Bellway

USER GUIDES
SOLAR DETAILS

Renelec
CHALGROVE

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INTRODUCTION

The TRIBUNE HE Unvented cylinder is made from Duplex Stainless Steel for excellent corrosion resistance. TRIBUNE HE has a strong rust-proofed steel case and is highly insulated with environmentally friendly foam.

TRIBUNE HE is supplied complete with all the necessary safety and control devices needed to connect to the cold water mains. All are pre-adjusted. High quality controls have been selected to combine high flow rate performance with minimum pressure drop to make TRIBUNE HE perform well in all areas, even those with poor water pressure. TRIBUNE HE is KIWA approved to show compliance with Building Regulations G3+L.

benchmark

THE MARK OF QUALITY FOR THE INSTALLATION, COMMISSIONING AND SERVICING OF DOMESTIC HEATING AND HOT WATER SYSTEMS

Benchmark places responsibilities on both manufacturers and installers. The purpose is to ensure that customers are provided with the correct equipment for their needs, that it is installed, commissioned and serviced in accordance with the manufacturer's instructions by competent persons and that it meets the requirements of the appropriate Building Regulations. The Benchmark Checklist can be used to demonstrate compliance with Building Regulations and should be provided to the customer for future reference.

Installers are required to carry out installation, commissioning and servicing work in accordance with the Benchmark Code of Practice which is available from the Heating and Hotwater Industry Council who manage and promote the Scheme. Visit www.centralheating.co.uk for more information.

IMPORTANT NOTE TO THE INSTALLER

Read these instructions before commencing installation. Unvented cylinders are a controlled service as defined in the latest edition of the building regulations and should only be fitted by a competent person.

The relevant regulations are: England and Wales – Building Regulation G3, Scotland – Technical Standard P3, N Ireland – Building Regulation Part F
After installation the Benchmark check list must be completed and left, with these instructions, with the householder for future reference.

GENERAL INSTALLATION

COLD MAINS PIPEWORK

Run the cold main through the building to the place where the TRIBUNE HE is to be installed. Take care not to run the cold pipe near hot water or heating pipework so that the heat pick-up is minimized. Identify the cold water supply pipe and fit an isolating valve (not supplied).
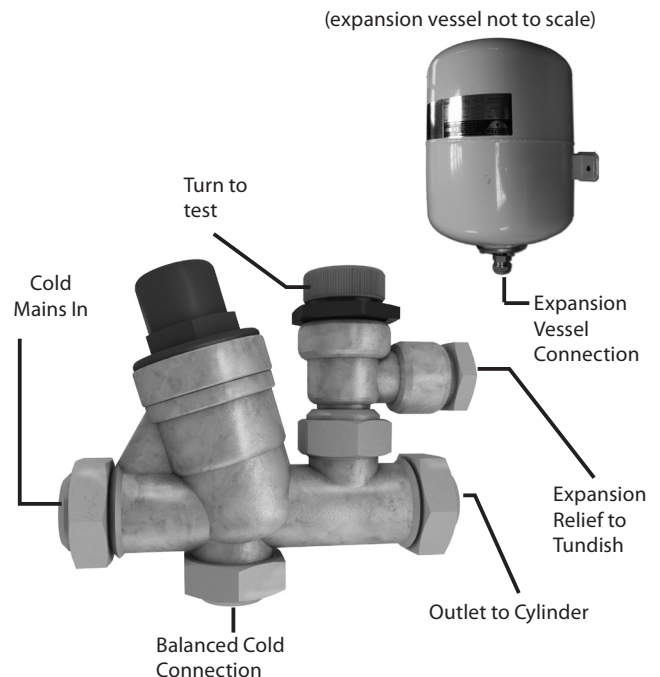
A 22mm BS1010 stopcock can typically be used but a 22mm quarter turn full bore valve would be better as it does not restrict the flow as much. Do not use "screwdriver slot" or similar valves. Make the connection to the cold feed of the cylinder and incorporate a drain valve. Position the drain valve no higher than the cold inlet to ensure sufficient draining of cylinder when required. Position the inlet control just ABOVE the Temperature & Pressure Relief Valve (TPRV) mounted on the side of the cylinder. This ensures that the cylinder does not have to be drained down in order to service the inlet control set. Ensure that the arrow points in the direction of the water flow. Select a suitable position for the expansion vessel. Mount it to the wall using the bracket attached to the vessel. Use suitable fittings capable of supporting full vessel weight (and with appropriate consideration to wall material). Connect the expansion vessel to the cold feed pipework between the inlet control set and the cold inlet on the cylinder. Ensure that the top of the vessel is accessible for servicing.

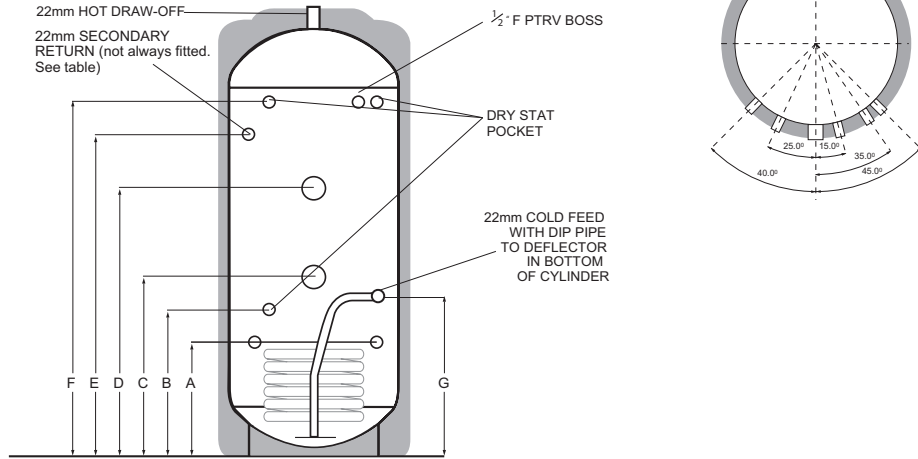## CONNECTING TO THE CYLINDER

All of the pipework connections on the cylinder are 22mm compression and supplied complete with gland nuts and olives, in the Accessory Kit box. Only connect 22mm Table X copper tube to these connections.

Cut the tube with a pipe cutter and ensure no sharp edges or burrs protrude. Slide both gland nut and olive onto the tube and push tube fully home into the connection, ensuring the tube end fully bottoms on the connection recess. Smear the outer wall of the olive with plumbing paste and tighten gland nut to form a water tight seal. Upon filling/commissioning, ensure all connections are completely watertight. Note: No control or isolation valve should be fitted between the expansion relief valve and the storage cylinder. The relief valve connections should not be used for any other purpose.
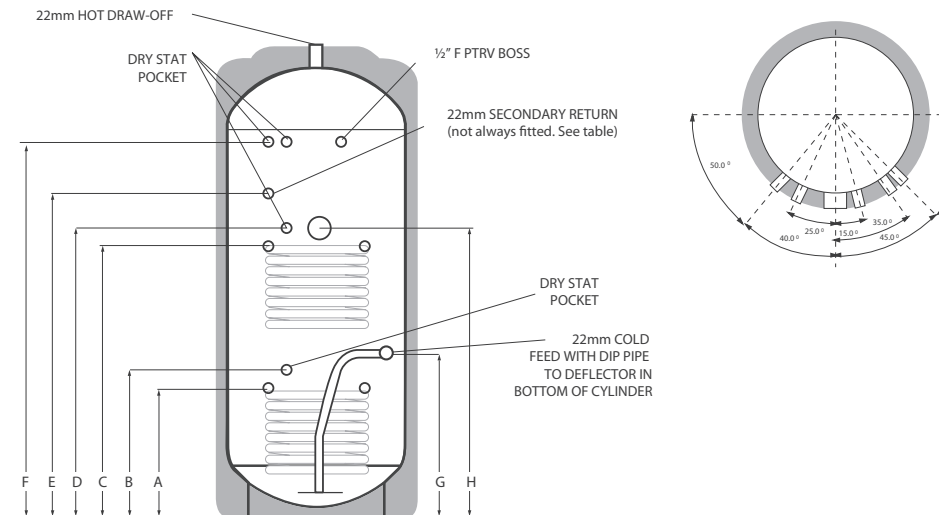
(expansion vessel not to scale)

Turn to test

Cold Mains In

Expansion Vessel Connection

Expansion Relief to Tundish

Outlet to Cylinder

Balanced Cold Connection

TECHNICAL SPECIFICATIONS

TRIBUNE HE SOLAR DIRECT

22mm HOT DRAW-OFF

22mm SECONDARY RETURN (not always fitted. See table)

½" F PTRV BOSS

DRY STAT POCKET

22mm COLD FEED WITH DIP PIPE TO DEFLECTOR IN BOTTOM OF CYLINDER

F E D C B A   G

25.0º 15.0º 35.0º
40.0º 45.0º

CODE	HEIGHT	DIAMETER	A	B	C	D	E	F	G
TSS150	1093	550	290	345	390	610	N/F	892	390
TSS180	1281	550	290	345	445	710	N/F	1080	390
TSS210	1469	550	365	420	500	810	1150	1268	465
TSS250	1719	550	365	420	670	1045	1400	1519	465
TSS300	2032	550	365	420	670	1100	1600	1831	465

TRIBUNE HE SOLAR INDIRECT

22mm HOT DRAW-OFF

DRY STAT POCKET

½" F PTRV BOSS

22mm SECONDARY RETURN (not always fitted. See table)

DRY STAT POCKET

22mm COLD FEED WITH DIP PIPE TO DEFLECTOR IN BOTTOM OF CYLINDER

F E D C B A   G H

50.0º

40.0º 25.0º 15.0º 35.0º
45.0º

CODE	HEIGHT	DIAMETER	A	B	C	D	E	F	G	H
TT150	1093	550	290	345	642	697	N/F	892	390	693
TT180	1281	550	290	345	674	729	N/F	1080	390	725
TT210	1469	550	365	420	779	834	1150	1268	465	830
TT250	1719	550	365	420	950	1005	1400	1518	465	1000
TT300	2032	550	365	420	979	1034	1600	1832	465	1030

All Dimensions are in mm and are of the cased unit.
N/F = not fitted.

Kingspan Hot Water Systems

TRIBUNE HE SOLAR INSTALLATION

DIRECT SINGLE COIL CYLINDER

Detail for the installation of a Solar Unvented Direct cylinder.

GENERAL
When installing this product it is essential the overall installation meets all current legislation including, in particular, the high limit isolation requirements of Building Regulation G3. This document is designed to assist in achieving that aim.

WATER
The potable water connection and tundish discharge connection are to be connected in exactly the manner described in Pages 6 to 8 of this manual.

IMMERSION HEATERS
The standard issue immersion heaters are designed for domestic usage where the lower heater is connected to a low rate off-peak tariff and the upper heater used for occasional top-up purposes. Heaters of this nature are not designed to be permanently live. Connect in accordance with instructions on page 6.

SOLAR CONNECTIONS
The flow and return from the solar heat source are to be connected to the indirect coil. Either primary coil connection may be utilised as the flow or return. The solar primary circuit must have its own dedicated circulating pump, thermal and safety controls which must be installed as per the solar manufacturers instructions. The solar control system used must be of the solar differential control type and should be connected to the solar sensor.
The solar sensor, supplied as part of the solar controls should be inserts into Pocket B and is held in-situ with the black sensor pocket retaining bung provided.
It is necessary to connect the solar pump via the over-temperature high limit cut-out (provided) to ensure the heat input to the solar coil is interupted if the cylinder over heats. Some method to prevent thermosyphoning must also be employed. Non-return check valves in the primary flow and return pipework would be acceptable.
If solar controls do not offer appropriate isolation a 2 port zone valve (not supplied) can be used with the pump and high limit stat as shown on page 14.

INDIRECT TWIN COIL CYLINDER

UPPER COIL
The upper coil is connected to the fossil fuel boiler as per the instructions for the TRIBUNE HE Unvented Indirect single coil model with the dual stat control and high limit thermostat inserted into pocket D (lower diagram page 12). The wiring requirements are as depicted on page 14.

LOWER COIL: SOLAR INSTALLATION
The flow and return from the solar heat source are to be connected to the indirect coil. Either primary coil connection may be utilised as the flow or return. The solar primary circuit must have its own dedicated circulating pump, thermal and safety controls which must be installed as per the solar manufacturers instructions. The solar control system used must be of the solar differential control type and should be connected to the solar sensor.
The solar sensor, supplied as part of the solar controls should be inserts into Pocket B and is held in-situ with the black sensor pocket retaining bung provided.
It is necessary to connect the solar pump via the over-temperature high limit cut-out (provided) to ensure the heat input to the solar coil is interrupted if the cylinder overheats. Some method to prevent thermosyphoning must also be employed. Non-return check valves in the primary flow and return pipework would be acceptable. If solar controls do not offer appropriate isolation a 2 port zone valve (not supplied) can be used with the pump and high limit stat as shown on page 14.

NOTE: If it is intended to fit a cylinder with a solar coil to be used at a later date, the 2 coils should be connected in series to make use of the solar coil, using the dual stat in Pocket D

The Domestic Heating Compliance Guide document L1A and L1B provides excellent advice in sizing both cylinder designated solar areas and heat exchangers to the surface area of the solar collectors. Using this guide Range are able to offer sizing advice for specification.

NB: The total detail of compliance guide document should be consulted prior to specifying product or commencing design.

PRE-PLUMBED

CYLINDER INSTALLATION

COLD MAINS PIPEWORK

Run the cold main through the building to the place where the TRIBUNE HE PRE-PLUMB unit is to be installed. Take care not to run the cold pipe near hot water or heating pipework so that the heat pick-up is minimized. Identify the cold water supply pipe and fit an isolating valve (not supplied). A 22mm BS1010 stopcock can typically be used but a 22mm quarter turn full bore valve would be better as it does not restrict the flow as much. Do not use "screwdriver slot" or similar valves. Make the connection to the inlet control set (Position 2). Ensure that the arrow points in the direction of the water flow. Select a suitable position for the expansion vessel. Mount it to the wall using the bracket provided. Connect the expansion vessel to the cold feed pipework between the inlet control set and the cold inlet. Ensure that the top of the vessel is accessible for servicing.

CONNECTING TO THE CYLINDER

All of the pipework connections on the cylinder are 22mm compression and supplied complete with gland nuts and olives, in the Accessory Kit box. Only connect 22mm Table X copper tube to these connections. Cut the tube with a pipe cutter and ensure no sharp edges or burrs protrude. Slide both gland nut and olive onto the tube and push tube fully home into the connection, ensuring the tube end fully bottoms on the connection recess. Smear the outer wall of the olive with plumbing paste and tighten gland nut in the prescribed manner. Upon filling/commissioning, ensure all connections are completely watertight.

BALANCED COLD CONNECTION

If there are to be showers, bidets or monobloc taps in the installation then a balanced cold supply is necessary. There is a 22mm balanced connection on the inlet set.

HOT WATER PIPEWORK

Connect to HWDO (Position 1 on diagram). Run the first part of the hot water distribution pipework in 22mm. This can be reduced to 15mm and 10mm as appropriate for the type of tap etc. Your aim should be to reduce the volume of the hot draw-off pipework to a practical minimum so that the time taken for the hot water is as quick as possible. Where monobloc mixing taps and showers are used, these should be installed to comply with the Water Supply (Water Fittings) Regulations 1999. If these devices are supplied with un-balanced supplies there should be single check valves installed at both inlets, to stop over pressurising of either supply.

CONNECTIONS FOR INDIRECT UNITS

Connect to the boiler flow and return (Positions 19 & 14) lines. An additional expansion vessel and safety valve is supplied. The boiler may be Gas, Electric or Oil but must be under effective thermostatic control. Uncontrolled heat sources such as some AGA's, back boilers, solid fuel stoves, etc. are NOT SUITABLE. Please contact our Technical department for guidance. Connect

to (Position 9 & 14) for the radiator circuits. Twin zone heating unit are supplied with 2 port zone valves in positions 9a and 9b.

CONNECTIONS FOR SOLAR COILS

Connect to the solar coil as detailed on page 13 ensure the solar pump is connected via the over temperature cut out as described on page13.

SECONDARY CIRCULATION

TRIBUNE HE can be used with secondary circulation. An appropriate WRAS approved bronze or stainless steel circulator should be used in conjunction with a non-return valve to prevent backflow. On large secondary circulation systems it may be necessary to incorporate an extra expansion vessel into the circuit to accommodate the increased system water volume. A secondary return boss is fitted as standard on 210, 250 & 300 ltr units (Position 17). On smaller sizes, tee into the cold feed pipe above the drain using a swept tee.

IMMERSION HEATERS

Only immersion heaters with a thermal cutout may be used. To help ensure this, the immersion heaters have a special 1¾" thread. They are rated at 3 kW at 240 V and are of a low noise Incoloy construction. They have both a thermostat and a high limit cutout. Please order the correct replacement via partshop; fitting non-approved immersions may affect your guarantee. When fitting, ensure the 'O' ring is positioned correctly on the head of the immersion heater and lubricate before fitting. Fit it by hand until almost home then tighten gently as the 'O' rings will seal easily. The electrical supply to each immersion heater must be fused at 13A via a double pole isolating switch to BS 3456. The cable must be 2.5mm2 heat resistant (85°C HOFR) sheathed flex complying to BS 6141:1981 Table 8. Do not operate the immersion heater/s until the unit is full of water. Do not operate the immersion heater/s if any sterilisation liquid is in the cylinder as this will cause premature failure.

ELECTRICAL CONNECTIONS

Complete the wiring – use the appropriate wiring diagrams on pages 17 & 18.

COMMISSIONING

Carry out commissioning as per instructions on page 21 and in line with boiler manufacturer's instructions for the heating and the primary circuit. Primary pipework must be filled, bled and tested in accordance with the boiler manufacturer's instructions, to avoid damage to the circulation pump.

INDIRECT PRE-PLUMBED
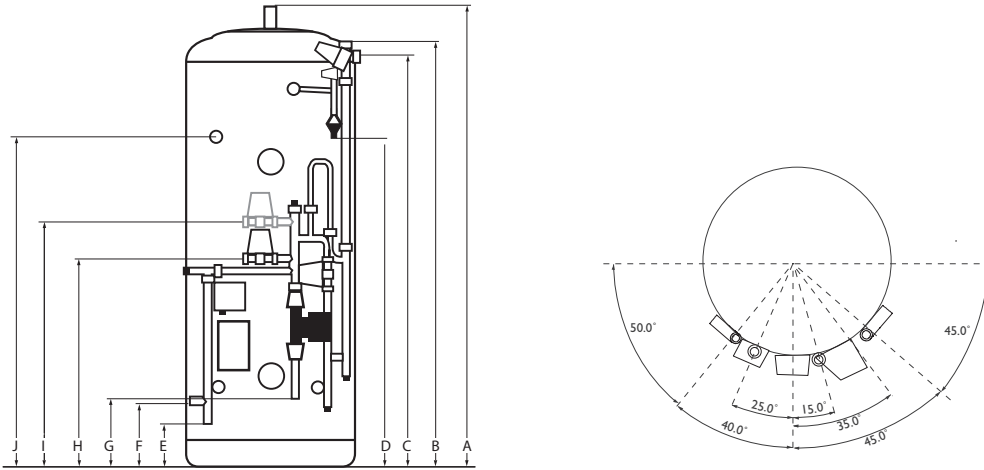
CODE	A	B	C	D	E	F	G	H	I	J
TI120P4	922	883	836	573	171	246	102	470	590	N/F
TI150P4	1109	1070	1023	760	211	286	140	508	628	N/F
TI180P4	1297	1258	1211	948	211	286	320	690	810	N/F
TI210P4	1485	1446	1399	1136	246	321	320	690	810	1150
TI250P4	1735	1696	1649	1386	246	321	320	690	810	1400
TI300P4	2048	2009	1962	1699	246	321	418	784	904	1600

For Twin Zone codes please replace P4 with PT4
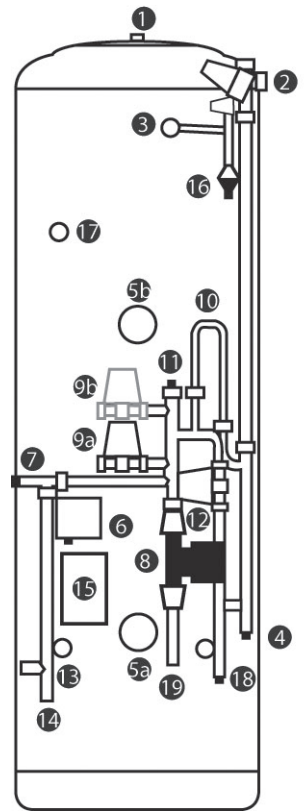
SOLAR INDIRECT PRE-PLUMBED
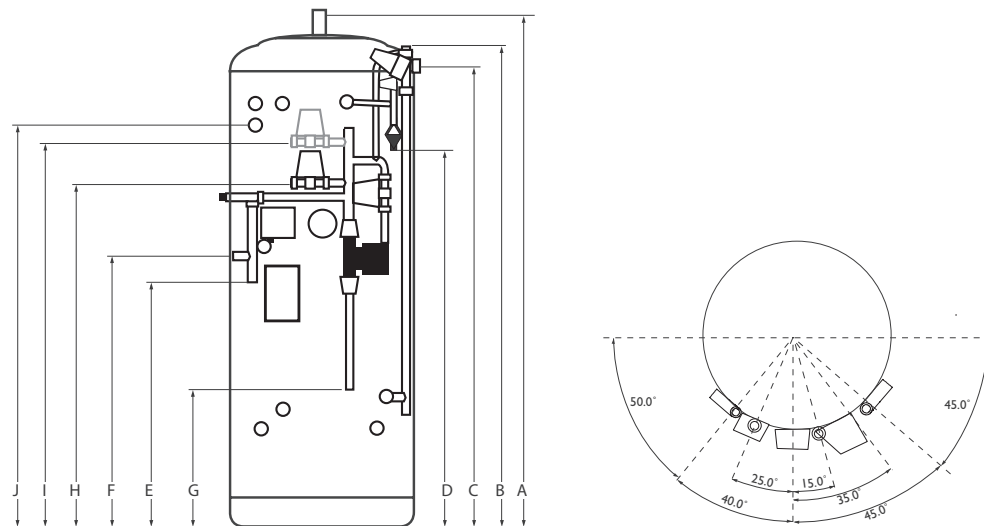
CODE	A	B	C	D	E	F	G	H	I	J
TT180P4	1297	1258	1211	948	560	635	480	850	970	N/F
TT210P4	1485	1446	1399	1136	665	740	585	955	1075	1150
TT250P4	1735	1696	1649	1386	830	905	770	1130	1250	1400
TT300P4	2048	2009	1962	1699	859	934	799	1159	1279	1600

For Twin Zone codes please replace P4 with PT4

All Dimensions are in mm and are of the cased unit.

N/F = not fitted.

Kingspan Water Hot Systems
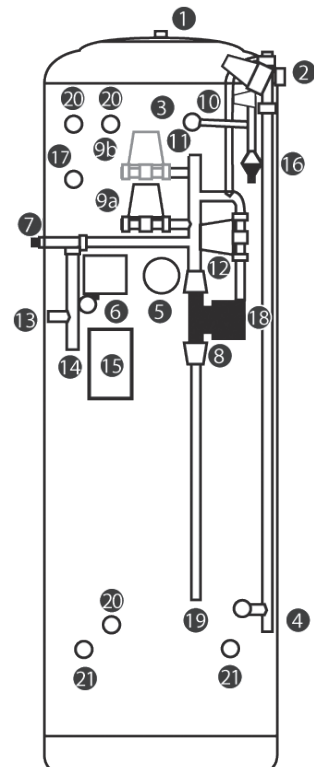
COMMISSIONING

FLUSHING & FILLING

Check that the pressure in the expansion vessel is 3 bar (45PSI), i.e. the same as the setting of the pressure reducing valve. The valve is of the car tyre (Schrader) type. Check all the connections for tightness including any factory made connections such as the immersion heater and the temperature and pressure relief valve. Before filling, open the hot tap furthest away from the TRIBUNE HE to let air out. Open the cold main isolation valve and allow the unit to fill. When water flows from the tap allow it to run for a short while to flush through any dirt, swarf or flux residue. Close the tap and open every other hot tap in turn to purge all remaining air.

DIRECT UNITS

After filling with water and after sterilisation liquid has been purged, switch on the power to the immersion heaters and allow the unit to start to heat. The immersion heater is supplied preset at 55°C. Turning fully to + sets to approx 65°C. Allow unit to heat up, adjust the thermostat so that the heater switches off at 60°C. Record information on commissioning check list (Page 30).

INDIRECT UNITS

Consult the boiler manufacturer's commissioning instructions and fill the primary circuit. Ensure the lever on the two port valve is set to the filling position. When full, move the lever back. Switch the programmer to Domestic Hot Water (DHW) and allow the unit to start to heat. Adjust the dial of the dual thermostat to between 55°C and 65°C as required. Allow unit to heat up, adjust the thermostat so that the heater switches off at 60°C. Record information on commissioning check list (Page 30).

STORAGE TEMPERATURE

The recommended storage temperature for both direct and indirect cylinders is 60-65°C. In hard water areas consideration should be given to reducing this to 50-55°C. In many healthcare applications the guidance on Legionella control and safe water delivery temperatures will require storing the water at 60-65°C, distributing at 50- 55°C and using thermostatic mixing valves to control the final temperature. For details consult the NHS Estates Guidance on safe hot water temperatures.

SAFETY VALVE CHECKS

During heat-up there should have been no sign of water coming from either the expansion relief valve or the temperature/pressure relief valve. Now hold both of these safety valves fully open, allowing as much water as possible to flow through the tundish. Check that your discharge pipework is free from debris and is carrying the water away to waste efficiently. Release the valves and check that they reseat properly. On Completion of commissioning, fill in the Benchmark check list and leave with the house owner.

BENCHMARK SCHEME

The installer must follow the Benchmark code of practice for the Benchmark certification to be valid. The benchmark code of practice can be found on the internet using the following internet site www.centralheating.co.uk and follow links.

SERVICING

GENERAL

Servicing should only be carried out by competent installers and any spare parts used must be purchased from Range Cylinders or merchants. NEVER bypass any safety devices or operate the unit without them being fully operational.

DRAINING

Isolate from the electrical supply to prevent the immersion heaters burning out. Turn off the boiler. Isolate the unit from the cold mains. Attach a hose to the draining tap ensuring that it reaches to a level below the unit (this will ensure an efficient syphon is set up and the maximum amount of water is drained from the unit). First open the hot tap closest to the unit and then open the draining tap.

WARNING: WATER DRAINED OFF MAY BE VERY HOT!
IMPORTANT: After draining the cylinder do not close the hot tap until the cylinder has fully cooled, failure to follow this instruction may result in damage to the cylinder and will invalidate the guarantee.

ANNUAL MAINTENANCE

TRIBUNE HE requires an annual service in order to ensure safe working and optimum performance and maintain the guarantee. It is essential that the following checks are performed by a competent installer

on an annual basis. Commonly this is done at the same time as the annual boiler service.
1) Twist the cap of the expansion relief valve on the inlet control set and allow water to flow for 5 seconds. Release and make sure it resets correctly. Repeat with the pressure / temperature relief valve. In both cases check that the discharge pipework is carrying the water away adequately. If not, check for blockages etc. and clear.
WARNING: THE WATER DISCHARGED MAY BE VERY HOT!
2) Check that any immersion heaters fitted are working correctly and that they are controlling the water at a temperature between 55°C and 65°C.
3) Check the pressure in the expansion vessel is charged to 3 bar. Turn off the water supply to the unit and open a hot tap first. The air valve on expansion vessel is a Schrader (car tyre) type. Air, Nitrogen or CO2 may be used to charge the expansion vessel.
4) Unscrew the head on the inlet control set and clean the mesh filter within. (Some water may escape)
5) The Benchmark Service Record supplied (page 31) with this unit should be updated at each service.
YOUR GUARANTEE MAY BE VOID WITHOUT PROOF OF ANNUAL SERVICING.

FAULT FINDING

FAULT	POSSIBLE CAUSE	SOLUTION
Water escaping from the case	Compression fitting on hot - draw off not sealing	Check/remake joint with sealing paste
Cold water at Hot taps	Direct - immersion heater not switched on or cutout has triggered	Check / reset
	Indirect - boiler not working	Check boiler - consult boiler manufacturers' instructions
	Indirect - motorised valve fault	Check plumbing / wiring to motorised valve
	Indirect - cutout in dual stat has operated	Reset and investigate cause
Water discharges from expansion relief valve	If continual - pressure reducing valve (part of inlet control set) may not be operating correctly	Check outlet pressure from inlet control set is 3 bar.
	If continual - expansion relief valve seat may be damaged	Remove cartridge - check seat and renew if necessary
	If intermittent - expansion vessel charge may have reduced / bladder perished	Check pressure in expansion vessel. Recharge to 3 bar if necessary. If bladder perished replace vessel.
	Unit it being back pressurised	With cylinder cold check pressure in cylinder. If this is the same as the incoming mains pressure then you are getting backfeed. Install a balanced cold supply (see page 6)
Water discharges from temperature &. pressure relief valve	Unit has overheated - thermal controls have failed	"Switch off power to boiler and immersion heaters. Leave water supply on. Wait until discharge stops. Isolate water supply and replace if faulty"
Milky / cloudy water	Oxygenated water	Water from any pressurised system will release oxygen bubbles when flowing. The bubbles will settle out.
No hot water flow	Cold main off	Check and open stopcock
	Strainer blocked in pressure reducing valve	Isolate water supply and clean
	Inlet control set may be fitted incorrectly	Check and refit as required
Noise during hot water draw-off -typically worse in the morning.	Loose airing cupboard pipework	Install extra clips
Hot or warm water from cold tap	If tap runs cold after a minute or so the pipe is picking up heat from heating pipework.	Insulate / re-route

SPARE PARTS

A full range of spare parts is available from Kingspan spare Parts Website   www.kepartshop.com

USER INSTRUCTIONS

Your stainless system is automatic in normal use and requires only annual servicing. You should employ a competent installer to perform the annual servicing. Normally this is timed to coincide with the annual boiler service.

IF WATER IS FLOWING FROM THE SAFETY VALVES THROUGH THE TUNDISH THIS INDICATES A FAULT CONDITION AND ACTION IS NEEDED.

If this water is hot, turn the boiler and / or the immersion heater off. Do not turn off the water until the discharge runs cool. The discharge may also stop.

CALL OUT A COMPETENT PLUMBER TO SERVICE THE UNIT.

Tell them you have a fault on an unvented cylinder. We stock all the spare parts they may need (see page 3).

DRAINING

IMPORTANT: After draining the cylinder do not close the hot tap until the cylinder has fully cooled, failure to follow this instruction may result in damage to the cylinder and will invalidate the guarantee.

The installer must follow the Benchmark code of practice for the Benchmark certification to be valid. Please see page 28 for further details.

Kingspan Water Hot Systems

GUARANTEE TERMS AND CONDITIONS

This guarantee applies only to products manufactured by Kingspan Environmental and its associated brands (hereafter the term 'product' refers to Range Tribune HE).

Kingspan Environmental guarantees to the homeowner that for a period of 2 years from the date of commissioning or legal completion if new build, that the products and associated components installed will - Conform to Kingspan Environmental specification; and be free from defects in materials and workmanship, subject to the conditions set out below.

Please note: this guarantee excludes all pipework and connections and excludes any ancillary equipment as may be connected to the product. (Ex: descaling equipment, water softeners)

The guarantee is extended to a total of 25 years for the stainless steel inner vessel in domestic properties.

This guarantee means that Kingspan Environmental will take responsibility for the cost of guarantee repair of a product by an approved Kingspan Environmental Service Engineer, so that the product shall conform to Kingspan Environmental specification.

Kingspan Environmental reserves the right, at it's discretion to replace a product or major component where it considers it to be beyond economical repair.

In the event of a breakdown during the guarantee period please call our Customer Service Department on:

0845 260 7260 - UK

Guarantee repair is free of charge to you for any parts and labour, providing all the guarantee conditions have been met.

GUARANTEE TERMS & CONDITIONS
Please read the following conditions before registering your product and before seeking any guarantee service support
IMPORTANT: Kingspan Environmental guarantee is subject to the home owner registering with the Kingspan Environmental Customer Service Department within 30 days of commissioning / occupation if new build to confirm:
• Product Make / Model
• Details installation (can be found in Benchmark Log Book left by installer)
Please complete the registration card provided and return to: Customer Service Department, Kingspan Environmental, Tadman Street, Wakefield, WF1 5QU, UK
or register the product on-line at
www.kingspanhws.com/warranty.
If you do not register the Product then Kingspan Environmental Guarantee is limited to twelve months from the date of commissioning.
The product must be serviced by a competent person* within 12 months after commissioning, and thereafter at 12 monthly intervals. Kingspan Renewables reserves the right to seek evidence of this maintenance to our reasonable satisfaction before approving any guarantee servicing / repairs. This may include evidence of completed BenchmarkTM service record and service agreement / invoice.

Annual Services are available from the Customer Service/ Technical Support team.
*A competent person is a business that has been adjudged by an accredited body** to be sufficiently competent to self-certify that its work complies with Document (G) Part 3 of the Building Regulations of England and Wales
*May Include SEI registered installers and/or FAS trained plumbers who have completed the renewables technology module
** An example of which is BPEC
Any exchanged component will become the legal property of Kingspan Environmental.
This guarantee is valid provided that:
• The product has been installed by a competent installer and as per the instructions contained in the installation manual and all relevant Codes of Practice and Regulations in force at the time of installation.
• Any disinfection has been carried out in accordance with BS 6700.
• The product has not been modified in any way.
• The system is fed from domestic mains water supply complience with water regulations 2000
• The product has only been used for the storage of wholesome water (max. 250mg/l chloride – for hard water areas, Kingspan suggest the use of an electrolytic scale reducer)
• Any 3rd party labour charges associated with replacing the unit or any of its components have been authorised in advance by the Customer Service/ Technical Support team.
• It has only been used for the storage of potable water.
• The product has not been subjected to frost, nor has it been tampered with or been subjected to misuse or neglect.
• No factory fitted parts have been removed for unauthorised repair or replacement.
• The BenchmarkTM Commissioning Checklist and Service Record included with this product Installation Manual have been completed.
• Regular maintenance has been carried out by a competent person in accordance with the requirements set out in the maintenance section of the installation manual.
• The owner or installer has registered the product on-line at www.kingspanhws.com/warranty within 30 days of purchase. Failure to do so may result in a reduced warranty period.
• Evidence of purchase and date of supply must be submitted upon making a claim.
• Any replacement parts used should be authorised Kingspan Environmental spare parts.

GUARANTEE TERMS AND CONDITIONS

•If a defect arises and a valid claim is received within the Warranty Period, at its option and to the extent permitted by law Kingspan Environmental shall either
(1) Repair the defect at no charge, using new or refurbished replacement parts or
(2) Exchange the product with a product that is new or which has been manufactured using new or serviceable used parts or
(3) Refund the purchase price or a reasonable proportion of the purchase price.
Kingspan Environmental reserves the right to inspect the product at your home before proceeding with any guarantee repair or replacement.
Any valid guarantee claim or guarantee service does not extend the original guarantee period.
The guarantee only applies to the property at which the product was originally installed and applied only to properties in the United Kingdom & Ireland. The guarantee is fully transferable from a change of legal ownership of the property.
EXCLUSIONS – The guarantee does not cover:
Kingspan Environmental will not be liable for any fault or costs arising from incorrect installation, incorrect application, lack of regular maintenance or neglect, accidental damage, malicious damage, misuse, any alteration, tampering or repair carried by a non competent person.
• The product if the factory fitted temperature and pressure relief valve has been tampered with or removed.
• Neither the Distributor nor Manufacturer shall be responsible for any consequential damage howsoever caused.
• The effects of scale build up or the effects of corrosion.
• Any consequential losses caused by the failure or malfunction of the product.
• Faults and any associated costs arising from lack of power or water.

• Failure incurred by water contamination, air pollution and natural disasters.
• This guarantee is not valid for installations outside the United Kingdom.
• Any consequential loss, loss of profits, revenues or receipts howsoever arising from any non-conformity or defect affecting the product or from any delay in repair or replacement of the product.
• Any loss or damage caused by delay in conduct of services or supply of parts required to rectify the non-conformity or defect. (provided Kingspan Environmental will use all reasonable efforts to ensure services are performed on a timely basis).
• For repair or replacement of any Product consumables or decorative finishes, such as filters and casings.
This guarantee does not affect any legal rights you may have as a consumer under applicable national legislation governing your purchase of this product
Kingspan Environmental shall make final determination as to the validity of any guarantee claim, and shall be entitled to charge you all reasonable costs incurred in investigating the claim where there is no fault found, or the guarantee claim is rejected in accordance with these conditions.

Customer Service Department
Kingspan Environmental
Tadman Street
WAKEFIELD
WF1 5QU
U.K

GUARANTEE REGISTRATION CARD

To be completed by the home owner. Please use this card to register within 30 days of commissioning / occupation if new build to benefit from the Kingspan Environmental 2 year guarantee.

By completing this form, you consent to Kingspan Renewables holding and using those details for all purposes directly related to the administration and conduct of guarantee services. Apart from the necessary usage, your personal data will not be disclosed to third parties by Kingspan Environmental.

Home Owner Name

Home Address

Post code

Make of product   Model/size

Serial Number

Installers Contact details
(can be found in benchmark log book)

Date of installation
can be found in benchmark log book)

Signature of homeowner   Date

Or Signature of developer
(If new build)   Date

TECHNICAL SPECIFICATIONS

PRESSURE SPECIFICATIONS

Maximum Inlet Water Pressure	12 Bar
Operating Pressure	3.0 Bar
Expansion Valve Opening Pressure	6.0 Bar
Expansion Vessel Charge Pressure	3.0 Bar
Maximum Operating Pressure	7.0 Bar
Opening Pressure of T & P Valve	7.0 Bar
Opening Temperature of T & P Valve	90°C
Maximum Pressure on Primary Circuit (Indirect & Solar Coil)	3.5 Bar

DIRECT IMMERSION ELEMENT SPECIFICATIONS

Element Rating	3kW 240 V
Thread Type	1 3/4" BSP
Fuse Requirement	13A via Double Pole Switch
Control Thermostat for Element - Temperature Range	45°C - 65°C
High Limit Thermostat for Element - Temperature Set Point	85°C

INDIRECT IMMERSION ELEMENT SPECIFICATIONS

Element Rating	3kW 240 V
Thread Type	1 3/4" BSP
Fuse Requirement	13A via Double Pole Switch
Control Thermostat for Element - Temperature Range	45°C - 65°C
High Limit Thermostat for Element - Temperature Set Point	75°C

Kingspan Water Hot Systems

SPECIFICATION

CYLINDER DETAILS & PERFORMANCE

PRODUCT CODE	WEIGHT EMPTY	WEIGHT FULL	CAPACITY	Designated Solar Volume	Fossil Fuel Volume	HEAT-UP TIME	70% RE-HEAT TIME	INDIRECT COIL SURFACE AREA	INDIRECT COIL CAPACITY	INDIRECT COIL kW RATING	SOLAR COIL SURFACE AREA	SOLAR COIL CAPACITY	Heat Loss (kW/24Hr)
TRIBUNE DIRECT SLIMLINE													
TDS60	20	80	60	-	-	55m	-	N/A	N/A	N/A	N/A	N/A	0.99
TDS90	29	120	90	-	-	80m	-	N/A	N/A	N/A	N/A	N/A	1.05
TDS120	38	160	120	-	-	105m	-	N/A	N/A	N/A	N/A	N/A	1.12
TDS150	46	200	150	-	-	125m	-	N/A	N/A	N/A	N/A	N/A	1.29
TDS180	54	235	180	-	-	140m	-	N/A	N/A	N/A	N/A	N/A	1.37
TDS210	60	270	210	-	-	160m	-	N/A	N/A	N/A	N/A	N/A	1.64
TRIBUNE INDIRECT SLIMLINE													
TIS60	26	90	60	-		10m 45s	8m 02s	0.67	3.69	17.2	N/A	N/A	0.99
TIS90	36	130	90	-		17m 22s	15m 12s	0.67	3.69	16.1	N/A	N/A	1.05
TIS120	44	165	120	-		25m 01s	16m 25s	0.67	3.69	19.0	N/A	N/A	1.12
TIS150	52	205	150	-		26m 24s	19m 37s	0.77	4.26	19.5	N/A	N/A	1.29
TIS180	60	240	180	-		32m 14s	23m 05s	0.77	4.26	20.4	N/A	N/A	1.37
TIS210	68	280	210	-		36m 36s	27m 40s	0.77	4.26	23.4	N/A	N/A	1.64
TRIBUNE DIRECT													
TD90	25	115	90	-	-	85m	-	N/A	N/A	N/A	N/A	N/A	0.91
TD120	30	150	120	-	-	110m	-	N/A	N/A	N/A	N/A	N/A	1.05
TD150	35	185	150	-	-	135m	-	N/A	N/A	N/A	N/A	N/A	1.23
TD180	40	220	180	-	-	160m	-	N/A	N/A	N/A	N/A	N/A	1.32
TD210	45	255	210	-	-	185m	-	N/A	N/A	N/A	N/A	N/A	1.58
TD250	50	300	250	-	-	225m	-	N/A	N/A	N/A	N/A	N/A	1.84
TD300	55	355	300	-	-	270m	-	N/A	N/A	N/A	N/A	N/A	2.10
TRIBUNE INDIRECT													
TI90	30	120	90	-		20m 25s	14m 18s	0.67	3.69	15.78	N/A	N/A	0.91
TI120	35	155	120	-		23m 47s	18m 00s	0.67	3.69	18.35	N/A	N/A	1.05
TI150	40	190	150	-		29m 36s	20m 35s	0.77	4.26	19.07	N/A	N/A	1.23
TI180	45	225	180	-		31m 58s	22m 47s	0.77	4.26	20.28	N/A	N/A	1.32
TI210	50	260	210	-		33m 05s	26m 16s	0.86	4.83	23.08	N/A	N/A	1.58
TI250	55	305	250	-		41m 18s	28m 20s	0.86	4.83	24.40	N/A	N/A	1.84
TI300	60	360	300	-		46m 01s	32m 52s	0.86	4.83	24.87	N/A	N/A	2.10
TRIBUNE ECOCYL DIRECT													
TDS60ECO	25	85	60	-	-	55m	-	N/A	N/A	N/A	N/A	N/A	0.86
TDS90ECO	30	120	90	-	-	80m	-	N/A	N/A	N/A	N/A	N/A	0.89
TDS120ECO	35	155	120	-	-	105m	-	N/A	N/A	N/A	N/A	N/A	0.96
TDS150ECO	40	190	150	-	-	125m	-	N/A	N/A	N/A	N/A	N/A	1.06
TDS180ECO	45	225	180	-	-	140m	-	N/A	N/A	N/A	N/A	N/A	1.19
TDS210ECO	50	260	210	-	-	160m	-	N/A	N/A	N/A	N/A	N/A	1.36

PRODUCT CODE	WEIGHT EMPTY	WEIGHT FULL	CAPACITY	Designated Solar Volume	Fossil Fuel Volume	HEAT-UP TIME	70% RE-HEAT TIME	INDIRECT COIL SURFACE AREA	INDIRECT COIL CAPACITY	INDIRECT COIL kW RATING	SOLAR COIL SURFACE AREA	SOLAR COIL CAPACITY	Heat Loss (kW/24Hr)
TRIBUNE ECOCYL INDIRECT													
TIS60ECO	30	90	60	-		10m 45s	8m 02s	0.67	3.69	17.2	N/A	N/A	0.86
TIS90ECO	35	125	90	-		17m 22s	15m 12s	0.67	3.69	16.1	N/A	N/A	0.89
TIS120ECO	36	156	120	-		25m 01s	16m 25s	0.67	3.69	19.0	N/A	N/A	0.96
TIS150ECO	45	195	150	-		26m 24s	19m 37s	0.77	4.26	19.5	N/A	N/A	1.06
TIS180ECO	36	216	180	-		32m 14s	23m 05s	0.77	4.26	20.4	N/A	N/A	1.19
TIS210ECO	55	265	210	-		36m 36s	27m 40s	0.77	4.26	23.4	N/A	N/A	1.36
TRIBUNE SOLAR DIRECT													
TSS150	40	190	150		-	31m 05s	22m 16s	N/A	N/A	N/A	0.67	3.69	1.23
TSS180	45	225	180		-	33m 30s	23m 34s	N/A	N/A	N/A	0.67	3.69	1.32
TSS210	50	260	210		-	33m 05s	26m 33s	N/A	N/A	N/A	0.86	4.83	1.58
TSS250	55	305	250		-	41m 18s	28m 20s	N/A	N/A	N/A	0.86	4.83	1.84
TSS300	60	360	300		-	46m 01s	32m 52s	N/A	N/A	N/A	0.86	4.83	2.10
TRIBUNE SOLAR INDIRECT													
TT150	45	200	150			22m 50s	11m 44s	0.67	3.69	17.2	0.67	3.69	1.23
TT180	50	235	180			25m 15s	17m 02s	0.67	3.69	20.2	0.67	3.69	1.32
TT210	55	270	210			28m 31s	15m 50s	0.77	4.26	23.4	0.86	4.83	1.58
TT250	60	315	250			31m 42s	22m 42s	0.77	4.26	28.3	0.86	4.83	1.84
TT300	65	370	300			36m 04s	21m 30s	0.86	4.83	29.2	0.86	4.83	2.10
TRIBUNE INDIRECT PRE-PLUMBED													
TI120P4	45	165	120	-		23m 47s	18m 00s	0.67	3.69	18.35	N/A	N/A	1.05
TI150P4	50	200	150	-		31m 05s	22m 16s	0.77	4.26	19.07	N/A	N/A	1.23
TI180P4	55	235	180	-		31m 58s	22m 47s	0.77	4.26	20.28	N/A	N/A	1.32
TI210P4	60	270	210	-		35m 30s	26m 16s	0.86	4.83	23.08	N/A	N/A	1.58
TI250P4	65	315	250	-		41m 08s	30m 06s	0.86	4.83	24.40	N/A	N/A	1.84
TI300P4	70	320	300	-		49m 40s	36m 12s	0.86	4.83	24.87	N/A	N/A	2.10
TRIBUNE SOLAR INDIRECT PRE-PLUMBED													
TT180P4	60	240	180			25m 15s	17m 02s	0.67	3.69	20.2	0.67	3.69	1.32
TT210P4	65	275	210			28m 31s	15m 50s	0.77	4.26	23.4	0.86	4.83	1.58
TT250P4	70	320	250			31m 42s	22m 42s	0.77	4.26	28.3	0.86	4.83	1.84
TT300P4	75	375	300			36m 04s	21m 30s	0.86	4.83	29.2	0.86	4.83	2.10

Kingspan **Water** Hot Systems

BENCHMARK SCHEME

The installer must follow the Benchmark code of practice for the Benchmark certification to be valid. The Benchmark code of practice can be found on the internet using the following internet site www.centralheating.co.uk and follow links.

Kingspan is a licensed member of the Benchmark Scheme which aims to improve the standards of installation and commissioning of domestic heating and hot water systems in the UK and to encourage regular servicing to optimise safety, efficiency and performance.

Benchmark is managed and promoted by the Heating and Hotwater Industry Council. For more information visit www.centralheating.co.uk

Please ensure that the installer has fully completed the Benchmark Checklist on the inside back pages of the installation instructions supplied with the product and that you have signed it to say that you have received a full and clear explanation of its operation.

The installer is legally required to complete a commissioning checklist as a means of complying with the appropriate Building Regulations (England and Wales).

All installations must be notified to Local Area Building Control either directly or through a Competent Persons Scheme. A Building Regulations Compliance Certificate will then be issued to the customer who should, on receipt, write the Notification Number on the Benchmark Checklist. This product should be serviced regularly to optimise its safety, efficiency and performance. The service engineer should complete the relevant Service Record on the Benchmark Checklist after each service. The Benchmark Checklist will be required in the event of any warranty.

MAINS PRESSURE HOT WATER STORAGE SYSTEM COMMISSIONING CHECKLIST

This Commissioning Checklist is to be completed in full by the competent person who commissioned the storage system as a means of demonstrating compliance with the appropriate Building Regulations and then handed to the customer to keep for future reference.

Failure to install and commission this equipment to the manufacturer's instructions may invalidate the warranty but does not affect statutory rights.

Customer Name _____ Telephone Number _____
Address _____
Cylinder Make and Model _____
Cylinder Serial Number [| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |]
Commissioned by *(print name)* _____ Registered Operative ID Number _____
Company Name _____ Telephone Number _____
Company Address _____
Commissioning Date _____

To be completed by the customer on receipt of a Building Regulations Compliance Certificate*:

Building Regulations Notification Number *(if applicable)* _____

ALL SYSTEMS PRIMARY SETTINGS (indirect heating only)

Is the primary circuit a sealed or open vented system?	Sealed ☐	Open ☐	
What is the maximum primary flow temperature?			☐ °C

ALL SYSTEMS

What is the incoming static cold water pressure at the inlet to the system?			☐ bar
Has a strainer been cleaned of installation debris (if fitted)?	Yes ☐	No ☐	
Is the installation in a hard water area (above 200ppm)?	Yes ☐	No ☐	
If yes, has a water scale reducer been fitted?	Yes ☐	No ☐	
What type of scale reducer has been fitted?			
What is the hot water thermostat set temperature?			☐ °C
What is the maximum hot water flow rate at set thermostat temperature (measured at high flow outlet)?			☐ l/min
Time and temperature controls have been fitted in compliance with Part L of the Building Regulations?		Yes ☐	
Type of control system (if applicable)	Y Plan ☐	S Plan ☐	Other ☐
Is the cylinder solar (or other renewable) compatible?		Yes ☐	No ☐
What is the hot water temperature at the nearest outlet?			☐ °C
All appropriate pipes have been insulated up to 1 metre or the point where they become concealed		Yes ☐	

UNVENTED SYSTEMS ONLY

Where is the pressure reducing valve situated (if fitted)?			
What is the pressure reducing valve setting?			☐ bar
Has a combined temperature and pressure relief valve and expansion valve been fitted and discharge tested?	Yes ☐	No ☐	
The tundish and discharge pipework have been connected and terminated to Part G of the Building Regulations		Yes ☐	
Are all energy sources fitted with a cut out device?	Yes ☐	No ☐	
Has the expansion vessel or internal air space been checked?	Yes ☐	No ☐	

THERMAL STORES ONLY

What store temperature is achievable?	☐ °C
What is the maximum hot water temperature?	☐ °C

ALL INSTALLATIONS

The hot water system complies with the appropriate Building Regulations	Yes ☐
The system has been installed and commissioned in accordance with the manufacturer's instructions	Yes ☐
The system controls have been demonstrated to and understood by the customer	Yes ☐
The manufacturer's literature, including Benchmark Checklist and Service Record, has been explained and left with the customer	Yes ☐

Commissioning Engineer's Signature

Customer's Signature

(To confirm satisfactory demonstration and receipt of manufacturer's literature)

*All installations in England and Wales must be notified to Local Authority Building Control (LABC) either directly or through a Competent Persons Scheme. A Building Regulations Compliance Certificate will then be issued to the customer.

benchmark
COLLECTIVE MARK
THE MARK OF QUALITY FOR THE INSTALLATION, COMMISSIONING AND SERVICING OF DOMESTIC HEATING AND HOT WATER SYSTEMS

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SERVICE RECORD

It is recommended that your hot water system is serviced regularly and that the appropriate Service Record is completed.

Service Provider
Before completing the appropriate Service Record below, please ensure you have carried out the service as described in the manufacturer's instructions.

SERVICE 1   Date _____

Engineer Name _____

Company Name _____

Telephone Number _____

Comments _____
_____
_____
_____

Signature _____

SERVICE 2   Date _____

Engineer Name _____

Company Name _____

Telephone Number _____

Comments _____
_____
_____
_____

Signature _____

SERVICE 3   Date _____

Engineer Name _____

Company Name _____

Telephone Number _____

Comments _____
_____
_____
_____

Signature _____

SERVICE 4   Date _____

Engineer Name _____

Company Name _____

Telephone Number _____

Comments _____
_____
_____
_____

Signature _____

SERVICE 5   Date _____

Engineer Name _____

Company Name _____

Telephone Number _____

Comments _____
_____
_____
_____

Signature _____

SERVICE 6   Date _____

Engineer Name _____

Company Name _____

Telephone Number _____

Comments _____
_____
_____
_____

Signature _____

SERVICE 7   Date _____

Engineer Name _____

Company Name _____

Telephone Number _____

Comments _____
_____
_____
_____

Signature _____

SERVICE 8   Date _____

Engineer Name _____

Company Name _____

Telephone Number _____

Comments _____
_____
_____
_____

Signature _____

SERVICE 9   Date _____

Engineer Name _____

Company Name _____

Telephone Number _____

Comments _____
_____
_____
_____

Signature _____

SERVICE 10   Date _____

Engineer Name _____

Company Name _____

Telephone Number _____

Comments _____
_____
_____
_____

Signature _____

Temperature differential controller
5 inputs, 2 outputs

Kingspan SOLAR

SC400
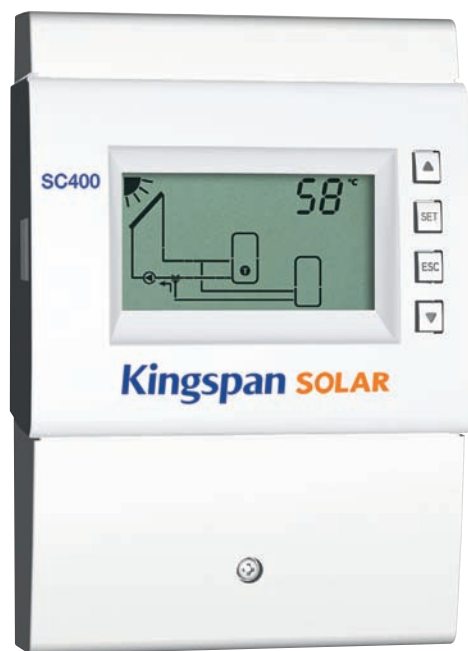
Installation and operating instructions

Content

General safety instructions

- This document is part of the product.
- Use the device only after reading and understanding this document.
- Keep this document in a safe place for the entire service life of the device. Pass this document on to subsequent owners and operators of the device.
- Adhere to all safety instructions. Consult (further) professional personnel in the event of any ambiguities.
- The measures described in this document may only be performed by qualified technical professionals. Exception: End-customers may operate the device when they have previously been trained by a technical professional.
- The solar system can be damaged by improper operation of the device.
- The device must not be connected to the power supply if it has an open or damaged casing.
- The device must not be connected to the mains power supply when:
    – the casing is open or damaged.
    – cables are damaged.
- Factory labels and markings must never be altered, removed or rendered unreadable.
- Observe the prescribed conditions of use, see Section 14, p. 50.
- This device is not intended for:
    – Children
    – Persons with physical, sensory or mental impairment
    – Persons without sufficient experience or knowledge unless they are instructed in the use of the device, and initially supervised, by a person responsible for their safety.

EC declaration of conformity

This product conforms to the applicable European directives with regard to its design and its operating behaviour. This conformity has been verified. Further information in this regard can be obtained from your dealer.

6 Operation

This section contains general information on operating the controller.

6.1 Operating buttons

The device is operated using the $\triangle$, $\triangledown$, SET, ESC and ⚲ buttons as follows:

$\triangle$	• Scrolls up through the menu [1] • Increases the setting value by 1 step
$\triangledown$	• Scrolls down through the menu [1] • Decreases the setting vaule by 1 step
SET	• Selects a setting to be changed (setting value flashes) • Confirms a setting value or jumps one level down in the menu structure [1] • Calls up the settings menu (not in manual mode)
ESC	• Discards an entered setting • Jumps up by one operating level
⚲	Sets the operating mode

[1] Exception: Initial commissioning

ⓘ **Note**
We recommend that you write down all settings that you have changed.

6.2 Display when operating

- A flashing component in the system graphic means: The displayed operational or setting value applies to the flashing component.
  Exception: ⚲ always flashes in manual mode.
- A flashing symbol is indicated in the figures by ☼.
- Displays that are automatically alternately displayed are shown overlapping in the figures. Example: Figure in Section 7.2, p. 21.

7 Modes of operation

7.1 Changing the mode of operation

⚠ **Caution**
Danger of pump damage if run dry. Only switch the system to manual or automatic mode when the system is filled.

1. Remove the front panel.
2. Press the ⚲ button for 2 seconds to change the mode of operation.
3. Repeat step 2 if necessary.
4. Mount the front panel.
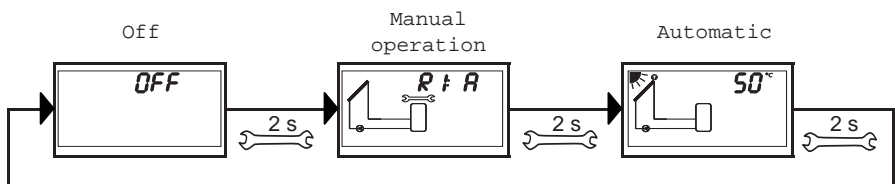
7.2 Off mode

Functionality

- All outputs are switched off (outputs/control outputs without power, relays open).
- OFF and the software version are displayed alternately.
  See example in Fig. below: Software version St 1.3
- Backlighting is red.
- Settings menu can be called up.
- The Off mode is preset when the device is delivered.

Operation

▶ Press and hold the SET button for 2 seconds to call up the settings menu (**1**).
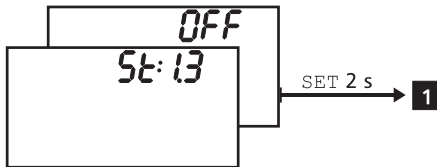
7.3 Manual mode

Functionality

- Backlighting is red, spanner symbol ⌇═══⌐ flashes.
- The controller outputs (pumps, valves) can be manually switched. Possible switching states
  0: off
  1: on
  A: Automatic operation as per the settings in the settings menu
- Current temperatures and operating hours can be displayed (status display).
- When changing to manual mode all outputs are switched to A, R1 is displayed.
  Exception: First commissioning (all outputs at 0).
- Typical application: Functional test (maintenance), fault-finding.

Operation

You switch the outputs on and off as follows:
1. If necessary, press △▽ to select a different output.
2. Press SET. The switching state flashes.
3. △▽ - Press to change the switching state.
4. Press SET to adopt the change.

See **2** in the following Figure (system 1.1 and output R1 are shown as an example).

You display the current temperatures and operating hours as follows:
1. Press ESC. The temperature/operating hours are displayed and the associated component flashes (**3**, display is not illustrated).
2. △▽ - Press to select a different component.
3. Press SET to leave the temperature/operating hours display.
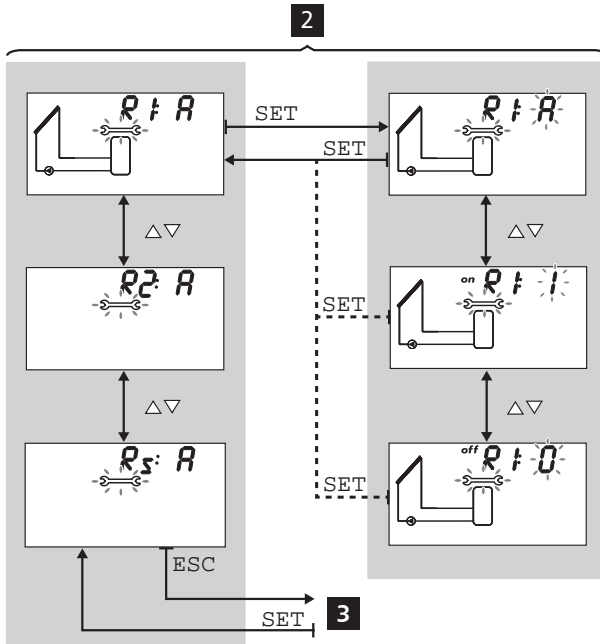
7.4 Automatic mode

Functionality

`Automatic` is the normal mode of operation and the system is automatically controlled. The following actions are possible:

- Display status (status display): Display the status of external components (temperatures, switching states, run times).
- Display stored min./max. values (temperature sensors) or sum/difference values (operating hours[1]) of the pumps and valves).
  Summed values (symbol ∑): Operating hours since first commissioning. Summed values cannot be reset.
  Difference values (symbol Δ): Operating hours since the last reset to 0.
- Reset the stored min./max./difference values.
- Call up the settings menu.

[1] Summed switch-on times of the outputs

Operation

√ The controller shows the status display.

You can display the status of external components as follows:

▶ △▽ - Press to display the status of other components (**4** , shown using system 1.1 as an example).

You can display and reset the stored min./max./difference values as follows:

1. Press △▽ as required, in order to display other components (**4** , component flashes).
2. Press SET. The min./max./difference values are displayed alternately **5** .
3. If desired, press and hold the SET button for 2 seconds to reset the **currently** (!) displayed value **6** .
4. Press ESC. The status display is shown.
5. Repeat steps 1 to 4 if necessary.

You access the settings menu as follows:

▶ Press and hold SET for 2 seconds **7** . The settings menu appears.

8 Settings menu

8.1 Overview

The following graphic provides an overview of the structure of the settings menu.

Time		System		Functions [1]	
	▽△		▽△		▽△
SET		**SET**		**SET**	
Set time		No system – 0.1		Circulation – F01	
			▽△		▽△
		1 storage tank, 1 collector array – 1.1		Back-up heating – F02	
			▽△		▽△
		1 storage tank with heating return increase, 1 collector array – 1.2		Solid fuel boiler – F03	
			▽△		▽△
		1 storage tank with external heat exchanger, 1 collector array – 1.3		Quick charge – F04	
			▽△		▽△
		1 storage tank with zone loading, 1 collector array – 1.4		Heat quantity – F05	
			▽△		▽△
		1 storage tank, 2 collector arrays – 1.5		Thermostat – F06	
			▽△		▽△
		2 storage tanks, 1 collector array (pump-controlled) – 2.1		Difference thermostat – F07	
			▽△		▽△
		2 storage tanks, 1 collector array (pump/valve-controlled) – 2.2		Interval – F08	
			▽△		▽△
		1 swimming pool, 1 collector array – 3.1		Stagnation reduction – F09	
			▽△		▽△
		1 swimming pool with external heat exchanger, 1 collector array – 3.2		Holiday - recooling – F10	
			▽△		▽△
		1 storage tank, 1 swimming pool, 1 collector array (pump-controlled) – 4.1		Active cooling – F11	
			▽△		▽△
		1 storage tank, 1 swimming pool, 1 collector array (pump/valve-controlled) – 4.2		Frost protection – F12	
					▽△
				Upper storage tank display – F13	
					▽△
				Alarm output – F14	

▽△	Parameters [1]	◄ ▽△ ►	Priority	◄ ▽△ ►	Factory setting
	SET		**SET**		**SET for 5 seconds**

Parameters
Maximum temperature storage tank 1 – P01
▽△
Maximum temperature storage tank 2 – P02
▽△
Maximum temperature swimming pool – P03
▽△
Switch-on temperature difference solar circuit 1 – P04
▽△
Switch-off temperature difference solar circuit 1 – P05
▽△
Switch-on temperature difference solar circuit 2 – P06
▽△
Switch-off temperature difference solar circuit 2 – P07
▽△
Switch-on temperature difference external heat exchanger – P08
▽△
Switch-off temperature difference external heat exchanger – P09
▽△
Maximum collector temperature – P10
▽△
Minimum collector temperature – P11
▽△
Switch-on temperature difference heating return increase– P12
▽△
Switch-off temperature difference heating return increase – P13
▽△
Maximum temperature loading circuit – P14
▽△
Minimum temperature loading circuit – P15
▽△
Loading strategy storage tank 1 – P16
▽△
Loading strategy storage tank 2 – P17
▽△
Speed control R1 – P18
▽△
Speed control R2 – P19
▽△
Control of storage tank loading valve – P20
▽△
Control of zone loading valve – P21
▽△
Control of return increase – P22

Priority
Storage tank 1 before storage tank 2
▽△
Storage tank 2 before storage tank 1
▽△
Only storage tank 1
▽△
Only storage tank 2

Factory setting
Reset to factory settings

[1] Only specific functions and parameters may be called up depending on the selected system.

8.2 Calling up the settings menu and selecting a menu entry

√ `Automatic` or `Off mode` is selected.

1. Press and hold SET for two seconds. The settings menu is displayed, menu entry 🕐 flashes.
2. Press △▽ to select a different menu entry.
3. Change the settings as described in the following sections.

8.3 Setting the time

√ 🕐 flashes.

1. Press SET. The hours display flashes.
2. Press △▽ to change the hour.
3. Press SET. The minutes flash.
4. Press △▽ to change the minute.
5. Press SET. The change is adopted.

8.4 Setting the system

ⓘ **Note**
The systems are described in Section 3.4, p. 10.

√ **S**yst flashes.

1. Press SET. The number of the current system flashes.
2. Press ▽△ to select another system.
3. Press SET. The change is adopted.

8.5 Setting the functions

√ **F**unc flashes.

▶ Continue as described in Section 9, p. 28.

8.6 Setting the parameters

ⓘ **Note**
Details on the parameters are provided in Section 10, p. 43.

√ **P**ara flashes.

1. Press SET. P:01 (parameter number) flashes.
2. Press △▽ to display a different parameter.
3. Press SET. The value of the parameter is displayed, associated components flash in the system graphics.
4. Press SET. The parameter value flashes.
5. Press △▽ to change the value.
6. Press SET to adopt the change.
7. Press ESC. The parameter number is displayed (flashing).
8. If necessary, repeat steps 2 – 7.

8.7   Setting the priority

Functionality

The priority determines the sequence in which the storage tanks are loaded (only for systems with more than 1 storage tank). If the higher priority storage tank (first-priority storage tank) cannot be loaded because the collector temperature is too low then the lower priority storage tank (second-priority storage tank) is loaded [1]. The following values can be selected:

-1-: Only storage tank 1 is loaded.
-2-: Only storage tank 2 is loaded.
1-2: Storage tank 1 is the first-priority storage tank.
2-1: Storage tank 2 is the first-priority storage tank.

[1]   Every 30 minutes, the controller checks to see if the first-priority storage tank can be loaded. Due to the warming of the collector array this check can take several minutes. On the basis of the heating process, the controller predicts whether it is possible to load the first-priority storage tank in a foreseeable period of time.

Operation

√   **Prio** flashes.

1. Press SET. The current value flashes.
2. △▽ - Press to change the priority. The system graphics change accordingly.
3. Press SET. The change is adopted.

8.8   Resetting to factory defaults

√   ↻ flashes, RESEt is displayed (RE and SEt alternately).

1. Press and hold SET for 5 seconds.
2. After a brief progress display, ok is displayed and the reset is finished.
3. Continue as described in Section 4, p. 13.

9   Functions

9.1   Operation

Displaying the functions
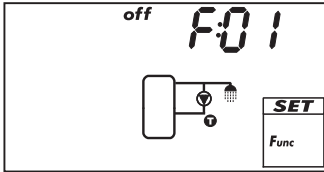
The following information is visible when the functions are displayed:
- Function number, e.g. F:01 (Fig. left)
- Switching state:
  - on: Function is activated
  - off: Function is deactivated (Fig. left)

ⓘ **Note**
If neither on nor off are displayed then the function cannot be used. Possible causes:
- The set system does not allow the use of this function.
- All outputs are used.

You display the functions as follows:

√   **Func** flashes.

1. Press SET. F:01 flashes.
2. △▽ - Press to display the next function.

Activating the function
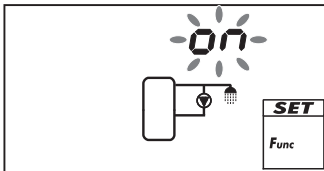
A function must be activated (activation = on) and all the associated characteristics must be correctly set before it can be used. If a function is activated and then exited before the characteristics are set then oFF flashes briefly (Fig. left). After this, the function is displayed with a switching state of off (function is deactivated).

You activate a function as follows:

√   Function number flashes.

1. Press SET. The function is selected.
2. Press SET. oFF flashes.
3. △▽ - Press. on flashes.
4. Press SET. The function is activated.
5. Set the characteristics as described below.

Setting the characteristics

The functions have different numbers of characteristics. The characteristic values are always set via the same sequence of operating steps.

You set the values of characteristics as follows:

√   The function has been activated as described previously.

1. △▽ - Press to select a characteristic.
2. Press SET. The value of the characteristic is displayed, the associated components flash in the system graphics.
3. △▽ - Press to change the value.
4. Press SET to adopt the change.
5. Repeat steps 1 to 4 for the other characteristics.
6. Press ESC when all characteristics of the function have been set. The function number flashes.

9.2   Characteristics

The main characteristics for the functions are described below. The figures show examples.

Output
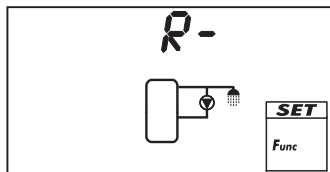
When a function should control an output, instead of the factory setting R- (= *no output*; Fig. left), one of the outputs R1, R2 or R_S must be selected. Only free outputs are displayed for selection.

Temperature control
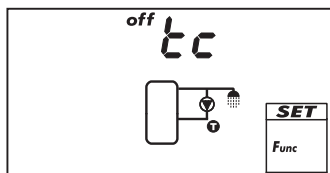
When a function is to be temperature controlled, the temperature control must be switched on (tc = temperature control). In the figure, the temperature control is switched off (off).

Input
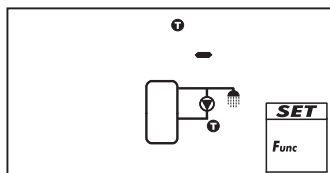
When a function requires a temperature sensor, a sensor input must be selected instead of the factory setting. The factory setting is "❶ –" (no input; Fig. left).
All sensor inputs are displayed for selection. A single sensor input can be simultaneously used by several functions.

Switch-on temperature difference
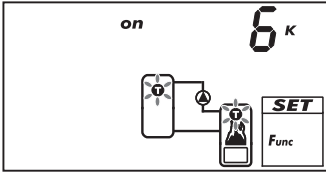
If a function contains a differential thermostat then the switch-on temperature difference can be set. The relevant sensor symbols flash.

Switch-off temperature difference
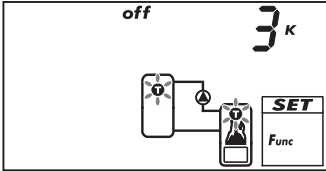
If a function contains a differential thermostat then the switch-off temperature difference can be set. The relevant sensor symbols flash.

Switch-on temperature
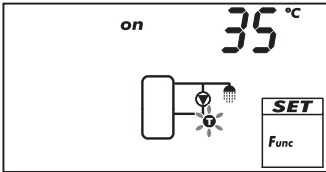
If a function contains a thermostat then the switch-on temperature can be set. The relevant sensor symbol flashes.

Switch-off temperature
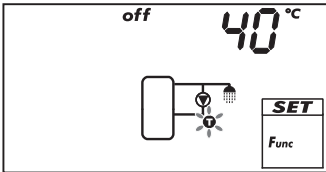
If a function contains a thermostat then the switch-off temperature can be set. The relevant sensor symbol flashes.

Time control
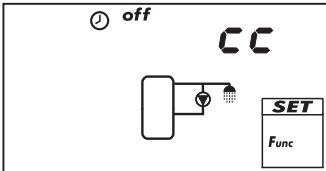
If a function is to be time controlled then the time control must be activated and the time windows must be set (cc = clock control). In the Fig. at the left the time control is switched off (off).

Starting time of a time window
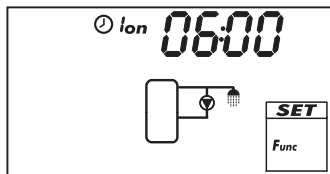
When setting the start time of a time window, the following is displayed to the left of the start time (see Fig. left):

- ⏱
- Number of time window 1 ... 3, whose start time is to be set (in this case: 1)
- on

End time of a time window
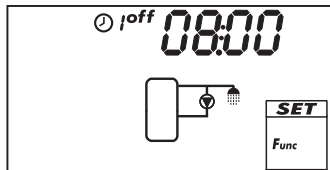
When setting the end time of a time window, the following is displayed to the left of the end time (see Fig. left):

- ⏱
- Number of time window 1 ... 3, whose end time is to be set (in this case: 1)
- off

ⓘ **Note**
The start time always lies *before* the end time! When an attempt is made to set a start time that is later than the end time, the end time is automatically adjusted.

9.3 Function descriptions

The tables in this section describe the function characteristics as follows:

- The *rows* contain the characteristics in the same sequence as they appear on the display.
- The *columns* contain the following information, from left to right:

Column	Description
Display	Sample display when setting the characteristics.
Characteristic	Designation of the characteristics and their interdependence. Dependent characteristics can only be selected and set when the higher level characteristic has the value on. This is shown as follows: • Higher-level characteristic: **bold** text • Dependent characteristics: indented to the right below the higher level characteristic Example: In the table for the *circulation* function, the sensor input, switch-on temperature and switch-off temperature characteristics are only displayed when the temperature control is set to on.
min., max., factory default setting	Lower (min.) and upper limit (max.) of a characteristic range and the factory setting. When a value range only contains a few values then these are individually listed. Example: on, oFF.

9.3.1 Circulation

off **F·0 1**
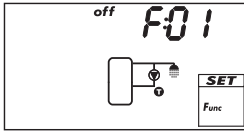
Switches a circulation pump on and off on a temperature and/or time controlled basis.

Temperature control: If the temperature in the circulation return falls below the T_{on} value, then the circulation pump is switched on until the T_{off} temperature is reached.

Time control: The circulation pump is switched on when the current time lies within one of 3 configurable time windows.

Temperature and time control: The circulation pump is switched on when the switch-on conditions for the temperature *and* time control are satisfied.

(i) **Note**
Install the circulation sensor at least 1.5 m away from the storage tank to avoid false measurements due to heat conduction of the pipes.

Display	Characteristic	min.	max.	Factory setting
	Activation	on, oFF		oFF
	Output (circulation pump)	free output R1/R2/R$_S$		–
	Pump type (R1, R2 only)	AC, HE [1]		AC
	Pump characteristic (HE only)	AA, Ab, C (see page p. 16)		–
	Temperature control	on, oFF		oFF
	Sensor input for circulation return temperature sensor	1 ... 5		–
	Switch-on temperature T_{on}	0 °C	T_{off} – 2 K	30 °C
	Switch-off temperature T_{off}	T_{on} + 2 K	95 °C	35 °C
	Time control	on, off		off
	Time window 1 start/end	0:00	23:59	6:00/8:00
	Time window 2 start/end	0:00	23:59	12:00/13:30
	Time window 3 start/end	0:00	23:59	18:00/20:00

[1]

⚠ **Caution:**
Standard pump: Set **AC**!
High-efficiency pump: Set **HE**!
External relay: Set AC pump type!

9.3.2   Back-up heating
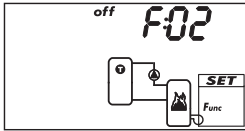
Performs temperature-dependent switching of an output for heating a storage tank using an oil or gas burner. The function can be time restricted.

Temperature control: If the temperature in the storage tank falls below the T_{on} value, then the external heating is switched on until the T_{off} temperature is reached.

Time restriction: The function is executed when the current time lies within one of 3 configurable time windows.

Display	Characteristic	min.	max.	Factory setting
	Activation	on, oFF		oFF
	Output (external heating)	free output R1/R2/R$_S$		–
	Pump type (R1, R2 only)	AC, HE [1]		AC
	Pump characteristic (HE only)	AA, Ab, C (see page p. 16)		–
	Sensor input for readiness part of the storage tank	1 … 5		–
	Switch-on temperature T_{on}	0 °C	T_{off} – 2 K	55 °C
	Switch-off temperature T_{off}	T_{on} + 2 K	95 °C	60 °C
	Time restriction	on, oFF		oFF
	Time window 1 start/end Time window 2 start/end Time window 3 start/end	0:00 0:00 0:00	23:59 23:59 23:59	6:00/8:00 12:00/13:30 18:00/20:00

[1]

⚠ **Caution:**
Standard pump: Set **AC**!
High-efficiency pump: Set **HE**!
External consumer (e.g. 230 V relay): Set AC pump type.

9.3.3   Solid fuel boiler
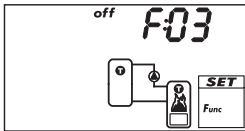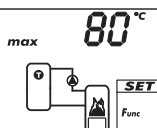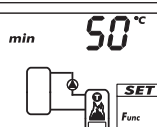
Controls a pump in order to heat a storage tank using a solid fuel boiler. The pump is switched on when all of the following conditions are satisfied at the same time:
- The temperature difference between the solid fuel boiler and the storage tank exceeds $T_{diff on}$.
- The solid fuel boiler temperature lies above the *min. solid fuel boiler temperature*.
- The storage tank temperature lies below the *max. storage tank temperature*.

The pump is switched off when one the following conditions is satisfied:
- The temperature difference between the solid fuel boiler and the storage tank drops below $T_{diff off}$.
- The solid fuel boiler temperature drops below the *min. solid fuel boiler temperature*.
- The storage tank temperature reaches the *max. storage tank temperature.*

Speed control of the pump can be activated as required. The loading strategy of the speed control system attempts to regulate the temperature of the solid fuel boiler to match the control target that has been set. The control target should be at least 10 K above the minimum temperature of the solid fuel boiler.

Display	Characteristic	min.	max.	Factory setting
	Activation	on, oFF		oFF
	Output (pump)	free output R1/R2/R$_S$		–
	Pump type (R1, R2 only)	AC, HE [1] [2]		AC
	Pump characteristic (HE only)	AA, Ab, C (see page p. 16)		–
	Speed control (R1, R2 only)	on, oFF [2]		oFF
	Minimum speed (AC only)	30%	100%	50%
	Minimum speed (HE + AA only)	0%	100%	25%
	Minimum speed (HE + Ab only)	0%	100%	75%
	Sensor input for storage tank temperature	1 … 5		–
	Sensor input for solid fuel boiler temperature	1 … 5		–
	Switch-on temperature difference $T_{diff\ on}$	$T_{diff\ off}$ + 2 K	20 K	6 K
	Switch-off temperature difference $T_{diff\ off}$	0 K	$T_{diff\ on}$ − 2 K	3 K
max **80**°C (SET / Func)	Max. storage tank temperature	0 °C	150 °C	60 °C
min **50**°C (SET / Func)	Min. solid fuel boiler temperature	30 °C	95 °C	50 °C
	Control target for solid fuel boiler temperature (Speed control = on)	0 °C	95 °C	60 °C

[1]

⚠ **Caution:**
Standard pump: Set **AC**!
High-efficiency pump: Set **HE**!

[2]

⚠ **Caution:**
External consumer (e.g. 230 V relay): Set AC pump type and set the speed control to oFF!

9.3.4 Quick charging
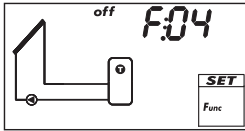
Uses a higher loading temperature to load the the upper region of the storage tank more quickly in order to provide early prevention of back-up heating by the conventional heating system. To do this, the loading strategy of the first-priority storage tank is changed from differential loading to absolute temperature loading as soon as the temperature in the upper tank region drops below T_{on}[*]. At the same time, an attempt is made to achieve a higher temperature in the storage tank by using the speed control.

[*] To retain the proven quick charging functionality , when T_{on} is changed the value of T_{off} is changed in parallel.

ⓘ **Note**
To use the *quick charge* function, the speed control must be switched on; more information on this is provided in Section 10, p. 43 (P18, P19).

Display	Characteristic	min.	max.	Factory setting
	Activation	on, oFF		oFF
	Sensor input for upper storage tank temperature	1 ... 5		–
	Switch-on temperature T_{on}	0 °C	85 °C	50 °C
	Switch-off temperature T_{off}	T_{on} + 2 K	T_{on} + 10 K	52 °C

9.3.5 Heat quantity
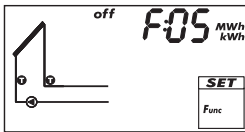
Calculates the acquired heat volume based on the following information:
• Supply temperature
• Return temperature
• Flow rate volume determined via calculations based on the pump speed or by pulse water meter measurements (terminal 5).
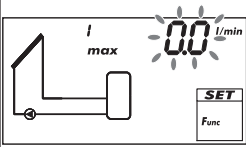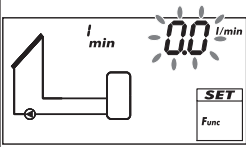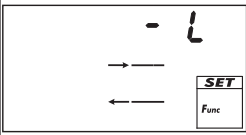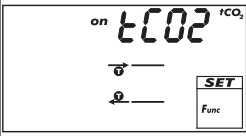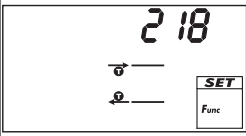
ⓘ **Note**
Calculation based on the pump speed cannot be performed when *No system* (system 0.1) has been selected.

• Glycol proportion and accounting for the temperature dependent thermophysical properties of the heat transfer fluid

Additional possibility: Display of the amount of CO_2 saved by using the system. The amount of CO_2 is calculated from the acquired heat volume. To do this, the controller requires the conversion factor g_{CO2}/kWh_{therm} to be entered.

Display	Characteristic	min.	max.	Factory setting
	Activation	on, oFF		oFF
	Type of flow rate acquisition	tyP 1, tyP 2 [1]		–

	Type 1: Flow rate value at max. speed $F_{max.}$ (pump 1). When the Fig. at the left is displayed (value flashes) then enter the value read from the flow rate display.	$F_{min.}$	99.9 l/min	0.0 l/min
	Type 1: Flow rate value at min. speed $F_{min.}$ (pump 1). When the Fig. at the left is displayed (value flashes) then enter the value read from the flow rate display.	0.0 l/min	$F_{max.}$	0.0 l/min
	Type 1: Flow rate value at max. speed $F_{max.}$ (pump 2) [2]	$F_{min.}$	99.9 l/min	0.0 l/min
	Type 1: Flow rate value at min. speed $F_{min.}$ (pump 2) [2]	0.0 l/min	$F_{max.}$	0.0 l/min
	Type 2: Flow rate of the pulse water meter in litres/pulse; see the pulse water meter data sheet.	1L, 10L, 25L		−L (no flow rate value selected)
	Glycol proportion	0%	60%	40%
	Supply sensor input (warm)	1 … 5		−
	Return sensor input (cold)	1 … 5		−
	CO_2 display	on, oFF		oFF
	g_{CO2}/kWh_{therm}	1	999	218 [3]

[1] tyP 1: Calculation of the flow rate from the pump speed. To do this, the displayed flow rate values are entered at two measuring points (pump speed min. and max.).
tyP 2: Determining the flow rate using a pulse water meter. The flow rate of the pulse water meter in litres/impulse is entered.

[2] Only for systems with 2 pumps. Enter the displayed flow rate values at F_{max}/$F_{min.}$ in the same manner as with type 1, pump 1.

[3] Source: Erneuerbare Energien in Zahlen – Nationale und internationale Entwicklung (Renewable energy sources in figures - national and international development), p. 20, as of: June 2010; Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)

9.3.6 Thermostat
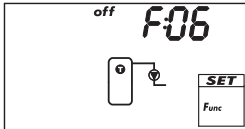
Switches an output on and off, depending on the temperature range of any desired sensor. The function can be time restricted and is set for heating or cooling as follows:

Heating: The T_{on} value is set lower than T_{off}.
When the sensor temperature drops below T_{on}, the output is switched on until the temperature exceeds T_{off}.

Cooling: The T_{on} value is set higher than T_{off}.
When the sensor temperature exceeds T_{on}, the output is switched on until the temperature drops below T_{off}.

Time restriction: The function is executed when the current time lies within one of 3 configurable time windows.

> **Note**
> The T_{on} value can be set to the same value as T_{off}. However, this setting has no practical application.

Display	Characteristic	min.	max.	Factory setting
	Activation	on, oFF		oFF
	Output	free output R1/R2/R$_S$		–
	Pump type (R1, R2 only)	AC, HE [1]		AC
	Pump characteristic (HE only)	AA, Ab, C (see page p. 16)		–
	Sensor input	1 … 5		–
	Switch-on temperature T_{on}	0 °C	180 °C	20 °C
	Switch-off temperature T_{off}	0 °C	180 °C	20 °C
	Time restriction	on, oFF		oFF
	Time window 1 start/end	0:00	23:59	00:00/00:00
	Time window 2 start/end	0:00	23:59	00:00/00:00
	Time window 3 start/end	0:00	23:59	00:00/00:00

[1]

Caution:
Standard pump: Set **AC**!
High-efficiency pump: Set **HE**!
External consumer (e.g. 230 V relay): Set AC pump type!

9.3.7 Differential thermostat
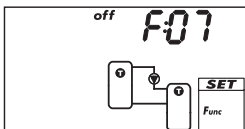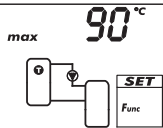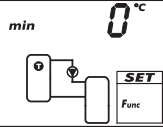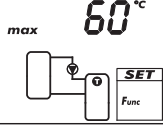
Switches an output on and off as follows – time restricted and depending on the set temperature difference between 2 selectable sensors:
When the temperature difference exceeds $T_{diff\ on}$, the output is switched on until the temperature difference drops below $T_{diff\ off}$. In addition to this, the discharging of the heating source can be limited to a particular temperature range ($T_{src\ min.}/T_{src\ max.}$) and the loading of the heating target can be limited to a maximum value ($T_{sink\ max.}$).

Time restriction: The function is executed when the current time lies within one of 3 configurable time windows.

Speed control of the pump can be activated as required. The loading strategy of the speed control system attempts to regulate the temperature difference to match the switch-on temperature difference that has been set.

Display	Characteristic	min.	max.	Factory setting
	Activation	on, oFF		oFF
	Output	free output R1/R2/R$_S$		–
	Pump type (R1, R2 only)	AC, HE [1] [2]		AC
	Pump characteristic (HE only)	AA, Ab, C (see page p. 16)		–
	Speed control (R1, R2 only)	on, oFF [2]		oFF
	Minimum speed (AC only)	30%	100%	50%
	Minimum speed (HE + AA only)	0%	100%	25%
	Minimum speed (HE + Ab only)	0%	100%	75%
	Heat source sensor input	1 … 5		–
	Heat sink sensor input	1 … 5		–
	Switch-on temperature difference $T_{diff\ on}$	$T_{diff\ off}$ + 2 K	80 K	6 K
	Switch-off temperature difference $T_{diff\ off}$	0 K	$T_{diff\ on}$ − 2 K	3 K
	Heat source max. temperature $T_{src\ max.}$	$T_{src\ min.}$ + 2 K	180 °C	100 °C
	Heat source min. temperature $T_{src\ min.}$	0 °C	$T_{src\ max.}$ − 2 K	0 °C
	Heat sink max. temperature $T_{sink\ max.}$	0 °C	95 °C	60 °C
	Time restriction	on, oFF		oFF
	Time window 1 start/end	0:00	23:59	00:00/00:00
	Time window 2 start/end	0:00	23:59	00:00/00:00
	Time window 3 start/end	0:00	23:59	00:00/00:00

[1]

⚠ **Caution:**
Standard pump: Set **AC**!
High-efficiency pump: Set **HE**!

[2]

⚠ **Caution:**
External consumer (e.g. 230 V relay): Set AC pump type and set the speed control to oFF!
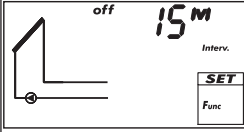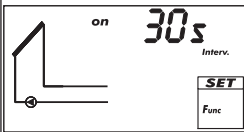
9.3.8 Interval
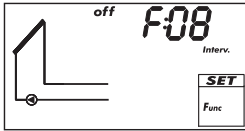
Periodically switches the solar circuit pump on and off in order to measure the actual collector temperature. The delay between 2 switch-on operations and the switch-on duration can be set. Applications:
- Collector types where the mechanical construction prevents the temperature from being measured at a suitable place
- Unsuitable position of the temperature sensor on the collector

The function can be time restricted to prevent unnecessary periodic operation at night.

Display	Characteristic	min.	max.	Factory setting
	Activation	on, oFF		oFF
	Time window start/end	00:00	23:59	08:00/19:00
	Wait time	1 min	999 min	15 min
	Switch-on duration	3 s	999 s	5 s

9.3.9 Stagnation reduction
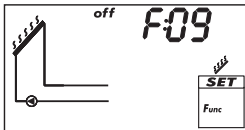
Delays the end of the storage tank's loading phase in order to reduce, or even to avoid, the system standstill (stagnation) times at high temperatures. To do this, the pump is stopped repeatedly, and only briefly switched on again at high collector temperatures. Since the efficiency drops heavily at high collector temperatures, the loading takes longer and possible stagnation occurs later.

ⓘ **Note**
This function cannot be activated in systems with swimming pools.

Display	Characteristic	min.	max.	Factory setting
	Activation	on, oFF		oFF

9.3.10 Holiday - recooling
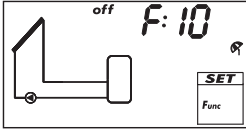
Attempts to reduce, or even to avoid, the system standstill (stagnation) times at high temperatures. To do this, at night the storage tank – or the second-priority storage tank if 2 storage tanks are present – is discharged as far as possible to the set minimum temperature, if the storage tank temperature during the day was 10 K below the set maximum temperature.

Stagnation occurs when not enough hot water is removed form the system during an absence (holiday).

(i) **Notes**
The following applies to this function:
- Only activate if you intend to be absent for an extended period.
- Deactivate this after returning from a holiday in order to avoid an unnecessary waste of energy via the collector circuit.
- This function cannot be activated in systems with swimming pools.

Display	Characteristic	min.	max.	Factory setting
	Activation	on, oFF		oFF
	Minimum storage tank temperature	0 °C	95 °C	35 °C

9.3.11 Active cooling
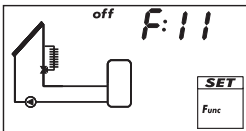
Switches an additional cooler into the solar circuit when one of the following conditions is satisfied:
- The temperature of the storage tank – or of the second-priority storage tank in the case of 2 storage tanks – lies 10 K below the set maximum temperature.
- Holiday recooling is performed at night.

Application examples: Areas with strong solar irradiation, avoidance of stagnation.

Display	Characteristic	min.	max.	Factory setting
	Activation	on, oFF		oFF
	Output (switching-in of additional cooler)	free output $R1/R2/R_S$		–

9.3.12 Frost protection
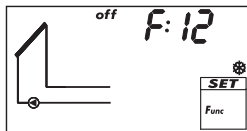
Attempts to prevent freezing of the collectors by pumping heat from the first-priority storage tank into the collectors:

- The collector temperature is below +5 °C: Solar circuit pump is switched on.
- The collector temperature is above +7 °C: Solar circuit pump is switched off.

The frost protection function is only useful when the heat transfer fluid contains insufficient or no anti-freeze. It is recommended to generally use heat transfer fluid with anti-freeze!

⚠️ **Caution**

Despite the frost protection function being activated, the solar system can freeze under the following conditions:

- The first-priority storage tank is unloaded, a back-up heating system is not present.
- Heat transfer fluid contains insufficient or no anti-freeze.
- Power outage
- Unsuitable position of the temperature sensor on the collector
- Collector sensor or cable is broken or has a short.circuit.
- The collectors are installed in a position exposed to the wind.
- Solar circuit pump is faulty.

Display	Characteristic	min.	max.	Factory setting
	Activation	on, oFF		oFF

9.3.13 Upper storage tank display
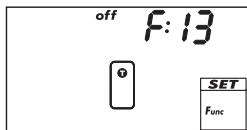
Shows the temperature in the upper region of 1 or 2 storage tanks. For this, an appropriate sensor must be connected to each tank. The measured temperatures are not used for control purposes.

Display	Characteristic	min.	max.	Factory setting
	Activation	on, oFF		oFF
	Storage tank 1 upper sensor input	1 ... 5		–
	Storage tank 2 upper sensor input[1]	1 ... 5		–

[1] Only for systems with 2 storage tanks

9.3.14   Alarm output

off **F: 14**

⚠
SET
Func
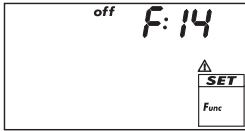
Activates the set output in the case of the following faults:
- Sensor fault due to short-circuit or interruption
- Clock loses the current time due to an extended power outage.
- Volume flow fault: `Er: 1` [1]
- The electronic overload switch or fuse has triggered: `Er: 3 ...  Er: 6` [1]

Display	Characteristic	min.	max.	Factory setting
	Activation	on, oFF		oFF
	Output	free output R1/R2/Rs		–
norm ⚠ **SET** *Func*	Control	norm, InV [2]		norm

[1]   More information is provided in Section 13.2, p. 48.
[2]   `norm` = normal: Contact closes when a fault occurs.
       `InV` = inverted: Contact opens when a fault occurs.
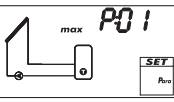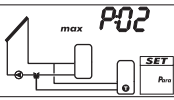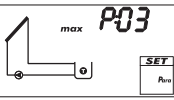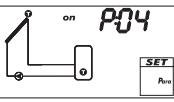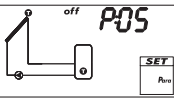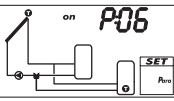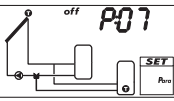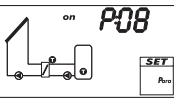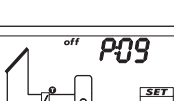
10 Parameters
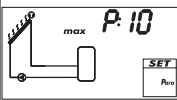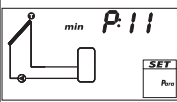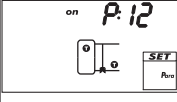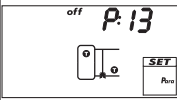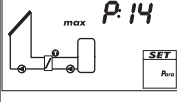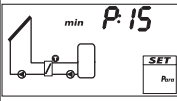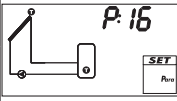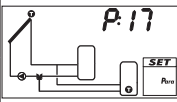
Note the following when setting parameters:
- Observe the operating data of the solar components used.
- The individual parameters are only displayed and can be changed when this is permitted by the type of solar system that has been set.
  Special case: System 0.1 has no parameters, no P is displayed.
- In most applications the controller can be used without modifying any parameters.
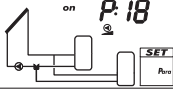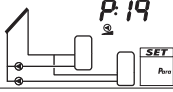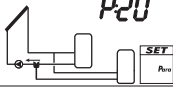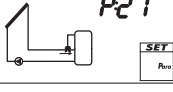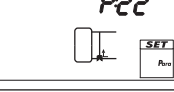
More information is provided in the *Functionality* column.

The figures in this section show examples.

Display	Parameter	min.	max.	Factory setting	Functionality
max $PO1$ SET Pro	Maximum temperature storage tank 1	0 °C	95 °C	60 °C	When the maximum temperature is exceeded, no more loading occurs until the temperature drops to 3 K below the set value.
max $PO2$ SET Pro	Maximum temperature storage tank 2	0 °C	95 °C	60 °C	
max $PO3$ SET Pro	Maximum temperature swimming pool	10 °C	45 °C	30 °C	
on $PO4$ SET Pro	Switch-on temperature difference solar circuit 1	T_{P05} + 2 K	50 K	8 K	When the switch-on temperature difference between collector and storage tank is reached, the storage tank is loaded. Loading ends when the switch-off temperature difference is reached.
off $PO5$ SET Pro	Switch-off temperature difference solar circuit 1	0 K	T_{P04} – 2 K	4 K	
on $PO6$ SET Pro	Switch-on temperature difference solar circuit 2	T_{P07} + 2 K	50 K	8 K	
off $PO7$ SET Pro	Switch-off temperature difference solar circuit 2	0 K	T_{P06} – 2 K	4 K	
on $PO8$ SET Pro	Switch-on temperature difference external heat exchanger	T_{P09} + 2 K	50 K	6 K	When the switch-on temperature difference between the secondary side of the external heat exchanger and the storage tank is reached, the storage tank is loaded.
off $PO9$ SET Pro	Switch-off temperature difference external heat exchanger	0 K	T_{P08} – 2 K	3 K	Loading ends when the switch-off temperature difference is reached.

Display	Parameter	min.	max.	Factory setting	Functionality
P:10	Maximum collector temperature	$T_{P11} + 20$ K	180 °C	130 °C	When the maximum collector temperature is exceeded, no more loading occurs until the temperature drops to 3 K below the set value.
P:11	Minimum collector temperature	0 °C	$T_{P10} - 20$ K	0 °C	Load only starts when the minimum collector temperature is exceeded.
P:12	Switch-on temperature difference heating return increase	$T_{P13} + 2$ K	50 K	6 K	The heating return increase is switched on (switching valve on) when the switch-on temperature difference between the storage tank and heating return temperature is reached.
P:13	Switch-off temperature difference heating return increase	0 K	$T_{P12} - 2$ K	3 K	When the switch-off temperature difference is reached, the heating return increase is switched off.
P:14	Maximum temperature loading circuit	$T_{P15} + 20$ K	130 °C	100 °C	The difference between P14 and the temperature of the secondary side of the heat exchanger controls the solar circuit pump and the storage tank loading pump. [1]
P:15	Minimum temperature loading circuit	0 °C	$T_{P14} - 20$ K	0 °C	The storage tank loading pump is only switched on when the secondary side of the heat exchanger is greater than or equal to P15.
P:16	Loading strategy storage tank 1	dIFF[2], AbS		[3]	The loading strategy depends on the storage tank system used and the usage of the system.
	Control target of differential temperature loading (dIFF)	2 K	50 K	8 K	diff: Highest efficiency. The control target is the temperature difference between the collector and the storage tank. [4]
	Control target of absolute temperature loading (AbS)	0 °C	95 °C	60 °C	AbS: Useful when the system requires particular temperatures, e.g. to avoid switching on the external back-up heating system.
P:17	Loading strategy storage tank 2	dIFF[2], AbS		[3]	The control target is the temperature of the collector. [4]
	Control target of differential temperature loading (dIFF)	2 K	50 K	8 K	
	Control target of absolute temperature loading (AbS)	0 °C	95 °C	60 °C	

Display	Parameter	min.	max.	Factory setting	Functionality
`P:18` on	Pump type `R1`	`AC`, `HE`		`AC`	⚠️ **Caution** Danger of malfunctions in the controller or damage to the components. `HE` **must** be set when using a high-efficiency pump and `AC` **must** be set when using a standard pump! Set speed control to `oFF` when an external relay is connected or speed control is not wanted.
	Pump characteristic (`HE` only)	`AA`, `Ab`, `C` (see p. 16)		–	
	Speed control (`R1`, `R2` only)	`on`, `oFF`		`oFF`	
	Minimum speed (`AC` only)	30%	100%	50%	
	Minimum speed (`HE` + `AA` only)	0%	100%	25%	
	Minimum speed (`HE` + `Ab` only)	0%	100%	75%	
`P:19`	Pump type `R2`	`AC`, `HE`		`AC`	
	Pump characteristic (`HE` only)	`AA`, `Ab`, `C` (see p. 16)		–	
	Speed control (`R1`, `R2` only)	`on`, `oFF`		`oFF`	
	Minimum speed (`AC` only)	30%	100%	50%	
	Minimum speed (`HE` + `AA` only)	0%	100%	25%	
	Minimum speed (`HE` + `Ab` only)	0%	100%	75%	
`P:20`	Control of the storage tank loading valve	`norm`, `InV`		`norm`	`norm` (normal) must be set when the valve has been installed according to the installation instructions in Section 3.4, p. 10. `InV` (inverted) must be set when the valve has been installed in a *different* way compared to the installation instructions.
`P:21`	Control of the zone loading valve	`norm`, `InV`		`norm`	
`P:22`	Control of the return increase	`norm`, `InV`		`norm`	

Tab. 3:   Parameters

[1] When the secondary side of the heat exchanger reaches 3 K below `P14`, the *solar circuit pump* is switched off. At 10 K below `P14` the solar circuit pump is switched on again.
   When the secondary side of the heat exchanger reaches `P14`, the *storage tank loading pump* is switched off. Below `P14`, the storage tank loading pump is switched on again.

[2] `diFF` is defined as a fixed value for swimming pools.

[3] The factory setting depends on the system that has been set.

[4] The pump speed is adjusted accordingly to achieve the control target.

11 Deinstallation and disposal

⚠️ **Danger**
Risk of death by electrocution!
- Disconnect the device from the power supply before opening the casing.
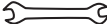- All work on an open device must be performed by professional personnel.

1. To dismantle the controller, follow the installation instructions in the reverse order; see Section 3, p. 5.
2. Dispose of the device in accordance with the local regulations.

12 Information messages

Display	Description
max **139**℃	The maximum collector temperature has been reached, the solar circuit pump in the respective solar circuit has been switched off. The symbols in the status display flash when the temperature of the respective collector is selected
89℃	The maximum collector temperature has been reached, the solar circuit pump in the respective solar circuit has been switched off. ✎ is shown in the status display when the temperature of the respective collector is *not* selected.
max **98**℃	The maximum storage tank temperature has been reached. The symbols in the status display flash when the temperature of the respective collector is selected.

13 Troubleshooting

⚠️ **Warning**
Risk of death by electrocution!
- Immediately disconnect the device from the mains supply when it can no longer be operated safely, e.g.in the case of visible damage.
- Disconnect the device from the mains power before opening the case.
- All work on an open device must be performed by professional personnel.

ⓘ **Note**
The controller is a quality product, conceived for years of continuous trouble-free operation. Observe the following points:
- Faults are often caused by connected components and not by the controller.
- The following notes on fault identification indicate the most common causes of faults.
- Only return the controller when you are absolutely sure that none of the problems listed below is responsible for the fault.

13.1 General faults

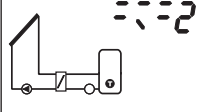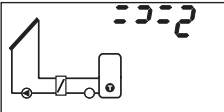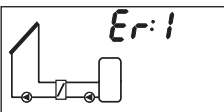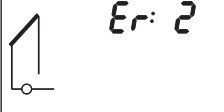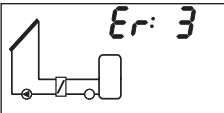| Display	Possible cause	Remedy
Controller not functioning at all		
Display empty/ dark	Controller power supply is interrupted.	• Check the controller power cable. • Check the fuse for the power supply.
Controller constantly displays 12:00		
12 flashes	Controller power supply was interrupted for longer than 15 minutes.	Set the time.
Solar circuit pump not operating + switch-on condition is fulfilled		
	Pump power supply is interrupted.	Check the pump power cable.
	Pump has seized up.	Get the pump working again, replace if necessary.
	• The maximum storage tank temperature has been reached. • The maximum collector temperature has been reached. • In multi storage tank systems: The system has stopped due to a priority test. • The minimum collector temperature has not been reached. • The maximum loading temperature has been reached. • Stagnation reduction is activated and is actively intervening in the control process. • The storage tank has been deactivated in the priority settings.	No fault
flashes	Pump has been switched off in manual mode (off).	• No fault • Switch to automatic mode if necessary.
Solar circuit pump is operating + switch-on condition not fulfilled		

	• The following functions are activated and are actively intervening in the control process:
	    – Interval function
	    – Holiday function
	    – Anti-freeze function
	 • Blockage protection for the pumps is being performed.
		• No fault
		 • Deactivate the relevant function, if necessary.

flashes	Pump has been switched on in manual mode (on).	• No fault • Switch to automatic mode if necessary.

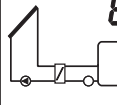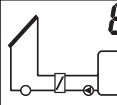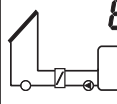| Solar circuit pump is operating + switch-on condition is fulfilled but no heat transport in the solar circuit (no heat transfer fluid circulation)		
	Air is in the solar circuit.	Check the solar circuit for air.
	The isolating valve is closed.	Check the isolating valve.
	Limescale or contamination in solar circuit	Clean the solar circuit (flush).
Solar circuit pump shows cycle behaviour		
	Temperature difference too small	Adjust temperature difference in the *Parameters* settings menu.
	Collector sensor incorrectly positioned	Check the position of the collector sensor and correct if necessary.

Tab. 4:   General faults

13.2   Error messages

When an error message is displayed and no button has been pressed for 5 minutes, the backlighting turns red and starts flashing.
The figures in this section show examples.

Display	Description	Remedy
	An interruption was detected at the displayed sensor input (in this case: sensor input 2).	Check the cable and sensor connected to the sensor input.
	A short-circuit was detected at the displayed sensor input (in this case: sensor input 2).	Check the cable and sensor connected to the sensor input.
	The controller has detected a flow rate fault in the primary or secondary circuit. A permanently high temperature difference exists between the heat source and loading target. Primary and secondary circuit pumps are flashing. Possible causes: • Air in system • The isolating valve is closed. • The pump is faulty.	• Bleed air from the system. • Check the isolating valve. • Check the pump.
	The controller has detected faulty operation of the system. This is probably caused by swapped collector connections.	Check the collector connections.
	A short-circuit exists at output R1, the pump connected to output R1 flashes. Possible causes: • The pump is faulty. • Wiring fault	• Check the pump. • Check the wiring to R1.

Er: 4	Output `R1` is overloaded, the pump connected to output `R1` flashes. Cause: The permissible values for `R1` specified on the type plate have been permanently exceeded, the output has been switched off.	Check the electrical data of the pump, replace pump if necessary. `R1` is automatically switched on again.
Er: 5	A short-circuit exists at output `R2`, the pump connected to output `R2` flashes. Possible causes: • The pump is faulty. • Wiring fault	• Check the pump. • Check the wiring to `R2`.
Er: 6	Output `R2` is overloaded, the pump connected to output `R2` flashes. Cause: The permissible values for `R2` specified on the type plate have been permanently exceeded, the output has been switched off.	Check the electrical data of the pump, replace pump if necessary. `R2` is automatically switched on again.

Tab. 5:   Error messages

13.3   **Checking the Pt1000 temperature sensors**

Warning
Risk of death by electrocution! Before opening the device, make sure that all cables leading to the device have been disconnected from the mains power and cannot be unintentionally reconnected to the mains power.

1. Remove the terminal cover.
2. Disconnect the temperature sensor.
3. Measure the resistance of the temperature sensor with an ohmmeter and compare with the following table. Small deviations are acceptable.
4. Mount the terminal cover.

Temperature – Resistance assignments

Temperature [°C]	-30	-20	-10	0	10	20	30	40	50	60	70
Resistance [Ω]	882	922	961	1000	1039	1078	1117	1155	1194	1232	1271

Temperature [°C]	80	90	100	110	120	130	140	150	160	170	180
Resistance [Ω]	1309	1347	1385	1423	1461	1498	1536	1573	1611	1648	1685

Tab. 6:   Temperature-resistance assignment with Pt1000 temperature sensors