice.

SERVICE 1 DATE
ENGINEER NAME
COMPANY NAME
TEL No.
CORGI ID CARD SERIAL No.
COMMENTS

SIGNATURE

SERVICE 2 DATE
ENGINEER NAME
COMPANY NAME
TEL No.
CORGI ID CARD SERIAL No.
COMMENTS

SIGNATURE

SERVICE 3 DATE
ENGINEER NAME
COMPANY NAME
TEL No.
CORGI ID CARD SERIAL No.
COMMENTS

SIGNATURE

SERVICE 4 DATE
ENGINEER NAME
COMPANY NAME
TEL No.
CORGI ID CARD SERIAL No.
COMMENTS

SIGNATURE

SERVICE 5 DATE
ENGINEER NAME
COMPANY NAME
TEL No.
CORGI ID CARD SERIAL No.
COMMENTS

SIGNATURE

SERVICE 6 DATE
ENGINEER NAME
COMPANY NAME
TEL No.
CORGI ID CARD SERIAL No.
COMMENTS

SIGNATURE

SERVICE 7 DATE
ENGINEER NAME
COMPANY NAME
TEL No.
CORGI ID CARD SERIAL No.
COMMENTS

SIGNATURE

SERVICE 8 DATE
ENGINEER NAME
COMPANY NAME
TEL No.
CORGI ID CARD SERIAL No.
COMMENTS

SIGNATURE

SERVICE 9 DATE
ENGINEER NAME
COMPANY NAME
TEL No.
CORGI ID CARD SERIAL No.
COMMENTS

SIGNATURE

SERVICE 10 DATE
ENGINEER NAME
COMPANY NAME
TEL No.
CORGI ID CARD SERIAL No.
COMMENTS

SIGNATURE

BENCHMARK No. | | | | | | | |

CYLINDER COMMISSIONING CHECKLIST

CYLINDER SERIAL No. _____ **NOTIFICATION No.** _____

APPLIANCE & TIME CONTROL DETAILS

MANUFACTURER			MODEL	
CAPACITY	litres		SERIAL No.	
TYPE	UNVENTED	☐	or THERMAL STORE	☐
TIME CONTROL	PROGRAMMER	☐	or TIME SWITCH	☐

BOILER PRIMARY SETTINGS (INDIRECT HEATING ONLY) ALL BOILERS

IS THE PRIMARY A SEALED OR OPEN VENTED SYSTEM?	SEALED ☐ OPEN ☐	
WHAT IS THE BOILER FLOW TEMPERATURE?		°C

ALL MAINS PRESSURISED SYSTEMS

WHAT IS INCOMING STATIC COLD WATER PRESSURE AT THE INLET TO THE PRESSURE REDUCING VALVE?		bar
HAS STRAINER (IF FITTED) BEEN CLEANED OF INSTALLATION DEBRIS?	YES ☐ NO ☐	
HAS A WATER SCALE REDUCER BEEN FITTED?	YES ☐ NO ☐	
WHAT TYPE OF SCALE REDUCER HAS BEEN FITTED?		

UNVENTED SYSTEMS ONLY

ARE COMBINED TEMPERATURE AND PRESSURE RELIEF VALVE AND EXPANSION VALVE FITTED AND DISCHARGE TESTED?	YES ☐ NO ☐	
IS PRIMARY ENERGY SOURCE CUT OUT FITTED (NORMALLY 2 PORT VALVE)?	YES ☐ NO ☐	
WHAT IS THE PRESSURE REDUCING VALVE SETTING (IF FITTED)?		bar
WHERE IS OPERATING PRESSURE REDUCING VALVE SITUATED?		
HAS THE EXPANSION VESSEL OR INTERNAL AIR SPACE BEEN CHECKED?	YES ☐ NO ☐	
WHAT IS THE HOT WATER TEMPERATURE AT THE NEAREST OUTLET?		°C

THERMAL STORES ONLY

WHAT IS THE OPERATING SETTING OF THE PRESSURE REDUCING VALVE (WHERE FITTED)?		bar
WHERE IS PRESSURE REDUCING VALVE SITUATED?		
WHAT STORE TEMPERATURE IS ACHIEVABLE?		°C
WHAT IS THE MAXIMUM HOT WATER TEMPERATURE?		°C
WHAT IS THE MAXIMUM HOT WATER FLOW RATE AT MAXIMUM TEMPERATURE?		lts/min

ALL PRODUCTS

DOES THE HOT WATER SYSTEM COMPLY WITH THE APPROPRIATE BUILDING REGULATIONS?	YES ☐
HAS THE SYSTEM BEEN INSTALLED AND COMMISSIONED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS?	YES ☐
HAVE YOU DEMONSTRATED THE OPERATION OF THE SYSTEM CONTROLS TO THE CUSTOMER?	YES ☐
HAVE YOU LEFT ALL THE MANUFACTURER'S LITERATURE WITH THE CUSTOMER?	YES ☐

COMPETENT PERSON'S SIGNATURE _____ CUSTOMER'S SIGNATURE _____

(To confirm demonstrations of equipment and receipt of appliance instructions)

COMMISSIONING ENG'S NAME PRINT _____ CORGI ID No. _____

SIGN _____ DATE _____

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