



Hamworthy Trigon

ST3 Solar Pump Station

**Installation, Commissioning,
Operation & Service Instructions**

IMPORTANT NOTE

**THESE INSTRUCTIONS MUST BE READ
AND UNDERSTOOD BEFORE INSTALLING,
COMMISSIONING, OPERATING OR
SERVICING EQUIPMENT**



Heating *at work.*

Customer After Sales Services

Telephone: **01202 662555** E-mail: **service@hamworthy-heating.com** Fax: **01202 662522**

Technical Enquiries

To supplement the detailed technical brochures, technical advice on the application and use of products in the Hamworthy Heating range is available from our technical team in Poole and our accredited agents.

Site Assembly

Hamworthy offer a service of site assembly for many of our products where plant room access is restricted. Using our trained staff we offer a higher quality of build and assurance of a boiler built and tested by the manufacturer.

Commissioning

Commissioning of equipment by our own engineers, accredited agents or specialist sub-contractors will ensure the equipment is operating safely and efficiently.

Service Contracts

Regular routine servicing of equipment by Hamworthy service engineers inspects the safety and integrity of the plant, reducing the risk of failure and improving performance and efficiency. Service contracts enable you to plan and budget more efficiently.

Breakdown service, repair, replacement

Hamworthy provide a rapid response breakdown, repair or replacement service through head office at Poole and accredited agents throughout the UK.

Spare Parts

We offer a comprehensive range of spare parts, providing replacement parts for both current and discontinued products. Delivery options are available to suit you. Please refer to our website for more details.

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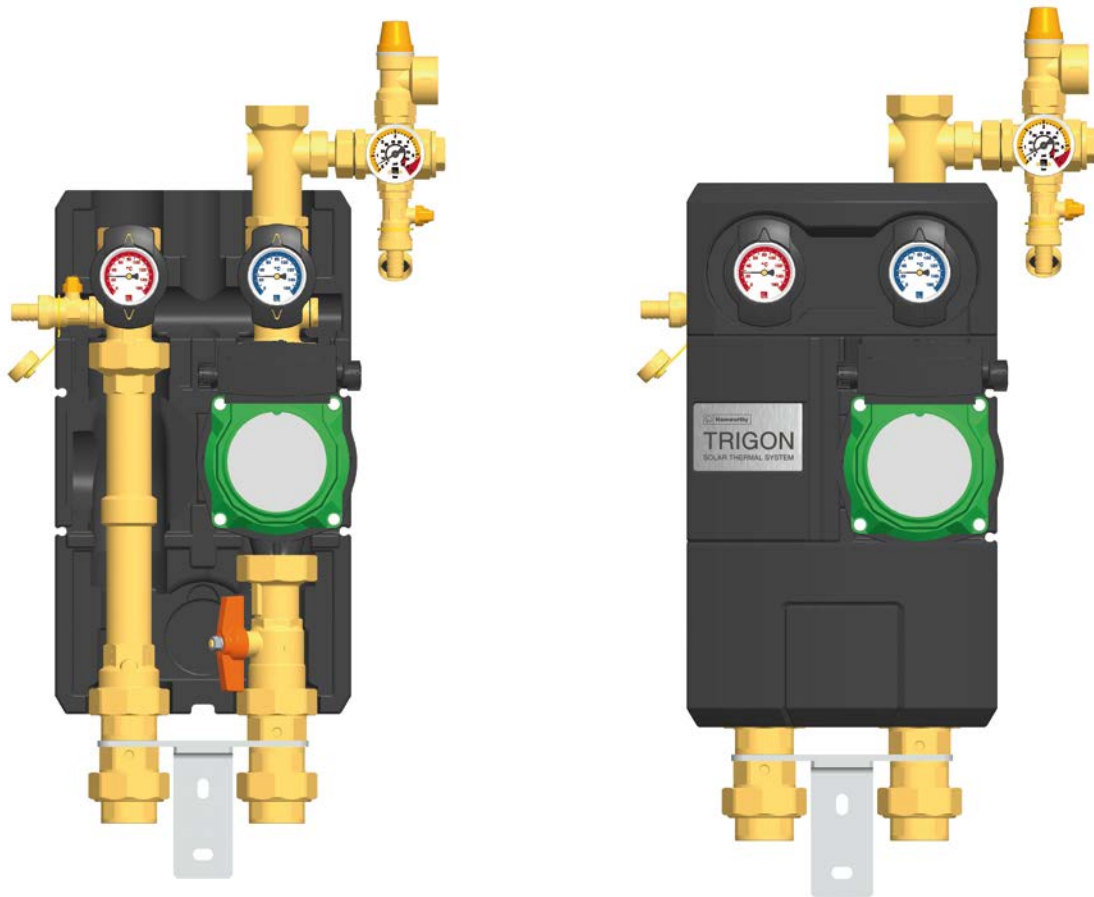
**NOTE: THESE INSTRUCTIONS MUST BE READ AND UNDERSTOOD BEFORE
INSTALLING, COMMISSIONING, OPERATING OR SERVICING THIS EQUIPMENT.**

THE TRIGON ST3 SOLAR PUMP STATION COMPLIES WITH ALL RELEVANT EUROPEAN DIRECTIVES.

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HAMWORTHY TRIGON INSTALLATION AND OPERATION MANUAL

SOLAR PUMP STATION ST3



Customer Service Centre
Hamworthy Heating Limited
Fleets Corner, Poole,
Dorset BH17 0HH I

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We reserve the right to make technical changes without notice!

Translation of the original instructions

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1 General information



Carefully read these instructions before installation and commissioning. Save these instructions in the vicinity of the installation for future reference.

1.1 About these instructions

These instructions describe the installation, commissioning, function and operation of the TRIGON ST3 Solar Pump Station. For other components of the solar system such as collectors, tanks, expansion vessels and controllers, please see the instructions "TRIGON SOLAR TECHNICAL SPECIFICATION". The chapters called [installer] are intended for installers only.

1.2 About this product

The station is a premounted group of fittings checked for leakage to be installed in the primary or solar circuit. It contains important fittings and safety devices for the operation of the installation:

- Ball valves with integrated thermometers in the solar circuit (flow and return)
- Check valves in the screw connections of the mounting plate, in the flow and return line
- Pressure relief valve to prevent inadmissible overpressure
- Pressure gauge to display the system pressure in the solar circuit
- Connection for an expansion vessel
- Pump group which can be completely isolated

An Automatic Air Vent (AAV) and flowmeter are supplied as separate items with the transfer station.

The expansion vessel required for operation is not a part of this station and must be ordered separately.

The connection line of the expansion vessel must be equipped with a valve with integrated drain valve. Thus the expansion vessel can be easily connected and disconnected from the solar installation.

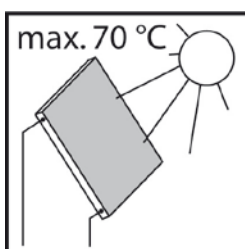
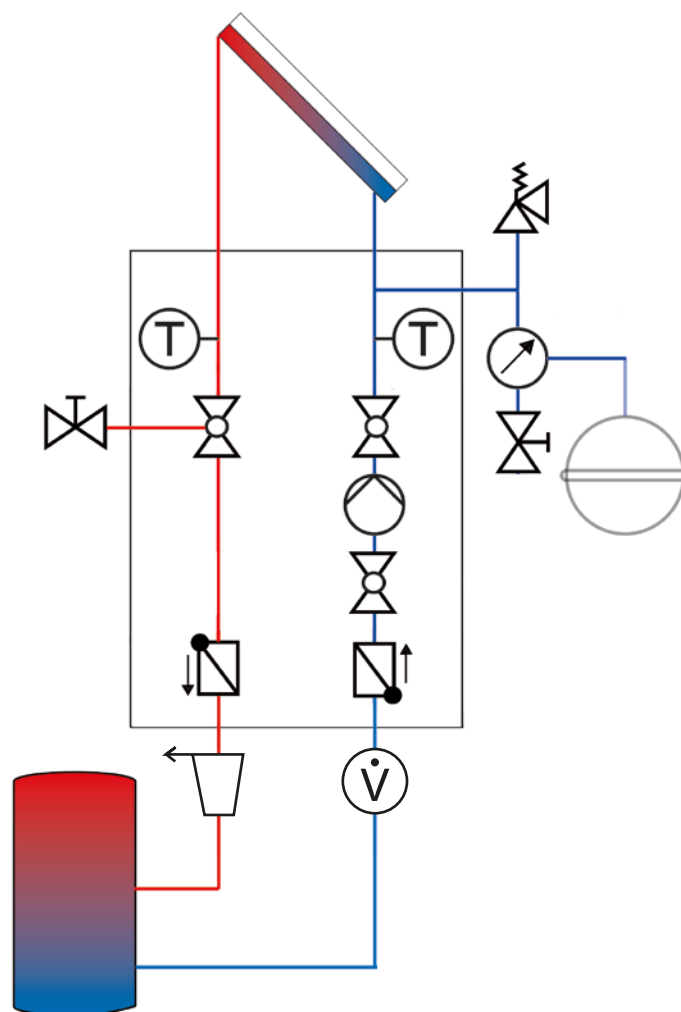
The wrapping materials are made of recyclable materials and can be disposed of with recyclable materials.

1.3 Designated use

The ST3 solar station may only be used between the solar and storage tank circuits in solar thermal systems taking into consideration the technical limit values indicated in these instructions.

Due to its design the station must be mounted and operated as described in these instructions!

Only use original accessories with the solar station. Improper usage excludes any liability claims.





When the sun shines, the collector can become very hot. The solar fluid in the circuit can heat up to more than 100 °C.



Only flush and fill the solar circuit when the collector temperatures are below 70 °C when wearing appropriate personal and protective equipment e.g. safety glasses, gloves, long sleeved safety jacket.



2 Safety instructions

The installation and commissioning as well as the connection of electrical components require technical knowledge commensurate with a recognised vocational qualification as a fitter for plumbing, heating and air conditioning technology, or a profession requiring a comparable level of knowledge [installer]. The following must be observed during installation and commissioning:

- relevant local and national regulations
- accident prevention regulations of the professional association
- instructions and safety instructions mentioned in this manual
- use appropriate personal and protective equipment e.g. safety glasses, gloves, etc...

	 WARNING
	<p>Danger of scalding due to vapour escape!</p> <p>With pressure relief valves there is risk of scalding due to vapour escape. During installation, check the local conditions and if a discharge line must be connected to the safety group.</p> <ul style="list-style-type: none"> ➤ Observe the instructions regarding the pressure relief valve. ➤ The pressures calculated by the installation planner for the expansion vessel and the operating pressure of the installation must be set.

	 CAUTION
	<p>Risk of burns!</p> <p>The valves, fittings and the pump may heat up to more than 100 °C during operation.</p> <ul style="list-style-type: none"> ➤ The shell must remain closed during operation.

	 CAUTION
	<p>Personal injury and damage to property due to overpressure!</p> <p>By closing the two ball valves in the primary circuit you isolate the pressure relief valve from the heat exchanger. A rise in temperature in the storage tank will cause high pressures and could result in personal injury or damage to property!</p> <ul style="list-style-type: none">➤ Only close the ball valves for service and maintenance.

NOTICE

Material damage due to mineral oils!

Mineral oil products cause lasting damage to seals made of EPDM, whereby the sealant properties are lost. We do not assume liability nor provide warranty for damage to property resulting from sealants damaged in this way.

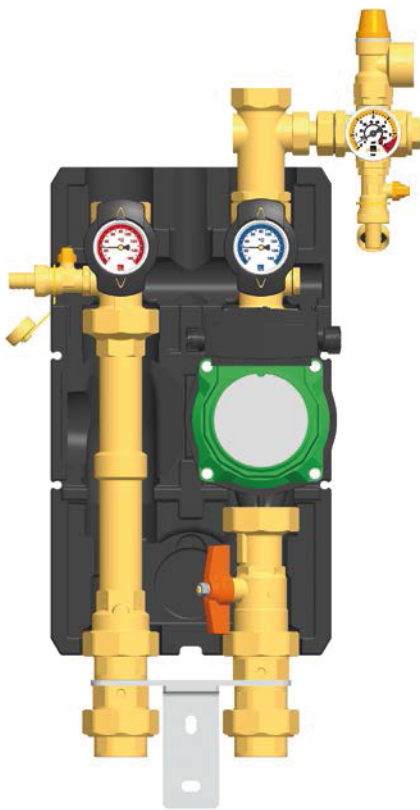
- It is imperative to avoid that EPDM gets in contact with substances containing mineral oils.
- Use a lubricant based on silicone or polyalkylene and free of mineral oils such as Unisilikon L250L and Syntheso Glep 1 of the Klüber company or a silicone spray.

3 Assembly and installation [installer]

NOTICE

Material damage due to high temperatures!

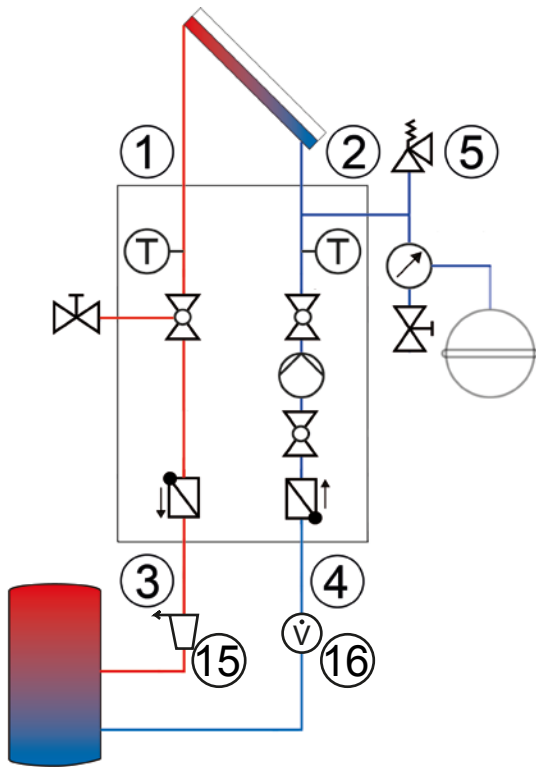
Install the pump station at a sufficient distance from the collector field, since the solar fluid may be very hot near the collector. It may be necessary to install an intermediate tank in order to protect the expansion vessel.



The location of installation must be dry, load-carrying and frost-proof. Furthermore, the access to the control and safety equipment must be guaranteed at all time during operation!

The discharge line of the safety equipment should be guided into a heat-resistant container with corresponding size. This allows you to avoid uncontrolled discharging into the environment and to easily refill the circuits!


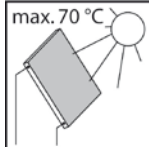
1. Remove the station from the packaging.
2. Take off the thermometer handles and remove the insulating front shell.
3. Copy the mounting holes of the wall bracket to the mounting surface.
4. Drill the holes.
5. Fasten the bracket to the wall with the enclosed wall plugs and screws.



6. Slide the solar station with the preassembled mounting plate onto the wall bracket. Screw the mounting plate to the wall bracket.
7. Connect the solar station to the system by pipework:
 - ① Flow from the collector field
 - ② Return to the collector field
 - ③ Flow to the storage tank
 - ④ Return from the storage tank
 - ⑤ Safety group: expansion vessel
 - ⑮ An Automatic Air Vent is supplied for installation in the flow of the solar circuit local to the pump station.
 - ⑯ A flowmeter is supplied for installation in the return of the solar circuit upstream and local to the pump station.

4 Commissioning [installer]

Observe the following safety instructions regarding the commissioning of the station:

 	<div style="background-color: yellow; padding: 5px;">! WARNING</div> <p>Risk of burning and scalding!</p> <p>The fittings can heat up to more than 100 °C. Therefore, do not clean or fill the system with the collectors heated (intense sunshine). Please note that hot solar fluid can leak from the pressure relief valves in case of too high system pressure!</p> <p>During venting the solar fluid may escape as vapour and cause scalding!</p> <ul style="list-style-type: none"> ➤ Only flush and fill the installation when the collector temperatures are below 70 °C when wearing appropriate personal and protective equipment.
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NOTICE

Risk of frost!

It often happens that the solar system cannot be completely drained after flushing. Thus, there is risk of frost damage when flushing with water. Therefore, do only use the solar fluid used later to flush and fill the solar system.

- Use a water and propylene glycol mixture with max. 40% propylene glycol as a solar fluid.

NOTICE

Note regarding the commissioning sequence

When putting the system into operation, first fill the heating circuit and then the solar circuit. This guarantees that heat that may possibly be absorbed by the collectors during commissioning can be dissipated.

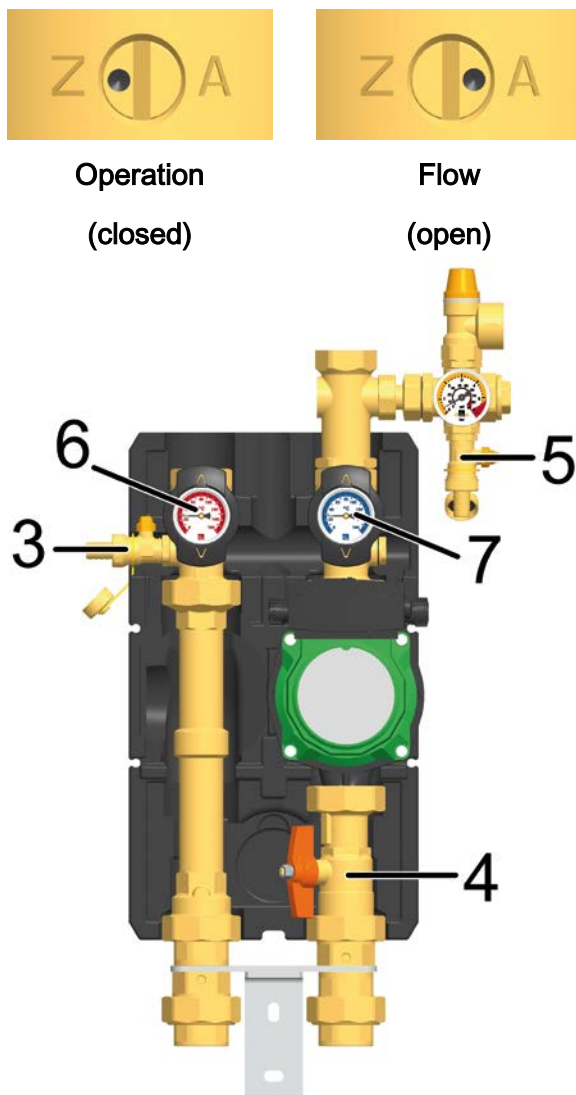
NOTICE

Note regarding the expansion vessel

To prevent that the dirt particles in the solar thermal system are flushed into the expansion vessel, some manufacturers recommend to disconnect the expansion vessel from the solar circuit before flushing and filling. Please observe the instructions of the manufacturer.

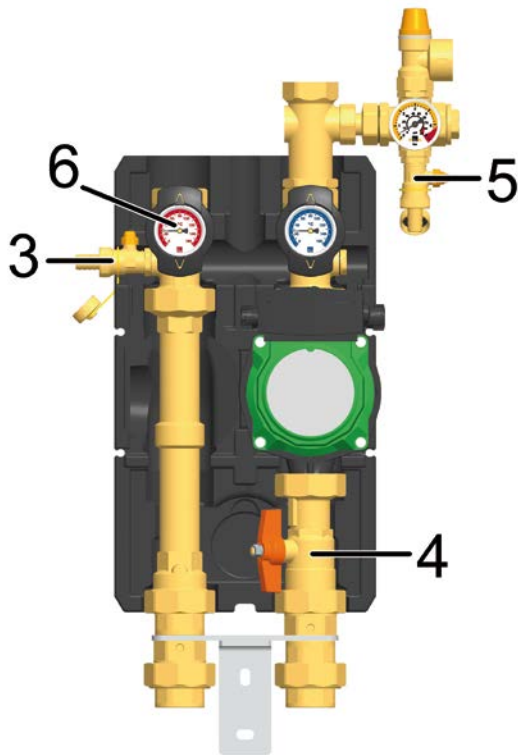
4.1 Flushing and filling the solar circuit

Make sure not to wash dirt particles that may be present in the solar system into the expansion vessel. Disconnect the expansion vessel from the solar circuit during flushing and filling, if necessary, and only use flush and fill stations with fine filters.





Connection of the fill station

1. Turn both check valves to the operating position "Z" and open the ball valves in the flow and return [6|7].
2. Close the shut-off valve [4]. This guarantees that the dirt particles that may be still present will be washed out of the system and will not access the circuit again.
3. Connect the filling pump to the solar station:
 - Pressure hose to the fill valve [3]
 - Flush hose to the drain valve [5]
4. Open the fill and drain valve [3|5].
5. Close the shut-off valve of the expansion vessel during flushing and filling to prevent that dirt particles are washed from the solar installation into the expansion vessel.



Filling the solar circuit

1. Put the flush and fill station into operation.
2. Flush the collector system for at least 15 minutes.
3. In order to eliminate the air from the storage tank open the shut-off valve [4] and close the ball valve [6] in the flow.
4. Close the drain valve [5] with the filling pump running and increase the system pressure to about 5 bars. The system pressure can be read on the pressure gauge.
5. Close the fill valve [3] and switch off the pump of the flush and fill station.
6. Check the pressure gauge to see whether the system pressure reduces and eliminate leaks where necessary.
7. Reduce the pressure on the drain valve [5] to the operating pressure.
8. Open the isolating valve to the expansion vessel and set the operating pressure of the solar system by means of the flush and fill station (see instructions regarding the expansion vessel).
9. Open the ball valve [6] in the flow.

	 WARNING
	<p>Risk to life and limb due to electric shock!</p> <ul style="list-style-type: none">➤ Prior to commencing electrical work on the controller, disconnect the mains plug from the mains.➤ Only after completing all installation work, plug the mains plug of the controller into a socket. This avoids an unintentional start of the motors.

10. Connect the controller to the mains. Set the solar circuit pump in the manual mode to ON according to the controller manual. Let the solar circuit pump run at maximum rotation speed for at least 15 minutes.



11. Remove the hoses of the flush and fill station and screw the sealing caps onto the fill and drain valves.



The sealing caps only serve to protect the valves against dirt. They are not designed to take up high system pressures. The ball valves must be closed.

4.1.1 Setting the solar system

1. Set the desired flow rate by adjusting the rotation speed of the solar circuit pump.
2. Mount the insulating front shell to the solar station.
3. Switch the controller to automatic mode (see controller instructions).

5 Maintenance [installer]

5.1 Draining the solar installation





Operation
(closed)



Flow
(open)

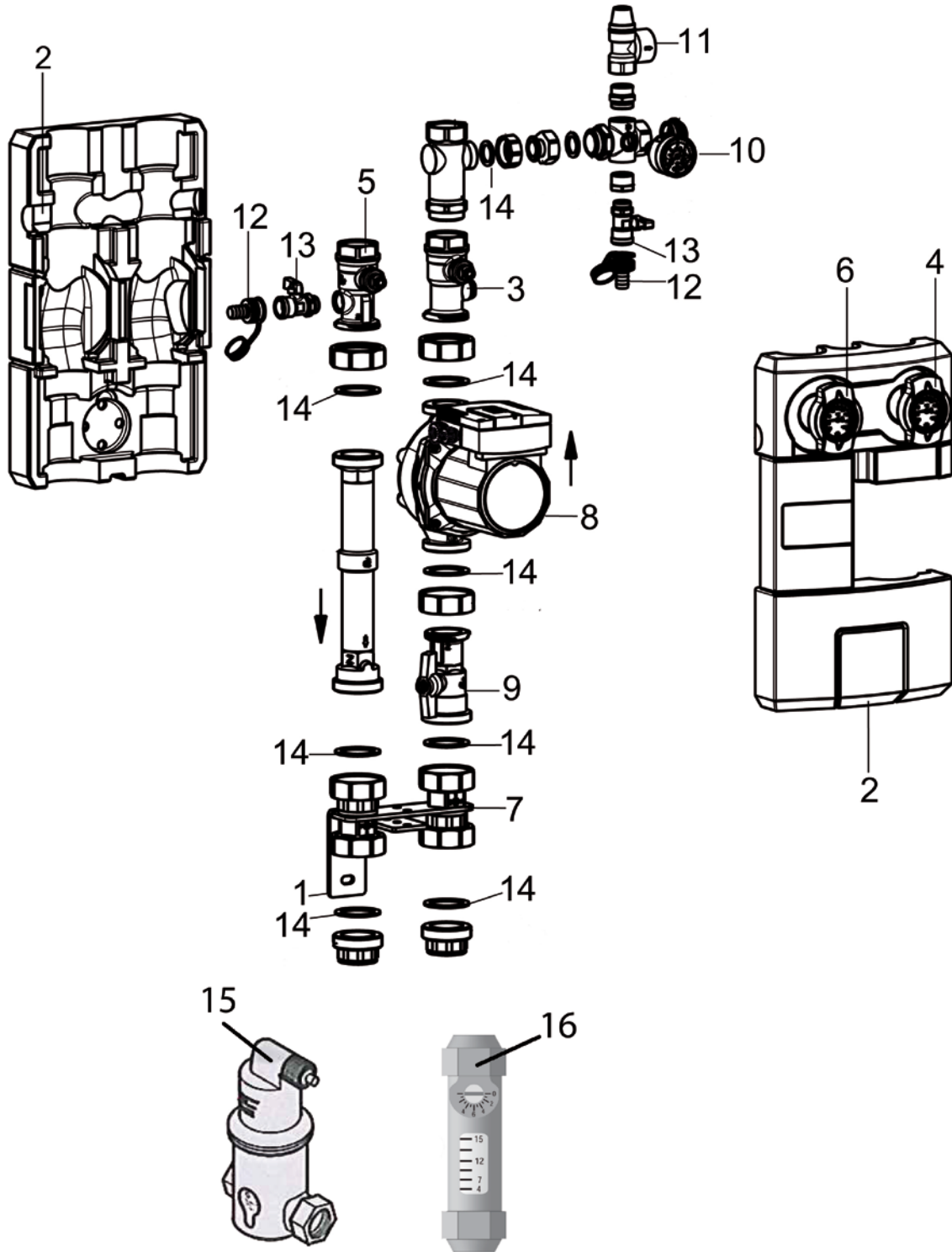
1. Switch off the controller and make sure that a restart is not possible.
2. Turn the check valves to position "A" and open the ball valves in the flow and return.
3. Connect a heat-resistant hose to the drain valve [5]. Draining completely the solar system/the storage tank is only possible with a drain valve at the lowest point of the installation which must be ordered separately.
Make sure that the solar fluid is collected in a heat-resistant container.

	 WARNING
	<p>Danger of scalding due to hot solar fluid!</p> <p>The escaping medium may be very hot.</p> <ul style="list-style-type: none"> ➤ Place and fix the heat-resistant collecting container so that people standing nearby are not endangered when the solar system is being emptied.

4. Open the drain valve [5] of the solar station.
5. Open a vent valve that may be present at the highest point of the solar system.
6. Dispose of the solar fluid observing the local regulations.

5.2 Disassembly

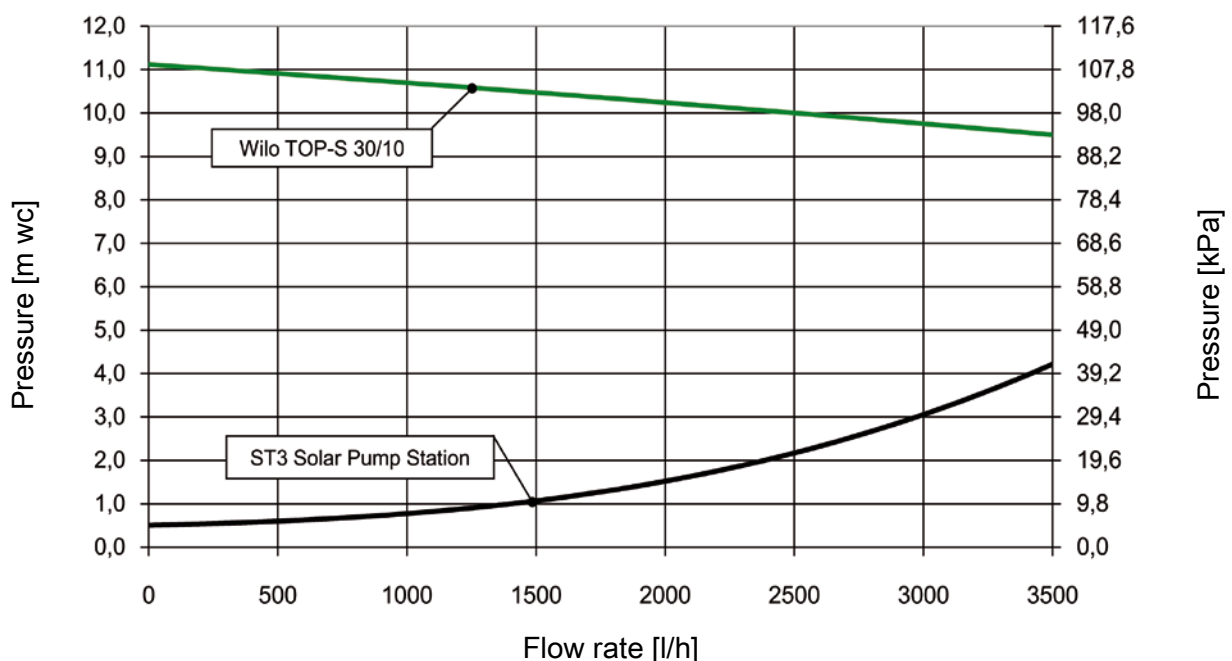
1. Drain the solar installation as described above.
2. Disconnect the pipe joints with the solar system.
3. To remove the solar station from the wall bracket, unscrew the screws of the mounting plate.
4. Pull out the station towards the front.

6 Spare parts [installer]


Spare parts: ST3 Solar Pump Station		
Position	Designation	HHL Part No.
1	Wall bracket	073339
2	Front and back insulating shell made of EPP	073803
3	Ball valve, return collector	073079
4	Thermometer, return collector (blue)	073788
5	Ball valve, flow collector	073078
6	Thermometer, flow collector (red)	073787
7	Check valve flow / return	073796
8	Pump Wilo TOP-S 30/10	073081
9	Ball valve below the pump	073082
10	Pressure gauge 0-6 bars	073083
11	Pressure relief valve 6 bars, solar	073084
12	Drain connection	073346
13	Fill and drain valve	N.C.
14	Sealing set ST 40	073355
15	De-aerator for ST3	553001071
16	Flow indicator for ST3	553001070

7 Technical data and pressure drop characteristics

Dimensions:	Height	671 mm
	Width	366 mm
	Depth (insulation, without pump head)	125 mm
	Centre distance (wall – insulation)	80 mm
	Centre distance (pipe – pipe)	125 mm
	Pipe connections	1¼" internal thread
	Outlet pressure relief valve	1" internal thread
	Connection for expansion vessel	1" internal thread
Operating data:	Max. admissible pressure	6 bars
	Max. operating temperature	120 °C
	Max. propylene glycol concentration	40 %
Equipment:	Pressure relief valve	6 bars
	Pressure gauge	0-6 bars, with shutoff valve
	Check valves	Opening pressure 2 x 200 mm wc, can be opened
	Dial thermometers	0-160 °C
Materials:	Valves and fittings	Brass
	Seals, o-rings	EPDM / Viton
	Seals, flat sealings	AFM 34, asbestos-free
	Insulation	EPP, $\lambda = 0.041 \text{ W}/(\text{m K})$



8 Function check valves [installer]

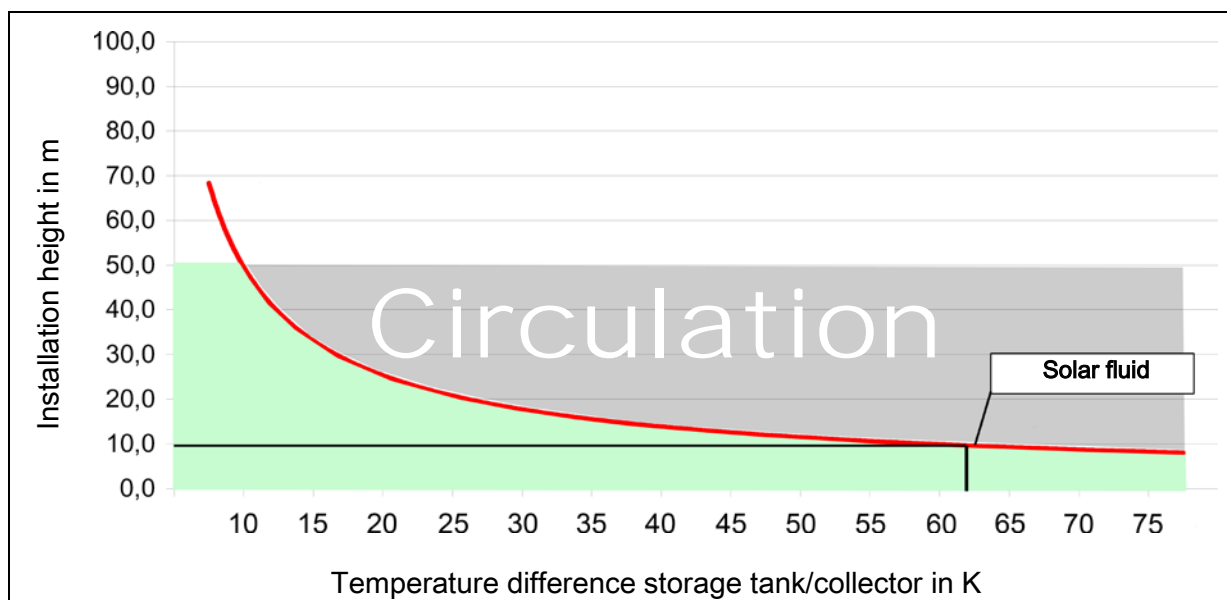
Within their application range, the check valves in this station prevent unwanted gravity circulation. The efficiency of the check valves depends on:

- the installation height
- the temperature difference between the storage tank and the collector
- the type of heat transfer medium

In the diagram below you can see whether the check valves integrated in the station are sufficient. If the check valves are not sufficient, you need to install additional components to prevent gravity circulation. You can mount components such as syphons ("heat traps"), 2-way valves (zone valves) or additional check valves.

Example:

- The station comprises two check valves (2 x 200 mm wc = 400 mm wc).
- You use a mixture of water and 40% of propylene glycol as a **solar fluid**.
- The installation height between the collector and the storage tank is **10 m**.



Result:

The check valves prevent gravity circulation up to a temperature difference of **about 62 K**. If the temperature difference between the collector and the tank is larger, the difference in density of the solar fluid will be so large, that the check valves are pushed open.



Do you need to know it exactly?

The density of the solar fluid decreases with rising temperature. In high installations with large temperature differences, the difference in density will cause gravity circulation. This circulation can cool down the storage tank.

Calculation example: $\Delta p = \Delta \rho \cdot g \cdot h$

Collector temperature: 5 °C → Density solar fluid $\rho_1 = 1042 \text{ kg/m}^3$

Storage tank temperature: 67 °C → Density solar fluid $\rho_2 = 1002.5 \text{ kg/m}^3$

$$\Delta \rho = \rho_1 - \rho_2 = 39.5 \text{ kg/m}^3$$

$$g = 9.81 \text{ m/s}^2$$

Installation height $h = 10 \text{ m}$

$$\Delta p = 3875 \text{ Pa} = 395 \text{ mm wc}$$

The two check valves in the station (2 x 200 mm wc) are sufficient for an installation height of 10 m and a temperature difference between the collector and the tank of up to 62 K.

9 Commissioning report

Installation operator _____

Location of installation _____

Collectors (number / type) _____

Collector surface _____ m²

Installation height _____ m (Difference in height between station and collector field)

Pipes \varnothing = _____ mm | = _____ m

Venting (collector field) Manual vent valve Automatic deaerator

No Vented

Airstop (station) Vented

Solar fluid (type) _____ % glycol

Antifreeze tested up to: _____ °C

Flow rate _____ l/m

Pump (type) _____

Pump speed level (I, II, III) _____

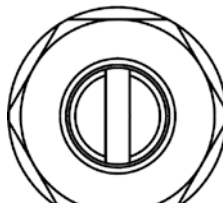
System pressure _____ mbars

Expansion vessel (type) _____

Initial pressure _____ mbars

Pressure relief valve Checked

Check valves Checked

Serial numbers	
Station	
Controller	
Software version	
Restrictor position:	

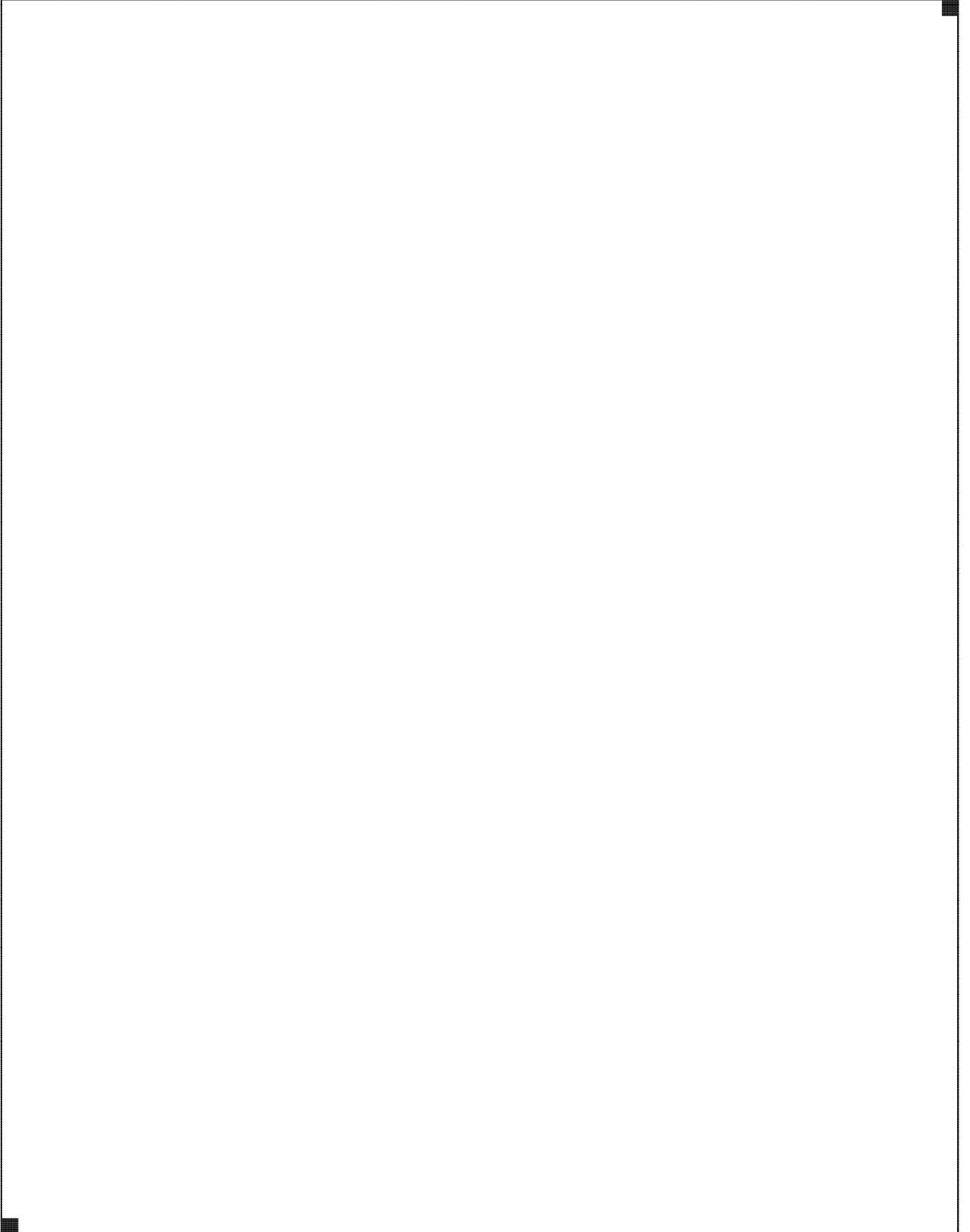
Plumbing company

Date, signature

Customer Service Centre
Hamworthy Heating Limited
Fleets Corner, Poole,
Dorset BH17 0HH

Telephone: 0845 450 2866
Fax: 01202 662522
service@hamworthy-heating.com

Notes



Hamworthy Heating Accredited Agents

Southern Ireland (Sales & Service)

HEVAC Limited
Naas Road, Dublin 12, Ireland
tel: **00 353 141 91919** fax: **00 353 145 84806**
email: **info@hevac.ie**

Scotland (Sales & Service)

McDowall Modular Services
2 Penson Road, Queenslie Industrial Estate, Glasgow, G33 4AG
tel: **0141 336 8795** fax: **0141 336 8954**
email:
MMS.McDowallModularServices@hamworthy-heating.com

Northern Ireland (Sales & Service)

HVAC Supplies Limited
Unit A6, Dargan Court, Dargan Crescent, Belfast BT3 9JP
tel: **028 9077 7737**
email: **hvacsupplies@btconnect.com**

North East England (Service)

Allison Heating Products
12 Sunnyside Lane, Cleadon Village, Sunderland SR6 7XB
tel: **0191 536 8833** fax: **0191 536 9933**
email: **allison.heating@gmail.com**

Hamworthy Heating Customer Service Centre

Sales

tel: **01202 662552**
email: **sales@hamworthy-heating.com**

Technical Enquiries

tel: **01202 662505**
email: **technical@hamworthy-heating.com**

Servicing

tel: **01202 662555**
email: **service@hamworthy-heating.com**

Spares

tel: **01202 662525**
email: **spares@hamworthy-heating.com**

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the commercial heating and hot water specialists.



Customer Service Centre

Hamworthy Heating Limited,
Wessex House,
New Fields Business Park,
Stinsford Road,
Poole,
Dorset,
BH17 0NF

Telephone: **01202 662500**
Fax: **01202 662522**
Email: **service@hamworthy-heating.com**
Website: **www.hamworthy-heating.com**