Hamworthy Trigon

Pump Station Accessories Manual

Installation, Commissioning, Operation & Service Instructions

Accessories For : ST1 / ST1 Dual Aspect / ST2 /ST3 Solar Pump Stations

IMPORTANT NOTE

THESE INSTRUCTIONS MUST BE READ AND UNDERSTOOD BEFORE INSTALLING, COMMISSIONING, OPERATING OR SERVICING THE ACCESSORIES SUPPLIED FOR USE WITH THE EQUIPMENT IN THE TRIGON PRODUCT RANGE

Hamworthy

Heating *at work.*

Customer After Sales Services

Telephone: **0845 450 2866** E-mail: **aftersales@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 in instances where plant room area 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.

Maintenance Agreements

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. Maintenance agreements enable our customers 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

A comprehensive spare parts service is operated from our factory in Poole, providing replacement parts for both current and discontinued products. Delivery of parts and components is normally from stock within seven days. However, a next day delivery service is available for breakdowns and emergencies.

Hamworthy Trigon

Solar Pump Station Accessories

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THE TRIGON SOLAR PUMP STATION ACCESSORIES COMPLIY WITH ALL RELEVANT EUROPEAN DIRECTIVES.

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Hamworthy

HAMWORTHY TRIGON
COMMERCIAL SOLAR WATER HEATING SYSTEM

INSTALLATION AND OPERATION MANUAL

HYDRAULIC ACCESSORIES FOR TRIGON SOLAR PUMP STATIONS GUIDE:

ST1, Dual ST1 (two collector fields)
ST2
ST3

Customer Service Centre
Hamworthy Heating Limited
Fleets Corner, Poole,
Dorset BH17 0HH
Telephone: 0845 450 2866

CONTENTS

Standards and regulations – Safety

Standards and requirements

The following regulations and requirements must be observed when assembling and installing collectors, solar stations and controllers:

Solar thermal installation connections: EN 12976 and EN 12977.

Solar station installation and accessories:

- IEE Wiring Regulations 17th edition (2008) BS 7671
- L8: Approved Code of practice and guidance for the control of legionella bacteria in potable hot water systems.

1 – Hydraulic connection

Refer to the installation and operating instructions manual supplied with Trigon Solar Pump stations ST1, ST2, ST3 and Double array ST1.

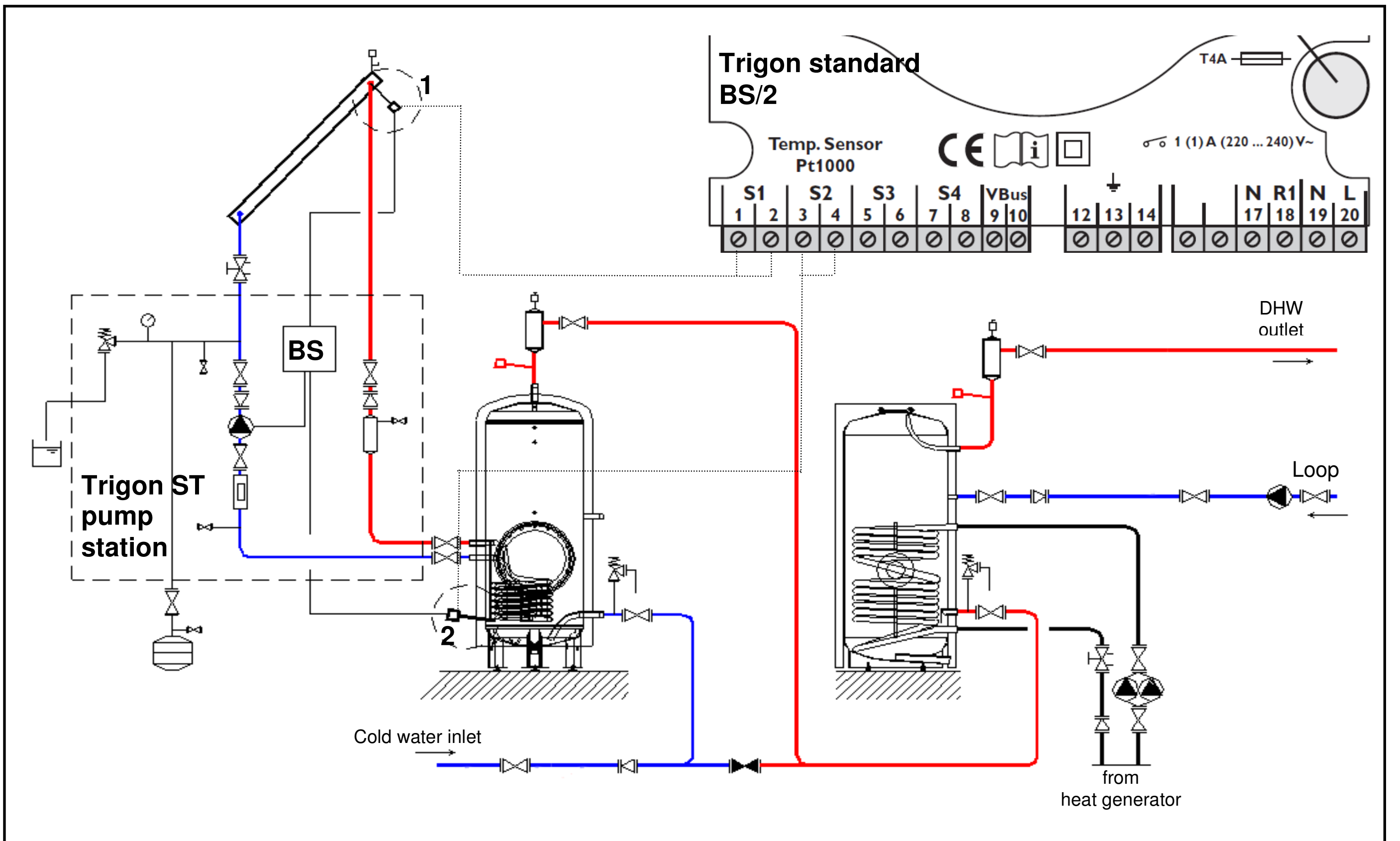
The ST1 and ST2 solar stations have a de-aerator integrated in the unit on the collector array outlet circuit.

On the ST3 solar stations, the de-aerator is not integrated in the unit. It forms part of the supply of the ST3 stations but is supplied **not mounted**. The de-aerator must be installed by the installer.
This de-aerator is defined for the solar stations and is designed to be mounted horizontally.

Caution: The Trigon solar ST3 pump station must be equipped with the de-aerator supplied with the station.

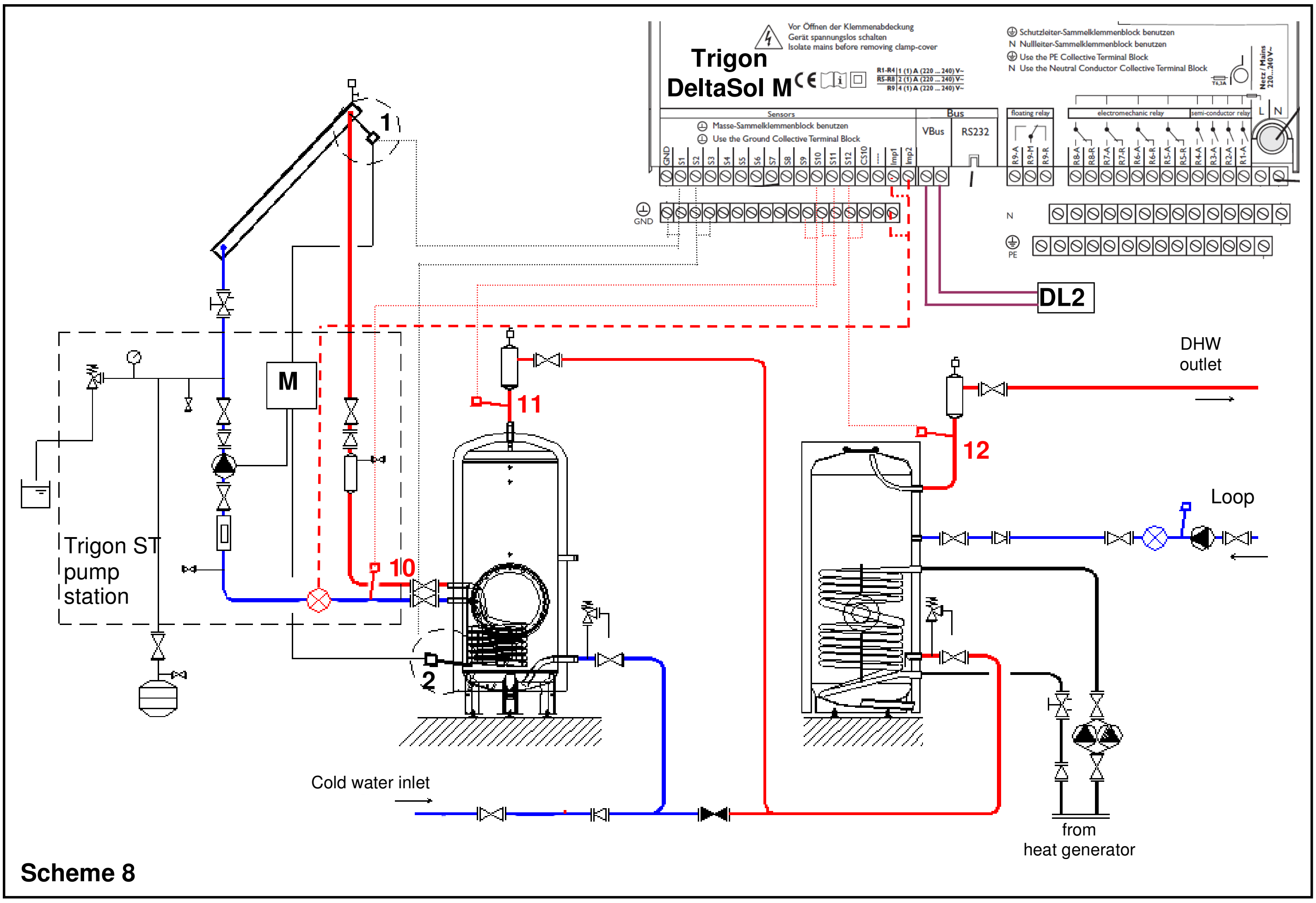
The de-aerator must be mounted horizontally by the installer on the collector array outlet ① of the station.

Hydraulic diagram for Trigon solar ST pump station managed by a Trigon standard BS/2 solar controller (scheme 8)

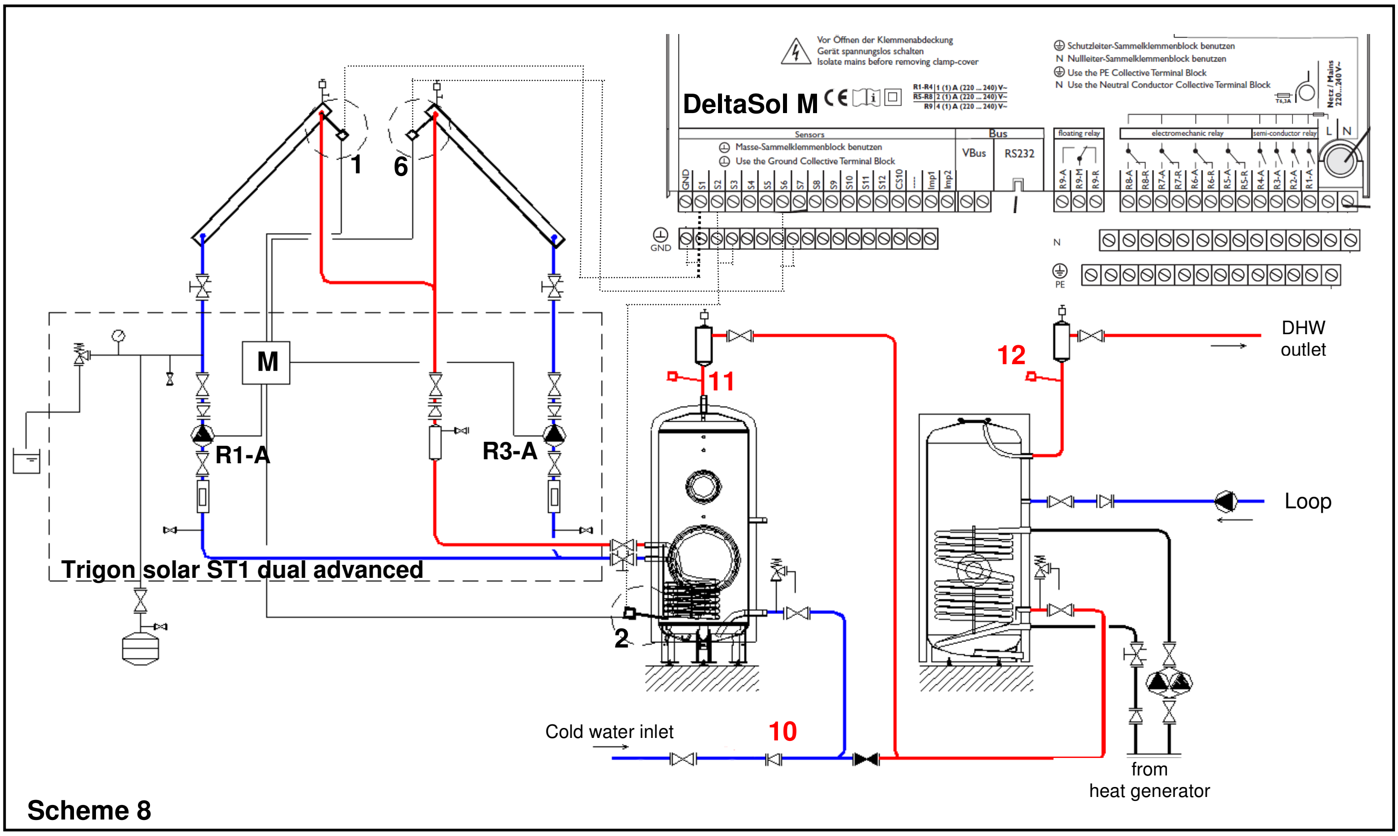


Scheme 8

Hydraulic diagram for Trigon solar ST pump station managed by a Trigon DeltaSol M controller (scheme 8)



Hydraulic diagram for Trigon solar dual ST pump station managed by a Trigon Deltasol M controller (scheme 8)



2 – Installation of balancing valves (accessory)

Commissioning of the solar system balancing valves must be done by a specialist company for 'MCS Approval'.

Balancing solar fluid flowrates
A balancing valve installed on each collector array is used to balance the solar fluid flowrates.
This provides higher solar productivity and prevents overheating in the installation.
The balancing valve of the general collector must be placed on the terrace roof to facilitate fine adjustment of the general balancing of the installation. **The balancing valves must never be completely closed**.

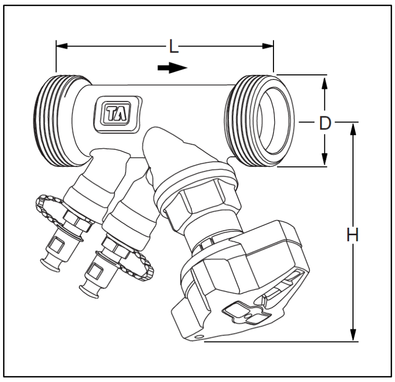
If the installation is set up to be able to isolate one or several collector arrays, these must be equipped with a secondary safety valve.

Recommendations: After you have adjusted all the balancing valves, check that all of them are open.

2.1 - Dimensions and characteristics

Install as indicated by the arrow shown in the figure opposite.

Caution: Maximum operating temperature = 150℃ (the handwheel should be removed for temperatures exceeding 120℃). The valve must be installed on the coldest collector array inlet line.

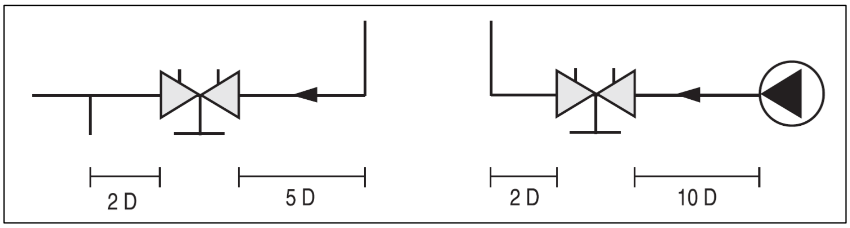


Model STAD-C	D	L	H	Min. flowrate (l/h) Min. Δp: 0.3 mCE	Pre-setting	Max. flowrate (l/h) Min. Δp: 0.3 mCE	Pre-setting	Kvs*	Weight
15	G3/4''	97	100	92	1,95	436	4	2,52	0,62
20	G1''	110	100	437	2,4	987	4	5,70	0,72
25	G1''1/4	115	105	988	2,6	1507	4	8,70	0,88
32	G1''1/2	134	110	1508	2,8	2460	4	14,2	1,2
40	G2''	150	120	2461	3,2	3326	4	19,2	1,6
50	G2''1/2	168	120	3327	2,8	5716	4	33,0	2,3

*Kvs = m3/h for a differential pressure of 1 bar, with valve completely open.

2.2 - Installation

Do not install the balancing valve immediately downstream of a pump, another valve or an elbow. Be sure to observe the distances given in the figure below:



Install the valve as indicated by the arrow shown in the figure in section 2.1 which gives the solar fluid direction of circulation.
Use only high-temperature flat fiber seals.

2.3 - Determining the balancing valve setting

Example: Valve diameter: let's say DN 25
Flowrate: 1.6 m3/h. Pressure drop: 10 kPa.

Determining the value Kv by calculation:

When the Δp and the flowrate are known, use one of the following 2 formulas to calculate Kv:

$$Kv = 0{,}01 \frac{q}{\sqrt{\Delta p}} \quad q \text{ l/h}, \Delta p \text{ kPa} \qquad Kv = 36 \frac{q}{\sqrt{\Delta p}} \quad q \text{ l/s}, \Delta p \text{ kPa}$$

Calculation of Kv of example:

Kv = 0,01 x 1600 / √10 = 0,01 x 1600 / 3,16

Kv = 5,06

The calculated value of Kv is used to find the setting of the valve in the table below:

	Balancing valve per array	Collector field balancing valves	
Setting position	**DN 15**	**DN 20**	**DN 25**
0,5	0,127	0,511	0,60
1	0,212	0,757	1,03
1,5	0,314	1,19	2,10
2	0,571	1,90	3,62
2,5	0,877	2,80	5,30
3	1,38	3,87	6,90
3,5	1,98	4,75	8,00
4	2,52	5,70	8,70

2.4 - Adjustment of balancing valves

After calculating, and for the given example, set the valve to 2,3 as follows:
1. Fully close the valve (Fig. 1).
2. Open the valve to the setting 2,3 (Fig.2).
3. Screw the central rod clockwise up to the limit stop using a 3mm hex key (Fig. 4).
4. The valve is now pre-set.
To check the valve pre-set position, start by closing the valve (position 0,0). Then, open the valve up to the limit stop (position 2,3 as in the example in figure 2).
The valve can be opened to 4 turns maximum (Fig. 3). Opening the valve by more than 4 turns will not (practically) increase the flowrate.
Detail concerning adjustment: setting **1** +/- 14 % of Kv, setting **4** +/- 5 % of Kv.

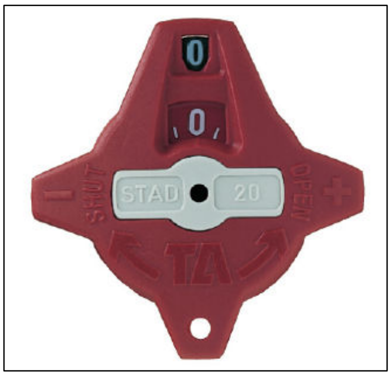


Fig. 1 Valve closed

Fig. 2 Vanne set to 2,3

Fig. 3 Valve open

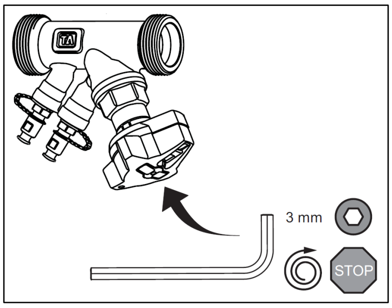


Fig. 4 Turning the central rod

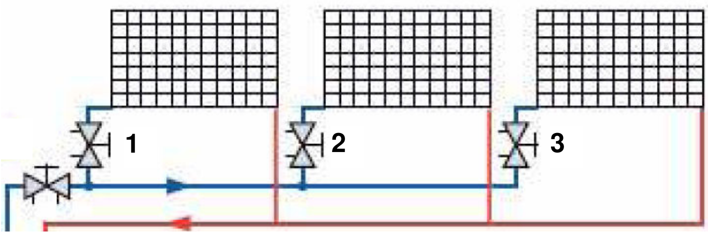
2.4.1 - Adjustment of balancing valves on site

Before you begin to adjust the balancing valves, set the solar controller to manual mode (MAN 1 set to ON) ; the green indicator light flashes. In this manual position, the circulator operates at its maximum speed, ensuring the maximum flowrate in the solar circuit. At the end of the adjustment procedure on all the valves, return to the automatic mode (MAN 1 set to Auto); the indicator light comes on green steady.

The balancing valves for each collector array and of the main collector can be adjusted using the TA-Scope instrument.
The balancing valves of each array must be adjusted first, with the valve of the main collector adjusted last.

For each balancing valve of the arrays:

1) Measure the actual flowrate
2) Close the valve
3) Measure the pressure drop
4) Open the valve
5) Indicate the desired flowrate: pre-set indication



For the main valve of the main collector:
1) Close the valve
2) Measure the pressure drop

The instrument used to measure the pressure drop transfers the pre-set positions to the TA-scope which calculates the setting positions for each valve. The valves of each collector array can be adjusted. This is followed by adjustment of the main collector valve by which the correct flowrate is obtained in each array valve.
The circuits are thus proportionally balanced with minimum pressure drop in the valves.

2.4.2 - Check of Δp using pressure taps

The pressure taps on the balancing valves have a double safety feature and are self-sealing. To measure the pressure, unscrew the cap and insert the measuring sensor through the pressure tap.

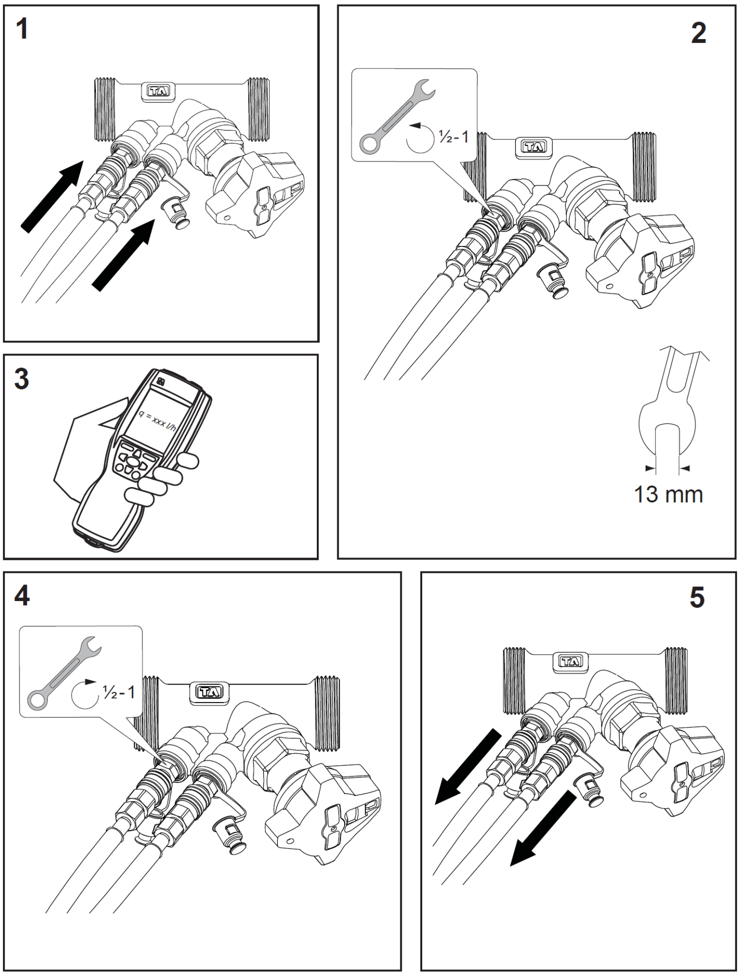
1. Connect the measuring hoses.

2. Open the pressure taps by 0.5 to 1 turn using a 13 mm wrench.

3. Measure the Δp.

4. Close the pressure taps once the measurement has been taken.

5. Disconnect the measuring hoses.



Caution: Make sure the temperature of the solar fluid is less than 100℃ before measuring the pressure drop of the valves.

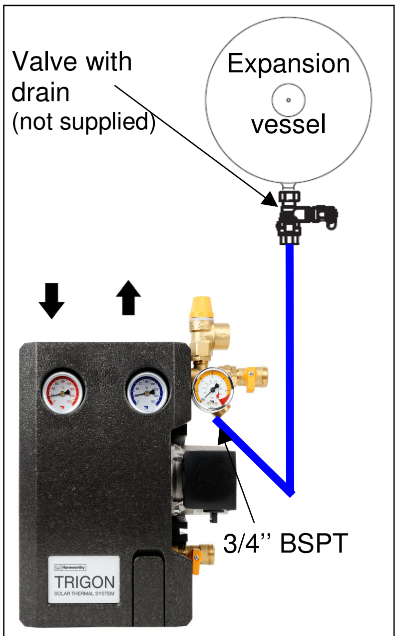
3 – Solar fluid expansion vessel (accessory)

3.1 - Connection and installation

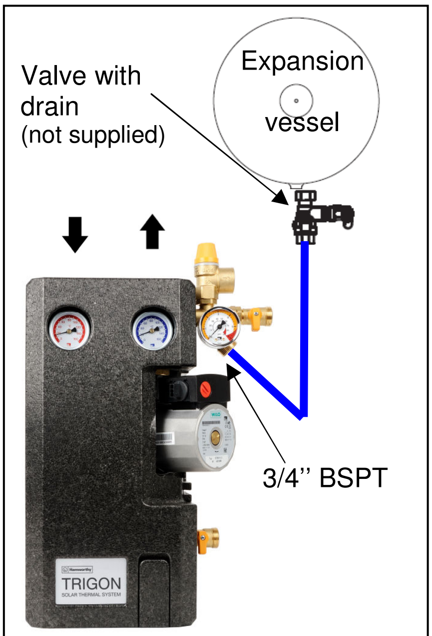
On the expansion vessel coupling, install an isolating valve with drain to isolate the vessel during flushing operations and to check its charge pressure as part of the annual maintenance procedure.
Use high-temperature fiber seals and sealing compounds.

On the Trigon solar pump stations:

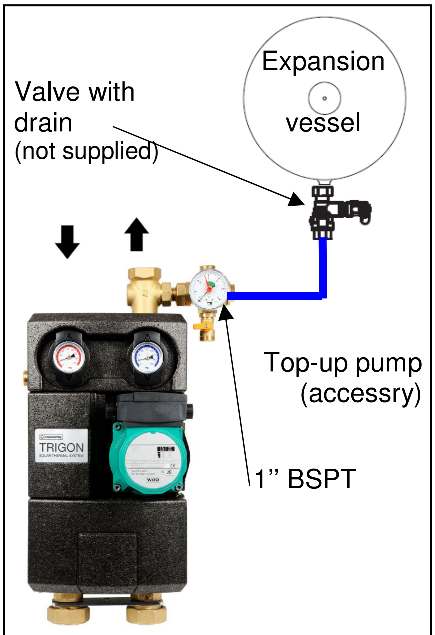
The expansion vessel is connected to the **discharge line** of the pump on the Trigon solar ST1, ST2 and ST3 pump stations.



Trigon solar ST1



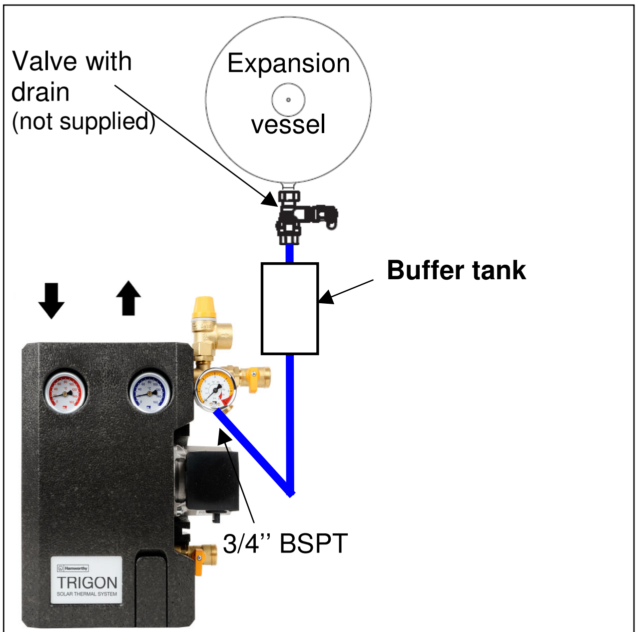
Trigon solar ST2



Trigon solar ST3

Installation precaution: The diaphragm of the expansion vessels is designed to safely work over a temperature range of 5℃ to 70℃. On a solar installation, an accidental overheat condition (due to an electrical failure or a solar pump problem) can drive a quantity of high temperature solar fluid into the expansion vessel. The temperature of the fluid mixture in the vessel could then exceed 70℃.
If the line between the solar controller and the collectors has a volume **less** than the volume contained in the collectors, a buffer tank must be installed between the expansion vessel and the installation. This will provide a buffer volume of solar fluid at low temperature.

The volume of the buffer tank must be at least equal to the volume of the collectors less the volume of the collector connection pipes.



Trigon ST1 pump station

An alternative to a buffer tank is to use large un-insulated diameter pipe on the return line to the collector field or in the expansion vessel branch. Proprietory corrugated stainless steel pipe used in the expansion vessel branch will also assist cooling.

3.2 – Expansion vessel sizing

Glycol decays under the action of heat, oxygen and bacteria so the solar fluid's concentration and acidity should be checked every 12 months.

To avoid under-sizing the expansion vessel and over pressure of the system, resulting in an elevation of the boiling point, Table 15.2 indicates suggested sizes for the expansion vessel and pressure settings to avoid safety valve discharge.

When measuring the vessel pre-charge, with a hand held pressure gauge or tyre pump, the vessel must be disconnected from the system.

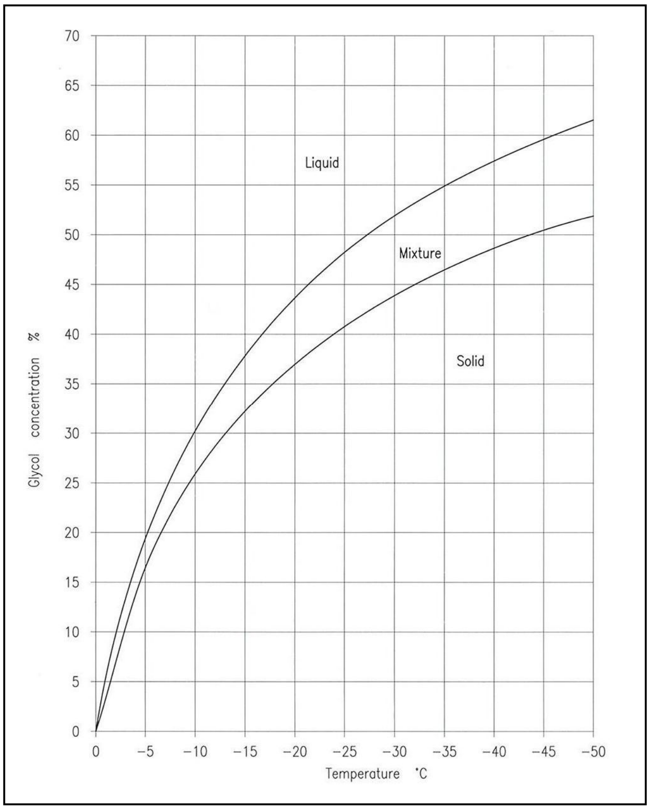


Figure – Relationship Between Freeze Point & Aqueous Glycol Concentration

System Height (m)	2.5	5	10
System Volume (Litres)	*Vessel Size* / ***Gas Pre-Charge*** / Initial Fill Pressure *Litres* / ***Bar*** / Bar		
<10	*18* / ***1.3*** / 1.6	*18* / ***1.5*** / 1.8	*18* / ***2.0*** / 2.3
20	*25* / ***1.3*** / 1.6	*25* / ***1.5*** / 1.8	*35* / ***2.0*** / 2.3
30	*35* / ***1.3*** / 1.6	*35* / ***1.5*** / 1.8	*40* / ***2.0*** / 2.3
40	*40* / ***1.3*** / 1.6	*50* / ***1.5*** / 1.8	*50* / ***2.0*** / 2.3
50	*50* / ***1.3*** / 1.6	*50* / ***1.5*** / 1.8	*60* / ***2.0*** / 2.3

Table - Vessel Settings With 6 bar Safety Valve & 1.0 bar Overpressure

Method Of Calculation Of Expansion Vessel Size, Gas Pre-charge & Initial Fill Pressure

STEP 1: Calculate V expanded. Where V expanded = System Volume x Fluid Expansion Coefficient

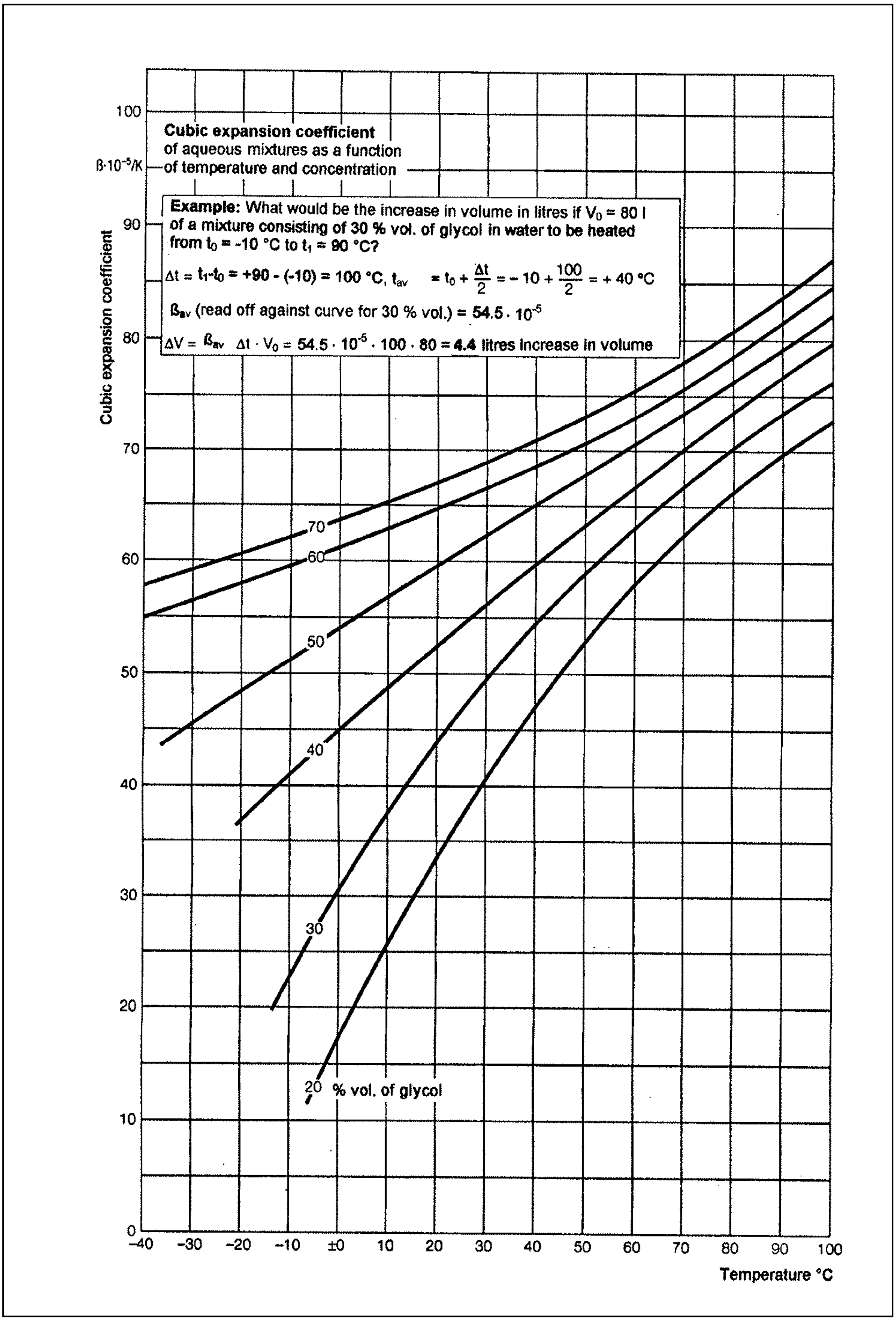


Figure – Determine Expansion Coefficient Of Particular Concentration Of Glycol From Graph

STEP 2: Calculate Volume Of Extra Fluid For Protection Against Steam & For Small System Leaks (V seal).

Where V seal = V total x 0.000654 x (T fill - T min)

For very small systems the minimum V seal must not be less than 3 litres.

STEP 3: Calculate Volume In Collector Array & Adjacent Pipework That May Vaporise At Stagnation (V vapour)

Where the volume in each collector is 1.46 Litres

STEP 4: Calculate Working Volume Of Expansion Vessel (V working)

Where V working = V expansion + V seal + V vapour

STEP 5: Calculate Final System Pressure During Stagnation (P final)

P final is used to set the intended vaporisation point of the antifreeze.

Where P sv = Rated Safety Valve Relief Pressure
P margin = A margin set on the Rated Safety Relief Valve Pressure so no discharge occurs in stagnation
= 0.1 x P sv & P margin > 0.5 bar
P final = P sv - P margin

STEP 6: Calculate Gas Pre-charge Pressure (P gas)

Where H geo = Height difference between the vessel inlet and the highest point of the collector array.
P geo = H geo x 1 bar / 10 m
P op = Over pressure of the collector at the highest point in the circuit.
P gas = P op + P geo

P op provides a means to prevent the pressure in the system becoming sub—atmospheric, which could lead to suction of air into the circuit or cause pump cavitation.

STEP 7: Set P wseal = 0.3 bar Where P wseal ensures the expansion vessel contains V seal.

STEP 8: Calculate the cold fill pressure for the solar circuit (P initial)

$$\text{P initial} = \frac{\text{P wseal} + \text{P gas}}{\text{P wseal} + (\text{P op} + \text{Pgeo})}$$

STEP 9: Calculate the Pressure Factor for the vessel Pf

Where P pump = 0.3 bar

$$\text{P f} = \frac{\text{P final} + 1\text{ bar}}{\text{P final} - (\text{P gas} + \text{P pump})}$$

STEP 10: Calculate Nominal Expansion Vessel Volume (V nominal)

Where V nominal = Pf x V working x 1.1

Worked Example

A solar hot water system consists of 3 solar collectors, a circuit of 36m of D22mm copper pipe connected to the lower coil of a Powerstock 400l calorifier. The static height between the collector array and the expansion vessel is 8 meters. The ambient temperature during filling is 15^{o}C and the minimum external temperature has been specified as –10^{o}C. The solar circuit is filled with an aqueous solution of 40% glycol in water. The pressure relief valve is rated for 6 bar. An over pressure in the collector array (pump head on stagnation) has been specified as 1.1 bar.

			Units	Formulae
Total number of solar collectors		3.0	each	
Pipe run from plantroom to collector field		18.0	metres	
Solar system static height		8.0	metres	
Pipe diameter from plantroom to collectors		0.02	m	
Safety relief valve setting	P sv	6.0	barg	
Maximum ambient temp during initial cold fill		15.0	°C	
Lowest potential operating outside air temperature		-10.0	°C	
System volume				
Collector Array Volume		4.4	litres	Internal volume per collector = 1.46 litres
Calorifier lower coil		12.2	litres	PS300 = 10.4 litres PS400 = 12.2 litres PS500 = 13.15 litres PS750 = 13.5 litres PS1000 = 17.1 litres
Pipe volume plantroom to collector field		11.3	litres	
Header volume behind collectors		3	litres	
Flexible connections volume		1	litres	
Total system volume	**V total**	**31.9**	**litres**	
Expansion volume	**V expanded**	**2.6**	**litres**	**0.08 x V total**
Vessel water seal volume	V seal	3.0	litres	V total x 0.000654 x (filling temp + minimum external air temp)
Vapour volume (steam volume)	V vapour	5.4	litres	
Working volume expansion vessel	V working	10.9	litres	V expanded + V wseal + V vapour
Building static pressure	P geo	0.8	barg	Building height (metres) / 10.2
Collector minimum pressure	P op	1.1	barg	Constant
Expansion vessel cushion pressure	P gas	1.9	barg	P geo + P op
Pressure margin for safe operation	P margin	0.5	barg	P sv x 10% **Must not be less than 0.5**
Maximum operating pressure	P final	5.4	barg	P sv - P margin
Water seal equivalent pressure	P wseal	0.3	barg	Constant
Pressure factor	P f	2.5	factor	((P final + 1 barg) / P final - (P gas + P pump)) / 1.25
Required nominal expansion vessel volume	V nominal	25	litres	P f x V working
Cold fill pressure	P initial	2.2	barg	P gas + 0.3

Table – Results from worked example on previous page

Servicing

The maintenance intervals apply to sealed installations with losses ≤ 3 liters or ≤ 0,5 % of the content of the installation. An installation with higher solar fluid losses must be inspected more frequently by a professional.
Between each maintenance cycle, the differences with respect to the commissioning values must be less than Δp= -0,2 bar.

P0 (charge pressure): **maintenance interval ≤ 5 years**: ΔP0≤-0,2 bar
Pa (filling pressure): **maintenance interval ≤ 1 year**: ΔPa≤-0,2 bar

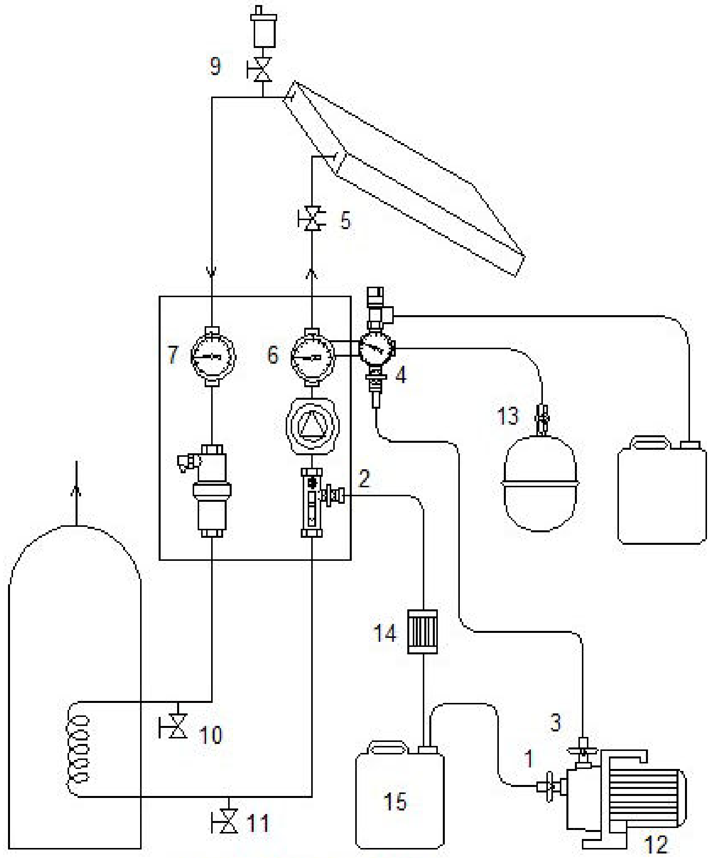
Caution: Beware of high temperatures at the expansion vessel and its connection line.

4 – Installation of solar system filling and pressurization pump

The pump allows you to fill and top up with a solution of 40% Tyflocor mixed in water.

Hydraulic diagram for installation of system pressurization Trigon solar pump stations

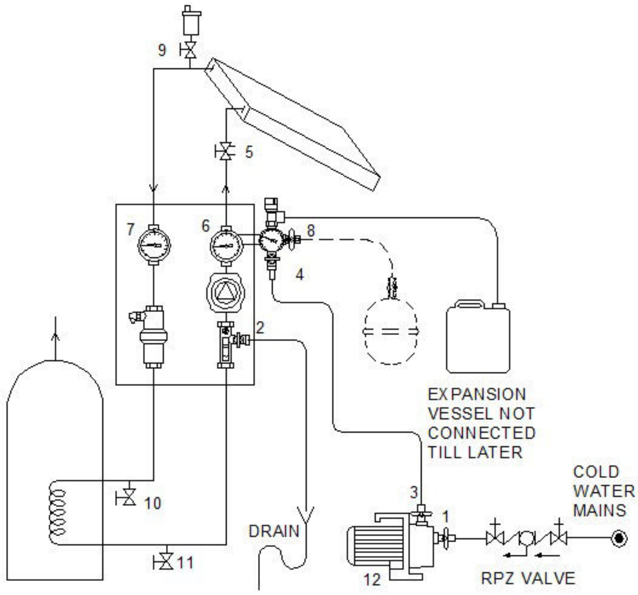
1. Filling Pump Inlet Valve
2. Pump Station Drain Valve
3. Filling Pump Outlet Valve
4. Pump Station Fill Valve
5. Collector Field Balancing Valves
6. Ball Valve & Thermometer Pump Station Collector Field Return Connection.
7. Ball Valve & Thermometer Pump Station Collector Field Flow Connection.
9. Isolating Valve Collector Array AAV.
10. Drain Valve Flow Connection To Coil.
11. Drain Valve Return Connection To coil.
12. Filling Pump.
13. Isolating Valve Expansion Vessel.
14. Strainer.
15. Container Of Antifreeze



Procedure For Filling /Pressurising & Draining The Solar Circuit

Before carrying out this procedure undertake a risk assessment to those carrying out the work as well as to occupants and passers-by. Whilst carrying out these procedures wear appropriate personal protective equipment & restrict access to those in the vicinity of the installation. Remember the collectors will be sited on the roof so it may be necessary to cordon-off at ground level a suitable area underneath the collector installation.

1. Filling Pump Inlet Valve
2. Pump Station Drain Valve
3. Filling Pump Outlet Valve
4. Pump Station Fill Valve
5. Collector Field Balancing Valves
6. Ball Valve & Thermometer Pump Station Collector Field Return Connection.
7. Ball Valve & Thermometer Pump Station Collector Field Flow Connection.
8. Valve Plugging Expansion Vessel Connection.
9. Isolating Valve Collector Array AAV.
10. Drain Valve Flow Connection To Coil.
11. Drain Valve Return Connection To coil.
12. Filling Pump.



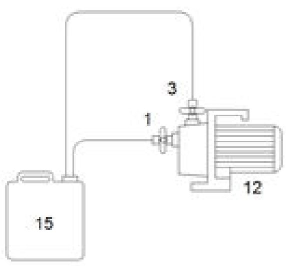
4.1 – To flush the solar circuit with mains water using pump (part No. 564300050)

Refer to previous figure.

A) Remove filling pump (12) from it's packaging & cut off the moulded plug and wire a 3-pinned UK plug to the pump's flying lead.
B) Connect a length of hose over the hose tail of valve (1) using a Jubilee-clip & the other end of the hose into the nearest drain connection.
C) Connect the free end of the hose at (3) on the pump over the hose tail of valve (4) and assemble using a Jubilee-clip.
D) Connect the inlet of the pump (1) via an RPZ valve to the cold water mains supply ensuring leak proof joints through out. There is no need to prime the pump as the mains pressure will do this.
E) Open valves (1), (2), (3), (4), (5) & (7).
F) Shut valves (6), (8), (9), (10) & (11).
G) Where possible cover the glass face of the collectors from direct sunlight using a tarpaulin, because with a high level of solar radiation it is possible that vapour could be generated in the collectors. Alternatively pressurise or flush the system on a cloudy day.
H) Switch the pump (12) on.

4.2 – To pressure test the solar circuit with mains water using pump (part No. 564300050)

A) Repeat procedure 4.1 but shut valve (2). Keep pump running till 6 bar is reached.



1. Filling Pump Inlet Valve
3. Filling Pump Outlet Valve
12. Filling Pump.
15. Container Of Antifreeze

Figure – Hydraulic Circuit For Priming Pump With Antifreeze Mixture

4.3 – Priming filling pump (part No. 564300050) with antifreeze if pump not used previously

Refer to Figure – hydraulic circuit for priming pump with antifreeze mixture on page 15.

A) Put the filling pump on something so it is at a greater height than the top of the container of antifreeze (15) used to fill the solar circuit.
B) Hamworthy Heating Ltd can supply a 25L plastic container of propylene glycol antifreeze. Part No.553000401.
C) Fill container 553000401 with tap water, to a level just below the threaded neck of the container for a mixture of 40% (10L) propylene glycol in water.
D) Connect a length of hose to the inlet of valve (1) on the pump and submerge the other end of the hose in the container of Antifreeze.
E) Shut valve (1) & open valve (3) on the filling pump. Fill the pump head with water through (3).
F) Open valve (1) until water can be seen to drain from the pump head to the level in the container. Shut (1). Refill the pump head. Shut valve (3).
G) Cut a length of hose sufficient to go between valve (3) & valve (4) (when the pump is on the floor as in figure below).
H) Assemble this to valve (3) on the pump outlet.
I) Immerse the other end of the hose in the container.
J) Half close the valve (3).
K) Plug the pump into an electrical socket and turn the pump on.
L) Turn the pump on to prime the pump.

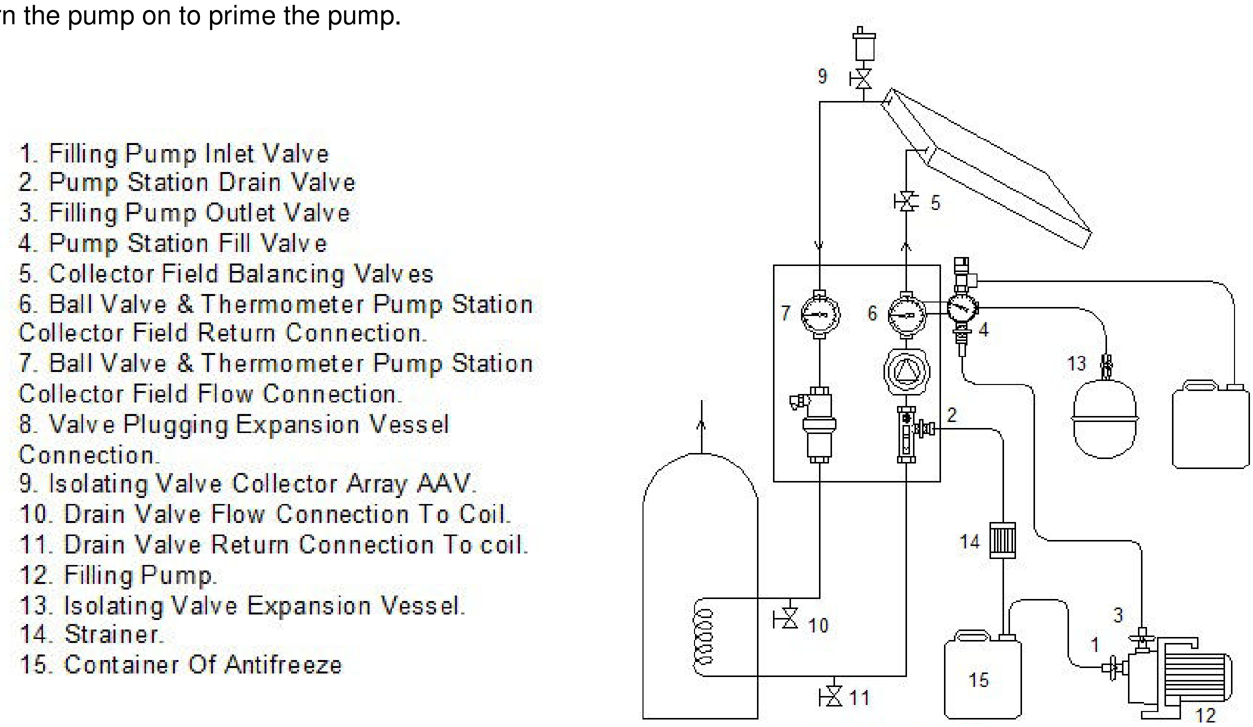


Figure – Hydraulic Circuit For Filling Solar Circuit

4.4 – To fill the solar circuit with antifreeze

Refer to Figure above.

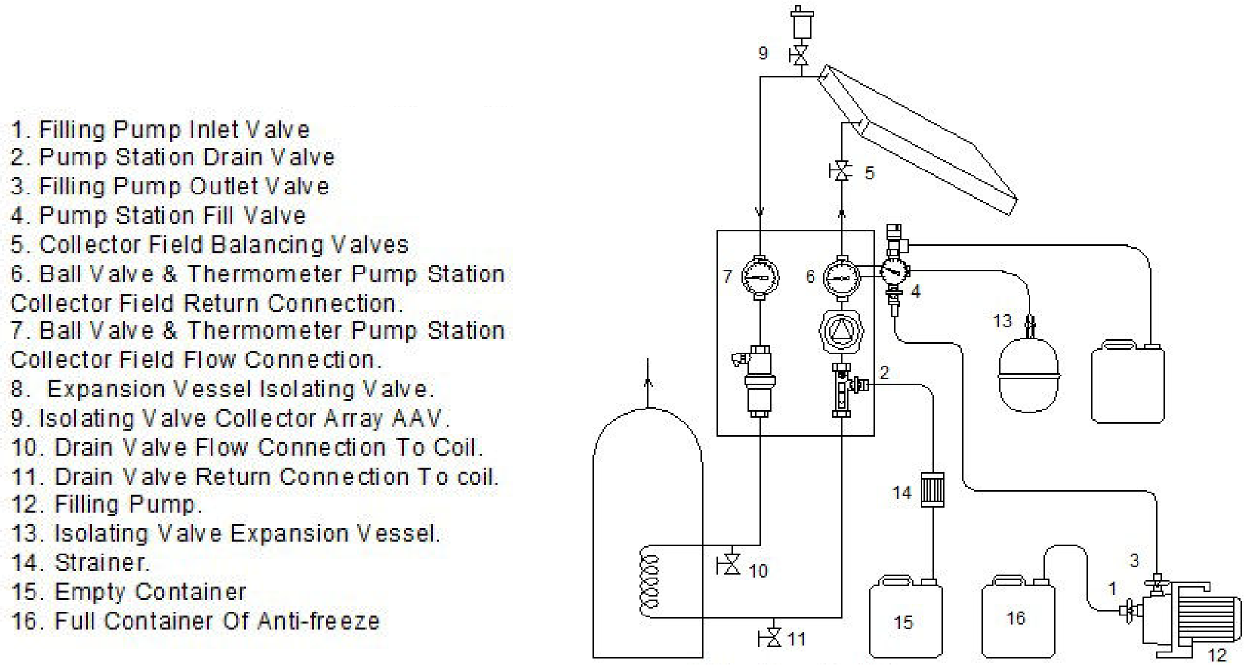
A) Connect the hoses supplied with filling pump 564300050 as shown in figure above.
C) For all hose tail connections use Jubilee-clips & ensure the joints are tight & leak free.
D) Ensure the expansion vessel cold fill pressure has been determined and the gas pre-charge been set.
E) Open valves (3), (4), (5), (7), (2) & (13). Shut valve (1), (6), (10 & (11).
F) If possible open valve (9) as well.
G) Where possible cover the glass face of the collectors from direct sunlight using a tarpaulin, because with a high level of solar radiation it is possible that vapour could be generated in the collectors. Alternatively fill the system on a cloudy day.
H) Open valve (1) & switch the pump on simultaneously.
I) Allow the glycol/water mix to be recirculated back to the container and back round the solar circuit, so that all air is purged from the solar circuit for 20 minutes.
J) Ensure valve (9) is shut on completion of this procedure.

4.5 – Pressurising the solar circuit with antifreeze

Refer to Figure – Hydraulic circuit for filling solar circuit on page 16.

A) Ensure that valves (1), (2), (10) & (11) are shut.
B) That valves (3), (4), (5), (6), (7) & (13) are open.
C) Open valve (1) & switch the pump on simultaneously to pressure the solar circuit until the cold fill pressure is reached.
D) Shut valve (1) & switch off the pump simultaneously.
E) Check each joint in the circuit for leakage and tighten where necessary.
F) Drain & re-pressurise if necessary.
G) If the internal pressure is higher than required the pressure can be reduced by opening & closing valve 2.
H) Remove the tarpaulin cover over the collectors.

4.6 – To replace the antifreeze in a filled solar circuit



A) When flushing poor condition antifreeze where possible completely cover the glass face of the collector field with tarpaulins.
B) Depending on the solar circuit volume a number of containers of new glycol/water mix may be required.
C) Put the solar controller to run the solar circulating pump in manual to dump its heat.
D) If operations A-C are not possible & the operation is to be done on a sunny, rather than a cloudy day, take precautions & use appropriate personal protective equipment to avoid being scolded.
E) The old antifreeze mix should be captured in empty containers and disposed of through the local authority disposal facility & not down the drain.
F) Connect the hoses supplied with filling pump 564300050 as shown in Figure above.
G) Endure valves (2), (3), (4), (5), (7) & (13) are open.
H) Close valve (1), (6), (10) & (11).
I) Switch the pump on and open valve (1) simultaneously.
J) When each container of new antifreeze is emptied or container filled with old, switch the pump off and shut valve (1) simultaneously.
K) If access to open valve (9) is possible open that as well. If not procedure 4.4 operation (I) and (J) will need to be repeated after flushing.

4.7 – To drain the solar circuit

A) Take the precautions listed in section 4.6 when draining the solar circuit.
B) Connect hoses to valves, (2), (4) & (11).
C) Do not use the pump station safety valve (17) to drain or drop the pressure in the circuit as this valve will not reseal once opened & will require replacing. Valve 13 should be open.
D) Drain the solar circuit in stages.
   i) Shut valves 6 & 7. Slowly open valve (9).
   ii) Open valve 4 and drain to 15.
   iii) Open valves 2, 6 , 7, 18 and drain to 15.
   iv) Open valve 11 and drain to 15.
E) Depending on the circuit volume it may be necessary from time to time to change the container.

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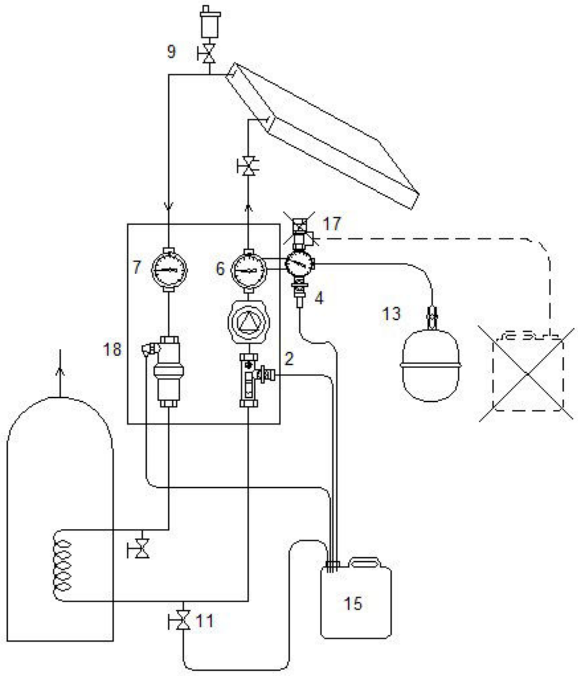


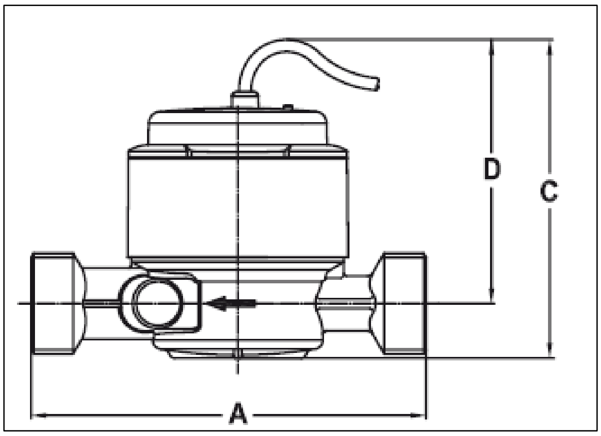
5 – Installation of 0.6-1.5 m3/h metering kit (accessory)

The **0.6** / **1.5 m3/h metering kits** are connected on a Trigon DeltaSol M controller system.
There are two metering kits from 0.6 m3/h to 1.5 m3/h. They are formed by a class 3 V40 volumetric flowmeter with pulse generator and 2 sensors PT1000 with pocket.

The **0.6** / **1.5 m3/h WMZ metering kits** are connected on a WMZ energy meter.
There are two metering kits from 0.6 m3/h to 1.5 m3/h. They are formed by a WMZ energy meter, a class 3 V40 volumetric flowmeter with pulse generator and 2 sensors PT1000 with pocket.

5.1 - Dimensions of V40 volumetric flowmeters

Dimensions of V40 volumetric flowmeters, from 0.6 to 1.5 m3/h

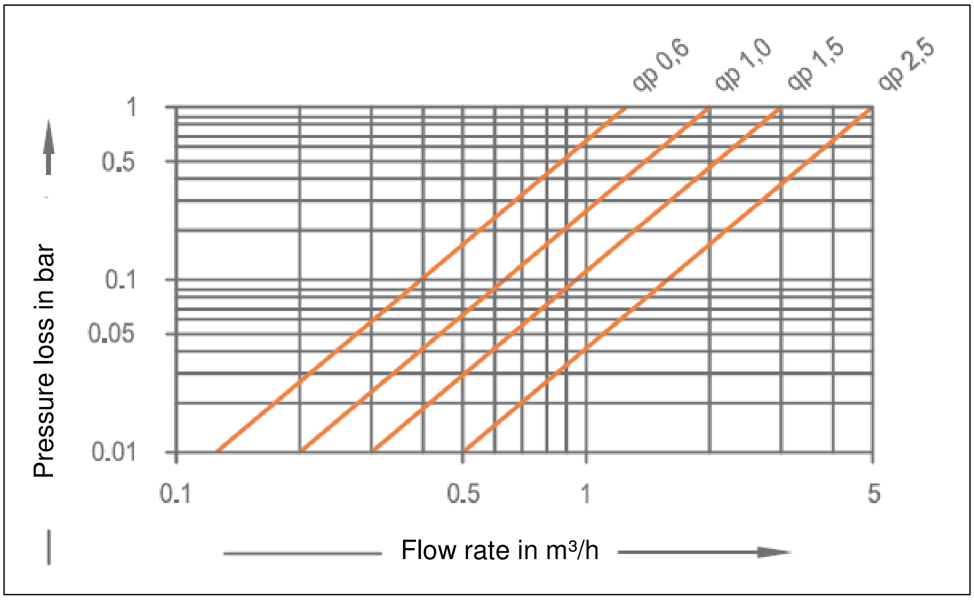


DN20 meter		V40-06	V40-15
Nominal flowrate (m^3/h)		0.6	1.5
A	Length without couplings	110 mm	
	Length with couplings	209 mm	
C	Height with cable	108 mm	
D	Height at center line	90 mm	
	Diameter of meter	72 mm	
	Weight without couplings	0,6 kg	
	Horizontal and vertical mounting		

5.2 - Characteristics of V40 volumetric flowmeters, from 0.6 to 15m3/h

V40 meter			V40-06	V40-15
Pulse rate		l/Imp	1	10
Nominal diameter of couplings	DN	DN	15	
Coupling threading		''	½''	
Meter threading		''	¾''	
Maximum pressure	Pmax	bar	16	
Maximum temperature	Tmax	°C	120	
Nominal flowrate	Qn	m3/h	0,6	1,5
Pressure drop at nominal flowrate	Δp_{nom}	bar	0,25	
Maximum flowrate	Qmax	m3/h	1,2	3
Pressure drop at maximum flowrate	Δp_{max}	bar	1	
Flowrate limit, precision +/-3%	Qt	l/h	48	120
Horizontal minimum flowrate	Qmin	l/h	12	30
Vertical minimum flowrate	Qmin	l/h	24	60

Pressure drop of V40 volumetric meters, 0.6 to 2.5 m3/h



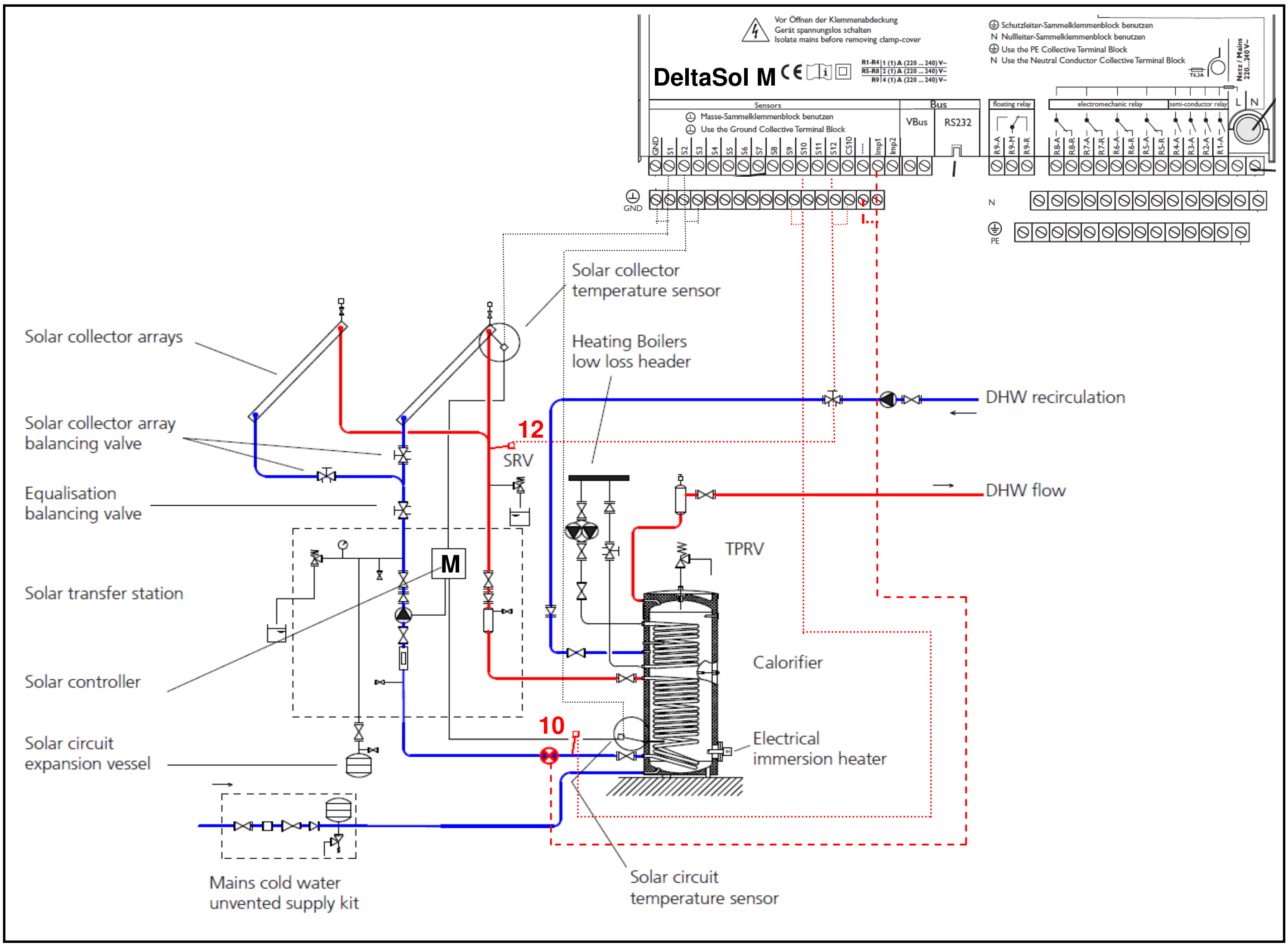
5.3 - Hydraulic and electrical connection of metering kit on Trigon DeltaSol M controller

Installation of V40 volumetric flowmeters:

⚠ **Caution: To obtain a uniform flowrate, provide a straight length of 30 cm at the inlet and outlet of the V40 meter.**

Electrical connection of V40 volumetric flowmeters

Example: **Scheme 1**, **Metering of solar contribution with Trigon DeltaSol M controller on a Trigon solar ST pump station**



Refer to the Trigon solar Technical Specification No. 0DNO0210 for configuration of the controller.

6 – Installation of WMZ metering kits (accessory)

There are 2 metering kits, from 0.6 m3/h to 1.5 m3/h. These comprise a WMZ energy meter, a V40 volumetric flowmeter and 2 sensors PT1000 with pocket.

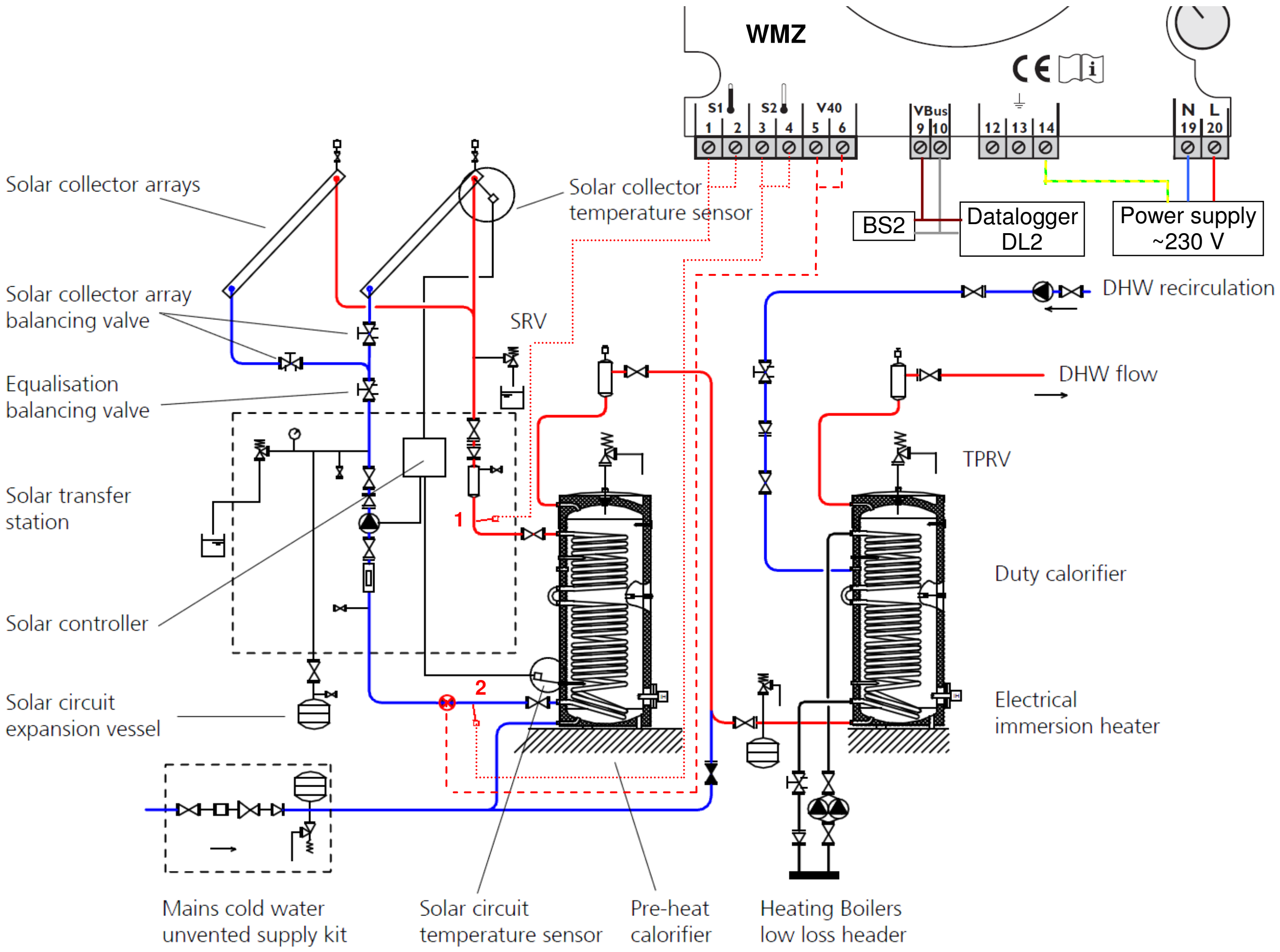
Dimensions and characteristics of V40 flowmeters, see section '*5 – Installation of 0.6-1.5 m3/h metering kit (accessory)*'.

Installation of WMZ energy meter: Refer to installation and operating instructions manual supplied with WMZ.

For a Trigon solar ST pump station, the WMZ energy meter is mounted on the wall.

Hydraulic and electrical connection of WMZ metering kit

Example scheme 8: **Metering of DHW demand with WMZ energy meter on a Trigon solar ST pump station**



Scheme 8

Refer to the Trigon Technical Specification No. 0DNO0210 for controller configuration.

7 – Installation of Datalogger DL2 recording interface (accessory)

Refer to the installation and operating instructions manual supplied with the Datalogger DL2.
The datalogger DL2 is mounted on a wall or in an electrical cabinet (take the necessary precautions with respect to high currents).

Bus link: Using a network cable, connect the 2 Vbus terminals of the WMZ calorimeters, the DeltaSol M or BS/2 controller and the Datalogger DL2.

Configure the WMZ calorimeters.

Notes

Notes

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