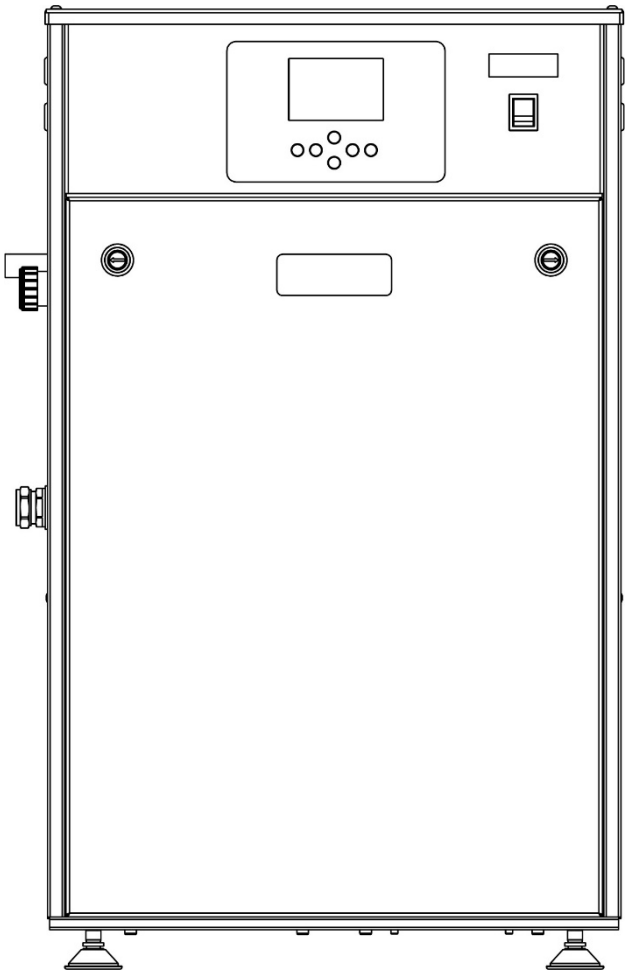
Core values, quality products

CORE MAXI AP

Installation, Operation & Maintenance Instructions

Please leave this instruction booklet with the end user as it contains important warranty, maintenance and safety information



Read this manual carefully before commencing installation.
This manual covers the following products:

CORE MAXI AP 140	CORE MAXI AP 240
CORE MAXI AP 180	CORE MAXI AP 280

MADE IN BRITAIN | 2 YEAR WARRANTY | UK CA CE

PRODUCT DESCRIPTION

Heating and cooling system pressurisation top up unit with integral water storage tank and electric motor driven peripheral pump(s) with an automated control system consisting of pressure transducer and water level sensors. The tank includes an AB air gap for category 5 fluid isolation (BS EN 1717).

APPLICATION

The CORE Maxi AP range is designed to provide initial system fill and intermittent water top up to compensate for intermittent losses in system pressure in heating and cooling systems in commercial or industrial applications. These could include minor leaks, air venting, etc.

The units are not designed to deal with sudden losses of system pressure due to major water losses over extended periods. They are also not to be used for water boosting applications.

STORAGE

If this product is not to be installed immediately on receipt, ensure that it is stored in a dry, frost and vibration free location in its original packaging.

CONTENTS

1. GENERAL SAFETY INFORMATION

- These instructions are intended for the installer/operator/user/maintenance of this equipment and must be kept with the equipment, for the life of the equipment and made available to all persons. Please read GENERAL SAFETY INFORMATION before doing anything else, and then follow them carefully.
- The unit must only be installed/operated/used/maintained by a competent person; *A competent person is someone who is technically competent and familiar with safety practices and the hazards involved.*
- Hydraulic Accumulators/Expansion Vessels installed in conjunction with this equipment, with Pressure x Volume above 250 Bar-litres, require regular formal inspection by a *competent person.* This is a Legal Requirement under the "Pressure Systems Safety Regulations" (PSSR) and the Owner/User should be made aware of their responsibility for this. (see Section 4. Servicing).
- Failure to install/operate/use/maintain the equipment as recommended below could cause damage to the equipment and anything subsequently connected to it, and invalidate the warranty provided by Smith Brothers Stores Ltd to the buyer.
- Any damage caused to the equipment by misapplication, mishandling or misuse could lead to risk of **Electrocution, Burns, Fire, Flooding or injury to people or damage to property** dependent upon the circumstances involved.
- This equipment contains moving/rotating parts that must remain guarded. Removal of, or missing guards could lead to serious personal injury.
- This equipment automatically restarts after a power interruption.
- We accept no responsibility or liability for any consequences or damage/losses due to misapplication, mishandling or misuse of the equipment.
- It should be noted that the assembly of pressure equipment on site under the responsibility of the user (or his representative) is not subject to the Pressure Equipment Directive 2014/68/EU. (National legislation covering assembly on site will apply)

1.1 WARNINGS

1.1.1 **Do not touch any live parts for at least 5 minutes after switching off the electricity supply. Failure to observe this will constitute a severe Electric shock and/or Burns hazard and may be lethal.**

1.1.2 **The equipment is only suitable for earth referenced supplies and must be permanently earthed to avoid Electric shock hazard.**

1.1.3 **With equipment isolator switch turned OFF, mains voltage may still be present from BMS system. This constitutes an Electric shock hazard.**

1.1.4 **Emergency stop button does not remove dangerous voltages from control panel/pump motor assemblies. This constitutes an Electric shock hazard.**

1.1.5 **Metal parts (e.g. heat sinks) may reach temperatures of 90 degrees centigrade and will constitute a Burns hazard.**

1.1.6 **Some attached equipment can be designed to operate with liquid temperatures up to 200 degrees centigrade and will constitute a Burns/scalding hazard.**

1.1.7 **The equipment must not be pressurised beyond the maximum working pressure as stated on pumps/pipework/vessels/control panel otherwise serious mechanical damage/destruction could occur causing injury to people or property.**

1.1.8 **The equipment must not be heated/chilled beyond the maximum/minimum working temperature as stated on pumps/pipework/vessels/control panel otherwise serious mechanical damage/destruction could occur causing injury to people or property.**

1.1.9 **Any damage to equipment, pumpset, vessels, pipework or system components caused by misapplication, mishandling or misuse could lead to Electric shock hazard, Burns hazard, Fire hazard, Flooding hazard or cause injury to people or property.**

1.1.10 **This equipment may contain moving/rotating parts that must remain guarded. Removal of or missing guards could lead to serious personal injury.**

1.1.11 **Pressure vessels must never be disassembled whilst in use, they contain high pressure air/gas charge which could cause injury to people or property.**

1.1.12 **Ensure the base/foundation/plinth/wall to which the equipment is to be attached is sufficiently strong enough to carry the entire mass of the equipment including the water that it will contain under worst-case fault conditions. E.g. fully saturated pressure vessel with no air charge, break/spill tank full to overflowing, etc. Failure to observe this could cause serious mechanical damage/destruction resulting in injury to people or damage to property.**

1.1.13 **This equipment contains a fluid which may under certain circumstances leak/drip/spray fluid (e.g. servicing, repair or malfunction). Ensure any fluid discharge will not cause damage to the surroundings by taking appropriate action. E.g. install in a place that will not be damaged by leakage or install in a bunded area with adequate drainage.**

1.2 CAUTIONS FOR INSTALLATION

1.2.1 READ GENERAL SAFETY INFORMATION 1, WARNINGS 1.1 and CAUTIONS 1.2, 1.3 & 1.4

1.2.2 The unit should only be installed/operated by a competent person; *A competent person is someone who is technically competent and familiar with safety practices and the hazards involved.*

1.2.3 Do not lift the pumpset by pipework. Lift the pumpset by the container pallet using a pallet/forklift or crane by passing strops underneath the skid using a spreader bar. Failure to utilise these facilities will result in damage to the pumpset.

1.2.4 Store in a dry place to avoid damp conditions deteriorating the equipment.

1.2.5 Protect against dirt, damage and frost. It is absolutely essential that no foreign matter such as pipe thread swarf, welding slag, grit or stones are allowed to enter the equipment. Debris of this type can cause severe damage to the mechanical seals, diaphragms and impeller. Frost/freezing will damage pumps/pipework and control panel components.

1.2.6 The equipment is only suitable for installation in a clean, dust-free indoor environment, with adequate protection from heat and frost, and sufficient ventilation to ensure cooling of the motors. Ambient air temperature should be between 5 and 40 degrees centigrade, non-condensating. Operation outside of these conditions could seriously damage the equipment.

1.2.7 If the equipment were to be stored or taken out of service for a period of time (e.g. 1 week or more), then we would recommend draining the equipment of all water/liquid (with due regard to any local regulations) to prevent frost damage to components. When restarting is required we would recommend commissioning by our authorised service agent.

1.2.8 Ensure the base/foundation/plinth/wall to which the equipment is to be attached has sufficient mass compared to the equipment, in order to avoid noise/vibration transmission. E.g. the mass of the base should be at least five times the mass of the equipment.

1.2.9 Ensure the electrical supply is the correct voltage, current, frequency and type for the equipment supplied and that suitable circuit protection equipment is installed in the supply. Incorrect electrical installation could be an electric shock/burns/fire hazard.

1.2.10 When accessing the control panel to make electrical connections adopt anti-static procedures e.g. wear anti-static earthed wristband, to avoid risk of damaging the controller.

1.2.11 Where Hydraulic Accumulator(s)/Expansion Vessel(s) are supplied as a loose item, they must be installed/connected correctly before operating the equipment; otherwise, serious damage from over-pressure/pump overheating could occur.

1.2.12 Do not operate this equipment/pumpset prior to commissioning (section 3.1) This could cause irreparable damage to equipment/pumpset/pipework/system components.

1.2.13 Isolate the equipment/pumpset before pressure testing system. Excess pressure could irreparably damage the pressure transducer, pressure switches (where fitted) and the diaphragms of pressure vessel/hydraulic accumulators.

1.2.14 It is the installers' responsibility to ensure subsequent pipework etc can accept the pressures generated by the equipment/pumpset and to install an overpressure safety device into the system with due respect to the suction pressure present on the pumpset, the pump closed valve pressure stated on the pump, the maximum working pressure stated on any of the attached pressure vessels and any other device connected to the system e.g. boilers, calorifiers etc.

1.2.15 When chlorination of the system is carried out, ensure that any residual chlorine is removed by thorough flushing as detailed in the HSE approved code of practice L8, to avoid damaging the equipment/pumpset. The normal level of chlorination is up to 2 parts per million (ppm), but shock dosing for sterilization purposes, at 25-50 ppm for 24-48 hours is acceptable as long as all chlorine is

removed once the process is complete. Chlorination beyond these limits could seriously damage pumpset components and WILL NOT be covered by the warranty.

1.2.16 The installer/user is responsible for the installation of the correct earthing and protection according to valid national and local standards. All operations must be carried out by a suitably qualified person.

1.2.17 The equipment is only suitable for earth referenced supplies and must be permanently earthed to avoid electric shock hazard.

1.2.18 The equipment must be permanently earthed with appropriately sized Earthing.

1.2.19 Never perform high voltage resistance tests on control panels, variable speed drives/motors without first disconnecting the panel/drive/motor from the circuit being tested as this will damage the built in electronic components.

1.2.20 Metal parts (e.g. heat sinks) may reach temperatures of 90 degrees centigrade.

1.2.21 We do not recommend using the "Pressurisation unit" for filling the system pipework. This type of equipment is designed for topping up small losses/leaks in the system. A separate means of filling e.g. a quick fill loop (check with local water regulations first!) should be used instead, with the system connection valve to the equipment closed.

1.2.22 Where "Expansion vessels" are used on LTHW heating system pressurisation units, the temperature of the fluid returning to the vessels should not exceed 70 degrees Centigrade (except where Solar vessels are used rated at 100 degrees centigrade) as this could damage the vessel diaphragm. Where the temperature exceeds 70/100C an intermediate cooling vessel should be fitted.

1.2.23 Do not use the "Pressurisation unit" for dosing the system with chemicals. Only allow clean cold water into the break tank. Anything other than clean cold water could damage the pumps/pipework components.

1.2.24 Drain cocks and air bleed screws must not be left open as this could cause flooding.

1.3 CAUTIONS FOR OPERATION/USER

1.3.1 READ GENERAL SAFETY INFORMATION 1, WARNINGS 1.1 and CAUTIONS 1.2, 1.3 & 1.4

1.3.2 The unit should only be operated/used by a competent person; *A competent person is someone who is technically competent and familiar with safety practices and the hazards involved.*

1.3.3 The Owner/User of this equipment has a Legal Responsibility to ensure that it is subject to regular formal inspections. See Section 3. Servicing, for details.

1.3.4 Where Hydraulic Accumulator(s)/Expansion Vessel(s) are supplied as a loose item, they must be installed/connected correctly before operating the equipment, otherwise serious damage from over-pressure could occur.

1.3.5 The equipment must not be run until commissioned by an authorised SBS CORE agent, this could irreparably damage the pump equipment and/or system components/pipework connected to it.

1.3.6 The pumpset should be left switched ON with the pumps switched to AUTO for normal operation.

1.3.7 The pumpset should not be left in "Hand" operation for more than 1 minute. This could lead to severe damage of pumpset components and/or pipework system from over-pressure and/or overheating.

1.3.8 Ensure pumpset always has an adequate water supply to prevent dry running causing pump seal damage and water leakage.

1.3.9 Do no attempt to start pumps without liquid in volutes (pumps must be fully primed); mechanical seals must have a film of liquid between faces for proper operation and to prevent damage.

1.4 CAUTIONS FOR MAINTENANCE

1.4.1 READ GENERAL SAFETY INFORMATION 1, WARNINGS 1.1 and CAUTIONS 1.2, 1.3 & 1.4

1.4.2 The unit should only be operated/maintained by a competent person; *A competent person is someone who is technically competent and familiar with safety practices and the hazards involved.*

1.4.3 Where the pumpset is fitted with Building Management Services (BMS) interconnections, notify the appropriate persons before switching OFF for maintenance or adjustments, to avoid unnecessary alarm conditions occurring. WARNING: With pumpset isolator OFF, mains voltage may still be present from BMS system. This constitutes an Electric shock hazard.

1.4.4 To prevent seizing, pumpsets must not be left unused for long periods (e.g. 1 week).

1.4.5 Do not vent air from air valves on vessels. These are for adjustment of pre-set cushion pressures. If wrongly adjusted this will lead to incorrect operation of the pumpset and possible damage to pumps, pipework and system components from overheating and over-pressure.

1.4.6 Switch OFF pumpset before accessing pumps and/or control panel.

2 INSTALLATION INSTRUCTIONS

2.1 GENERAL

These instructions are intended for the installer of this pressurisation unit. Please follow them carefully.

The unit should only be installed by a competent person; *A competent person is someone who is technically competent and familiar with safety practices and the hazards involved.*

It should be noted that the assembly of pressure equipment on site under the responsibility of the user (or his representative) is not subject to the Pressure Equipment Directive 2014/68/EU. (National legislation covering assembly on site will apply).

Failure to install the equipment as recommended below could invalidate the warranty provided by Smith Brothers Stores Ltd to the purchaser.

2.2 PROCEDURE

2.2.1 OFF-LOADING AT SITE

Do not lift unit by pipework. Lift the unit by the container pallet using a pallet/forklift or crane by passing strops underneath the skid using spreader bar. Or use lifting eyes where provided. Failure to utilise these facilities could result in damage.

2.2.2 LOCATION

If the equipment is to be installed in an unheated room, ensure that there is adequate frost protection. On a heating system do not lag any expansion vessel or its connection to the system. This can result in damage occurring.

The location of the equipment should have adequate drainage, bunding or other appropriate measures to protect assets and the building fabric in the event of leakage or water spillage. Failure to provide such measures may result in water damage to property and assets.

Ensure that location for pumpset provides adequate clear space to accommodate unit with reasonable access to all parts; CORE recommend a minimum distance of 500mm. There must be sufficient room to fully open control panel door; withdraw diaphragms from vessels, repair or replace pumps, or access float valve in the breaktank.

Should any of these location conditions not be satisfied Smith Brothers Stores Ltd reserve the right to charge labour on any warranty work required on the unit.

2.2.3 FIXING

Install the equipment on a flat, even and level surface, where practical on a raised plinth to keep equipment above damp floor. Locate unit in position.

2.2.4 PIPEWORK

2.2.4.1 Mains Water Supply

i. Fit an isolating valve in the supply to enable the unit to be isolated from the supply for maintenance.

ii. Connect the supply. For Maxi AP models this is a ½" BSP male connection at the side of the cabinet.

iii. The recommended mains water supply should be 1 bar dynamic pressure.

2.2.4.2 Overflow/warning pipe

i. Fit appropriately sized overflow/warning pipe pipework from the pressurisation unit mains water breaktank/spill tank to drain via an air break (e.g. Tundish) in a conspicuous location.

2.2.4.3 System Connection

i. The unit must be connected with any expansion vessels and cooling/active buffer vessels, to the underside of the return header on the suction side of the circulating pumps and boiler/chiller.

ii. The system connection(s) on the pressurisation unit should be via a lockshield type isolating valve. All hydraulic accumulators and expansion vessels fitted to the system must have isolating and drain off valves to enable them to be serviced, as well as removable pipework to enable bladders to be changed (see fig 2.3 for examples).

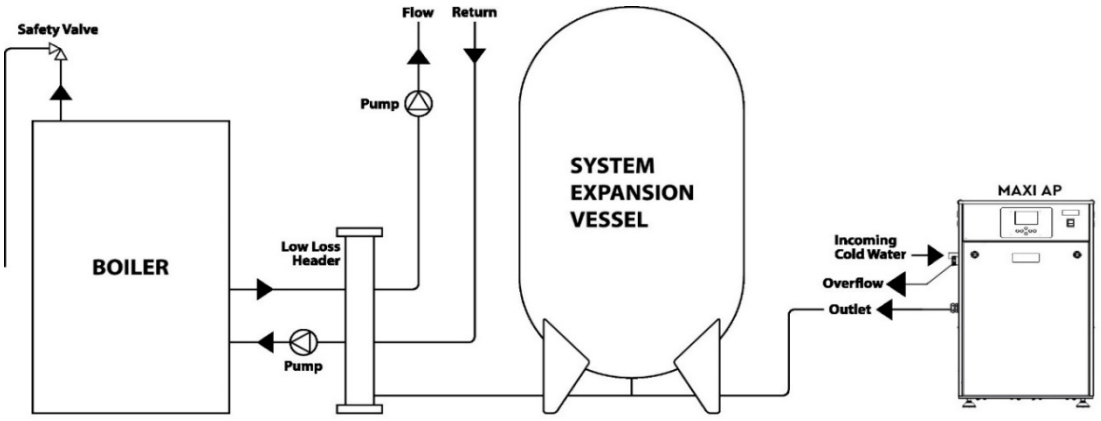


Fig 2.1 Typical pipework layout for Maxi AP

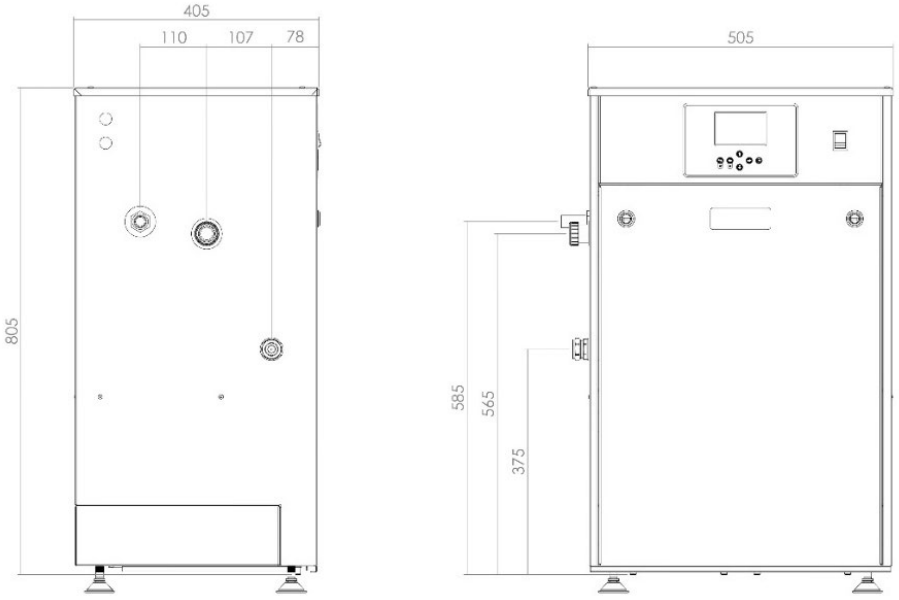


Fig 2.1 General Assembly Drawing (dimensions in mm)

2.2.5 EXPANSION, CONTROL and HYDRAULIC ACCUMULATOR VESSELS

All vessels must be securely mounted to prevent any movement from imposing strain on the attached pipework. Vessels of 60 litres capacity or greater MUST be mounted vertically on the integral legs with water connection lowermost.

Set up the vessel so the air charge filling valve and the diaphragm are accessible for future maintenance. All vessels must have isolating and drain off valves fitted to enable them to be serviced. The connecting pipework should be removable to give access for replacing the diaphragm and should be the same size as the vessel connection to minimise friction losses. Note: if using a flexible hose it must be suitable for the temperature of the system.

Fig 2.3a & b Isolation valve on system pipework & Drain cock on vessel.

Set the air cushion pre-charge pressure (see section 3.4 Maintenance Procedure for details) to the correct level, dependent on the application required for the vessel. Refer to the Operating parameters at the back of this manual or SBS for advice.

Caution: If the air cushion pre-charge pressure required exceeds 4.0 Bar then you must follow the procedure shown in section 3.4 to avoid damaging/rupture of the internal diaphragm and consequences of. E.g. High and/or low pressure problems, unstable pump operation.

2.2.6 ELECTRICAL

2.2.6.1 READ GENERAL SAFETY INFORMATION 1, WARNINGS 1.1 and CAUTIONS 1.2, 1.3 & 1.4

2.2.6.2 All wiring must comply with the latest edition of local wiring Regulations.

2.2.6.3 Always wear anti-static wrist strap to avoid static discharge causing problems with the built in electronic program.

2.2.6.4 Connect incoming electrical mains supply to identified terminals in panel (see fig. 2.4) using spade and ring terminals provided. Ensure voltages and frequency indicated on the motor nameplates and wiring diagrams correspond with supply mains data and that the supply fuse ratings are correct for the total current rating of the equipment.

2.2.6.5 Make any BMS connections to terminals as shown in fig 2.4 inside control panel. The assignment of relays to alarms can be chosen in the parameter menu.

2.2.6.6 Complete any required earth bonding.

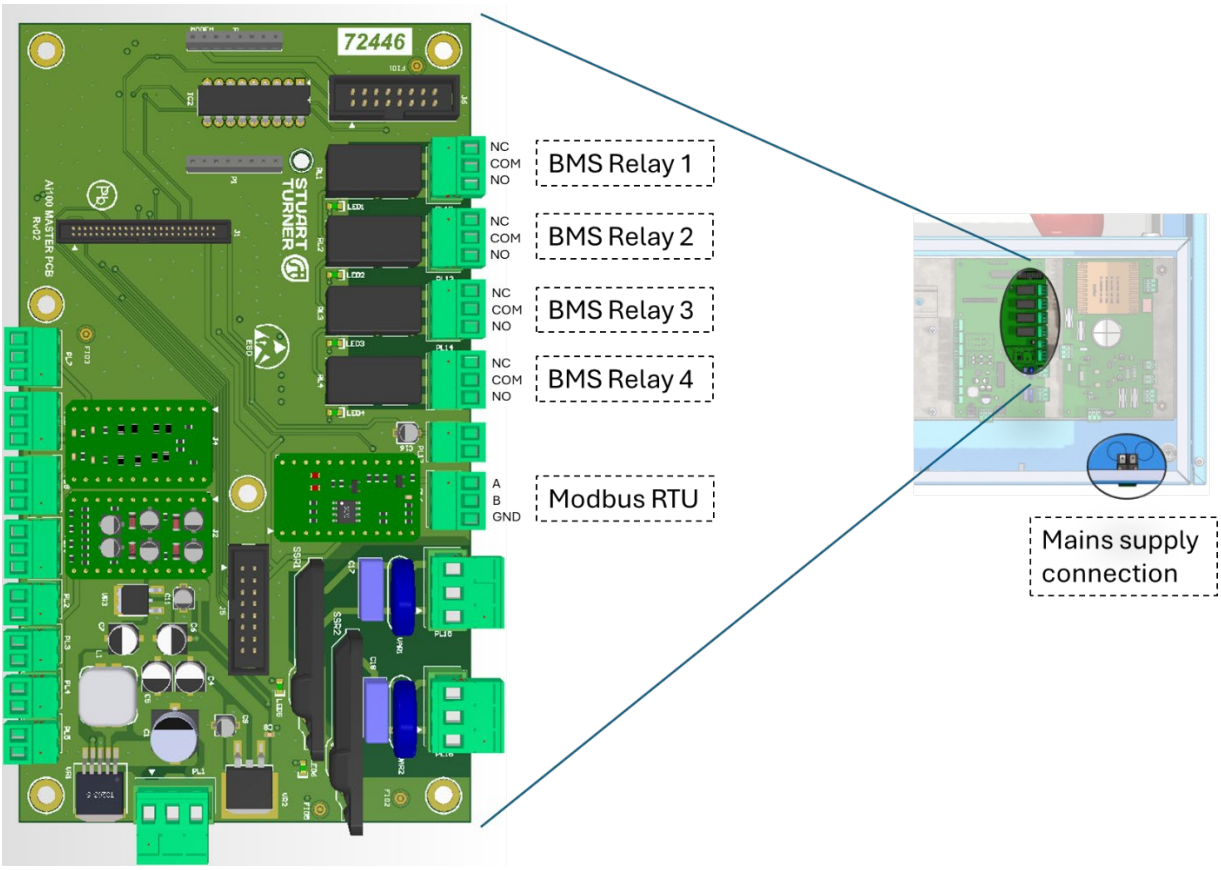


Fig 2.4 Electrical connections for Maxi AP units

3 USER INSTRUCTIONS

3.1 COMMISSIONING

Therefore, we strongly recommend **the equipment is commissioned by our authorised agent** who will prepare the equipment, make any necessary adjustments and leave the equipment in operational order.

Prior to requesting an engineer to attend the site for commissioning, the client must ensure that;

i. The equipment has been correctly installed;
ii. A written scheme of examination has been obtained where required under the Pressure Systems Safety Regulations
iii. An adequate water supply and permanent electricity supply are available.
iv. The equipment and pipework in the building being served by the pressurisation unit is capable of accepting the generated pressures.

If self-commissioning this unit, ensure that the pump pressure is set within the operating range of the pumps (see 3.1 Pump Performance). The pump pressure should not be set within 0.5 bar of the pump closed valve pressure.

The pre-charge of connected hydraulic accumulators should be set the same as the pump duty pressure (see section 4.3.1 – Expansion vessels).

Remove 'Commissioning Needed' Warning

Refer to section 3.3 and 3.3.3 for access to the 'Status Screen' On the status screen select 'Last service Date' and enter the date the unit was commissioned.

3.2 Pump Performance

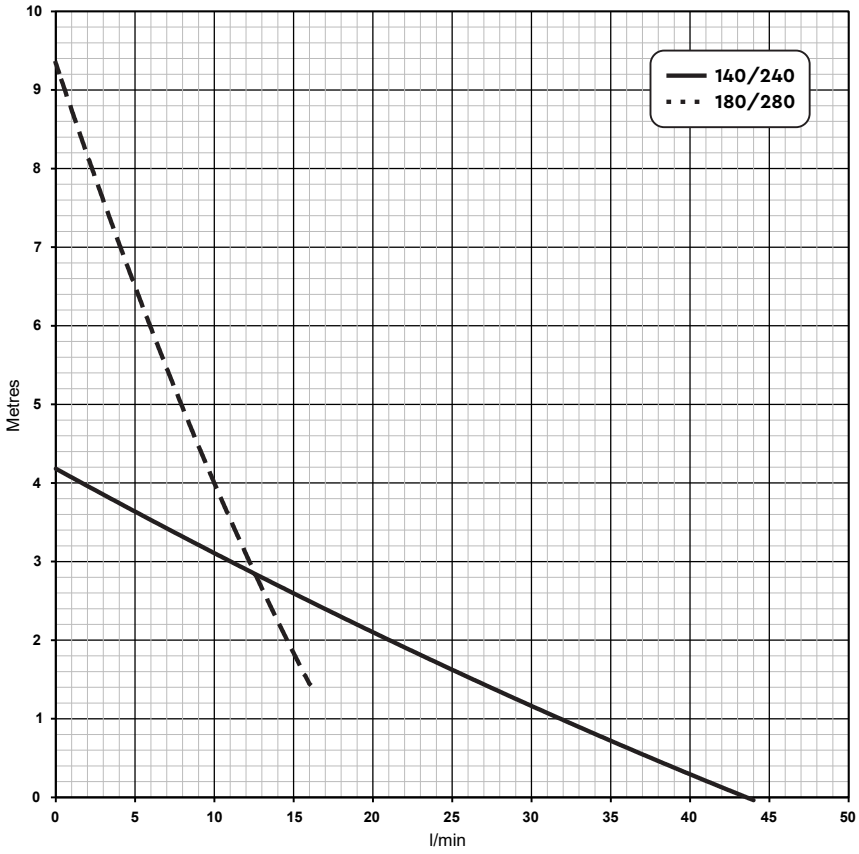


Fig 3.1 Pump Performance Curve

3.3 OPERATING INSTRUCTIONS

In normal operation, the **Main Screen** will show the system status as "PRESSURE CORRECT," along with the current system pressure in Bar, and the status of Pump 1 (P1) and Pump 2 (P2) as "AUTO" (for Maxi AP 240/Maxi AP 280 models) (see Fig 3.2).

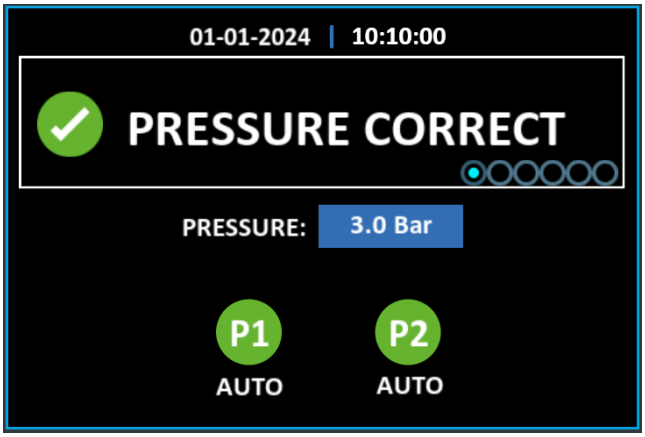


Fig 3.2: Main Screen

The various components of the **Main Screen,** such as the real-time clock, dynamic message window, page swipe, system pressure and status of pumps, are shown below (see Fig 3.3):

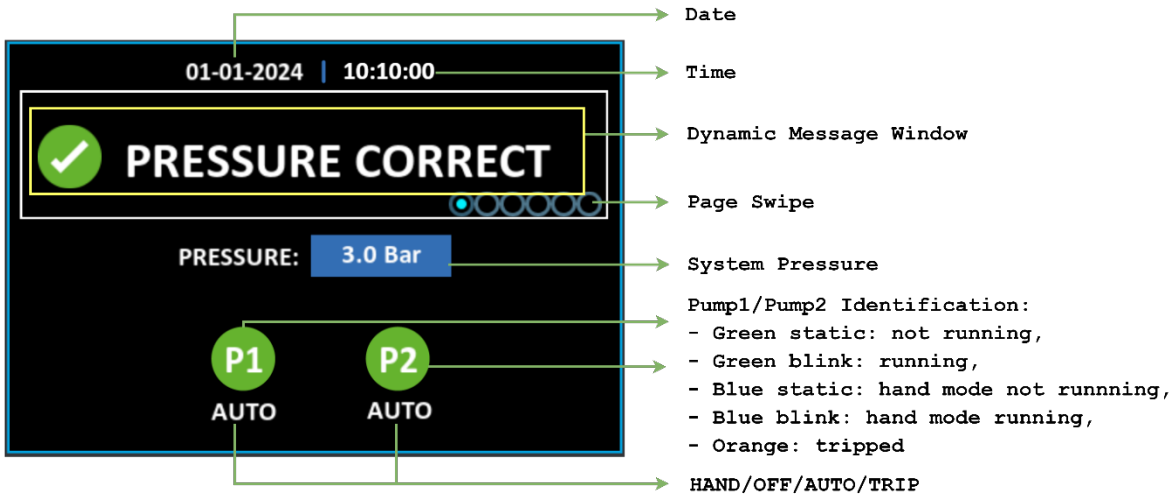


Fig 3.3: Components of Main Screen

3.3.1 Button Descriptions

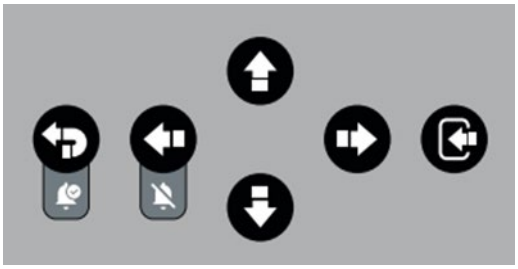


Fig 3.4: Hardware Buttons on the fascia

The unit has a total of 6 push buttons for configuring and viewing system parameters (see Fig 3.4).

- **Back/Clear Alarms Button:**
  - This button serves two functions:
    - **Back:** Press this button to return to the previous screen or menu.
    - **Clear Alarms:** When held down during active alarms, this button clears alarms from the dynamic message window for 30 seconds. The alarms will remain in a cleared state for 30 seconds, and if the alarm persists, they will reappear.

- **Mute/Left Arrow Button:**
  - This button serves two functions:
    - **Mute:** Press and hold this button to mute the alarm buzzer.
    - **Left Arrow:** Press to navigate left through the menus or screens.

- **Up Arrow Button:**
  - Use this button to move up through menu options or settings on the screen.

- **Down Arrow Button:**
  - Use this button to move down through menu options or settings on the screen.

- **Right Arrow Button:**
  - Press this button to move right through menu options or screens.

- **Enter Button:**
  - Press this button to select or confirm highlighted options or settings on the screen.

3.3.2 Setting and Viewing System Parameters

- Press and hold the 'ENTER'  button for 3 seconds to open the Menu Screen. The first row will be highlighted in **blue**, indicating that the cursor is on the first row (see Fig 3.5).

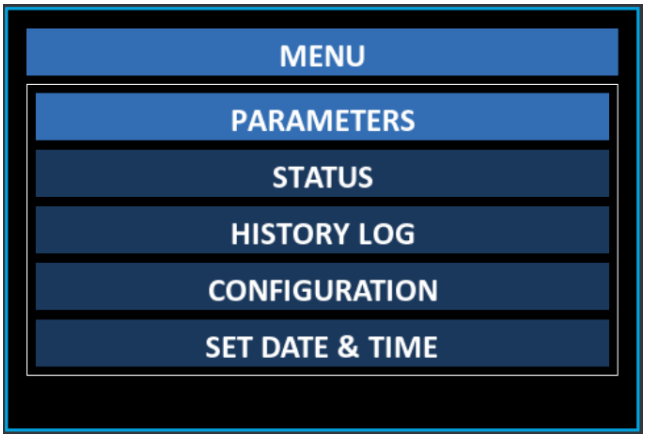


Fig 3.5: Menu Screen

- Use the 'UP'  and 'DOWN'  arrow buttons to navigate through the options in the menu.
- **The Parameters** On the 'PARAMETERS' tab, press the 'ENTER'  button to access the 'PARAMETERS MENU' screen, where system parameters can be set/viewed (see fig 3.6).

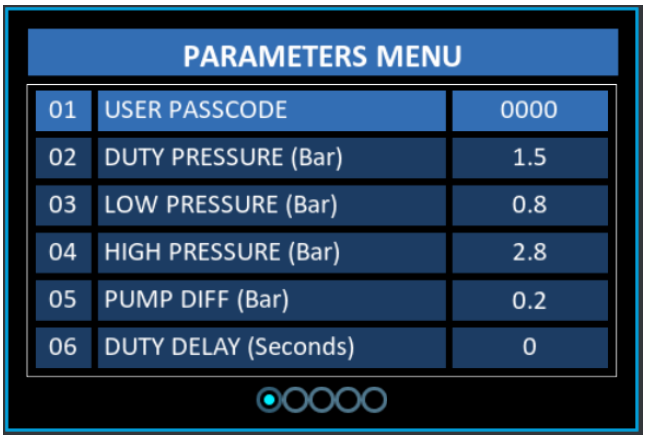


Fig 3.6: Parameters Menu

- Parameters such as Duty Pressure, Low Pressure, High Pressure, Pump Differential, Duty Delay, support delay, high pressure/low-pressure lockout, high pressure/low-pressure lockout delay, user passcode, MODBUS parameters, and BMS alarms can be configured here.
- Upon entering the 'PARAMETERS MENU' screen, the first row will be highlighted in **blue**, indicating that the cursor is on the first row and the parameter is ready to be edited (if needed).
- To change the duty pressure, use the 'DOWN' arrow button to navigate to 'DUTY PRESSURE' and press the 'ENTER' button to enter **Edit mode**, changing the row's colour to black, which confirms that editing is enabled. Adjust the selected parameter using the 'UP' and 'DOWN' arrow buttons (see Fig 3.7).

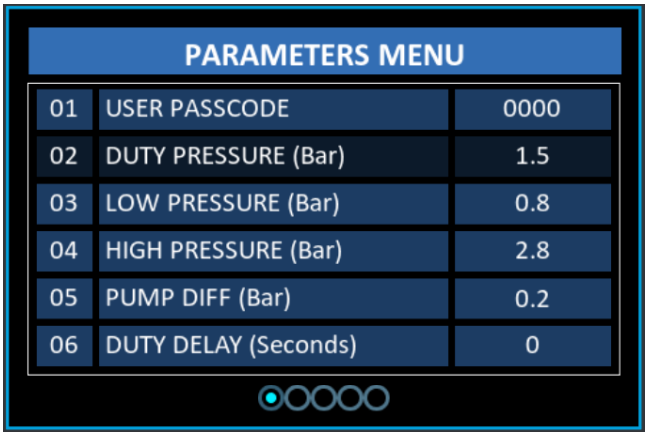


Fig 3.7: Duty pressure edit mode

- Press the 'ENTER' button again to confirm the change. The row will turn back to **blue**, indicating that the new value has been set (see Fig 3.8).
- Use the 'UP' and 'DOWN' arrow buttons to scroll through the list and the 'RIGHT' and 'LEFT' arrow buttons to swipe across the pages to edit other parameters, if needed (see Fig 3.9).

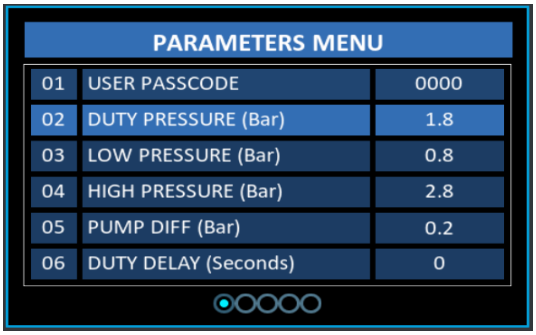


Fig 3.8: Edited Duty pressure

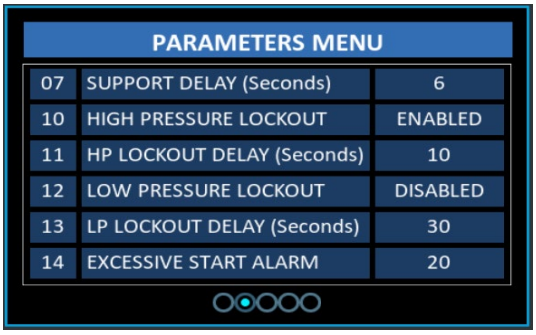


Fig 3.9: Swiping across the Parameters

- After making changes, press the 'BACK' button to save them.
- A confirmation window will appear with the options 'Yes', 'No', and 'Cancel,' with the cursor initially highlighted on 'Yes' (see Fig 3.10).

Fig 3.10: Parameters Menu Save

3.11: Parameters Menu Save confirmation

- Use the 'RIGHT' and 'LEFT' arrow buttons to navigate between the 'Yes', 'No' and 'Cancel'. Press the 'ENTER' button to confirm your selection (see Fig 3.11).

3.3.3 Viewing System Status

- **The Status Screen**—On the 'STATUS' tab, press the 'ENTER' button to view real-time system parameters, including the total runtime for Pump 1 and Pump 2, the total system on time, the last service date and the software version. (see Fig 3.12)

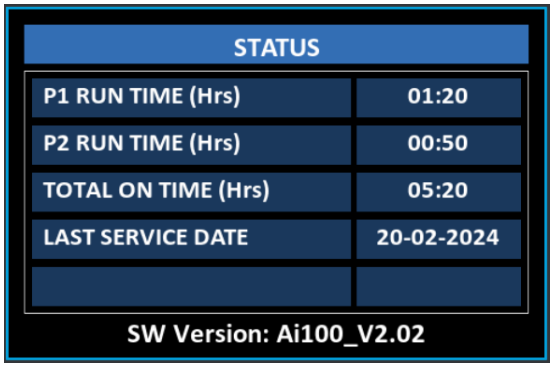


Fig 3.12: Status Screen

- On the 'STATUS' screen, press and hold the 'DOWN' arrow button for 3 seconds to highlight the first row (see Fig 3.13).

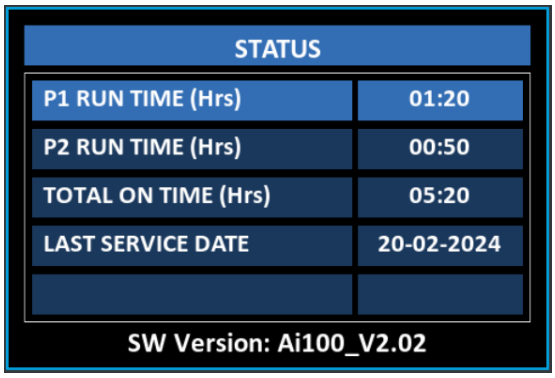


Fig 3.13: Removing Commissioning Needed Alarm

- Scroll to the 'LAST SERVICE DATE' row, press the 'ENTER' button and enter the date the unit was commissioned (see Fig 3.14).

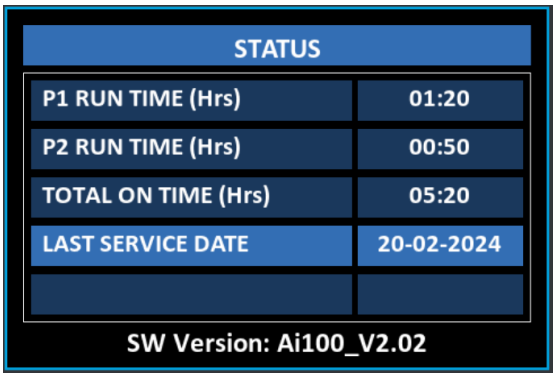


Fig 3.14: Resetting Last Service Date

- Press the 'BACK' button to return to the 'MENU' screen.

3.3.4 Accessing and Navigating the History Log

- The History Log screen is an intelligent logging system that stores all the alarms, system parameters, and changes made by the user in memory with time and date. It is helpful to refer back to these logs if any fault occurs.

- **The History Log Screen**—On the 'HISTORY LOG' tab, press the 'ENTER' button to view system logs and alarms in real-time, arranged in chronological order with the most recent entries displayed first (see Fig 3.15).

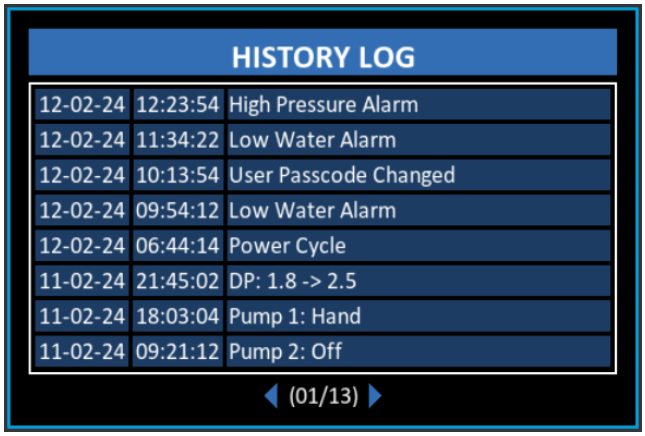


Fig 3.15: History Log

- Use the 'RIGHT' and 'LEFT' arrow buttons to swipe across the pages of historical logs. The unit can display up to the last 100 logs with timestamps.

3.3.5 Setting/Changing System Date and Time

- The Set Date & Time screen allows for updating the unit's date and time, particularly when British clocks move forward by 1 hour in the summer and back by 1 hour in the winter. The unit is pre-configured to UK time.

- **The Set Date & Time Screen**—On the 'SET DATE & TIME' tab, press the 'ENTER' button to set the date (see Fig 3.16).

Fig 3.16: Setting Date

- Use the 'UP' and 'DOWN' arrow buttons to change the date.

- Use the 'RIGHT' and 'LEFT' arrow buttons to navigate between the date, month and year.

- Once a new date is set, pressing the 'ENTER' button will move to the 'SET TIME' screen, where time can be updated (see Fig 3.17). Pressing the 'BACK' button will move to the date change screen, and pressing the 'ENTER' button will save the new time.

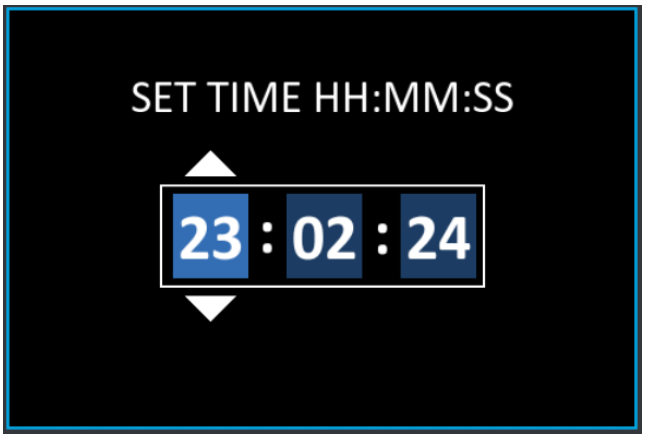


Fig 3.17: Setting Time

3.3.6 Changing Pump Modes (HAND/OFF/AUTO)

- On the 'MAIN SCREEN', press and hold the 'DOWN' arrow button for 3 seconds to activate the cursor, highlighting Pump 1 (P1) with a square box (see Fig 3.18).

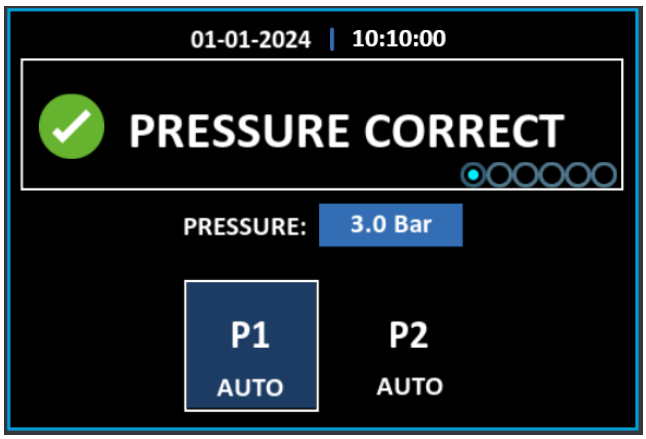


Fig 3.18: Pump 1 Edit Mode

- Use the 'RIGHT' and 'LEFT' arrow buttons to toggle between Pump 1 (P1) and Pump 2 (P2) (see Fig 3.19).

- Press the 'ENTER' button when the desired pump (P1 or P2) is highlighted to select it.

- Once selected, the square box around the pump will display three mode options: 'HAND,' 'OFF,' and 'AUTO,' with the cursor initially highlighting 'HAND' (see Fig 3.20).

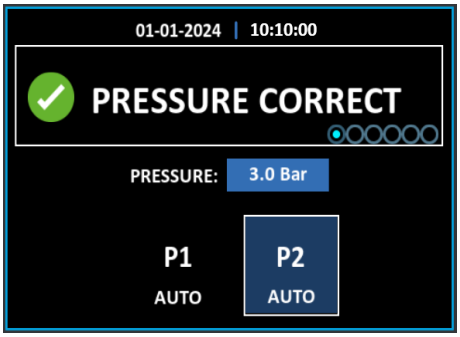


Fig 3.19: Pump 2 Edit Mode

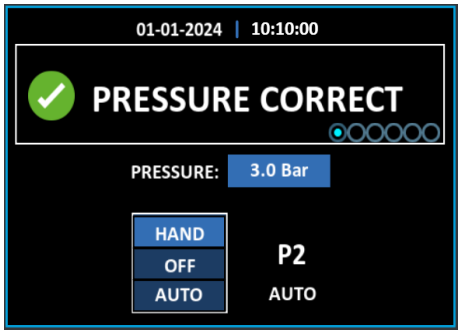


Fig 3.20: Pump 1 Mode Selection

- Use the 'UP'  and 'DOWN'  arrow buttons to navigate between 'HAND', 'OFF' and 'AUTO' (see Fig 3.21).

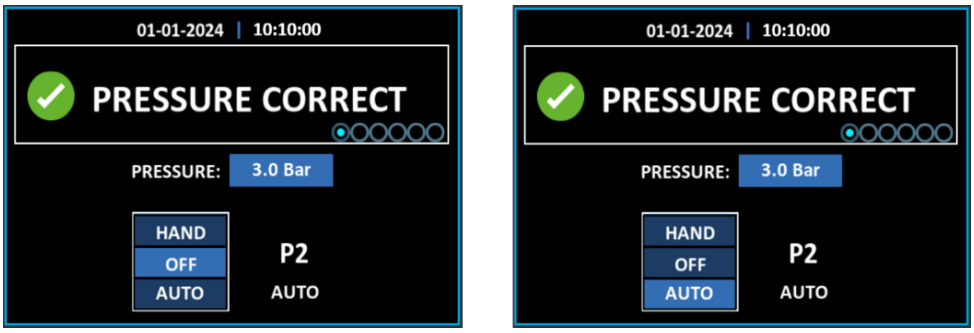


Fig 3.21: Pump 1 Mode Selections (Hand, Off, Auto)

- Press the 'ENTER'  button to confirm your selection (see Fig 3.22).

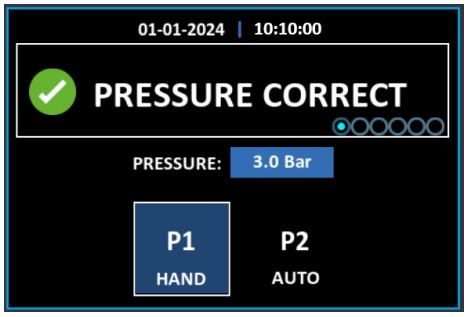


Fig 3.22: Pump 1 Mode Selection as Hand

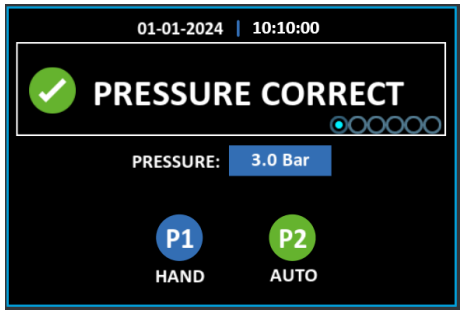


Fig 3.23: Pump 1 running in Hand

- After making your selection, press the 'BACK'  button to return to the 'MAIN SCREEN' (see Fig 3.23).

3.3.7 Pump Mode Indicators and Animations

- The 'MAIN SCREEN' displays different animations to indicate the selected and running pump modes.
- When a pump is set to 'HAND' mode, a static **blue** circle will appear around P1 or P2 to indicate that the pump is configured as 'HAND' mode.
- If the pump runs in 'HAND' mode, the **blue** circle will begin blinking, signalling that the pump is active.
- Similarly, when either of the pumps is selected to 'AUTO' mode, a static **green** circle will appear around it.

- When the pump is running in 'AUTO' mode, the **green** circle blinks to indicate that it is operational.
- In 'OFF' mode, no circle will be displayed around the pump.
- If the pump trips, an **orange** circle will appear around it to signal the fault.

3.3.8 Monitoring Real-time System Alarms

- Real-time system alarms are displayed on the 'MAIN SCREEN' within the dynamic message window.
- The following seven alarms can be displayed as they occur: 'LOW PRESSURE', 'HIGH PRESSURE', 'LOW WATER', 'HIGH WATER', 'SYSTEM LEAK', 'PUMP TRIP' and 'TRANSDUCER FAIL' (see Fig 3.24).
- When an alarm is triggered, a warning symbol ⚠ will appear next to the corresponding alarm message.
- During the system operation, if High-Pressure Lockout or Low-Pressure Lockout is enabled from the parameters screen, and either of these two gets active, it will completely lockout the unit from running and will display 'HIGH PRESSURE LOCKOUT! CYCLE POWER' or 'LOW PRESSURE LOCKOUT! CYCLE POWER' on the dynamic message window (see Fig 3.25).

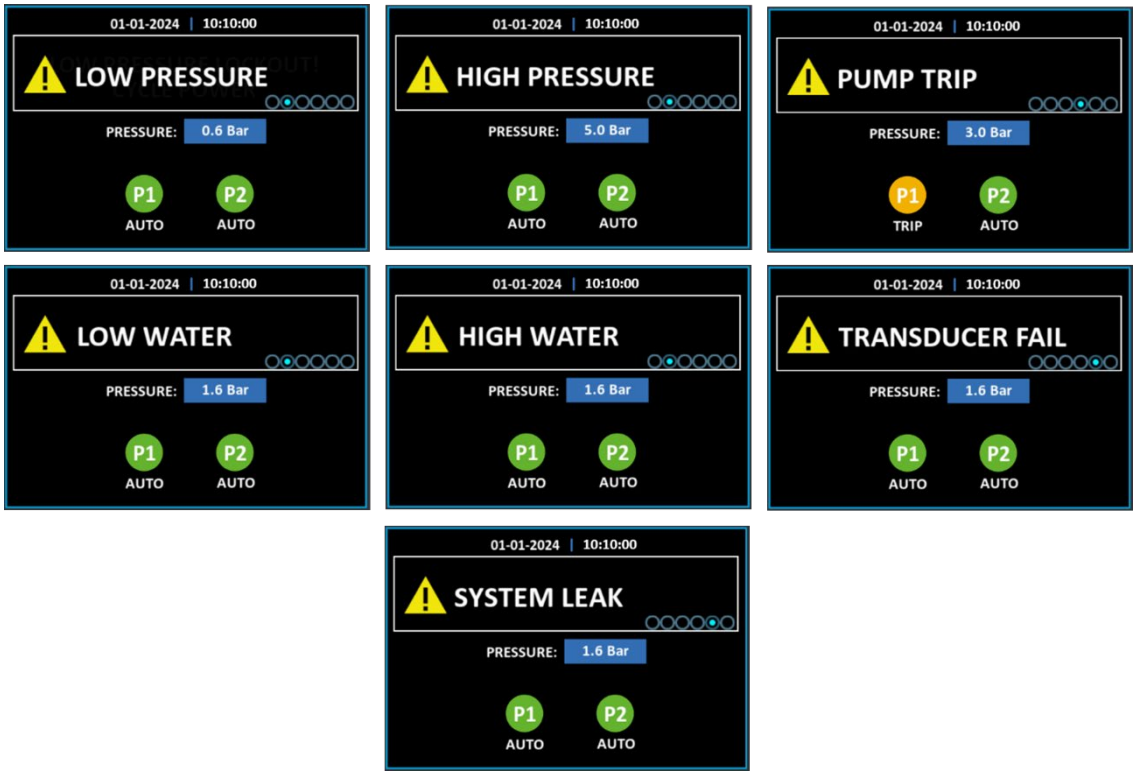


Fig 3.24: Various Alarms on Main Screen

Fig 3.25: High Pressure & Low-Pressure Lockout Alarms

- Only option to reset 'HIGH PRESSURE LOCKOUT! CYCLE POWER' or 'LOW-PRESSURE LOCKOUT! CYCLE POWER' is to cycle the main power of the unit.

- If no alarms are present, the dynamic message window will display a green checkmark alongside the 'PRESSURE CORRECT' message. When the pumps are in AUTO and topping up; 'SYSTEM FILLING' will be displayed.

3.3.9 Muting/Clearing Real-time System Alarms

- Real-time system alarms displayed on the 'MAIN SCREEN' within the dynamic message window can be muted or cleared during commissioning or repair. These actions should only be performed by a qualified service engineer.
- To mute an alarm, press and hold the 'LEFT' button until the buzzer stops sounding.
- To clear an alarm from the dynamic message window, press and hold the 'BACK' button until the alarms are cleared. **Note:** The alarms will remain in a cleared state for 30 seconds, and if the alarm persists, they will reappear.

3.3.10 Service Due Alarm

- The Maxi-AP unit is configured to indicate when it requires servicing by displaying the 'SERVICE DUE CONTACT SUPPORT' alarm on the dynamic message window (see Fig 3.26). This alarm is activated every six months after the Maxi-AP has been commissioned.

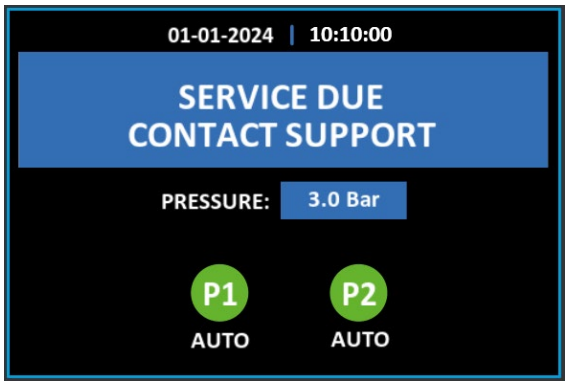


Fig 3.26: Service Due Alarm

3.3.11 Commissioning Needed (if applicable)

- The Maxi-AP unit is designed to display the 'COMMISSIONING NEEDED, CONTACT SUPPORT' alarm (if this option is enabled from the factory). This indicates that the Maxi-AP unit requires commissioning by an authorised service engineer. In such cases, please contact our support team for assistance (see Fig 3.27).

Fig 3.27: Commissioning Needed Alarm

3.3.12 System Alarms

***** Alarm *****	Cause	Check
High Pressure	High pressure alarm threshold has been reached.	Pressure vessel air charge incorrect? Insufficient expansion capacity? Pump(s) left in Hand?
Low Pressure	Low pressure alarm threshold has been reached.	Pressure vessel air charge incorrect? Water usage exceeds design capacity? Pump(s) switched Off or Tripped? Pump(s) Airlocked?
Transducer Fail	Pressure sensor output normal range or pressure sensor not connected correctly.	Pressure sensor failed? Pressure sensor wiring loose?
Pump Trip	No power is passing through pump fuse – suspect blown. Affected pump shown in yellow.	Check or Replace fuse. Pump seized? Motor failed?
Low Water	Water level below supply tank low water alarm probe.	Break tank float valve stuck closed? Mains water interruption to break tank? Output of units exceeds mains water supply into break tank?
High Water	Water level above supply tank high water alarm probe	Break tank float valve wrongly adjusted, stuck open or letting by? Non return valve failed?
System Leak	Either: The 'Excessive Starts' or 'Excessive Run Time' parameter has been exceeded.	Check history log to confirm which parameter has been exceeded. Resolve system leak or adjust parameters to reduce sensitivity.

3.3.13 Instructions for Configuring MODBUS-RTU on Maxi-AP

This section provides step-by-step instructions for connecting a MODBUS Master device to a Maxi-AP, which operates as a MODBUS Slave. The guide includes details on communication settings, register mapping, and procedures to read controller parameters.

3.3.13.1 Introduction

The Maxi-AP is equipped with a MODBUS-RTU interface that allows seamless integration with MODBUS Master devices. This manual provides all the necessary information to configure and use the MODBUS-RTU interface for monitoring and data acquisition.

3.3.13.2 Communication Settings

To establish a successful connection between the MODBUS Master and the Maxi-AP (MODBUS Slave), ensure the following communication settings are correctly configured:

- **Slave Device ID:** 1–247 (Configurable)
- **Baud Rates Supported:** 9600
- **Data Bits:** 8
- **Parity:** None
- **Stop Bits:** 1
- **Protocol:** MODBUS-RTU

3.3.13.3 MODBUS Register Mapping

The Maxi-AP controller uses specific MODBUS registers for data representation. Below are the details of Input Registers and Discrete Inputs available for reading the unit's parameters.

Input Registers (Function Code 04)

Parameter	Register Type	Access	Register Address	Size	Function Code	Description
Pressure Value	Input Register	Read Only	30001–30002	32-bit Float	04	Current pressure value
P1 Run Time	Input Register	Read Only	30020–30021	32-bit Integer	04	Pump 1 total run time (in hours)
P2 Run Time	Input Register	Read Only	30022–30023	32-bit Integer	04	Pump 2 total run time (in hours)
System Run Time	Input Register	Read Only	30024–30025	32-bit Integer	04	Total system run time (in hours)

Note: 32-bit values are stored in two consecutive 16-bit registers.

Discrete Inputs (Function Code 02)

Alarm Name	Register Type	Access	Address	Size	Function Code	Description
BMS Alarm 1	Discrete Input	Read Only	10004	1-bit	02	High Pressure Alarm
BMS Alarm 2	Discrete Input	Read Only	10005	1-bit	02	Low Pressure Alarm
BMS Alarm 3	Discrete Input	Read Only	10006	1-bit	02	Common Alarm
BMS Alarm 4	Discrete Input	Read Only	10007	1-bit	02	System Healthy Indicator
BMS Alarm 5	Discrete Input	Read Only	10008	1-bit	02	High Water Alarm

BMS Alarm 6	Discrete Input	Read Only	10009	1-bit	02	Low Water Alarm
BMS Alarm 7	Discrete Input	Read Only	10010	1-bit	02	Transducer Failure
BMS Alarm 8	Discrete Input	Read Only	10011	1-bit	02	Pump Failure

3.3.13.4 Step-by-Step Configuration Guide

Follow these steps to connect your MODBUS Master to the Maxi-AP and read data.

1. Setting Up the MODBUS Master

Configure Communication Parameters:

- **Slave Device ID:** Set to match the Maxi-AP 's ID (default is typically **42**, but confirm your specific setting).
- **Baud Rate:** Select the appropriate rate (default is typically **9600,** but confirm your specific setting).
- **Data Bits:** Set to **8**.
- **Parity:** Set to **None**.
- **Stop Bits:** Set to **1**.
- **Protocol:** Choose **MODBUS RTU**.

Software Configuration:

- Input the register addresses and specify data types according to the MODBUS Register Mapping section.
- Ensure your software uses Function Codes **02** and **04** for reading Discrete Inputs and Input Registers, respectively.

2. Connecting to the Pump Controller

Physical Connection:

- Use a shielded twisted pair cable suitable for RS-485 communication.
- Connect the MODBUS Master's RS-485 terminals to the Maxi-AP 's RS-485 terminals:
  - **A (-)** to **A (-)**
  - **B (+)** to **B (+)**
  - **Gnd** to **Gnd**
- Connect the shield to the ground on one side to prevent ground loops.

Termination Resistors:

- If the communication line is long or prone to interference, use termination resistors (typically 120 Ω) at both ends of the RS-485 network.

3. Reading Input Registers

Pressure Value:

- **Register Addresses:** 30001–30002
- **Function Code:** 04 (Read Input Registers)
- **Data Type:** 32-bit Float
- **Description:** Reads the current pressure value from the Maxi-AP.

Pump Run Times:

- **P1 Run Time:**
  - **Register Addresses:** 30020–30021
- **P2 Run Time:**
  - **Register Addresses:** 30022–30023

- **System Run Time:**
  - **Register Addresses:** 30024–30025
- **Function Code:** 04
- **Data Type:** 32-bit Integer
- **Description:** Reads the total run times for Pump 1, Pump 2, and the entire system.

Procedure:
- Initiate a MODBUS query using Function Code 04.
- Specify the starting register address and the number of registers to read.
- Collect and process the response from the Maxi-AP.
- Combine the two 16-bit registers to form the 32-bit value.
- For floating-point values, ensure your system interprets the combined registers as a 32-bit IEEE 754 float.

4. Reading Discrete Inputs (Alarms)

Alarms and Indicators:
- **Register Addresses:** 10004 to 10011
- **Function Code:** 02 (Read Discrete Inputs)
- **Data Type:** 1-bit
- **Description:** Reads the status of various alarms and system indicators.

Procedure:
- Initiate a MODBUS query using Function Code 02.
- Specify the starting address (e.g., 10004) and the number of inputs to read.
- Interpret each bit in the response as the status of a specific alarm:
  - **0:** Alarm inactive
  - **1:** Alarm active

5. Troubleshooting

No Response from Maxi-AP MODBUS:
- Verify the physical connections and ensure the RS-485 lines are correctly wired.
- Check that the communication settings (baud rate, parity, etc.) match on both devices.
- Ensure the Slave Device ID is correctly set.

Incorrect Data Values:
- Confirm that the correct function codes are being used.
- Make sure the register addresses and data types match the mapping provided.
- For 32-bit values, verify that the registers are combined in the correct order (big-endian or little-endian as per your MODBUS Master specification).

Communication Errors:
- Check for termination resistors if the network is long.
- Ensure there are no grounding issues causing interference.
- Use shielded cables and avoid running communication lines parallel to power cables.

3.3.13.5 Technical Support

If you encounter issues not covered in this manual, please contact our technical support on:

+44 (0) 116 222 7330

4 SERVICING

4.1 MAINTENANCE AND CARE OF YOUR EQUIPMENT

The SBS CORE equipment that is described in this instruction booklet has been manufactured and tested to the highest standards of design and quality. It will give trouble free operation over many years provided it is maintained regularly from when it is commissioned. To keep it operating efficiently in a safe, economical and environmentally friendly condition, regular maintenance is an essential part.

4.2 LEGAL REQUIREMENTS

Hydraulic Accumulators/Expansion Vessels installed as part of/in conjunction with this equipment, with Pressure x Volume above 250 Bar-litres, require formal inspection in accordance with a "Written Scheme of Examination". This is a Legal Requirement on the part of the Owner/User under the "Pressure Systems Safety Regulations" (PSSR). A "Written Scheme" and regular inspection can be provided by either AGM Pressurisation Services see details below.

AGM Pressurisation Services

Plant Servicing & Inspection
AGM PRESSURISATION SERVICES,
AGM House, London Rd, Copford, Colchester, Essex, CO6 1GT.
Ph: 01206 215151
10 Wheel Forge Way, Manchester. M17 1EH. Ph: 0161 226 4727

AGM provides maintenance and installation of all types of packaged water pumping equipment for building services. Its specialist fields are Pressure booster equipment and sealed systems for heating and chilled water distribution systems.

Regular servicing of any plant for essential services is vital because wear and tear are very gradual processes.

With preventative maintenance, the costs are small and benefits in reliability, safety and economy can be significant. AGM Pressurisation Services can provide a complete package of schemes for preventative maintenance on all CORE and other makes of equipment.

5 COMPONENT LIST

Any components within the CORE Maxi AP unit that may require replacing have been listed in this section with their respective part code. If any part needs replacing which is not listed here, please contact our technical department on +44 (0) 1785 218 206 for assistance.

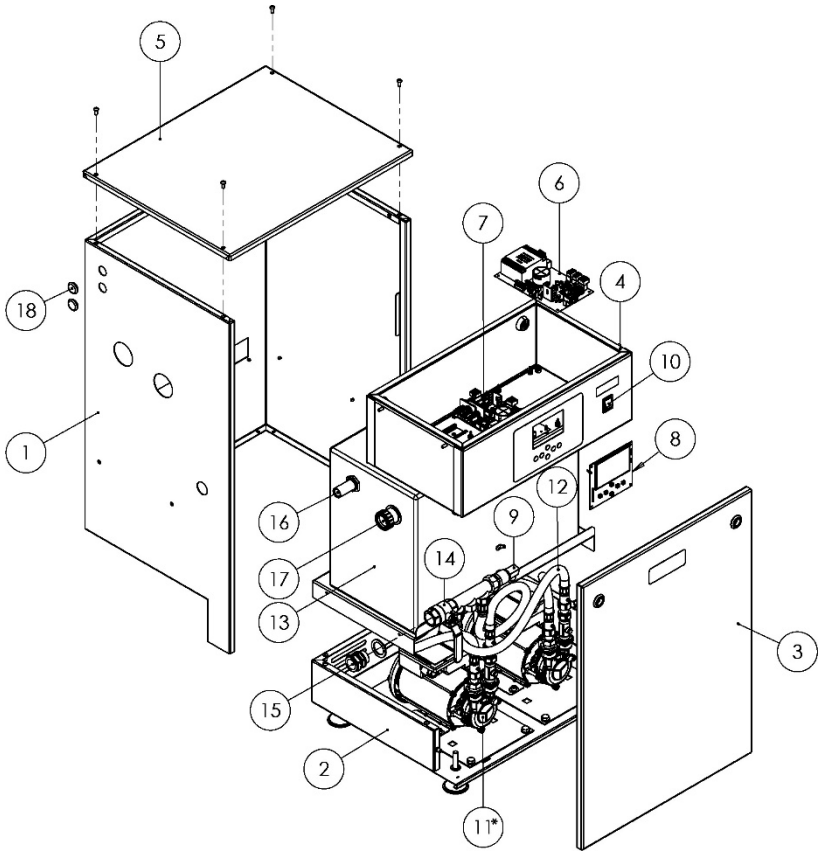


Fig 5.1 Component List

1.	MX1100007	Casing, Main Body
2.	MX1100008	Casing, Bottom Panel
3.	MX1100010	Casing, Front Panel
4.	MX1100009	Casing, Electrical Box
5.	MX1100012	Casing, Top Panel
6.	72451	Ai100 Power Board
7.	72446	Ai100 Master PCB
8.	72457	Ai100 Display PCB
9.	RNT-601000	Pressure Sensor, 0-10 Bar
10.	MX1100019	Rocker Switch
11.	MX1000038	Stuart Turner PH45TS (Maxi AP 140 & 240)
11.	MPP-21007C	Lowara PSAM70/C (Maxi AP 180 & 280)
12.	MX1100032	15mm Flexi Hose with Isolation Valve
13.	MX1100014	Maxi AP Tank
14.	MVN400008	Airaga Lever Ball Valve, 3/4In F
15.	PCX-612206	CU Com Union 22mmx 3/4In M
16.	MVB-000004	1/2In BSP Float Valve
17.	PJA-101923	Overflow Fitting, Universal 19/23mm
18.	SAG-202001	Grommet Rubber, 20mm Blind

6 TECHNICAL SPECIFICATIONS

Pressurisation Unit		CORE MAXI AP 140	CORE MAXI AP240	CORE MAXI AP 180	CORE MAXI AP 280
General	Warranty	2 years			
	Conformity Certification	UKCA			
Features	Mounting	Floor Mounted			
	Sealed sys Capacity	Up to 300,000 litres			
	Pump Control System	✓			
	Intelligent Control Interface	✓			
	Dry Run Protection	✓			
Material	Break Tank	Polyethylene			
	Casing	Powder Coated Steel			
Performance	Max. Cold fill pressure	3.9 bar (Flowrate 2.5l/min)		8.0 bar (Flowrate 2.5l/min)	
	Flowrate (Max/pump)	16.5l/min (at 1.5bar)			
	Flowrate(nominal/pump)	6l/min (at 6 bar)			
	Ambient air temp.	Min 4°C/Max 40°C			
	Relative humidity	95% non-condensing			
	Min/Max water temp.	Min 10°C/Max 23°C			
Water Tank	Usable water capacity	18 litres			
	Inlet valve and fill rate	Float Valve			
	Fluid Category	CAT 5 (type AB air gap with weir)			
Connections	Cold water Inlet	1/2" BSP M			
	System Outlet	22 mm compression			
	Overflow	20 mm			
Pump	Number of pumps	1	2	1	2
	Pump Mode	Duty	Duty/Assist	Duty	Duty/Assist
	Pump Type	Peripheral			
	Motor type	Induction, auto-reset thermal trip			
	Duty Rating	Continuous (S1)			
	Pump head and Impeller	Brass			
Electrical	Power Supply (V/Ph/Hz)	230 V AC/1/50Hz			
	Power consumption (Standby)	21 Watts	21 Watts	21 Watts	21 Watts
	Power consumption(filling)	620 Watts	1240 Watts	700 Watts	1400 Watts
	Current-Full Load	4.6 amp	7.2 amp	5.2 amp	8.4 amp
	Fuse Rating	5 amps	10 amps	10 amps	10 amps
	Alarm output	✓			
	Max load BMS relays	5 amps			
Physical	Enclosure protection	IP55			
	Width	505 mm			
	Depth	405 mm			
	Height (not including feet)	805 mm			
	Net weight	38 Kg	45 Kg	42 Kg	54 Kg

7 MAINTENANCE INSTRUCTIONS

7.1 PROCEDURE

Pump Lubrication
The pumps require no lubrication, as the pumps are self-lubricating.

History Log
Enter the history log and record any entries since the last service. Refer to the alarm definitions table 3.3.9 for potential causes and rectification.

Expansion Vessels

Air Charge Pressure. The correct charge pressure provides reliable operation of the system and a prolonged lifetime of the diaphragm. This should be checked regularly. Caution: If the air cushion pre-charge pressure required exceeds 4.0 Bar then you must follow the procedure shown below to avoid damaging/rupture of the internal diaphragm and consequences of. E.g. High and/or low-pressure problems, unstable pump operation.

1. **To adjust air charge pressure < 4.0Bar**: isolate the vessel from the system and release pressure on water side by opening the drain cock disposing of the water-mix in the appropriate manner. The water inside the bladder will be pushed back by the air charge pressure. Remove cap on the filling valve, set air charge pressure refilling using dry air or nitrogen. Screw cap firmly on filling valve. Close the drain cock and slowly open water connection to the system.
2. **To adjust air charge pressure > 4.0Bar**: If vessel is already in use then isolate hydraulically, reduce the air charge to 4.0Bar then evacuate the water side of the vessel followed by evacuation of the air side. With the vessel empty of water and air, set the air charge pressure (using dry air or nitrogen) to 4.0Bar, bring the water side pressure up to 5.0Bar and close isolating valve, then add more air until the air side pressure is equal to the required pre-charge pressure multiplied by 1.2 e.g. for a pre-charge pressure of 6.0Bar after filling vessel with air to 4.0Bar followed by water to 5.0Bar, fill the air side to 6.0 x 1.2 = 7.2Bar. Screw cap firmly on filling valve and slowly open isolating valve & water connection to the system.

LEAVE EQUIPMENT WITH ALL PUMPS IN 'AUTO'
THE MAINS SUPPLY SWITCHED ON AND THE SYSTEM CONNECTION OPEN.

Update last service date
Refer to section 3.3 and 3.3.3 for access to the 'Status Screen' On the status screen select 'Last service Date' and enter the date the unit was serviced. This will reset the service reminder.

8 DISPOSAL

Disposal of this product or parts of it must be carried out in accordance with the following guidelines:

- Use the local public or private recycling/waste collection service.
- In case such a recycling/waste collection service does not exist or cannot handle the materials used in this product, please deliver the product or any hazardous material from it to your nearest Stuart Turner Group office.

DECLARATION OF CONFORMITY

Supply of Machinery Regulation - 2008
EN ISO 12100:2010, EN 809:1998+A1:2009/ AC:2010

Electrical Equipment Regulation – 2006
EN 60335-1:2012/A2:2019, EN 60335-2-41:2003/A2:2010

EMC Regulation – 2016
EN 55014-1:2017/a11:2020, EN 55014-2:2015, EN61000-3-2:2014, EN 61000-3-3:2013

EMF Regulations – 2012
EN 62233:2008

RoHS Regulation – 2012
EN IEC 63000:2018

WEEE Directive-2013

IT IS HEREBY CERTIFIED THAT THE CORE PRESSURISATION UNITS:
SBS CORE MAXI AP 140, SBS CORE MAXI AP 240
SBS CORE MAXI AP 180, SBS CORE MAXI AP 280
COMPLY WITH THE ESSENTIAL REQUIREMENTS OF THE ABOVE STATUTORY REGULATIONS.

SMITH BROTHERS STORES LIMITED
UNIT V2 WINCHESTER AVENUE BLABY
LEICESTER, LE8 4GZ Website: www.sbscore.co.uk
Tel: +44 (0) 116 222 7330

RESPONSIBLE PERSON AND MANUFACTURER

SIGNED: .....

ANDREW RAINE, SUPPLY CHAIN DIRECTOR

Core values, quality products