



flowmat[®]

Pressurisation Units

OPERATION AND MAINTENANCE MANUAL

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Revision:

Revision Date:

General Information

These instructions are to assist in the installation of the flowpress Watchman Pressurisation Units please follow them carefully.

If, having read this Operation & Maintenance Manual, there is any doubt about any aspect of the installation please don't hesitate to contact our technical team.

Definitions of Safety Warnings and Precautions



WARNING!

Indicates a potentially hazardous situation which, if not avoided, can result in serious injury or death.



CAUTION!

Indicates a potentially hazardous situation which, if not avoided. Can result in minor to moderate injury, or serious damage to the product.

Safety

Information

It is essential that correct and safe working practices are adhered to at all times when installing, operating and/or maintaining any piece of equipment. Always consult safety data sheets, operating and maintenance manuals, Health & Safety legislation and recommendations and specific requirements of any equipment manufacturer, site controller, building manager or any other persons or organisation relating to the procurement, installation, operation and/or maintenance of any piece of equipment associated or in conjunction with any product provided by **flowtech** Water Solutions.

This document is intended for ALL installers, operators, users and persons carrying out maintenance of this equipment and must be kept with the equipment, for the life of the equipment and made available to all persons at all times. Prior to carrying out any work associated with the set it is essential that the following sheets are read, fully understood and adhered to at all times.

Equipment must only be installed, operated, used, and/or maintained by a competent person. A competent person is someone who is technically competent and familiar with all safety practices and all of the hazards involved.

Any damage caused to any equipment by misapplication, mishandling or misuse could lead to risk of Electrocutation, Burns, Fire, Flooding, death or injury to people and/or damage to property dependent upon the circumstances involved. **flowtech** Water Solutions accepts no responsibility or liability for any damage, losses, injury, fatalities or consequences of any kind due to misapplication, mishandling or misuse of any equipment, or as a result of failure to comply with this manual.

Failure to install, operate, use or maintain the equipment in accordance with the information contained within this document could cause damage to the equipment and any other equipment subsequently connected to it, invalidating any warranties provided by **flowtech** Water Solutions to the buyer.

SAFETY WARNINGS &

PRECAUTIONS

These instructions should be read and clearly understood before working on the system. Please read this manual carefully and all of the warning signs attached before installing or operating the equipment keep this manual handy for your reference. This equipment should be installed, adjusted and serviced by trained and qualified personnel. Failure to observe this precaution could result in bodily injury.



WARNING! - Install an emergency stop key separately from the isolator. Rotating shafts can be hazardous.



WARNING! - This equipment has a high leakage current and must be permanently fixed to earth.



WARNING! - Do not attach or remove wiring or connectors when the power is applied. Do not check signals during operation. When the power is turned on and the running command is on, the motor will start rotating. The stop key is only effective when the function is set. If there is a power failure and an operation instruction is given the unit may start automatically when the power is reinstated.



WARNING! - Make sure that the input voltage is correct. Be sure to install the unit in a room that is not exposed to direct sunlight and is well ventilated.

Avoid environments which have a high ambient temperature, high humidity or excessive condensation. Avoid dust. Corrosive gas, explosive gas, inflammable gas, grinding-fluid mist and salt damage, etc.



WARNING! - Do not connect the power source to any terminals except power connectors.



WARNING! - Motor control equipment and electronic controllers are connected to hazardous line voltages. When servicing drives and electronic controllers, you may be exposed to components at or above the line potential. Extreme care should be taken to protect against shock. Dangerous voltage may exist after the power light is off.

Wait more than 5 minutes after turning off the power supply before performing maintenance or inspection. Hazard of electric shock. Disconnect incoming power before working on this unit.



WARNING! - The inverter should be protected separately against ground fault.

Observe the regional regulations for electrical installation!



CAUTION! - It is strongly recommended that all electrical equipment conforms to National Electrical Codes and local regulations. Only qualified personnel should perform installation, alignment and maintenance. The manufacturer reserves the right to alter the technical data in order to make improvements or update information.



CAUTION! - Failure to observe these rules will render the guarantee invalid. The same applies to repair jobs and/or replacement. Your legal rights are not affected.



CAUTION! - The manufacturer declines all responsibility in the event of damage or injury caused as a result of tampering with the equipment.



CAUTION! - Do not switch on/off power supply to run/stop the motor/system! Start the unit only by using run button or external run command.



We strongly recommend that commissioning and service work is carried out by the manufacturer's personnel or appointed agents ~ please contact our technical sales department for information on our commissioning and service contract packages.

CUSTOMER / CONTRACTOR

RESPONSIBILITIES

It is the responsibility of the customer and/or the contractor:

- To ensure that anyone working on the equipment is wearing all necessary protective gear and/or clothing.
- Is aware of appropriate health & safety warnings.
- Has read the information in this section of the manual.

This equipment is covered against manufacturing defects for 12 months from date of purchase from Flowtech Water Solutions.

This warranty covers the replacement of parts or products, verified as having a manufacturing defect, when inspected at the factory.

Flowtech Water Solutions reserves the right to inspect an installation to verify that the equipment has been installed in accordance with the written instructions.

Any modifications to the supplied equipment must be approved in writing by Flowtech Water Solutions, failure to do so will invalidate the warranty.

All goods are carefully tested and inspected before dispatch. Should any goods appear defective owing to faulty materials or manufacture, they must be returned to us for examination. If we (acting reasonably) agree they are defective, we shall replace them. This shall be our only obligation in relation to the defective goods, unless we have notified you in writing of any additional warranties we may provide and you have complied with all conditions attached to these warranties. Beyond this all conditions, warranties and representations expressed or implied by statute, common law or otherwise in relation to the Goods (save for the conditions implied by section 12 of the Sale of Goods Act 1979) are excluded from the Contract to the fullest extent permitted by law (if you are acting as a consumer please see paragraph below).

Flowtech Water Solutions can only respond to warranty queries from its direct customer. If in doubt, please contact your installer to establish the supply chain.

We are not liable for any indirect, special or consequential liabilities, losses, charges, damages, costs and expenses you suffer howsoever caused and including, without limitation, pure economic loss, loss of anticipated profits, goodwill, revenue, reputation, anticipated savings, management time, business receipts or contracts or losses or expenses resulting from third party claims. Nothing in these Conditions excludes or limits our liability (a) for death or personal injury caused by our negligence, (b) for our fraud or fraudulent misrepresentation or (c) for any matter which it would be illegal for us to exclude or attempt to exclude our liability. If you are acting as a consumer you will have additional statutory rights which we cannot contract out of and we are not excluding or limiting these rights.

Environment

- It is not anticipated that this equipment will be exposed to adverse environmental conditions without additional protection.
- Site the equipment in a Frost Free Area.
- Ensure that 500mm of clear access is available around the equipment with dedicated clear access at the front of the pump set cabinet and above the spill vessels.
- Flush the mains water supply pipe before connection to this equipment.
- An inline filter must be fitted to the inlet of the equipment if the mains water supply is suspected to contain debris.
- Please refer to BS 7074 for the installation code of practice.
- Maximum running conditions 40 °C and 70% humidity.

Safety

- Electrical installation must be carried out by a competent* person
- WARNING – LIVE TERMINALS WITHIN THIS EQUIPMENT
- Isolate the equipment before removing any covers
- Do Not make any electrical adjustments to the equipment unless it is isolated from the mains electrical supply
- Do Not operate with the electrical covers removed
- Do Not alter any internal pipe-work, this equipment is tested prior to Dispatch.
- Do Not obstruct and ventilation fans or apertures
- Check supply voltage and overload protection is correct
- All Electrical installations must be carried out in lines with BS7671:2008

Warning

Within this manual there is reference to the symbol for 'Danger – Electric Current'
Disregarding these warnings may:

- Jeopardise Health
- Cause death, fire or other damage
- Lead to overloading of system components and permanent damage
- Impair the function of the equipment

Warning: This equipment contains sensitive electronic components which may be adversely affected by electrical installation testing. The equipment must be disconnected from the supply before carrying out electrical installation tests.

Delivery of Goods

Buyers or their agents within the United Kingdom and Republic of Ireland must notify the carrier and Flowtech Water Solutions in writing in the event of damage to or partial loss of goods within three days of delivery.

In the event of non-receipt of goods, both the carrier and Flowtech Water Solutions must be notified in writing within ten days of receipt. Unless such notification is received, the goods will be deemed to have arrived in good condition and we shall not be liable upon and shall have the right to reject any claim in respect of any such damage, loss, shortage or non-receipt of goods.

Transportation

Vessels are shipped horizontally within a disposable wooden frame, pump sets are shipped upright on a disposable wooden pallet. Care must be taken to ensure the pallets, packaging and equipment does not bottom out, tip or rock causing damage or marking of the powder coated finish. Lifting lugs and points, when provided, will be clearly visible and marked. Do not stack equipment, once removed from the transportation packaging the equipment must be put into position.

Unloading of goods

Due to the nature, size, weight, and shape of the goods, appropriate offloading equipment will be required on site, as well as any moving equipment such as winches, forklifts and trolleys. Please refer to your site health and safety officer for appropriate procedures.

Storage

Once delivered this equipment must be stored appropriately, without exposure to adverse weather conditions and in a frost free area for the duration of the storage period. Water may remain within the unit following factory testing, in the event of a frost, sensitive electronic equipment may be damaged by the expansion of water as it turns to ice.

Storage conditions:	Temperature:	50 °C Max
	Humidity:	60- 70% Max
	Protection against:	Sunlight, heat radiation and vibration
	Room conditions:	Closed, Frost free, Dry

Appropriate Use

This equipment is designed for use on sealed heating and chilled systems, where the thermal expansion and contraction directly affects the fluid system volume.

This equipment is intended for use on balanced sealed heating and chilled systems where a closely maintained pressure is required.

Water based, sealed heating and chilled systems are in accordance with BS EN 12828:2003. For system temperatures exceeding 105 °C additional rules and regulations may apply, please contact the thermal system designer for confirmation.

Commissioning must be carried out by a qualified person. This is defined as anyone who has successfully received professional training and guidance from the manufacturer of the equipment. The qualified person is also expected to have sufficient knowledge and experience of relevant national safety standards.

Installation Location

Access for unqualified and untrained personnel must be restricted or forbidden to this equipment. The intended location for the equipment must ensure operation, service, maintenance, inspection, repair, installation and dismantling of the equipment can be carried out unhindered and in safety (See Appendix 1 for example).

Weight loadings must be checked to ensure the vessel and pump set are stable throughout the operation life of the equipment.

A suitable drain point must be located within a practical distance of the spill vessel(s). In a service or fail condition it may be necessary to drain the fluid content of the spill vessel(s). This fluid may be up to 70°C under normal operating conditions, and over this temperature as a result of improper usage. Therefore a safe and appropriate drainage point is essential.

Care must be taken to ensure the equipment is not submerged in the event of a flood situation; internal components are not suitable for complete immersion in water and must be practically prevented from doing so.

Emergency Stop

Directive 2006/42/EC requires an emergency stop facility is made available on the main power switch to the control unit. This separates the phases and neutral lines. Where additional Emergency Stop facilities are required, these are to be installed onsite and do not form part of the equipment supplied.

Personal Protective Equipment (PPE)

PPE must be used when carrying out potentially dangerous work, including but not limited to, transportation of equipment, installation, commissioning and maintenance, please refer to your site health and safety officer for appropriate procedures and wears.

Over Temperature

Equipment used in combination with the expansion automat must guarantee that the permitted operating temperature and the permitted fluid temperature cannot be exceeded. Excess pressure and temperature may lead to component overload, irreparable damage to components, loss of function and, as a result, to severe personal injury and damage to property. Regular checks/inspections of these safeguards must be carried out.

It is the responsibility of the end user to ensure appropriate installation of safety devices to protect equipment in such events as over pressurisation, over temperature and any other foreseeable system problems that may occur, to protect both the equipment and personnel.

System Fluid

Fluid that is non flammable, does not contain solids or long fibre components and does not present danger to operations due to its contents, and will not affect or damage the water bearing components.

The Flowmat Equipment is suitable for water glycol mixes up to and including 50:50 mix (please note that any addition of glycol in to water vastly increases the expansion coefficient, if the original sizing has not been done on the correct percentage mix then the equipment may be under sized!).

Operation with improper media can lead to impaired function, damage to components and, as a consequence, to serious personal injury and damage.

***Definition: Competent person:** A person who possesses sufficient technical knowledge, relevant practical skills and experience for the nature of the (electrical) Work undertaken and is able at all times to prevent danger, and where appropriate, injury to him/herself and others

Safeguards

The equipment supplied is equipped with the required safety devices. To test their effectiveness or restore the set-up conditions, the equipment must first be taken out of service. Taking the system out of service implies that the electrical power and hydraulics must be isolated.

Mechanical hazards:

The fan wheel casing on the pump protects operators from personal injury from moving parts. Before commissioning, check that it is fit for purpose and fixed in place. Expansion automats with protective casings are protected against dirt, prevent unauthorized operation and minimize noise emission.

Electrical hazards:

The protection class of electrically-operated components prevents personal injury by electrocution, which can be deadly. The protection class is usually IP54 (5: access with wire impossible, dust protected, 4: protected against splashing water). The control unit enclosure, the cover of the pump feed, the threaded cable glands and the valve connector plugs must be inspected for effectiveness prior to commissioning. The installed pressure and volume sensors are operated with protective extra- low voltage.

Avoid welding work on additional equipment which is electrically connected to the control unit. Stray welding current or an improper earth connection could lead to the danger of fire and damage to parts of the unit (e.g. the control unit).

Electrical Equipment Inspection

Regardless of the prescriptions of the property insurer / operator it is recommended to inspect the electrical equipment of the Flowmat together with the heating or refrigerating installation at least every 1.5 years.

Maintenance & Repair

These services may only be carried out when the system is shut down, or if the expansion automat is not required to balance the thermal expansion and contraction. The pressurisation equipment must be taken out of service and guarded against unintentional re-starting until the maintenance work is finished. Note that the safety circuits and data transmissions made while shutting down could trigger the safety chain or lead to false information transmitted to the Building Management System (BMS). Existing instructions for the heating or cooling unit as a whole must be observed. To stop hydraulic components, isolate the relevant sections and drain them using the available drain connections, and release the pressure.

Caution: The maximum system water temperature in conducting components (vessel, pumps, casings, hoses, pipelines, peripheral equipment) may reach 70°C and, in the case of improper operation, may exceed that. This brings a danger of burns and/or scalding.

The maximum pressure of system water in conducting components may equal the maximum set pressure for the applicable safety valve. Vessel, nominal pressure 2 bar, Safety valve max. 2 bar; pump-unit nominal pressure 6; 10 or 16 bar: Safety valve max 6, 10 or 16 bar. Use of eye/face protectors is required if the eyes or face could be injured by flying debris, parts or spraying fluids.

To stop electrical equipment (control unit, pumps, valves, peripheral equipment), isolate the power to the control unit. The power supply must remain off for the period of the work. It is forbidden to alter or use non-original components or replacement parts without written authorisation. Such acts may result in serious personal injury and endanger operational safety. They will also render any claim for damages against product liability null and void.

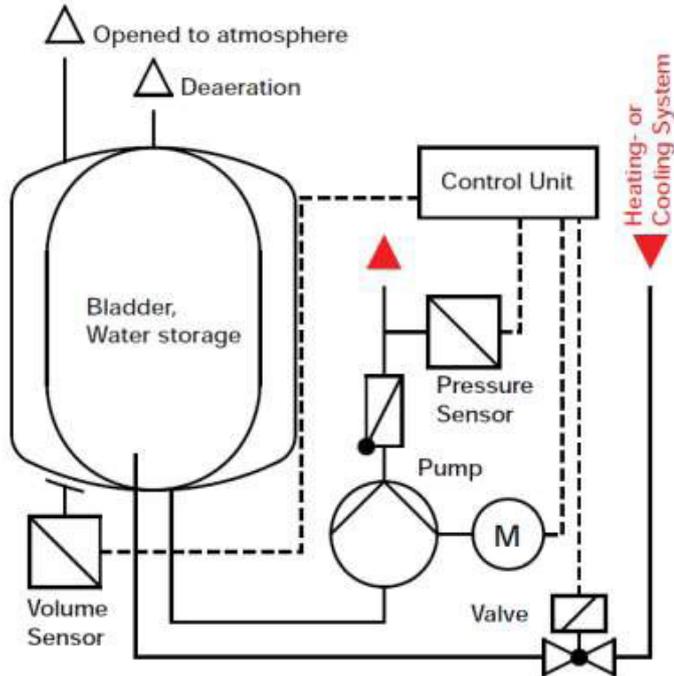
Validity

All technical information, data and schematics contained herein are correct at the time of publication. This information is the sum of our current findings; we reserve the right to make technical changes subject to future development and product enhancement.

Images and schematics, therefore, may not represent assemblies or parts as delivered. Images, drawings and schematics are not to scale and may contain symbols for simplification.

Operating Principle

The Flowmat (PHP) is designed to accurately balance system pressure to within (typically) 0.2 barg.

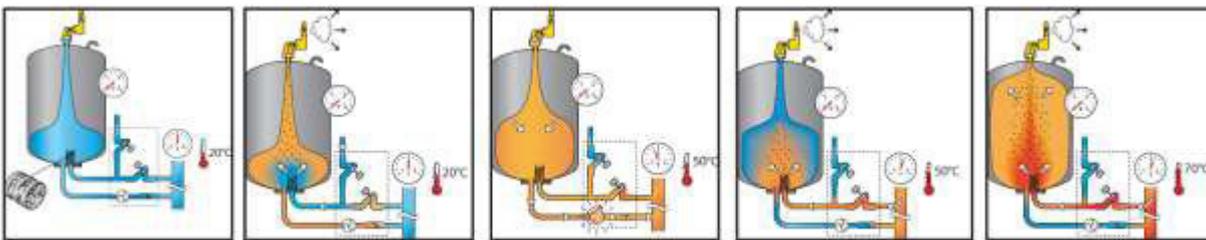


Expansion Relief

As the system fluid heats up it expands, during expansion the system pressure attempts to rise. The Flowmat (PHP) control equipment senses the pressure rise and opens the connection (solenoid) valve to the expansion vessel. The expanding fluid flows into the vessel, through an orifice (to restrict flow rates) and a system pressure rise is prevented.

Contraction Compensation

As the system cools down, the system fluid contracts, during contraction the system pressure attempts to drop. The Flowmat (PHP) control equipment senses the pressure drop and energises the pumps. The fluid is actively from the vessel back into the system, and a system pressure drop is prevented.



Unit Safeguards

Weight sensor to calculate water content of vessel at any one time. The weight sensor is calibrated in the factory with the system dry, this allows for accurate water measurement during normal operation.

Pressure sensor for monitoring system pressure.

Filling interlock for replenishment fluid (via integral pressurisation unit). System fluid is lost through leaks and evaporation during air removal, fluid top up is required for maintaining the system content and integrity. This is automatically activated if the vessel volume drops below 12%.

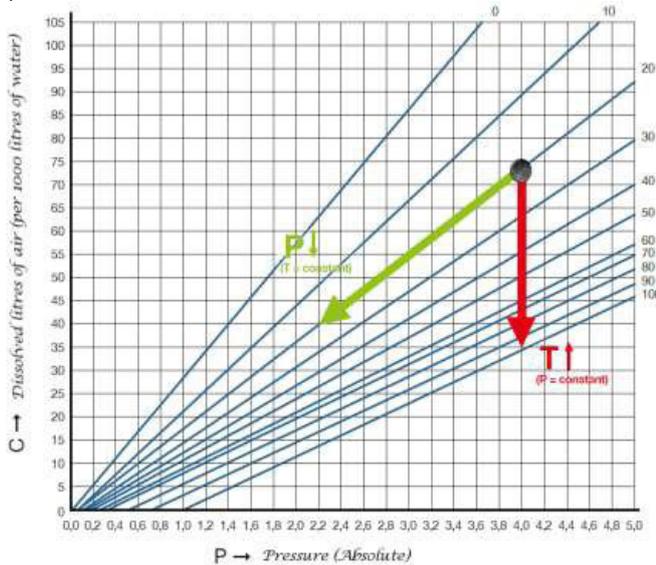
Flowmat (PHP) self diagnostics. The system holds the most recent alarm conditions in its memory, these can include water top up, excessive pump activation and high / low pressure alarms.

Cascade setting for the pumps allows the second pump to energise in addition to the first, if faster fluid replenishment is required.

Pressureless Vessel and Active De-aeration

The water held in the vessel is at atmospheric pressure. The system effectively spills the expanded water into the Flowmat (PHP) vessel. This action creates an active pressure drop between the system and the vessel.

In accordance with Henry's law dissolved air can be released from water by increasing the temperature or dropping the pressure.

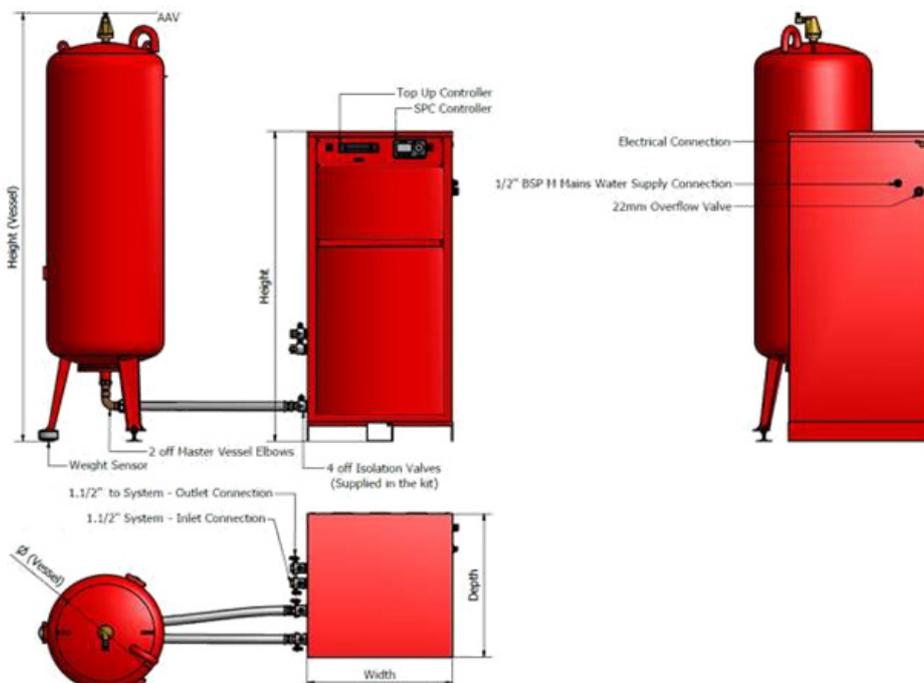


The Flowmat (PHP) system with its pressure drop design allows dissolved air to be released from the system water. This is enhanced by a cartridge of patented PALL rings in the inlet stream to the vessel. The released air is allowed to vent out of the vessel via an automatic air vent on the top. The air vent is also fitted with a non return valve to prevent air being drawn back into the system.

When the Flowmat (PHP) is in passive de-aeration mode air is released during the heating and cooling cycles only.

When the Flowmat (PHP) is in turbo de-aeration mode the system water is continually being exchanged with the vessel water by cycling the solenoid and pumps on the skid. This turbo mode operates within the +/-0.2 bar tolerance on the system pressure setting.

Note: Active De-aeration is not suitable and must not be activated on systems with flow temperatures exceeding 90°C.

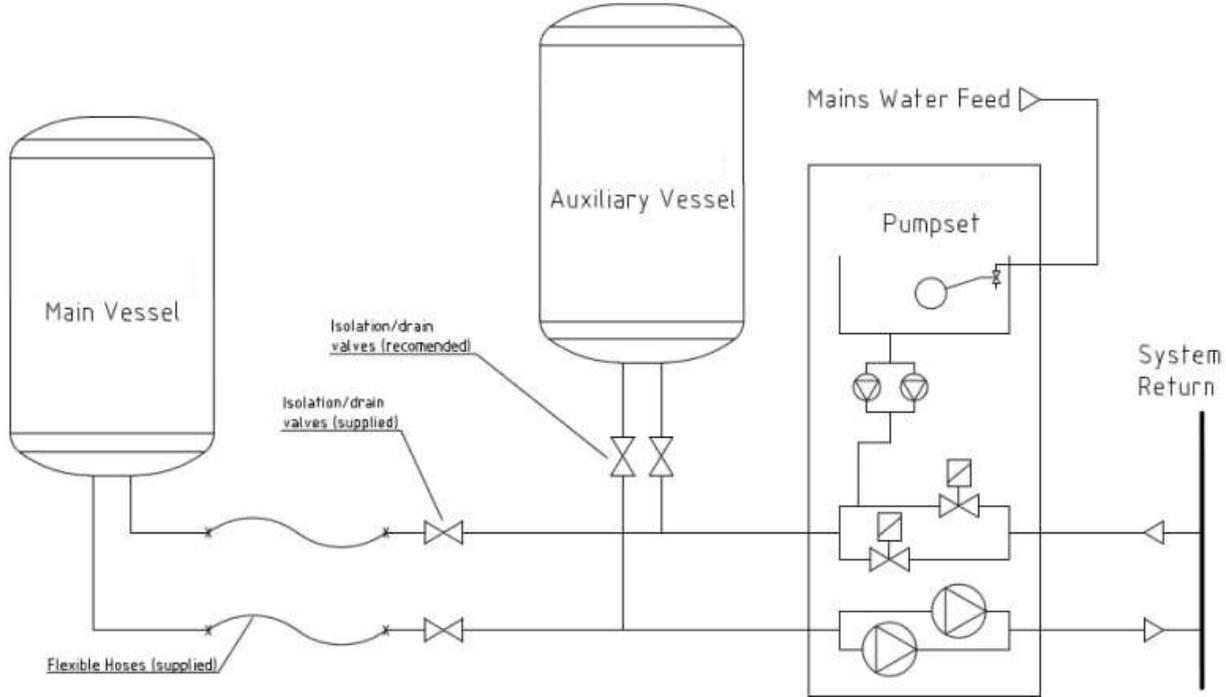


Installation & Placement:

The Flowmat (PHP) should be installed in a frost-free and humidity free area. All vessels must be installed at the same height.

The main vessel must be connected using the flexible hoses to give an accurate weight reading from the foot sensor.

Additional auxiliary vessels can be connected using hard pipe. Individual isolation and drain valve for each vessel are recommended.



Note: Many internal components of the Flowmat pump set have been omitted.

Typical Installation Diagram (illustration purposes only)

Pump Curve:

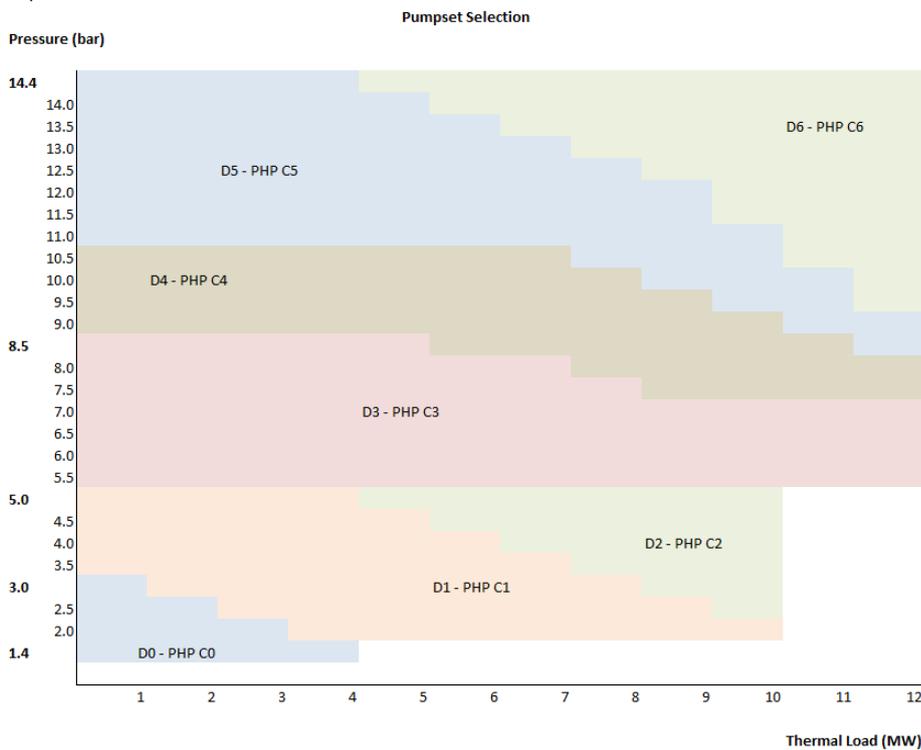
Curve designated with a prefix of 'M' show the normal characteristics of the pump module running as a single pump, curves with a prefix of 'D' show the normal characteristics of the pump module with 2 pumps running in duty assist mode.

For system requirements outside the shaded areas please contact your technical advisor.

Please Note:

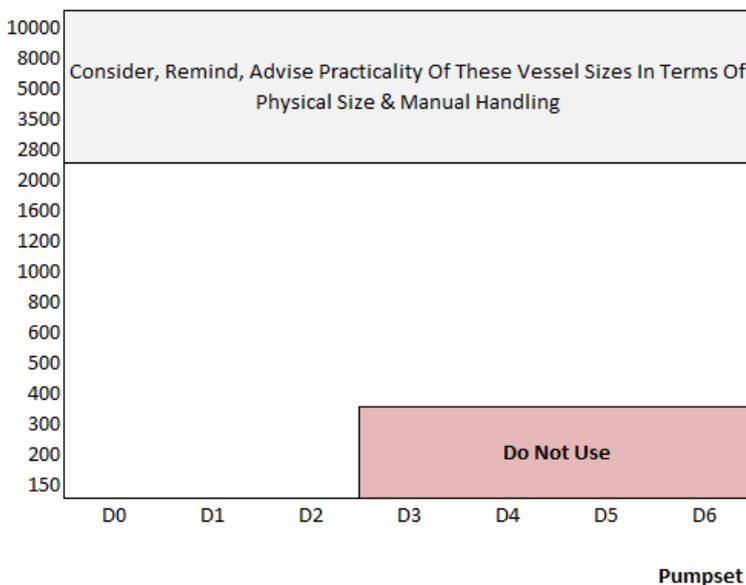
The dimensions of the atmospheric expansion vessels are shown separately in this document. Flowmat Pump set D0 FLCs stating the figures for both pumps running at the same time. FLC for Top up unit shows figure for single pump running only as far as duty/standby mode is applicable.

Therefore the Flowmat unit Final Full Load Current will be sum up of the Main Pump set current draw + Top up unit current draw.



Vessel Considerations

Vessel Size





Flowmat - Atmospheric expansion vessels

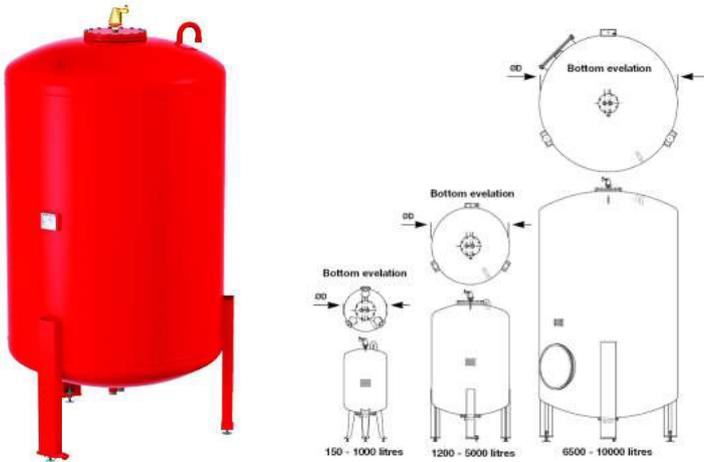
Flowmat main & Auxiliary vessel are manufactured to DIN 4807. The vessel includes a de-aeration cartridge containing Pall ring technology.

Flowmat Main Vessels

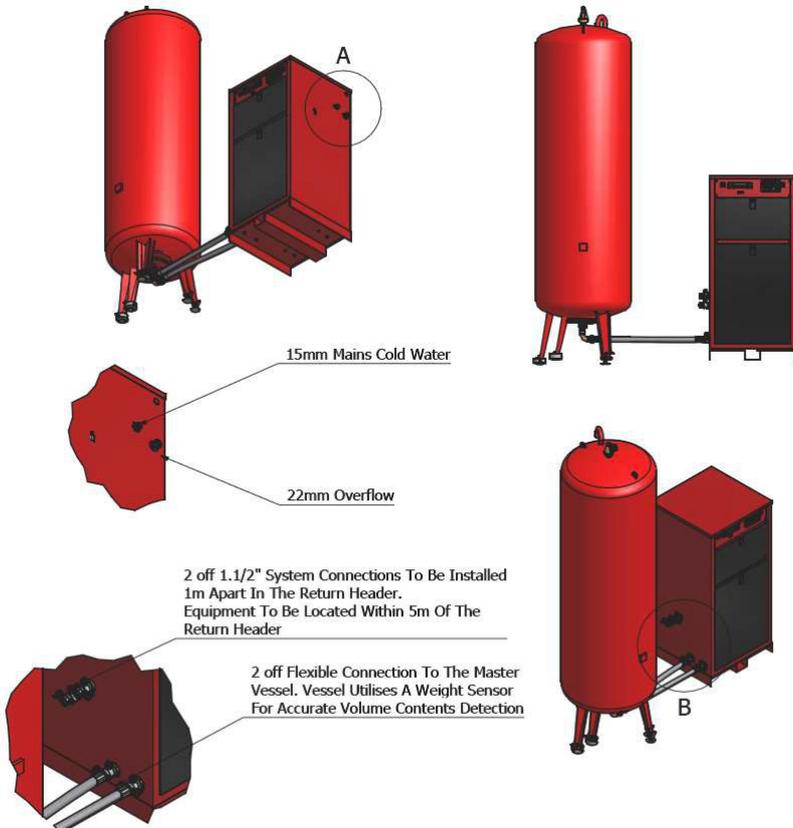
Type	Capacity (l)	Dimensions		Dry Weight (Kg)
		Ø (mm)	Height (mm)	
800	800	790	2144	92

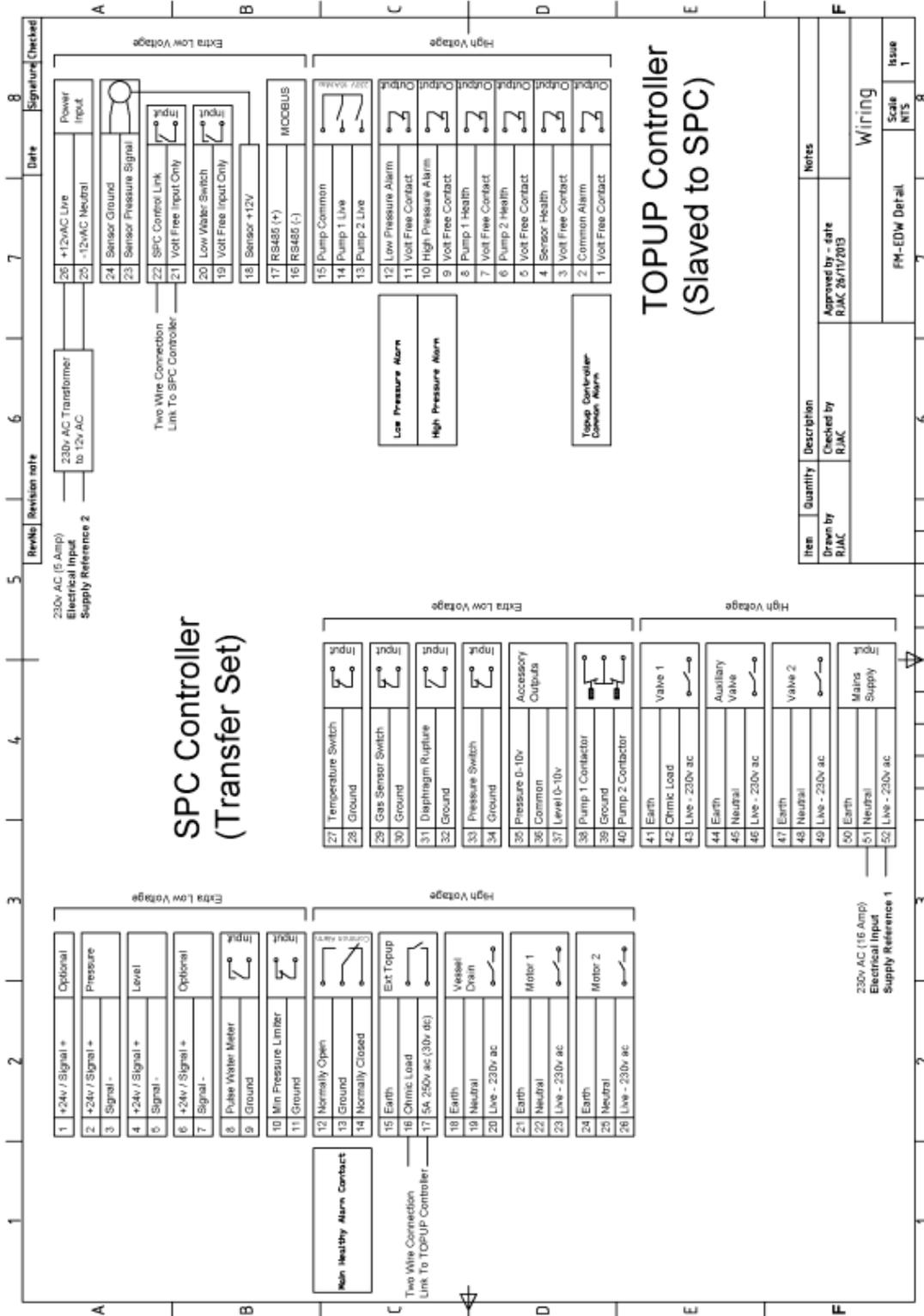
Flowmat BB Auxiliary Vessels

Type	Capacity (l)	Dimensions		Dry Weight (Kg)
		Ø (mm)	Height (mm)	
800	800	790	2144	92



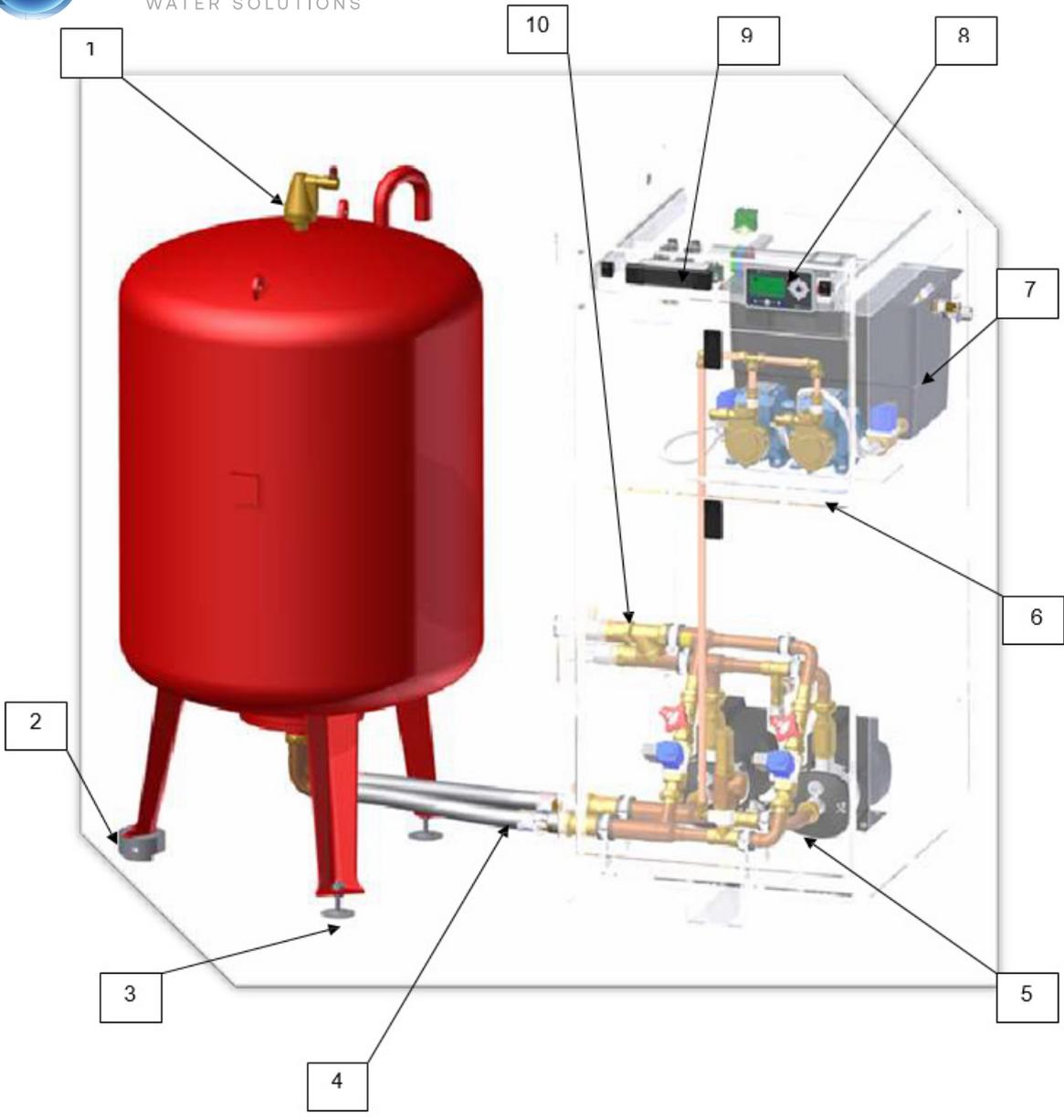
Connection requirements:





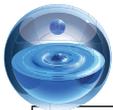
SPC Terminal Plan Glossary

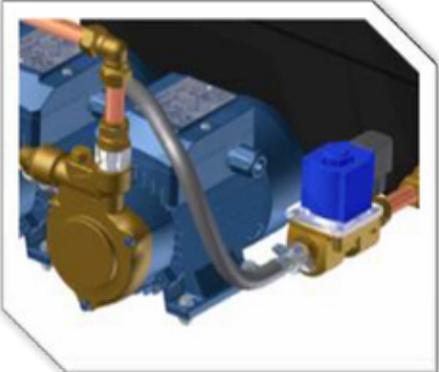
Accessory	Optional expansion connections for vessel volume and system pressure
COM 485	Serial communications port
Com	Common connection for volt free contacts
data	Optional data expansion connection
drs	Optional diaphragm rupture connection
extra low voltage	Protective low voltage \approx 24v
fault	Common alarm volt free contact
F1/2 MS1/2	Motor circuit switch 1/2, combination motor circuit switch 1/2 (SPCx-hw)
gs	Optional vented gas sensor connection
high voltage	Voltage as per the markings on the Flowmat
mains supply	Mains power feed
mpl	Optional minimum pressure limiter connection
M3/3.1 V3/3.1	Motor 3 (Optional top up) / 3.1 (Optional drainage valve) / Valve 3
M1 V4 K1/MS1	Motor 1 / Valve 4 (Optional) / Compressor 1 / Motor circuit combination 1
M2 V5 K2/MS2	Motor 2 / Valve 5 (Optional) / Compressor 2 / Motor circuit combination 2
niveau	Water level / vessel contents
ohmic load	Ohmic load / resistance
Option	Not available as standard
pressure	Pressure / System pressure
pwm	Optional Pulse Water Meter
ps	Optional Pressure switch / low level top-up switch
refill/drain	Optional top-up / drain
sensors	Sensors
tc	Optional Temperature switch
V1; 1.1	Valve 1; 1.1; Parallel expansion balancing valve
V2	Valve 2; expansion balancing valve
V2.1	Optional Valve 2.1



D0 (C0) Pump set shown for illustration

1		<p>Automatic air vent with non return valve</p> <p>Atmospheric Vent (Do not block or valve off)</p>
2		<p>Weight sensor cable connection</p> <p>Foot sensors (Weight / Load cell) Please Do Not Throw Away</p> <p>Transport Guard, to be removed by the commissioning engineer only!</p>
3		<p>Jacking screw for levelling of the vessel. It is recommended that magnetic spirit levels are used to ensure the vessel is installed vertically</p>
4		<p>Flexible connection set. For main vessel(s) only.</p> <p>Elbow and swivel nut.</p> <p>Lock-shield valve complete with drain point, Flexible hose</p>



5		<p>Non return valve</p> <p>Transfer pump</p> <p>Flow restrictor valve</p> <p>Expansion solenoid valve</p> <p>Safety relief valve (vessel protection only)</p>
6		<p>Non return valve</p> <p>Antigravity Solenoid</p> <p>Top-up pump</p>
7		<p>Top-up break tank complete with Fluid category 5 "AB" Air Gap (as per BS EN 13077:2008)</p> <p>WRAS approved float valve</p> <p>22mm Overflow Fluid Category 4 "AF" Air Gap</p>

8		SPC front panel
9		Top-up controller (slaved to the SPC controller)
10		“Y” Strainer System connections (1.25") Flow in to unit Flow out of unit

Note: Flowmat vessel 200-1000 L (2017 range have now change please see next page for more information about product change. Older vessel style need the older version of level sensor (FSI 1/FSI 2)

New level sensors have been introduced as the weight of the new vessels has decreased. These sensors are installed on an extension, are delivered separately and will need to be installed onsite. These sensors are not backwards compatible. As the new vessels have less weight, during installation the controller needs to be setup for A type (STAG) or B type (Bunschoten) vessel. All new vessels are clearly marked A type or B type on the product label.

Installation Checks & Tasks

- Remove the appropriate coverings.
- Prior to installing the vessels, ensure the weight sensor cover plate is in place. Do not remove the cover plate; this task must be left for the commissioning engineer.
- If the cover plate has been removed prior to installing/standing the vessel in position, extreme care must be taken to prevent impact damage to the weight sensor.
- Vessels must be installed vertically, use of magnetic spirit levels is recommended.
- Vessels must be free standing and not bolted down to the ground.
- Vessels must be connected using the provided flexible hoses to allow the foot sensor to work correctly
- Vessels must not have electrical trunking, pipe work or cable trays attached or resting upon or against them; this will interfere with the weight reading on the vessel and disrupt normal operation.
- Vessels must be installed on the same level as the pump set unit.
- Multiple vessels must be installed at the same level
- Multiple vessels must have the same volume, e.g. 2 x 600 litre vessels is acceptable 2 x 300 + 1 x 600 is not acceptable
- Ensure that the float valve within the top-up break tank is set to it lowest position.
- All pipe-work connections are to be made with appropriate proprietary jointing compound. PTFE is not permitted.



Connect the overflow pipe-work.

- Connect the mains water pipe-work.
- Connect the system pipe-work, the system connections must be 1m apart and both connections are to be on the return header to the boiler. Water entering the Flowmat (PHP) must be below 70 °C, if the temperature at the point of connection is greater than 70 °C then appropriate measures must be taken to reduce the temperature before it enter the Flowmat (PHP). An intermediate vessel(s) is typically used for this purpose.
- When multiple intermediate vessels are supplied, they must be piped in series, with the hotter water connected to the top of the vessel, cooler water from the bottom of the vessel is then taken to the top of the next intermediate vessel. Cool water from the bottom of the last intermediate vessel is then taken and connected to the pump set.
- The Flowmat pump set (PHP) is typically sited within 5m of the connection points to the return header. The pipe-work diameter must not be reduced over this distance.
- The Flowmat vessels (PHP) are also typically located within 5m of the Flowmat pump set; the master vessel must be freestanding and connected using the flexible hoses provided. The pipe-work diameter must not be reduced over this distance.
- When using multiple Flowmat (PHP) vessels the additional vessels, without the foot sensor, can be hard piped. The pipe-work diameter must not be reduced and the additional vessels must be within 5m of the pump set.
- If the pump set or vessels are installed at distances over 5m and under 15m the equipment may operate correctly by increasing the pipe-work diameter to 50mm (2"). It may also be required in this case to move the pressure sensor from the pump set and install the sensor directly in the return header. A 15mm (1/2") connection in the header would be required in this case.
- Installation distances over 15m are not recommended.
- Check the break tank internal pump suction filter is present and clear.
- Connect the electrical supply to the fused connection block / fused spur as appropriate.
- Connect the boiler to the boiler interlock connection / Common Alarm if required.

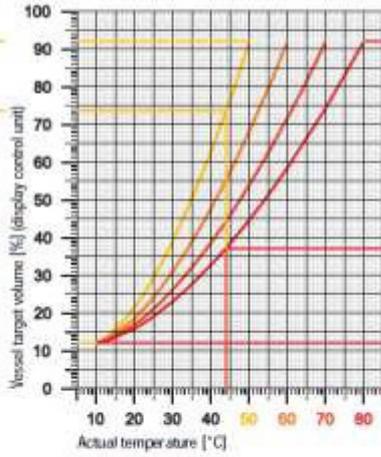
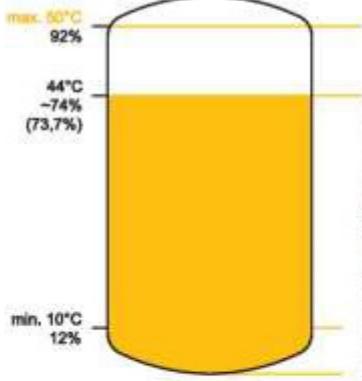
Commissioning Against a Running System

Commissioning can only be guaranteed and recognised when performed in conjunction with an operational heat exchanger. Standard practice involves setting up the Flowmat (PHP) with the heat exchanger disabled, and then operation is confirmed with the heat exchanger activated.

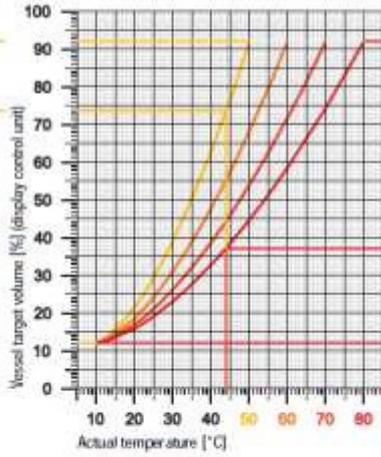
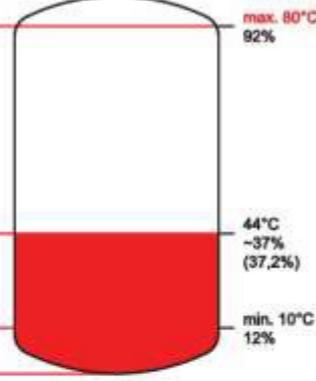
If a different volume level is required than the self-established minimum level after start (operational system), the vessel should be filled according to the minimum required level needed for the actual system temperature, after completing the commissioning procedure on the control unit.

The graphs below are provided for guidance only, individual systems may require interpretation to achieve the desired results.

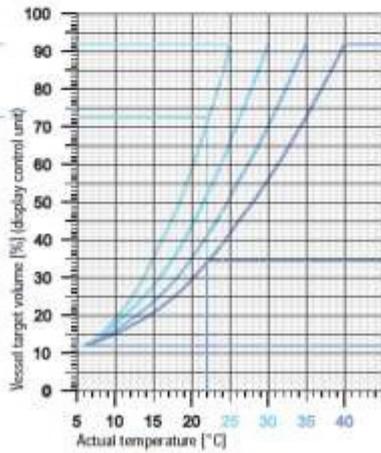
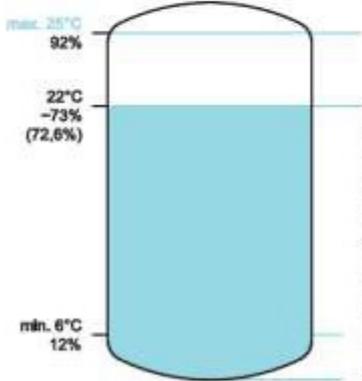
Example 1
 Max. design temperature: 50 °C
 Max. filling level: 92 %
 Min. filling (top-up) level: 12 %
 Min. filling temperature: 10 °C



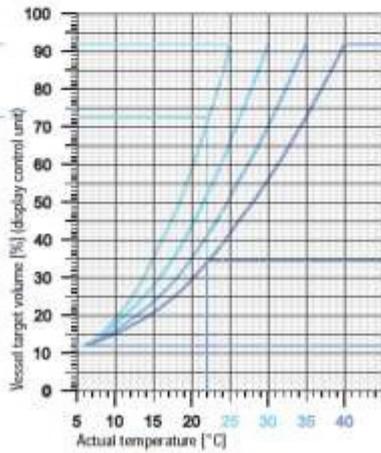
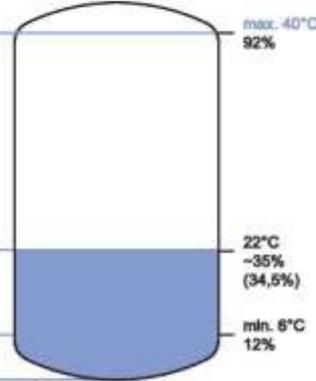
Example 2
 Max. design temperature: 80 °C
 Max. filling level: 92 %
 Min. filling (top-up) level: 12 %
 Min. filling temperature: 10 °C



Example 3
 Max. design temperature: 25 °C
 Max. filling level: 92 %
 Min. filling (top-up) level: 12 %
 Min. filling temperature: 10 °C

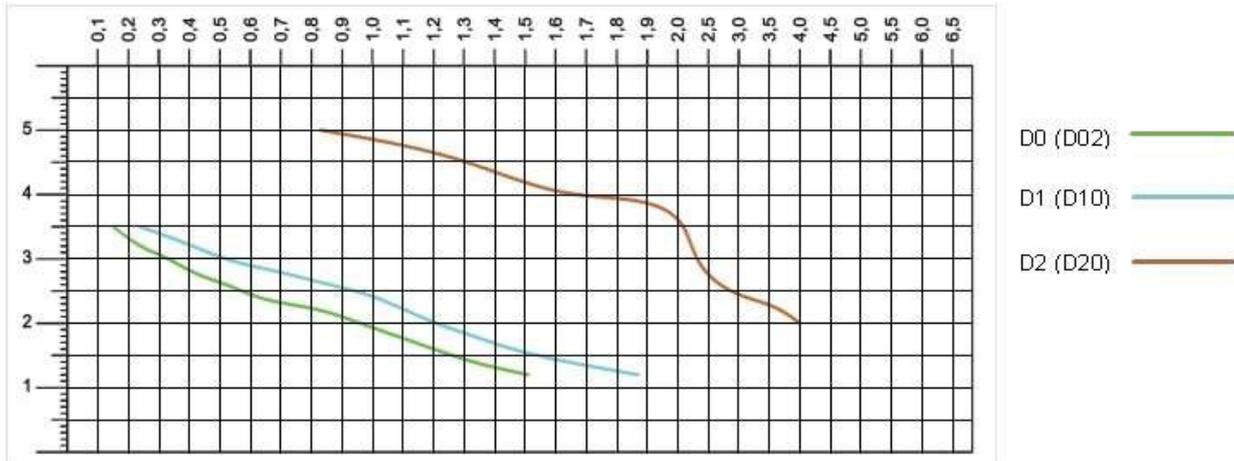


Example 4
 Max. design temperature: 40 °C
 Max. filling level: 92 %
 Min. filling (top-up) level: 12 %
 Min. filling temperature: 10 °C

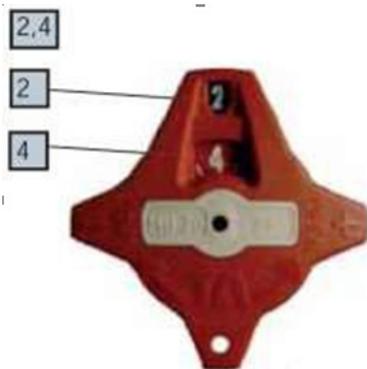


Initial Commissioning

- Document the commissioning procedure (actions and settings).
- Check that all the installation and other actions prior to use have been carried out in full (e.g. power supply available and connected, functioning or active fuses, seal tightness of the equipment, removed transport securing of the volume sensor).
- Caution: Ensure that the basic vessel is not filled until all the commissioning measures have been completed.
- Adjust the flow restrictor valve on the pump module, remove the centre plastic cover (beige plastic) to reveal the limiting 'grub' screw

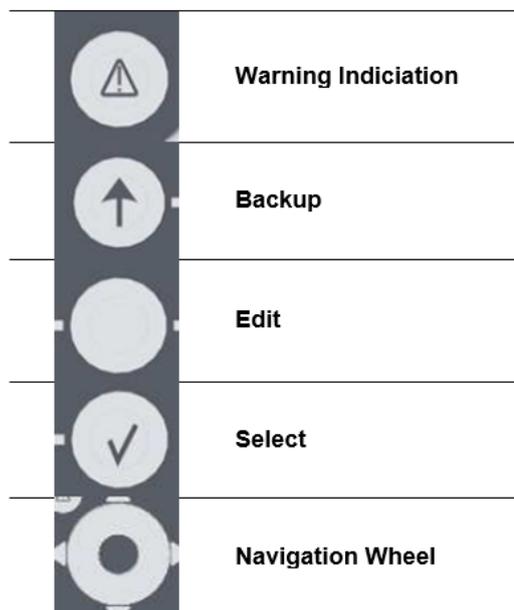


Flow Restrictor Setting



- Fill and vent the heating or cooling system (not the vessel!)
- Check the operational readiness of the top-up equipment
- Open the lock shield valves at the flexible connection assembly (vessel connections)
- Switch ON the control unit and run the start menu procedure
- This start-up procedure is followed by switching ON the top-up. Until a volume level of approx. 7% is reached (see display), turn the control unit OFF and de-aerate pump or pumps. In the case of pumps with automatic vents these should be opened by a single turn of the red cap.
- Open the lock shield valves on the system side of the Pump set.
- Seal all the lock shield valves (open position).
- Read through the manual for any and all recommendations and checks, perform actions as required
- SWITCH ON THE CONTROL UNIT

SPC Controller Set-up



The SPC Controller is a Touch sensitive multifunction Controller



Scroll to Start menu Symbol and press select

The menu (below) will be shown, you have to set up in order the unit will not allow you to move on until each selection has been confirmed.

First option is a Prompt to read the Manual (9-1),  Press "Select"

System Safety Valve

Nom. Pressure (Nominal pressure) (9-4)  Press "Select"



Scroll to Edit (9-4-1) and press "Select" you will be given the following menu-
 Using the Edit and Select buttons change to appropriate level the Select and confirm.

Factory Operating Calibration (9-6)  press select an hour glass will briefly appear and if vessel is empty and correct vessel has been selected then a tick will appear on screen to confirm.

Pressure setting (9-8)  press select you will have a screen below.



- Psv- System Safety valve Setting
- Pe- Upper Alarm Limit
- PA- System working pressure
- Po- Lower Alarm Limit
- PA+ - Upper Differential (usually 0.2 b)
- PA- - Lower Differential (usually 0.2 b)
- P+ - Low Limit Warning

Using the Scroll pad select the parameter you want to change i.e. Working pressure (PA) and Press select.

As before use the middle edit button to start editing the value, the select button to confirm and the scroll button to move to the next digit.

Once set press select, either scrolls to any other parameter and repeat the above or press “Back” to confirm entries.

Start (9-9) the screen will appear as shown.

Press the back button to go to the main menu before Starting the unit.

Scroll to Level (8-2) and press select.

Select Top up (8-2-1) and make sure that the tick box next to on is ticked (8-2-1-1) Scroll to Litres.

Counter (8-2-1-2) and again make sure the box is ticked.

Go back to the main menu.

Degassing (8-5)*

To activate select so the tick boxed is ticked (8-5-1)

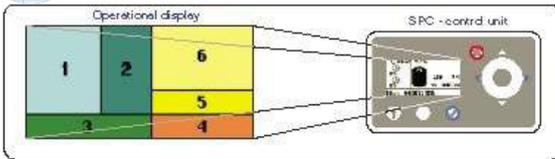
*Please note that if your return temperature is greater than 70°C and intermediates Vessels are being used then this option should remain disabled and at no point be reactivated.

(8-5-(2 to 6)) Scroll to desired Degassing Option usually Set to Normal or Fast in cases of first system set up, Select so its marked with a tick.

Normal Mode: pumps and valves will cycle every 60.

Enter the start menu again and activate start function.





1	4.2bar (Over-) pressure, read out at pressure sensor (example)	Pump	Valve
		Pump, ON (pressure increase)	Valve, ON (pressure decrease)

2	12 % Vessel volume, read out (example)	Vessel volume, visual	de-aeration procedure active (Menu 8-5-1 ON)
	Min. filling level ON [Error- Nr.: 19; 10]		Max. filling level ON [Error- Nr.: 11]

3	Top-up, self monitored			Top-up, externally monitored		
	Valve, 230V 1~	Valve, potential-free	Pumpe, 230V 1~	Signal, 230V 1~	Signal, potential-free	
	Valve, 230V 1~ ON	Valve, potential-free, ON	Pumpe, 230V 1~ ON	Signal, 230V 1~ ON	Signal, potential-free, ON	
	[Possible errors: error-no.: 14; 18; 22- 27]			[Possible consecutive errors: error-no.: 19; 9; 10]		
Indicated value of top-up in [hours] : [minutes] with impulse water meter in [litres].						

4	Water treatment, remaining volume of conditioned water in litres, (Top-up with pulse water meter required) Value 0: conditioned water used up [possible error error-no.: 56]
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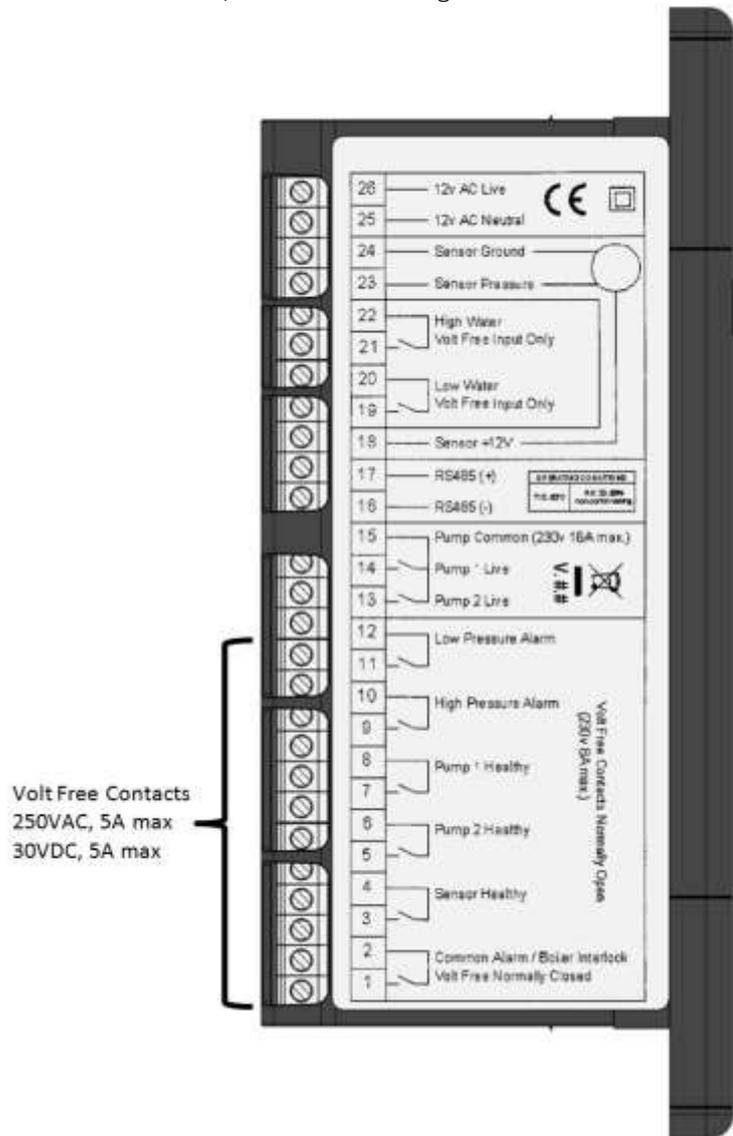
5	Drainage, self monitored			Drainage, externally monitored		
	Valve, 230V 1~	Valve, potential-free	Pumpe, 230V 1~	Signal, 230V 1~	Signal, potential-free	
	Valve, 230V 1~ ON	Valve, potential-free, ON	Pumpe, 230V 1~ ON	Signal, 230V 1~ ON	Signal, potential-free, ON	
	[Possible errors: error-no.: 28; 29; 11]			[Possible consecutive error: error-no.: 11]		
Indicated value of drainage with impulse water meter in [litres].						

6	De-aeration procedure					
	+: within range P _{max} , -: within range P _{min}	Gas-sensor (optional) (Menu 8-5-2 ON)	Normal cycle (Menu 8-5-4 ON)			
	Temperature limiter ON, de-aeration OFF (optional)	Fast cycle (Menu 8-5-5 ON)	Sleep-mode ON (Menu 8-5-6 ON)			
	Reduced cycle (1. reduction triggered by signal of sensor)	Test cycle (2. reduction triggered by signal of sensor) (Menu 8-5-3 ON)				
	Maintenance mode ON (Default: ON, when pumps have not been activated within a period of 14 days)					

Topup Controller Overview

Fault contacts

There are 6 volt free fault contacts which can be used for connection to a BMS system, or as a boiler interlock. These are terminals 1-12, located on the digital controller:



With the exception of the Common Alarm, it is possible to convert all other fault contacts to normally closed. For further information please refer to the commissioning section of this manual.

The following image shows the front of the pressurisation unit digital controller. 4 buttons are provided for programming, and an LED display which shows scrolling messages.



When the controller is first powered up, it will display the controller version number. This manual relates to controller version >8.0. If the controller is of a different version, there may be differences in the menu items available.



In normal operation, the controller will display the current system pressure. If a fault occurs, the controller will display a fault code and produce an audible alarm.

In normal operation, the functions of the buttons are as follows:

Button	Function	
	Press	Hold
SET	-	Show Current System Pressure
MUTE	Mute Audible Alarm	Reset Unit
+	-	Enter Programming Menu
-	-	Enter Programming Menu

Topup Controller Programming

Do not alter any settings without first understanding the implications of doing so. Incorrect settings may cause damage to the equipment, system or property.

To enter the programming menu, hold the (+) button until “enter code” appears on the screen, followed by “0000” with a flashing cursor after the first digit.

To gain access to the programming menu, one of the following codes must be entered:

Customer Code	Standard set of options	2601
---------------	-------------------------	------

To enter the code, change the first digit with the (+) and (-) buttons, then press (SET) to move onto the next digit. Repeat for all digits, then once the correct code is shown on the display, press (SET) to enter the programming menu.

Once a correct code has been entered, the first option [COLD FILL] will appear on the screen.

Once in the menu, the value of the current menu item can be changed using the (+) and (-) buttons. Once the current value has been set, pressing the (SET) button will move on to the next option.

It is not possible to navigate backwards through the menu. To return to a previous setting in the menu, press the (SET) button repeatedly to scroll through to the end of the menu, and then re-enter the appropriate code.

If the controller loses power while in the programming menu, all changes made will be erased. To confirm all changes, the end of the menu must be reached, and the “SAVING...” message must be displayed.

Topup Program List

The table below gives details of all menu items, in the order that they will appear:

#	Menu Item	Function	Default Value
1	COLD FILL	Set this figure to match the balanced pressure setting on the SPC controller	1.0 Bar
2	HIGH SET	The high pressure alarm setting. If the pressure in the system reaches this value, the <HIGH PRESSURE> alarm and common alarm will be activated. The recommended setting is 10% below the safety valve rating. For example, if the safety valve rating is 3 Bar, the recommended setting is 2.7 Bar. It is not possible to enter a value lower than the current [COLD FILL] value.	2.7 Bar
3	LOW SET	The low pressure alarm setting. If the pressure in the system falls below this value, the <LOW PRESSURE> alarm and common alarm will be activated, and the pressurisation pumps will not run. The recommended setting is 0.5 Bar below the [COLD FILL] pressure. It is not possible to enter a value higher than the current [COLD FILL] value.	0.5 Bar
4	DIFFERENTIAL	Not applicable on Flowmat (PHP) Systems	0.2 Bar
5	FLOOD LIMIT	The maximum continuous run time for each of the topup pressurisation pumps. If a pump runs continuously for longer than this period, the pump will stop and a <FLOOD LIMIT> alarm will be activated. This is to prevent the unit from pumping large amounts of water in the event of a large leak/burst pipe. For very large systems, this may need to be increased. The value can be changed in increments of 10 minutes, to a maximum of 990.	30 MINS
6	PUMP 1 COUNT	The cumulative number of pump starts for pump 1. This is a cumulative counter, the value of which cannot be modified. If using the engineer's code, the counter can be reset to zero by holding the (MUTE) button.	-
7	PUMP 1 HOURS	The cumulative run time in hours for pump 1. This is a cumulative timer, the value of which cannot be modified. If using the engineer's code, the counter can be reset to zero by holding the (MUTE) button.	-
8	PUMP 2 COUNT	The cumulative number of pump starts for pump 2. This is a cumulative counter, the value of which cannot be modified. If using the engineer's code, the counter can be reset to zero by holding the (MUTE) button.	-
9	PUMP 2 HOURS	The cumulative run time in hours for pump 2. This is a cumulative timer, the value of which cannot be modified. If using the engineer's code, the counter can be reset to zero by holding the (MUTE) button.	-
10	ALARM COUNT	The cumulative number of all alarm incidents. This is a cumulative counter, the value of which cannot be modified. If using the engineer's code, the counter can be reset to zero by holding the (MUTE) button.	-



11	POWER INTERRUPTED	The cumulative number of power interruptions (i.e. controller turned off/power cut). This is a cumulative counter, the value of which cannot be modified. If using the engineer's code, the counter can be reset to zero by holding the (MUTE) button.	-
12	PULSE	When enabled, if a pump has been inactive for 60 days, it will start and run for 2 seconds. This is to prevent the pumps from seizing.	YES
13	EXCESSIVE START	When enabled, if there are more than 3 individual pump runs within an 8 hour period, the unit will register an <EXCESSIVE DEMAND> alarm. Enabling this option may cause false alarms on some systems.	NO
14	SERVICE	When enabled, a service reminder will be displayed after 12 months from when the option was enabled. To reset the service reminder, set the value to 'NO' and exit the menu. Then, re-enter the menu and set the value to 'YES' again.	NO
15	FILL SYSTEM	Not applicable on Flowmat Systems	NO

If using the customer code, the menu will end at this point. After pressing (SET) once more, the controller will display "SAVING..." and return to normal operating mode. If using the engineer's code, additional menu items will be displayed.

The following settings are all pre-programmed in the factory and should not need to be modified on site. If these settings appear to have been reset, the most likely cause is a power spike. If this problem persists, a power filter may be required.

The following settings are for experienced engineers only. Incorrect configuration of these settings can cause the equipment not to function correctly, and may cause damage to the equipment, system or property.

#	Menu Item	Function	Default Value
16	PUMPS NUMBER	The number of pumps installed in the pressurisation unit. This can be set to either 1 or 2.	2
17	PUMP TYPE	The type of pump installed in the pressurisation unit. There are two options, which are as follows: 0 – Centrifugal Pump 1 – Piston Pump	0
18	PUMP SENSE	Disabling this option will stop the controller from monitoring the pumps and generating <PUMP FAIL> faults. It is not recommended to disable this option. Please consult Flowtech Water Solutions Technical before doing so.	YES
19	SENSOR TYPE	The type of pressure sensor installed in the unit. There are two options which are as follows: 1 – 1-6V Output, 0-10 Bar Range 2 – 1-6V Output, 0-16 Bar Range	1
20	SPC CONTROLLER	Essential setting on balanced pressurisation equipment	YES
21	ADDITIVE	Not required on standard Pressurisation unit	NO
22	ID NUMBER	A user configurable identification number. This option does not serve any functional purpose.	01
23	RELAY INVERSION	When enabled, all normally open fault contacts (i.e. all except the common alarm) are converted to normally closed.	NO
24	OVERRUN	Allows the pump to continue running for a set period of time after the required pressure has been reached. This will prevent the pumps from 'hunting'. The value can be set from 0 – 10 seconds.	5
25	PRESSURE ALARM AUTO RESET	When enabled, the <HIGH PRESSURE> and <LOW PRESSURE> alarms will be cleared automatically if and when the pressure returns to normal. If disabled, the alarms must be manually reset.	YES
26	CASCADE	Allows the pumps to operate in duty/assist mode. After either pump starts, the other pump will start after a set period of time. This option can be set to OFF, or 5 – 30 seconds.	OFF
27	BOOST	When enabled, the controller will allow the pumps to run even if the system pressure is zero.	YES
28	SOLENOID CONTROL	When enabled, the "high water" input is used to trigger a top up solenoid valve connected to the "sensor healthy" volt free contact. This option should only be enabled on units which utilize a solenoid valve as the means of top-up.	NO

Note:

21 = GLYCOL UNIT

28 = FLOWMAT ON (>7.3 VERSION CONTROLLER)

Once commissioned, the pressurisation unit should operate without any user intervention. Under normal operating conditions, the display will show the current system pressure in Bar. While the unit is filling, the display will show <PUMP 1 RUN> or <PUMP 2 RUN> depending on which pump is currently running.

If the unit identifies a fault, the display will show the relevant fault code.

If the pressurisation unit is showing a fault code on the display, holding down the [SET] will cause the current system pressure to be temporarily shown on the display.

The following table gives the meanings of all fault codes used on the digital controller:

Fault Code	Description	Auto/Manual Reset
LOW PRESSURE	The system pressure is below the [LOW PRESSURE] set point.	User Defined
HIGH PRESSURE	The system pressure is above the [HIGH PRESSURE] set point.	User Defined
LOW H2O	The break-tank low level float switch has been activated	Auto Reset
HIGH H2O	The break-tank high level float switch has been activated	Auto Reset
P1 FAIL	The controller has detected a fault (incorrect current draw) on the respective pump	Manual Reset
P2 FAIL		
P1 FLOOD LIMIT	The respective pump has run for longer than the [FLOOD LIMIT] period	Manual Reset
P2 FLOOD LIMIT		
ERR. 1	The signal from the pressure sensor is out of range	Manual Reset
EXCESSIVE DEMAND	There have been 4 pump starts within an 8 hour period	Manual Reset
SERVICE	The pressurisation unit is due an annual service	Manual Reset

For practical guidance on diagnosing and rectifying faults, please refer to the Troubleshooting section of this manual.

Shutdown procedure

The pressurisation unit must be shut-down during any of the following scenarios:

- Work is being carried out on the system.
- Work is being carried out on the pressurisation unit
- The heating/cooling system is being flushed

To shut down the pressurisation unit, please follow the steps below:

1. Isolate the electrical power supply to the pressurisation unit
2. Isolate the mains water supply to the pressurisation unit
3. Isolate the pressurisation unit from the system using the isolation valves
4. Vent the internal pipework using the drain valves on the isolation valves
5. If required vent and drain the expansion vessels
6. If it is anticipated that the unit will be out of commission for more than 24 hours, it is advisable to drain the water from the break tank.

Start-up Procedure

Attention – This procedure is for restarting the unit after being shutdown (as described above). For initial start-up and commissioning procedures, please refer to the Commissioning section of this manual.

To restart the pressurisation unit, please follow the steps below:

1. Perform a visual inspection of the unit and installation to check for signs of damage
2. Check the break-tank for debris/deposits and remove if necessary
3. Turn on the mains water supply to the pressurisation unit and allow the break tank to fill
4. Open the internal isolation valve
5. Turn on the mains power supply and wait for the controller to start
6. Depending on the conditions in the system, the unit may display one or more fault codes at this point. If this happens, please refer to the Troubleshooting section of this manual for guidance.

Maintenance

Due to variations in operating conditions, and the varying loads placed on pressurisation units, it is not feasible to provide accurate predictions of component lifespan. The most effective method of maintenance is to inspect the pressurisation unit for early signs of component failure and take action accordingly.

The following maintenance procedures should be performed at least once a year:

Visual Inspection

A basic visual inspection will highlight the majority of potential faults on a pressurisation unit. It is recommended to perform a visual inspection annually. However, due to the simplicity of performing these checks, frequent inspections are encouraged.

- Check the digital display for fault codes
- Check for signs of leakage (e.g. water, mineral deposits, and corroded components/cabinet)
- Check the break tank overflow for signs of water discharge
- Check flexible hoses for signs of degradation (e.g. cracks)
- Check that the pressure reading on the digital display corresponds to the actual system pressure (read off another gauge)

Interrogate Controllers

The digital controllers keep a log of the number of pump starts and total hours run for each pump, as well as the number of alarm activations and power interruptions. It is advisable to take a note of these figures when servicing the unit, as they may be helpful in diagnosing potential issues. Fields are provided in the service log for these figures.

It is advisable to scroll through all the settings (including engineers setting) and check them against the figures on the commissioning report. If there are any discrepancies, check first with on-site staff to see if the changes are deliberate. If not, reconfigure appropriately.

If settings are persistently becoming corrupted, a power filter may be required. Please refer to the Installation section of this manual for more information.

Test Unit Operation

The best way to test the operation of the pressurisation unit is to drain water from the system, allowing the pressure to drop slowly. Once the pressure falls below the pump cut-in pressure ([COLD FILL] – [DIFFERENTIAL]) the pump should start. As soon as the pump starts, close the drain point and allow the system pressure to rise. Once the [COLD FILL] pressure is reached, the pump should stop.

If the unit is a twin pump model, this test should be repeated until both pumps have run and successfully re-pressurised the system.

The SPC controller will also allow trained engineers to manually activate the electrical components to verify operation and integrity. This should be done in a controlled and structured manner.

Check Float Valve Operation

To test the operation of the break tank float valve, first ensure that the break tank overflow has a suitable path to drain.

Gently push down on the arm of the float valve until it starts to discharge water, then release the float valve arm. Once the arm has been released, the flow of water should stop within a few seconds.

Check Float Switch Operation

To test the operation of the break tank low level float switch, reach into the break tank and gently push the float switch down into the horizontal position.

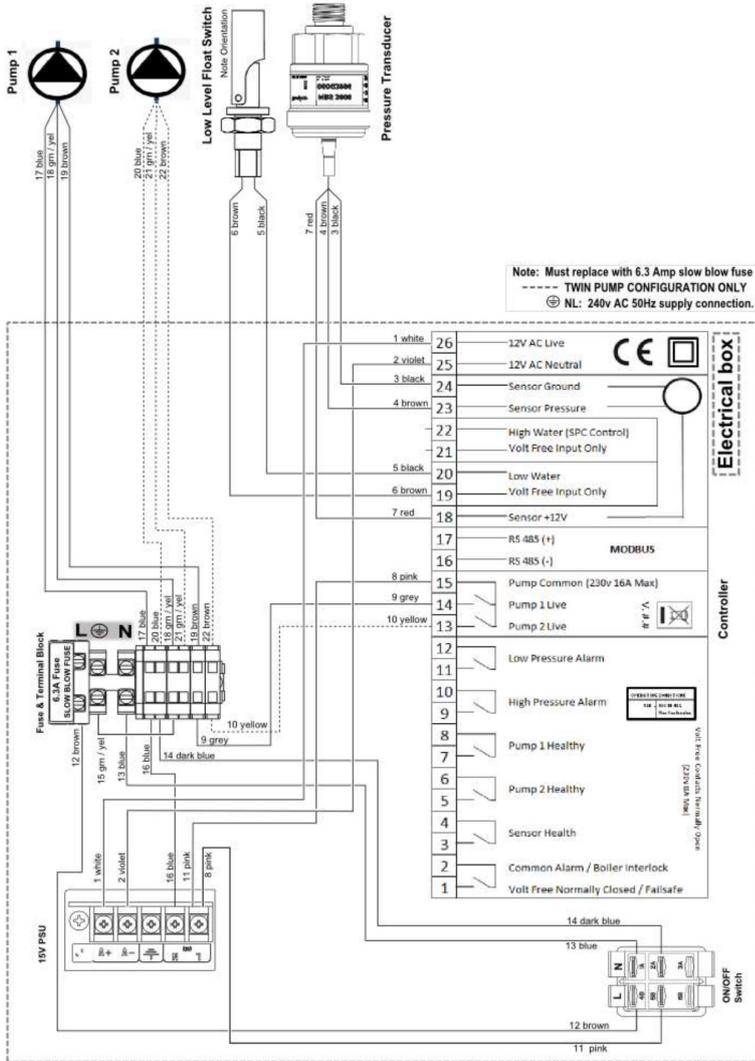
The digital controller should now display a <LOW H2O> fault.

Release the float switch and observe the display. The fault should clear after a delay of a few seconds.

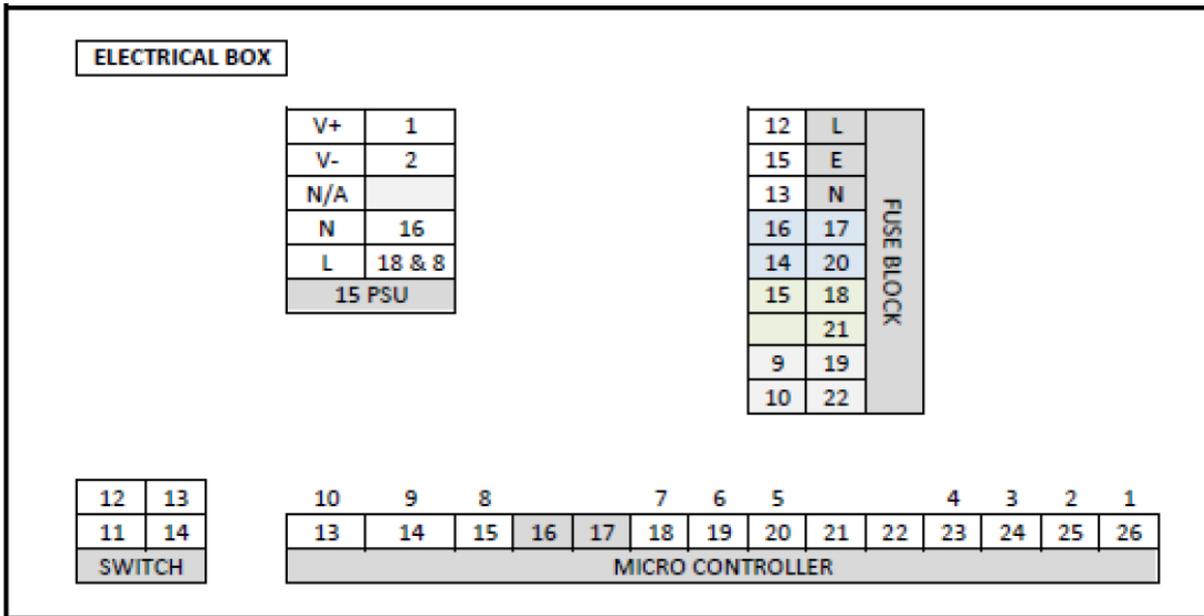
Check Break Tank Water Condition

Perform a visual check of the water in the break tank. If there is any dirt or debris in the water, or deposits on the sides of the tank, the tank should be drained down and cleaned.

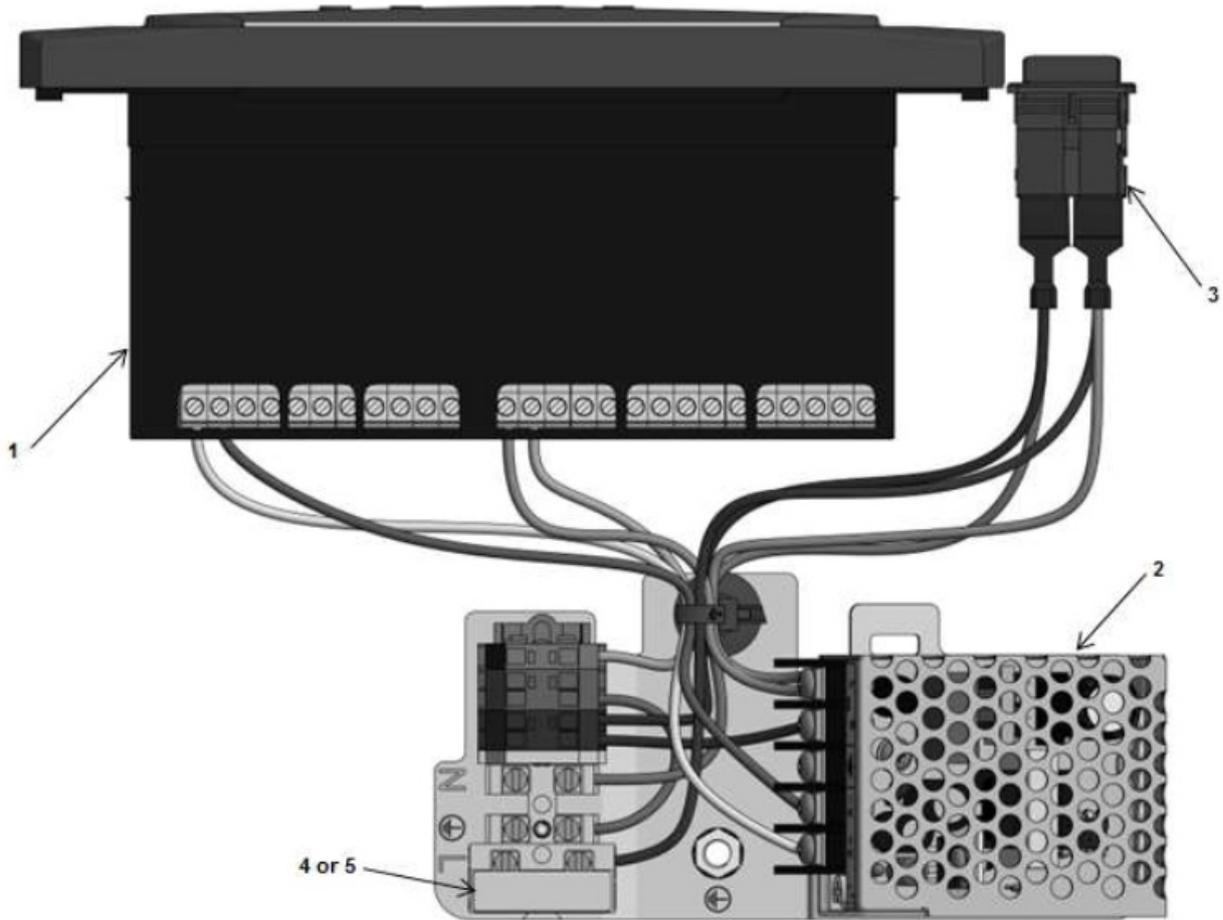
Topup Wiring diagram



Topup Wiring location list



No	Colour	Connection	→	Connection	
1	White	Controller (26)		15V PSU (V +)	
2	Violet	Controller (25)		15V PSU (V -)	
3	Black	Controller (24)		Transducer	
4	Brown	Controller (23)		Transducer	
5	Black	Controller (20)		Low level Float Switch (Water Tank)	
6	Brown	Controller (19)		Low level Float Switch (Water Tank)	
7	Red	Controller (18)		Transducer	
8	Pink	Controller (15)		15V PSU (L)	
9	Grey	Controller (14)		Fuse terminal	
10	Yellow	Controller (13)		Fuse terminal	TWIN PUMP (ONLY)
11	Pink	Switch (L)		15V PSU (L)	
12	Brown	Switch (L)		Fuse terminal (Grey)	
13	Blue	Switch (N)		Fuse terminal (Grey)	
14	Dark Blue	Switch (N)		Fuse terminal (Blue)	
15	Green/Yellow	Fuse terminal		Fuse terminal (G/Y)	
16	Blue	15V PSU (N)		Fuse terminal (Blue)	
17	Blue	Pump 1		Fuse terminal (Blue)	
18	Green/Yellow	Pump 1		Fuse terminal (G/Y)	
19	Brown	Pump 1		Fuse terminal (Grey)	
20	Blue	Pump 2		Fuse terminal (Blue)	TWIN PUMP (ONLY)
21	Green/Yellow	Pump 2		Fuse terminal (G/Y)	TWIN PUMP (ONLY)
22	Brown	Pump 2		Fuse terminal (Grey)	TWIN PUMP (ONLY)



The drawings on the following pages show the internal components for a range of pressurisation equipment. Due to continuing development and minor design changes, some components may be changed without notice. Therefore, the drawings may not accurately reflect the current production design. If in any doubt about the compatibility of replacement parts, please contact Flowtech Water Solutions.

*Image for indication only

#	Description
1	Digital Controller
2	Electrical Plate (Fuse Block and 15V PSU)
3	Power Switch
4	5 Amp Fuse
5	6.3 Amp Slow Blow Fuse (PQA90 Pumps Only)

Topup Troubleshooting

If for any reason the pressurisation unit does not seem to be functioning correctly, please refer to the table below for a list of solutions to known problems.

If the pressurisation unit is showing a fault code on the display, holding down the [SET] button will cause the current system pressure to be temporarily shown on the display.

Symptom	Problem	Solution
LOW PRESSURE fault is displayed and the pumps do not run	The internal isolation valve within the unit is closed	Open the internal isolation valve
	The system pressure has fallen below the LOW PRESSURE set point	Increase system pressure using a filling loop, or enable the SYSTEM FILL option
	The LOW PRESSURE set point is too high	Review the system specifications
HIGH PRESSURE fault is displayed	The internal isolation valve within the unit is closed	Open the internal isolation valve
	The system pressure has risen above the HIGH PRESSURE set point	Decrease system pressure using a suitable drain point
	The expansion vessel has failed or lost its pre-charge	Check the expansion vessel pre-charge and re-charge if necessary
	The expansion vessel is undersized	Review the expansion vessel selection
	The HIGH PRESSURE set point is too low	Review the system specifications
P1 and/or P2 FLOOD LIMIT is displayed	A large amount of water has been lost from the system	Investigate cause
	The relevant pump is air-locked and not pumping water	Bleed the pump
	The unit is undersized for the system	Review unit selection
	The FLOOD LIMIT time is too short.	Consult Flowtech Water Solutions
P1 and/or P2 FAIL is displayed	The PUMP TYPE option is set incorrectly.	Review PUMP TYPE setting
	The relevant pump has failed	Replace pump
P2 FAIL is displayed but the unit is a single pump model	The PUMPS NUMBER option is incorrectly set to 2	Set PUMPS NUMBER to 1

LOW H2O fault is displayed	The mains water supply to the unit has been isolated	Turn on the mains water supply
	The mains pressure is poor	The fault will clear once the break tank has been re-filled
	A non-standard electrical connection has been made into terminals 19 & 20	Remove all non-standard electrical connections
	The low water float switch has failed	Replace low water float switch
	The digital controller has failed	Replace digital controller
HIGH H2O fault is displayed	A non-standard electrical connection has been made into terminals 21 & 22	Remove all non-standard electrical connections
	The digital controller has failed	Replace digital controller
Pressure reading does not match actual system pressure.	The internal isolation valve within the unit is closed	Open the internal isolation valve
	The SENSOR TYPE option is set incorrectly	Review SENSOR TYPE setting
	A non-return valve has been installed between the unit and the system	Remove non-return valve
	The pressure sensor has failed	Replace pressure sensor
ERROR 1 fault is displayed	The SENSOR TYPE option is set incorrectly	Review SENSOR TYPE setting
	The pressure sensor has failed	Replace pressure sensor
Pump runs but does not make up pressure	The pump is air-locked and not pumping water	Bleed the pump
The pump is persistently becoming air-locked	The wrong/no flow restrictor is installed in the float valve WMDA units only	Check float valve flow restrictor selection
The break tank is overfilling and discharging water to drain or over the weir	The wrong/no flow restrictor is installed in the float valve WMDA units only	Check float valve flow restrictor selection
	The float valve position is set incorrectly	Set the float valve to its lowest possible position
	The float valve has failed	Replace float valve
	A pump non-return valve has failed	Replace non-return valve

The pump is repeatedly running in short bursts	The internal isolation valve within the unit is partially closed	Fully open the internal isolation valve
	The restriction in the connecting pipe work is too great	Increase bore/ reduce number of bends/ reduce length of connecting pipe work
	A pump non-return valve has failed	Replace non-return valve
	The expansion vessel has failed or lost its pre-charge	Check the expansion vessel pre-charge and re-charge if necessary
	The point of connection of the unit is too far away from the expansion vessel	Move unit/expansion vessel connection points closer together.
The buttons on the digital controller do not respond	The plastic housing of the digital controller has come apart and the PCB has moved	Reassemble the digital controller housing and ensure that the PCB is properly seated
The digital controller parameters are being corrupted	The controller is being subject to power spikes	Fit a suitable power filter
The digital controller does not power up when the unit is switched on	The fuse has blown	Replace the fuse
	The mains power supply is at an incorrect voltage or frequency	Check mains power supply
	The 12V transformer has failed	Replace Transformer
	The digital controller has failed	Replace digital controller
SERVICE is displayed on the screen	The unit is due an annual service	Contact service engineer

Error Number	Error, Name [Cause; effect/measure]	Menu Item Location	Default Menu Item Setting
1	Voltage spike sensor (short circuit)	-	On
2	Pressure sensor > 20mA	-	On
	Signal out of sensor range or short circuit, no pressure read-out; ball valve in cold-leg connection in incorrect position (closed) Check electrical installation, threaded round connector, sensor range (4-20mA; 16bar) cold-leg connection, change sensor if necessary and service		Automatic reset of error when fault condition is no longer seen
3	Pressure sensor < 4mA	-	On
	Signal below sensor range or not connected, no pressure read-out / Check electrical installation, threaded round connector, sensor range (4 -20 mA; 16 bar), change sensor if necessary » service		Automatic reset of error when fault condition is no longer seen
4	Volume sensor > 20mA	-	On
	Signal out of sensor range or short circuit, no volume readout / Check electronic installation, threaded round connection or sensor range FSI 1: 150-300 FSI 2: 400-800 FSI 3: 1000-2000 FSI 4:2500-5000 FSI 5: 6500-10000 Change sensor if necessary and service		Automatic reset of error when fault condition is no longer seen
5	Volume sensor < 4mA	-	On
	Signal out of sensor range or not connected, no volume read-out/ Check electrical installation, threaded round connector or sensor range; change sensor if necessary and service		Automatic reset of error when fault condition is no longer seen

8	Pressure	8-4-1	Off
	<p>Minimum working pressure ON (actual pressure): Default setting has been reached or not achieved; Ball valve in vessel or cold-leg connection in incorrect position (closed), insufficient capacity of pumps, improper system layout, or as consequence of error-no. : 10-16; 15-17; 19; 20; 22-27</p> <p>Check system lay-out, electronic installation, pumps, leak tightness of the equipment and system and ball valve; insufficient capacity diagnosed, service as required</p>		<p>PA - PA- - 0,3 bar</p> <p>Automatic reset of error when fault condition is no longer seen</p>
9	Pressure	8-4-1	Off
	<p>Maximum working pressure ON (actual pressure): Default setting has been reached or exceeded; Ball valve in cold-leg connection in incorrect position (closed), improper system layout, or as consequence of error-no. : 11; 20</p> <p>Check system lay-out, electronic installation, Valve 1; 2 , particle filter, cold-leg connection, ball valve Service as required</p>		<p>PA + PA+ + 0,3 bar</p> <p>Automatic reset of error when fault condition is no longer seen</p>
10	Vessel Volume	8-4-2	Off
	<p>Minimum vessel volume ON: Default setting has been reached or not achieved; Pump motor 1; 2 is turned OFF; with top-up feature installed top-up is ON (rising level starting at 0%)/ See error-no.: 19;</p>		<p>5%</p> <p>Automatic reset of error when fault condition is no longer seen</p>
11	Vessel Volume	8-4-2	Off
	<p>Maximum vessel filling volume ON: Default setting has been reached or exceeded; Valves 1; 2 (3 is OFF) are switched OFF, Pump motor 1; 2 are not switched ON; no pressure increase or decrease; error-no.:(8) 9 can be consecutive error; improper system lay-out of initial filling / Check functioning of valves 1; 2; 3; check valve, re-calculate expansion volume, drain system water (beware of error-no.: 19);</p>		<p>96%</p> <p>Manual reset of error when fault condition is no longer seen</p>

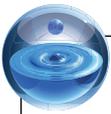


	Motor Circuit Switch	8-4-4	Off
	<p>Motor 1</p> <p>SPCx-lw: current-value is not reached, the temperature safety switch of the motor has been triggered due to elevated working temperatures, limiter has opened, (winding fault, power or temperature overload, no motor ventilation)</p> <p>Exception: the power supply installation of the motor is after signal „motor ON “not available or disconnected), may be followed by error-no. 8 /</p> <p>Ensure that medium and ambient temperature (module) are within admissible ranges, if necessary supply sufficient ventilation; Check electronic installation, at recurring error</p> <p>Service as required</p> <p>SPCx-hw: the default value of the motor circuit- switch has been exceeded, overcurrent (winding fault, power or temperature overload) or incorrect default setting is present, no motor ventilation, may be followed by error-no. 8 / Reassure admissible medium and ambient temperature (module), if necessary supply sufficient ventilation, check default setting and correct if necessary (name plate module: in case of DP-modules the nominal current value $\times \frac{1}{2}$ corresponds with the default setting of each motor circuit-switch), at recurring error</p> <p>Service as required</p>		<p>...<0,0 A</p> <p>Manual reset of error when fault condition is no longer seen</p>

13	Motor Circuit Switch	8-4-4	Off
	<p>Motor 2</p> <p>SPCx-lw: current-value is not reached, the temperature safety switch of the motor has been triggered due to elevated working temperatures, limiter has opened, (winding fault, power or temperature overload, no motor ventilation)</p> <p>Exception: the power supply installation of the motor is after signal „motor ON“not available or disconnected), may be followed by error-no. 8 /</p> <p>Ensure that medium and ambient temperature (module) are within admissible ranges, if necessary supply sufficient ventilation; Check electronic installation, at recurring error</p> <p>Service as required</p> <p>SPCx-hw: the default value of the motor circuit- switch has been exceeded, overcurrent (winding fault, power or temperature overload) or incorrect default setting is present, no motor ventilation, may be followed by error-no. 8 / Reassure admissible medium and ambient temperature (module), if necessary supply sufficient ventilation, check default setting and correct if necessary (name plate module: in case of DP-modules the nominal current value $\times \frac{1}{2}$ corresponds with the default setting of each motor circuit-switch), at recurring error</p> <p>Service as required</p>		<p>...<0,0 A</p> <p>Manual reset of error when fault condition is no longer seen</p>

14	Motor Circuit Switch	8-4-4	Off
	<p>Motor 3 Topup Motor</p> <p>SPCx-lw: current-value is not reached, the temperature safety switch of the motor has been triggered due to elevated working temperatures, limiter has opened, (winding fault, power or temperature overload, no motor ventilation</p> <p>Exception: the power supply installation of the motor is after signal „motor ON“not available or disconnected), may be followed by error-no. 8 /</p> <p>Ensure that medium and ambient temperature (module) are within admissible ranges, if necessary supply sufficient ventilation; Check electronic installation, at recurring error</p> <p>Service as required</p>		<p>...<0,0 A</p> <p>Manual reset of error when fault condition is no longer seen</p>
15	Motor runtime	8-4-7	Off
	<p>Motor runtime of Motor 1 exceeded:</p> <p>Default value has been reached or exceeded; suspected leakage in equipment or system, insufficient pump capacity, ball valve in vessel or cold-leg connection in incorrect position, improper system lay-out; may be followed by error-no.: 8 /</p> <p>Check system lay-out, electronic installation, pumps, leaks in equipment and installation, ball valves; insufficient pump capacity diagnosed</p> <p>Service as required</p>		<p>30 minutes</p> <p>Manual reset of error when fault condition is no longer seen</p>
16	Motor runtime	8-4-7	Off
	<p>Motor runtime of Motor 2 exceeded:</p> <p>Default value has been reached or exceeded; suspected leakage in equipment or system, insufficient pump capacity, ball valve in vessel or cold-leg connection in incorrect position, improper system lay-out; may be followed by error-no.: 8 /</p> <p>Check system lay-out, electronic installation, pumps, leaks in equipment and installation, ball valves; insufficient pump capacity diagnosed</p> <p>Service as required</p>		<p>30 minutes</p> <p>Manual reset of error when fault condition is no longer seen</p>

17	Minimum pressure limiter (optional)	8-4-5	Off
	<p>Minimum pressure limiter ON:</p> <p>The default setting at pressure limiter has been reached (limiter has opened); Pump motors 1; 2 and valves 1, 2, 3 are switched OFF (further pressure decrease will lead to vapour build-up in the installation)</p> <p>Check functioning of valves 1, 2 and check valve, check equipment and installation for leaks (Error-no.: 8 is ON)</p>		Manual reset of error when fault condition is no longer seen
18	Level top-up pump (optional)	8-4-4	Off
	<p>Minimum volume level top-up pump ON:</p> <p>Break tank of top-up unit with insufficient volume level;</p> <p>Top-up pump is turned off, no top-up function, feed pressure is too low, feed-valve with insufficient flow rate, may be followed by error-no.: 8; 10; 19 /</p> <p>Check feed conditions</p>		Automatic reset of error when fault condition is no longer seen
19	Vessel Volume	8-4-2	Off
	<p>Minimum vessel filling volume ON:</p> <p>Default setting has been reached or not achieved;</p> <p>Pump motor 1; 2 is turned OFF, no pressurisation; May be followed by error-no.: 8; Execution without top-up feature, insufficient initial filling or as consequence of error-no. : 22-27 /</p> <p>Check top-up functioning, leaks in equipment, system lay-out; if necessary re-fill manually, beware of error-no: 11!</p>		6% Automatic reset of error when fault condition is no longer seen
20	Bladder rupture (optional)	8-4-3	Off
	<p>Bladder rupture sensor ON:</p> <p>Water at electrodes of conductive sensors;</p> <p>Pump motors 1; 2 and valves 1; 2; 3 are switched OFF, no pressure increase / decrease or top-up;</p> <p>Error-no.: 8; 9 can be consecutive errors;</p> <p>Suspected bladder rupture / open condensate drain valve. If the opening results in water discharging continuously, the bladder should be visually checked for ruptures and leaks (Hint: inspect the vessel internally, which is part of the routine vessel inspection),</p> <p>clean the inside of the vessel</p>		Manual reset of error when fault condition is no longer seen
22	Topup	8-4-9	Off



	<p>Top-up alarm: top low (pulse water meter, optional)</p> <p>WATER SOLUTIONS</p> <p>No pulse from pulse water meter after top-up request;</p> <p>Valve 3, Motor 3 are switched OFF, feed pressure too low, valves in incorrect position or not functioning properly, motor 3 with insufficient pump capacity; Exception: signal leads not installed or otherwise missing, water meter not functioning properly /</p> <p>Check electronic installation, component functioning, restore feed conditions;</p>		Manual reset of error when fault condition is no longer seen
23	Topup	8-4-9	On
	<p>Uncalled-for top-up (pulse water meter, optional)</p> <p>Pulse received from pulse water meter without request for top-up, valve 3, motor 3 are switched OFF; Equipment in in flow direction after the water meter or valve 3 is leaking or fails to close (incorrect flow direction due to non-return valve blocking) /</p> <p>Check functioning and check for leaks in the equipment</p>		Manual reset of error when fault condition is no longer seen

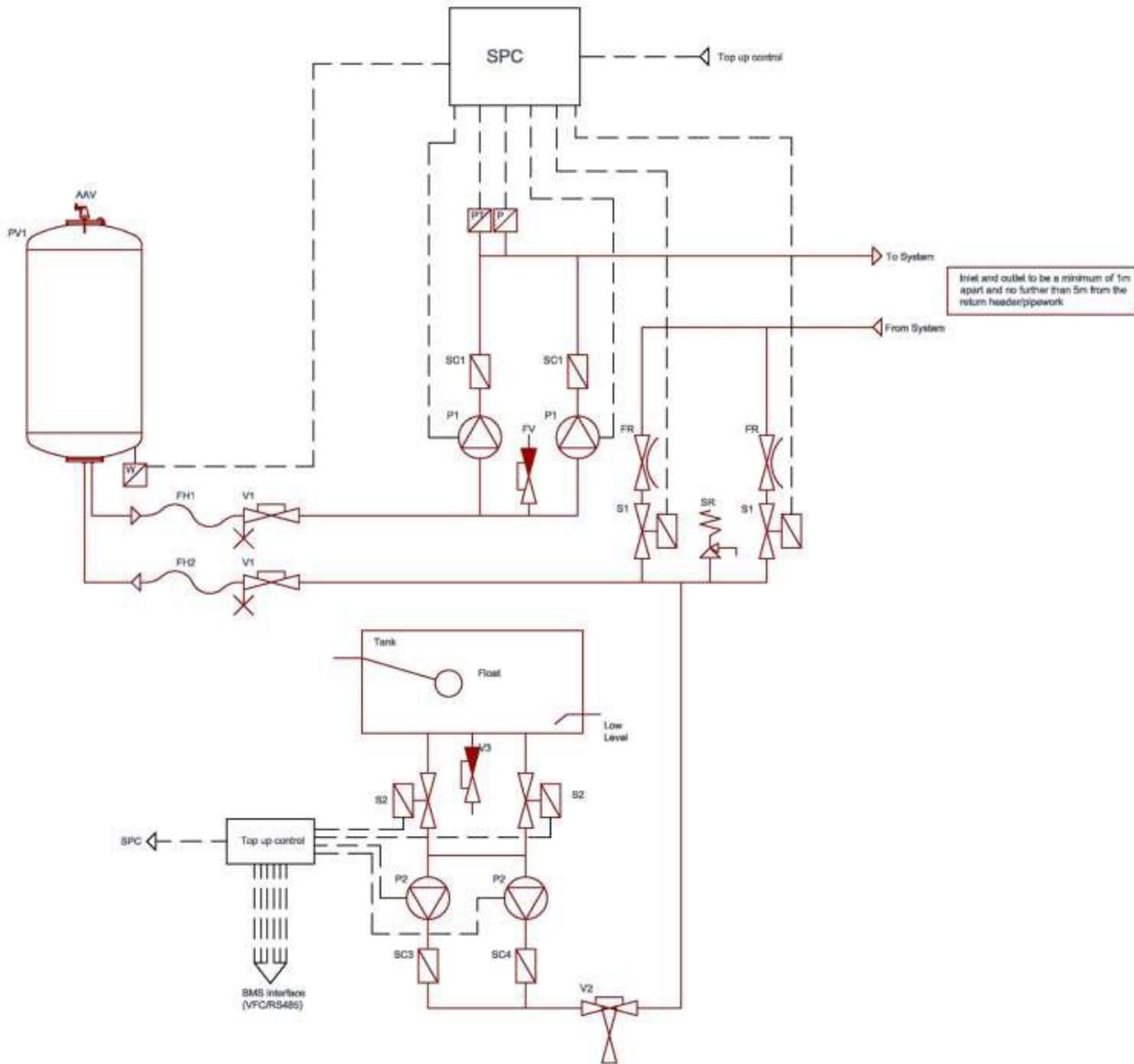
24	Topup	8-4-9	On
	Minimum cycle distance exceeded		Manual reset of error when fault condition is no longer seen
25	Topup	8-4-9	On
	Maximum no. of cycles per timeframe exceeded.		Manual reset of error when fault condition is no longer seen
26	Topup	8-4-9	On
	Maximum top-up cycle amount exceeded (pulse water meter, optional)		Manual reset of error when fault condition is no longer seen
27	Topup	8-4-9	On
	Maximum top-up cycle time exceeded		Manual reset of error when fault condition is no longer seen
28	Draining (Optional)	8-4-10	Off
	Draining amount too low (pulse water meter, optional). No pulse from pulse water meter after draining request; valve 3:1, Motor 3:1 are switched OFF, feed pressure too low, valve in incorrect position or not functioning properly, motor 3:1 with insufficient or defective pump capacity; Exception: signal leads not installed or otherwise missing, water meter not functioning properly / Check electronic installation, component functioning, restore drain conditions		Manual reset of error when fault condition is no longer seen

29	Draining (Optional)	8-4-10	Off
	<p>Uncalled-for draining (pulse water meter, optional)</p> <p>Pulse to pulse water meter without request for draining; valve 3.1, motor 3.1 switched OFF; equipment may leak in flow direction after the water meter or valve 3.1 fails to close (incorrect flow direction due to non-return valve being blocked) /</p> <p>Check component functioning, check for leaks in the equipment</p>		Manual reset of error when fault condition is no longer seen
30	SPCx-hw: Phase monitor (optional)	8-4-17	Off
	<p>Missing phase or sequence of phases is incorrect, motors and valves are switched OFF, no pressure increase or decrease</p> <p>Hint: the equipment supplied is installed for operation with clockwise rotating field (U/L1; V/L2; W/L3) /</p> <p>Locate phases, check power supply fuse for this equipment, switch wiring for correct sequence</p>		Automatic reset of error when fault condition is no longer seen
55	Conditioning (optional)	8-4-11	Off
	Amount of additive in conditioning exceeded		Manual reset of error when fault condition is no longer seen
56	Service 1	8-4-12	Off
	Carry out service 1 (equipment service)	365 days	Manual reset of error when fault condition is no longer seen
57	Service 2	8-4-13	Off
	Carry out service 2 (inspect vessel internally)	1825 days	Manual reset of error when fault condition is no longer seen

58	Service 3	8-4-14	Off
	Carry out service 3 (strength test vessel)	3650 days	Manual reset of error when fault condition is no longer seen
59	Service 4	8-4-15	Off
	Carry out service 4 (routine test electronic installation)	584 days	Manual reset of error when fault condition is no longer seen
53	Date, time invalid	8-4-16	Off
	Backup power for date, time is too small, not available or incorrect line entry of these data / redo or complete entry or when after complete entry error recurs » service Error OFF: self-resetting when error resolved.		Manual reset of error when fault condition is no longer seen

Appendix 1

P&ID – Standard layout





flowtech[®]
WATER SOLUTIONS

flowzone[®]

MEMBERS AREA

This section of the **flowtech**[®] website holds information exclusively for members. Members will need to log in to gain access to these pages.

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We place great emphasis on providing technical back up to support our Service Engineers in resolving some difficult operational and technical issues. We pride ourselves on completing a project on time, within budget and never leaving a problem unresolved, or a customer waiting. This quality of service has made us the first choice for our customers.

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