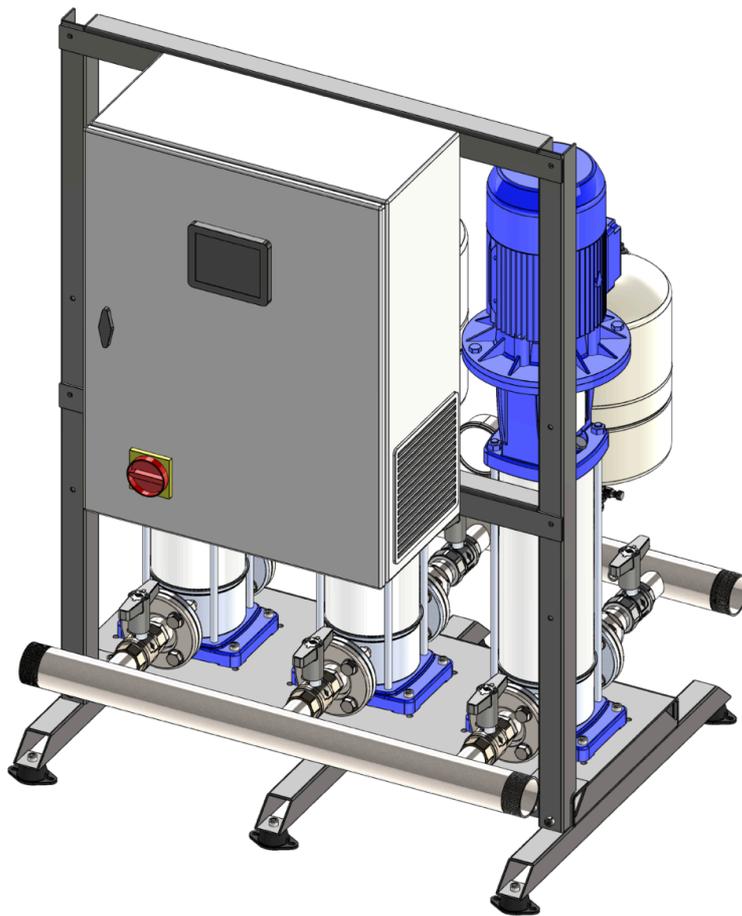




Trebles™

OPERATION & MAINTENANCE MANUAL



ECOPLUS

COLD WATER BOOSTER SET



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ABOUT THIS MANUAL

This manual contains all the relevant information to install, commission, operate and maintain the Trebles ECOPLUS range of Cold Water Booster Sets.

If you are not fully competent with this type of equipment we recommend that this manual is read in full before carrying out any work.

SYMBOLS USED



DANGER - Very Important safety information to prevent injury and damage to the equipment or system.



CAUTION - Important information to prevent any damage to the equipment or system.



IMPORTANT - Important information to help the equipment function correctly.



USEFUL - Information which is helpful but not critical to the operation of the unit.

FOR MORE INFORMATION

For more information please contact Trebles head office:



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EQUIPMENT OVERVIEW



Booster Sets should always be sized/specified by qualified or competent persons. If in doubt please contact our office.

Trebles ECOPLUS combines energy efficiency and performance whilst minimising space requirements. Manufactured with over 50 years of experience, this unit is a high quality, fully featured solution to your water boosting requirements.

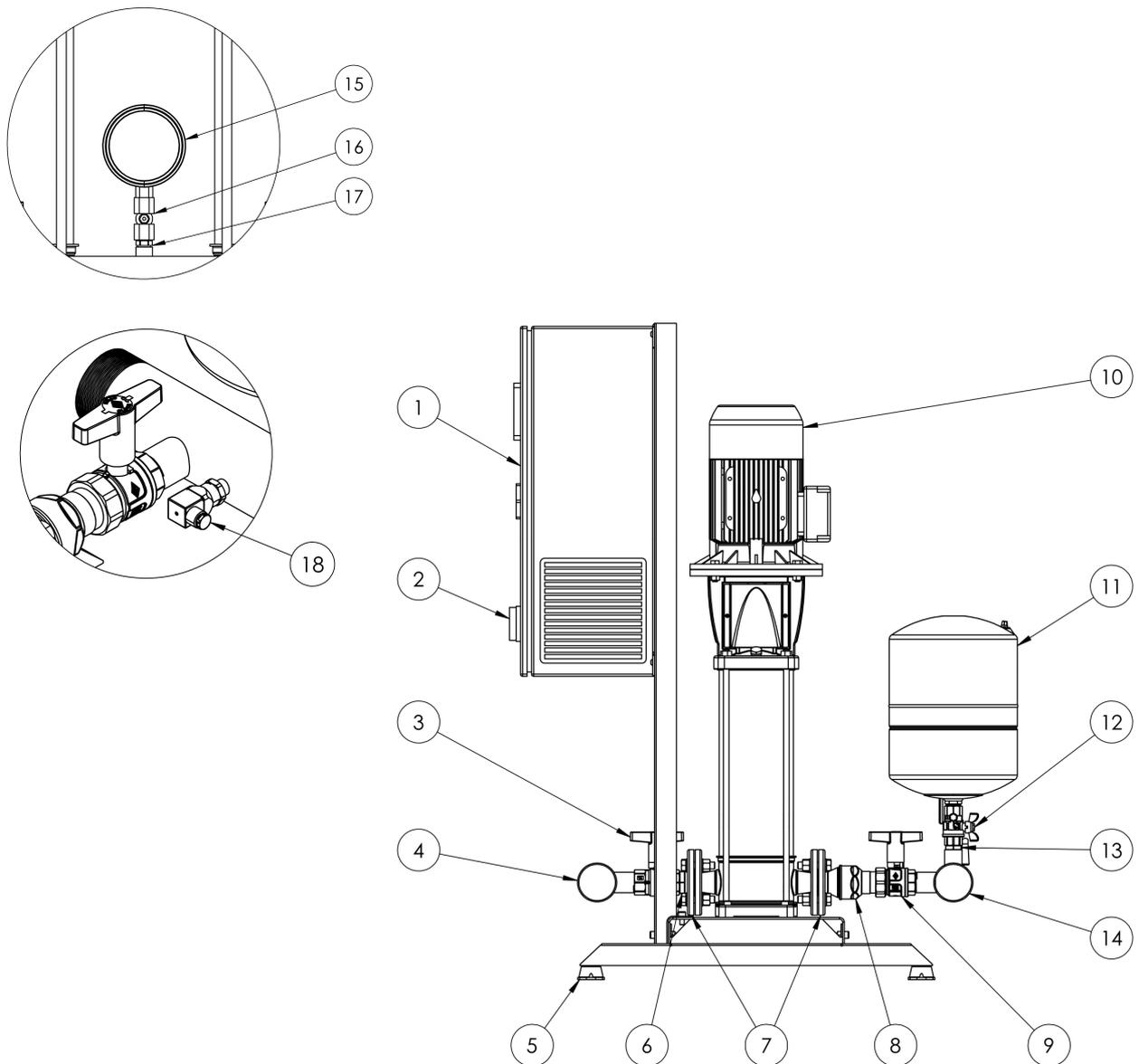
Once installed the system pressure will constantly be monitored via a pressure transducer. When an outlet has been opened and a pressure drop is detected, the unit will automatically start and maintain the desired set point. Variable speed drives will only run the pump at the speed required thus saving huge amounts of energy compared to traditional methods of pump control. The touchscreen HMI combines intuitive navigation and monitoring whilst also providing BMS communication including MODBUS.

The ECOPLUS range uses the latest vertical multi-stage, stainless steel pumps equipped with IE3 motors in accordance with EN standards to ensure comfort, reliability and maximum energy efficiency.



The unit should be sized and specified by qualified personnel only, the unit will not work correctly if it is under or over sized. If in doubt please contact our office where our technical sales engineers can specify the correct pump to suit demand.

COMPONENT LAYOUT



1	Control Panel	10	Vertical Multi-Stage Pump
2	Door Inter-Locked Isolator	11	Pressure Vessel (24L / 16 bar)
3	Isolation Valve	12	Vessel Isolation / Drain Valve
4	Inlet Manifold	13	Hex Nipple
5	Anti-Vibration Mounts	14	Outlet Manifold
6	Hex Nipple	15	Pressure Gauge
7	Screwed Flanges	16	Gauge Isolation Valve
8	Check Valve	17	Hex Nipple
9	Union Isolation Valve	18	Pressure Transducer

INSTALLATION



This unit is not designed to be installed outside and open to the elements. If there is no room inside the building it must be installed inside a suitable enclosure with necessary frost protection.



The ECOPLUS range **CANNOT** be connected directly to the mains water due to water authority regulations. Always install in conjunction with a break tank.

PIPE CONNECTIONS



Take care to ensure that all pipework is adequately supported to prevent any undue strain on the connections.

- ✓ The unit should be located on a firm, level base with adequate access to all parts to facilitate any future maintenance.
- ✓ Where possible, try to install as close as possible to the water supply tank.
- ✓ Ensure the minimum water level inside the tank will always be above the units inlet manifold.
- ✓ Remove protective covers from the inlet & outlet manifolds and proceed to cap off one end of each manifold using the Stainless Steel caps provided, to suit site requirements.
- ✓ In the case of DN65 - DN80 units, connect the provided screwed flange to the opposite end. DN100 units will have welded flanges and thus provided with 2 blank flanges instead of end caps.
- ✓ Connect site pipework to inlet & outlet manifolds.



All pipe connections should incorporate a suitable joining compound or PTFE tape.

ELECTRICAL SUPPLY



All electrical work must only be carried out by a qualified electrician, engineer or competent person.



The unit must be completely electrically isolated before removing any covers. Cables connected to any volt free contacts may be supplied from another source and remain live, these must be isolated elsewhere.

- ✓ Connect incoming mains electricity supply (230V or 400V dependent upon unit) to the relevant terminals within the control panel.
- ✓ DO NOT connect mains directly to inverters as this bypasses certain control elements.
- ✓ Wire a low water float switch to the control panel. If this is not completed the unit will display a low water fault upon initial start.



FAILURE TO INSTALL LOW WATER PROTECTION WILL VOID WARRANTY SHOULD DAMAGE OCCUR FROM DRY RUNNING.

COMMISSIONING



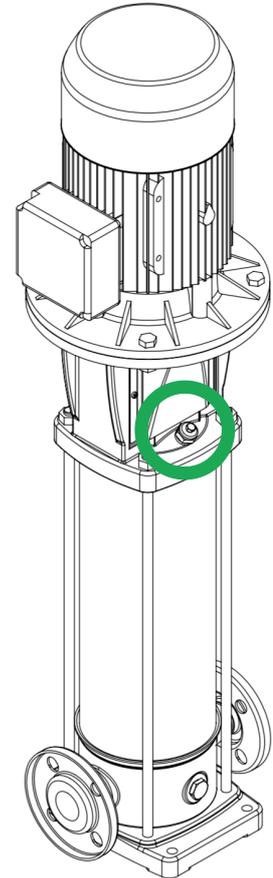
It is recommended that this equipment is commissioned by competent personnel only. Any damage incurred through incorrect commissioning / set-up will not be covered under warranty.

1 - WATER SUPPLY

- ✓ Check that the supply tank has sufficient water and that there are no open pipe ends.
- ✓ Ensure the vessel and pump isolation valves are open.
- ✓ Turn on water supply to the unit.

2 - VENTING PUMPS

- ✓ Ensure all valves are open.
- ✓ Loosen the air bleed plug on the pump casing.
- ✓ Once water begins to seep out of the bleed plug, tighten and clear any excess water.
- ✓ The pump is now primed.
- ✓ Complete this for each pump on the unit.



It is important to check pumps are fully vented and rotating correctly before leaving the equipment otherwise pump failure by cavitation is highly likely.

3 - INITIAL START UP

- ✓ Once wired up correctly, turn on power supply to the unit.
- ✓ Switch on the isolator and wait a few seconds for the unit to start up.
- ✓ Once the panel has completed its start up, the unit should automatically begin to run to the set point from factory test.
- ✓ The pumps will ramp up to the set point before ramping down and commencing normal operation.

4 - ADJUSTING THE SET POINT

The set point at which the unit will maintain pressure can be altered within the parameters of the controller and the capabilities of the pump model. If the set point needs to be altered from its original settings, please follow the below steps:

- ✓ Press the 'Mode' key to open Operating Mode menus.
- ✓ Press the 'Off' key to prevent the pumps from running.
- ✓ Isolate each expansion vessel and drain all water using the drain valve provided.
- ✓ Adjust the air cushion in both vessels accordingly (this should be 0.5 bar below the desired set point).



The vessel air cushion must be adjusted prior to altering the inverter settings.



In some high performance installations, there may also be an auxiliary pressure vessel connected alongside the ECO-BOOST+. The air charge for this vessel will also need altering accordingly.

- ✓ Open the vessel isolation valves.
- ✓ Press the 'Settings' key and scroll to 'Pressure Set Point' and adjust accordingly.
- ✓ Once entered, return to the Operating Mode menu and press the 'Auto' key.

OPERATION

NORMAL RUNNING

When water is drawn off in small quantities it will be supplied from the accumulators (vessels), but once this has been exhausted the current duty pump will start to supply both the demand and refill the accumulator. During periods of sustained demand this pump will run continuously but at varying speeds to maintain a constant output pressure whilst reducing the amount of energy used, thus increasing efficiency. If demand ceases entirely so the pump stop operating.

PUMP ASSIST

In the event of exceptional demands in excess of the maximum performance of a single pump, the Standby Pump will start and run alongside the Duty Pump thus increasing the flow rate to cope with demand. Once the demand falls below the rated duty, the Standby Pump will stop and the Duty Pump will increase its speed to take up the remaining demand individually.

In the case of three pump units, pumps 2 and 3 can assist simultaneously if required.

In the case of four pump units, pumps 2, 3 and 4 can assist simultaneously if required.

PUMP ALTERNATION

To ensure all pumps receive approximately equal periods in both 'roles' i.e. Duty & Standby/ Assist, the pumps are exchanged automatically on a running time basis by the inverters. Should one of the pumps for any reason be taken out of service by having its inverter set 'Off' the remaining pump will run alone as required. The duty pump exchange facility is a feature of the variable speed drive and will only exchange the pumps during a period when the demand is low and the interruption to pump set output should pass unnoticed. This facility it can be disabled but only by reprogramming the drive.

AUTO-CHANGEOVER ON PUMP FAILURE

As long as all inverters are 'on' a Standby Pump will always take up the Duty Pump role automatically should the current Duty Pump trip. In a twin pump unit, the new Duty Pump can then operate individually as a single pump unit until the other pump is either repaired or replaced. In failure of a three pump unit it will continue to run as a twin.

PRESSURE SETTING (SET POINT)

Before leaving our works the unit will have been fully tested and pre-set in relation to the design duty from the quotation. This pressure setting will display on the Inverters on start-up.

CONTROL PANEL

ENVIRONMENT

The control panel is suitable for indoor use only.

Ambient operating temperature: 10-35 °C

IP rating: IP54

The control panel includes a cooling fan and filter that are used to remove excess heat created by the inverters however in order to ensure the effectiveness of these the filters must be correctly maintained. More information on this can be found within the maintenance section of this guide.

NAVIGATION

The controller is touch screen and all diagnostics and settings can be navigated to using the touch screen interface. There are 4 navigation buttons found at the bottom of all screens and are used to navigate between the different sections:



Each of the above 4 sections of the controller are described within the chapters below.

SECURITY

A number of features within the screen can only be used when logged in to the correct user profiles. If the setting or button requires a password to be used the login pop-up will appear. The user name and password must be entered and then login pressed. Once this has been done the exit button must be pressed to return to the previous screen.

After 10 mins of inactivity the controller will automatically logout.

The username and password are as follows:

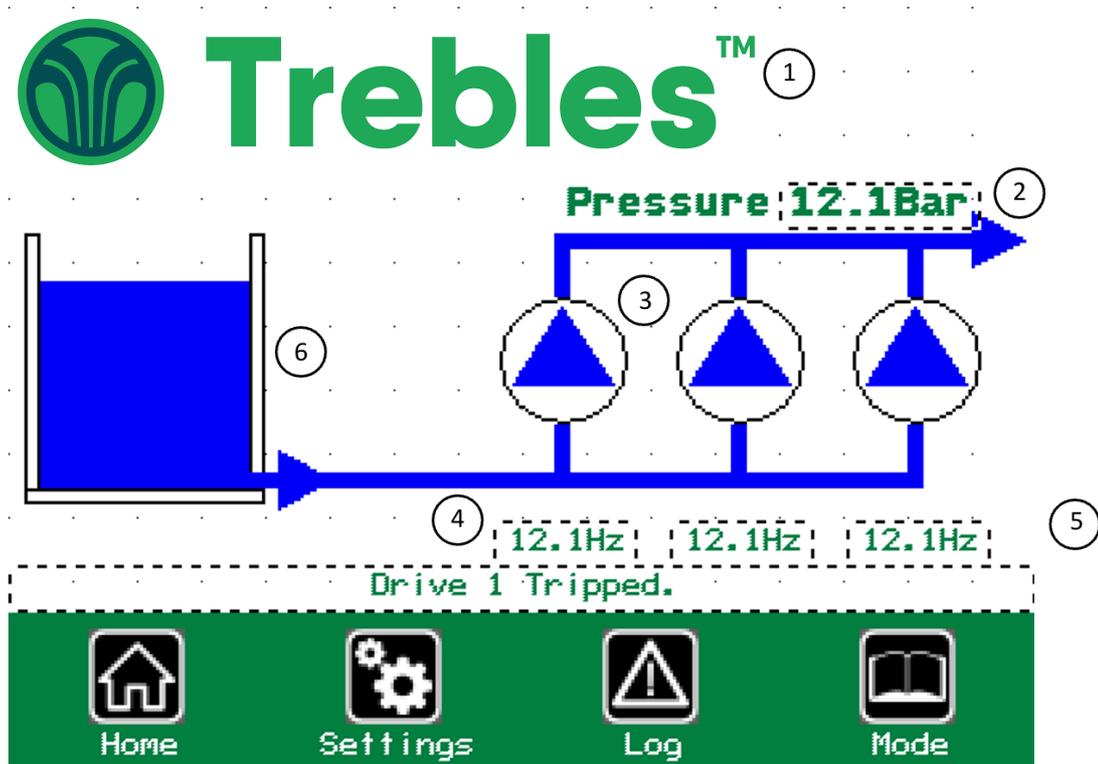
Username: engineer

Password: 1966

HOME SCREEN

The home screen is the default screen the controller will bring up as soon as it is powered up and it give an overview of system and show the state of each pump, current pressure within the system and the current status of the tank float switch / suction transducer.

The home screen also allows navigation to the pump screens and to the contact us screens.



1. Trebles logo - navigation to the contact us screen
2. Pressure readout - gives a live readout of the pressure in the system
3. Pump display symbol - changes colour based on pump state, and provides navigation to the pump page (pump no's start from LHS counting up). The colours of these symbols relate to the pump states as follows:

Green: Ready to run

Yellow: Running

Red: Tripped

Blue: PLC issue- please contact GM Treble.

4. Drive output frequency (pump no's start from LHS counting up)
5. Home screen message display - gives a brief message to say what state the system is in
6. Tank icon - will turn red if low water in the tank and will be blue if water level / suction is ok

SETTINGS

The settings screens are where all the motor details, set points, sensor details, and all other settings can be seen and adjusted. The settings span a number of pages and navigating between the pages can be done using the left and right buttons.

To change settings simply touch the setting value and a pop up screen will with a keypad to enter the new setting value.

Left Arrow - return to previous page

Right Arrow - navigate to next setting page

Pressure Set Point

The pressure the system is required to maintain.

Start Speed

The speed that the 1st pump will run at in order to build pressure in the system gently (soft fill speed).

Start Speed Disable Pressure

The pressure that must be achieved before the PI control takes over.

2nd Pump On Speed

The speed at which the 1st pump must be equal to or greater than before the 2nd pump will start.

2nd Pump On Time

The time at which the 1st pump must be at equal to or greater than the 2nd Pump on speed before the 2nd pump can start.

2nd Pump Off Speed

The speed at which the 1st pump must be less than before the 2nd pump will stop.

2nd Pump Off Time

How long the pump will continue to run at the 'Off Speed' before ramping down and stopping.

3rd Pump On Speed

The speed at which the 2nd pump must be equal to or greater than before the 3rd pump will start (only displayed on systems with more than 2 pumps).

3rd Pump On Time

The time at which the 2nd pump must be at equal to or greater than the 3rd Pump on speed before the 3rd pump can start (only displayed on systems with more than 2 pumps).

3rd Pump Off Speed

The speed at which the 2nd pump must be less than before the 3rd pump will stop (only displayed on systems with more than 2 pumps).

3rd Pump Off Time

How long the pump will continue to run at the 'Off Speed' before ramping down and stopping.

4th Pump On Speed

The speed at which the 3rd pump must be equal to or greater than before the 4th pump will start (only displayed on systems with more than 3 pumps).

4th Pump On Time

The time at which the 3rd pump must be at equal to or greater than the 4th Pump on speed before the 4th pump can start (only displayed on systems with more than 3 pumps).

4th Pump Off Speed

The speed at which the 3rd pump must be less than before the 4th pump will stop (only displayed on systems with more than 3 pumps).

4th Pump Off Time

How long the pump will continue to run at the 'Off Speed' before ramping down and stopping.

Changeover Time

The time period in hours before the duty, 2nd, 3rd, and 4th drives swap over to ensure equal operation of all pumps.

P-Gain

The proportional gain, this is the multiplier applied to a given error (the difference between the setpoint and the feedback) to adjust the inverter speed.

A higher P gain will give a larger increase/ decrease in speed for a given error however too high a value will cause instability.

I-Gain

The integral gain, this controls how quickly the speed is changed for a given error.

A lower value means a more reactive system, and a higher value gives a slower reaction. Too low a value will cause instability, and too high will mean the system does not react quickly enough.

Sensor Min Value

To be set to the sensors min value in bar (the pressure at which it will output 4mA).

Sensor Max Value

To be set to the sensors max value in bar (the pressure at which it will output 20mA).

Low Pressure Warning

The pressure at which the system must be equal to or less than before the low pressure warning is displayed on the home screen.

High Pressure Warning

The pressure at which the system must be equal to or greater than before the high pressure warning is displayed on the home screen.

Sleep Threshold

The pressure at which the system must be equal to or greater than before it will go to sleep. This should always be the same as the pressure set point.

Sleep Time Delay

The time the pressure in the system must be equal to or greater than the sleep threshold before it will go to sleep.

Wakeup Pressure Difference

The difference between the pressure feedback and the set point that must be seen before the systems wakes up when in sleep mode.

e.g. If the pressure set point is 2.5bar and the wakeup pressure difference is 0.3Bar and the system enters sleep mode it will not restart until the pressure drops to 2.2Bar (2.5-0.3).

The following settings will write to the inverters parameters when the save button is pressed, please note the system must be in off mode when a save is to be carried out.

Pump x Motor Current

To be set to the motor rated current found on the motor name plate.

Pump x Motor Voltage

To be set to the motor rated voltage found on the motor name plate.

Pump x Motor Frequency

To be set to the motor rated frequency found on the motor name plate.

Pump x Min Frequency

To be set to the min frequency the drive will be able to run at (normally set to 0).

Pump x Max Frequency

To be set to the max frequency the drive will be able to run at.

Pump x Acceleration Rate

The time it takes the inverter to accelerate from 0Hz to the motor rated frequency.

Time

Displays the current time set in the controller.

Date

Displays the current date set in the controller.

Auto Min Speed

The lowest speed the pumps will run at when operating in PI (auto) mode.

The following settings are only used when a suction transducer is used rather than a tank level switch:

Tank Sensor Min

To be set to the suction transducers min value in bar (the pressure at which it will output 4mA).

Sensor Max Value

To be set to the suction transducers max value in bar (the pressure at which it will output 20mA).

Tank Low Level

To be set to the pressure below which the system needs to stop on low water.

If set to 0 the suction transducer is ignored.

Suction Delay Time

To be set to the time after the pumps start before the suction level is looked at, this allows suction to be built up when the system 1st starts up.

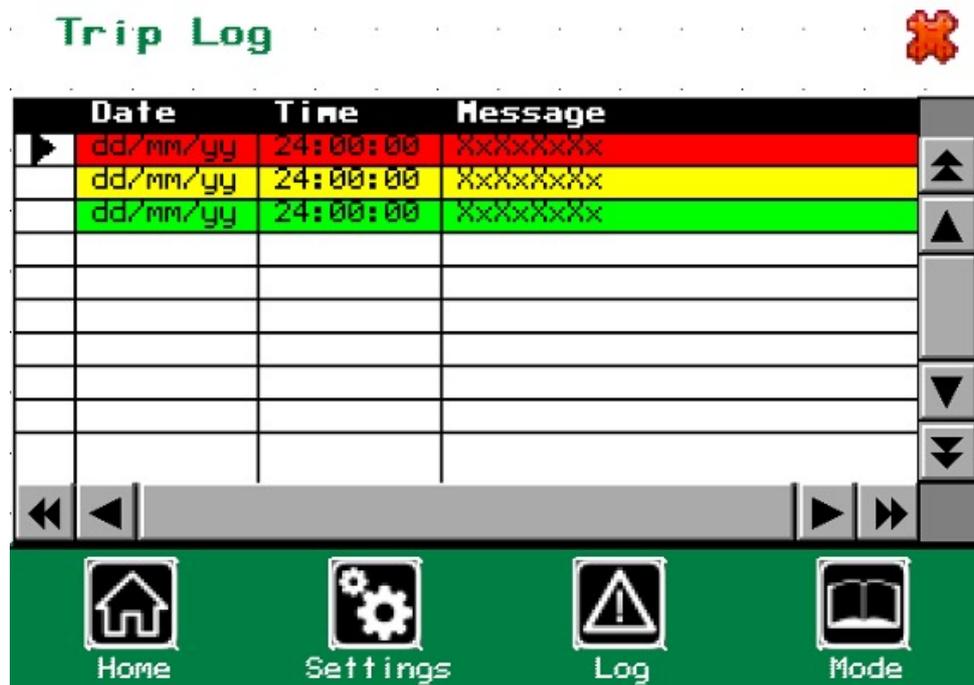
Suction Filter Time

A filter to be applied to the suction transducer feedback, to stop the system from stopping and starting due to inconsistent suction feedback.

TRIP LOG

This is where the last 100 trips are stored, alongside the time and date. Any trips that may occur will give detailed information on the trip and also possible causes. Low water occurrences will also be logged in the trip log.

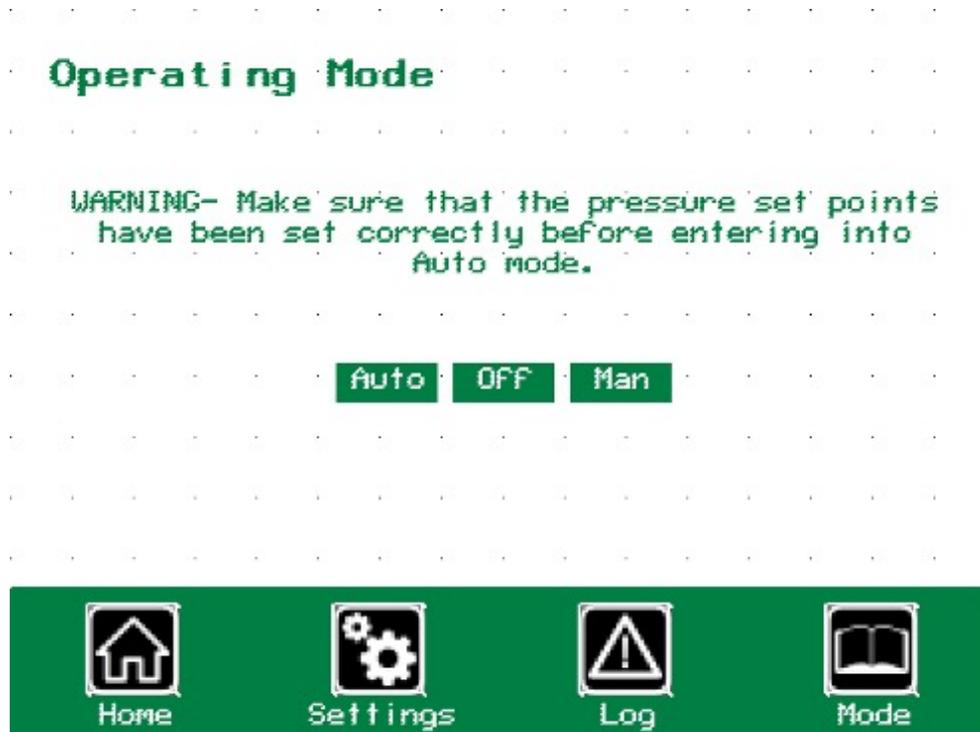
The red 'X' in the top left will clear all entries in the trip log when pressed.



OPERATING MODE

The mode page is where the operating mode of the system is set.

When the hand/off/auto switches and potentiometers are fitted to the panel this will need to be left in auto.



Auto Mode

This will set the controller up to use the pumps in a cascade function to maintain a constant pressure within the system as described in the settings above. In order to run in auto an enable must be present as must the tank level switch (unless suction transducer is used).

Off

Stops anything from running.

Manual Mode

This will allow the panels to be manual run from the pump pages.

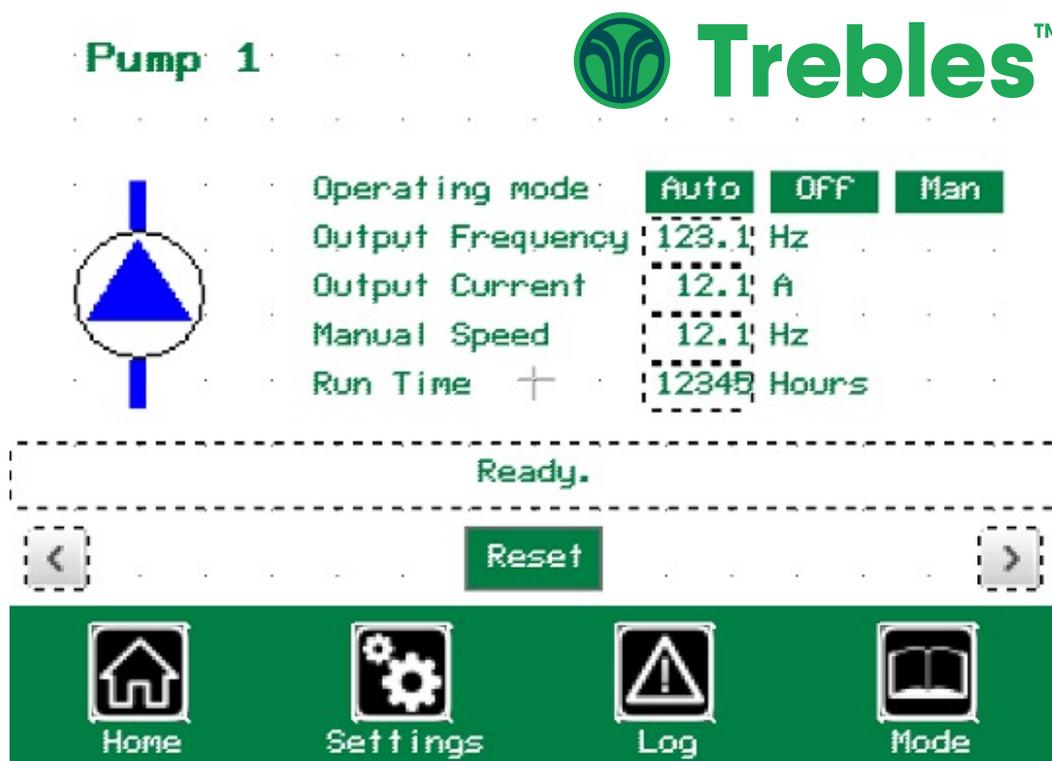
When changing modes the individual pumps will need to be set back to auto or manual (depending on which mode is being used).

PUMP SCREENS

Each pump has its own screen where the individual pump Auto/Off/Manual selector is shown alongside the output frequency, output current, speed used when in manual and hour run readout are all shown.

A message along the bottom of the screen gives information just relating to the individual pump.

When the operating mode is set to auto, only pumps that have auto selected on their pump page will be able to run.



As per the home screen, the colour of the pump symbol will change depending on the state of the pump, the colours are as follows:

- Green: Ready to run
- Yellow: Running
- Red: Tripped
- Blue: PLC issue- please contact GM Treble

The left and right buttons can be used to cycle through the individual pump pages.

RELAY OUTPUTS

Relay outputs are provided within the panel for indication back to other equipment, the relay functions are as follows:

Running

If any of the drives are running this will close

Alarm

If any drive trips or any other trips occur this will close. This will also close during soft fill.

Low Water

If low water is seen this will close.

All connection information is to be found in the wiring diagrams.

CONTROL PANEL OPTIONS

Tank Selector Switch

Where a Tank 1 / Tank 1 & 2 / Tank 2 switch has been fitted, the position of the switch will dictate which tank switch(es) are used for the low water.

Tank 1- Only tank 1 is used, tank 2 is ignored.

Tank 1 & 2- Both tanks are used.

Tank 2- Only tank 2 is used, tank 1 is ignored.

Suction Transducer

See settings section above for control implications, wiring will be shown in the wiring diagrams provided with the panel.

MAINTENANCE

SYSTEM EXPANSION VESSEL

Checks of the air cushion pressure of the pressure vessels should be carried out annually using the below steps:

- ✓ Press the 'Mode' key to open Operating Mode menus.
- ✓ Press the 'Off' key to prevent the pumps from running.
- ✓ Isolate each expansion vessel and drain all water using the drain valve provided.
- ✓ Check the air cushion in both vessels accordingly (this should be 0.5 bar below the set point).

ADJUSTING THE AIR CUSHION

If the pressure is found to have fallen, follows the below steps:

- ✓ Adjust the air cushion in both vessels accordingly.
- ✓ Open the vessel isolation valves.
- ✓ Press the 'Mode' key to open Operating Mode menus.
- ✓ Press the 'Auto' key to resume normal operation.

ABSENT AIR CUSHION PRESSURE

Normally after draining the expansion vessel the air cushion pressure should only be slightly below the correct level, unless this check has been neglected for some time.

If the air cushion is found to be very low a further check should be made on all vessel connections for possible air leaks. This is best carried out using soap/water solution or leak detector after inflation. Any leaks that are identified will require repair or the vessel replaced.

If the air cushion is totally absent, if air discharges from the drain valve whilst reflating or the Schrader Valve discharges water then a internal diaphragm failure has occurred. A new diaphragm or complete new vessel will be required.

VISUAL CHECK

The pump requires no lubrication but a visual check should be made for any signs or leakage or any unusual sounds when running. This also applies to isolation valves and all fittings/pipework connections within the unit.

FILTER CLEANING

The cooling filters will become clogged up with dirt if not cleaned regularly, this will lead to reduced airflow and high temperature issues. In order to prevent this regular cleaning of filters is required; the frequency will depend on the atmosphere the panel is in.

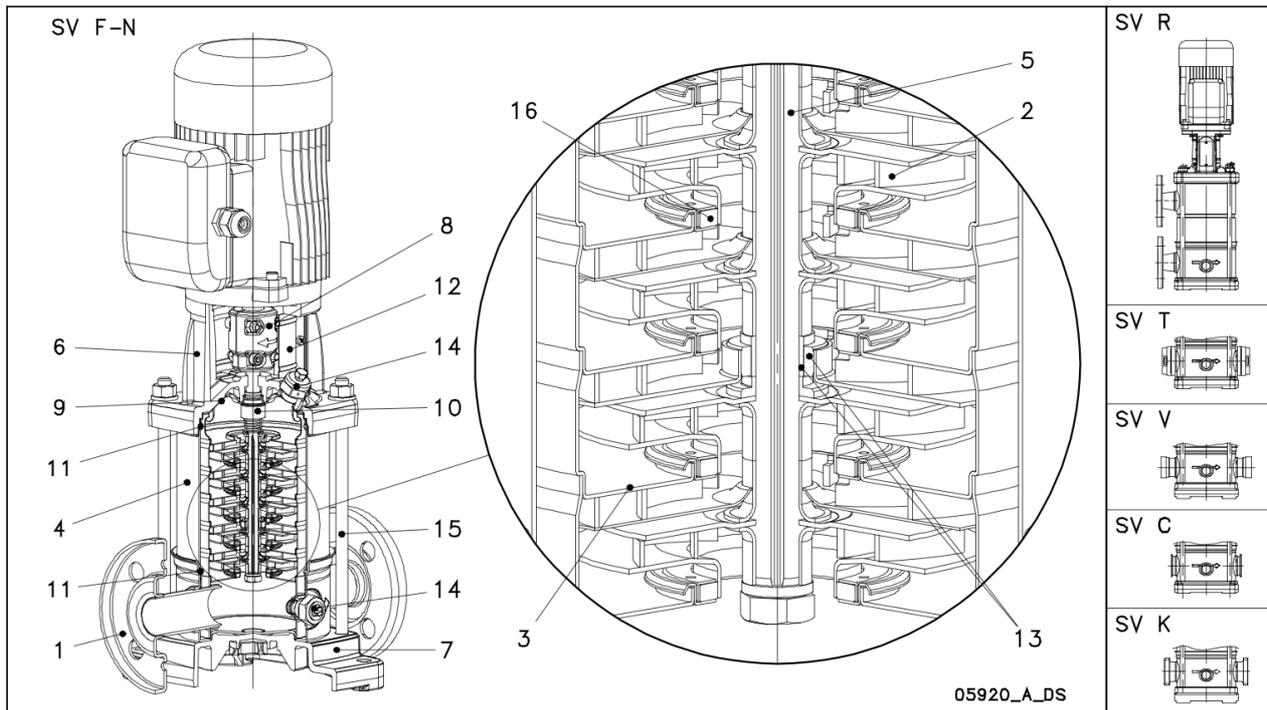
CONNECTION CHECKS

All electrical components need to be checked to ensure they are tightening correctly after the panel is transported and annually thereafter.

PANEL CLEANING

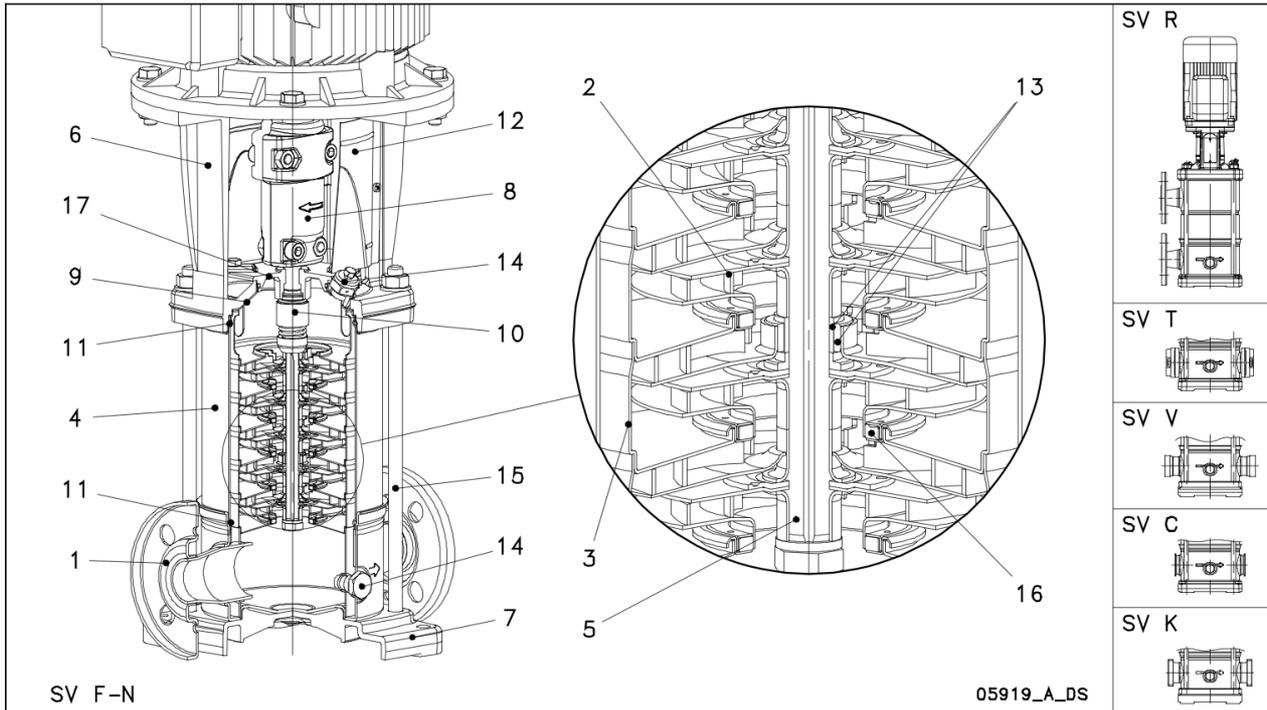
The interior of the control panel should be kept clean and tidy at all times.

PUMPS



F, T, R VERSIONS

REF. N.	NAME	MATERIAL	REFERENCE STANDARDS	
			EUROPE	USA
1	Pump body	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
2	Impeller	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
3	Diffuser	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
4	Outer sleeve	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
5	Shaft	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
6	Adapter	Cast iron	EN 1561-GJL-250 (JL1040)	ASTM Class 35
7	Base	Aluminium	EN 1706-AC-ALSi11Cu2 (Fe) (AC46100)	-
8	Coupling	Aluminium	EN 1706-AC-ALSi11Cu2 (Fe) (AC46100)	-
9	Seal housing	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
10	Mechanical seal	Silicon carbide / Carbon / EPDM		
11	Elastomers	EPDM		
12	Coupling protection	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
13	Shaft sleeve and bushing	Tungsten carbide		
14	Fill / drain plugs	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
15	Tie rods	Galvanized steel	EN 10277-3-36SMnPb14 (1.0765)	
16	Wear ring	Technopolymer PPS		

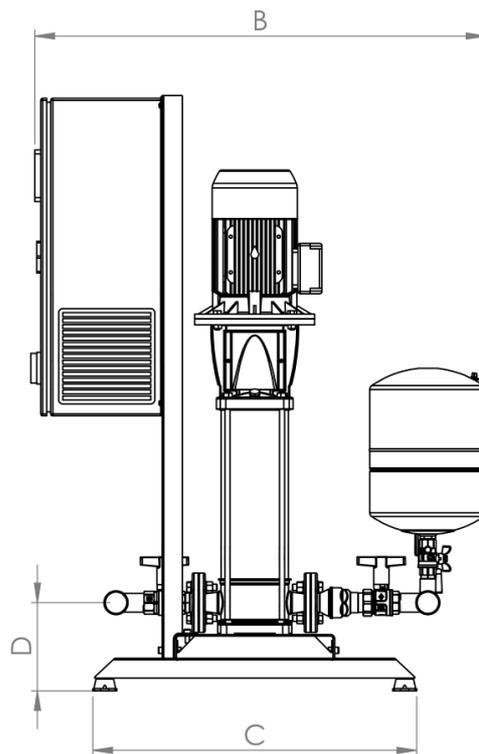
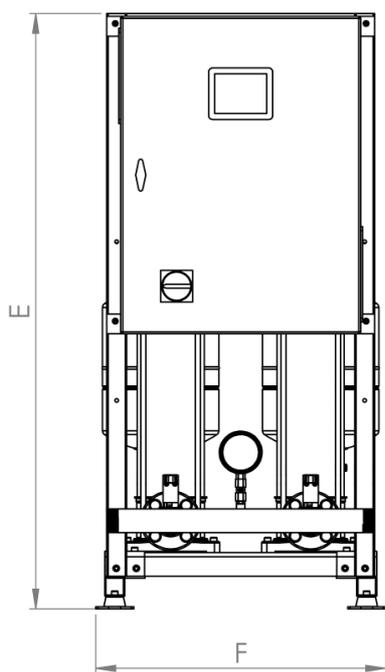
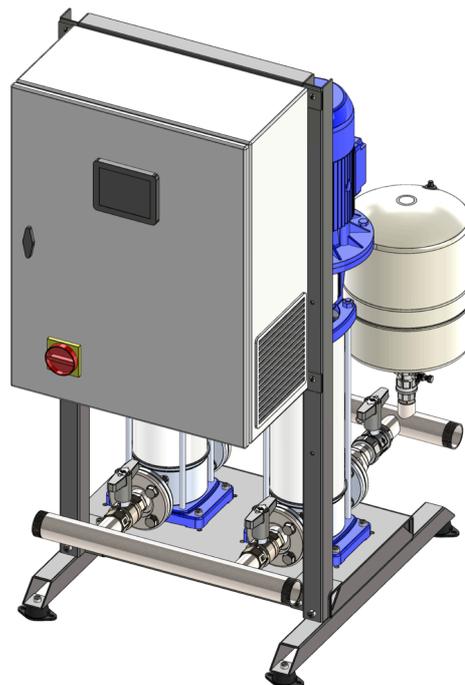
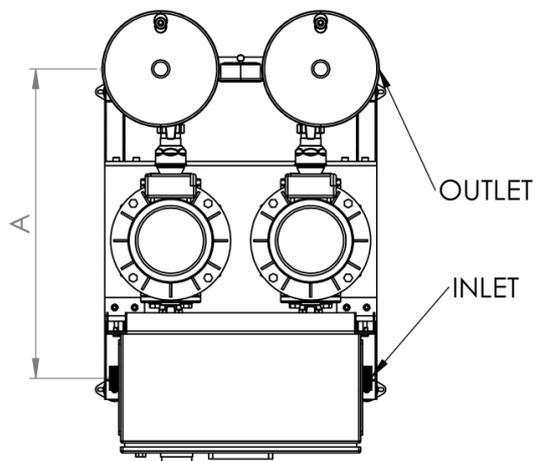


F, T, R VERSIONS

REF. N.	NAME	MATERIAL	REFERENCE STANDARDS	
			EUROPE	USA
1	Pump body	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
2	Impeller	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
3	Diffuser	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
4	Outer sleeve	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
5	Shaft	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
6	Adapter	Cast iron	EN 1561-GJL-250 (JL1040)	ASTM Class 35
7	Base	Aluminium	EN 1706-AC-AISI11Cu2 (Fe) (AC46100)	-
8	Coupling	Aluminium	EN 1706-AC-AISI11Cu2 (Fe) (AC46100)	-
9	Seal plate	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
10	Mechanical seal	Silicon carbide / Carbon / EPDM		
11	Elastomers	EPDM		
12	Coupling protection	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
13	Shaft sleeve and bushing	Tungsten carbide		
14	Fill / drain plugs	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
15	Tie rods	Stainless steel	EN 10277-3-365MnPb14 (1.0765)	
16	Wear ring	Technopolymer PPS		
17	Seal gland	Stainless steel	EN 10213-4-GX5CrNi19-10 (1.4308)	AISI 304

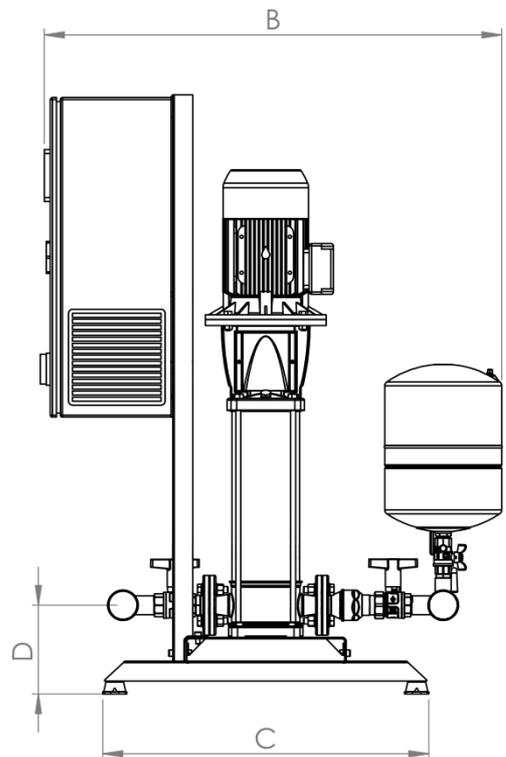
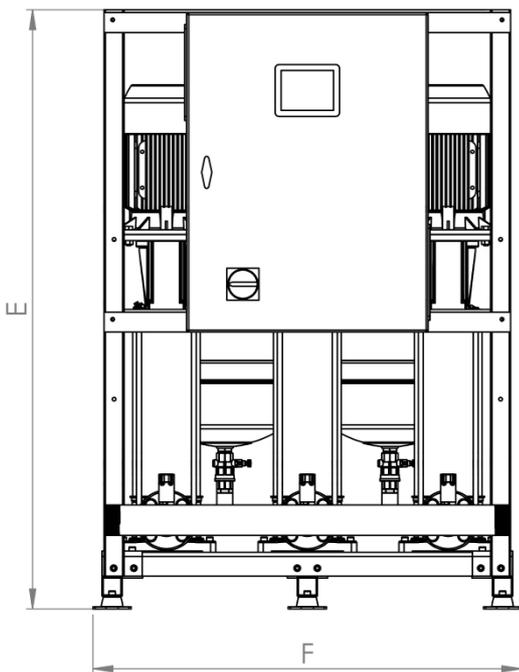
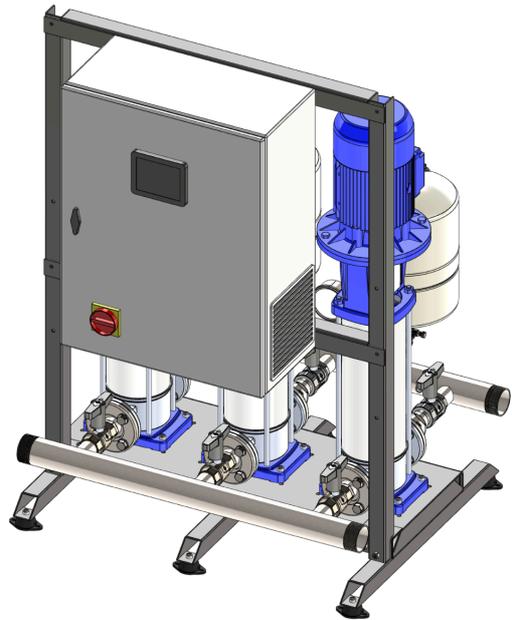
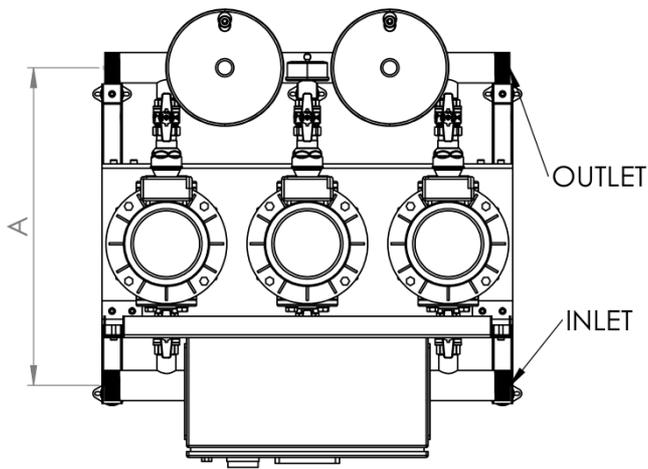
DIMENSIONS

5240 SERIES



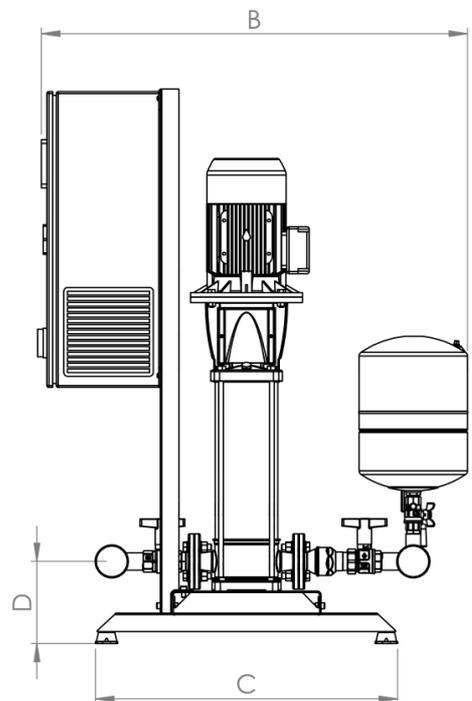
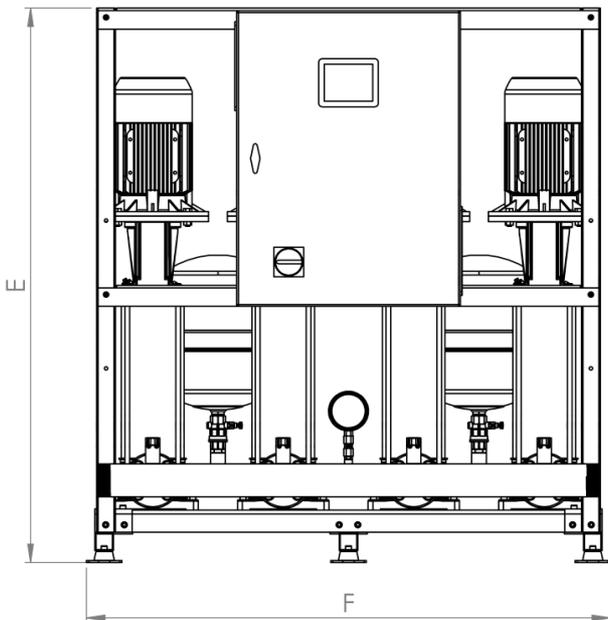
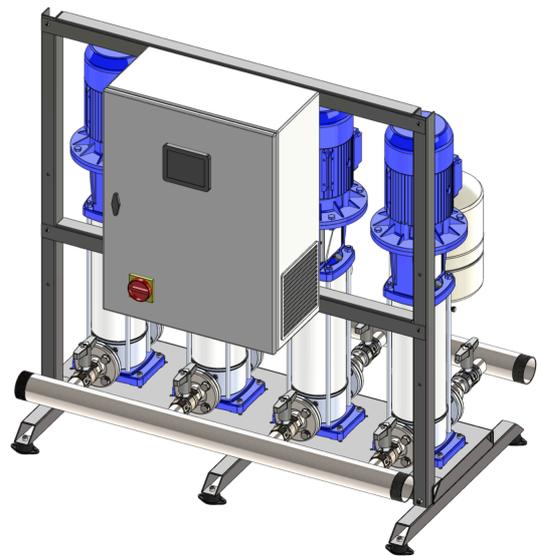
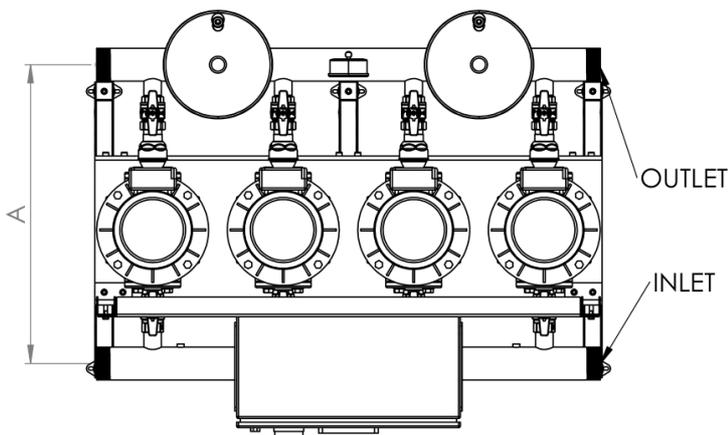
Model	Inlet	Outlet	A	B	C	D	E	F	
3SV	1-1/4" Male BSP		630	1050	810	217	1500	725	
5SV	1-1/2" Male BSP		675	1070					
10SV	2" Male BSP		780	1130		222			
15SV	DN80 PN16		880	1190					232
22SV									

5241 SERIES



Model	Inlet	Outlet	A	B	C	D	E	F
3SV	1-1/2" Male BSP		640	1050	810	217	1500	1065
5SV	2" Male BSP		685	1070		222		
10SV	DN65 PN16		795	1135		232		
15SV	DN80 PN16		880	1190	810	232	1500	1065
22SV								

5242 SERIES



Model	Inlet	Outlet	A	B	C	D	E	F	
3SV	2" Male BSP		650	1060	810	217	1500	1405	
5SV	DN65 PN16		700	1080					
10SV	DN80 PN16		810	1150		222			
15SV	DN100 PN16		910	1190					232
22SV									

WARRANTY

Congratulations and thank you for purchasing a Trebles product.

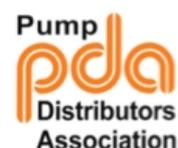
At Trebles we pride ourself on the quality of all our products, ensuring they are manufactured to the highest standard and designed to provide a long service life.

The ECOPLUS Cold Water Booster Set is guaranteed by us to be free from defects in materials or workmanship for 2 years from the date of purchase.

We will repair or replace the unit free of charge within this 2 year period, if identified to be a direct result of faulty material or workmanship. This guarantee does not cover any damage from incorrect installation, improper use or normal wear and tear.

Proof of purchase, or the product serial number, must be provided in the event of a claim in order to identify that the unit is within this warranty period.

Model	Serial No.	Date Purchased



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