

Grant Solar Pump Station Installation & Servicing Instructions



Important Note

Important Note for Installers

The Pump Station supplied with your Grant Solar Thermal system differs from that shown in the Installation Instructions supplied. This change is part of our continued product improvement process.

The information in these Solar Pump Station Installation Instructions replaces that given in Sections 13 and 14 of the Grant Solar Thermal Systems Installation Instructions (DOC 73, Rev.02). Please read these Pump Station instructions in conjunction with the System Installation Instructions supplied.

After commissioning, please leave both the System Installation Instructions and these Pump Station Instructions with the user for future reference.

Important:

All system pipe connections must use compression fittings with brass olives. Soft soldered joints must NOT be used on the solar primary circuit.

Plastic pipe must NOT be used for any part of the solar primary circuit.



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This manual is accurate at the date of printing but will be superseded and should be disregarded if specifications and/or appearances are changed in the interests of continued product improvement.

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1 Introduction

1.1 Description

A two-line Solar Pump Station for the circulation of glycol mix solar fluid through Grant solar thermal systems. All components are housed within an insulated enclosure designed to be wall mounted.

The pump station provides the following functions:

- Filling and flushing connection points
- Fluid flow rate regulation
- System pressure and temperature readings
- Check valves (Gravity Brakes) for anti-gravitation circulation
- Safety pressure relief valve and discharge connection
- System expansion vessel connection point
- Isolation valves for upper and lower system levels and pump

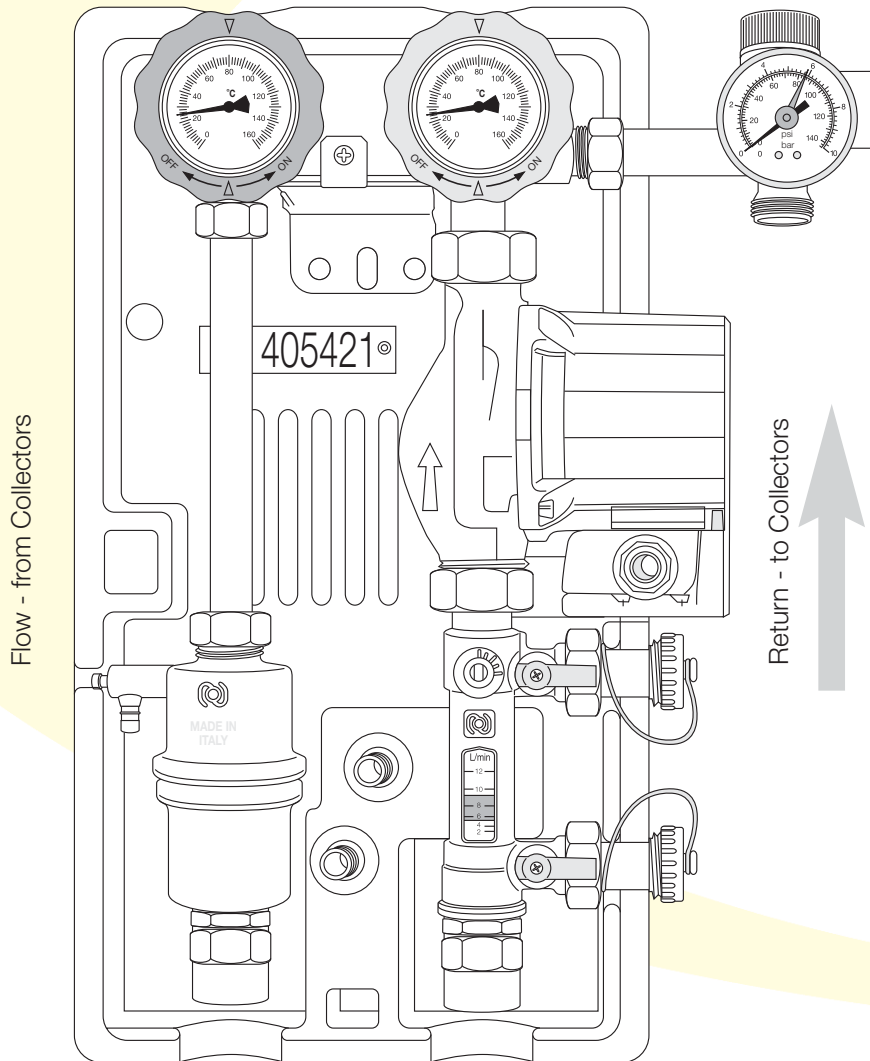


Figure 1-1: Pump station with front cover removed

2 Technical Specifications

2.1 Specification

System pipe connections:	¾" BSP Female
Safety valve:	6 bar - certified TUV to SV100 7.7 - Directive 97/23/CE
Safety valve discharge connection:	¾" BSP Female
Pressure gauge range:	0-10 bar
Thermometer gauge range:	0-160° C
Maximum run temperatures:	130°C
Maximum peak temperatures:	150°C
Maximum glycol (%) in solar fluid:	50%
Circulator:	WILO STAR ST 15-6 Eco. 3P connections, 1M-130mm Class F, PN10, TF110, IP44, 2 µF, 230V 50Hz, VDE, CE
Electrical supply:	230-240V 50 Hz
Insulation:	Black PPE density 40kg/m³, plain
Flow and Return valves:	DN20. ¾" BSP Female connection, integral check valve
Min pressure to open check valve:	2 kPa (200mm w.g./ 20mbar)
Check valve activation:	Closure at 90° and opening at 45°

2.2 Pump Performance

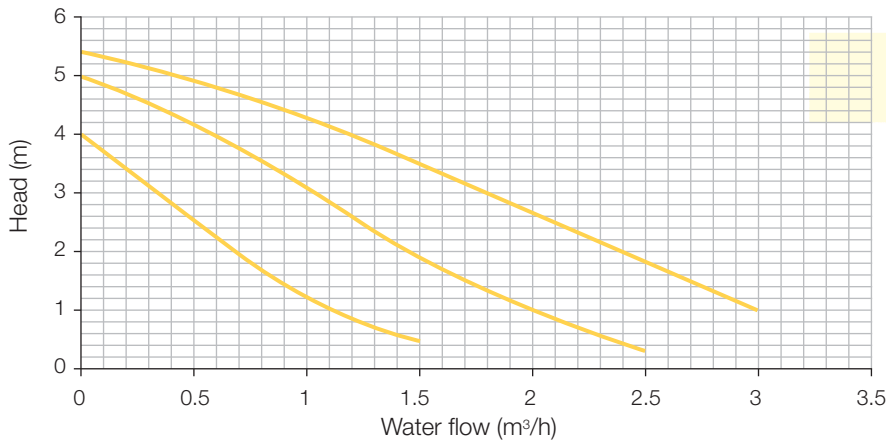


Figure 2-1: Standard 6m head pump - performance curves

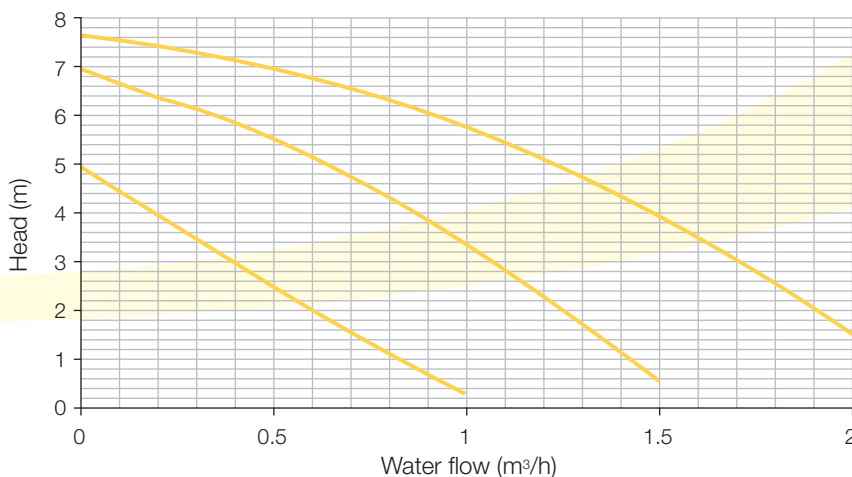
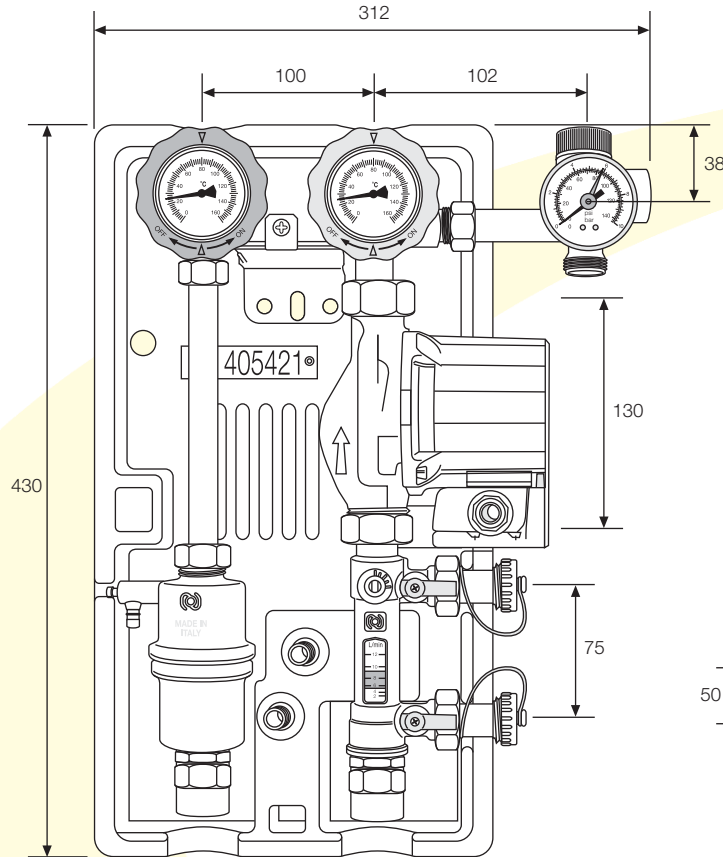


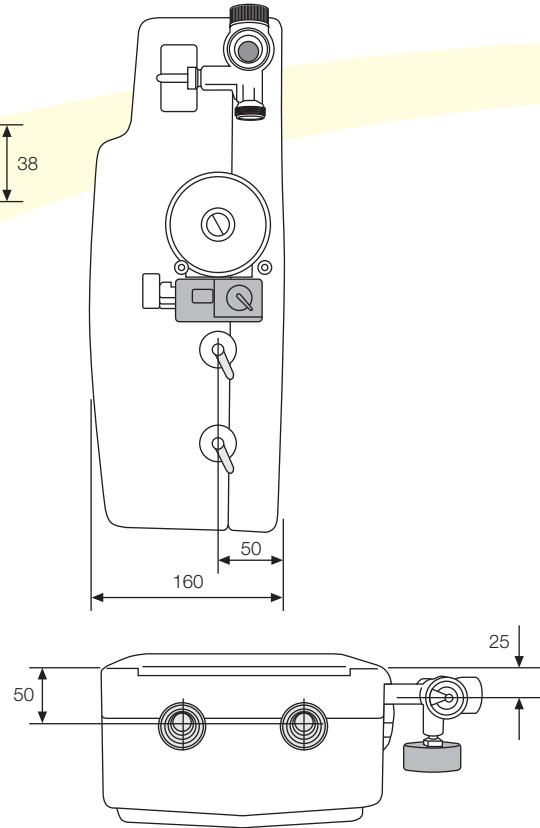
Figure 2-2: Optional 8m head pump - performance curves

2 Technical Specifications

2.3 Dimensions

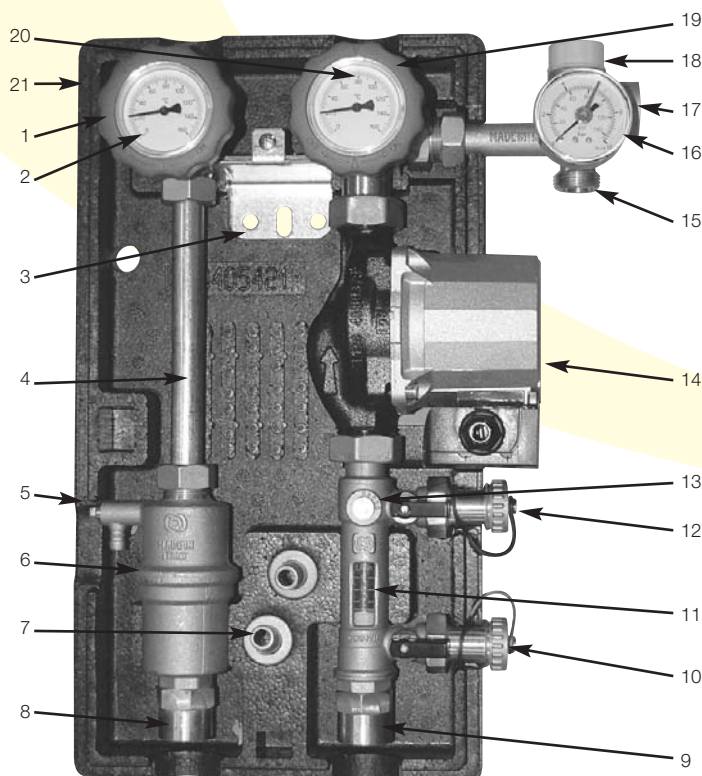


Side view of pump station



Plan view of pump station

2.4 Components



Key No.	Description
1	Flow valve (red knob) - 3/4" BSP Female connection
2	Thermometer (0-160°C) - on flow valve
3	Wall bracket - with retaining clip and screw
4	Connection pipe - copper 18mm
5	Manual air vent - with hose connection
6	Air separator - with integral manual air vent
7	Filling hose connectors (x 2) - to fit filling/flushing valve - 15mm dia x 3/4" swivel nut
8	System connection - 3/4" Female
9	System connection - 3/4" Female
10	Filling return valve connection - 3/4" BSP Male - with safety cap and chain
11	Flow meter - range 2-12 l/min
12	Filling flow valve connection - 3/4" BSP Male - with safety cap and chain
13	Filling/shut-off valve
14	Circulator - Wilo STAR ST 15-6 - 6m head
15	Expansion vessel connection 3/4" BSP Male - with flat gasket connection
16	Pressure gauge (0-10bar)
17	Safety valve discharge connection
18	Safety valve (6 bar)
19	Return valve (blue knob) - 3/4" BSP Female connection. 3/4" BSP Male connection always open on right side
20	Thermometer (0-160°C) - on return valve
21	Insulated housing

3 Installation

3.1 General

Installation of this pump station must be carried out by a competent installer in compliance with all current local Building Regulations, codes of practice, Health & Safety legislation and any relevant bylaws and regulations in force at the time.

All electrical installation work must be carried out by a qualified electrician. All wiring and bonding must comply with current IEE wiring regulations (including any amendments).

3.2 Fitting Procedure

1. Remove the front section of the insulated pump station housing.
2. Undo screw and remove retaining clip from wall bracket.
3. Lift out both the flow valve/air separator assembly and the return valve/pump assembly.
4. Position the back section of the insulated housing in the required location. If necessary check the cover is level using a spirit level and mark the two holes for the wall bracket.

Note: The solar pump station MUST only be installed vertically, as shown in Figure 1-1.

5. Separate the wall bracket from the back section of the housing. Drill the wall with an 8mm drill and securely fix the wall bracket to the wall using the fixings supplied.
6. Fit the back section of the insulated housing onto the wall bracket, taking care to insert it completely. Refer to Figure 3-1.
7. Re-fit the flow and return assemblies, inserting the body of the flow and return valves into the corresponding fork in the wall bracket. Refer to Figure 3-2.
8. Fit the retaining clip and secure using the screw provided.
8. Connect the flow and return pipes. Refer to figure 3-3.

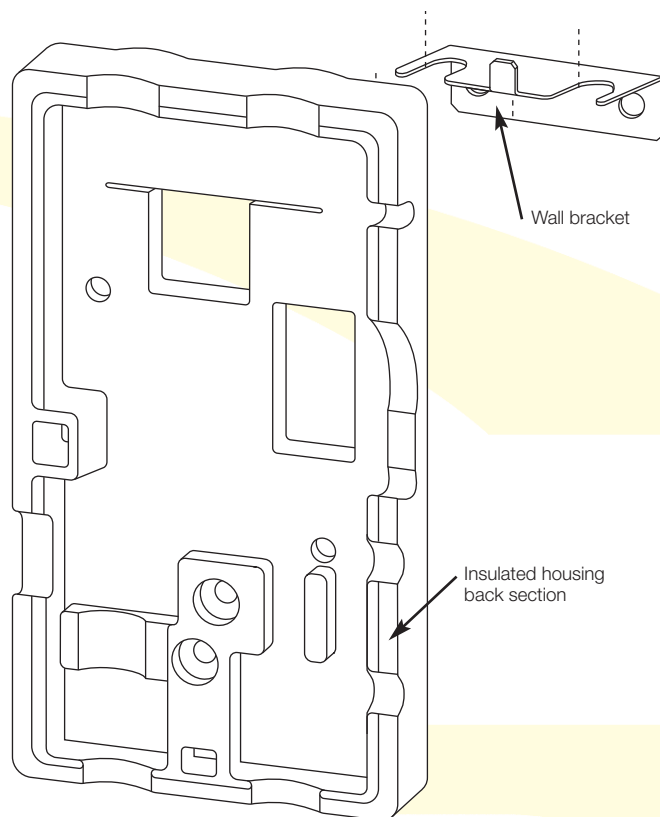


Figure 3-1: Fit back section of housing onto wall bracket

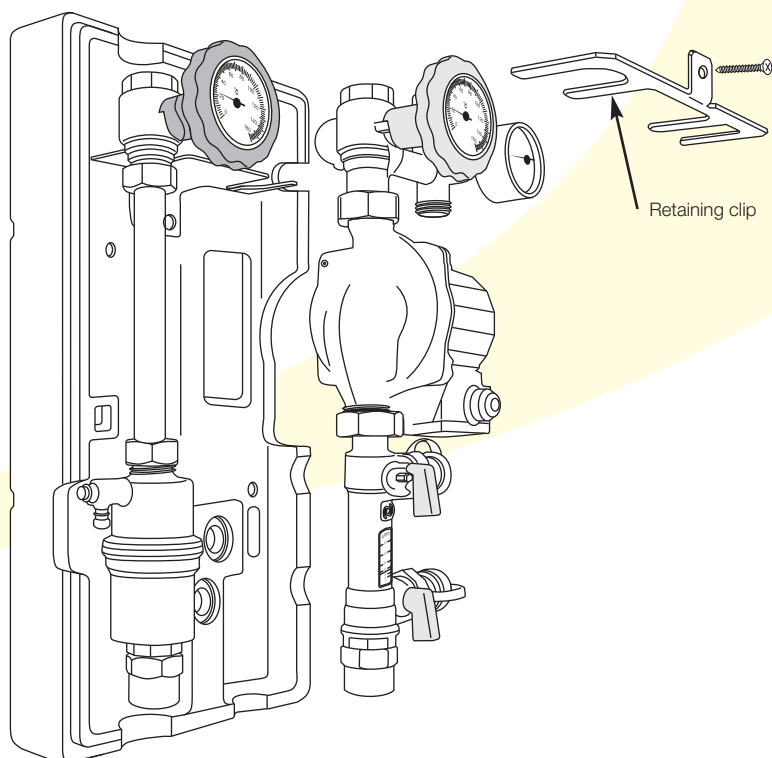


Figure 3-2: Re-fitting flow and return assemblies to wall bracket

3 Installation

3.3 System Connections

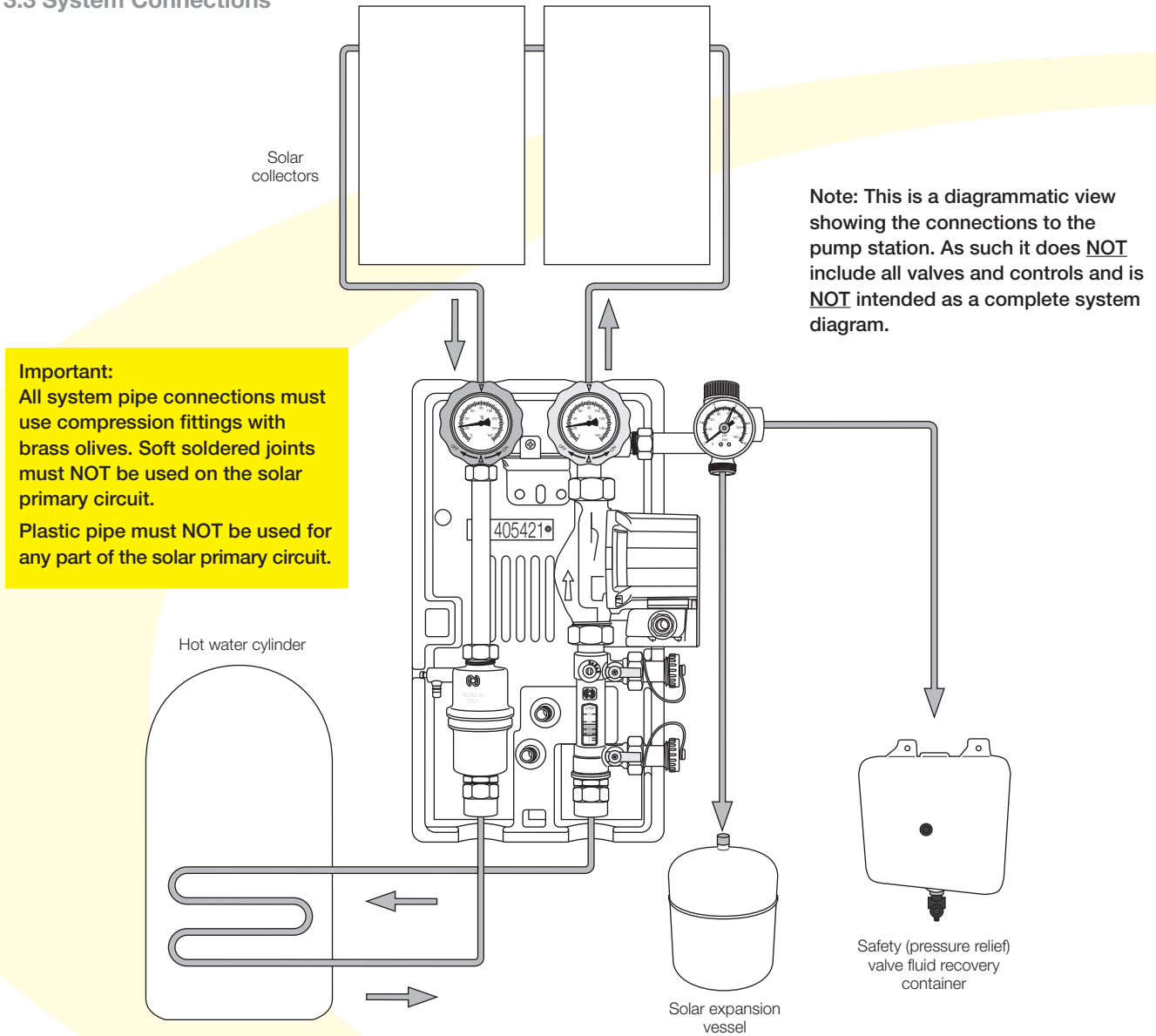


Figure 3-3: System connections to solar pump station

3.4 Expansion Vessel

The correct size of expansion vessel should be used, based on the volume of the system – i.e. the number of collectors, the length and diameter of the system pipework, etc.

For systems using up to 4 Grant solar collectors, with no more than 50 metres of 15mm pipework (total length of flow and return combined), an 18 litre expansion vessel is supplied as standard. For 5 collectors a 24 litre expansion vessel is used. For larger system configurations, contact the Grant Technical department for

guidance on the expansion vessel required.

The expansion vessel is connected to the pump station via the 3/4" BSP connection on the safety valve manifold, using the 1250mm long flexible corrugated stainless steel pipe. This pipe is supplied with flanged ends, each fitted with a 3/4" union nut, and two sealing washers (Grant Part No. GS222074).

This flexible pipe cannot be cut and must be used as supplied.

The expansion vessel is fixed to the wall using the Vessel Mounting kit (Grant Part No. GS222073). This kit includes an isolation valve union and the vessel mounting bracket.

Fix the mounting bracket to the wall, using the screws and wall plugs provided, to position the vessel in the required location.

IMPORTANT

The expansion vessel must be located BELOW the connection on the pump station with the vessel connection pointing upwards. See Figure 3-3.

Assemble and fit the isolation valve union as follows, referring to Figure 3-4:

- Fit the small black sealing washer onto the threaded connection of the bleed valve.
- Screw the bleed valve into the threaded port in the side of the valve union body and tighten.
- Remove the thin nut from the thread on the valve union.
- Fit the threaded connection on the expansion vessel up through the hole in the mounting bracket and secure using the thin nut.
- Using the sealing washer supplied, fit the valve union to the expansion vessel connection.
- Tighten the union nut to secure the valve union in the required position.

Connect the flexible stainless steel pipe to the safety valve manifold and expansion vessel union valve, using the sealing washers provided with the pipe.

Ensure that the expansion vessel isolation valve is **OPEN** – this is indicated when the two indicators (on the square end of the valve) are in line with the valve.

Ensure that the bleed valve is fully **CLOSED** before filling the system.

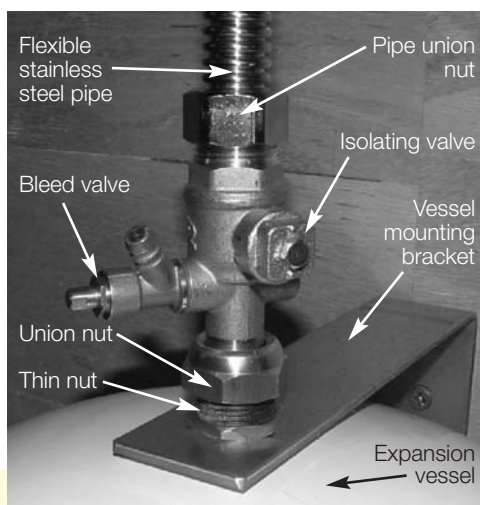


Figure 3-4: Expansion vessel connection

3.5 Safety Valve Discharge

A discharge pipe must be fitted to the outlet of the safety valve.

It is recommended that the safety valve discharge should be connection to a suitable discharge recovery tank, such as the Grant safety valve liquid recovery container with drain valve (Grant Part No.GS550001).

This discharge pipe should be 15mm copper.

IMPORTANT

Plastic pipe should NOT be used.

3.6 Electrical Connection

The pump requires a 230V 50Hz power supply from the Solar Controller to operate. Refer to the Installation instructions provided with the Solar Controller for further information on the electrical control system wiring.

IMPORTANT

The electrical supply must be isolated before making the connections to the solar pump. After making the connections ensure cover is fitted to enclosure before reconnecting the electrical supply.

The power supply should be connected to the solar circulating pump (in the pump station) as follows:

Insert the blade of a small flat screwdriver into the retaining clip on the side of the electrical enclosure on the pump.

Carefully prise open the clip and pull the cover upwards and remove from the enclosure.

Slacken off the cable gland nut and feed the electrical cable through the gland. See Figure 3-5.

Prepare the cable – cut back the outer sheath and strip the ends of the three wires as required.

Fit the wires into the terminals by pushing the black lever away from the enclosure (to open the terminal). See Figure 3-5.

Release the lever to secure the wire in the terminal.

Fit the three wires into the terminals as follows:

- Live – terminal 'L'
- Neutral – terminal 'N'
- Earth – terminal '⏏'

Tighten the cable gland to grip the cable and re-fit the cover to the enclosure.

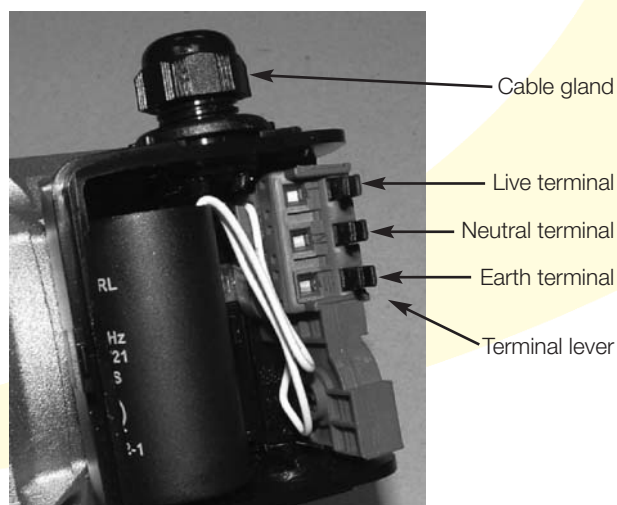


Figure 3-5: Solar pump electrical connections

Reconnect the electrical supply to test the operation of the pump.

4 Commissioning

4.1 Expansion Vessel

Ensure that the expansion vessel charge pressure is correct for the system pressure (when cold) and that this, in turn, corresponds to the height of the system. Refer to Table 4-1.

The height of the system should be measured from the expansion vessel to the top of the highest collector.

NOTE: If the collectors are positioned below the level of the expansion vessel (e.g. if the collectors are mounted at ground level), then measure from the bottom of the collectors to the expansion vessel. This will be a 'negative' height value, e.g. -5 metres.

The vessel charge pressure must be checked **before** filling the system.

Height difference (height of the collector field minus height of expansion vessel)	Initial expansion vessel charge pressure (air charge setting on valve)	System charge pressure @20°C (0.2 – 0.5 bar greater than vessel charge pressure)
- 5m	~ 1.0 bar	~ 1.3 bar
< 0m	~ 1.0 bar	~ 1.3 bar
< 5m	~ 1.5 bar	~ 1.8 bar
< 10m	~ 2.0 bar	~ 2.3 bar
< 15m	~ 2.5 bar	~ 2.8 bar
> 15m	Contact Grant Technical Department for guidance	

Table 4-1: Expansion vessel pressures

4.2 Filling Valves

The Filling flow and return valves, and the Filling/Shut off valve, are used for filling and flushing the solar thermal installation. Refer to Figure 4-1.

To enable filling/flushing of the system, the Filling/Shut-off valve must be rotated fully 90° clockwise. Refer to Figure 4-2. This will divert the flow from the filling station, entering the system via the Filling flow valve, through the pump, up to the collectors, through the coil of the cylinder and back to the filling station via the Filling return valve.

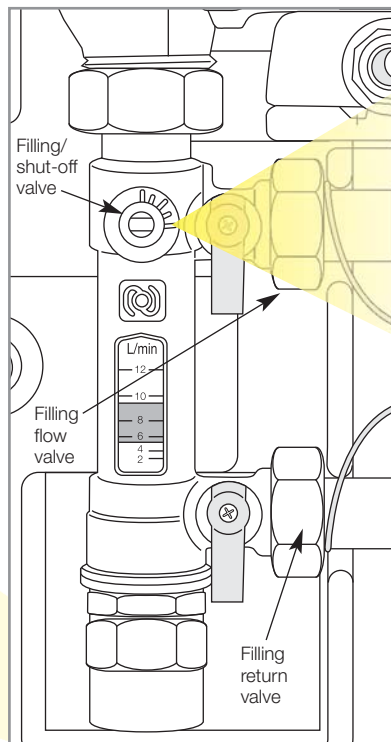


Figure 4-1: Filling and flushing valves

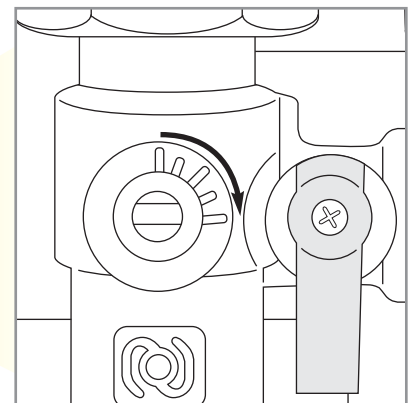


Figure 4-2: Closing Filling/Shut off valve to prepare to fill system

4.3 Gravity Brakes

The gravity brakes (check valves) are incorporated into both the flow and return valve assemblies. These gravity breaks operate at 20 mbar and are operated by turning the valve handle on the valves as follows:

Flow and Return valves OPEN – ‘∇’ markers on valve handles in VERTICAL position

To prevent ‘gravity’ circulation of solar fluid, gravity brakes must be in the operating position (closed), i.e. with ‘∇’ markers in vertical position. See Figure 4-3.

Gravity Brakes OPEN – ‘∇’ markers on valve handles at 45° angle

To fill or completely empty the solar thermal installation, the gravity brakes must be opened, i.e. by turning the valve handles to the right to an angle of 45°. See Figure 4-4.

Flow and Return valves CLOSED – ‘∇’ markers on valve handles in HORIZONTAL position

The flow and return valves are closed by turning the valve handles 90° to the right, i.e. until the ‘V’ markers are horizontal. See Figure 4-5.

4.4 Solar Fluid

In order to prevent frost and corrosion damage to solar collectors and pipework, the system must only be filled with a high quality solar fluid. The Grant solar fluid is a ready mixed 40% solution of 1,2 propylene glycol/water providing frost protection down to approx. -23°C.

To prevent damage to the system the same specification solar fluid should be used when replacing or topping up the solar fluid in the system.

If required, a copy of the Material Safety Data Sheet for the Grant solar fluid is available on request from Grant UK.

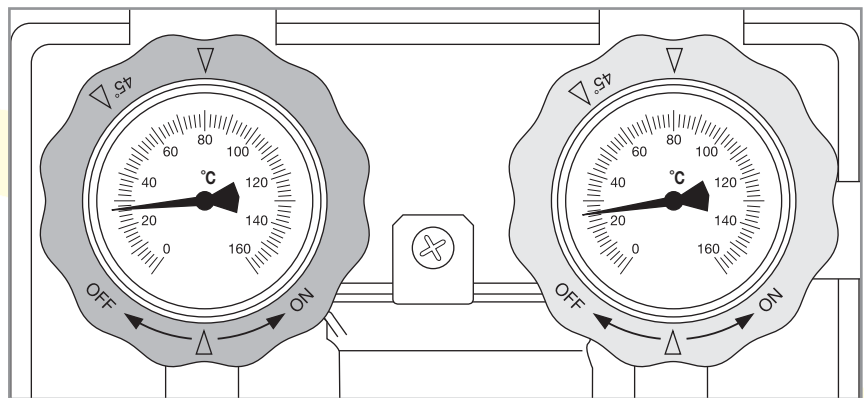


Figure 4-3: Flow and return valves open

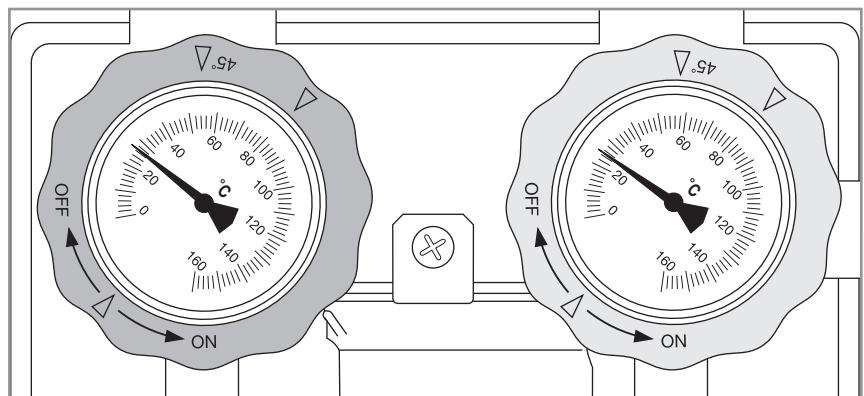


Figure 4-4: Gravity breaks open

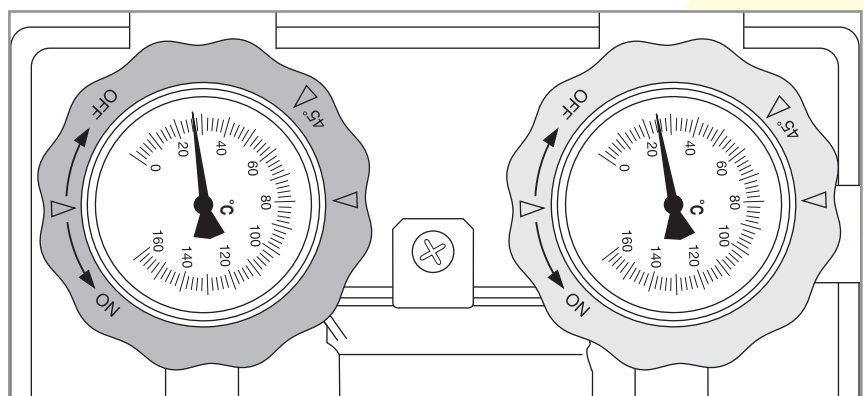


Figure 4-5: Flow and return valves closed

4 Commissioning

4.5 Filling the System

Grant Solar Thermal systems should be flushed and filled using a purpose designed closed circuit solar thermal filling station, incorporating a high pressure pump, such as the Grant Solar Filling Station. See Figure 4-6.



WARNING

If the pump station is located in the roof space, there must be a suitable flat surface on which to stand the filling station, e.g. floor, loft boarding or similar, capable of carrying the weight of the filling station with a full tank of solar fluid.



Figure 4-6: Grant Solar Filling Station

4.6 Filling Procedure

IMPORTANT

The collectors must be cool before filling the system. They must be covered, to stop solar radiation reaching them, until the filling and commissioning procedure is completed.

Before filling the system: Check all system connections and the expansion vessel charge pressure. Refer to Table 4-1 (page 10).

Phase 1

- Connect the pressure hose from the filling station to the Filling Flow valve connection and open the valve. Refer to Figure 4-1 (page 10).
- Connect the return hose from the filling station to the Filling Return valve connection and open the valve. Refer to Figure 4-1 (page 10).
- Using a small spanner, rotate the Filling/Shut-off valve 90° clockwise. Refer to Figure 4-2 (page 10).
This will divert the flow from the filling station through the pump, up to the collectors, through the coil of the cylinder and back to the filling station via the filling return valve.
- Fill the filling station tank with sufficient solar fluid for the system.
- Check that Flow and Return valves are set to 'half open' position (to open the gravity brakes) as shown in Figure 4-4 (page 11).
- Switch on the filling station to fill and then flush the solar circuit for approx. 15 minutes.

Phase 2

- Whilst the filling pump is running, close the Filling Return valve and allow the system pressure to reach around 4 - 5 bar.
- When the pressure reaches 5 bar, close the Filling Flow valve and immediately switch off the filling pump.
- Check that the system pipework and pump station are leak-free. After leaving the system at about 5 bar for a minimum of 15 minutes,

check if the pressure gauge shows any significant drop in pressure. If it does, this points to a leak in the system that must be traced and rectified.

- Check the operation of pressure relief valve by slowly rotating the valve knob, lifting the valve, until fluid is discharged. This should be collected in a suitable container, e.g. a pressure relief valve fluid recovery container (as shown in Figure 3-3 on page 8).

Phase 3

- Re-open the Filling/Shut-off valve by turning 90° anti-clockwise.
- Switch on the circulating pump (by setting the solar controller to "manual") to the highest pumping speed and allow the solar fluid to circulate for at least 15 minutes.
- Set the solar controller to "stand by" (pump = OFF).
- Bleed the air separator using the manual air vent until the solar fluid begins to escape. Refer to section 4.7 (page 13).
- Set the operating pressure (as in Table 4-1) by carefully opening the Filling Return valve and releasing the fluid back into the filling station tank.

Phase 4

- Reset Flow and Return valves to fully open position. Refer to Figure 4-3 (page 11).
- Switch on the circulating pump (solar controller set to "manual").
- Set the flow rate on the flow rate indicator (refer to section 4.8) by selecting the appropriate pump speed and by using the Filling/Shut-off valve.
- Remove the filling station hoses from the filling connections and screw the caps on both valves. Release the Filling Return valve first and then the Filling Flow valve.
- Switch the solar controller to automatic operation and remove covers from the collectors.

4.7 Releasing Trapped Air

The residual air from the heat transfer fluid is collected in the air separator and manually released via the air vent. There is no need to use an automatic air vent elsewhere on the solar primary circuit, e.g. at high level.

To release any air collected in the air separator, push a plastic tube on to the manual air vent outlet and catch the fluid that is released in a suitable container. Open the manual air vent until all air has been vented, i.e. a steady stream of solar fluid is flowing from the air vent.



CAUTION

Venting air from the system should only be carried out only by a competent installer. Frequent venting leads to system pressure loss and disruption to the system operation.

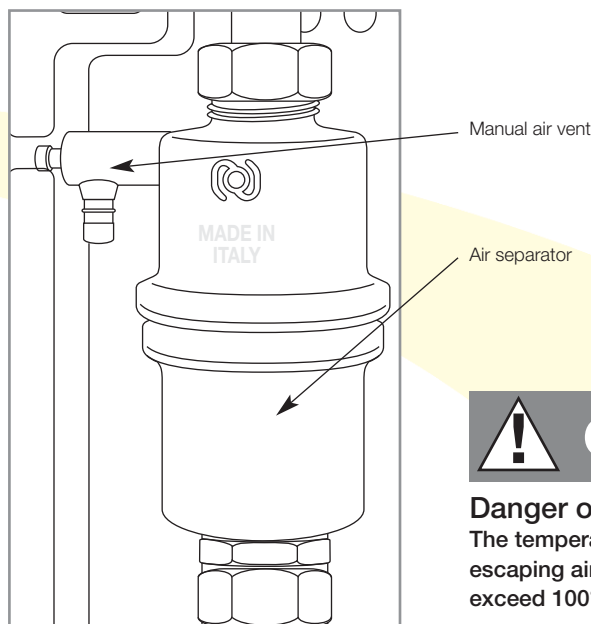


Figure 4-7: Air separator and air vent



CAUTION

Danger of scalding!

The temperature of both the escaping air and the solar fluid can exceed 100°C.

4.8 Setting the Flow Rate

The setting of the solar fluid flow rate is made via the speed setting of the circulating pump and the Filling/Shut-off valve. For required system flow rates refer to Table 4-2.

The flow indicator displays the fluid flow rate. The display range is between 1 and 13 litres per minute. See Figure 4-8.



NOTE

For larger installations, please contact Grant Technical Department for assistance.

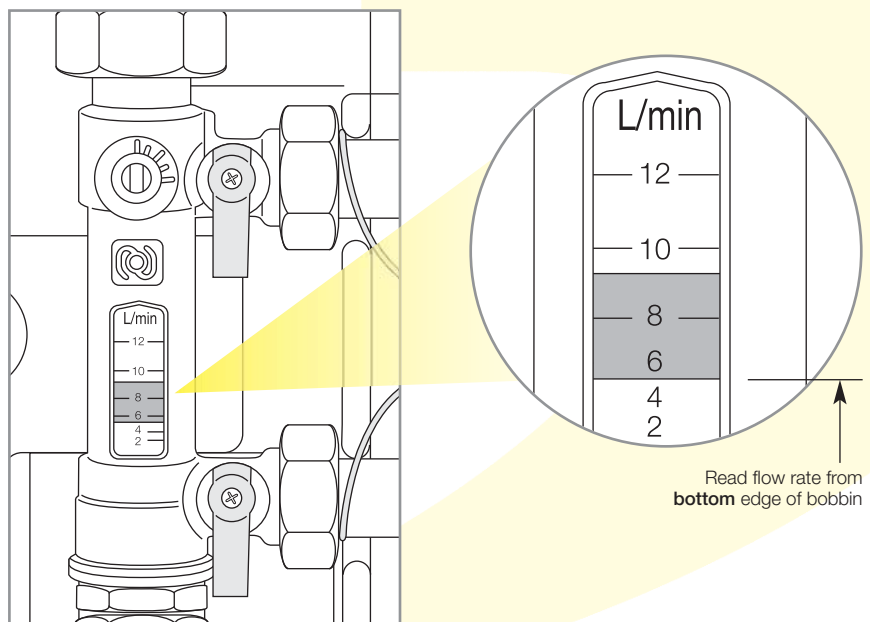


Figure 4-8: Flow rate indicator

Number of solar panels	1 to 5	6	8	9	12
Type of connection	Up to 5 in series	2 x 3 in parallel	2 x 4 in parallel	3 x 3 in parallel	4 x 3 in parallel
Flow and return pipe diameter	15mm	22mm	22mm	22mm	22mm
Minimum volume flow rate	2-3 l/ min	4-5 l/ min	4-5 l/ min	6-8 l/ min	6-8 l/ min

Table 4-2: System volume flow rates

5 Fault Finding

In the event of a problem occurring with your Grant Solar Thermal system, follow the information given below in order to identify and rectify the matter:

5.1 No System Circulation

Check for the following:

- Pump is not operating (see 5.2 below).
- If pump is noisy, there may be air in the system.
- Pump may be air locked and needs venting. Turn off power, remove central screw on pump motor to vent.
- Valves are closed – ensure that Flow, Return and Filling/Shut off valves are all fully open. Refer to Fig 4-3 on page 11.

5.2 Pump not Operating

Check for the following:

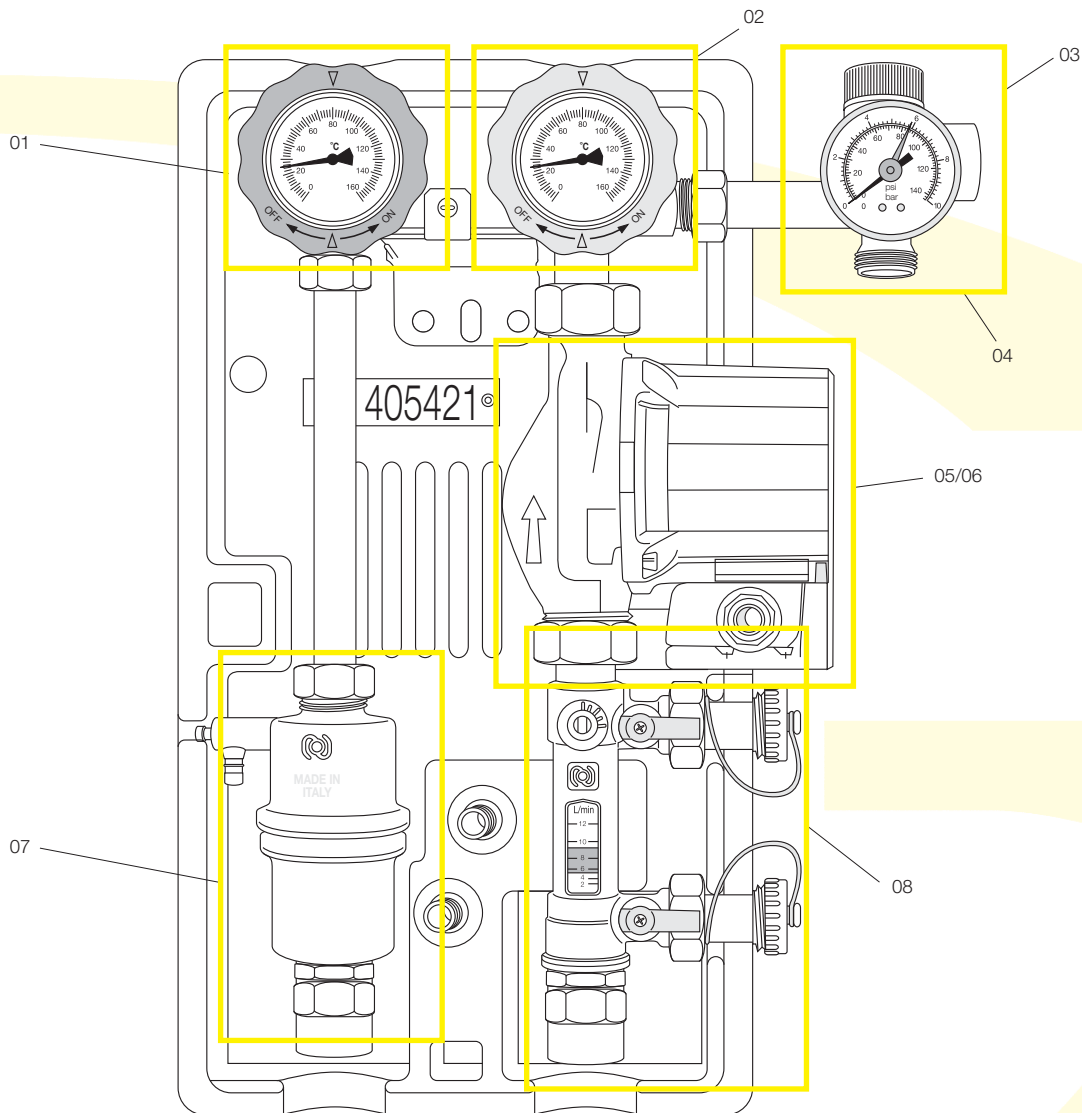
- No electrical supply to pump.
 - Controller is not calling for pump to operate (see below).
 - Check power supply to controls (at fused spur).
 - Check wiring to controller and pump is correct.
 - Check for any loose connections.
- Controller is not calling for pump to operate.
 - Check controller settings and correct as necessary (see Instructions supplied with the Solar Controller).
 - Collectors may be in stagnation mode – wait for system to cool down.
 - Collector temperature may be too low (insufficient solar radiation).
 - Cylinder temperature setting may be satisfied.
- Pump is stuck - Turn off power, remove central screw on pump motor and rotate motor using a screwdriver.
- Motor capacitor failed – replace capacitor or pump motor.

5.3 Loss of System Pressure (on pressure gauge)

Check for the following:

- Leaks on system – find and rectify as necessary.
- Expansion vessel pre-charge lost – check and re-charge vessel as necessary.
- Pressure relief valve discharging fluid – check and rectify/replace valve.

6 Spare Parts



Key No.	Description	Part No.
01	Flow valve assembly (Red)	GSE01
02	Return valve assembly (Blue)	GSE02
03	Safety valve assembly (6 bar)	GSE03
04	Pressure gauge	GSE04
05	Solar circulator (6 metre)	GSE05
06	Solar circulator (8 metre)	GSE06
07	Air separator assembly	GSE07
08	Fill/flush valve and flow regulator assembly	GSE08



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