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ORAKEL Non-Contact Flow Monitoring System

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ORAKEL Non-Contact Flow Monitoring System

1. Safety Precautions

The safety instructions contained in this manual must be observed. The owner is responsible for ensuring compliance with local safety regulations. Before attempting to unpack, set up, or operate this instrument, this entire manual should be read.

The owner must ensure that all maintenance, inspection and installation work is undertaken by authorised and duly qualified personnel who have also studied this manual and are suitably qualified for this work. The areas of responsibility, competence and supervision of the personnel must be precisely defined by the owner. Personnel who do not have the required know-how must be trained and instructed. If required, this can also be undertaken by Detectronic (or their approved distributor) on behalf of the owner. In addition, the owner of the system must ensure that the relevant personnel are fully familiar with and have understood the contents of this manual.

Failure to comply with the safety instructions may endanger not only people, but also the environment and the unit. The following hazards in particular may arise:

- Failure of major unit functions
- Failure of specified methods for maintenance and repair
- Danger to people due to electrical, mechanical, and chemical effects
- Damage to the equipment

Users should be aware of the following before beginning to undertake installation or maintenance:

1. Usage other than as described in this manual will lead to the immediate cancellation of the warranty and any other manufacturer's liability
2. The ORAKEL **must** always be isolated before starting any work
3. The ORAKEL may be controlling chemical dosing or pumps. As such, shutting down the ORAKEL without due regard to the systems it is controlling can lead to chemical release or pump failure
4. The device may **not** be modified or converted without consultation with the manufacturer
5. Genuine spare parts and accessories authorised by the manufacturer ensure greater safety
6. Children are not permitted to use this product

7. Equipment should be unpacked with the accessories ordered carefully in order not to misplace small parts. Immediately compare the scope of delivery to the delivery note. If there are any discrepancies, users should contact their supplier
8. When working with this equipment, the accident prevention regulations applicable on-site **must** be observed and the specified personal protective equipment worn
9. The Orakel Analyser/Control unit is not an ATEX Certified product and should not be installed in a potentially hazardous environment. Should attached ATEX sensors need to be installed in a potentially hazardous environment, a Galvanic Isolator should be used

During installation and maintenance, the following instructions must also be undertaken:

1. The unit **must** be disconnected from the power source before attempting to service or remove any component
2. The unit **must** be disconnected from other sources of force or pressure (for example, pneumatic or hydraulic), before attempting to service or remove any component
3. To prevent risk of electric shock:

- Connect only to a suitable isolated hard wired electrical outlet
- Replace damaged electrical cables immediately
- Do not use an extension
- Do not bury the electrical supply cable
- The outlet should be in compliance with all local electrical regulations. It is recommended that the outlet is protected by an RCD (Residual Current Detector)

4. Should the sensors attached to the ORAKEL be in contact with hazardous chemicals, great care must be taken when handling the sensors

2. Overview

The ORAKEL System measuring both water flow and water quality at the same time. Created as a modular system, a wide range of water quality sensors can be added to measure various characteristics, such as pH, COD, and suspended solids.

Optional comms packages allow Profibus, Modbus ASCII, Modbus RTU, Modbus TCP, 4-20mA analogue outputs and relays for alarms and control.

The ORAKEL Non-Contact Flow Monitoring System is designed as a complete system for the monitoring of the flow of waste water or industrial effluent where a submerged sensor would be inconvenient or undesirable. Due to being non-contact, the ORAKEL doesn't physically come into contact with water, instead being placed above it and sending an Ultrasonic signal down to water level. The system comprises three elements:

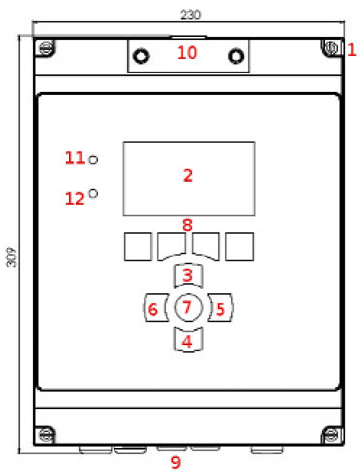
1. ORAKEL analyser
2. Ultrasonic Level Sensor
3. Radar Velocity Sensor

4-20mA analogue outputs and relays can be connected to control and monitoring equipment and dataloggers. Detectronic can provide a full data monitoring package allowing users to access the latest data online, for further details users should contact their Detectronic sales representative.

2.1 ORAKEL Analyser

Every analyser is carefully checked before leaving the factory. If for any reason, users are unhappy with their purchase, it is recommended that they contact the organisation the analyser was purchased from or Detectronic Limited directly.

Diagrammatic Overview:



Label	Component
1	Front panel screws (x4)
2	Display
3	Up Button
4	Down Button
5	Right Button
6	Left Button
7	Enter/Select Button
8	Soft Keys
9	Cable Glands
10	Micro SD Access
11	Power Lamp
12	Indication Lamp

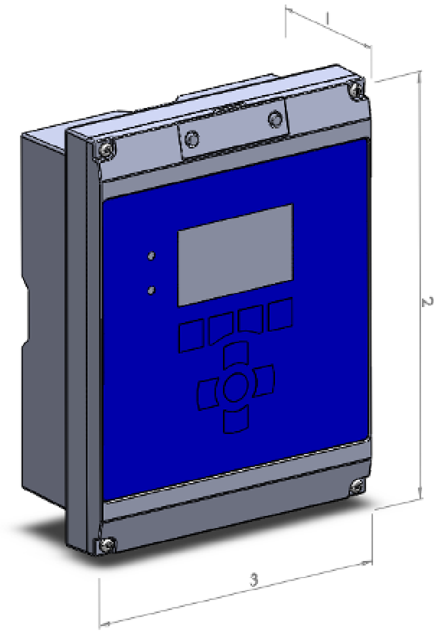
Specifications:

Power: 100-240VAC/0.25 A or 12VDC/0.8 A
Fuse: 2A (100-240VAC)
Display: 4.3” 480x272 24-bit colour

Inputs: Up to 4 configurable sensor inputs; 4-20mA loop-powered.
Outputs: Up to 6 dedicated configurable analogue outputs: 0-20mA, 4-20mA, 0-1 VDC, 0-10 VDC, 1-10 VDC. 2 SPST electromechanical relays rated 10A at 125 VAC, 3A at 250 VAC, 5A at 30 VDC
Status Log: Over 1 million records
Data Log: Internal Single parameter data log or status message log over 1 million records
Weight: 2kg
IP Rating: IP65, Nema 4X
Enclosure Material: ABS flame retardant
Seals: EPDM

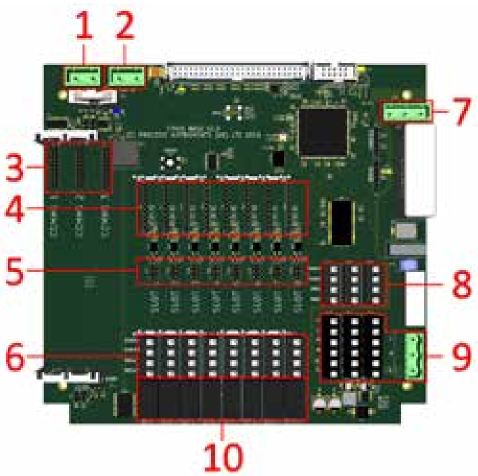
ORAKEL Dimensions & Installation

A diagram of the ORAKEL dimensions is shown below:



1. 103mm
2. 309mm
3. 230mm

A diagram of the ORAKEL's electrical connections is shown below:



Label	Component
1	Auxiliary power from secondary PSU
2	12V input from main PSU
3	Communication card slots
4	Sensor and output card slots
5	Digital input configuration jumpers
6	Relay and digital input connectors
7	AC power to main PSU
8	Auxiliary power out
9	AC power connectors
10	Electromechanical relays

Connections to the board are made via 'press to open' connectors. An insulated Screwdriver, or the plastic tool provided, can be used to operate the connector.

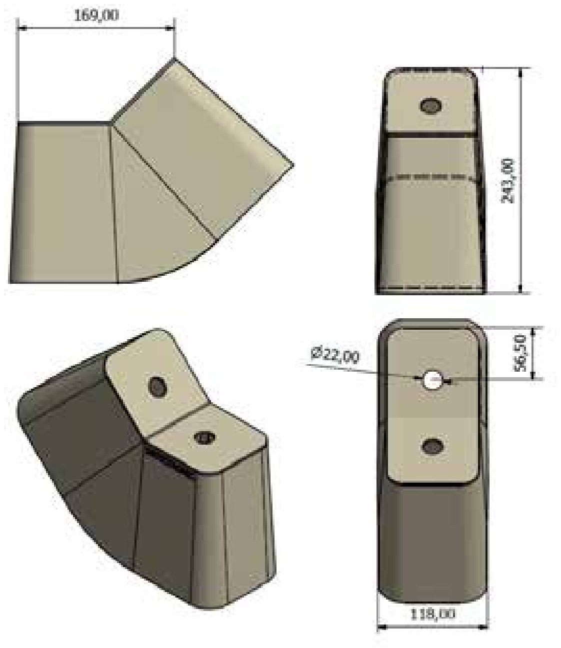
2.2 Ultrasonic Level Sensor

The ORAKEL Non-Contact Ultrasonic Level Sensor is a sophisticated ultrasonic level measurement system which provides non-contacting level measurement for a wide variety of applications in both liquids and solids. Its unique design gives unrivalled performance in echo discrimination and accuracy in a loop-powered device.

The Ultrasonic Level Sensor is certified for use in hazardous area installations with either Ex mb or ATEX certification. With the use of a Galvanic Isolator, the Velocity Sensor is also ATEX approved for use in Level 1 hazardous areas.

The Ultrasonic Level Sensor operates on the principle of timing the echo received from a measured pulse of sound transmitted in air and utilises the latest echo extraction technology. It has a range of from 0.125m to up to 3.00m, though this can be tailored to fit specific sites at the factory.

The Level and Velocity sensors are supplied in a plastic shroud which protects the sensors from direct sunlight and prevents errors due to temperature changes. The dimensions of the sensors are shown below, along with the shroud held between the sensors and the stainless steel mounting bracket:



2.3 Velocity Sensor

The ORAKEL Non-Contact Radar Velocity Sensor is a 2-wire loop-powered non-contacting Velocity Sensor with hazardous area approval. The sensor provides reliable flow velocity measurements using short pulses of micro-waves, which are transmitted by an enclosed antenna. When reflected off a moving surface, the signal experiences a shift in frequency characteristics. The reflected signal is captured by the on-board microprocessor via the antenna and analysed to determine the velocity.

Benefits to using the Radar Velocity Sensor:

- Non-contact velocity measurement
- Loop powered and ideal for remote monitoring
- Low-power consumption

- Hazardous area approval (Ex ia) for Zone 0
- Easy to install
- Ideal for confined spaces
- Easy to program
- ‘See through’ capability for enclosed plastic pipes and concrete (not reinforced) channels
- Suitable for abrasive and aggressive materials
- Resilient to liquid vapour, wind or temperature
- No minimum liquid level required for measurement
- Maintenance free
- No interruption to operational flow
- Can be installed in addition to existing in process contact measuring devices
- Easily setup
- The sensor is capable of monitoring flow of very shallow liquid, mitigating the constraint associated with in-liquid techniques

2.4 The ORAKEL System

Four sensors can be connected as standard to one controller. However, one configured system could have up to sixteen sensors connected via three additional dummy control units and controlled by one controller. The ORKAEL system’s range of water monitoring equipment includes three Flow Meters and five different pH meters. It has a range of conductivity and TDS meters for different applications and many other sensors. All the sensors are compatible and both Flow Meter and water quality sensors can be configured onto one system.

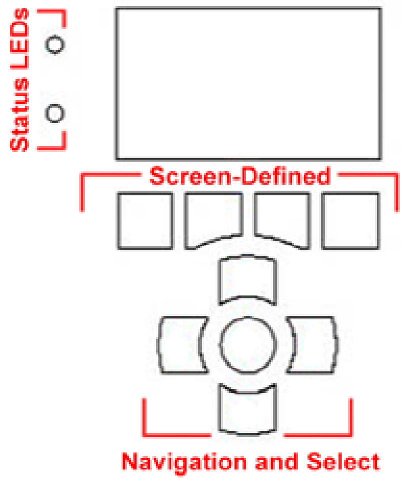
The ORAKEL controller is equipped with a display screen, readings can be taken directly from the control unit or downloaded from the internal data logger. An optional Detectronic modem allows for remote communication capabilities.

3. ORAKEL Operation

3.1 Navigating the ORAKEL

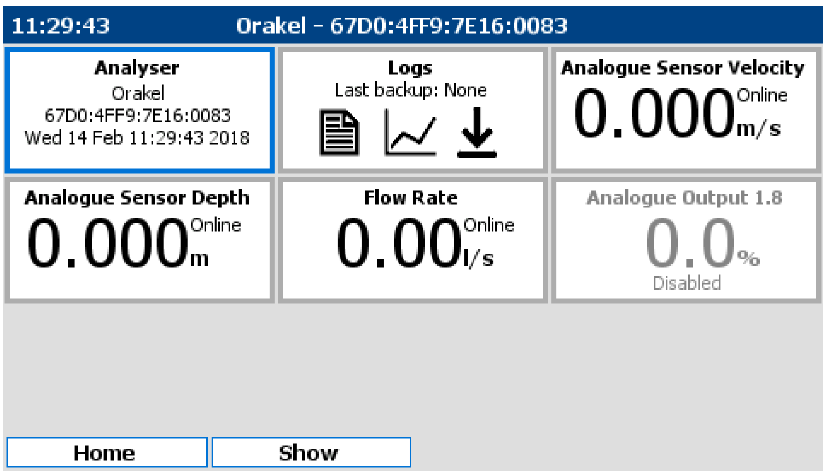
The ORAKEL has a colour display best viewed from directly in front. The user interface is accessed via nine buttons in the lid of the box. There are two status LEDs, showing power and alarm status, and an audible buzzer. The buttons all have a tactile feedback response. Holding the buttons in will inject multiple key presses of increasing speed until the button is released. In some cases, holding a button will provide access to a different function.

The diagram below illustrates the buttons on the ORAKEL device:



The four buttons along the bottom of the screen are defined for each screen by the legend above the button. The navigation and select buttons below the display are always for navigation of the display. The Up and Down, Left and Right buttons are used for moving the cursor around the display.

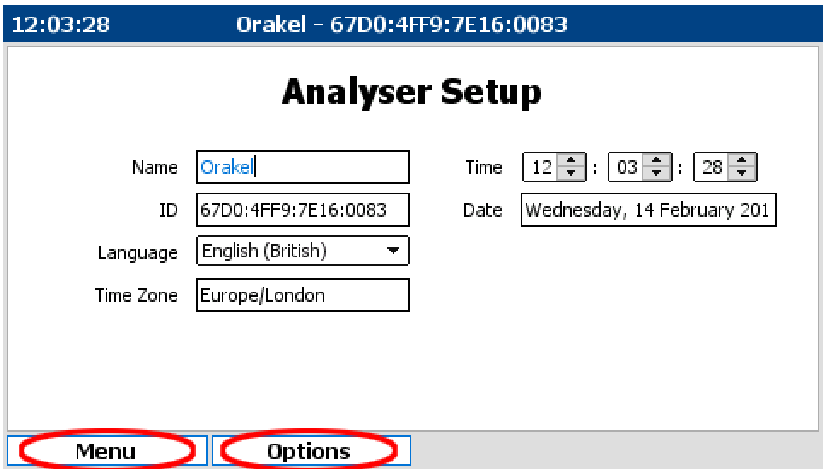
The screen displayed once the system is started will either be the default Home screen (if one has been configured), or the Main Menu. An example Main Menu is shown below:



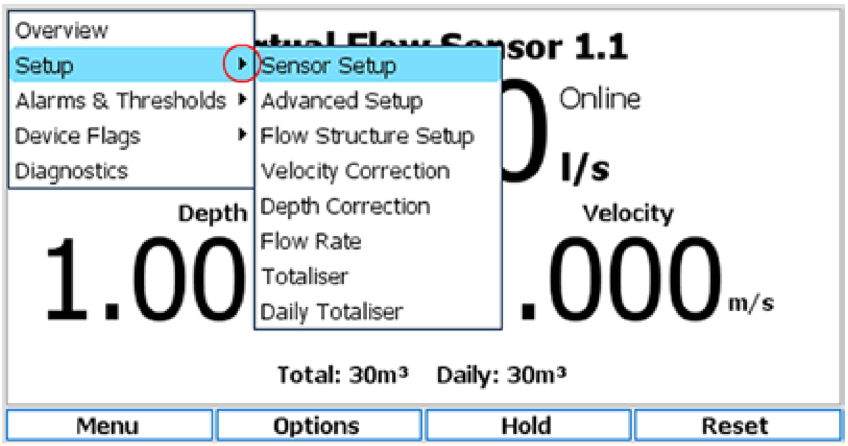
The Menu screen is a tile-based display of all the physical devices (such as sensors) and software constructs (such as a Flow Rate calculation and logs) that make up a user's analyser. By navigating using the navigation buttons, users can select (shown by a blue outline around a tile) and interact with each of the different tiles.

Selecting a device tile will take the user an Overview or Setup screen. The Overview screen gives the user key information for a device and may allow the entering of commonly changed variables.

Once a tile is selected, there is further navigation at the bottom of the screen. This includes a Menu button which will take the user back to the Main Menu, and for some tiles also includes an Options button which opens a pop-up menu specific to each tile. An example of this further navigation is shown below:



Users should note that within the Options menu, a “►” symbol indicates that there is a sub-menu contained within the menu. Sub-menus are accessed by highlighting the menu item with the “►” symbol, then by pressing the Right button on the ORAKEL’s keypad. An example of an opened sub-menu is shown below:

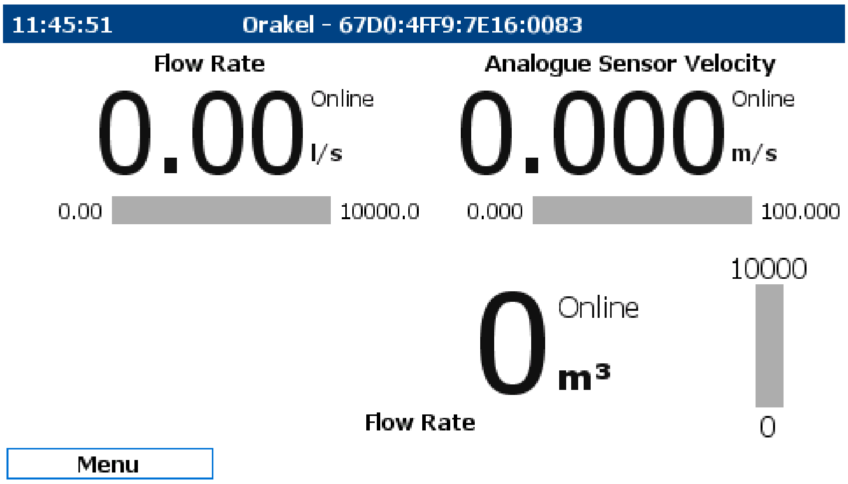


Not every Options menu in each tile has precisely the same options, but they often have the following sub-menus and sub-sections in common: Setup, Connections, Alarms & Thresholds, Device Flags, and Diagnostics.

3.2 Home Screen

Home screens display information from more than one sensor on a single display. They are accessed by pressing “Home” from any screen displaying the soft-key, and then by pressing the Left or Right button to scroll through the available Home Screens. On any Home Screen, pressing the Up or Down buttons will highlight different aspects of the display which can then be accessed by pressing “Select”.

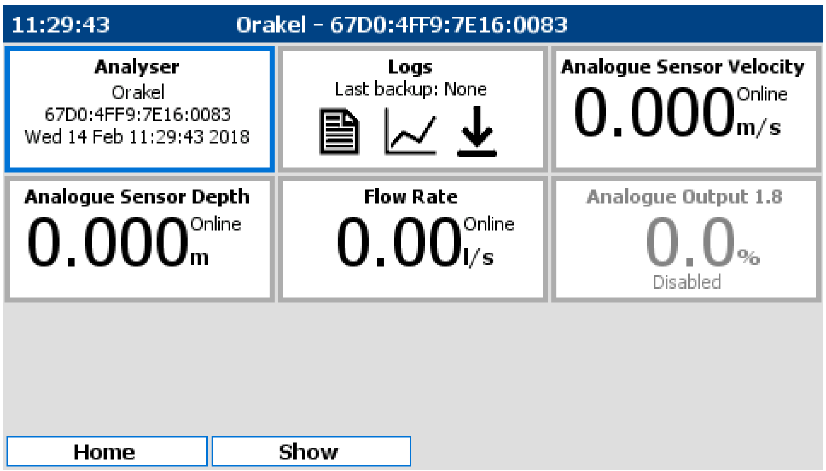
The Home screen below for the ORAKEL Non Contact Flow Monitor System shows the Flow Rate, Velocity, and a Totaliser:



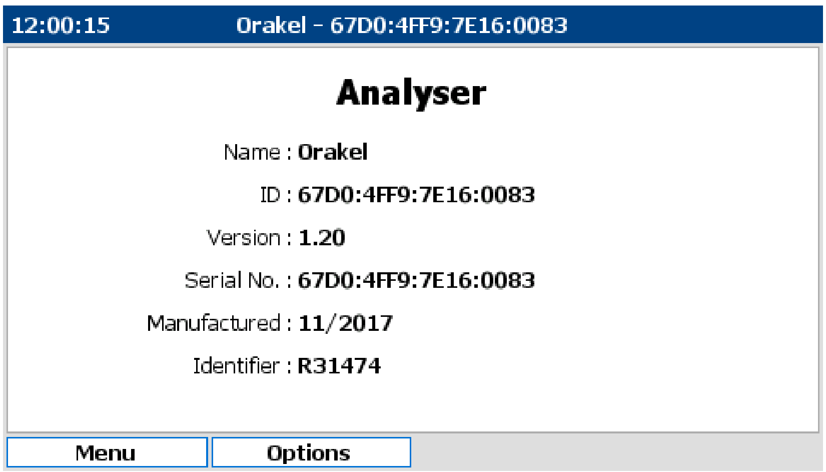
Users can customise what each section of the Home Screens displays (see Home Screen Customisation for further information).

3.3 Analyser

The “Analyser” tile gives access to information and configuration options for the unit. Navigate to the Analyser by selecting the tile from the Main Menu shown in the below screenshot:



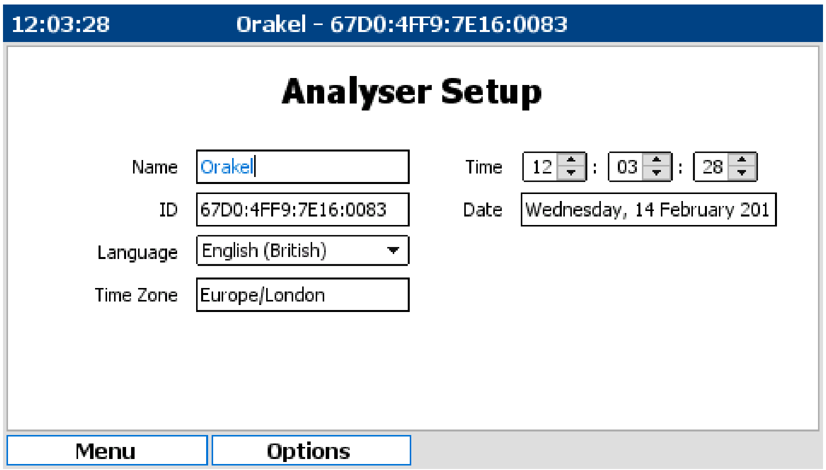
The screen should appear similarly to as follows:



The date and time are used in the Data Logs and Status Logs of a user's controller and it is therefore important that they are set correctly. To modify the settings for the Analyser, navigate to:

Options → Setup → Analyser

The Analyser Setup is shown below:

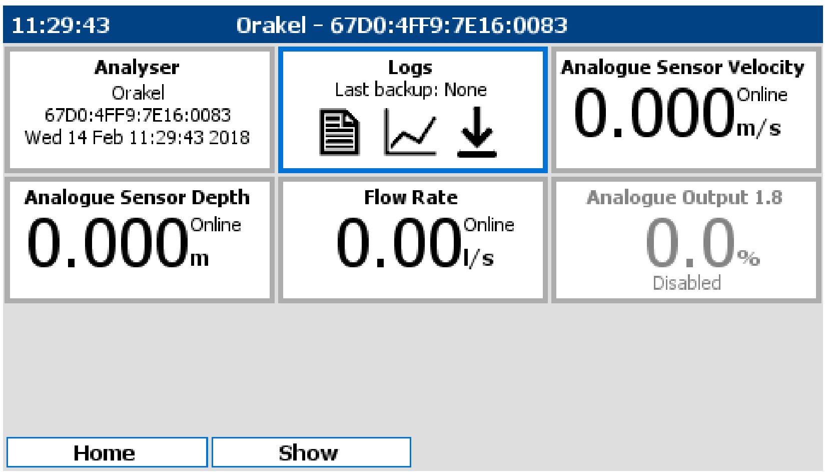


Users can access settings and enter details that relate to the Analyser Setup. These typically do not affect the sensors, communications or control functions. The information fields and their functions are described below:

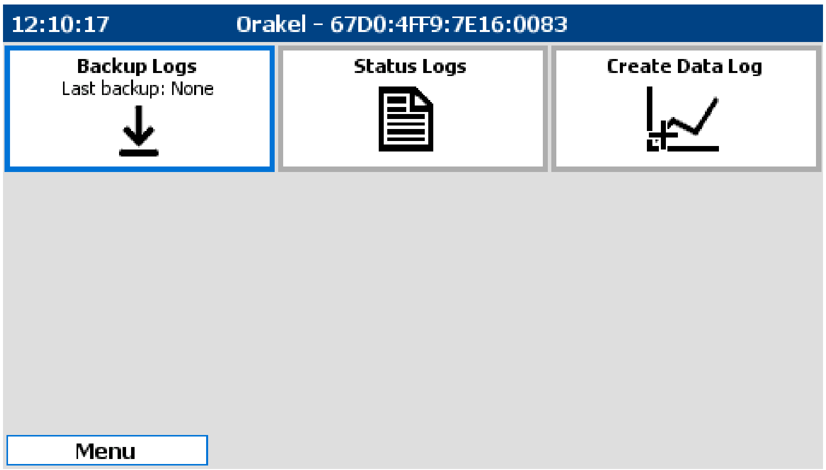
Name & ID: allows the user to name the instrument in various ways. These tags are used to identify the instrument, for example, when an instrument sends a text alarm, the Name and ID details are used to inform the recipient as to which instrument is in alarm. The Name would typically be the site name and the ID would typically refer to a specific analyser.
Language: the user interface of the ORAKEL can be set to any supported language by using the drop down list to select the language of choice.
Time Zone: select the required time zone. The internal clock stores the time in UTC format. Therefore, changing the time zone will change the current time. Daylight savings, if applicable for the selected time zone and turned on, will automatically be followed. This means that during annual clock changes, time stamped values will include the hour going forward or backward.
Time: set the required time by modifying the values using the Up and Down buttons
Date: select the date using the calendar widget that will appear when the date entry box is selected.

3.4 Logs

The Log allows access to the status and data logs stored on the unit. Navigate to the Log by selecting the Logs tile as shown in the screenshot below:



The Logs screen should appear similarly to as follows:



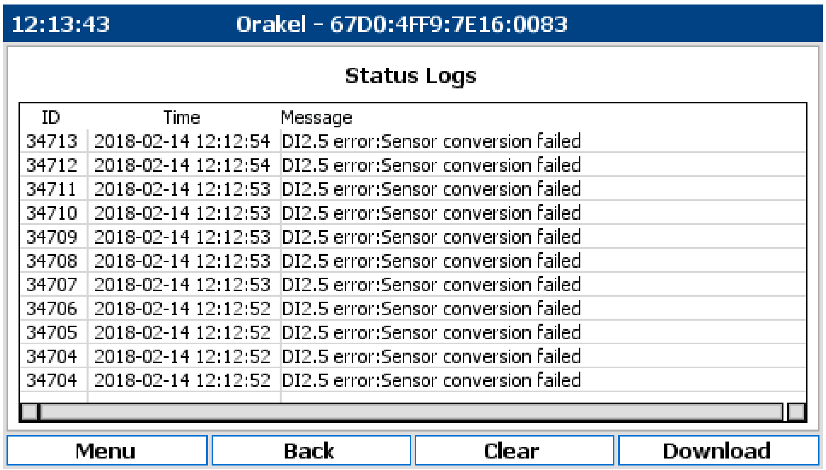
Within Logs, users can select different tiles to navigate between the different sections as described below:

Backup Logs

Data Logs can be backed up to SD Card by selecting this tile. The screen will display the last time logs were successfully backed up. With an SD card inserted in to the Analyser, press the “Backup” button to begin. Log entries since the last successful backup will be written to the SD card. A progress bar will display the backup task progress and a message displayed to indicate the result.

Status Log

Status Log displays the Status Log messages for events (information such as recording when calibrations are performed, when users log in etc) and Errors. An example is shown below:

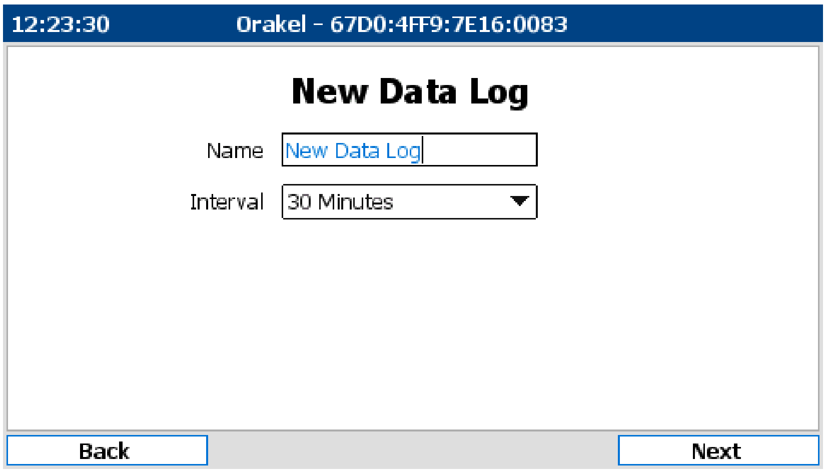


Pressing “Clear” will delete the current status log messages and truncate the status log. Pressing “Download” will save the Status Log to an SD card.

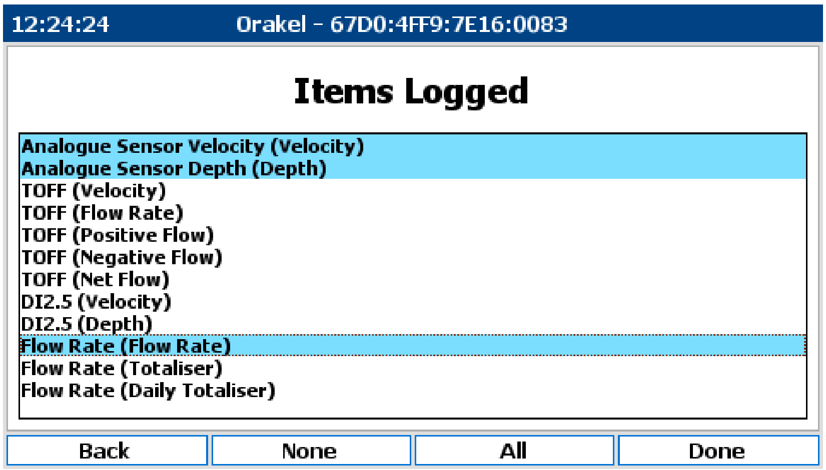
Create Data Log

Creating a Data Log allows users to create a log of readings from sensors of their choice at defined intervals.

1. Navigate to ‘Create Data Log’. The screen should appear similarly to as follows:



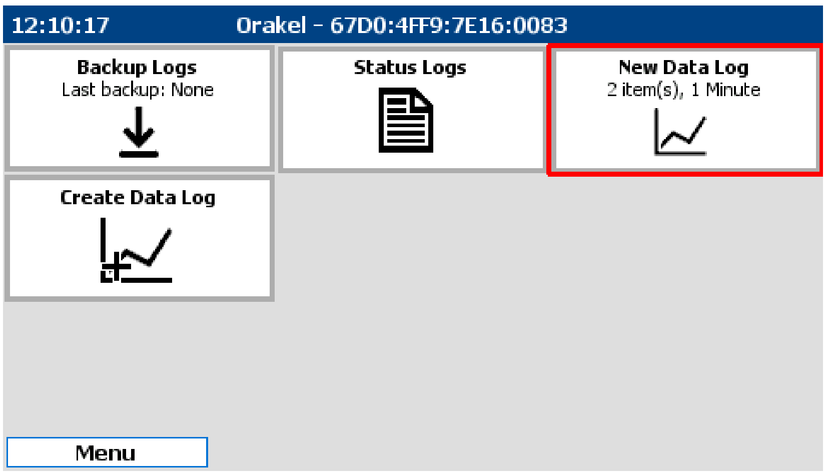
2. Enter a name to identify the log data
3. Enter an interval. The logged interval is how often data from the ORAKEL device will be sent to the log (e.g. with an hourly interval, the device will time stamp that value every hour)
4. Press “Next”. A list of parameters will appear. An example is shown below:



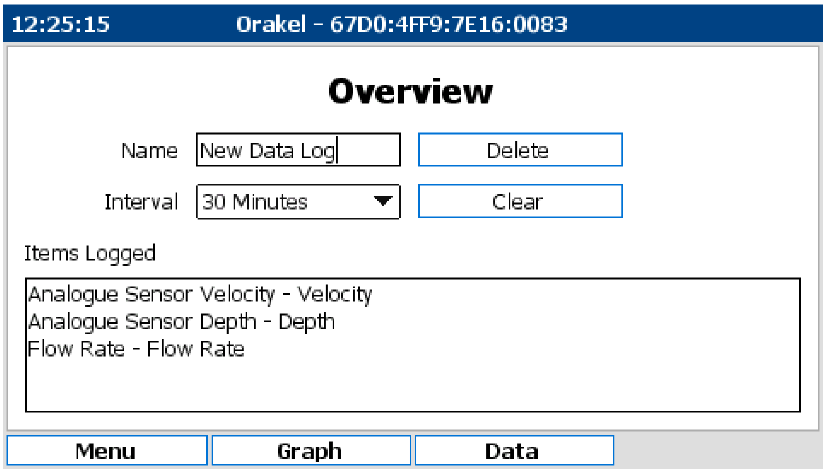
5. Select the channel(s) of data to log from the list of parameters
6. Press “Done” and the log will be created

Viewing Data Logs

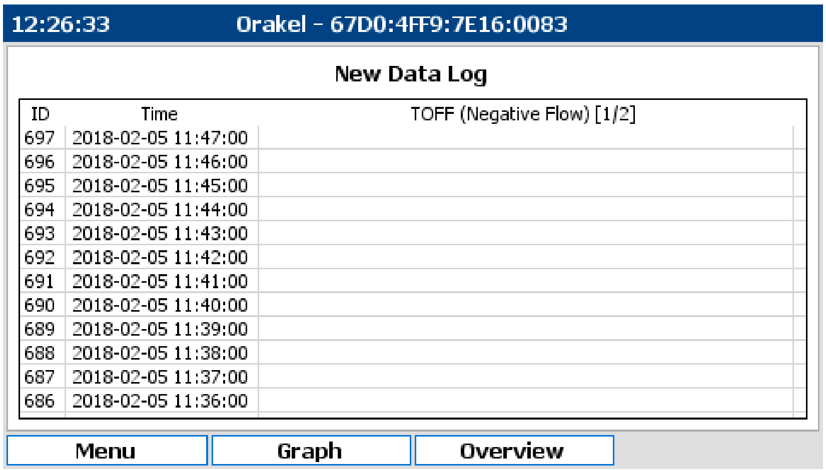
New Data Logs created using “Create Data Log” will appear as their own tiles with user-defined names within Logs, as shown outlined in red in the example below:



To view a Data Log, select the tile for that Log and the Overview screen will appear, as shown in the following example:

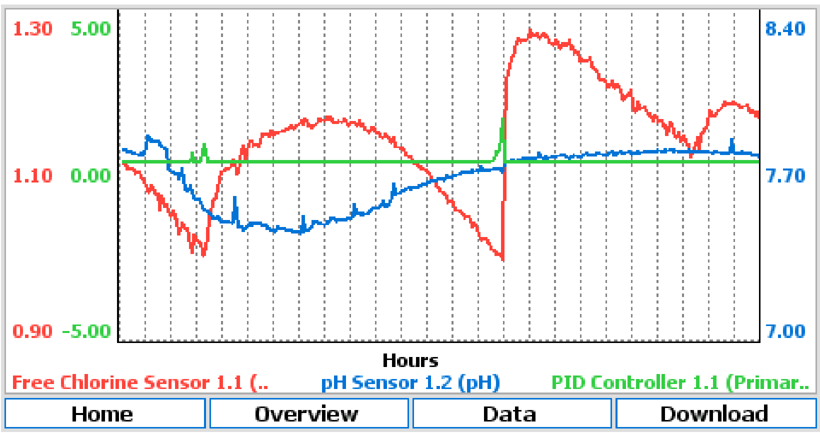


To view the data log values collected, press the “Data” button. A table of recorded values will be displayed, as shown in the example below:



ID	Time	TOFF (Negative Flow) [1/2]
697	2018-02-05 11:47:00	
696	2018-02-05 11:46:00	
695	2018-02-05 11:45:00	
694	2018-02-05 11:44:00	
693	2018-02-05 11:43:00	
692	2018-02-05 11:42:00	
691	2018-02-05 11:41:00	
690	2018-02-05 11:40:00	
689	2018-02-05 11:39:00	
688	2018-02-05 11:38:00	
687	2018-02-05 11:37:00	
686	2018-02-05 11:36:00	

To view the Data Log Graph, press the “Graph” button. The legend shows the line style for each measurement and axis, as shown in the example below:

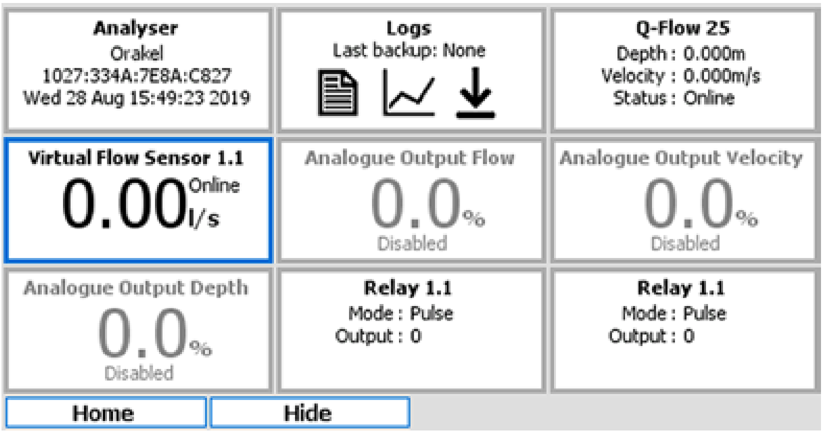


3.5 Virtual Flow Sensor

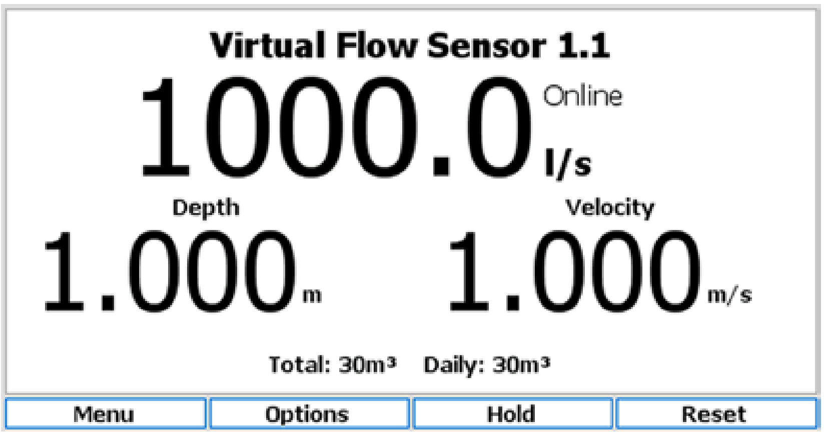
The Virtual Flow Sensor is a tile that displays the calculated Flow Rate. The ORAKEL recognises the level (often accessed via a Linear Sensor) and velocity input modules when installed and can calculate and display flow measurement data in a dedicated tile on the main menu. This tile is the Virtual Flow Sensor tile. This virtual device has its own settings and, via its own analogue output card, can transmit data to the Detectronic Data Centre or to external SCADA systems.

The Flow calculation will have been set up by Detectronic with default values. It is important to check/change those values bespoke to your installation

To access the Virtual Flow Sensor setup and options, select and press the Flow Sensor tile from the ORAKEL's Main Menu. The Flow Sensor tile's default name is "Virtual Flow Sensor 1.1" and it will display the Flow Rate and the device Status (online or offline). An example is shown below:



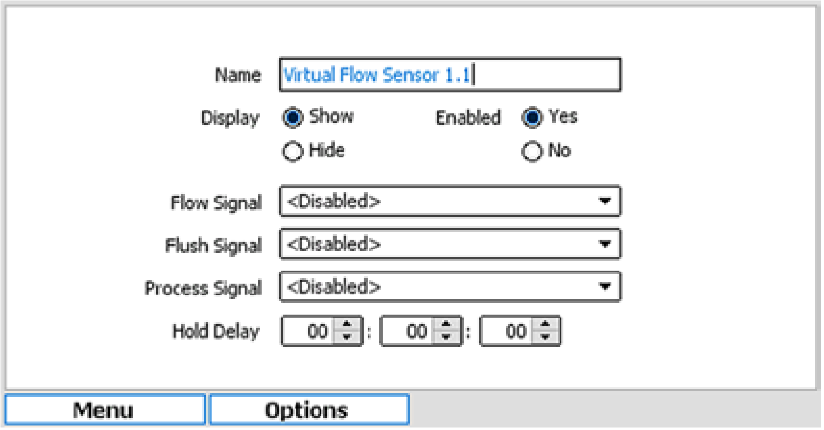
An example of the Virtual Flow Sensor screen is shown below, displaying the Flow Rate, Depth, Velocity, Device Status (online or offline), and the Totaliser and Daily Totaliser count:



Access the Setup menu by navigating to:

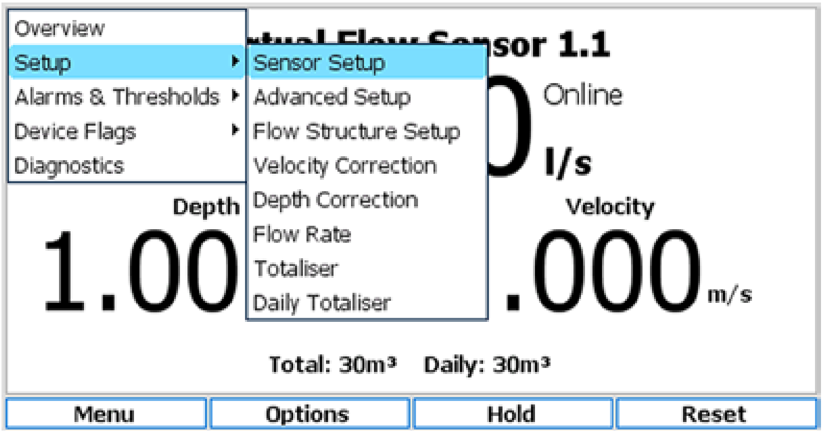
Options → Sensor Setup

Sensor Setup appears as follows:



Enter the desired settings. This screen allows the renaming of the Flow Sensor. The device can be enabled or disabled and be hidden or shown on the main menu. The Flow Signal, Flush Signal, and Process Signal are not available options for the Flow Sensor.

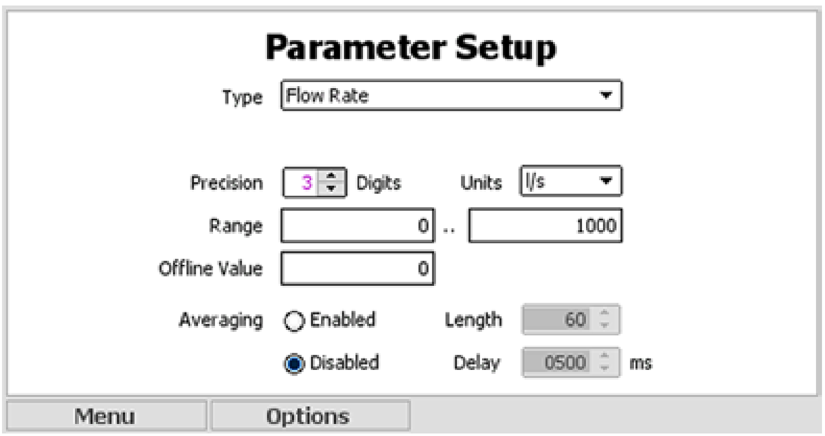
There are a number of other options contained within the Setup menu, as shown below:



Each option is summarised below:

Advanced Setup: contains the settings for the Flow structure, be it a circular pipe, a rectangular channel, etc. The source of depth and velocity data can also be chosen here.
Flow Structure Setup: contains the pipe or channel dimensions, according to what is selected in the Advance Setup.
Velocity Correction and **Depth Correction**: these settings provide advanced settings for channel profiling. For assistance with this please contact support@detectronic.org
Flow Rate: The configuration of the number of decimal places, units of measurement and the minimum and maximum ranges can be configured here. This is entitled Parameter Setup.

The Parameter Setup screen appears as similar to as follows:



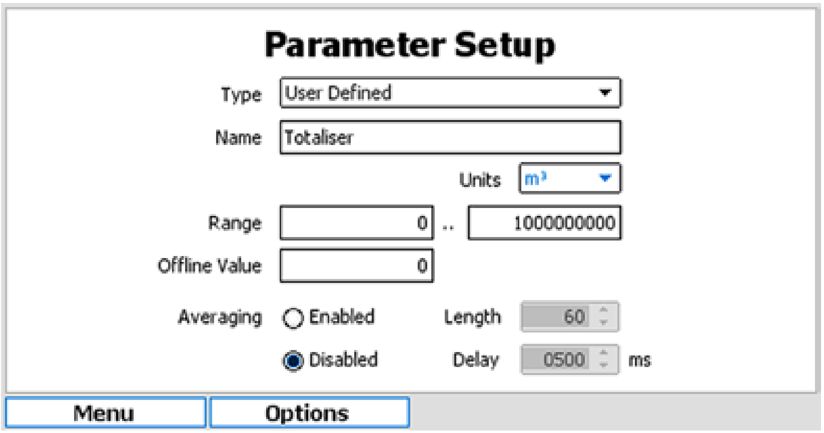
Setting up the Flow Rate follows the standard Parameter Setup within the ORAKEL device. The available units are l/s, l/min, m^3/s, m^3/min, m^3/hr, ft^3/s, ft^3/min, ft^3/hr, gal/min.

Users should be aware that the Flow Rate uses the readings from the sensors as defined in Flow Meter section 2.2. Therefore if the sensors selected already calculate average readings, having the Averaging set to Enabled within the Flow Rate Setup will result in fewer fluctuations but less precision for the Flow Rate.

Totaliser

The Totaliser accumulates the total volume of liquid that has passed the sensor within a period of time. It can also be used to generate pulse outputs for sampling when the Totaliser reaches its target value.

The default Parameter Setup for the Totaliser appears as follows:



Setting up the Totaliser follows the standard Parameter Setup within the ORAKEL device. The available units are Ml, m^3, ft^3, and gal.

Users should be aware that the Totaliser will automatically reset to 0 once it reaches the maximum limit as defined in the Range so it is recommended to set the Range as high as possible (1,000,000,000). The Totaliser is an accumulator and enabling Averaging for the Totaliser results in an average Flow Rate count across a period of time rather than a total count of the Flow Rate, therefore Averaging for the Totaliser should be kept to the default Disabled option.

Daily Totaliser

The Daily Totaliser accumulates the total volume of liquid that has passed the sensor within a 24 hour period and it automatically resets to 0 at 00:00 hours by the internal clock in the ORAKEL device. The Daily Totaliser can also be used to generate pulse outputs for sampling when the Daily Totaliser reaches its target value.

The remainder of the setup for the Daily Totaliser follows the same procedure as described for the Totaliser. For the Daily Totaliser, the maximum value for the Range is 10000 as this value is unlikely to be exceeded within a 24 hour period.

3.6 Linear Sensor

Using a Linear Sensor provides accurate depth measurements to the Virtual Flow Rate within the ORAKEL without the need for a complicated external sensor setup. Using a Linear

Sensor (which is, in effect, a calculation on the existing Depth Sensor) means users can offset the depth reading with mm accuracy without having to physically move the sensor or communicate directly with the physical depth sensor.

The Depth Sensor is pre-configured with a 0.00-3.00m range and the offset (0.00m) is adjusted by the use of a Linear Sensor. Depth and Velocity Sensors will have been calibrated by Detectronic prior to the user receiving them and will not need to be adjusted on site.

All devices should come with a Linear Sensor (often renamed Adjusted Depth) as standard. If not, users may need to add the Linear Sensor as a new device code. If a Linear Sensor is already present, proceed to Step 5. To setup the Linear Sensor, undertake the following instructions starting from Step 1:

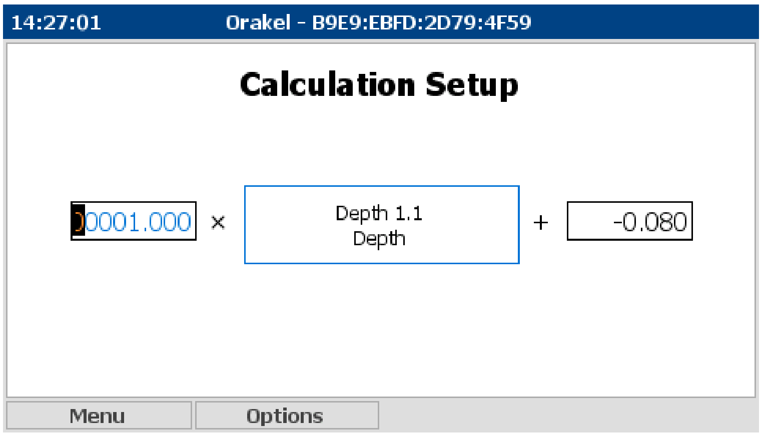
1. Go to the Analyser tile
2. Navigate to:

Options → Device Code → Enter Code

3. Press the centre button and carefully enter the provided device code
4. Press "Done". If the device code is accepted, the Orakel will restart
5. Go into the new Linear Sensor tile.
6. Navigate to:

Options → Setup → Calculation Setup

The screen should appear similarly to as follows:



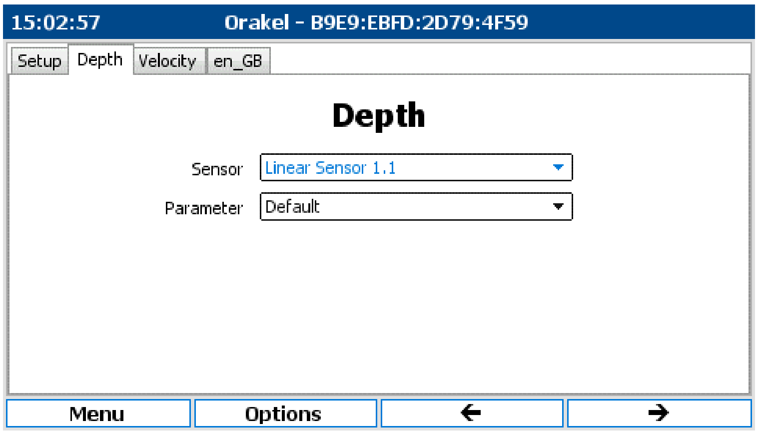
7. Leave the first box at the left-hand side at "1.000"
8. In the middle box, select "Sensor - Depth" and "Parameter - Depth"
9. In the box at the right, perform any offset adjustment until the level reads exactly the value it should
10. If the depth reading is correct, skip to Step 12. If the depth reading is not giving a valid value, it may be because the units are incorrect. On the Linear Sensor tile navigate to:

Options → Setup → (bottom option – this may be set as "Default")

11. Choose the Depth from the "Type" options and set the digits and units as appropriate
12. From the Main Menu, go into the Virtual Flow Sensor tile
13. Navigate to:

Options → Setup → Advanced Setup

14. Press the right arrow to go to the Depth tab
15. Change the Sensor from “Depth” to “Linear Sensor” and leave the Parameter field as Default, as shown below:



The Flow Calculation is now based on the depth measurement provided by the Linear Sensor, and the offset in the Linear Sensor can be adjusted as required.

4. Outputs

Outputs are the means by which values from measuring sensors, control outputs, or system statuses are transmitted to another device, for example to a SCADA for data acquisition or to a pump for dosing control. The two types of output used by ORAKEL are the Analogue Output and Relay.

In order to utilise the full capability of the instrument it is necessary to link the signal/ value and an output device, such as an alarm, threshold or control options for the relays or analogue outputs. Detectronic utilises the latest in firmware and electronic innovations and as such analogue outputs and relays are extremely flexible, and are not tied to individual sensors.

4.1 Analogue Outputs

Analogue outputs are typically a current output varying between 4mA and 20mA (although other options are available), and are proportional to a varying signal of interest generated by the instrument. Analogue outputs are installed by plugging in a small output board into one of the available slots and connecting wires from the external device to it.

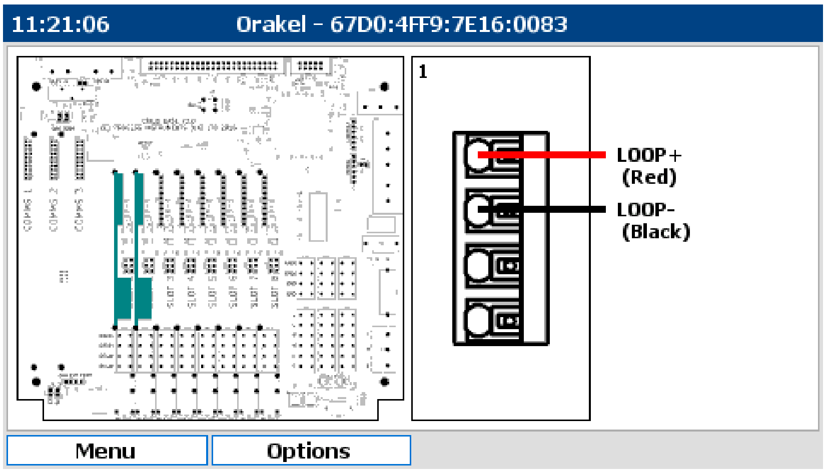
Technical Data

Supported modes: 4-20mA
Maximum voltage output: 15V DC

In order to view the Analogue Output Connections, navigate to the following:

Options → Connections

The screen should appear as follows:



The image above is for an output with the types selected as 4-20mA.

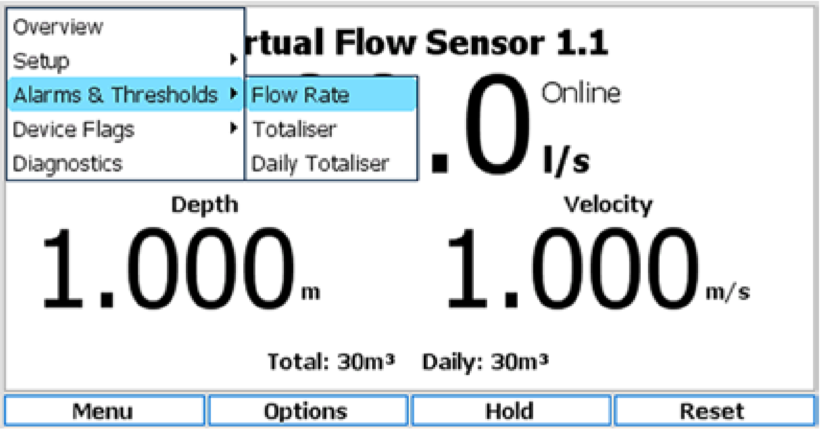
4.2. Alarms & Thresholds

Alarms and Thresholds are used to trigger alerts and events when sensor readings reach beyond a set trigger level. The alarm or threshold will only be activated once this value has been **exceeded,** not if the reading is equal to the set value.

Alarms trigger alarm alerts (a buzzer will sound and a coloured bar will appear at the top of the screen) and Thresholds can be linked to other inputs such as relays to trigger events once the trigger level of a given reading has been exceeded.

There is a maximum of one alarm per sensor.

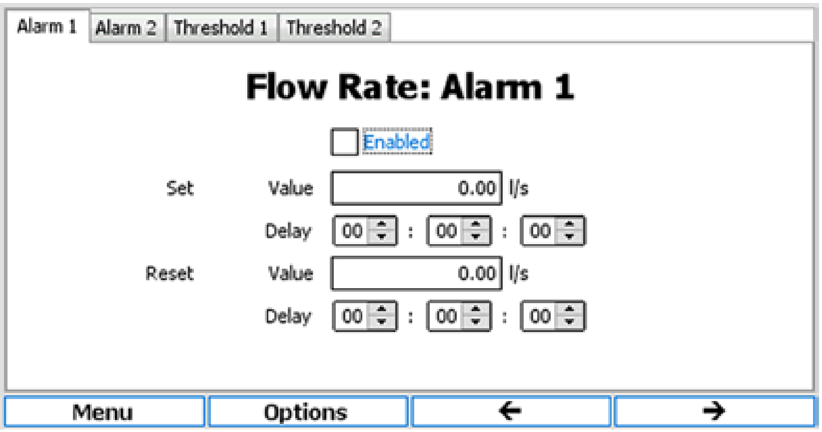
Settings for Alarms and Thresholds are found within various Options menus from within different tiles. The below example shows the Alarms & Thresholds menu from within the Flow Meter tile:



Alarms and Thresholds can be set for the Flow Rate, the Totaliser, and the Daily Totaliser by navigating to:

Options → Alarms & Thresholds → Flow Rate (or) Totaliser (or) Daily Totaliser

The default screen appears as follows and the title will vary according to the option selected during the menu navigation:



The setup for the Alarms & Thresholds is standardised across the ORAKEL Device. Enter the desired settings for the Alarm or Threshold. The options are described below:

Enabled: ticking this option turns the Alarm/Threshold on. Unticking it turns the Alarm/ Threshold off
Set Value: the value used to trigger the Alarm or Threshold.
Delay: the amount of time the value has to exceed the set value before the Alarm/Threshold is triggered.
Reset Value: the value the reading needs to fall underneath in order for the Alarm or Threshold to no longer be triggered

4.3 Relay Outputs

In order to take advantage of the full capability of modern electronics, it is necessary to map the various alarms, thresholds and other options to the relays.

Two relay outputs are installed at the time of manufacture of the ORAKEL, both of which can be assigned to parameters of the user's choosing. A relay is an output trigger – i.e. a mechanical or electronic device mounted on the electronics within the instrument that can switch currents to an external device (e.g. a pump).

The maximum current for the relay outputs is as follows: 10A at 125 VAC, 3A at 250 VAC, 5A at 30 VDC.

To access the Relay Output Setup and Maintenance, select the desired relay device tile in the main menu and press "Select". The output setup screen will be displayed initially, though other functions are available by pressing the "Options" button.

Test Output

It is possible to test a Relay by manually changing the Relay's polarity and active state. Changing the polarity inverts a trigger (i.e. instead of the Relay triggering an output to be raised under a specific circumstance, it will trigger it to be lowered). To test a Relay, bearing in mind that leaving the configuration screen will return the Relay to its previous state, navigate to:

Options → Test Output

An example Test Output screen is shown below:

Users can alter the following options:

Polarity: the options are "Normally Open" or "Normally Closed".
Active: Selecting "No" turns the Relay off. Selecting "Yes" turns the Relay on.

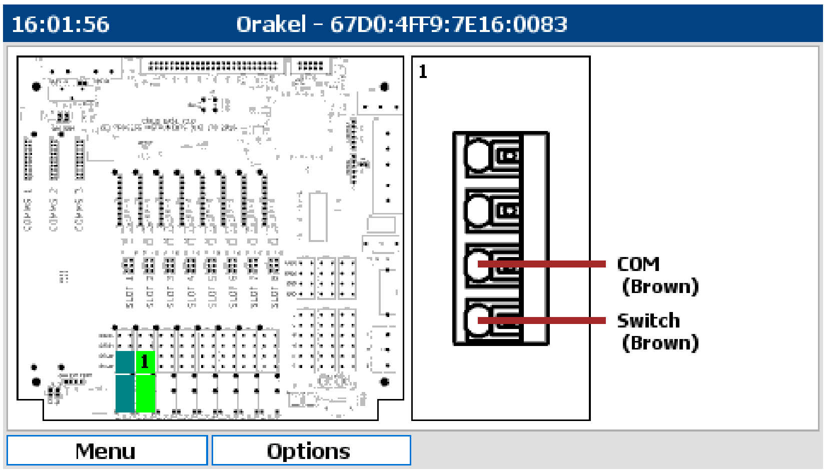
4.4 Connections

The Connections screen identifies the terminals to use for electrical connections for this Relay.

Navigate to Connections by going to:

Options → Connections

The left hand pane identifies the terminal block and the right hand pane the connectors on the terminal block.



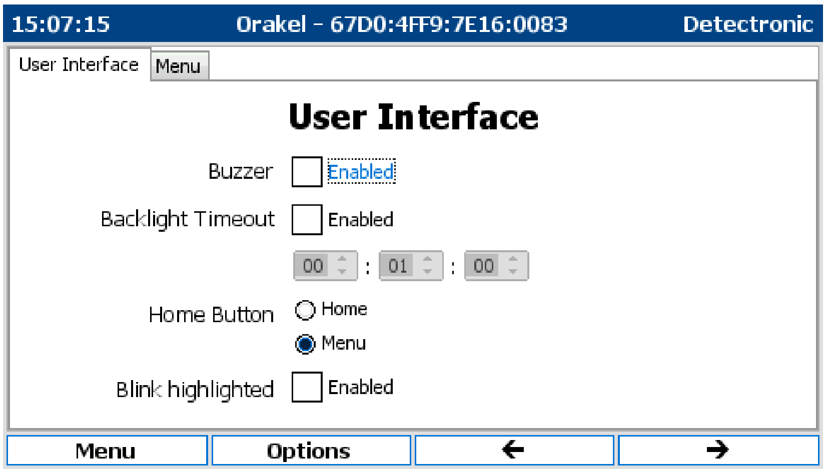
5. Customisation

5.1 User Interface

The User Interface screen allows users to configure options for the interface. Navigate to User Interface from the Analyser tile by going to:

Options → Setup → User Interface

The screen should appear similarly to as follows:

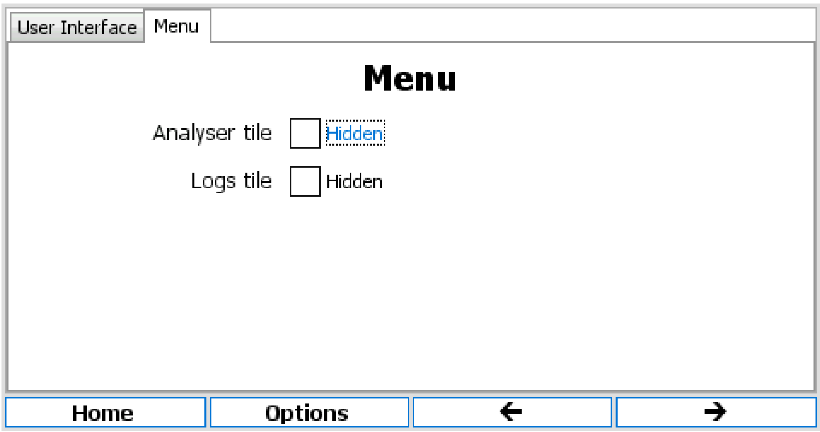


There is a “User Interface” tab and a “Menu” tab, which can be accessed using “←” and “→” to move between tabs.

The options for User Interface are described below:

Buzzer: sounds when a key is pressed or to indicate that the Analyser is in alarm. Use the checkbox to enable or disable the buzzer sounding.
Backlight Timeout: to extend the life of the display, a timeout can be set. At the end of the timeout the display will go dark. Any button press will turn the screen back on. Use the checkbox to enable or disable the backlight timeout and set the desired timeout using the up/down buttons. The timeout is in HH:MM:SS format.
Home Button: on most displays the left button under the display can be set to take the user to the Home screen or the Menu screen.
Blink highlighted: if this option is enabled, the element the user needs to look at blinks between two colours to attract attention.

The Menu tab allows users to control which tiles are visible or hidden in the Home screen. The options for the Menu are shown and described below:



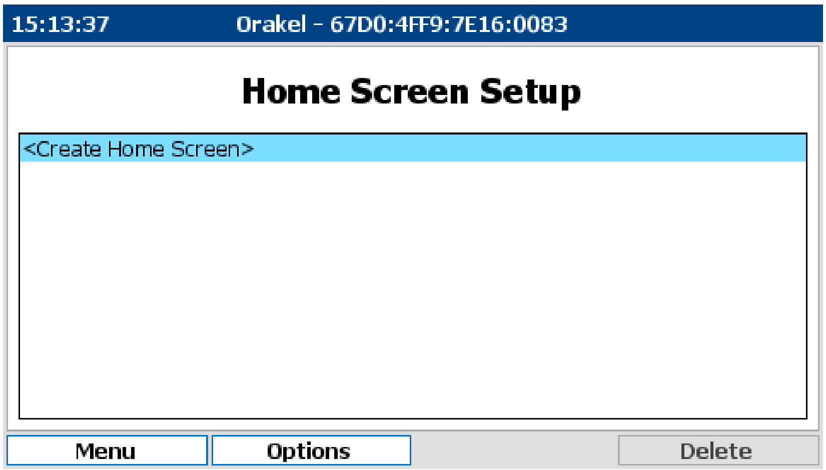
Analyser tile: if the checkbox is ticked then the Analyser tile will be hidden as default on the main menu.
Logs tile: If the checkbox is ticked then the Logs tile will be hidden as default on the main menu.

5.2 Home Screen

The ORAKEL offers multiple Home Screens which give the user different options to view how information is displayed. To set up a new Home Screen, edit, or delete an existing Home Screen, go to the Analyser tile and then navigate to:

Options → Setup → Home Screen

The screen should appear similarly to as follows:



Deleting a Home Screen

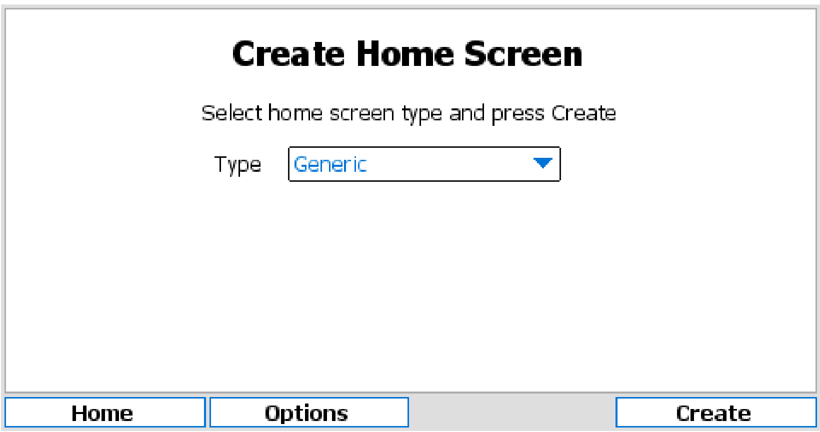
To delete a Home Screen, highlight the home screen name with the up/down buttons, then press “Delete”. Pressing and holding the “Delete” key will make the “Delete All” function available. A confirmation message box will appear before all Home Screens are deleted.

Editing a Home Screen

To edit the Home Screen, again select the name, and press the select button.

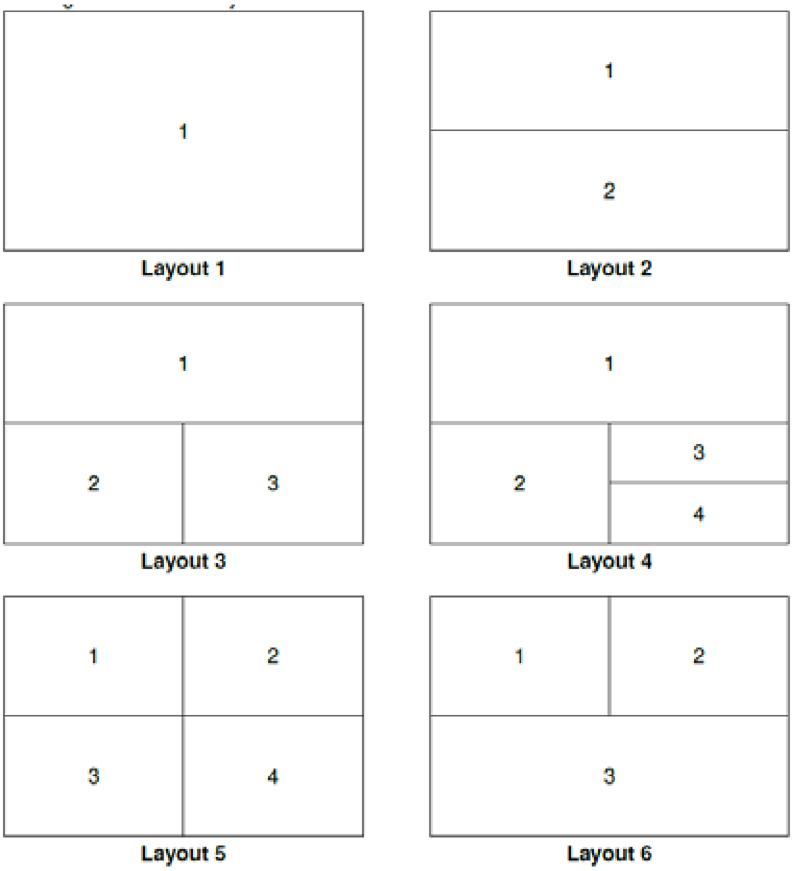
Creating a Home Screen

1. To create a new Home screen, highlight “Create Home Screen”, and press the Select button
2. The screen should appear similarly to as follows:

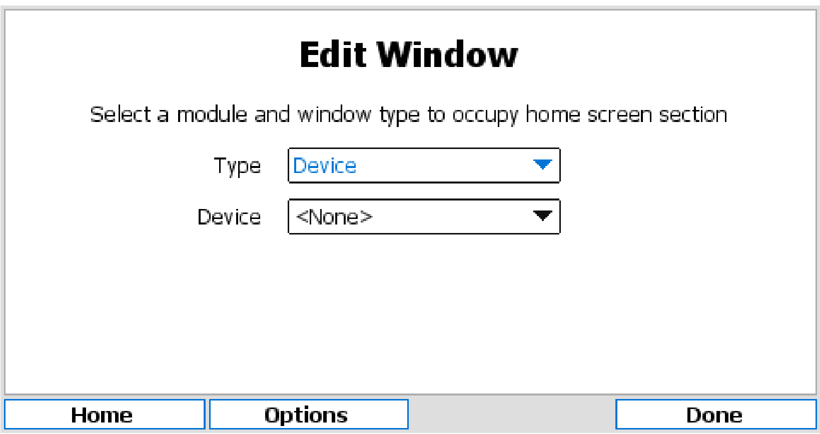


3. Select the Home Screen type from the “Layout” drop-down list. For this example, select “Generic”.

Generic Home Screens allow up to four devices to be displayed in a variety of formats. Each layout is made up of a window section that displays information about a device or a Data Log Graph. The possible window arrangements for the layouts are as follows:



4. To select what is displayed in each window of a particular layout, highlight the window, then press the Select button. The screen should appear similarly to as follows:



5. (Optional) Enter the following settings:

Type: select the type of information to display in the selected window. The options are “Device” or “Data Log”.

Data Log: if “Data Log” is selected in the type field, this option will be available. Select the data log to display.
Device: if “Device” is selected in the type field, this option will be available. Select the device to display in the selected window.
Window: If the device selected above has multiple types of display possible for this type of window, then this option will be available. Select the type of information to display.

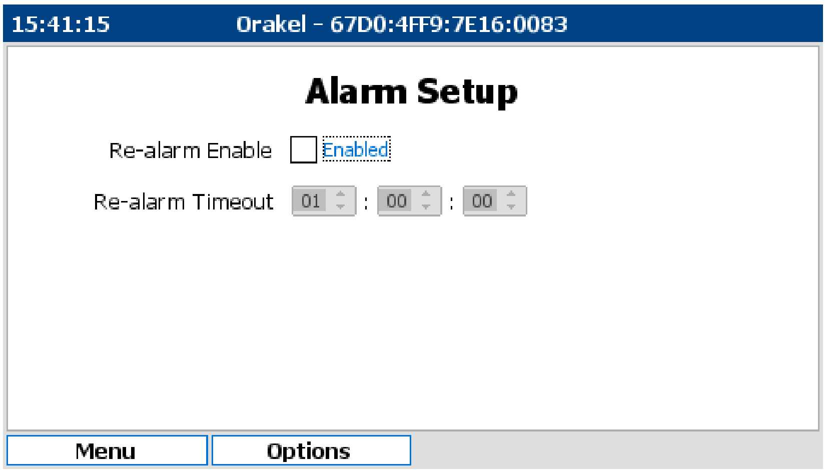
6. Once compete, press “Done”
7. (Optional) Return to the Main Menu and choose “Home” to view the new Home Screen setup.

5.3 Alarm Settings

When the Analyser detects an error condition, it will enter an alarm state. This will be indicated with a buzzer sounding, the alarm light flashing red, a red bar appearing at the top of the screen, and the tile that is giving the alert being outlined in red. To access the Alarm Configuration, navigate to:

Options → Alarm → Setup

The screen should appear similarly to as follows:



The Re-Alarm feature can be enabled and the timeout can be set. If the analyser is in alarm and that alarm is acknowledged, then the Analyser will return to the alarm state after the timeout has expired if the error condition has not been rectified.

When the analyser is in alarm, a message shows the time and date of when the message was updated and an “Ack” button (short for “Acknowledge”) silences the alarm and prevents any further alarm SMS messages being generated. The alarm message will change to indicate the alarm has been acknowledged.

To view and alter Alarm Messages, navigate to:

Options → Alarm → Message

The following alarm options are available:

Type: a selectable list of parameter types. The selection made here will affect what options are available below.
Name: Available if “User defined” is selected as the type. The name can be up to 25 characters.

Units: If “User defined” is selected above, set the units using the custom units’ entry screen that will be displayed when pressing the select button. Otherwise, select from an appropriate list of units for the parameter type.
Precision: Select the number of digits following the decimal point to display. This should be appropriate for the measurement. Options are 0 to 5.
Range: Set the range values for the parameter. Options are restricted to those appropriate to the parameter.
Offline Value: This is the value reported by the parameter when in ‘Offline’ mode, for example, if the sensor is in alarm. Options are within the range of the parameter.

6. Errors and Flags

6.1 Error Flags

Error Flags show any problems causing an error for a device. Flags can either be active or not. To view Error Flags, navigate to:

Options → Device Flags → Error Flags

Flags that are active are shown in black text on a white background, those that are not active are greyed out. Available flags are:

I/O card fault detected: if set, this flag indicates that a low-level hardware fault has occurred. Users should report it to their supplier.
Incorrect I/O card found: if set, this flag indicates that the I/O card fitted is of the wrong type.
I/O card in use: set when two devices are attempting to use the same I/O card.
Sensor connection error: set when the sensor hardware detects a physical connection fault.
Sensor failed to read input signal: if set, the sensor has failed to read the state of the flow, flush or process signal.
Sensor flow alarm active: set if a low/no flow condition is reported by the flow signal.
Sensor data alarm active: when the sensor readings trigger a data alarm, this flag is set.
I/O card configuration failed: set if the I/O plugin card fails to respond correctly. Users should contact their supplier for advice.
Sensor conversion failed: set if the analyser fails to read sensor values from the I/O plugin card. Users should contact their supplier for advice.

6.2 Parameter Flags

The parameter flags show the state of an individual parameter of a particular sensor. These flags can either be active or not. To see the state of these parameter flags, navigate to:

Options → Device Flags → Parameter Name

Flags that are active are shown in black text on a white background, those that are not active are greyed out. Available flags are:

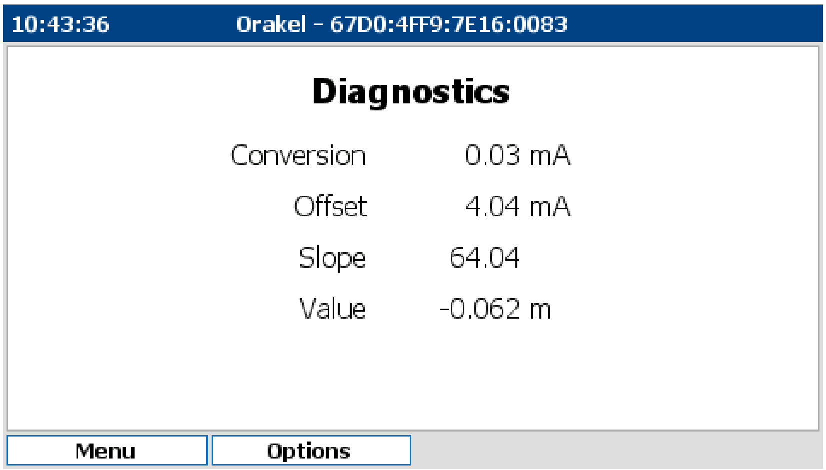
Alarm 1 active: the first parameter data alarm is active and triggered.
Alarm 2 active: the second parameter data alarm is active and triggered.
Averaging enabled: the value displayed for this parameter is averaged.
Threshold 1 active: the first parameter threshold is active and triggered.
Threshold 2 active: the second parameter threshold is active and triggered.

6.3 Diagnostics

To view raw sensor conversion data and calibration settings for live sensor values, navigate to:

Options → Diagnostics

The screen should appear similarly to as follows:



The following information may be helpful for troubleshooting sensor issues:

Conversion: raw sensor output readings converted by hardware. Values are either in mA or mV, depending on the exact type of sensor.
Offset: the zero offset applied to the calibration.
Slope: the slope calculated by performing a span calibration.
Value: the value measured as determined by the conversion value and calibration variables. The value is calculated using the formula:

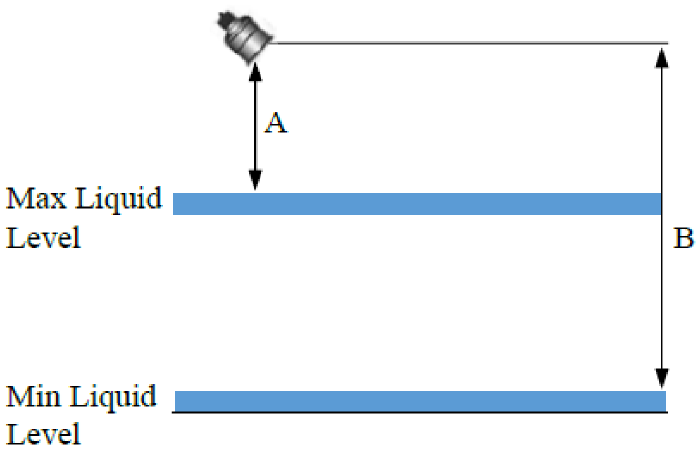
Value = (Conversion – Offset) / Slope

7. Sensor Installation

The ORAKEL Non-Contact Flow Monitoring System requires the simultaneous use of an Ultrasonic Level Sensor and a Radar Velocity Sensor. For ease of mounting, a bracket is supplied which angles the radar at 45 degrees and the Ultrasonic Sensor at 90 degrees.

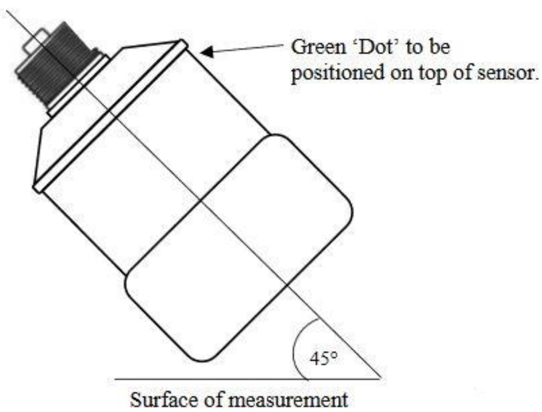
Important considerations when locating the sensors:

- The signal paths of both sensors must be located free of falling material and obstructions such as pipes and beams
- The mounting surface must be vibration free
- There must be no high voltage cables or electrical inverter wiring in close proximity to the transducer cabling
- The ambient temperature should be between -20ºC and 60ºC
- For optimum accuracy, install the Radar Velocity Sensor where the flow is not turbulent. An ideal location for the sensor is in the centre of a long straight channel. Vertical drops, baffles, curves or junctions can cause the velocity profile to be distorted
- The Radar sensor must be positioned at a height of 250mm above the maximum liquid level or up to two times the channel width from the minimum liquid level, whichever is greater, as shown below:

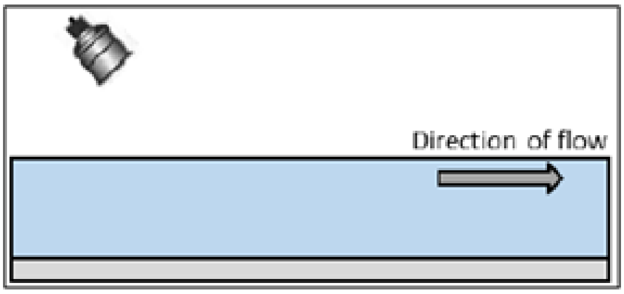


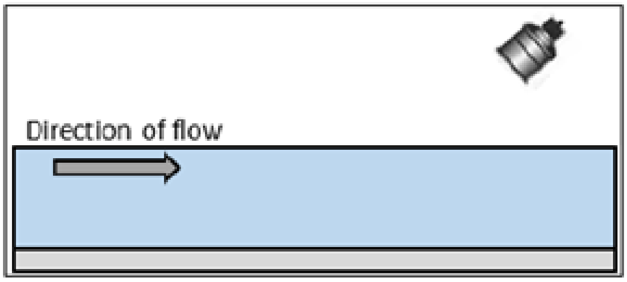
A: Minimum 250mm above Maximum Liquid level.
B: Maximum 3m above Minimum Liquid Level.

- If the maximum water height exceeds two times the width of the channel or if the maximum water height in channel is less than 50% of the width of the channel, consult Detectronic product support for assistance
- Make sure the green dot on the Velocity Sensor is pointing upwards at 45 degrees as illustrated in the diagram below:



- If desired, the sensor cable may be extended up to a maximum of 1000m. Install the sensor cables in grounded metal conduit. Do not run in cable trays or duct banks with variable frequency drives or other high voltage sources
- When extending cable for a sensor, ensure that all wiring in any junction/connector boxes are correct
- Attention should also be taken when mounting the unit to ensure that strong windy conditions are avoided wherever possible to prevent abnormal operation. For best results, face the Velocity Sensor towards the incoming flow
- The sensor can be positioned to obtain readings following the direction of the flow, or it can be positioned to measure the oncoming flow as seen below:





The Ultrasonic and Radar Sensors operate from a DC voltage supply of 24 volts and draws less than 22mA. When wiring the sensors, users should use a twisted pair cable. The wiring colours of the sensors in the ORAKEL is described below:

Red: Power 24 VDC
Black: 0 Volts
Green: Screen

The cable of the Ultrasonic Level sensor is fitted with an over current protection device in the form of a fuse. Under **no** circumstances should this fuse be removed. The fuse must be fitted in the non-hazardous area (if appropriate).

Before moving on to the wiring stage, ensure that the following is checked:

- The Radar Velocity Sensor is mounted correctly and is secure as outlined above
- All wiring is correct

General Maintenance

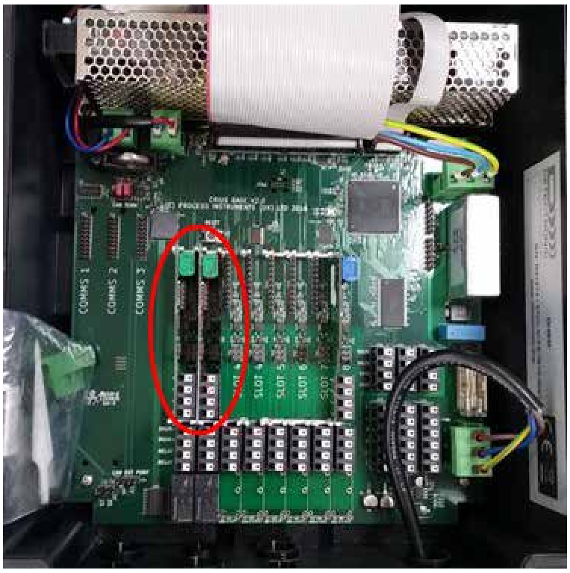
There are no user serviceable parts inside the Radar Velocity Sensor. If users experience any problems with the unit, they should contact their Detectronic representative.

To clean the equipment, wipe with a damp cloth. Do not use any solvents on the enclosure.

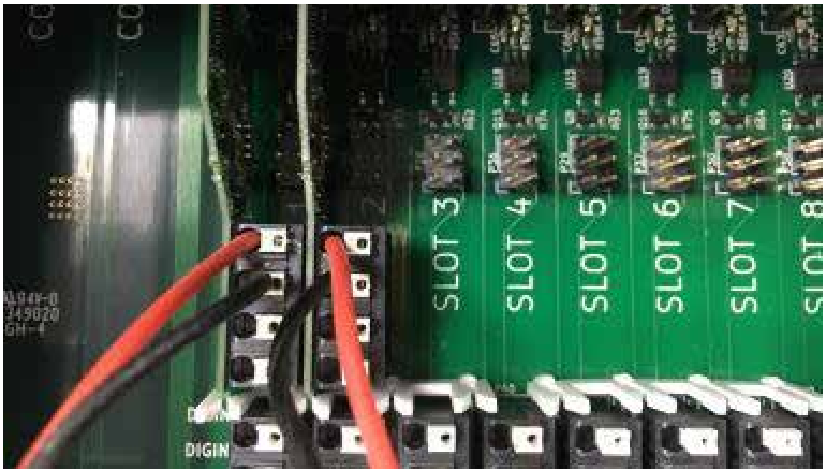
7.1 Wiring the Sensors

Once a suitable site for the sensors has been found and the sensors and bracket are mounted, the sensors can be connected to the ORAKEL. Do not connect or remove wires when power is connected.

The wires are connected to two Analogue Input cards, highlighted in the photo below:



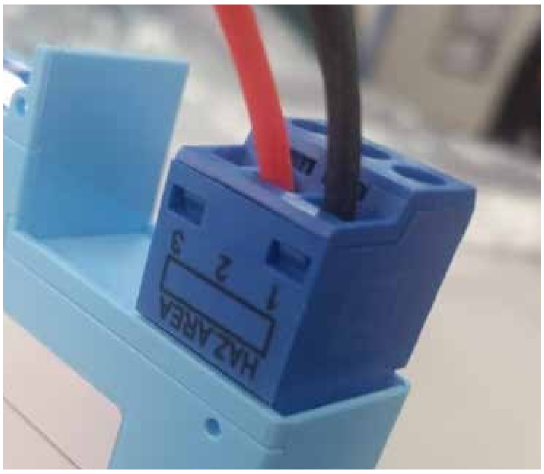
Level Sensor: Wire this card in Slot 1. Fit the red wire to Pin 1 and the black wire in Pin 2, as shown in the image below.
Velocity Sensor: Wire this card in Slot 2: Fit the red wire to Pin 1 and the black wire in Pin 2, as shown in the image below:



When using the equipment in an ATEX Zone 1 hazardous area, the Radar Velocity sensor must be used with the Detectronic-approved Galvanic Isolator.

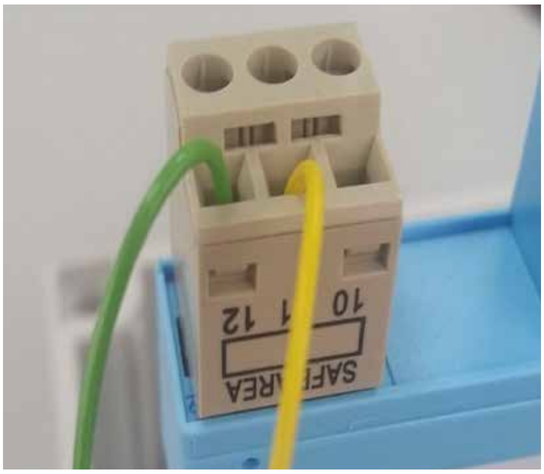
7.2 Wiring the Radar Velocity Sensor to the Galvanic Isolator (Optional)

The Detectronic-approved Galvanic Isolator has blue terminals for the Hazardous Area, as shown in the images below:



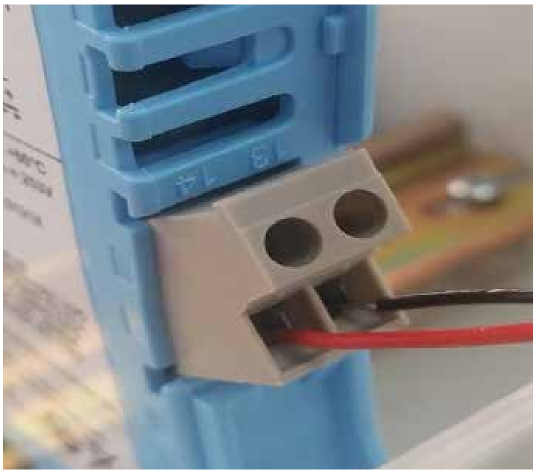
Terminal 1: connection to the black lead of the Radar Sensor.
Terminal 2: the red wire of the Radar Sensor.

The beige terminal block is for wires to the safe area (i.e. to the ORAKEL), and is shown below:



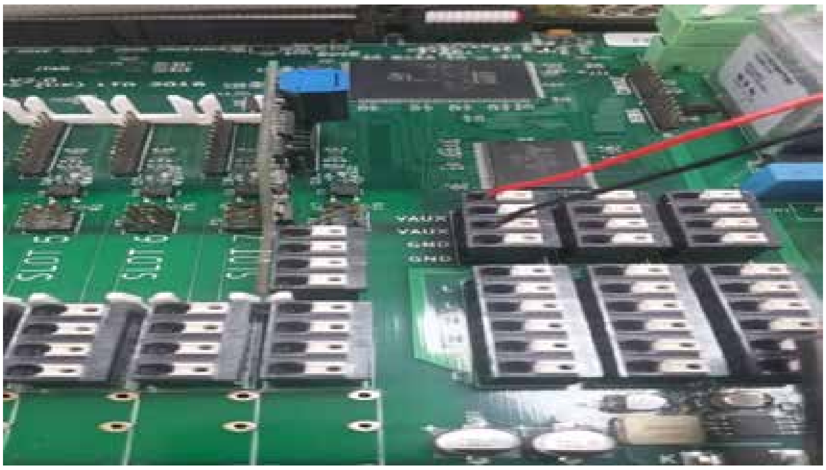
Terminal 11: the positive wire to the ORAKEL (yellow)
Terminal 12: the green (negative) wire

Fit the other end of the yellow wire into Pin 1 and the green wire in Pin 2 of the ORAKEL.

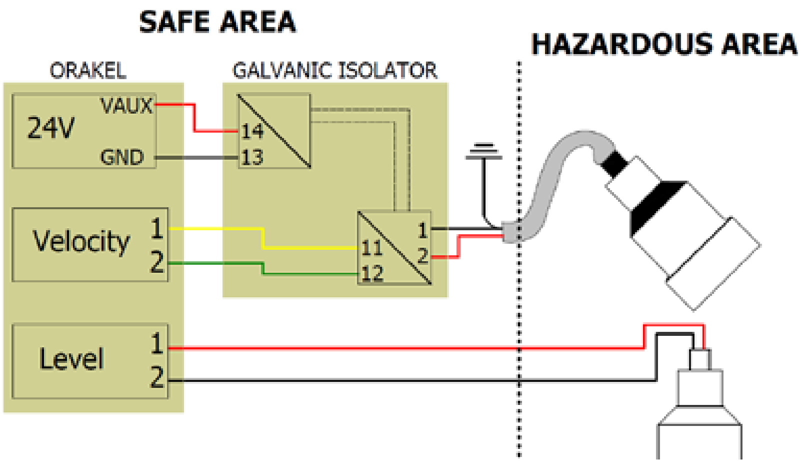


Terminal 13: connected to the black negative wire
Terminal 14: connected to the red positive wire

The red and black wires are connected to the VAUX and GND terminals on the ORAKEL main board, as shown below:



The following image is a wiring diagram for the two sensors, the ORAKEL, and a barrier (Galvanic Isolator):



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