

# MIKROFILL 3 PRO

**The full product breakdown for:**  
Installation, operation and maintenance



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## Specification

### Operating specification

Max inlet pressure	9 bar
Min inlet pressure	1.1 bar
Max cold-fill pressure	8.7 bar
Max operating pressure	9 bar
Max flow rate	12 l/min

### Dimensions

Height (to bottom of connections without hoses)	290 mm
Height (to bottom of tundish)	386 mm
Width	250 mm
Depth	155 mm
Weight (without hoses)	5.3 kg

### Electrical

Supply voltage	230 VAC/1/50 Hz
Fuse rating	3A
BMS relays (max load)	5A

### Operating (environmental) conditions

Ambient temperature range	5-45°C
Inlet water temperature range	5-23°C
System water temperature range	5-85°C
Maximum relative humidity	70% (non-condensing)
IP rating	55

### System control

Colour (backlit) LCD screen	Y
Pressure setting resolution = +/- 0.1 bar	Y
Low inlet pressure cut-out (0.3 bar)	Y
User password access	Y
HAND mode for manual operation	Y
Flood protection (run time limiter)	Y
On screen service reminder (user set)	Y
Customisable volt-free contacts	4
High/low pressure fault indication	Y
Leak detection	Y
Usage monitor, fill volume, logs and counters	Y
Smart fault logic for fault diagnosis	Y
Live flow readings +/- 3% accuracy	Y

### Installation and connection

Inlet	15 mm compression
System	15 mm compression
Drain	22 mm compression
Wall Attachment	Backplate supplied. Fixings not included
Clearance (left)	100 mm
Clearance (right)	170 mm
Clearance (top)	100 mm
Clearance (from front face with door closed)	750 mm

### Communication

MODBUS RTU	Y
BMS outputs	4

### Fluid protection

WRAS Category 4	Y
Kiwa Regulation 4	Y

### Warranty

Standard	2 years
With vessel packages	4 years

### Accessories

Braided hose with integrated isolation valve	2
Tundish	15 mm x 22 mm compression

### Service and repair

Live, in-situ testing	Y
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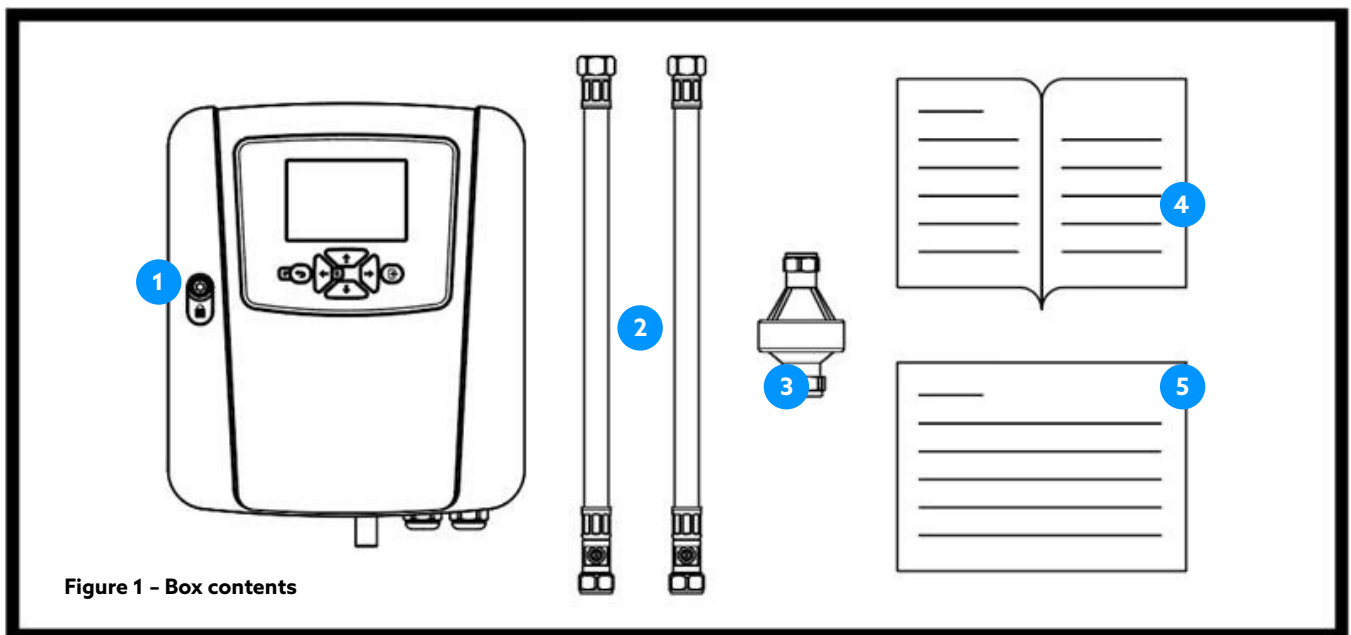


Figure 1 – Box contents

### Box contents

1. Mikrofill 3 PRO with backplate attached
2. 2x braided flexible isolation hoses
3. 1x tundish
4. 1x safety datasheet
5. 1x quick start guide sheet

The Mikrofill 3 PRO is a fully automatic sealed system filling device suitable for hot water management of domestic and commercial heating and cooling systems. It is intended to be installed in a plantroom environment with adequate drainage. **It is not suitable for installation outside, or in environments outside of the specified ambient temperature range (5-45°C). If temperatures are expected to regularly be below 15°C, consider heating or dehumidification to reduce risk of condensation.**

The unit is designed to be connected directly to the mains water supply or a boosted cold-water supply with a dynamic pressure range within 1 to 9 bar (inclusive) and can fill a system up to 0.3 bar below the inlet water pressure to the unit.

Its primary function is to compensate for up to intermittent losses of system pressure in heating and chilled water systems in commercial or industrial applications, up to 1% of total volume per 24 hours. These could include minor leaks, air venting, etc.

It is not designed to continuously fill the system in the event of a significant, sudden loss of system pressure due to major water loss. It can be used to re-fill the system from empty once a leak has been rectified. It is also not to be used for water boosting purposes.

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.

**These instructions are intended for the installer/user for setup and maintenance of this unit and must be kept with the equipment, for the life of the equipment and made available to all persons.**

## Safety information

**Please read this section carefully before commencing installation.**

The unit must only be installed/operated/maintained by a competent person; **a competent person is technically skilled, capable and familiar with safety practices and the hazards involved.**

This equipment automatically restarts after a power interruption.

Expansion vessels installed in conjunction with this equipment, with pressure x volume above 250 bar-litres, require a written scheme of examination provided by a competent person/company. 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 servicing section). AGM, part of the fluid water group, can provide a written scheme. For more information, **call 0333 577 5151.**

Failure to install/operate/maintain the equipment as recommended below could cause damage to the equipment and surrounding system and invalidate the unit's warranty.

We accept no responsibility or liability for any consequences or damage/losses due to incorrect installation, misapplication,

mishandling or misuse of the equipment.

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

The assembly of pressure equipment on site is the responsibility of the user (or his representative) not subject to the Pressure Equipment Directive 2014/68/EU; national legislation covering assembly on site will apply.

## Warnings

**Before continuing, read "Safety Information" page.**

1. Do not touch any live parts. With equipment isolator switch turned off, mains voltage may still be present from BMS system. Failure to observe this will constitute a severe electric shock and/or burn hazard and may be lethal
2. The equipment is only suitable for earth referenced supplies and must be permanently earthed to avoid electric shock hazard
3. Emergency stop button does not remove dangerous voltages from control panel/solenoid motor assemblies. This constitutes an electric shock hazard
4. Metal parts may reach temperatures of 90 degrees Celsius (°C) and will constitute a burns hazard
5. Some attached equipment can be designed to operate with liquid temperatures up to 85°C and will constitute a burns/scalding hazard
6. The equipment must not be pressurised beyond the maximum working pressure as stated on unit/pipework/vessels/ancillary equipment otherwise serious mechanical damage/destruction could occur causing injury to people or property
7. The equipment must not be heated/chilled beyond the maximum/minimum working temperature as stated on the technical specification otherwise serious mechanical damage/destruction could occur causing injury to people or property
8. Any damage to equipment, 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
9. Pressure vessels must never be disassembled whilst system is in operation. They contain high-pressure air/gas charge which could cause injury to people or property

10. This equipment contains fluid which may escape the system during servicing, repair or malfunction. Ensure any discharge will not damage the surroundings by taking appropriate actions e.g. Install in a place that will not be affected by leakage or a bunded area with suitable drainage
11. Following every fill procedure, the unit will discharge a small amount of water, establishing an air-break. This is part of the normal function of the unit. Mikrofill Systems Ltd does not accept responsibility for any damage caused by failure to connect the tundish to a suitable drain

## Installation/maintenance warnings

### Before continuing, read "Safety information" section.

1. Isolate power to the unit before accessing internal control enclosure
2. 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
3. The equipment is only suitable for earth referenced supplies and must be permanently earthed to avoid electric shock hazard. 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
4. Where the unit 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 equipment isolator off, mains voltage may still be present from BMS system. This constitutes an electric shock hazard
5. To prevent any risk of system over-pressurisation and resulting damage such as burst pressure vessels, a pressure reducing valve or similar pressure regulating device must be installed on the inlet that should allow no greater pressure to be fed to the unit than what the system can safely cope with
6. To prevent damage to the unit from over-pressurisation on the system side, a pressure relief valve or similar pressure regulating device must be fitted after the unit
7. Isolate the equipment before pressure testing system. Excess pressure could cause significant damage
8. 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
9. The owner/user of this equipment has a legal responsibility to ensure that attached pressure vessels are subject to regular formal inspections. See servicing section for details
10. 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 equipment and possible damage to equipment, pipework and system components from overheating and over-pressure
11. Where "expansion vessels" are used on LTHW heating system pressurisation units, the temperature of the fluid returning to the vessels should not exceed 70°C as this could damage the vessel diaphragm. Where the temperature exceeds 70°C, an intermediate cooling vessel or anti-gravity loop should be fitted
12. Ensure the wall to which the equipment is to be attached is sufficiently strong to carry the entire mass of the equipment including the water that it will contain under worst-case fault conditions. Failure to observe this could cause serious mechanical damage/destruction resulting in injury to people or damage to property
13. Protect against dirt, damage and frost. It is essential that no foreign matter such as pipe thread SWARF, welding slag, grit or stones is allowed to enter the equipment. Debris can cause severe damage to the mechanical seals, diaphragms and other internal components. Frost/freezing may damage pipework, manifolds and control panel components
14. The equipment is only suitable for installation in a clean, dust-free, indoor environment, with adequate protection from heat and frost, and sufficient ventilation. Ambient air temperature should be between 5 and 45°C, non-condensing. Operation outside of these conditions could seriously damage the equipment. If temperatures are expected to regularly be below 15°C, consider heating or dehumidification to reduce risk of condensation. Chemicals and other hazardous materials should also be stored sufficiently away from the unit to eliminate risk of damage
15. If the equipment were to be stored or taken out of service for a sustained period which would put it at risk of freezing, then we recommend draining the equipment of all water/liquid (with due regard to any local regulations) to prevent damage to components. When restarting is required, we recommend commissioning by our authorised service agent

16. Some parts such as solenoid coils may reach temperatures of around 70°C
17. 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
18. Do not operate this equipment prior to commissioning (see commissioning section). This could cause irreparable damage to equipment/pipework/system components
19. If chlorination of attached water supply 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
20. Do not use the pressurisation unit for dosing the system with chemicals. Anything other than clean, cold water could damage the pipework and components. Dosing pots should be fitted downstream from the unit

## Installation instructions

**Before continuing, read "Safety information" and "Installation/maintenance warnings" sections.**

Failure to install the equipment as recommended below could invalidate the warranty provided by Mikrofill to the purchaser.

The unit must be installed on a flat, vertical surface using the provided backplate.

## Clearances

**NOTE: ensure there is adequate clearance to accommodate unit with reasonable access to all parts.**

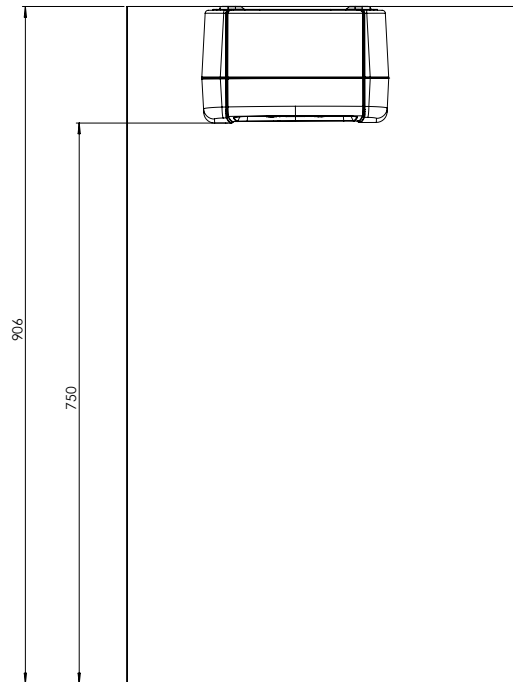
Min. clearance (left): 100 mm

Min. clearance (right): 170 mm

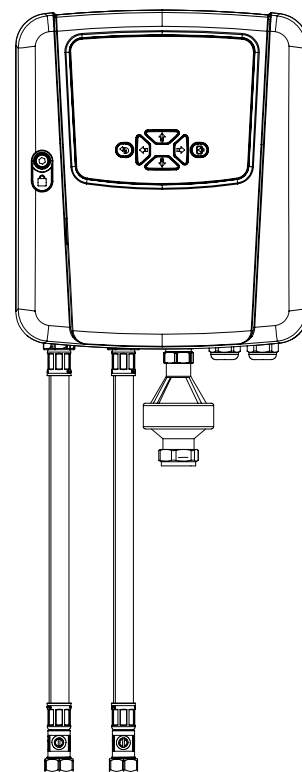
Min. clearance (top): 100 mm

Min. clearance (from front face with door closed): 750 mm

**Failure to comply with the provided installation instructions can cause damage not covered by warranty.**



**Figure 2 - front clearance (top view)**



**Figure 3 - right, left, top clearance (front view)**

## Installation steps

### 1. Remove parts from box

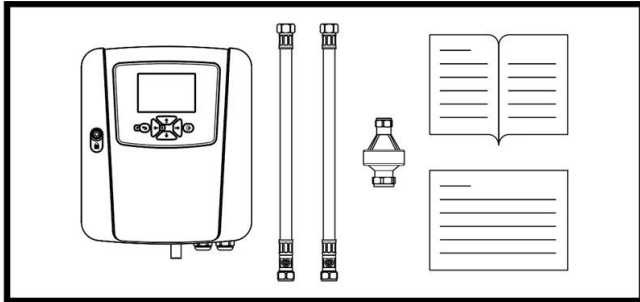


Figure 4 - Box contents

### 2. Removing the mounting plate

Unlock the front of the unit with a 5 mm hex key.

Unscrew both fixing screws inside the casing.

Remove the mounting plate from the back of the unit.

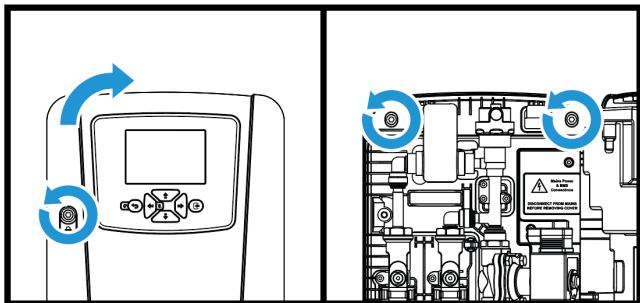


Figure 5 - M6 screw locations

### 3. Wall mounting

Fix the mounting plate to the wall using the mounting slots and suitable fasteners.

Attach the unit to the mounting plate by hanging it back onto the locating tabs.

Screw both fixing screws back into the casing.

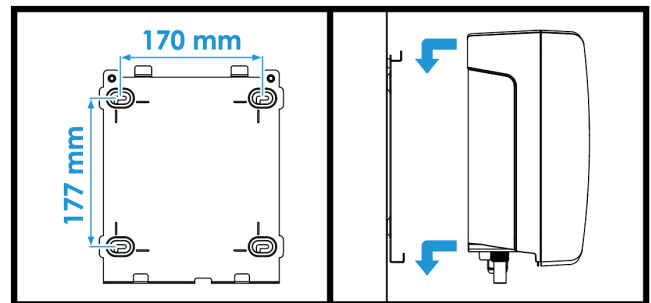


Figure 6 - Backplate slot arrangement

### 4. Water connections

Connect the 15 mm compression connections at the bottom of the flexible hoses to the inlet and system pipework and tighten to a recommended torque of 40 Nm. Ensure isolation valves are in closed position.

**NOTE: the pipework to the unit should be made in 15 mm copper or similarly approved plastic capable of withstanding the pressure requirements.**

Connect swivel nut of one flexible hose to the inlet (left) connection.

Connect swivel nut of the other flexible hose to the system (middle) connection. Tighten both swivel nuts to 25 Nm.

Fit the 15 mm compression end of the tundish to the 15 mm copper pipe protruding from the bottom of the unit. Adjust the plastic hose length adjacent to the copper pipe to be level with the top of the tundish airgap. Connect the bottom of the tundish to a suitable drain using 22 mm pipework.

**NOTE: following every fill procedure, the unit will discharge a small amount of water, establishing an air-break. This is part of the normal function of the unit.**

Mikrofill Systems Ltd does not accept responsibility for any damage caused by failure to connect the tundish to a suitable drain.

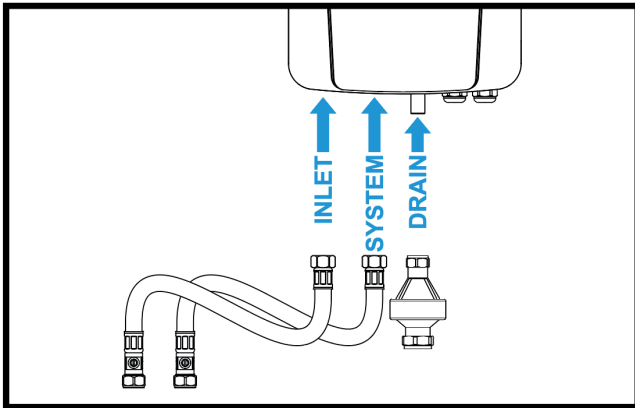


Figure 7 - Water connections

## 5. Electrical connections

Before continuing, read "Safety information" and "Installation/maintenance warnings" sections.

**NOTE: the base plate is removable to make access and cable routing into the electrical enclosure easier.**

All wiring must comply with the latest edition of local wiring regulations.

Complete any required earth bonding

Use an 5 mm hex key to open the unit

To remove the BMS cover, rotate the normally open solenoid valve to allow access to the electrical enclosure

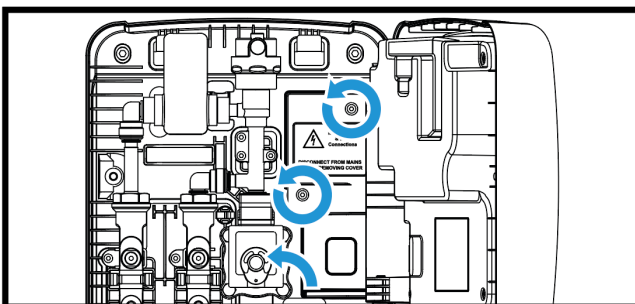


Figure 8 - BMS cover removal

Unscrew both retaining screws with a 3 mm hex key and lift away to reveal the WAGO mains supply connectors and BMS/MODBUS connections. Connect incoming electrical mains supply to WAGO connectors fitted to the rear case

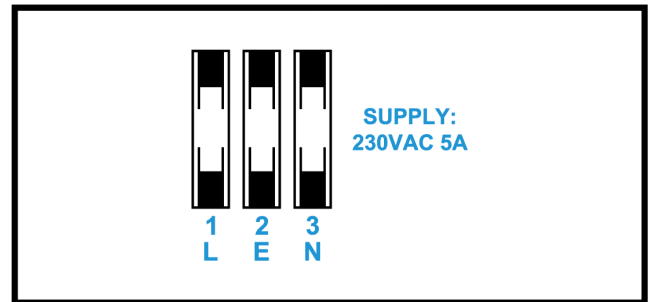


Figure 9 - Electrical connections

**NOTE: Ensure all mains voltage and fuse ratings are correct as specified in the Specification table and on the label attached to the side of the unit. The incoming mains supply must be fitted with a 3A fuse.**

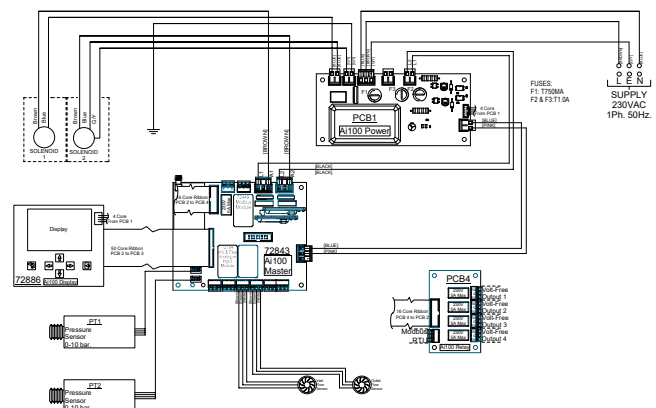
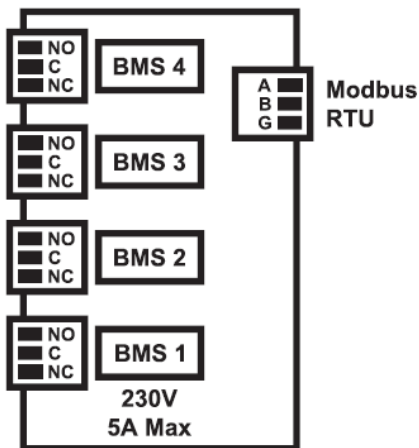


Figure 10 - Full electrical schematic of the unit

Make any BMS/MODBUS connections to terminals as shown in Figure 11 inside control panel



**Figure 11 - BMS/MODBUS connections**

The Mikrofill 3 PRO may come with 1 of 2 types of BMS connectors.

**1 - Spring cage 3 pin connector**



**Figure 12 - Spring cage 3-way connector**

To fit a wire into the spring cage connector, strip the wire, depress and hold the orange button to open the spring cage and push the stripped wire into the connector. Ferrules may improve ease of fitting however are not necessary. Ensure that the orange push button has fully returned before gently pulling the cable to check it is secure

**2 - Screw terminal 3-way connector**



**Figure 13 - Screw terminal 3-way connector**

To fit a wire into the screw terminal 3 way connector, un-tighten the screw on the connector to open the contacts, fit the wire, and re-tighten the screw to clamp the wire. Check the cable is secure prior to refitting the plug

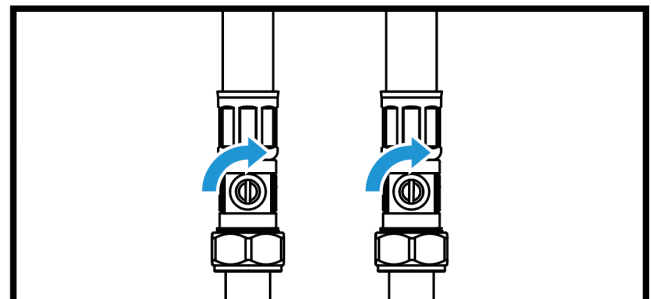
The assignment of relays to alarms can be chosen in the parameter menu. For further guidance on connecting to BMS and MODBUS, see communication settings section

Refit the electrical enclosure cover

**6. Opening the isolation valves**

Confirm the unit is connected electrically and mechanically

Open the inlet and system isolation valves



**Figure 14 - Opening isolation valves**

**NOTE: When the slot is in-line with the valve (as displayed above), the isolation valves are open. When the slot is perpendicular to the valve, the isolation valve is closed.**

### 7. Power on the unit and follow instructions in "Initial setup" section

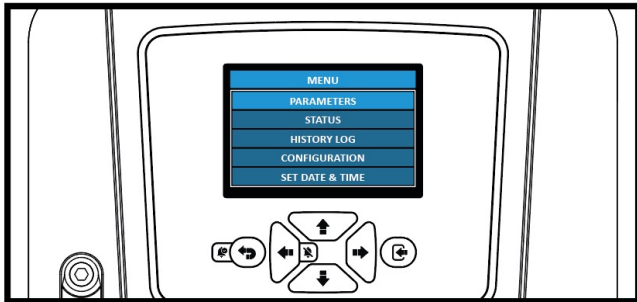


Figure 15 - Main menu screen

### 8. Remove the film cover on the screen.

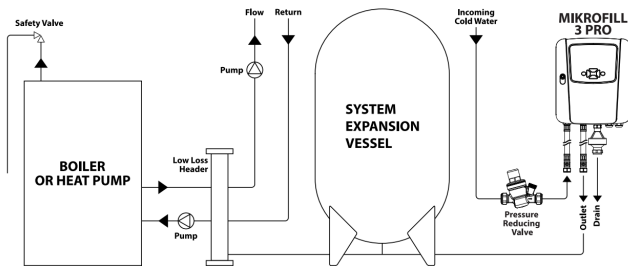


Figure 16 - Diagram showing a typical installation and ideal placing of expansion vessel

## Expansion vessel installation

Please contact our technical sales department on 03452 606020 if you require any assistance regarding vessel sizing.

The final connection into the system should be sized accordingly, recommendations are shown below:

- Vessel size up to 100L: 1/2" (15 mm) expansion pipework
- Vessel size up to 300L: 3/4" (22 mm) expansion pipework
- Vessel size up to 1000L: 1" (28 mm) expansion pipework

For vessel sizes more than 1000L capacity, please contact our technical department

Set the expansion vessel air/nitrogen charge to the same pressure as the cold-fill pressure of the system

**NOTE: If the installed height of the expansion vessel is different to that of the unit, then please contact our technical department who will advise on the air/nitrogen charge required.**

A suitably sized pressure relief/safety valve must be fitted to all sealed systems

## Notes for safe expansion vessel installation

- All vessels must be securely mounted to prevent any movement that will strain the attached pipework
- To prevent any risk of system over-pressurisation and resulting damage such as burst pressure vessels, a pressure reducing valve or similar pressure regulating device must be installed on the inlet that should allow no greater pressure to be fed to the unit than what the system can safely cope with
- To prevent damage to the unit from over-pressurisation on the system side, a pressure relief valve or similar pressure regulating device must be fitted after the unit
- 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 lockable isolation 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.**



**Figure 17 – images showing correct placement of isolating valve and drain cock on vessel**

- Set the air cushion pre-charge pressure equal to the pressure setting in the MK3 PRO (default 1.5 bar) (see Adjusting air charge pressure). If the vessel is located on a different level contact technical support for further advice

## Adjusting 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

### 1. To adjust air charge pressure < 4.0 bar:

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 by 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 > 4.0 bar:

If vessel is already in use, then isolate hydraulically, reduce the air charge to 4.0 bar 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 4.0 bar, bring the water side pressure up to 5.0 bar

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 6.0 bar, after filling vessel with air to 4.0 bar followed by water to 5.0 bar, fill the air side to  $6.0 \times 1.2 = 7.2$  bar. Screw cap firmly on filling valve and slowly open isolating valve & water connection to the system.

## Commissioning

We strongly recommend Mikrofill Products are commissioned by Mikrofill-approved engineers 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:

- A. The equipment has been correctly installed
- B. A written scheme of examination has been obtained where required under the Pressure Systems Safety Regulations
- C. An adequate water supply and permanent electricity supply are available
- D. The equipment and pipework in the building being served by the pressurisation unit can accept the generated pressures

The pre-charge of connected expansion vessels should be set to the same as the set cold-fill pressure on the unit.

## Operating instructions

### Button descriptions

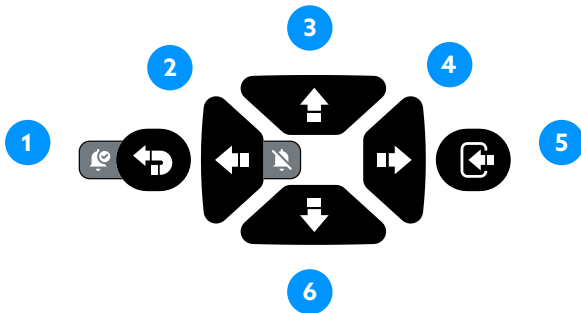


Figure 18 - Physical button arrangement



#### 1. BACK/CLEAR ALARMS button (NOTE: This button serves 2 functions):

- Back: Press this button to return to the previous screen or menu
- Clear Alarms: When held down for 3 seconds with 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



#### 2. MUTE/LEFT arrow button (NOTE: This button serves 2 functions):

- Mute: Press and hold this button to mute the alarm buzzer
- **NOTE: A muted fault will stay silent until a new fault occurs**
- Left Arrow: Press to navigate left through the menus or screens



#### 3. UP arrow button:

- Use this button to move up through menu options or settings on the screen



#### 4. RIGHT arrow button:

- Press this button to move right through menu options or screens



#### 5. ENTER button (NOTE: This button serves 2 functions):

- Enter: Press this button to select or confirm highlighted options settings on the screen
- Menu: Hold this button for 3 seconds to enter the menu from the main screen



#### 6. DOWN arrow button (NOTE: This button serves 2 functions):

- Down: Use this button to move down through menu options or settings on the screen
- Solenoid Control: Hold this button for 3 seconds to access the HAND OFF AUTO controls (see "HAND mode" section)

### Main screen

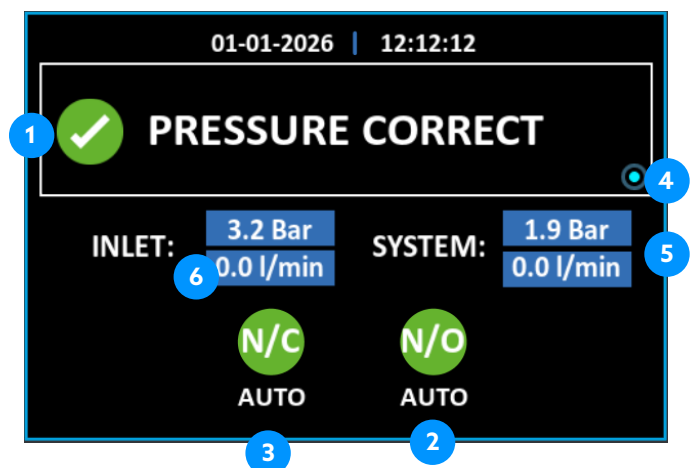


Figure 19 - Default main screen

1. Under normal circumstances, the main screen will show "Pressure Correct". If there are faults logged, it will scroll through them in order of logging
2. N/O refers to the Normally Open solenoid. Auto indicates it is in the normal operation mode
3. N/C refers to the Normally Closed solenoid. Auto indicates it is in the normal operation mode
4. A circle will appear for each active page that can be scrolled through. A filled circle indicates the current page
5. Live inlet and system pressures
6. Live inlet and system flow readings

## General user information – PLEASE READ FIRST

1. For button information, refer to “Button descriptions” section
2. When using the menus, the active line will be highlighted in a light blue
3. When on a menu with multiple screens, there will be a row of circles shown at the bottom of the page. A filled circle indicates the current page, and the unfilled circles indicated pages that can be accessed
4. Use the <UP> and <DOWN> buttons to move the current selection up and down, and the <LEFT> and <RIGHT> buttons to scroll between pages in that menu layer
5. Buttons require a deliberate press; the software includes timed button presses to minimise risk of accidental activation

## Initial setup

### Time and date

1. Hold down the <ENTER> to load “PARAMETERS MENU”
2. Use the <DOWN> arrow to navigate to the bottom of the menu screen and select “SET DATE & TIME”
3. Use the <UP> and <DOWN> arrows to select the date in DD-MM-YYYY format. Use the <RIGHT> and <LEFT> arrows to move between columns
4. Press <ENTER> to move to setting the time
5. Set the time and press <ENTER> to save new date and time

### Setting cold-fill pressure

1. Navigate to “COLD-FILL PRESSURE” in the “PARAMETERS MENU”. The line will be highlighted light blue
2. Press <ENTER>. The line background will change to black
3. Use the <UP> and <DOWN> buttons to set the desired cold-fill pressure
4. Press <ENTER> to confirm

### Set low/high pressure

1. Navigate to “LOW PRESSURE (bar)”/“HIGH PRESSURE (bar)” in the “PARAMETERS MENU” and press <ENTER>
2. Adjust the setting to the desired values for the low pressure and high pressure alarms
3. Press <ENTER> to confirm

### Service reminder

By default, the service reminder is set to 25 months from date of last service. We recommend regular servicing to prolong the lifespan of the unit and surrounding system (please see servicing section under maintenance). The service interval should be adjusted to the desired setting. We recommend 12 months due to the necessary servicing of the pressure vessels

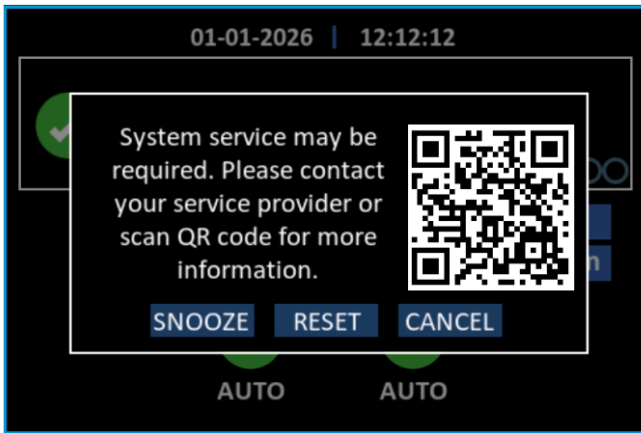
1. Navigate to “SERVICE DUE INTERVAL” in the “PARAMETERS MENU” and press <ENTER>
2. Change the value to the number of months desired as the service interval e.g. 3 will set the service interval to 3 months, and 24 will set the service interval to 2 years. The start date of the interval is the date the service reminder was last set

**NOTE: Each time the interval field is edited, including to the same interval length, it will reset the counter to the date of change. We recommend recording the service history of the unit.**

#### To set the date of the last service:

1. Hold <Enter> to load the “MENU” screen.
2. Select “STATUS”
3. Select “LAST SERVICE DATE”
4. Enter the date of the last service, or the date that you wish the service interval counter to start from

When the service reminder is active, you will see the below screen (Figure 20)



**Figure 20 – Active service reminder screen**

“SNOOZE” will silence the reminder for 24 hours

“RESET” will allow you to input a new date of last service which will reset the counter

“CANCEL” will allow you to disable the service reminder. This is not recommended under normal circumstances

## Flow logic

The Mikrofill 3 PRO features integrated flow sensors on both the inlet and system sides of the manifold. The flow sensors are used to accurately monitor water usage, determine how much water is being sent to drain (except for the small amount that is let go at the end of a fill cycle to create the air gap), and to detect faults far earlier than previously possible.

When a fault is detected, the flow logic lockout feature can stop the device from trying to fill in such a situation, reducing water wastage and risk of damage.

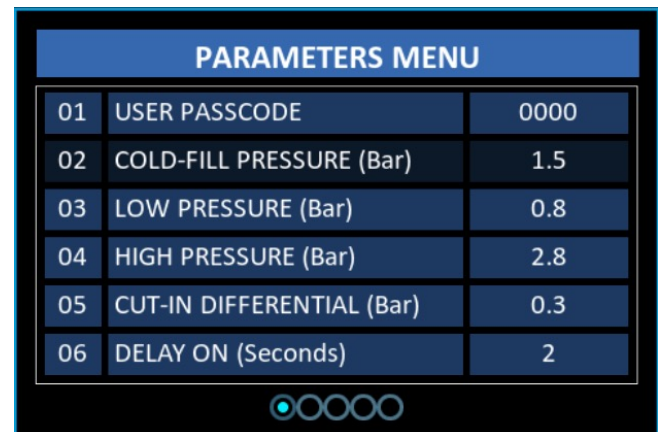
Flow logic lockout is disabled as standard. Please read more information on how the logic works in the “Flow logic” section prior to turning the flow logic lockout feature on. To disable/enable the flow logic lockout, follow the procedure below:

1. Navigate to “FLOW LOGIC LOCKOUT” in the “PARAMETERS MENU”
2. Press <ENTER>. The line background will change to black
3. Use the <UP> and <DOWN> buttons to change to “ENABLED” or “DISABLED” as desired
4. Press <ENTER> to confirm

## System parameters

**NOTE: When entering the PARAMETERS MENU, the unit will stop all mechanical function and default to its standby state. This may cause some errors to appear after exiting the PARAMETERS MENU and is normal. To clear the faults, hold down the <BACK/CLEAR ALARMS> button for 3 seconds.**

1. Press and hold the <ENTER> button for 3 seconds to load the Menu screen
2. Navigate to <PARAMETERS> and press <ENTER>
3. Navigate to desired parameter and press <ENTER>. When a parameter is selected for editing, the background colour of the row will turn dark blue



**Figure 21 – Parameters menu selection with black background**

4. Use the <UP> and <DOWN> buttons to edit the value
5. Confirm selection by pressing the <ENTER> button. Once complete, the row background will revert to light blue
6. Once you have updated all the desired parameters, press <BACK> to leave the parameters menu. This will trigger a confirmation window that will query if you would like to save the updated settings. “Yes” will save the new settings, “No” will exit menu and keep previous settings, and “Cancel” will return to the exit action

## Parameter list

**NOTE: N/O refers to the Normally Open solenoid, and N/C refers to the Normally Closed solenoid**

No.	Parameter name	Description	Min	Max	Unit	Default setting	Page #
1	User passcode	Allows selection of the user passcode. If set to 0000, then passcode is disabled.				0000	
2	Cold-fill pressure	Target cold-fill system pressure.	1	8.7	bar	1.5	
3	Low pressure	Threshold pressure at which 'low pressure alarm' is activated. Activation will cause the low pressure message to be displayed, the low pressure relay to energise and the system healthy relay to de-energise. If pressure increases, alarm is reset – (unless lockout active) – see 12.	0.5	8	bar	0.8	
4	High pressure	Pressure at which the 'high pressure alarm' is activated. Activation will cause the high pressure message to be displayed, solenoids will be disabled, the high pressure relay to energise and the system healthy relay to de-energise. If pressure decreases, alarm is reset – (unless lockout active) – see 10.	1.5	10	bar	2.8	1
5	Cut-in differential	Pressure difference between cold-fill pressure and unit cut-in pressures. E.G. Cold-fill pressure – cut-in differential = unit cut-in pressure	0.1	2.0	bar	0.3	
6	Delay ON	Time delay after unit cut-in pressure is reached before unit starts to fill.	0	100	sec	2	
7	Delay OFF	Time delay after cold-fill pressure is reached before unit turns off.	0	100	sec	5	
10	High pressure lockout	If 'enabled', and high pressure lockout delay (see 11) duration has expired, will prevent high pressure alarm from auto resetting. Lockout will prevent the unit from activating and can be reset by cycling power or holding back/clear button.				Disabled	
11	High pressure lockout delay	Time that high pressure alarm can be active before lockout is enabled.	0	60	sec	10	2
12	Low pressure lockout	If 'enabled', and low pressure lockout delay (see 13) duration has expired, will prevent low pressure alarm from auto resetting. Lockout will prevent the unit from activating and can be reset by cycling power or by user intervention.				Enabled	

## Parameter list

**NOTE: N/O refers to the Normally Open solenoid, and N/C refers to the Normally Closed solenoid**

No.	Parameter name	Description	Min	Max	Unit	Default setting	Page #
13	Low pressure lockout delay	Time that low pressure alarm can be active before lockout is enabled.	0	60	sec	30	2
14	Excessive start alarm	Number of starts allowed in a certain time (Parameter 15).	1	25		5	
15	Excessive run time	1. Set time window for the excessive start alarm. 2. Excessive run time - will fault if unit continuously runs for this period of time.	1	60	mins	20	
16	Excessive start lock-out	If enabled, unit will cease filling when excessive start lockout fault is triggered. This can be reset by cycling power or holding back/clear.				Disabled	
17	Excessive run lockout	If enabled, unit will cease filling when excessive run lockout fault is triggered. This can be reset by cycling power or holding back/clear.				Enabled	3
20	Pressure transducer	Not user configurable.				Millivolt	
25	Audible alarm	Buzzer can be enabled or disabled				Enabled	
30	Flow rate sensitivity	Acceptable differential between flow sensor readings as a percentage. Scale is: 9 (most sensitive, 90% agreement between sensors) to 1 (least sensitive 10%, agreement between sensors). 0 disables flow sensing error reporting.	1	9	count	7	
31	Flow logic lockout	Default is disabled. If enabled and any of the flow logic errors occur, filling will be disabled.				Disabled	
50	BMS MODBUS speed	Allows selection of baud rate for BMS MODBUS RTU.				9600	
51	BMS MODBUS address	Allows selection of address for BMS MODBUS RTU.				42	
55	Service due interval		3	25	months	25	4
60	BMS relay 1 function	Allows specific alarm condition to be assigned to this BMS relay				High pressure	
61	BMS relay 2 function	Allows specific alarm condition to be assigned to this BMS relay				Low pressure	
62	BMS relay 3 function	Allows specific alarm condition to be assigned to this BMS relay				Common alarm	
63	BMS relay 4 function	Allows specific alarm condition to be assigned to this BMS relay				System healthy	5

## Communication settings

### BMS relay codes

Code	Definition
SHP	System high pressure
SLP	System low pressure
CA	Common alarm
SH	System healthy
SL	System leak
LIP	Low input pressure
TF	Transducer failed
SF	Solenoid fuse fail
FE	Flow error

## Configuration

To establish a successful connection between the MODBUS Master and the Mikrofill 3 PRO (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

## MODBUS register mapping

MODBUS BMS data	Primary tables	Access	Address	Size	Function code	Starting register ADD
Inlet pressure value	I/P registers	Read only	30003-30004	32-bit float	4	30003-30004
System pressure value	I/P registers	Read only	30005-30006	32-bit float	4	30005-30006
Inlet flow value	I/P registers	Read only	30007-30008	32-bit float	4	30007-30008
System flow value	I/P registers	Read only	30009-30010	32-bit float	4	30009-30010
Top-up volume (l)	I/P registers	Read only	30011-30012	32-bit float	4	30011-30012
Operation count	I/P registers	Read only	30013-30014	32-bit int	4	30013-30014
Fill time (hours)	I/P registers	Read only	30015-30016	32-bit int	4	30015-30016

Energy (kWh)	I/P registers	Read only	30017-30018	32-bit float	4	30017-30018
Total on time (hours)	I/P registers	Read only	30024-30025	32-bit INT	4	30024-30025
BMS alarm 1	Discrete I/P	Read only	10004	1-bit	2	10004
BMS alarm 2	Discrete I/P	Read only	10005	1-bit	2	10005
BMS alarm 3	Discrete I/P	Read only	10006	1-bit	2	10006
BMS alarm 4	Discrete I/P	Read only	10007	1-bit	2	10007

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

- Ensure your software uses function codes 02 and 04 for reading discrete inputs and input registers, respectively

## Step-by-step configuration guide

Follow these steps to connect your MODBUS Master to the Mikrofill 3 PRO and read data.

### Setting up the MODBUS Master:

#### Configure communication parameters:

- **Slave device ID:** Set to match the Mikrofill 3 PRO'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

### 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 Mikrofill 3 PRO'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

### Reading input registers

#### Inlet pressure value:

- **Register Addresses:** 30003-30004
- **Function Code:** 04 (read input registers)
- **Data type:** 32-bit float
- **Description:** Reads the inlet pressure value from the Mikrofill 3 PRO

#### System pressure value:

- **Register addresses:** 30005-30006
- **Function code:** 04 (read input registers)
- **Data type:** 32-bit float
- **Description:** Reads the system pressure value from the Mikrofill 3 PRO

#### Total ON time (hours):

- **Register addresses:** 30024-30025
- **Function code:** 04
- **Data type:** 32-bit integer
- **Description:** Reads the total run time for the entire unit

#### 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 Mikrofill 3 PRO
- 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

### Reading discrete inputs (alarms)

#### Alarms and indicators:

- **Register Addresses:** 10004 to 10007
- **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

### Troubleshooting

#### No response from Mikrofill 3 PRO 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

If you encounter issues not covered in this manual, please contact Mikrofill's technical team on **03452 606020** or **technical@mikrofill.com**

## Fault history log

Navigate to the "HISTORY LOG" in the "PARAMETERS MENU". This will display the last 100 faults and/or parameter changes and after the limit has been reached, it will overwrite the oldest

**NOTE: The unit does not apply daylight savings.**

## Status screens

Navigate to "STATUS" in the main menu. The status screens will display top-up volume (cumulative), operation count, fill time (hours), energy consumption (kWh), total on time (hours), last service date and SW (software) version (Figure 22).

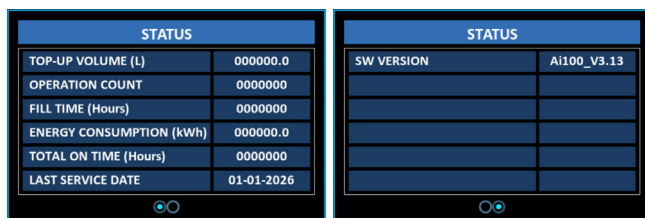


Figure 22 - Status screens

## HAND, OFF, AUTO modes

Using HAND, OFF and AUTO modes the operation of the unit can be checked, stopped or resumed.

### Modes

Code	Definition
HAND	HAND mode allows manual control of the solenoid valves. Selecting HAND on the N/C solenoid will only enable this valve and will dump water to drain via the tundish. Selecting HAND on the N/O solenoid opens both solenoid valves and will push water into the attached system.
OFF	Selecting OFF for either valve will set both valves to OFF. With the valves set to OFF, the valves will not operate.
AUTO	Selecting AUTO on one valve will set both valves to AUTO. The Mikrofill 3 PRO will then operate normally.

## Procedure

1. Hold the <DOWN> button for 3 seconds to open manual controls. You will see the box containing the selected solenoid at the bottom of the screen turn dark blue
2. Use the <LEFT> and <RIGHT> arrow keys to navigate to the desired solenoid and press <ENTER> to confirm. You will see a 3-button menu replace the selected solenoid box

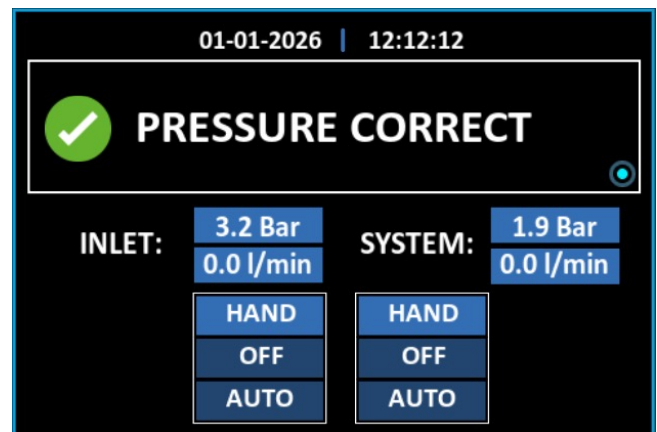


Figure 23 - HAND mode screen

3. Use the <UP> and <DOWN> buttons to navigate between "HAND", "OFF" and "AUTO"
4. To use HAND, select "HAND" and hold down the <ENTER> button for the desired duration. When <ENTER> the unit will revert to the previous selected mode when the button is released
5. To turn a solenoid off, navigate to "OFF" and press <ENTER>. The solenoid will remain OFF until either HAND or AUTO modes are selected
6. To return a solenoid to automatic operation, select "AUTO" and press <ENTER>
7. To return to the main screen press <BACK>

## Troubleshooting

### Fault codes

FAULT	CAUSE	ACTION
Display blank	No power to controls	<ol style="list-style-type: none"> <li>1. Check fuses</li> <li>2. Check power to unit</li> <li>3. If fault persists, contact technical</li> </ol>
N/O solenoid error	No flow into system detected during fill	<ol style="list-style-type: none"> <li>1. Check if flow is passing through tundish. If yes, check wiring of N/O solenoid</li> <li>2. Remove N/O solenoid, unscrew base and clean</li> <li>3. Check flow sensor wiring</li> <li>4. If fault persists, contact technical</li> </ol>
NC solenoid error 1	Inlet flow detected during standby	<ol style="list-style-type: none"> <li>1. Check inlet flow sensor connections</li> <li>2. Check if flow is passing through tundish. If yes, remove n/c solenoid, dismantle and clean</li> <li>3. If fault persists, contact technical</li> </ol>
N/C solenoid error 2	No inlet or system flow detected during fill	<ol style="list-style-type: none"> <li>1. Check wiring and fitment of N/C solenoid and system flow sensor</li> <li>2. Remove N/C solenoid, dismantle and clean</li> <li>3. If fault persists, contact technical</li> </ol>
Outlet NRV error	System flow detected during standby	<ol style="list-style-type: none"> <li>1. Check if flow is passing through tundish. If yes, check system manifold non-return valves</li> <li>2. If fault persists, contact technical</li> </ol>
Inlet flow error	No inlet flow detected during fill, but system flow is detected	<ol style="list-style-type: none"> <li>1. Check inlet flow sensor fitment and connections</li> <li>2. Contact technical for further support</li> </ol>
System high pressure	System pressure above set high pressure alarm	<ol style="list-style-type: none"> <li>1. Check/service expansion vessel</li> <li>2. Check system isolation</li> <li>3. Check settings</li> </ol>
System low pressure	System pressure below set low pressure alarm	<ol style="list-style-type: none"> <li>1. Check system for leaks</li> <li>2. Check/service expansion vessel</li> <li>3. Check settings</li> </ol>
Low inlet pressure	Inlet pressure is less than 0.3 bar above live system pressure during fill cycle	<ol style="list-style-type: none"> <li>1. Reduce system pressure setting</li> <li>2. Connect inlet to pressure boosted supply</li> </ol>
System leak - ex run	Continuous fill time exceeded	<ol style="list-style-type: none"> <li>1. Check system for leaks</li> <li>2. Increase excessive run time (parameter 15)</li> </ol>
System leak - ex starts	Excessive number of fill cycles occurred in set time	<ol style="list-style-type: none"> <li>1. Check system for leaks</li> <li>2. Increase excessive start alarm (parameter 14)</li> </ol>
Solenoid fuse fail	Blown solenoid fuse detected	<ol style="list-style-type: none"> <li>1. Check solenoid icon on primary display screen for indication of failed fuse</li> <li>2. Replace fuse</li> </ol>
Inl. transducer fail	Inlet transducer signal out of range	<ol style="list-style-type: none"> <li>1. Check connections</li> <li>2. Replace transducer</li> </ol>
Sys. transducer fail	System pressure transducer signal out of range	<ol style="list-style-type: none"> <li>1. Check connections</li> <li>2. Replace transducer</li> </ol>

## Maintenance

### Servicing

The unit is designed to be as service-free as possible; however, variables such as water hardness and other factors may affect the long-term functionality of the unit. Additionally, expansion vessels which are a necessary part of a closed system do require regular servicing. We strongly recommend setting the service interval on the unit (see "Service reminder" section under "Operating instructions") to 12 months which will trigger a reminder to book a service.

**NOTE: 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).**

Our service partners AGM are trained to service expansion vessels, reasonably check the surrounding system for any potential issues, and to carry out a full inspection on the unit. They are also trained and equipped to carry out repairs if necessary. Please call the number below to book your service.



**Phone:** 0333 577 5151

**Visit:** <https://agmservice.co.uk/>

### Plant servicing and inspection

AGM Ltd., AGM House, London Rd, Copford, Colchester, Essex, CO6 1GT

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

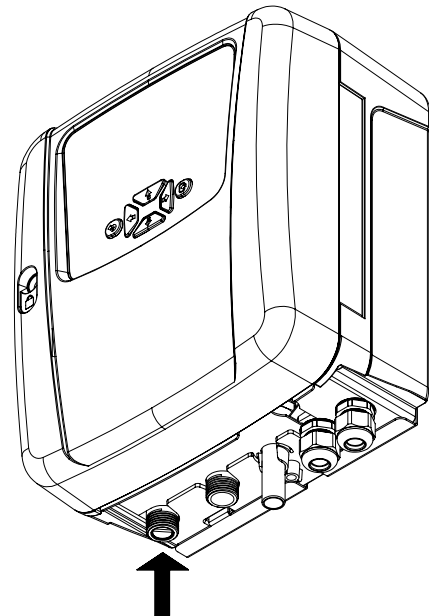
Regular servicing of any plant for essential services is vital because wear and tear are very gradual processes.

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

## Maintenance procedure

### Maintenance should be carried out by a competent person

1. Check the air charge pressure in the expansion vessel. See Installation Instructions section for how to set up the expansion vessel
2. Visually check the overall condition of the expansion vessel
3. Close the isolation valve on the inlet hose
4. Disconnect the inlet hose from the unit. There is a cartridge-body mesh filter inserted into the inlet manifold (see Figure 24). Remove and clean as necessary



**Figure 24 - Removable filter location**

5. Refit filter, reconnect inlet hose and inlet isolation valve

**NOTE: When refitting the filter, ensure the grab pin is facing away from the unit to allow for easy removal in the future.**

6. Check the Fault History Log. See the Troubleshooting section for more information
7. Put the N/C solenoid into HAND mode. See HAND Mode section. This will open the N/C solenoid and leave the N/O solenoid in the open position allowing full flow through the unit to drain

- A. Check that there is flow registering on the inlet flow sensor. The flow level will depend on the water supply  
Note that there is a 12 lpm flow restrictor on the inlet
  - B. Check that there is no flow registering on the system flow sensor; full flow should be going to drain
  - C. Check that there is water flowing through the tundish
8. Record all findings in a service sheet. A printable version is included in the appendix of this document

**NOTE: The ability to manually open the N/C solenoid and shut the N/O solenoid at the same time (as would happen during a fill cycle) is not present as this could result in accidental and damaging/dangerous over-pressurisation of the system.**

## Replaceable component list

Any components within the Mikrofill 3 PRO unit that may require replacing are listed below. If a part needs replacing which is not listed here, please contact our technical department on **03452 606020** for assistance.

- 73092** - Mikrofill 3 PRO PCB Set 1 – display, master, power PCBs
- 72768** - BMS PCB
- 72886** - Display PCB
- 73118** - Master PCB
- 72769** - Power PCB
- 73093** - AI100 4C Jumper Cable - MF3 PRO
- 73094** - AI100 50pin Ribbon Cable - MF3 PRO
- 73095** - AI100 BMS Ribbon Cable - MF3 PRO
- 73096** - Normally closed solenoid with 10mm push-fit elbow
- 72942** – Normally open solenoid
- 73097** - Automatic air vent with push-fit elbow and tube (tube requires cutting to length on site)
- 73100** – Mikrofill 3 PRO inlet manifold block assembly – includes all internals, blank plug and stem. No hall effect sensor or pressure transducer
- 73101** – Mikrofill 3 PRO system manifold block assembly – includes all internals and 10mm push-fit elbow. No hall effect sensor or pressure transducer
- 73102** - Mikrofill 3 PRO complete manifold assembly

**73104** - Mikrofill 3 PRO 2x transducers (set) paired with display PCB

**73105** - Mikrofill 3 PRO full wiring harness

**72784** - Hall effect sensor

**72900** - Flexible hose with isolation valve

**72848** - Tundish (15 mm x 22 mm compression)

## Declaration of conformity

<b>CE</b>		<b>EU DECLARATION OF CONFORMITY</b> MIKROFILL 3 PRO	
<p><b>Machinery Directive – 2006/42/EC</b> EN ISO 12100:2010, EN 809:1998+A1:2009/AC:2010</p> <p><b>Low Voltage Directive – 2014/35/EC</b> EN 60204-1:2018</p> <p><b>RoHS Directive – 2011</b> RoHS Directive 2011/65/EU And Amendment 2015/863</p> <p><b>WEEE Directive – 2012/19/EU</b></p>	<p><b>EMC Directive – 2014/30/EU</b> EN IEC 55014-1: 2021 EN IEC 55014-2: 2021</p> <p>EN IEC 61000-3-2: 2019/A1:2021 EN 61000-3-3: 2013/A2:2021</p> <p><b>EMF Directive – 1999/519/EC</b> EN 62233: 2008 + AC: 2008</p>	<p>IT IS HEREBY CERTIFIED THAT THE MIKROFILL PRESSURISATION UNIT:72846 COMPLIES WITH THE ESSENTIAL REQUIREMENTS OF THE ABOVE STATUTORY REGULATIONS AND EU DIRECTIVES</p>	
<p>MIKROFILL SYSTEMS LTD 11 MERSE ROAD, NORTH MOONS MOAT REDDITCH, B98 9HL WEBSITE: <a href="http://www.mikrofill.com">www.mikrofill.com</a> RESPONSIBLE PERSON AND MANUFACTURER</p>		<p>EU AUTHORISED REPRESENTATIVE ARC (AUTHORISED REP COMPLIANCE) GROUND FLOOR, 71 LOWER BAGGOT STREET, DUBLIN D02 P593, IRELAND <a href="http://www.authorisedrepcompliance.co.uk">www.authorisedrepcompliance.co.uk</a></p>	
<p>Signed ..... <i>Stuart Savill</i> .....</p>		<p>Stuart Savill, Head of Engineering Mikrofill Systems Ltd</p>	

<b>UK CA</b>		<b>UK DECLARATION OF CONFORMITY</b> MIKROFILL 3 PRO	
<p><b>Supply of Machinery Regulation - 2008</b> EN ISO 12100:2010, EN 809:1998+A1:2009/ AC:2010</p> <p><b>Electrical Equipment Regulation – 2006</b> EN 60204-1:2018</p> <p><b>RoHS Regulation – 2012</b> RoHS in EEE Regulation 2012 RoHS in EEE Regulation (Amendment) 2021</p> <p><b>WEEE Directive-2013</b></p>	<p><b>EMC Regulation – 2016</b> EN IEC 55014-1: 2021 EN IEC 55014-2: 2021</p> <p>EN IEC 61000-3-2: 2019/A1:2021 EN 61000-3-3: 2013/A2:2021</p> <p><b>EMF Regulations – 2012</b> EN 62233: 2008 + AC: 2008</p>	<p>IT IS HEREBY CERTIFIED THAT THE MIKROFILL PRESSURISATION UNIT:72846 COMPLIES WITH THE ESSENTIAL REQUIREMENTS OF THE ABOVE STATUTORY REGULATIONS AND EU DIRECTIVES</p>	
<p>MIKROFILL SYSTEMS LTD 11 MERSE ROAD, NORTH MOONS MOAT REDDITCH, B98 9HL WEBSITE: <a href="http://www.mikrofill.com">www.mikrofill.com</a> RESPONSIBLE PERSON AND MANUFACTURER</p>		<p>Stuart Savill, Head of Engineering Mikrofill Systems Ltd</p>	
<p>Signed ..... <i>Stuart Savill</i> .....</p>		<p>Stuart Savill, Head of Engineering Mikrofill Systems Ltd</p>	



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