



mikrofill

PRESSURISATION UNIT



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TECHNICAL DATA

WRAS Approval Number:	1806078
ELECTRICAL DETAILS	
• Supply Voltage:	230 Volt
• Full Load Current:	1 Amp
• Start Current:	1 Amp
• Fuse Rating:	3 Amp
• Maximum Load BMS Relays:	5 Amp
CONNECTION DETAILS	
• Cold Water Inlet:	15mm Compression
• System Outlet:	15mm Compression
• Drain (via Tundish):	¾" BSP
• Maximum Inlet Pressure:	5 Bar
• Maximum Cold Fill Pressure:	4.7 Bar
• Nominal Flow Rate:	14 l/min at 2 Bar
• Dry Weight:	5 kg

TECHNICAL DATA

The Mikrofill 3 is a fully automatic sealed system filling device and is suitable for the water management in domestic and commercial heating and cooling systems. It is designed for use in a normal environment. **It is not suitable for installation outside, or in environments where there are excessively cold temperatures.**

INSTALLATION

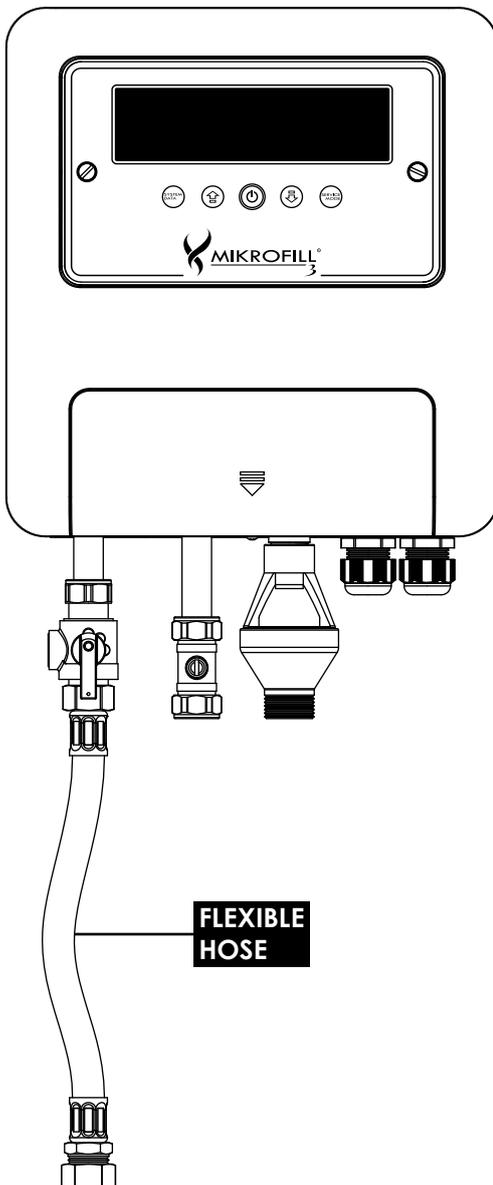
All Mikrofill products should be installed by a competent person with regard to the relevant requirements of the Health and Safety Regulations, Building Regulations, IEE Regulations, Water Supply (Water Fittings) Regulations, Water By-laws (Scotland) and any other by-laws or planning requirements.

The Mikrofill 3 is WRAS approved with certificate number **1806078**.

It is intended for wall mounting (see **page 08**) and should be mounted at such a height as to enable the display to be easily read.

MAINS / BOOSTED COLD WATER SUPPLY

The Mikrofill 3 is designed to be connected directly to the mains cold water supply, or a boosted cold water supply. The unit is supplied complete with all necessary isolating valves and incorporates a basket filter in the inlet ballcock valve.



A flexible hose is supplied with the unit which **MUST** be connected to the inlet ballcock valve, as shown in the diagram to the left. Failure to do so may result in damage to the inlet pressure sensor due to water hammer, resulting in a **SENSOR FAILURE**. Under such circumstances, this would not be considered a warranty fault.

The water inlet connection is 15mm compression and should be connected to the mains cold water supply by 15mm copper pipe or equivalent approved plastic pipework.

If the Mikrofill 3 is sited some distance from the mains cold water supply it may be advisable to install a single check valve adjacent to the mains cold water supply.

To reduce the pressure drop on very long supply routes 22mm supply pipework is recommended.

FILL PRESSURE

The Mikrofill 3 is capable of filling a system to within 0.3 bar of its current inlet water pressure.

Where the incoming water pressure exceeds 5 bar please contact our technical department on **03452 60 60 20** for further installation information.

TECHNICAL DATA

CONNECTION TO THE SYSTEM

The Mikrofill 3 is connected to the system by way of the 15mm outlet isolation valve. The pipework from the unit should be made in 15mm copper or similarly approved plastic pipework. A suitable sized expansion vessel should be incorporated into the system at this point (please refer to the typical installation diagram on **page 07** for more information).

Please contact our technical department on **03452 60 60 20** 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: ½" (15mm) expansion pipework
- Vessel size up to 300L: ¾" (22mm) expansion pipework
- Vessel size up to 1000L: 1" (28mm) expansion pipework

For vessel sizes in excess of 1000L capacity please contact our technical department.

IMPORTANT NOTE: The expansion vessel air / nitrogen charge must be set to the same pressure as the cold fill pressure of the system.

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 on all sealed systems.

DRAIN

Following every fill procedure the unit will discharge a small amount of water, establishing an air break. For this, the unit is supplied fitted with a ¾" BSP tundish, which must be connected to a suitable drain.

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

TECHNICAL DATA

DIMENSIONS (IN MILLIMETRES)

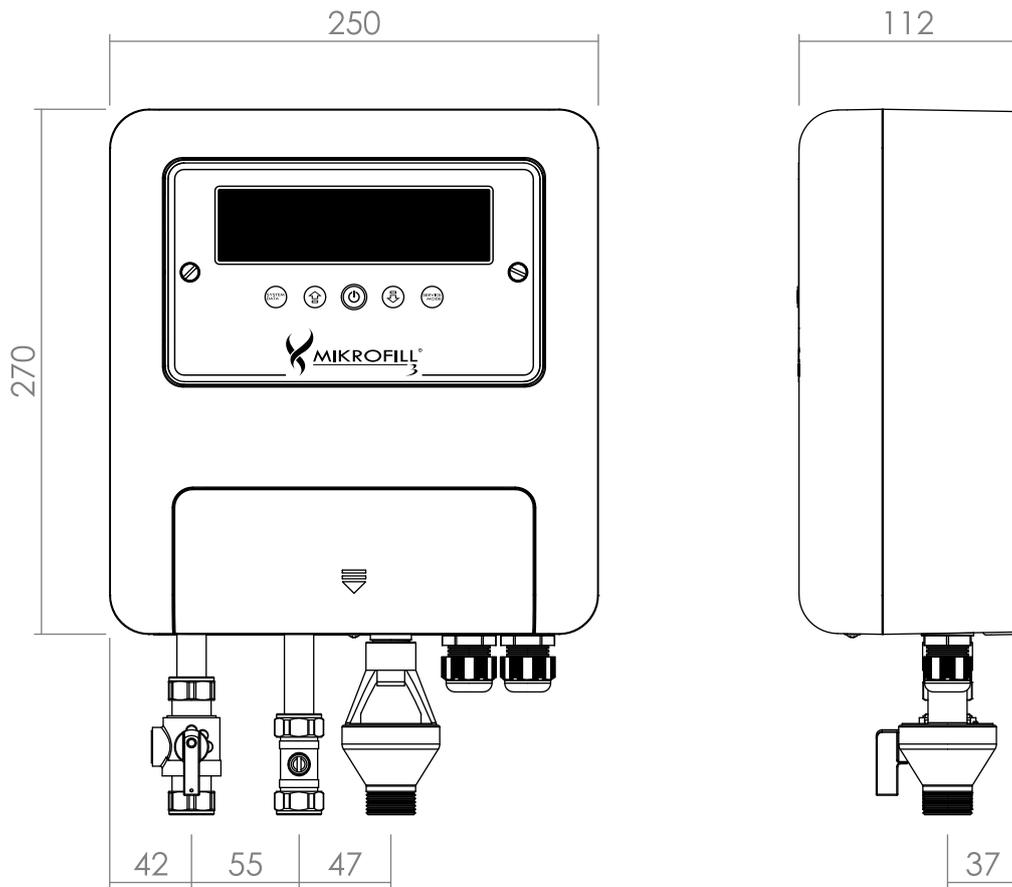
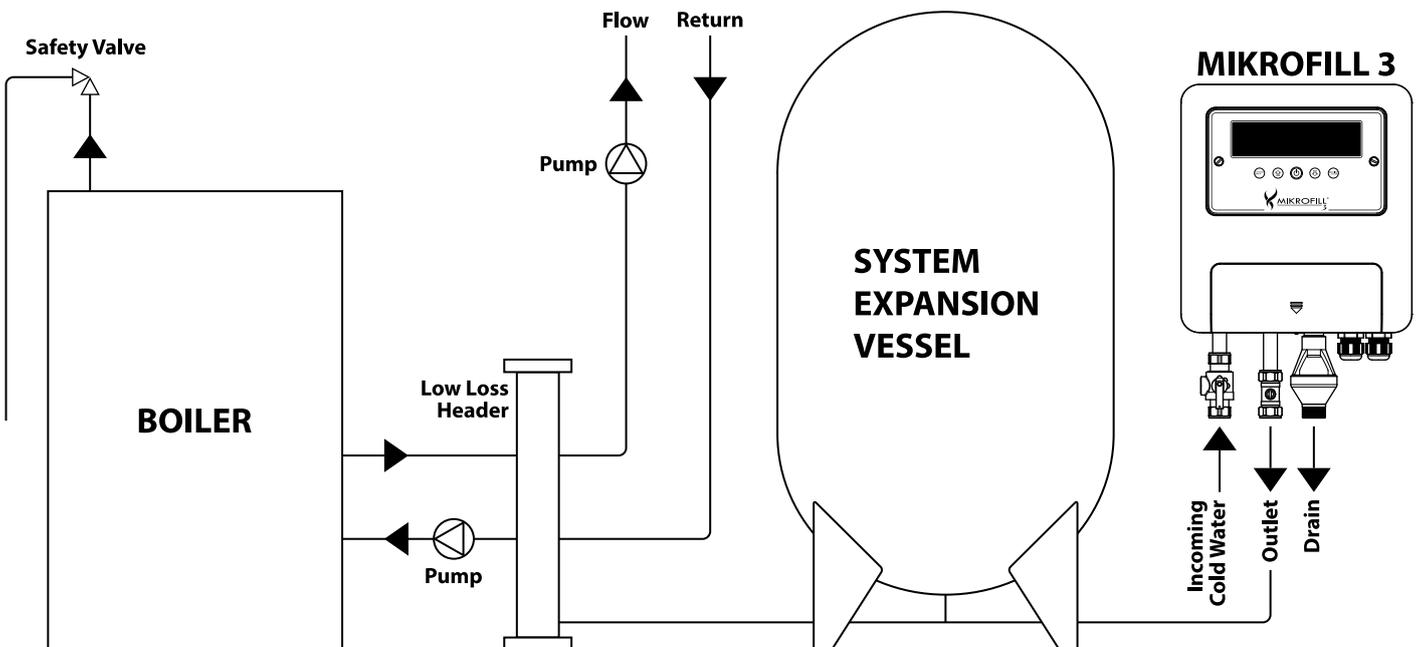


DIAGRAM OF A TYPICAL INSTALLATION

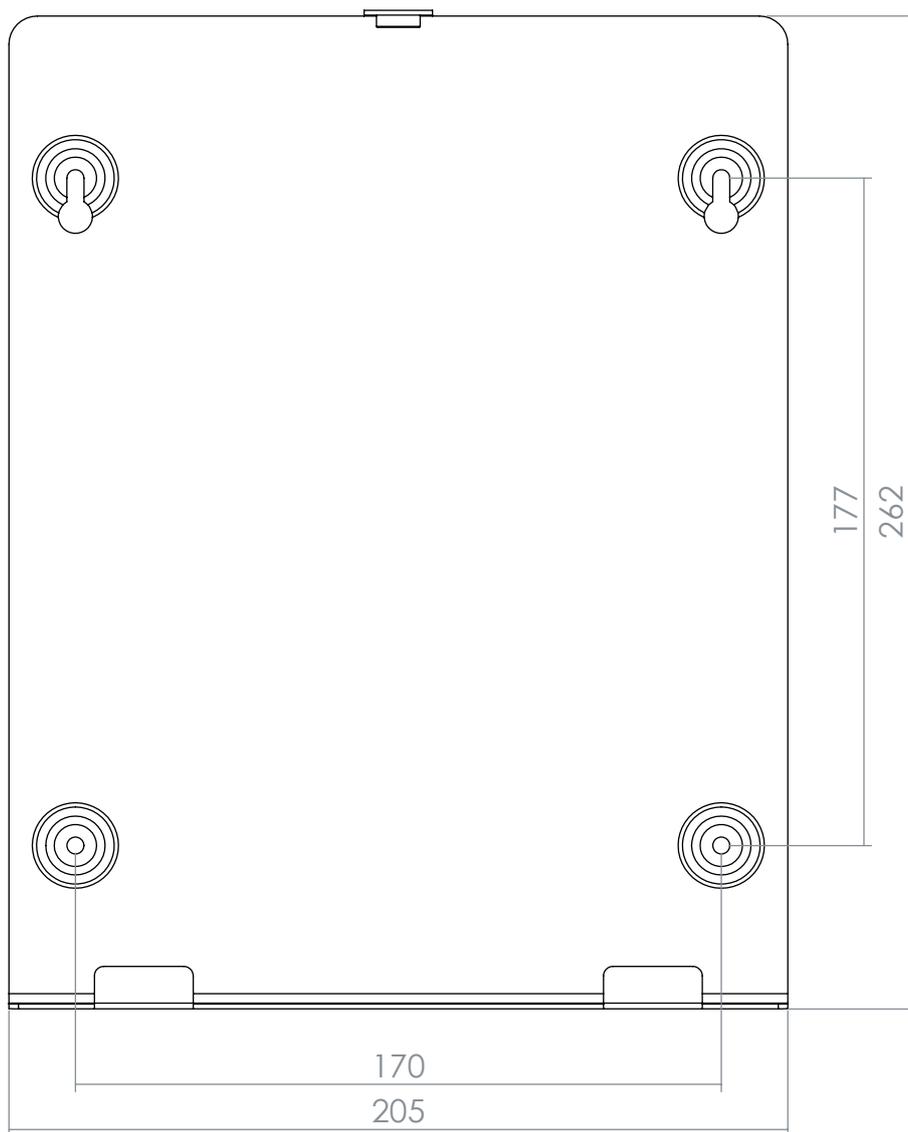


Please note that for the purpose of clarity, system valves are not shown. For systems exceeding 90°C contact our technical department on **03452 60 60 20** for advice.

Further installation guidelines can be found on **page 05** of this technical documentation.

TECHNICAL DATA

WALL MOUNTING PLATE DIMENSIONS FOR FIXING (IN MILLIMETRES)



- A maximum size of No. 8 screws or M4 bolts are to be used.
- A minimum of 25mm clearance either side of the unit is required.
- A minimum of 250mm clearance above the unit is required.
- The unit must be fitted on a sound, solid surface.

ELECTRICAL CONNECTIONS

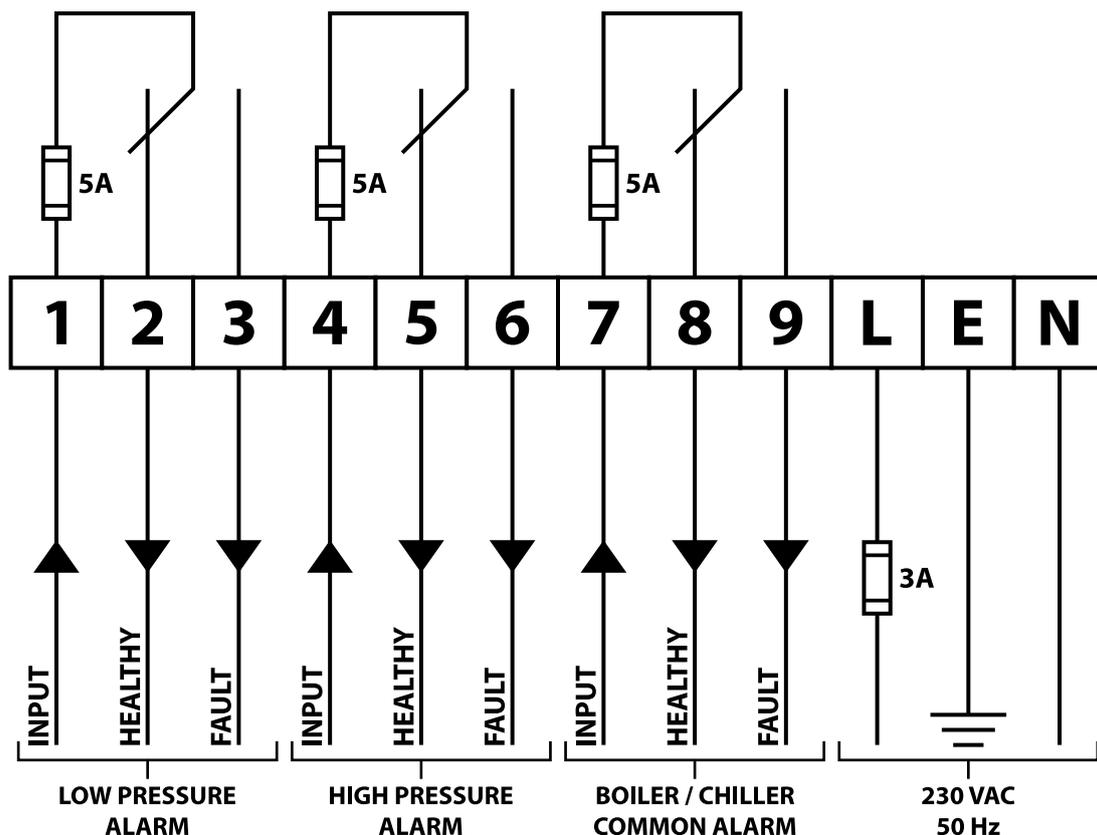
The Mikrofill 3 requires a permanent 230 V 50 Hz 1 phase fused supply rated at 3 Amp. The unit is internally fused at 3 Amp (see electrical installation diagram below).

The unit also incorporates two BMS relays offering volt free contacts for the remote indication of low or high pressure conditions within the system. These relays are also independently fused at 5 Amp to protect the Mikrofill 3 from external electrical faults. Alternatively, if only a common fault signal is required by the BMS as opposed to individual low and high alarms, a further volt free relay is included in the unit which can be used to interlock the boiler or chiller control circuits. Should either the low or high alarm relay operate, then this third relay will shut down the boiler or chiller and indication of any alarm situation will be shown on the display. The relays are suitable for use on control voltages up to 250 V.

To access the wiring connections on the Mikrofill 3, the cover on the lower front of the unit will first need to be removed by unscrewing the PZ2 screw located on the underside. Removing this cover will reveal a 12 way terminal block, with each connection labelled 1 - 9 for the volt free relays (see electrical installation diagram below), Live, Earth and Neutral. The wiring can be passed through the cable glands on the underside of the unit, through an opening in the front casing, then connected as required into the terminal block.

Once the Mikrofill 3 has been correctly connected, the unit is ready for use. Ensure that the unit has a water supply and that the service valves are open. Check for water leaks, switch on the electrical supply to the unit and press the central power button on the front of the unit until the display illuminates. After a brief period, the unit will start to fill the system. Once the system has achieved its set cold fill pressure, the unit will stop filling, discharge a small amount of water to drain and then go to **PRESSURE CORRECT**.

ELECTRICAL DIAGRAM (WHEN NOI AT FAULT)



ELECTRICAL DATA

- Supply: **230 V 1 ph 3 Amp.**
- Full Load Current: **1 Amp.**
- Start Current: **1 Amp.**
- Fuse Rating: **3 Amp.**
- BMS Relays and Boiler / Chiller Relays: **Volt Free Contacts rated at 250 VAC at 5 Amp.**
- **All relays are independently fused at 5 Amp.**

KEYPAD FUNCTIONS

- SYSTEM DATA



This button is used primarily to scroll through the various settings of the unit. Repeatedly pressing this button will cycle through each setting (see **page 12** for information on each of these settings). Pressing this button whilst the unit is in **SERVICE MODE** will again cycle through each setting, but in this mode the settings can now be adjusted (described in further detail on **page 11**).



- UP

When the unit is in **SERVICE MODE** this button is used to increase parameter values.



- POWER

Pressing and holding this button for approximately 2 seconds will turn the unit on or off. When the unit is powered on, the display should always be illuminated.

NOTE: This button will turn the unit off, but it does not isolate power to the unit.



- DOWN

When the unit is in **SERVICE MODE** this button is used to decrease parameter values. This button can also be used to view the calibration code for the unit's pressure sensors by pressing and holding it down for 2 seconds. The top line of numbers displayed will relate to the calibration of the unit.



- SERVICE MODE

This is a multi-function button that, when the unit is in operational mode, is used to mute the audible alarm conditions. Pressing and holding this button for approximately 8 seconds will put the unit into **SERVICE MODE** where various parameters can then be adjusted (described in further detail on **page 11**).

STATUS DISPLAY

The top line of the display on the Mikrofill 3 will provide information on the current status of the unit as well as the system that it is managing, providing information on any potential issues and / or faults as and when they occur.

The following status messages will be displayed on the unit based on current conditions:

- PRESSURE CORRECT

The Mikrofill 3 continuously monitors the system pressure. When the system pressure is within set parameters, the unit will show this message on the display.

- SYSTEM FILLING

This message indicates that the unit is currently filling the system to its target fill pressure.

- FILLING STOPPED DUE TO LOW MAINS WATER PRESSURE

The Mikrofill 3 continuously monitors the inlet pressure. If this inlet pressure falls below an acceptable level (**within 0.3 bar of the current system pressure**) whilst the unit is attempting to fill the system then the unit will operate a safety shut-down, displaying this message. Once the incoming pressure is reinstated, the unit will return to operating as normal.

- FREQUENT USE

There is a **FREQUENT USE** setting on the Mikrofill 3 which can be adjusted by accessing the **SERVICE MODE** (described in further detail on **page 11**). If the unit cuts in to top up the system more than the number of times this setting is set to within a 24-hour period then the unit will alarm and display this message. This alert is for informational purposes as it informs that the unit is having to top up the system unusually often, suggesting there may potentially be a leak somewhere on the system.

If the unit displays any messages other than those detailed above, then there is likely a fault either with the unit or the system. For a list of possible fault displays, along with causes and remedies, please refer to **pages 13 and 14** of this technical documentation.

ADJUSTING SETTINGS

The settings on the Mikrofill 3 can be adjusted on site by following the below steps:

- STEP 01:** Press and hold the  button for approximately 8 seconds.
- STEP 02:** The display will indicate that you are now in **SERVICE MODE**. You can then release the button.
- STEP 03:** The  button can now be used to scroll through the various settings.
- STEP 04:** To increase or decrease the value of a setting use the  or  buttons respectively.
- STEP 05:** After adjusting the settings, the unit will save any changes made and return to its normal operating mode when no button is pressed for approximately 30 seconds.

PARAMETER FUNCTIONS

The following lists each parameter of the Mikrofill 3 which can be adjusted through the **SERVICE MODE**, along with an explanation of their functions:

- **Cold Fill Pressure** - the required pressure of the system when cold.
- **Alarm Low Pressure** - the system pressure at which the low pressure alarm relay will operate, typically set 0.6 - 0.7 bar below the cold fill pressure.
- **Alarm High Pressure** - the system pressure at which the high pressure alarm relay will operate, typically set 0.2 - 0.3 bar below the system safety valve setting.
- **Usage** - provides information on water usage in the system based on the amount of water the unit has put into the system and how long it has been operating (this is for information only and thus no setting is required).
- to reset the usage, both the  and  buttons can be held together for 3 seconds.
- **Lvl 1 Leak Alert Time** - affects the flood protection facilities of the unit, if the Mikrofill 3 does not register a pressure increase in the system whilst filling for the period set here then it will assume that there must be a leak in the system and alarm, the longer the Lvl 1 Leak Alert setting (which is calculated in minutes) the less responsive the flood protection.
- set at 0.00 to disable Lvl 1 Leak Alert protection.
- **Delay Off** - refers to the amount of time in seconds that the unit will continue to fill the system once the cold fill pressure has been reached, to prevent overshoot or undershoot of the fill pressure - increasing the time prevents undershoot and decreasing it prevents overshoot.
- **Frequent Use Alarm** - warns of frequent filling, which would indicate a system leak, by showing a warning message if in any 24-hour period the unit operates in excess of this value.
- **Delay On** - refers to the amount of time in seconds that the unit will wait before it begins operation once the system pressure has dropped to its cut in point, increasing the setting will reduce the units sensitivity to temporary drops in system pressure.
- **Time & Date** - alters the time and date displayed on the unit.
- **Audible Alarm** - enables or disables the audible alarm when the unit goes to fault.
- **Fault Log** - provides information of the last five registered faults (described in further detail on **pages 13** and **14**), displayed as two letter codes which refer to the following:
 - **MP** - Low Mains Water Pressure when filling.
 - **FS** - Low System Water Pressure (if Leak Alert is **enabled**).
 - **LP** - Low System Water Pressure (if Leak Alert is **disabled**).
 - **HP** - High System Water Pressure.
 - **DR** - Leak Alert due to no increase in pressure whilst filling.
 - **FR** - Frequent Run / Use.
- **Leak Alert** - enables or disables flood protection for the unit, it is highly recommended that this setting is enabled.

FAULT DIAGNOSIS

The Mikrofill 3 has a full self-diagnostic microprocessor unit which continually self-checks its operation. If an internal fault is diagnosed then this will be displayed on the screen in place of the usual status display (described on **page 10**). The message displayed will directly relate to the issue that the unit has registered and will aid in resolving the fault.

If you continue to experience a fault, or are having difficulty in diagnosing the specific cause, then please contact our technical department on **03452 60 60 20** for further assistance.

STATUS / FAULT CONDITIONS

FAULT INDICATION	CAUSE	RESOLUTION
"FILLING STOPPED DUE TO LEVEL 1 LEAK ALERT - CHECK SYSTEM FOR LEAKS!"	The system pressure is not rising due to a leak.	The unit has been filling the system for longer than the Level 1 Leak Alert Time set in SERVICE MODE . The system should be checked for leaks. To reinstate the unit, power it off and back on again.
	The unit is going to fault when trying to fill due to low incoming water pressure.	The unit has been trying to fill the system but has been unable to due to a lack of mains water pressure, causing the unit to go to fault for the duration of the Level 1 Leak Alert Time. Check the incoming mains pressure when the unit is filling (see also "FILLING STOPPED DUE TO LOW MAINS WATER PRESSURE").
"FILLING STOPPED DUE TO LEVEL 2 LEAK ALERT - CHECK SYSTEM FOR LEAKS!"	Low system pressure.	The system pressure has dropped below the Alarm Low setting. Check for leaks and that the Alarm Low has not been set incorrectly (refer to page 12). To reinstate the unit, power it off and back on again.
"FILLING STOPPED DUE TO LOW MAINS WATER PRESSURE"	Low incoming water pressure.	The unit requires a dynamic mains pressure of 0.3 bar or more above its cold fill setting. If the mains pressure usually satisfies this requirement, then the cause of the mains pressure drop should be investigated.
	Blocked inlet ballcock valve filter.	The filter in the included mains inlet ballcock valve should be removed and cleaned to ensure flow into the unit is not being restricted (see page 17 for details).
"FREQUENT USE!"	Possible persistent leak on the system.	If the unit operates more than the Frequent Use set point during a 24-hour period this message will be displayed. This will not stop the unit from operating or trigger the BMS fault relays but it does indicate that there may be a small leak on the system which should be investigated. To reinstate the unit, power it off and back on again.
"HIGH PRESSURE FAULT - CHECK EXPANSION VESSEL!"	High system pressure.	The system pressure has exceeded the Alarm High setting. Drain down and check the air charge of any expansion vessels on the system. Confirm the diaphragm is still intact and check that the vessel is adequately sized. Also check the Alarm High has not been set incorrectly (refer to page 12). This fault will automatically reset when the pressure drops back down below the Alarm High setpoint.
"SENSOR FAILURE"	Possible damaged sensor.	Power the unit off and back on, and the unit will return to normal operation. If the unit displays a '#' in the corner of the display then this indicates that there is still a possible fault. After 10 minutes the unit will recheck the sensors and return to displaying "SENSOR FAILURE" if the issue still remains. Obtain the calibration code for the sensors (as outlined on page 10) and then contact our technical department on 03452 60 60 20 and we will be able to confirm if this is a genuine sensor fault.

continued on page 14...

FAULT DIAGNOSIS

STATUS / FAULT CONDITIONS *continued*.

FAULT INDICATION	CAUSE	RESOLUTION
"SENSOR FAILURE" cont.	Incoming voltage instability.	<p>The sensors use the voltage as a baseline to measure pressure. If the incoming voltage supply to the unit is fluctuating then this can cause the unit to go to "SENSOR FAILURE". If the pressure readings on the display are fluctuating, or the voltage is unstable when measured with a multimeter then there is likely an issue with the supply.</p> <p>The unit can be powered from an alternative source or a power suppressor can be fitted to try and stabilise the incoming voltage to the unit.</p> <p>In either case of "SENSOR FAILURE", the Mikrofill 3 can be put into MANUAL OVERRIDE to stop it from locking out any equipment on-site (described in further detail below).</p>
Water continuously passing through the tundish to drain.	Solenoid valve blocked.	<p>Over time either or both solenoid valves inside the unit can become blocked up with limescale or debris and this can affect their operation. The valves can be taken apart and cleaned, which will most likely resolve the issue.</p> <p>To diagnose which of the two valves is blocked, when the unit is still passing to drain it should be powered off. If the unit continues to pass then the normally closed solenoid valve in the top left of the unit will require cleaning. If the unit stops passing when powered off then the normally open solenoid valve directly above the tundish will require cleaning.</p> <p>For detailed instructions of how to access and successfully clean either valve, please refer to pages 16 and 17 of this technical documentation.</p>
	Solenoid valve or double non-return valve has failed.	<p>If cleaning the solenoid valves does not resolve the issue, then this will mean that either the solenoid valve or double non-return valve has failed and will require replacing.</p> <p>For more information please contact the technical department on 03452 60 60 20.</p>

MANUAL OVERRIDE

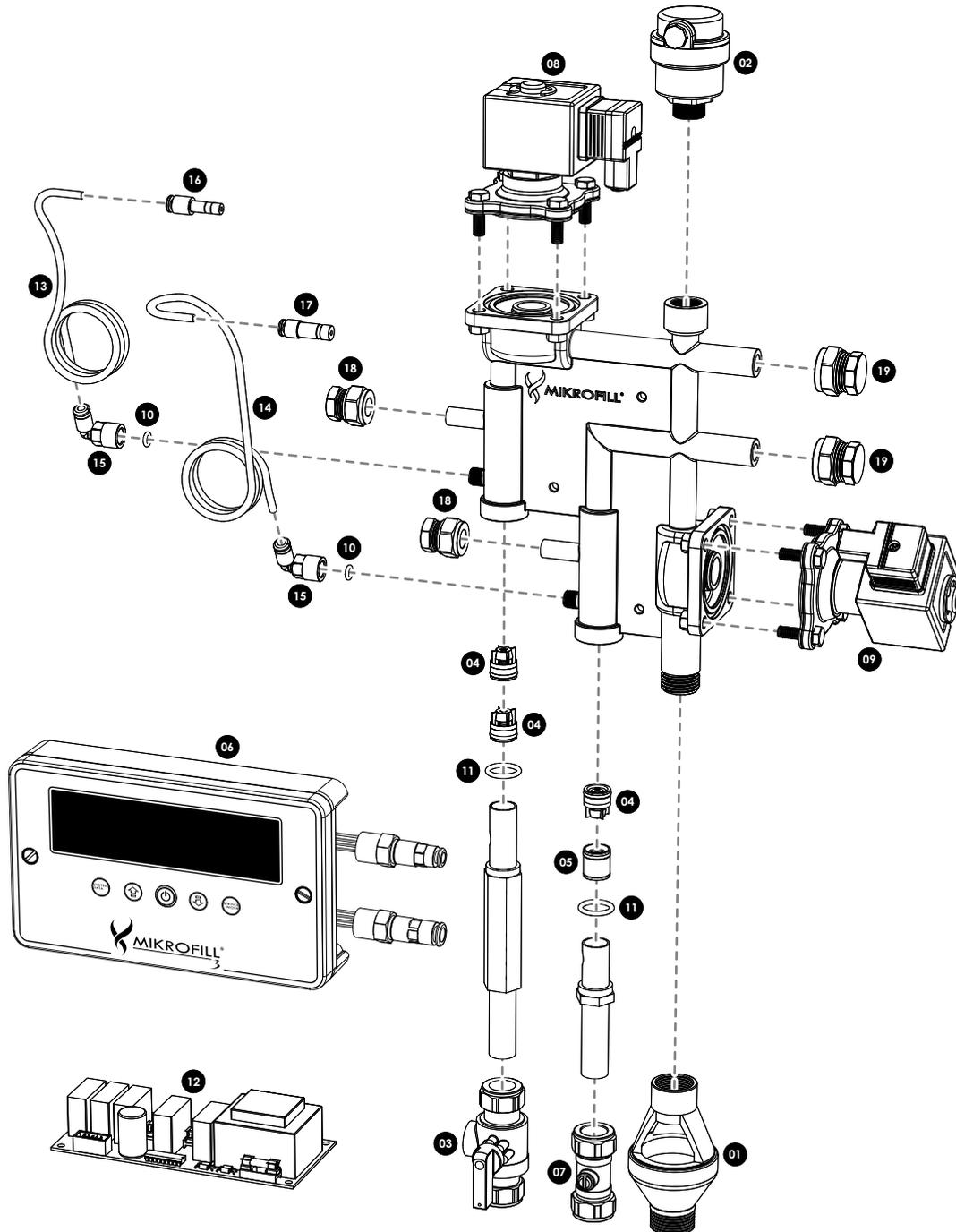
In the unlikely event of "**SENSOR FAILURE**", the Mikrofill 3 may begin to give incorrect readings and could cause alarm conditions. If this occurs, a **MANUAL OVERRIDE** can be employed which will reinstate the BMS relays in the unit, forcing them into a healthy position and preventing the unit from locking out any equipment that the unit has been linked to.

To put the unit into **MANUAL OVERRIDE**, press and hold both the  and  buttons simultaneously for approximately 2 seconds.

Before operating this feature, it must be ensured that there is sufficient pressure in the system. **MANUAL OVERRIDE** must not be employed if the unit has shown a potential leak condition or if there is insufficient pressure in the system.

COMPONENT LIST

Any components within the Mikrofill 3 that may require replacing have been listed in this section, along with their respective part codes. If any part needs replacing which is not listed here, please contact our technical department on **03452 60 60 20** for assistance.



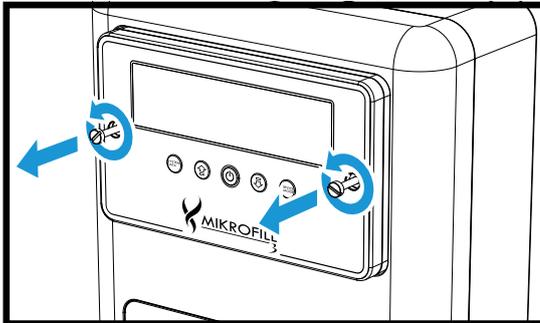
“(PART CODE) PART NAME”:

- | | |
|--|---|
| 01 (EFD000005) ¾" TUNDISH (½" FEMALE x ¾" MALE) | 11 (MK3000034) O-RING (NITRILE) (14.5mm I.D. x 3mm C.S.) |
| 02 (EFD000006) AIR VENT VALVE (¾" MALE) | 12 (MK3000017) PCB (POWER) |
| 03 (EFD000007) BALLOFIX VALVE - INLET (15mm COMPRESSION) | 13 (MK3000028) PIPE - CAPILLARY - INLET (COPPER) (Ø 4mm) |
| 04 (MK3000009) CHECK VALVE (Ø 15mm) | 14 (MK3000029) PIPE - CAPILLARY - OUTLET (COPPER) (Ø 4mm) |
| 05 (MK3000010) CHECK VALVE WITH FLOW REGULATOR (Ø 15mm) | 15 (MK3000019) PUSH FIT - ELBOW (Ø 4mm FEMALE x ½" FEMALE) |
| 06 (MK3000053) CONTROLS ASSEMBLY WITH SENSORS | 16 (MK3000020) PUSH FIT - REDUCER (Ø 6mm MALE x 4mm FEMALE) |
| 07 (EFD000012) ISOLATION VALVE - OUTLET (15mm COMPRESSION) | 17 (MK3000021) PUSH FIT - REDUCER (Ø 8mm MALE x 4mm FEMALE) |
| 08 (MK3000014) NORMALLY CLOSED SOLENOID VALVE | 18 (MK3000024) STOP END (BRASS) (10mm COMPRESSION) |
| 09 (MK3000015) NORMALLY OPEN SOLENOID VALVE | 19 (MK3000025) STOP END (BRASS) (15mm COMPRESSION) |
| 10 (MK3000033) O-RING (NITRILE) (3mm I.D. x 3mm C.S.) | |

MAINTENANCE

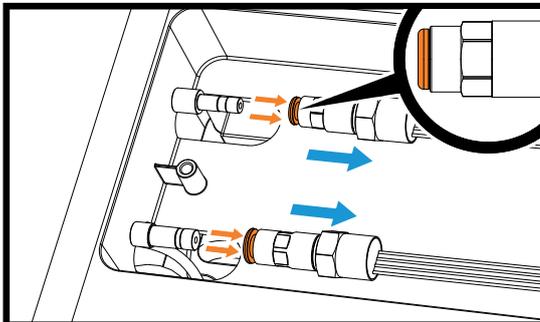
REMOVING THE CONTROLS ASSEMBLY

In the unlikely event of either a sensor or PCB failure, it may be necessary to replace the controls assembly. If this is the case then the unit must first be isolated mechanically and electrically, and then drained down by slackening the top inlet and system valve nuts, allowing any water in the internal pipework of the unit to drain out. Once this is done, the controls assembly may be removed by following the steps listed below.



STEP 01:

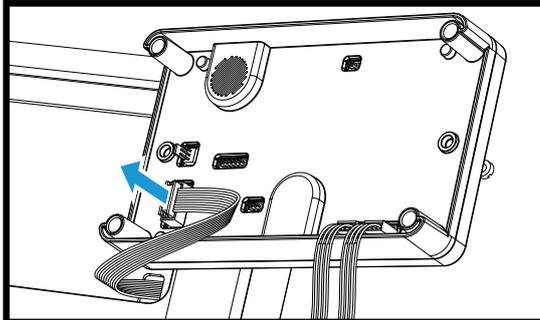
Unscrew the two retaining screws on either side of the front of the controls housing until they are extended enough to be able to grip and pull the control assembly forward and clear of the unit, ensuring not to pull it too far as to damage the wiring still connecting the controls assembly to the main unit.



STEP 02:

Unclip the two push-fit connectors holding the sensors to the pipework fittings.

This is done by depressing the orange retaining clip on the push-fit connector inwards and then pulling the connector and sensor away from the pipework fitting, which should be clipped into a slot in the front casing to hold it in place.



STEP 03:

With both sensors disconnected from the pipe fittings, the ribbon cable should then be removed from the back of the controls assembly. Once this is done, the controls assembly will be completely detached from the main unit and the above steps should be reversed in order to refit or replace the controls assembly back into the Mikrofill 3.

Care should be taken when fixing a controls assembly into the main unit to ensure that the two retaining screws are not over-tightened as this can damage the PCB and / or plastic casings.

CLEANING THE SOLENOID VALVES

Over time either or both solenoid valves inside the unit can become blocked up with limescale or debris and this can affect their operation. The most common indication that a solenoid valve is blocked is a steady flow of water constantly passing through the unit and out to drain.

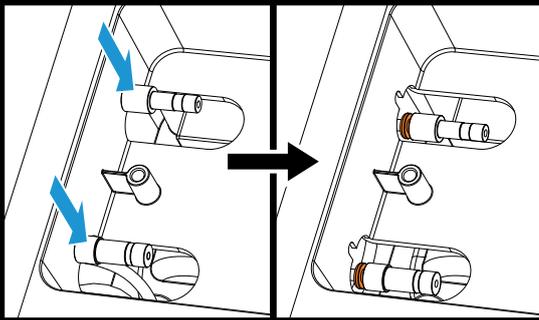
To diagnose which of the two solenoid valves is blocked, when the unit is still passing to drain it should be powered off completely. If the unit continues to pass then the normally closed solenoid valve in the top left of the unit will require cleaning. If the unit stops passing when powered off then the normally open solenoid valve directly above the tundish will require cleaning.

To clean the solenoid valve(s) and stop them passing, the unit must first be isolated and disconnected both mechanically and electrically. The wiring cover at the bottom of the unit is held in position by a single screw which can be removed with a PZ2 screwdriver to give access to the terminal block where the unit can then be disconnected electrically. Once fully isolated and disconnected both mechanically and electrically, the unit can be removed from the wall by unscrewing the slot-head bolt on the topside of the unit and lifting then pulling the unit from its backplate.

With the unit removed from the wall, the steps detailed on the following page will explain how to access and clean out both solenoid valves.

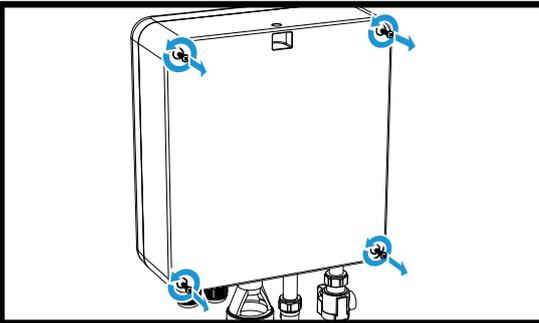
STEPS 01 - 03

First follow **STEPS 01 - 03** for **REMOVING THE CONTROLS ASSEMBLY** detailed on **page 16**.



STEP 04:

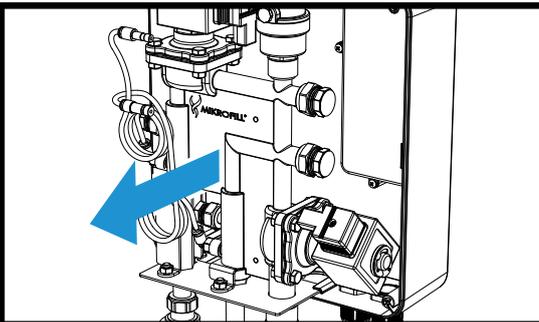
Once the controls assembly has been removed from the unit, the pipework fittings can be gently pushed down to unclip them from their slot in the front casing.



STEP 05:

Turn the unit around and there will be four recessed retaining screws, one in each corner, which can now be unscrewed using a PZ2 screwdriver. This will allow the casing to be opened, though care should be taken as the front and back casing will still be connected together with wiring.

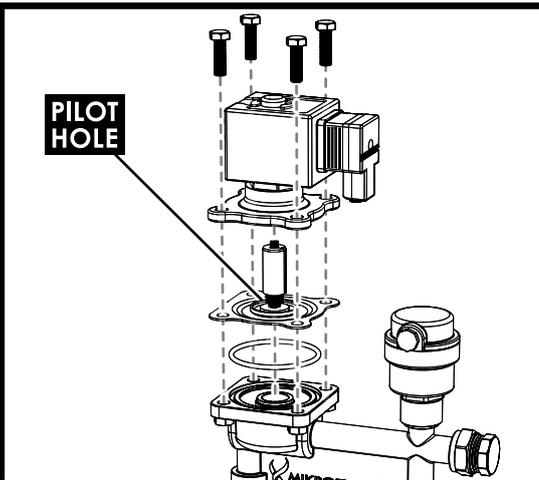
If required, the wiring can be separated using the plug and socket connectors so that the front casing can be fully detached.



STEP 06:

Three PZ2 screws will be holding the manifold assembly in place inside the casing. Unscrewing these will allow the entire assembly to be slid forward out of the casing, granting easy access to the solenoid valves.

Plug and socket connectors will allow the solenoid valves wiring to be separated, detaching the valves and the manifold assembly from the main unit.



STEP 07:

Once the valve to be cleaned has been identified (see **page 14** or **16** for details) the valve head should be removed from the manifold by unscrewing the four bolts using an 11mm spanner or socket. The valve should then be lifted from the manifold body, ensuring the internals are not disturbed in the process.

There is a small pilot hole in the diaphragm which aids in equalising the pressure when the valve opens or closes. This must be cleared of any obstruction. Depending on the valve, there may also be a small brass pin and ferrule in the pilot hole which can safely be removed, ensuring that the diaphragm is not damaged in doing so. The valve and manifold base should then be given a general clean.

To reassemble the unit, **STEPS 01 - 07** should be reversed.

CLEANING THE INLET BALLOFIX VALVE

As part of the annual maintenance for the unit we recommend cleaning the integral basket filter in the incoming ballofix valve to ensure it does not become blocked over time with dirt or debris from the incoming water supply. To do this, the valve must be isolated and the cap on the left hand side of the valve should be removed utilising a flat-head screwdriver. This will provide access to the filter which can be removed using a pair of long nose pliers or similar tool. Once the filter is clean, the cap and filter must both be refitted and the valve reopened.



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DECLARATION OF CONFORMITY

We Mikrofill Systems Ltd. 11 Merse Road, North Moons Moat, Redditch, B98 9HL declare that the Mikrofill 3 pressurisation unit satisfies the essential requirements of the **Electromagnetic Compatibility (EMC) Directive 2004/108/EC** and the **Low Voltage Directive (LVD) 2006/95/EC** and is manufactured in accordance with the harmonised European standard:

BS EN 60730-1:2011

Signed by:

Steven Cherrington

Technical Director

United Kingdom, 28th August 2015

A handwritten signature in black ink, consisting of a series of loops and a horizontal line, positioned above a solid horizontal line.

CE



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