MultiSense Foam Level Controllers and Sensors

Installation and Operation Manual

Includes all systems with controller types MLCF-----

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Version 1.4

CONTENTS

1 SPECIFICATIONS

CONTROLLERS

Power Supply:	AC Versions: 100-250 Vac, 0.5A DC Versions: 24Vdc, 0.5 A
Outputs:	Relay 1 – Not used in this version Relay 2 – Foam Level Control (Volt-free change over contacts) Relay 3 – Alarm Output (Volt-free change over contacts) Rating - 240 V a.c. / 30 V d.c. 3 A max. 4-20 mA for Foam level
Indicators:	Foam Led - Green Pump Led - Yellow Alarm Led - Red
Human Interface (HI):	2 line x 16 character display 6 button membrane keypad Menu system for configuration
Enclosure:	IP65, wall mounting Polystyrene with polycarbonate window 230 wide x 240 height x 260 depth mm Colour Grey (Ral 7035) Connections: screw terminals
Channels:	3-24, typically 8, 16 or 24

SENSORS

Head:	Stainless steel, 80x66x50mm
Connector:	21way (8,16 channels) or 26way (24 channels) LAPP EPIC series R
Diameter:	12 / 24
Length:	250 – 6000 mm
Construction:	316L Stainless Steel, Peek 450G
Seals:	silicon, EPDM, Viton or Perlast
Sections:	3-24, typically 8, 16 or 24
Sensor Cable:	Proprietary multicore cable assembly, 1- 10m long

2 Introduction

The Multisense level control system uses an entirely new type of level sensor. An array of small sensors operate together to give a very accurate form of level measurement. The array typically consists of 8 level sensor electrodes and one termination electrode at each end. The number of sensors can be much larger if the application demands it. Each electrode, or section as they are called, is 30 mm or more in length. The sections work together to measure an array of data, which is used to sense the levels of liquid or foam very precisely and can also be used to measure other data such as interfaces in multiphase systems.

A Multisense controller energises the sensor and processes the data. The controller includes measurement modules called expander boards that can drive a series of sensors. Each expander board drives up to 8 sensors and a maximum of 3 can be fitted to allow up to 24 micro-sensors to be used.

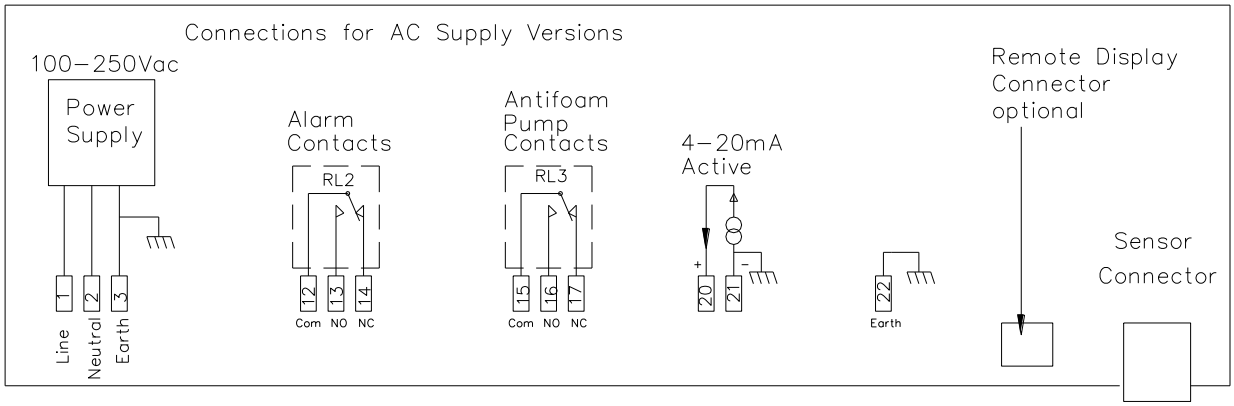
This version of MultiSense is designed to measure and control aqueous foam level. It is designated by the "F" character in the controller part number. (For controllers with part numbers beginning MLCC… please refer to the MultiSense Liquid and Foam manual instead.) The sensor should be installed in the space above the process liquid where foam will build up. In normal circumstances the sensor should not be in contact with the process liquid. If the liquid rises to the sensor it will be interpreted by the system as dense foam. (There are other versions of MultiSense, which can measure both liquid and foam together, in which case the sensor must be in the liquid.)

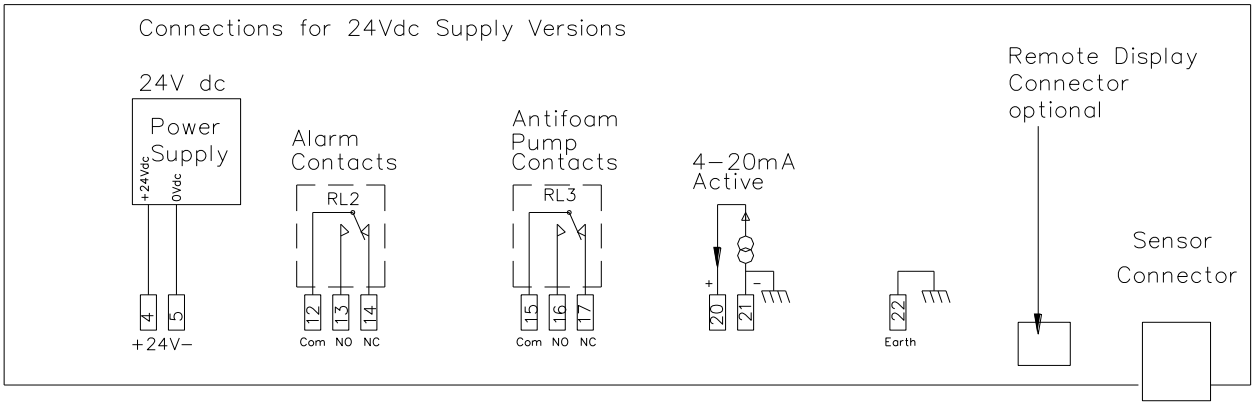
The benefits of the system are:

- High resolution
- Unaffected by temperature and conductivity changes.
- Hygienic and sterilisable
- Solid state – no moving parts
- High immunity to the effects of surface fouling

3 Quick Start Guide

The sensor and controller must be installed correctly as explained in section 5 of this manual. The controller should be connected to the sensor by means of a special cable. The controller terminals are shown in the diagram below. (details can be found in section 5.)





The system will require minimal setting-up and commissioning before use. In most cases the factory set up will be adequate for the initial operation. When the system is powered up initially it should start to sense foam immediately if any is present and transmit a signal via the 4-20 ma output. The 4-20ma range is set to cover 100% of the sensor length. The display reads the foam level in mm from the send of the sensor and % coverage of the sensor.

When foam is sensed the green Led on the top left of the display will light up.

The output contacts are normally disabled when shipped. If a switch output is required the level control relay (RL3) or the alarm relay (RL2) should be set to “auto”. For details on how to do this see section 6.1

If there is foam present but it is not being sensed then the sensitivity should be increased. This is only likely if the foam is very low density. The sensitivity can be increased by reducing the “Foam Threshold” setting in the parameters menu. The default value is 500 when shipped which is adequate for most applications. See section 4.3 for details.

See section 4 on how to carry out a full commissioning procedure.

Testing the sensor in a bucket of foam is quite difficult and is not recommended. However if this is required refer to section 4.7.

If the display seems to “hang-up” showing “wait …” press enter and then esc. This can happen if the buttons are pressed too quickly.

4 Operation

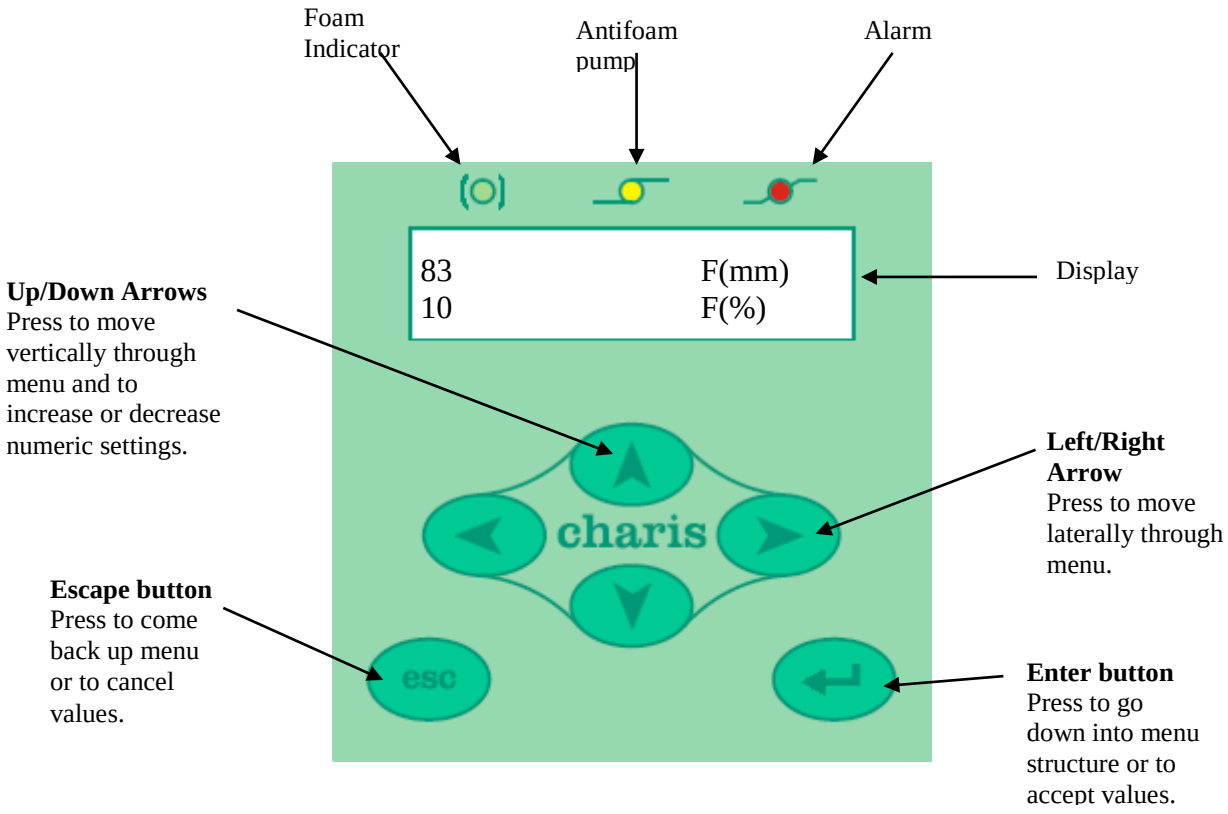
4.1 Powering up

Switch on the power to the controller and after a few seconds the front panel indicators will flash simultaneously as the self-test starts. The controller will then go through 3 initial tests to determine if it is working correctly. The success or otherwise of these tests will be shown on the display and will look something like this.

```
Init. stage1...
Synchro spi ...
```

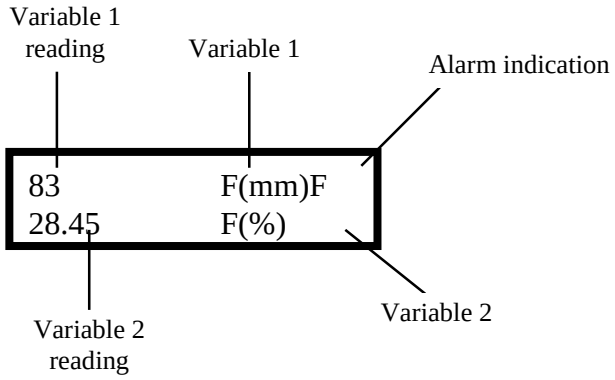
After these tests have been run the display will show the control screen as shown in 3.2 below. The display will show readings from the sensor and enable the user to monitor the situation and determine if any action needs to be taken. If the unit does not seem to do anything or if a "fatal error" is displayed then please refer to the troubleshooting section at the end of the manual.

4.2 Understanding the Control Interface



After power up the display will show the control screen. The control screen is the main operating screen and shows two continually updating readings. The user can set which two readings are displayed.

A typical control screen view is shown below with the variable reading on the left and the variable name on the right.



The variables displayed are selected in the Display Menu (see section 4.4) with variable 1 on the first line of the display and variable 2 on the second line. The resolution of the variable readings (the number of decimal places that are displayed for a numerical measurement) can be changed in the Display Menu with Display Resolution 1 referring to variable 1 and Display Resolution 2 referring to variable 2.

Any two of the following variables can be displayed on the control screen as variable 1 and variable 2.

Typical display reading	**Menu selection**	**Variable**
260 F(mm)	Foam (mm)	Foam height in mm
45% F(%)	Foam (%)	Foam height as %
1.8 K(mS)	conductivity-K	Effective conductivity of the foam in milliSeimens

The alarm indication position will be blank if no alarm has been triggered but will show F for a foam alarm.

The front panel Led indicators have the following functions:

Left – Green	On when foam is sensed
Centre – Yellow	On when foam control contacts operate (e.g. to run antifoam pump is used)
Right – Red	On when an alarm is triggered.

Try not to press the buttons too quickly, as in certain situations the display processor may seem to stick waiting for the main control processor to catch up. The system may seem to get stuck showing the following :

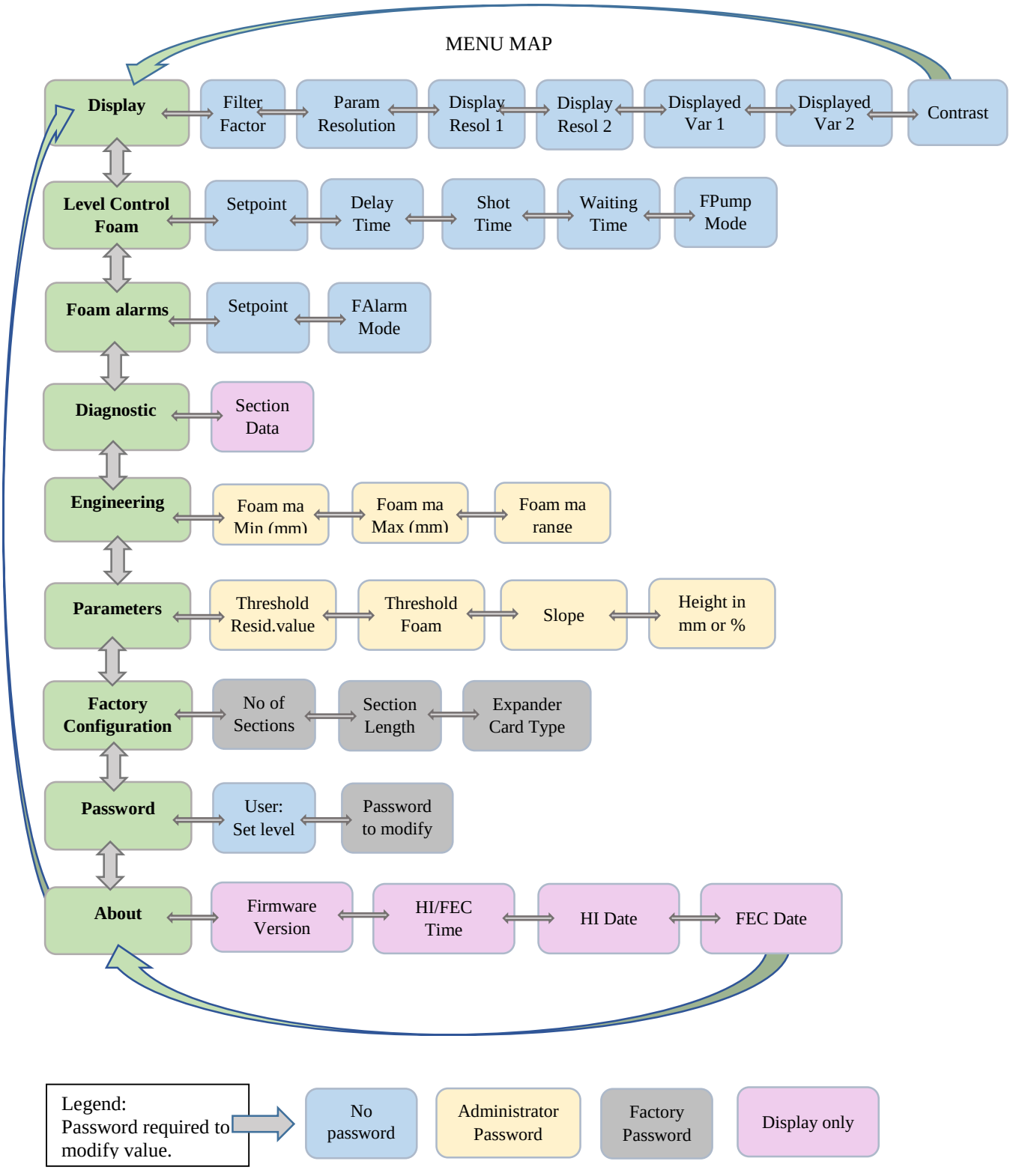
"wait ….."

If this happens then press enter followed by esc. The system should then return to the control screen.

4.3 The Menu System

The Menu system can be accessed by pressing “enter” from the control screen. The menu system is comprised of 9 menus for the normal foam level MultiSense, from which settings can be altered.

The Menu map is shown below



The colours show the level of password required to modify the value of parameter.

4.3.1 Menu Navigation

Navigating the menus is very easy after a short time of use and is mostly intuitive. Describing it is not so easy but instructions are below. To access the menus from the control screen press Enter.
A menu branch is easily recognisable by the presence of "* *" on the display.

1. Use the up and down buttons to scroll through the menus
2. Press enter to select a menu
    a. Use the left and right arrows to scroll sideways through the options.
    b. Press enter to modify an option. A '?' will appear if change is allowed.
    c. Press esc to go back to the menu list
3. Press esc to return to the control screen

In general to go further into the structure press enter and to return backwards press esc.

4.3.2 Modifying Options and Parameters

Make sure you have the access right to modify the option (see section 4.3.3).

1. Press enter to modify an option: a question mark will appear on the right of the screen.
    a. Press up or down to modify the value. Holding an arrow down makes the value move faster.
    b. Press esc to cancel the change.
    c. Press enter to confirm the change.

2. Press esc to return to the previous level.

4.3.3 Passwords

There are three levels of permission:

a) Default: no password required, only parameters shown in normal black text in the menu map above can be modified.

b) Administrator; set-up parameters shown in blue in the menu map can be changed (**p/w 9987**)

c) Factory: Everything can be changed including the basic sensor data. (**p/w 9968**)

After a return to the control screen the permission will be reset to default. This is to prevent someone from accidentally modifying the set-up of the system. The permission will also revert automatically to default after several minutes.

4.3.4 To Change the Permission

To change the permission to *Administrator*, go to the password menu and scroll right to the *"Pwd to modify"* option. Press enter and then use the down arrow key to set **9987**. Then press the enter key. The display will respond by showing "accepted". You can make sure you have successfully logged in by checking that the value of the option "*user*" is *admin*. Once this is done any of the set-up parameters can be modified. It is very important to change the set-up parameters with care. Some parameters are captured by the system automatically and may be difficult to recover if lost.

4.3.5 To Reset the Permission Level

To reset the permission to default (in other word log in as default user), set the option *"Pwd to modify"* to **9999**. You can make sure you have successfully logged out by checking that the value of the option "*user*" is *default*. Alternatively an easier way is to simply return to the control screen, at which point the permission level is reset to default and the password to 9999. However the permission level will return to default automatically after several minutes.

4.3.6 Factory Password

The factory password is normally only used to set-up the controller to match the sensor and some other physical parameters during the manufacture and is not normally required by the end user. The controller must have an accurate record of the dimensions of the sensor for it to process the data from the sensor correctly. The data is stored by entering all the individual section lengths. This is normally carried out in the factory before despatch. The sensor dimensions would normally only need to be changed if the sensor was replaced by one with different dimensions. The controller uses the factory set-up information to calculate height. If it is incorrect then all the readings could be incorrect.

4.4 Menu Functions

Each menu and its function is described in detail in the follow sections

4.4.1 * Display *

This menu controls what variables are displayed on the control screen and how the display appears.

Menu Item	Password to modify	Range	Description
Filter Factor	none	1 - 20	Set the Filter from 1 to 20 to smooth short term fluctuations. 1 gives a fast response, 20 gives a slow response. A typical value is 3.
Param. Resolution	none	0 - 0.001	The resolution used when setting any parameters such as setpoint low, contrast and so on.
Display Resol1	none	0 - 0.001	The number of decimal places displayed for *variable 1*. This does not change the accuracy of the measurements and the displayed resolution can be higher than the accuracy level.
Display Resol2	none	0 - 0.001	The number of decimal places displayed for *variable 2*. This does not change the accuracy of the measurements and the displayed resolution can be higher than the accuracy level.
Displayed Var 1	none	Foam height (mm) Foam height (%) Conductivity -K	The variable that is displayed on the top line of the control screen
Displayed Var 2	none	Foam height (mm) Foam height (%) Conductivity -K	The variable that is displayed on the bottom line of the control screen
Contrast	none	0 - 5	The viewing angle of the display can be adjusted between 0 and 90 degrees with 0 at eye level and 5 at 90 degrees

4.4.2 * Level Control Foam *

Foam Level Control Parameters

Menu Item	Password to modify	Range	Description
Setpoint	none	0 - top of probe (mm)	The height or depth of foam which controls the alarm level
Delay Time	none	0 – 255 secs	Initial delay before contacts operate, to discriminate against splashing
Shot Time	none	0 – 255 secs	Time for contacts to remain closed (e.g. on time of pump)
Waiting Time	none	0 – 255 secs	Time between shots (e.g. off time of pump)
FPump Mode	none	Auto / on / off	Auto = control of level by set-point, on = always on, off = always off.

4.4.3 * Foam Alarms*

Foam Alarm Parameters

Menu Item	Password to modify	Range	Description
Setpoint	none	0 - top of probe (mm)	The height or depth of foam above which the alarm is activated
FAlarm Mode	none	Auto / off	Auto = enable foam alarm, off= disable alarm

4.4.4 * Diagnostic *

Tools for checking raw data which may be useful during set-up and troubleshooting.

Section Data	Display only	Raw data as measured by the individual sensors.

4.4.5 * Engineering *

Sets 4-20 mA output ranges

Menu Item	Password to modify	Range	Description
Foam mA min (mm)	Admin	0 – top of probe mm	The level of foam for the minimum mA output (0 or 4mA)
Foam mA max(mm)	Admin	0 – top of probe mm	The level of foam for the maximum mA output (20mA)
Foam mA range	Admin	0 / 4 ma	Sets Foam mA range as 0-20 or 4-20

4.4.6 * Parameters *

Various set-up thresholds to set measurement configuration.

Menu Item	Password to modify	Range	Description
Threshold Risid. value	Admin	1-5000	Noise level of section data. Default = 100. Below this threshold the data is not significant.
Threshold Foam value	Admin	1-5000	Threshold to discriminate foam. Data exceeding this value is seen as foam. Default 600
Slope	Admin	0 – 20	Foam profile %/cm content of foam. Used to estimate height of foam on partially covered sections.
Mode	Admin	% / mm	Foam Level control and alarm can be set to % height or mm.

4.4.7 * Factory Configuration *

Menu Item	Password to modify	Range	Description
No of Sections	Factory	2 - 24	The number of active sections in the sensor
Section Length	Factory	10 – 255 mm	The length of each section in the sensor in mm
Expander Card	Factory	V 4.2	This should always be V 4.2 except on versions before 31/06/07

4.4.8 * Password *

Allows change of the permission level by entering a password.

User	none	Indicates which permission level is set. Default, Admin or Factory.
Pwd to Modify	Admin or Factory	Enables the user to modify parameters by entering the admin or factory password.

4.4.9 * About *

Describes the firmware version levels used in the controller

Functionality	Display only	Va200 or Va201 (Va200 is for liquid only, Va201 for liquid and foam
HI/FEC Time	Display only	Compilation time
HI Compile Date	Display only	Compilation date for display interface
FEC Compile Date	Display only	Compilation date FEC board
About	Display only	Company name

5 Commissioning

5.1 Introduction

Ensure that the sensor, the controller and the interface are installed correctly and that they are connected together as indicated on the schematic in section 6.4. Also ensure that the correct power supply has been connected, either 90-230Vac or 24Vdc depending on the version supplied.
The controller can then be powered up. When power is first applied all the front panel lights will flash as the self-test begins. The initialisation of the module requires few minutes. The display will show the following sequence: -

Init. Stage 1…..
Init. Stage 2 ….
Init. Stage 3 …..

After which the display should revert to the control screen which will look similar to this: -

<0	F(mm)
<0	F(%)

If the self-test does not terminate, or nothing appears or if a "fatal error" message is displayed then refer to the troubleshooting section at the end of the manual.

5.2 Factory Configuration

The *factory configuration* menu is set up initially before the instrument is shipped and is used to match the controller to the sensor. This sets the number of active sections in the sensor and the length of each sensor. The typical number of sections is 8 but there are sometimes more or fewer. The length of each section on the sensor must set in the controller for the height measurement to be correct. If the sensor is replaced with another of a different length then the controller settings have to be adjusted accordingly.

It is worth checking initially that the section lengths have been set up correctly by the supplier to match the particular sensor being used. This can be done by accessing the factory configuration menu and checking the displayed figures in the "Section Length" menu. This does not require a password unless the settings require to be changed, in which case the factory password is required. (see section 3.4.3)

Please note that section 0 is a special section, which acts as a terminator for the sensor. It is not just passive and is required for the correct operation. The controller needs to know the length merely so the measurement in mm can be referenced to the end of the sensor.

5.3 Setting Up the Controller

Setting up the system may not require very much adjustment depending on the interfaces used. Some interfaces need to be enabled as follows:

- Foam Control (antifoam pump) output – RL3 – if this is used it should be enabled by setting the "FPump Mode" option to "auto". (see section 6.1 for more details)

- Foam Alarm output – RL2 - if this is used it should be enabled by setting the "FAlarm Mode" option to "auto" (see section 6.2 for more details)

- Analogue output – 4-20mA – this is set in the factory to cover the whole range of the sensor. The range can be compressed if required by using the mA min & mA max options in the engineering menu. This interface cannot be disabled but always operates. (see section 6.6 for more details)

The system should now operate in most applications. But note the following comments:-

If the foam level control output is used (via the "anti-foam contacts") then the setpoint should be set to a suitable value in the "Level control Foam" menu and the output must be enabled by setting the FPUMP mode to "Auto". (see section 6.1). This is the height at which foam is to be controlled and is often done by means of antifoam addition.

The setpoints can be set as height in mm or % sensor range. This can be changed using the parameters menu (see section 3.4.6) If this is changed then the setpoints and 4-20ma range will change units. If this mode is changed the values set may change and need to be corrected. (note both mm and % can be displayed on the control screen at the same time but the setpoints & 4-20ma range must be one or the other)

The foam sensitivity (Foam Threshold) is set when shipped to the default value which will be suitable for most applications. However for very dense or very light foam this may need to be adjusted. For instructions on this see section 6.3).

5.4 Testing

Once the system is installed correctly and set-up it can be tested.

Please note that it is <u>not</u> a good idea to try to test the sensor in a bucket of foam.

It is very difficult to test the sensor in a bucket as the foam will drain very quickly and therefore will not be the same as in the process. Also as the sensor relies on the wall of the vessel as part of the measuring process it is necessary to use a metal bucket which is connected to an earth return.

The best way to test the sensor is to allow foam to be generated in the process and compare the foam level displayed on the display with a visual inspection. If this is not possible then it may be necessary to wait until foam is produced and to monitor the system at that time. There is no simple way to simulate foam at the sensor for a test.

Ensure that the connections between the Multisense controller and the rest of the process are operating correctly.

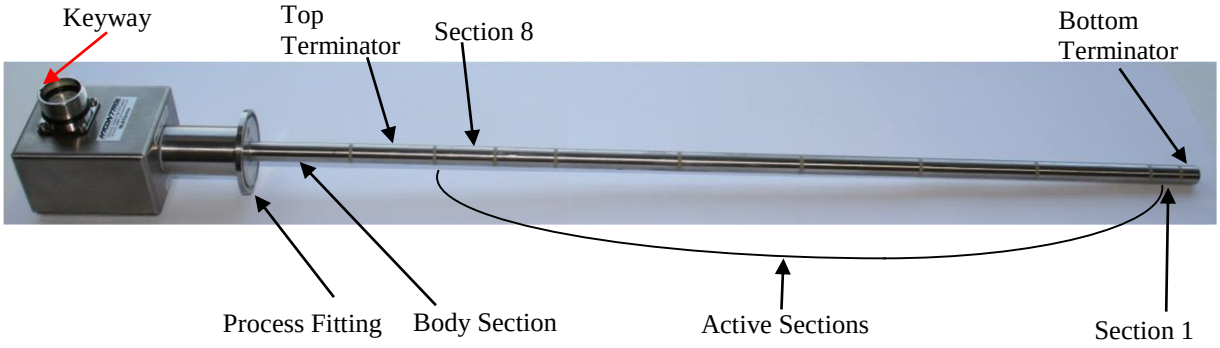
6 Installation

The system must be installed correctly for it to function properly. Please refer to the sections below and the schematic drawing for the correct installation procedure.

6.1 Sensor Installation

The sensor should be installed in the vessel in a secure position so that it cannot move during use. Any vertical movement will result in errors in the volume measurement. The sensor usually has a fitting to secure into the vessel and which also connects the body of the sensor to the vessel to connect it to earth. The orientation of the sensor must be vertical or very close to vertical to ensure the best accuracy.

It is essential that no active sections including the terminators come into contact with any metal parts or the sensor will suffer a short circuit and not work.

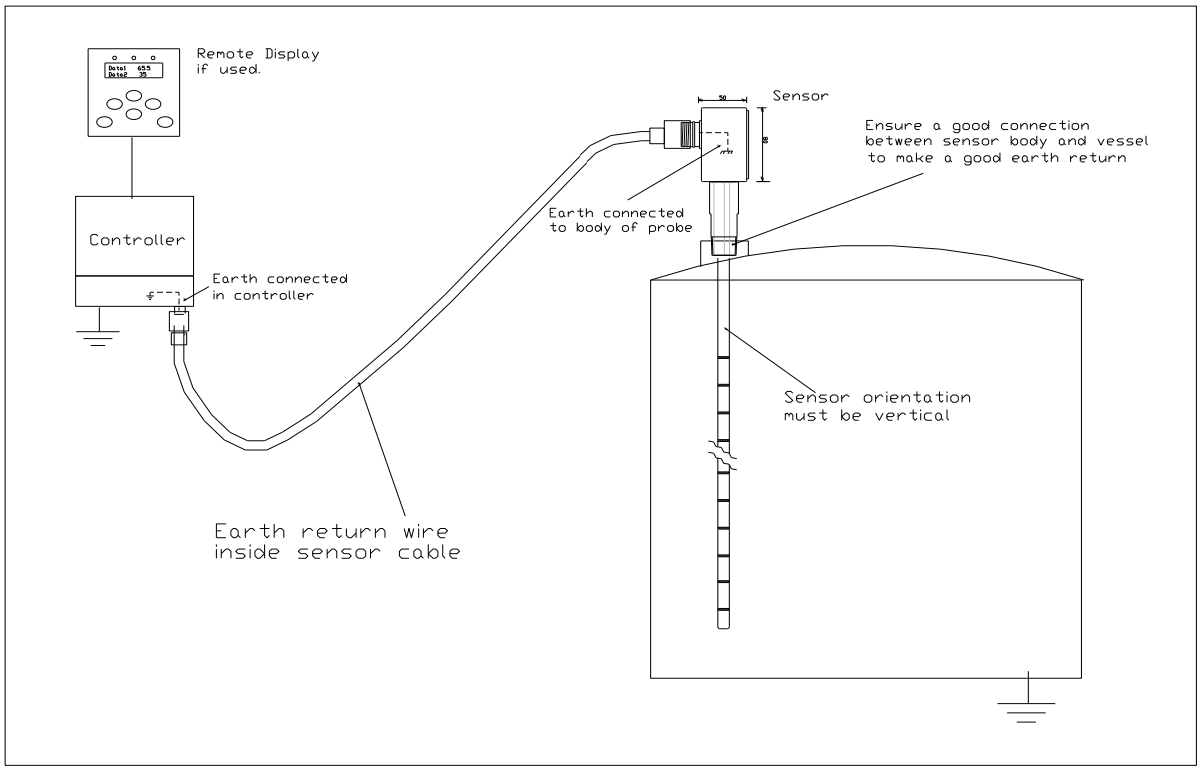


The sensor topography is shown in the photograph above. The process fitting fixes the sensor to the process tank. It also connects the earth in the sensor to the tank structure which will normally be connected to earth. The body section is connected to the process fitting and so is also connected to earth. However none of the other parts of the sensor may connect to any part of the tank. The number of active sections can vary up to 24. The sensor above has 8 sections which is the most common configuration.

The sensor cable should be connected carefully to the sensor head by aligning the connector. There is a key on the plug that should be aligned with a keyway on the socket. The connector should be secured by tightening the retaining ring. This only required to be hand tight – do not use a tool for this, but it must be fully screwed in to ensure all the pins connect properly. Note that the sensor cable is marked for the sensor at one end and the controller at the other. Although the connectors are identical the wiring is not.

An earth return path is required from the vessel to the controller. This is incorporated into the sensor cable so a separate earth cable is not required as a signal return. However it is essential that the sensor fitting or body makes a good contact with the vessel. This normally happens through the process fitting but if any plastic parts are used it may be necessary to bond the sensor body above the fitting to the vessel. (contact supplier for advice)

Note the diagram below which illustrates the earth return requirements.



6.2 Controller Installation

The controller is usually supplied as an integrated unit with the display interface (or Human Interface – "HI") in the front panel. However it is possible to have a separate HI unit which can be mounted remotely on the front of a control panel.

The controller itself is mounted using brackets fitted to the rear. The brackets have two parts, one that can be screwed to a wall or back panel and the other that attaches to the controller. The controller then slides onto the wall brackets and is attached with small screws that are inserted sideways into the brackets, between the wall and the controller. This is shown in the picture below:

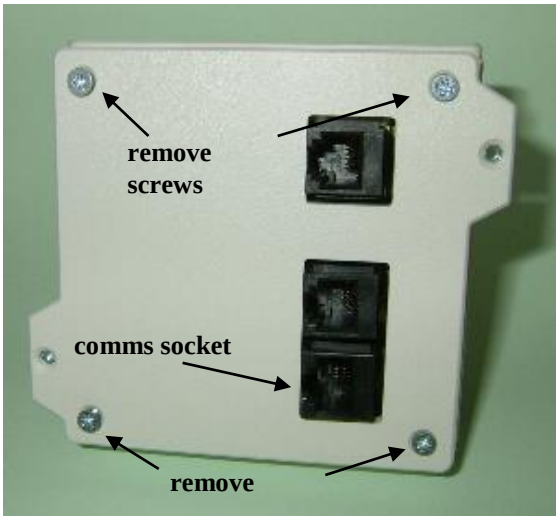
MLCCI08BN Controller
With integrated display interface

Mount wall brackets and then fit controller

Secure controller to brackets by tightening screws.

Integrated display option

Remote display option



6.3 Remote Display Installation

When the display interface is used remotely from the controller, it needs to be installed separately. The display (or human interface HI) is designed to fit a 92 x 92 mm panel cut out. It can be fitted by unscrewing the back cover of the display and placing the unit through the cut out and then reattaching the back cover on the inside of the panel. The unit is then secured on the panel by inserting screws on the two tabs and tightening them against the panel. Do not over-tighten. A comms cable then needs to be connected between the comms socket shown and the controller. The comms socket on the controller is next to the sensor connector for those units supplied with the remote panel option.

Note the photographs above showing the mounting arrangements.

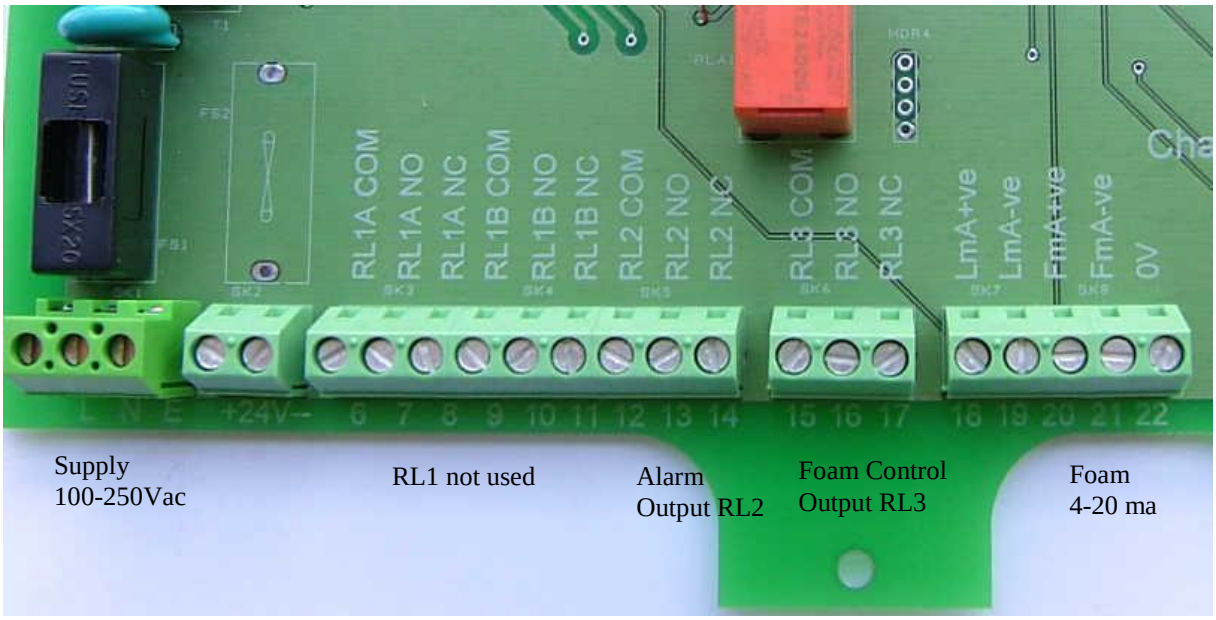
6.4 Cabling to Controller

The cabling has three parts:

- Sensor cables
- Power
- Interfacing

It is essential that a suitable type of cable is used in all cases.

The connections are all accessible inside the terminal housing, at the bottom of the controller. The terminals should be slackened with a small screwdriver to enable the wires to be fitted easily. The terminals for the AC supply option controller are shown in the picture below.



Terminals for AC Supply Versions.

Terminal No	Function	Terminal No	Function
1	Line Supply 100 -250Vac	12	Alarm common contact
2	Neutral	13	Alarm normally open contact
3	Earth	14	Alarm normally closed contact
4	Not used	15	Foam Control common contact
5	Not used	16	Foam Control normally open contact
6	Not used	17	Foam Control normally closed contact
7	Not used	18	Not used
8	Not used	19	Not used
9	Not used	20	Foam level 4-20 mA output +
10	Not used	21	Foam level 4-20 mA output -
11	Not used	22	0V return – for earth to vessel.

Terminals for DC Supply Options.

Terminal No	Function	Terminal No	Function
1	Not used	12	Alarm common contact
2	Not used	13	Alarm normally open contact
3	Not used	14	Alarm normally closed contact
4	+ 24 Vdc	15	Foam Control common contact
5	0 Vdc	16	Foam Control normally open contact
6	Not used	17	Foam Control normally closed contact
7	Not used	18	Not used
8	Not used	19	Not used
9	Not used	20	Foam level 4-20 mA output +
10	Not used	21	Foam level 4-20 mA output -
11	Not used	22	0V return – for earth to vessel.

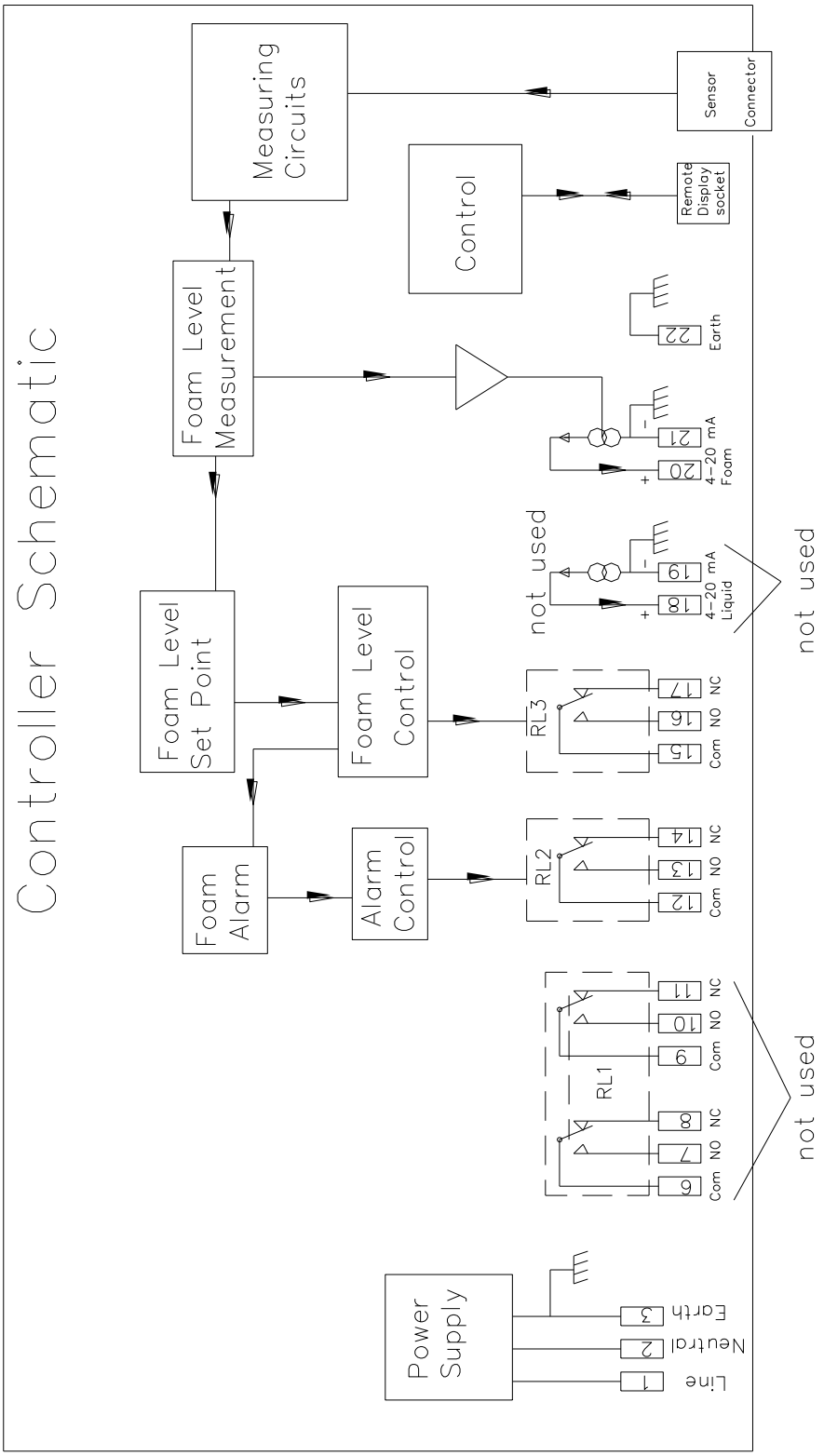
The supply cable must be suitable for the appropriate supply used e.g. 100 - 230Vac. Please ensure that the power is connected to the correct terminals and no loose wires can make contact with any other terminals.

The sensor cable can be routed as required but should not come into contact with any hot pipework as this may cause damage. An earth return cable is now provided inside the sensor cable loom connected to the body of the sensor, to provide a signal return from the vessel to the controller. (Previous versions required a connection to the vessel with a separate wire). This earth cable ensures a good signal return path from the vessel but is not intended to carry fault currents, so the vessel should be bonded to earth for safety in the normal way. The sensor cable is fitted to the connector on the controller in the same way as at the sensor. However note that the cable must be fitted the correct way. The end for the controller is marked “controller”. If the cable is reversed the controller may not be able to make anything.

The interface cabling required depends on the application. The relay outputs are volt-free and can be connected to any voltage up to 230Vac. Alternatively, these can be used with d.c. voltages if required. The rated current is 3 amps. The cable used must be suitable for the voltage and current chosen.

The 4-20 ma outputs can be used to send an analogue signal for the foam level. This is an active signals and does not require an external supply. It is not isolated, and the return is at earth potential.

Please note the schematic diagram below which shows the various functional blocks available and the way the outputs connect.



7 Foam Level Control & Measurement

7.1 Controlling Foam Level

The foam level controller can be used to control foam by connecting directly to an actuator such as an antifoam pump. Alternatively it can be connected to a process controller. The controller uses a set point which when exceeded causes and an output to be generated. There is a dosing function, which can be used to regulate the operation of an antifoam pump, or a valve.

Alternatively the analogue output (4-20mA) can be connected to a process controller which in turn can control a mechanism for dispersing foam.

When the foam rises to the setpoint the output contacts operate (volt-free contacts) and the centre (amber) led lights. The contacts are driven by the dosing function in a shot and delay mode to enable antifoam to be added to best effect. The dosing function is adjustable by means of 3 separate time functions described below.

To use the Foam level control outputs the *FPump mode* function in the foam control menu should be set to *Auto*.

The *Fpump mode* has the following actions:

- FPump mode = “on” - pump is always on. (useful for testing or priming)
- FPump mode = “off” - pump is always off.
- FPump mode = “Auto” – pump is controlled by level in relation to the set point.

The *FPump AutoMode* has the following functions:

- FPump AutoMode = Depth (mm) - foam is managed by depth.
- FPump AutoMode = Height (mm) – foam is managed by its absolute height.

The dosing function is defined as follows:

Delay time: - time after the foam exceeds the set point before the pump starts to operate. This avoids splashing
from activating the antifoam pump.

Shot time: - run time of the pump.

Waiting time: - off time of pump, i.e. time between shots.

The FPump mode does not need to be set if only the analogue output is being used.

7.2 Foam Alarm

The foam alarm operates in a similar way to the foam level control but has no dosing function. It can be used as a control output or as a high alarm. The alarm output (volt free contacts) operates when the foam level exceeds the setpoint. An “F” character appears on the right side of the screen to show that a foam alarm has been generated. When the foam falls below the setpoint the alarm automatically clears itself. The alarm led on the display also lights (red right most led) when there is a foam alarm. To enable the foam alarm the *FAlarm mode* should be set to “Auto”. See section 4.4.3

The *FAlarm mode* has the following actions:

- FAlarm mode = "off" - alarm is always off.
- FAlarm mode = "Auto" – contacts are controlled by foam level in relation to the Alarm set point.

7.3 Sensitivity Adjustment

The factory setting for sensitivity will usually be suitable but sometimes it may be necessary to change this for unusual applications (e.g. very low density foam). The sensitivity to foam can be adjusted using the Foam Threshold setting. This can be accessed in the *Parameters* menu after setting the Administrator password. Please note that there are two threshold settings in this menu as follows:

Threshold Residual - sets basic threshold for noise level in instrument. (typically 100)

Threshold Foam - sets sensitivity for foam detection. (must be > residual)

The actual value is the measurement in micro-amps x10 which starts to indicate foam. For example 100 =10uA Once the measurement on a section exceeds this value then the controller judges that foam has reached that section.
The value can be set close to but must be above the residual value. To increase the sensitivity reduce the foam threshold.

If the value is set too small the high sensitivity may result in spurious signals, (noise or fouling etc) could trigger the controller and the measurement of foam will be too high. If the value is too large then light foam may not be sensed at all.

The optimum setting depends on the nature of the foam but is likely to be about 500 in most cases. Usually the default setting will be suitable for most applications.

The data from the sections can be measured in the diagnostic menu to help with setting the sensitivity. The data measured at each section shows the response of each micro-sensor. The measured data value must be larger than the foam threshold to be interpreted as foam at that sensor. The section data can also be used to determine the foam profile to show how the foam varies up the height of the sensor.

7.4 Slope Setting (Foam Profile)

The slope setting is used by the height measurement function to interpolate the height of foam within an individual section or micro-sensor. Foam is not a homogeneous material and will normally be denser closer to the liquid surface. As foam rises there is a natural drainage effect and liquid runs down from the top of the column back to the liquid surface. This means that foam at the top of the column will be much lighter (i.e. lower liquid content) that at the liquid surface.

The sections measuring foam height will not be entirely linear in response. The height measurement algorithm uses the slope factor together with the response of the section below to calculate the height of foam within an individual section. The measurement will be most accurate at the bottom of the section and least accurate at the top. The slope factor is within the parameters menu and is set in the factory to an average level.

If the slope setting is set too small the measure foam level will appear to jump up as the foam crosses a physical junction between sections in the sensor. If the value is too large the foam will appear to jump down as the foam crosses a junction. It is impossible to make this completely accurate as the foam will vary from time to time and also often does not have a flat top to the column. The height measurement algorithm "knows" the position at the start of each section so the foam height will be constantly recalculated as the foam crosses each junction as it rises or falls.

7.5 Measurement Units Height vs. %

The control mode for the liquid level control can be set to height or volume. This results in all the corresponding parameters and secondary units changing. In the Volume mode the Reference height and reference volume are used to calculate the volume. In the Height mode the reference volume and height have no use and are set to zero. However these values are stored and will reset if the mode is returned to volume.
high and therefore see changes that may not be significant.

7.6 Setting-Up the Analogue Output (4-20 mA)

The 4-20 ma range can be adjusted in the *Engineering* menu. The following adjustments are possible: -

Foam mA min.: - This is the value in % or mm which corresponds to the minimum output i.e. 0mA or 4 mA

If the controller is set to operate in % units then this parameter will be in %
If the controller is set to operate in mm units then this parameter will be in mm.

Foam mA max.: - This is the value in litres or mm that corresponds to the top of the mA range i.e. 20mA.

The value will be in % or mm.

Foam mA range: - Sets the mA range as 0-20 or 4-20 as required.

The default setting is 4-20 mA corresponding to 0-100%. However this can be changed using the Administrator password to expand or contract the range.

Note that the mA output is not isolated and the negative side of the signal is at ground potential. The maximum resistance the output can drive is 500 ohms.

8 Troubleshooting

Symptoms	Possible Causes
Display “sticks” at wait……	Keys pressed too fast. Press enter to return to display menu. If remote display used, comms cable connection faulty.
Display does not respond at power up	Circuit boards shaken loose during transit. Remove front panel screws, slowly ease front panel forward to gain access. Push the three main boards into enclosure.
“Fatal error” message	“Expander” board fault. Check right hand board is connected properly. Note do not touch components on this board unless using an electrostatic wrist-strap.
Foam is present but is not sensed by the system.	1. check sensor is connected to controller 2. increase the sensitivity setting by reducing Foam Threshold in parameter menu (see section 6.3) 3. Check the earth is connected between the sensor fitting and the tank. 4. Check the cable is not reversed. The end for the sensor is marked “sensor”.
Foam is shown on display but antifoam pump does not run.	1. check that FPump Mode is set to “auto” 2. check cabling from terminals 15 & 16 in controller
Foam is above alarm setpoint but the output does not activate.	Check that Foam alarm is enabled (see section 6.2)
Foam is shown on display but none is actually present.	The sensitivity may be too high. Increase the Foam threshold setting to reduce the sensitivity.
Rising foam appears to jump down as it crosses each junction.	Slope setting in Parameters menu is too large. Reduce the value.
Rising foam appears to jump up as it crosses each junction.	Slope setting in Parameters menu is too low. Increase the value.