



User Guide

Flosense 3.0 & 4.0 software



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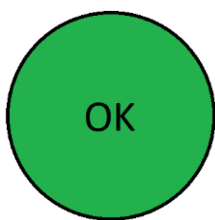
1. Introduction

This User guide serves as a reference for the operator of a Flosense 3.0 and 4.0 Manifold system. It describes configuration and operation of the Flosense software.

1.1. List of symbols

The following symbols can be found in the Flosense Software. In this section, their meaning will be described.

The Flosense software operates on a touchscreen display, so most of the symbols also function as buttons when pressed.



Normal operation
No Alarms or warnings



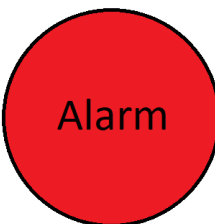
Information



Warning indicator



Settings



Alarm indicator



Return/Previous menu
/Back button



Home Screen



Exit menu



Previous page



Next page



Audit Settings



Configurations



Languages



Alarm button/symbol



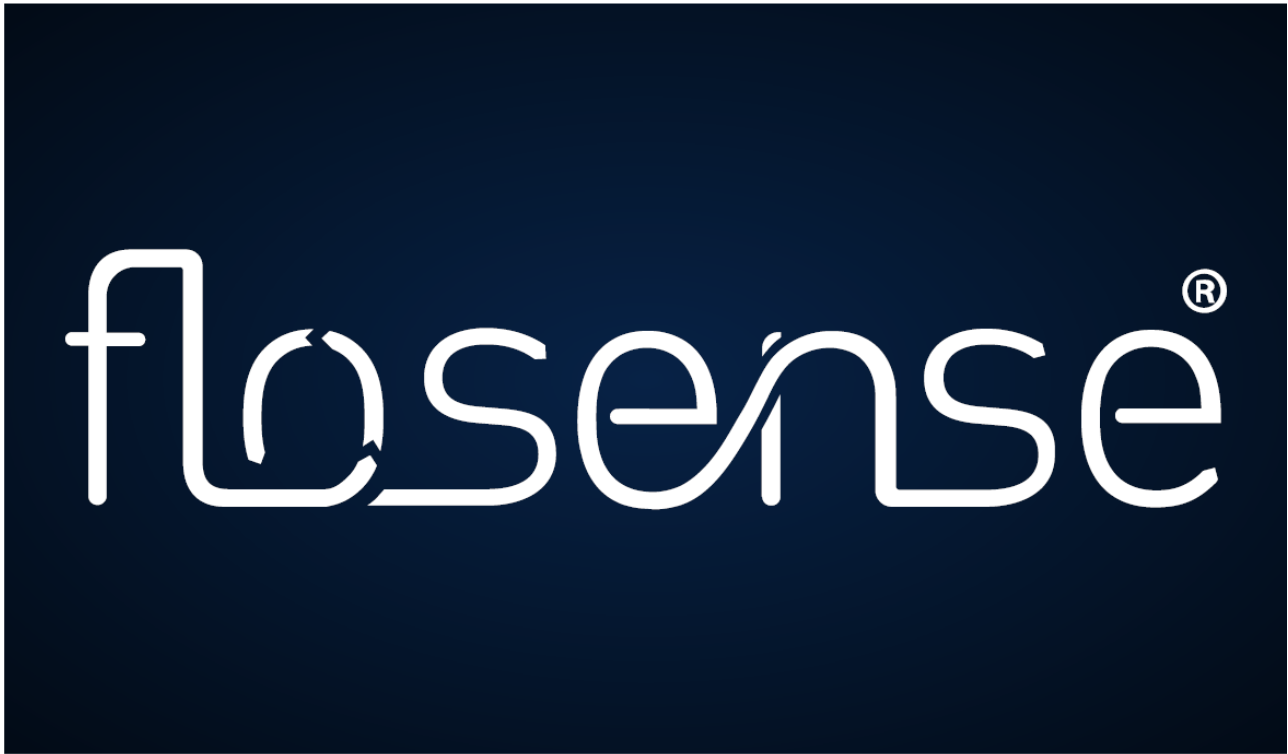
Display Graph / Graph
button



Download button

2. Startup

The Flosense software starts up on the splash screen, shown below. Pressing anywhere on the touchscreen, or waiting for 5 seconds, continues to the home screen.



If it is your first time starting up the software, then the software automatically redirects you to the select language screen instead. After selecting a language, the software continues to the home screen.

3. Home

After startup, the Flosense software automatically displays the Home screen. This screen displays all the connected manifolds.



The home screen displays the operating status for each of the manifolds. The status is indicated by the small coloured circle in the top right of each manifold. The status indicators are as follows:

Green	Normal operation
Orange	Warning indicator
Red	Alarm indicator

If the manifold is operating within the specified limits, the indicator will light green. If anything within the manifold does not operate within the specified limits, the indicator will either light orange or red, depending on the specified settings.

Additionally, the screen displays data as an indicator for the pressure loss [Bar], flow [lpm] (liters pr. minute) and temperature [°C] for each manifold. Additionally, the name of the manifold is displayed below the data.

The manifolds can additionally be pressed anywhere in the box containing manifold information and data, to access the Manifold screen (Section 3.2). Below the manifolds, you have access to the product information button (Section 3.1) and the settings button (Section 4)

3.1. Product information

This screen shows information about the product and the display. Information such as product and display ID can be found, as well as firmware and software versions for both.



From this screen it is only possible to return to the previous screen, or enter the settings menu (Section 4). There is also a QR code which can be scanned for more help and information.

3.2. Manifold screen

After selecting a manifold from the home screen, information and data from all the sensors in the manifold is displayed



The manifold screen displays the operating status for each of the sensors within the manifold. Exactly like the manifold, the status is indicated by the small coloured circle in the top right of each sensor. The status indicators are as follows:

Green	Normal operation
Orange	Warning indicator
Red	Alarm indicator

If the data measured by the sensors is within the specified limits, the indicator will light green. If the data is not within the specified limits, the indicator will either light orange or red, depending on the specified settings.

The manifold shows one sensor at the inlet and one at the outlet of the manifold, which measures the pressure at the inlet and outlet to determine the pressure difference, and it measures the temperature at the inlet. These 2 sensors are paired together in a box at the

bottom of the home screen (sensors S13 and S14 in the figure above). In this box, the total flow measured throughout the manifold is also displayed.

Additionally, the manifold contains between 4 and 12 flow and temperature sensors. These are placed in each channel, and measure the flow in the channel, and the temperature at the outlet of the channel.

The sensors can additionally be pressed, to access the sensor screen (Section 3.3). Below the sensors, you have access to the home button and the settings button (Section 4)

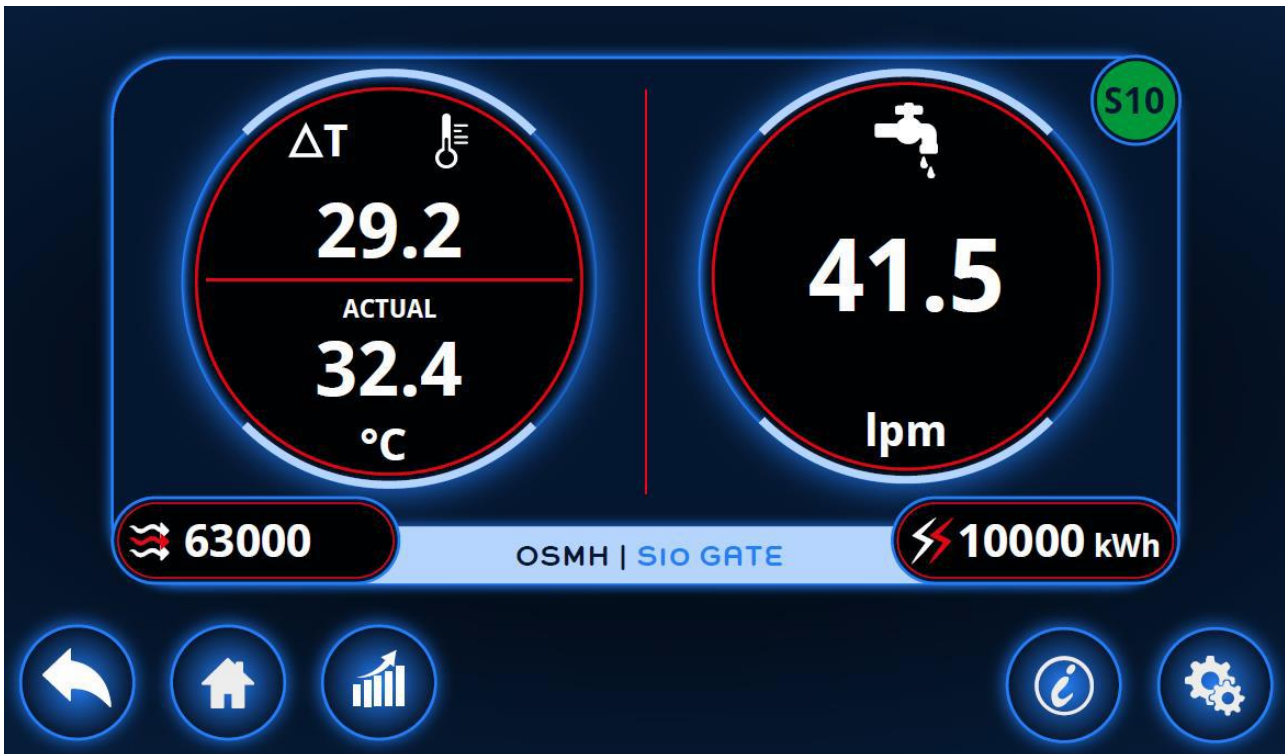
3.2.1. Manifold missing data

In case some of the sensors are not supplying readings, the manifold screen will mark the sensors completely red, and display a blank value.



3.3. Sensor screen

After selecting a sensor from the manifold screen, the data returned from the sensor is displayed.



The data available is the temperature difference from the channel inlet and outlet (ΔT), the actual temperature at the channel outlet the flow measured in the channel outlet, the Reynolds number and the energy dissipated in the cooling circuit calculated for the channel.



Laminar Flow



Transitional Flow



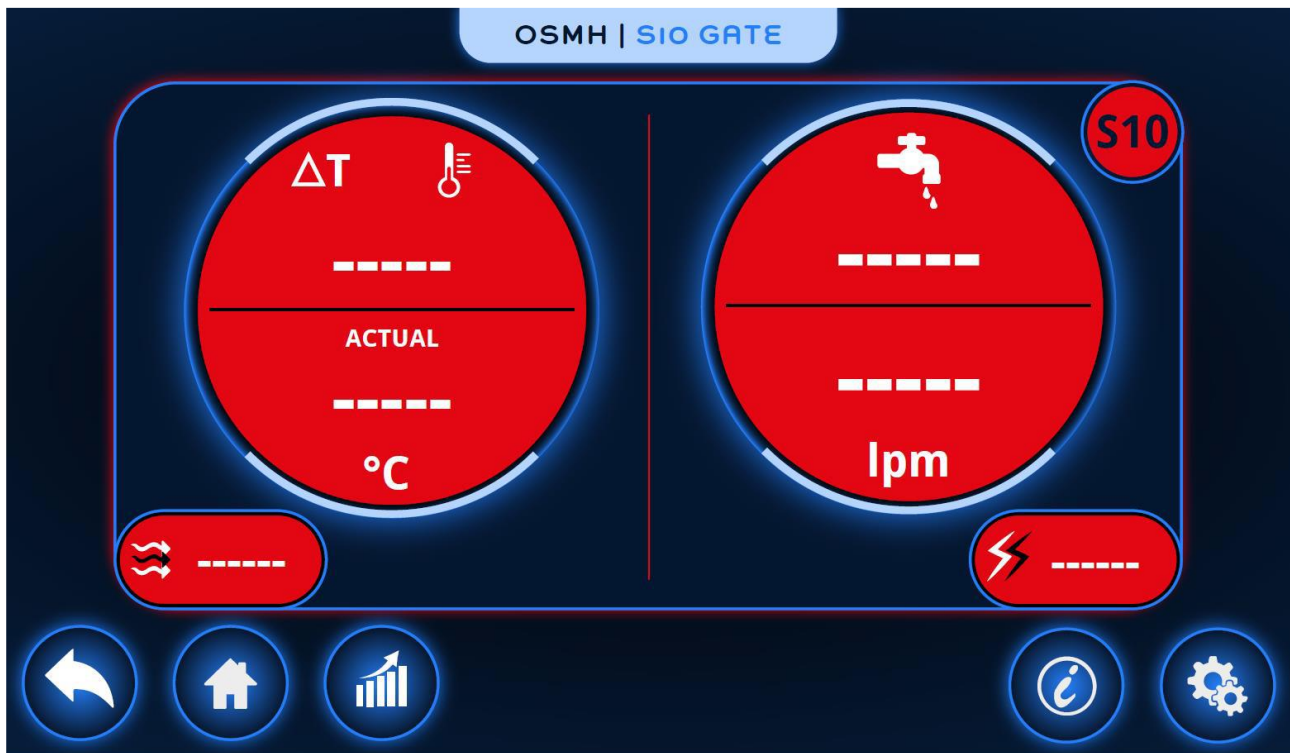
Turbulent Flow

Additionally, next to the Reynolds number, there will be a symbol, which indicates the type of flow in the channel.

From the sensor screen, it is possible to access the graphs screen (Section 3.5), the sensor information screen (Section 3.3.2) and the settings screen (Section 4)

3.3.1. Sensor missing data

If the selected channel is not returning data, then the sensor will be marked completely red, and display blank values



3.3.2. Sensor information

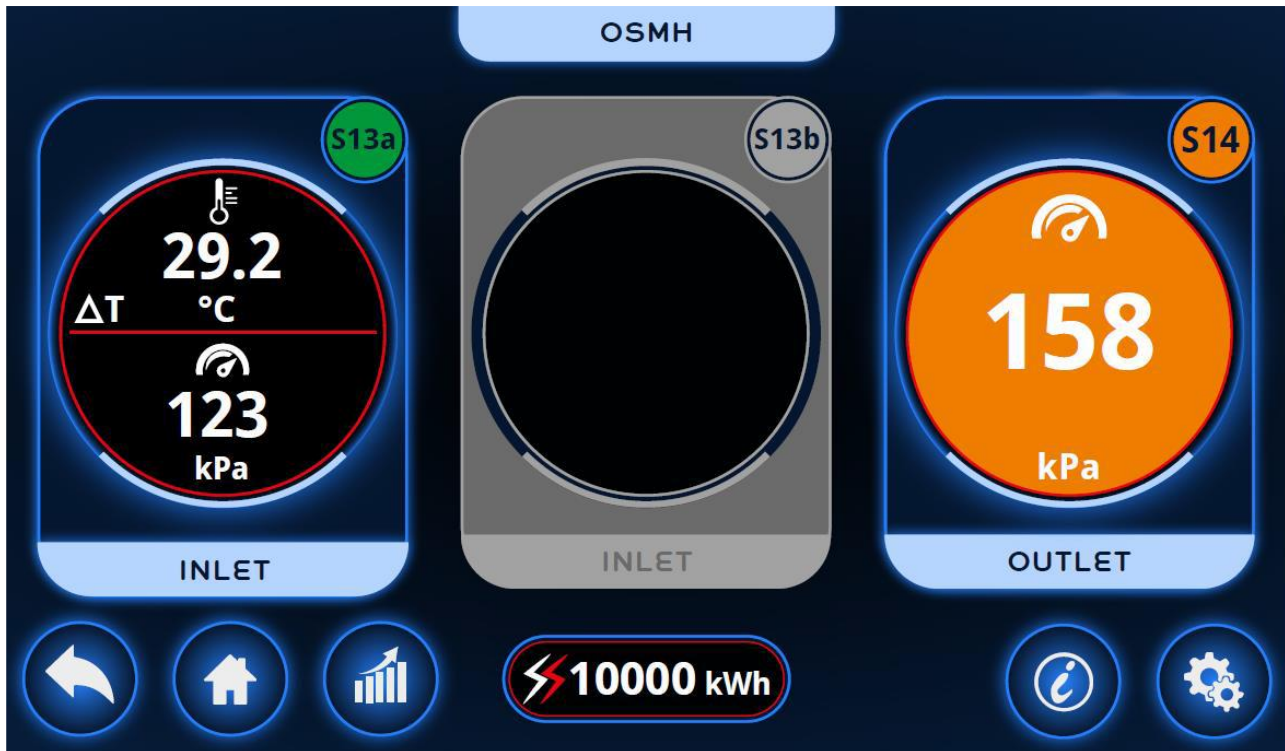
This screen shows information about the sensor. Here, the model number, the serial number, the flow range and the temperature range can be found



There is also a QR code which can be scanned for more help and information.

3.4. Inlet/Outlet sensors

After selecting the inlet/outlet sensor from the manifold screen, the data returned from the sensors is displayed.



The data available is the temperature difference from the manifold inlet and outlet (ΔT), the pressure at the inlet and outlet and the total energy dissipated calculated for all of the cooling circuits.

The figure above shows three possible sensors. This is because there are 2 pressure sensors on each side of the inlet. It is possible to select which sensor you wish to use (either S13a or S13b) in the Sensor settings menu, Sensors 2 (section 4.4.2).

From this screen, it is possible to access the graphs screen (Section 3.5), the inlet/outlet sensor information screen (Section 3.4.1) and the settings screen (Section 4)

3.4.1. Inlet/Outlet sensor information

This screen shows information about the inlet and outlet sensor. Here, the model numbers, the serial numbers, the flow range and the temperature range can be found for each sensor.



There is also a barcode which can be scanned for more help and information.

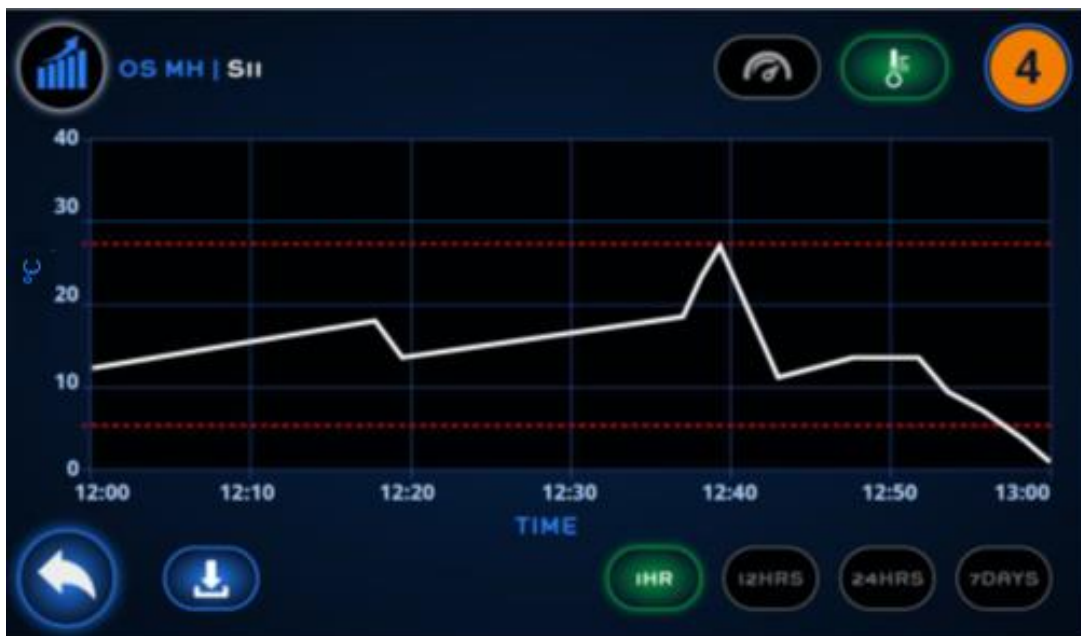
3.5. Plotting graphs

Once the plot graph screen has been selected, a graph will be displayed of the measured data.



(Above: Plotting flow for one of the flow sensors in the cooling channels

Below: Plotting temperature for one of the pressure sensors)



It is possible to select the parameters in the top right corner. The parameters will depend on the selected sensor, so they will either be flow and temperature (Top figure) or pressure and temperature (Bottom figure). By default, the flow or pressure will be selected, but if you exit the graph screen, your currently selected parameter will stay on the settings last used.

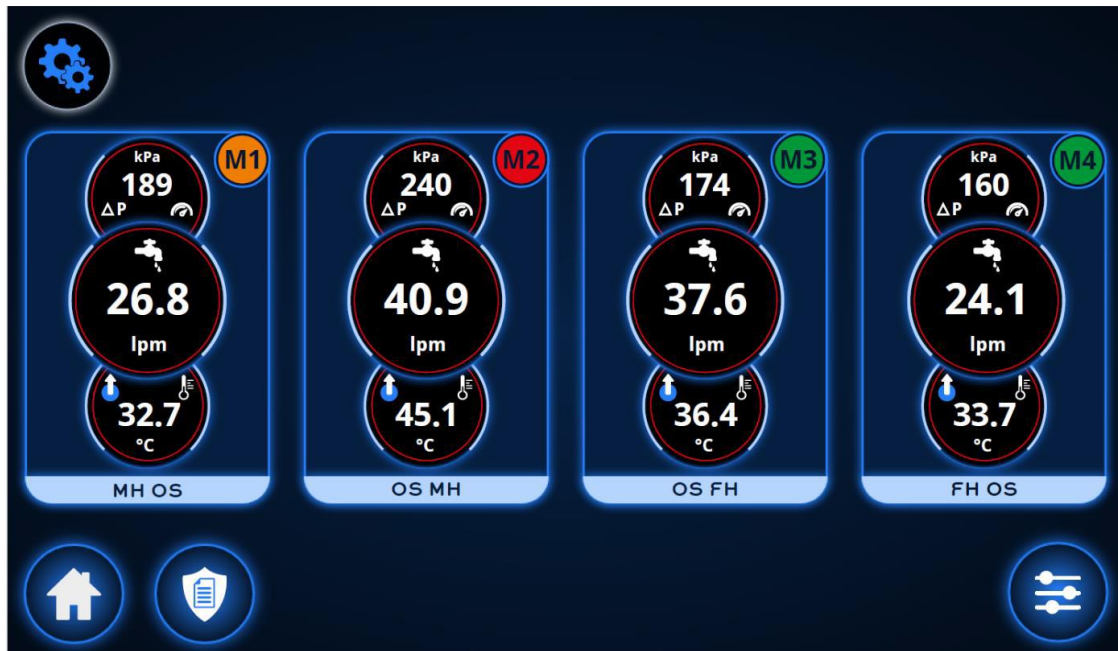
Additionally, it is possible to select the time period to observe, in the bottom right of the screen. Here it is possible to set the observed time to: 1 hour, 12 hours, 24 hours or 7 days. However, it is not possible to set the observable time a higher tier if the previous one has not been surpassed. This means that until an hour has passed, it is not possible to set it to 12 hours. The same thing applies for each of the next two tiers of observable time.

The graph will be plotted as a white line, and alongside the plotted data, a horizontal red dashed line will also be displayed, to show the alarm limits

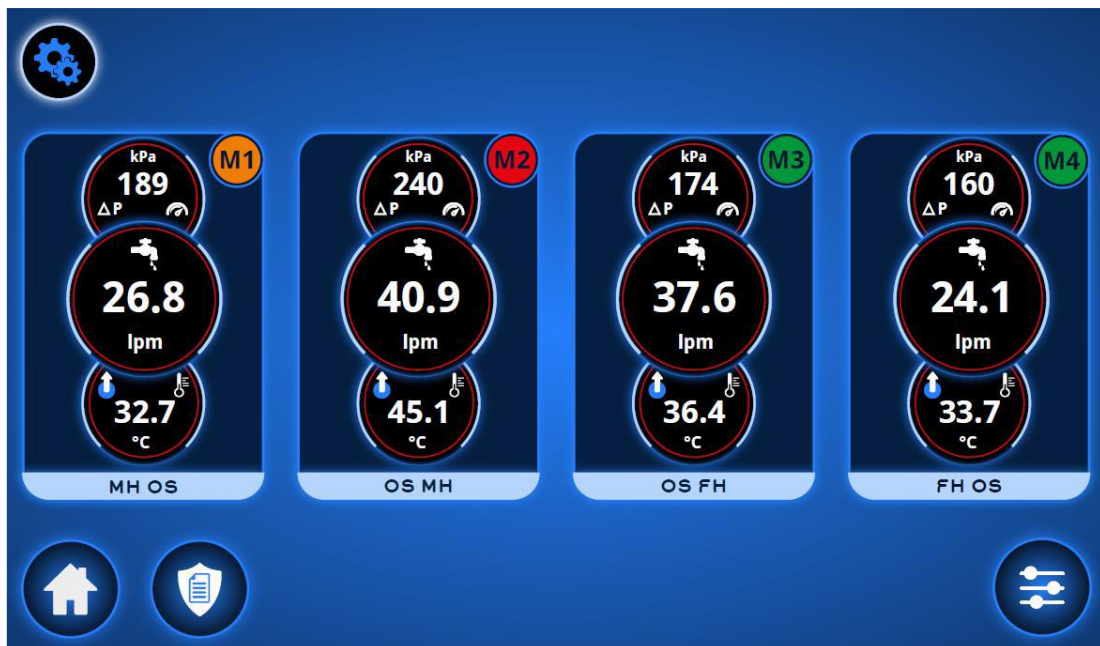
From this screen, it is possible to return to the selected sensor, or to press the download data button. If the download data button is pressed, the current data log will be downloaded via the USB port, to the root level of the connected USB drive, and the data on the Flosense screen will be deleted afterwards.

4. Settings

When entering the settings menu, the screen displays a similar state to the manifold menu.



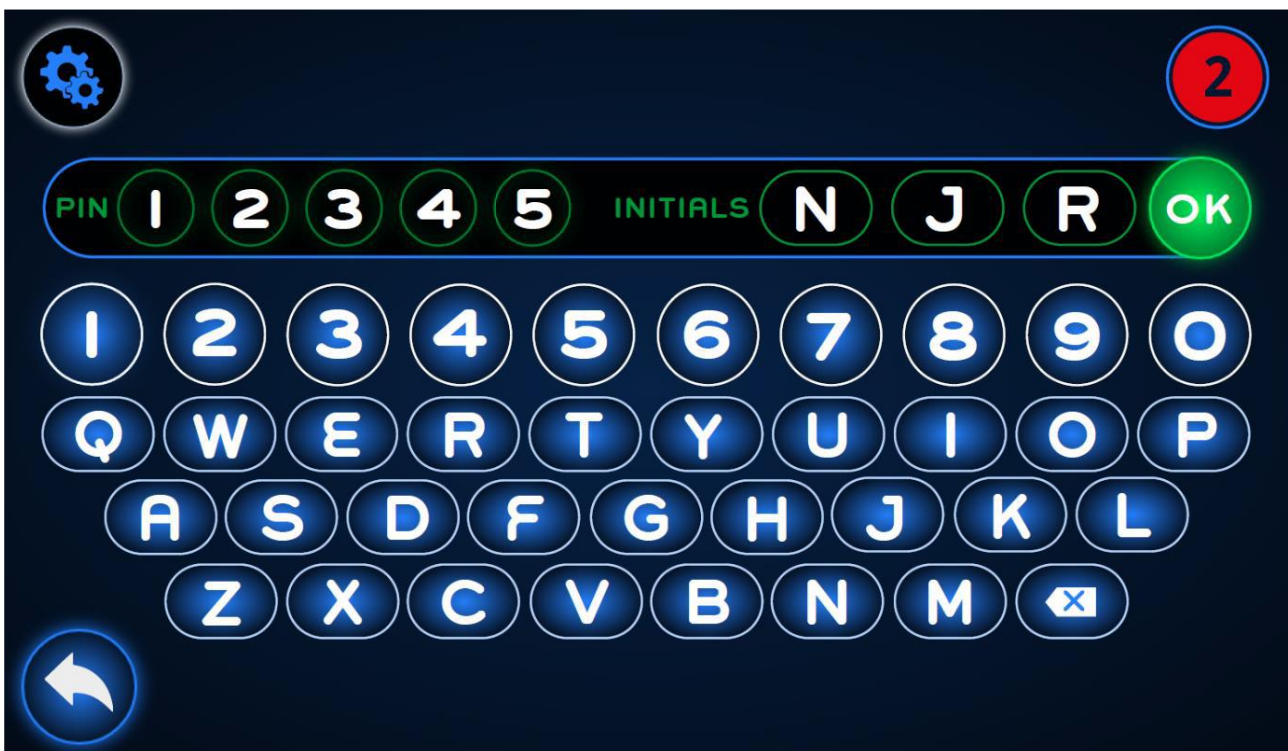
The settings menu is initially shown with a dark background. When pressing any option besides the home button, the screen will prompt the user to log in. Once the user has logged in, the background will turn blue, and it will be possible to access and change the settings.



From this menu it is possible to access the audit logs (Section 5.1), the configurations menu (Section 4.7) and the manifold settings (Section 4.3) which are accessed by selecting a manifold.

4.1. User login

When prompted to log in, the user is required to enter a 5-digit PIN, and 1-3 initials. Any initials may be entered, but these will be displayed in the audit log, if the user makes any changes in the settings/configurations.



Each display has a single PIN, which enables anyone who knows the PIN to access and change the settings. It is possible to change the PIN, by entering the PIN-settings menu (Section 4.6)

4.2. Global settings

When pressing any manifold in the settings menu, the screen will display the global menu. At the top of the display, there are 7 tabs in total. The currently selected tab will be displayed in dark blue, while the rest of the available tabs will be displayed in light blue. Pressing any of the tabs gives access to the appropriate menu, from manifold settings to PIN-settings (Sections 4.3-4.6)



From the global menu, it is possible to change the settings for the screen and all manifolds. To the left, it is possible to change the units of the measured data. For temperature, it is possible to choose between °C and °F. For flow it is possible to choose between liters or gallons pr. minute (LPM or GPM). For pressure it is possible to choose between kPa or Bar. It is also possible to access the select language menu (Section 4.2.1) from here.

To the right it is possible to change the data logging rate. The Min and Sec buttons can be toggled, so the changes made in data logging rate will be in the toggled magnitude. It is possible to adjust the data logging rate to any value between 1 second, and 5 minutes and 59 seconds. The gauge in the middle displays the data logging rate visually, with each of

the green bars lighting up for each minute added, as well as the dial moving clockwise for each second added. Additionally, the logging rate will be displayed in the center of the dial.

4.2.1. Select language

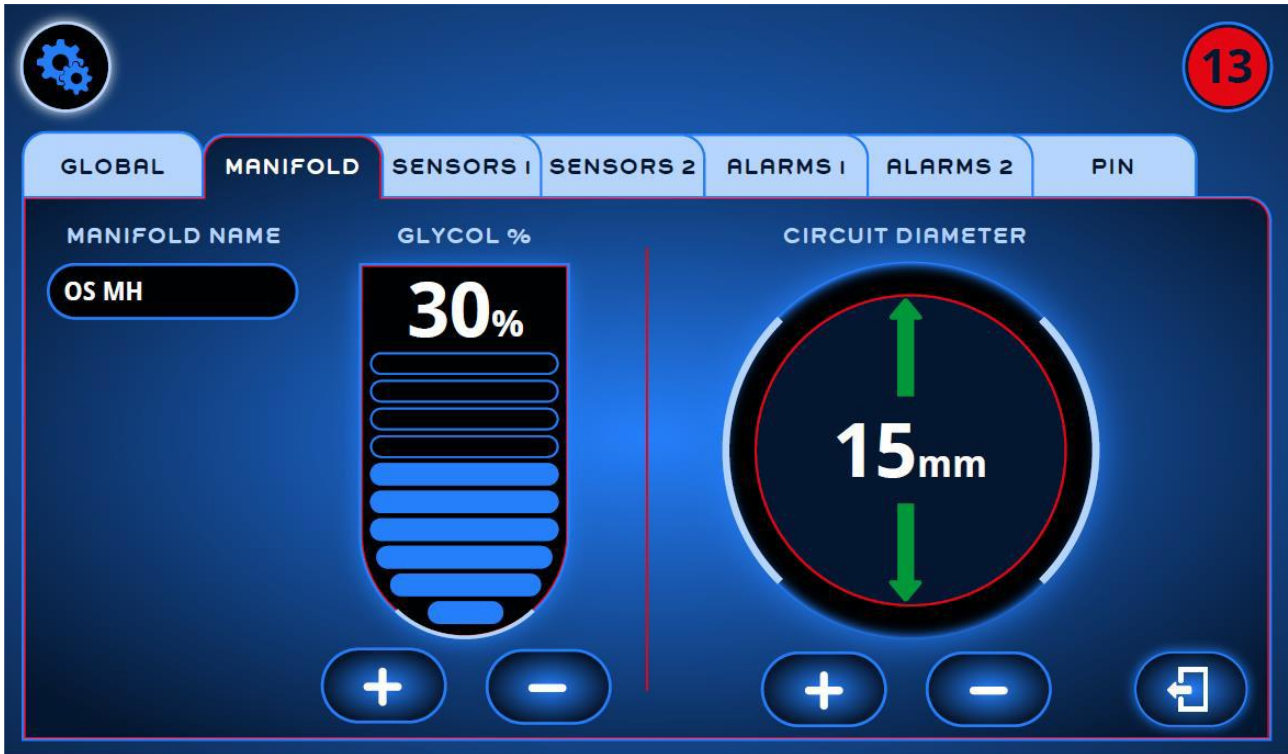
Whether accessed from the Global settings menu, or being redirected from the first time startup, the select language menu will display a list of the available languages for the software.



If more than 12 languages are available, the screen will display the left and right arrows at the bottom of the screen, and multiple pages with languages will be available. When selecting a language, the selected language is highlighted for 1 second, before returning the user to the previous menu, which will now be in the new selected language.

4.3. Manifold settings

When selecting the Manifold tab, it is possible to adjust the settings in the software to match the hardware. It is also possible to rename the manifold in the software.



There are two parameters which can be changed for the manifold. The first is the amount of glycol used in the cooling fluid, which can be adjusted in 5% increments from 0% to 50%. This will be visually represented by the bars filling up for every 5% added.

The second parameter is the cooling circuit diameter. This is the diameter of the cooling circuit in the mould. The diameter can be adjusted in 1mm increments from 5mm to 20mm.

These parameters are used to compute the flow by means of Reynolds number.

4.4. Sensor settings

There are two sensor menus, Sensors 1 and Sensors 2. The first menu is for naming, and arming and disarming the sensors in each channel. The second menu is for defining the inlet and outlet sensors, and to define the numbering order of the sensors in each channel.

4.4.1. Sensors 1

In the sensors 1 menu, it is possible to see the active sensors, name them, arm and disarm them and scan for sensors.



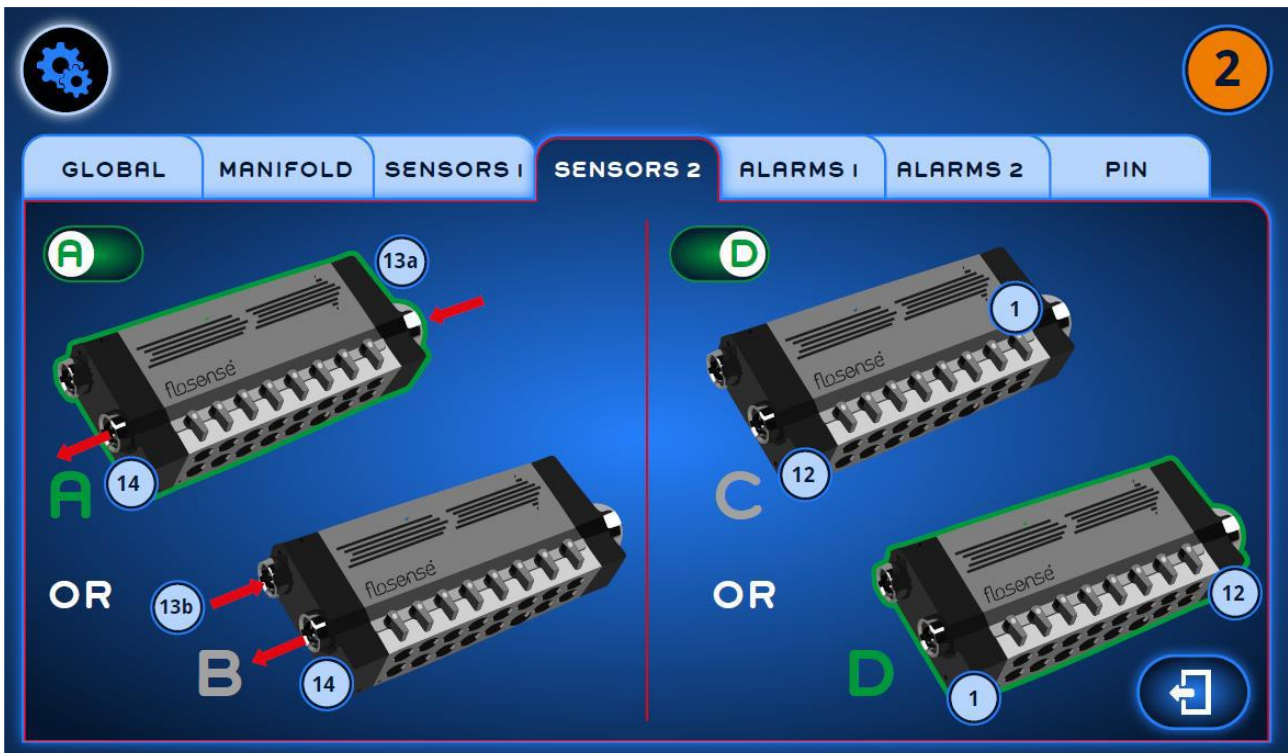
The active sensors are shown with the sensor ID (S1-S12). The Sensor ID is white if the sensor is armed and grey if the sensor is disarmed or not detected. The sensor name is next to the sensor ID and is by default named from Sensor 1 to Sensor 12. By selecting a sensor, the on-screen keyboard will be displayed, and the sensor can be renamed.

Additionally, the sensors can be armed or disarmed, by toggling the slider to the right of the sensor name. Arming a sensor means that the sensor is allowed to activate alarms throughout the software. By default, all detected sensors are automatically Disarmed and can only be armed manually by a user.

Finally, by pressing the button at the center bottom of the screen, it is possible to scan for sensors, which will detect any changes to the connected sensors, and update the Sensors 1 menu accordingly.

4.4.2. Sensors 2

In the sensors 2 menu, it is possible to choose the position of the used inlet and outlet sensors, and to choose the numbering order of the cooling channels.



On the left side it is possible to select whether the inlet and outlet are on the same side of the manifold or on the opposite side of the manifold. This needs to be defined, as the manifold contains one outlet sensor, and two inlet sensors, one sensor on each side of the inlet. Selecting the sensor on the side connected to the water supply allows the software to select which inlet sensor to use for measurements. On the right side it is possible to select the numbering direction of the cooling channels (and thereby also the position of the inlet). So the combination of settings A or B and C or D determines the direction of the flow, and the order of the sensors. It can be combined as shown in the following table.¹

¹ See Known Issues section 9.1

	C	D
A	The inlet 13a is on the bottom right side of the figure, and the outlet is on the top left. The sensor numbering starts at 1 from the right and ends at 12 to the left.	The inlet 13a is on the bottom left side of the figure, and the outlet is on the top right. The sensor numbering starts at 1 from the left and ends at 12 to the right.
B	The inlet 13b is on the bottom right side of the figure, and the outlet is on the top right. The sensor numbering starts at 1 from the right and ends at 12 to the left.	The inlet 13b is on the bottom left side of the figure, and the outlet is on the bottom right. The sensor numbering starts at 1 from the left and ends at 12 to the right.

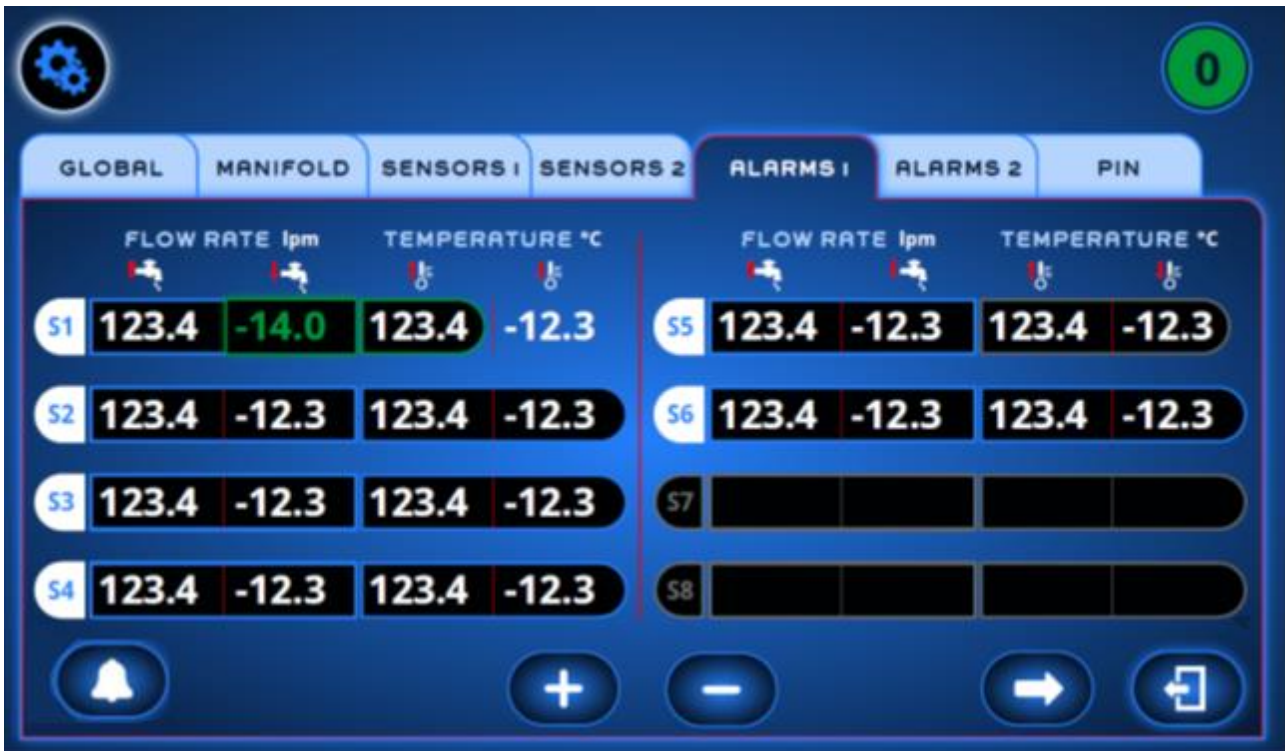
4.5. Alarms

There are two alarm menus, Alarms 1 and Alarms 2. Both menus are used for defining the upper and lower limits for temperature and flow on the circuits, and temperature and pressure for the inlet and outlet. If these limits are exceeded, the system will show an alarm for the sensor and manifold and to set up auto-alarm.

In addition to the system showing an alarm when the values are exceeded, the system will automatically set a warning threshold at a value 25% lower than the upper limit and 25% higher than the lower limit. If this threshold is exceeded, the system will show a warning, rather than an alarm.

4.5.1. Alarms 1

The Alarms 1 menu can show up to 8 channels, depending on the number of sensors connected. The unused channels will be greyed out.

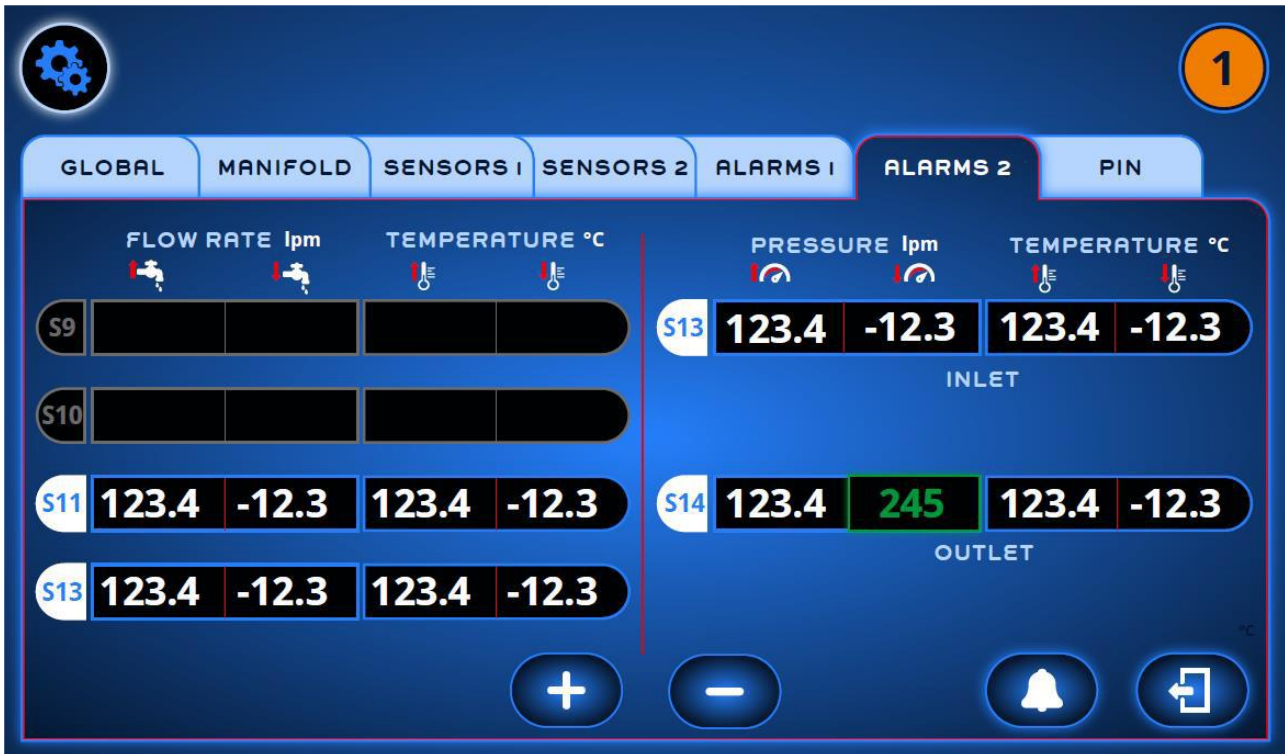


For each channel, it is possible to define the upper and lower limit for the flow and the temperature. This is done by pressing the setting which should be changed and pressing the + or – buttons at the bottom of the screen to increase or decrease the current value. The currently selected setting will be highlighted and turn green, while being changed. Tapping the + or – button will increase/decrease the alarm value by 0.1, while holding down one of the buttons will increase/decrease the value by 1 at a faster rate. Additionally, pressing the Alarm button will turn on auto-alarm (Section 4.5.3).

Pressing the right arrow will lead you to Alarms 2, and pressing the exit button, will lead you back to the previous menu.

4.5.2. Alarms 2

The Alarms 2 menu can show up to 4 channels, depending on the number of sensors connected. The unused channels will be greyed out. Additionally, to the right it shows the inlet and outlet channels.



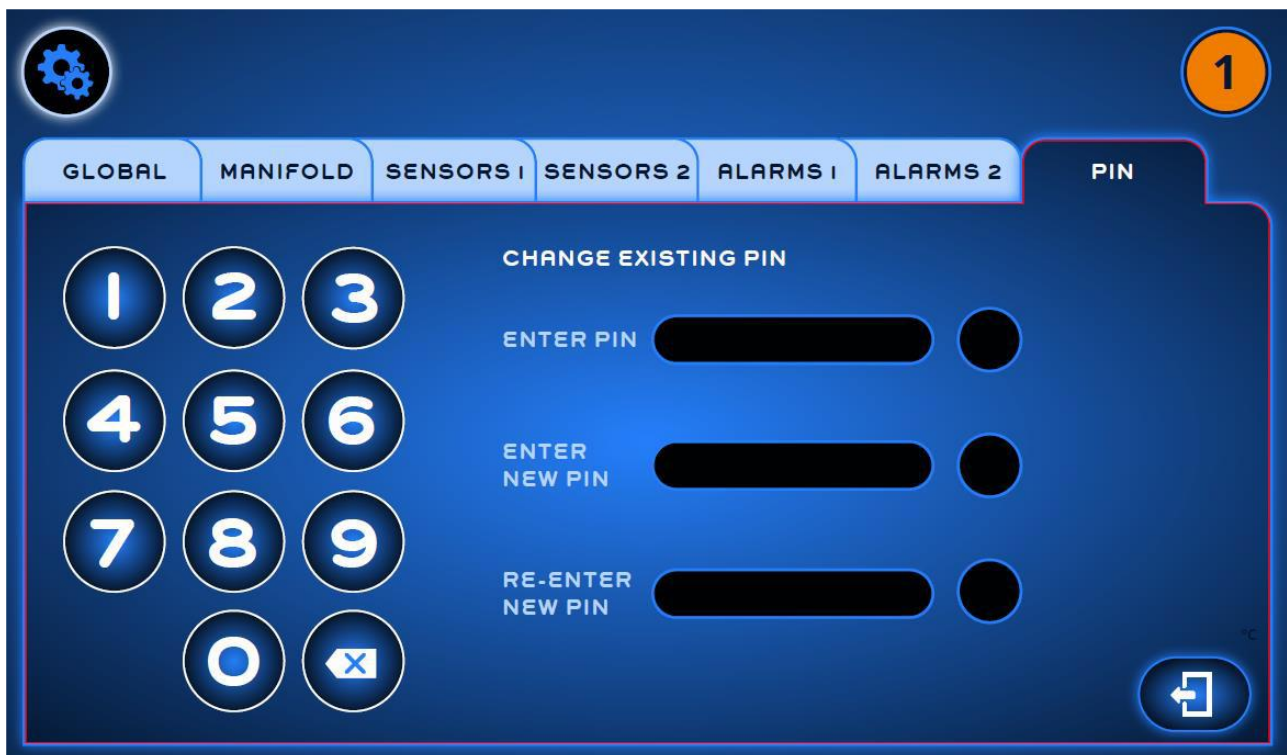
For each channel, it is possible to define the upper and lower limit for the flow and the temperature, and for the inlet and outlet channel it is possible to define the upper and lower limit for pressure and temperature. This is done by pressing the setting which should be changed and pressing the + or – buttons at the bottom of the screen to increase or decrease the current value. The currently selected setting will be highlighted and turn green, while being changed. Tapping the + or – button will increase/decrease the alarm value by 0.1, while holding down one of the buttons will increase/decrease the value by 1 at a faster rate. Additionally, pressing the Alarm button will turn on auto-alarm (Section 4.5.3). Additionally, pressing the exit button, will lead you back to the previous menu.

4.5.3. Auto-alarm

Auto-alarm can be accessed in the Alarm 1 and Alarm 2 tabs. Turning on auto-alarm will take the latest measured values for temperature, flow and pressure, and set the upper limits to a value 10% higher and the lower limits to a value 10% lower.

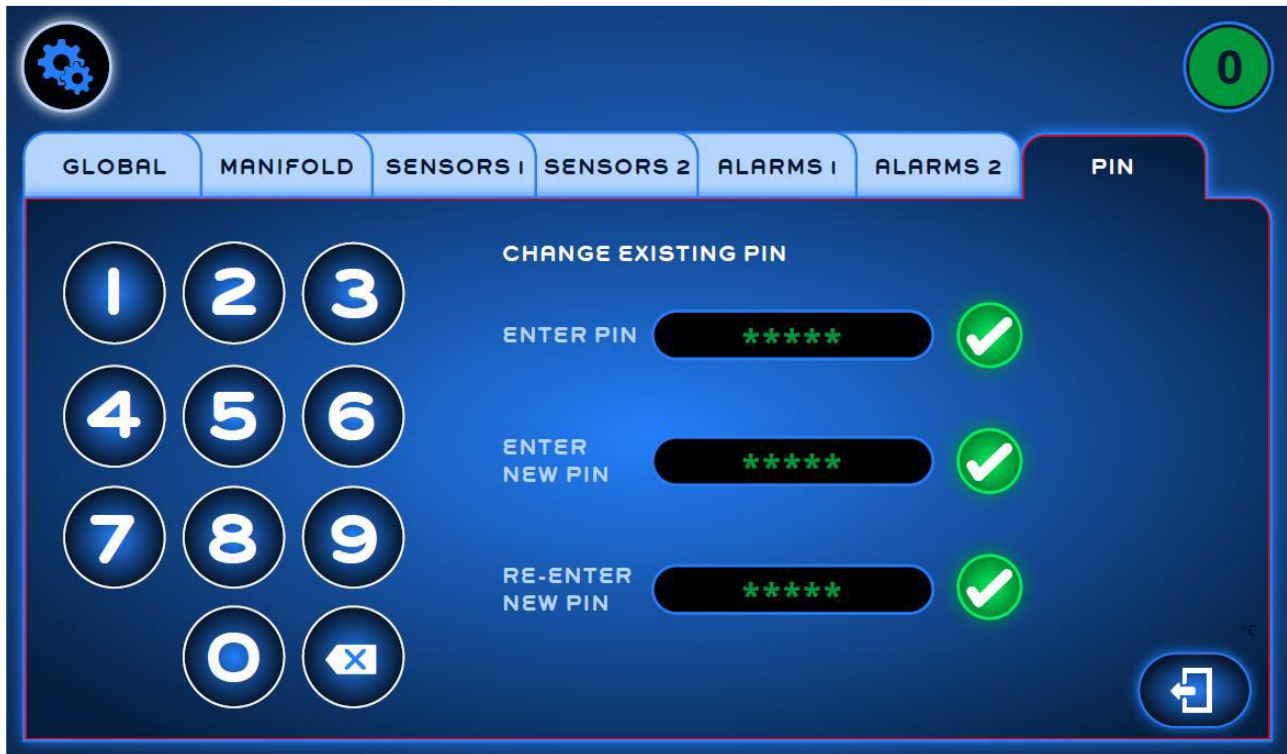
4.6. Pin settings

The Pin settings menu can only be used to change the pin used to access the settings menu.



To the left, you will see a numpad. Pressing the buttons will enter the pin as asterisks in the top bar. If the correct 5-digit pin is entered, the pin will turn green, and a green checkmark will be added in the circle to the right of the bar. It is also possible to delete the last digit with the delete button.

The default PIN is: **36963**



Afterwards, you can use the numpad to enter the new 5-digit pin. Once it has been entered, you will have to re-enter the new 5-digit pin below. If the two pins match, all three circles to the right will turn green and the text “New Pin Saved” will be displayed.

At any point, the user may press the exit button, and it will keep the currently saved pin, and clear all fields in the menu.

4.7. Configuration

If the configuration menu is selected from the settings menu, a list of configurations will be displayed. A configuration contains the all the settings from the manifold to the alarm tabs.²



Up to 21 configurations can be saved, and they will be indicated by their ID to the left, and a customizable name in the bar next to the ID. The currently activated configuration will be highlighted by a green outline. If no configuration is activated, the configuration used will be the default configuration, which cannot be deleted or edited. Pressing any configuration will select it and highlight it with an orange outline. In order to activate the selected config, you need to press the checkmark in the bottom right of the screen. Pressing the star icon will return the configurations to the default configuration.

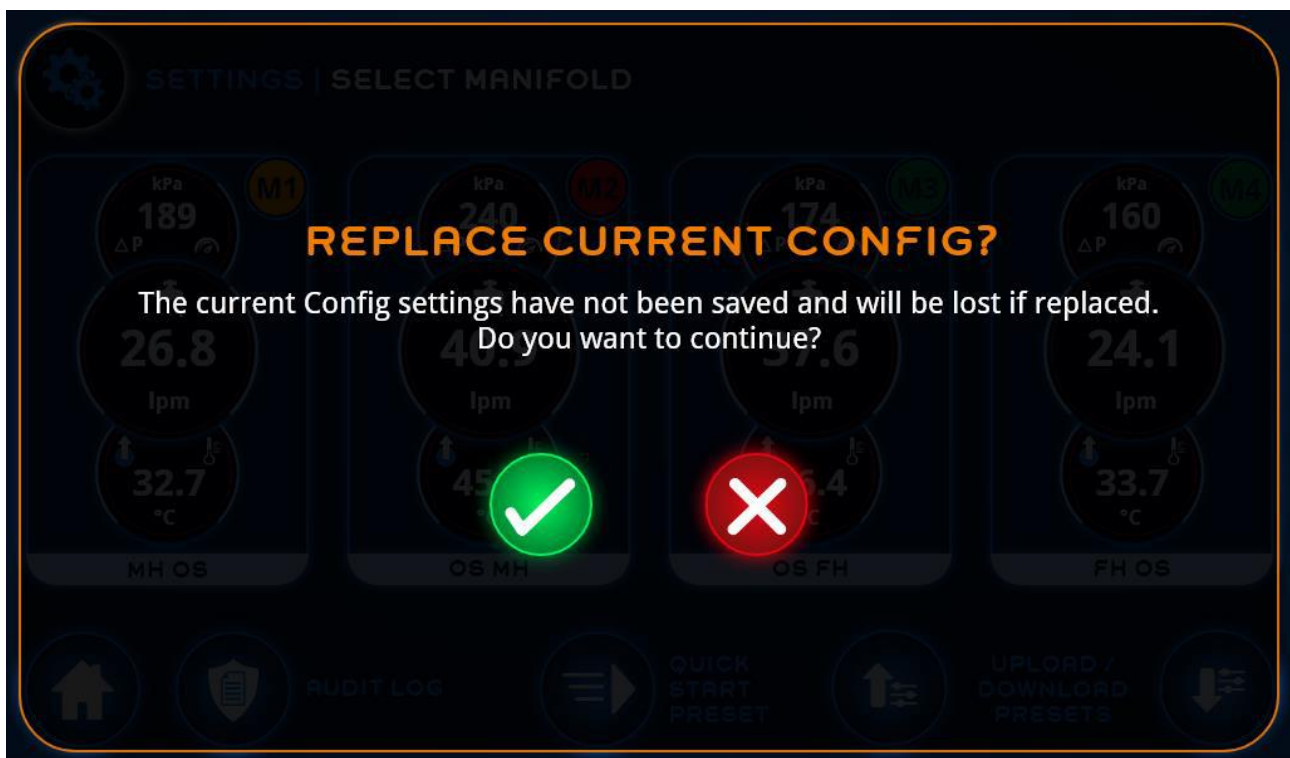
Unused configurations slots will be greyed out. It is possible to add new configurations. It is also possible to save a new configuration, and currently the upload button also functions as the save/overwrite current configuration button.

² See Known Issues section 9.2

Next to the star icon is the download and upload button. Pressing the download button will download all the saved configurations from the software to a connected USB. A USB can be connected to the mini USB port at the bottom of the screen by using the provided adapter. This is useful if you have set up the software for a specific system, and you wish to save it for future use. Pressing the upload button will upload all saved configurations from a connected USB to the software. This is useful if you have previously saved a configuration you wish to use again, or if you wish to change the configuration on a second system to be the same as the previously set up system, or if you wish to use the configuration on another moulding machine fitted with Flosense.

If you attempt to upload or download a set of configurations without a connected USB, you will either get a download error (Section 8.1) or upload error (Section 8.2)

If you attempt to activate a new configuration without saving the current configuration, a warning message will be displayed, to confirm if you wish to change configurations.³



If you attempt to activate a configuration which does not match the current settings, either

³ See Known Issues section 9.2

because of a differing number of manifold or sensors, you will get a config not compatible error (Section 8.3).

5. Log

From the settings menu, it is possible to access the audit log after logging in. The audit log contains information regarding any changes made to the system. The information displayed in the audit log cannot be edited or deleted once they are entered in the log.

5.1. Audit log

The audit log is separated into 6 columns. The columns display the date & time of the event, the initials of the user who made the changes, the type of event (Section 5.1.1), the designation of the manifold in which the event occurred, the designation of the sensor where the event occurred and type of alarm triggered due to the event. The colour of the alarm indicates whether it was a warning (**orange**) or a full alarm (**red**). If the field is blank it indicates no alarm.



DATE TIME	USER	EVENT TYPE	MANIFOLD	SENSOR	ALARM
12/07/2019 15:37:05	NJR	Change to High / Low Temperature Alarm Settings	FS MH	S7	
10/07/2019 06:11:45	CBS	Change to High / Low Temperature Alarm Settings	OS MH	S12	
09/07/2019 00:34:28	PLR	Change to High / Low Temperature Alarm Settings	MH OS	OUTLET	
09/07/2019 03:14:36	PWB	Change to High / Low Temperature Alarm Settings	OS MH	S10	
08/07/2019 09:22:11	NJR	Change to High / Low Temperature Alarm Settings	FS MH	S6	
04/07/2019 13:45:48	PLR	Change to High / Low Temperature Alarm Settings	MH OS	INLET	
02/07/2019 14:11:57	CBS	Change to High / Low Temperature Alarm Settings	OS MH	S1	

The audit log displays up to 7 entries at a time. However, there can be multiple pages, which can be scrolled through with the up and down arrow at the bottom of the screen. The page number and total number of pages can be seen to the right below the last entry displayed,

and there is a sidebar to the right of the entries, which displays visually how far up or down the user is in the list of pages of the audit log.

It is also possible to download the contents of the audit log to a connected USB drive, by pressing the download button.

All events are listed in the table below

5.1.1. Event types

Here, all of the possible event types will be listed, alongside an explanation

Event type	Description
Change to High/Low temperature alarm settings	A change to the temperature alarm limits has been made.
Change to High/Low flow alarm settings	A change to the flow alarm limits has been made.
Change to High/Low pressure alarm settings	A change to the pressure alarm limits has been made.
Auto-set alarm function used	The auto-set alarm function is activated.
Saved configurations used	A saved configuration is activated as currently used configuration.
Default configuration used	The default configuration is activated as currently used configuration.
Change to manifold names	The designation of a manifold has been changed. The new manifold name will be displayed in the Manifold column.
Change to sensor names	The designation of a sensor has been changed. The new sensor name will be displayed in the sensor column.
Change to measurement parameters	One or more of the measurement parameters in the Global settings tab have been changed, e.g. °C to °F or kPa to Bar.
Change to logging rate	The logging rate has been changed in the Global settings tab.
Sensor switched on or off	A sensor has been activated or deactivated.
Sensor out of range	A sensor reached a temperature, pressure or flow outside of the alarm range
Reverse order function used	The reverse order function in section 4.4.2 has been used, to change the order of sensors, either from C to D or D to C.

6. On screen keyboard

The on screen keyboard has been designed to be easy to use. It is used whenever it is necessary to enter characters into the Flosense software.



When using the keyboard to enter characters, it is not possible to select the space in which you wish to write. If you wish to move to an earlier entered space, you will have to use the delete key to move back.

Once you finish writing, pressing go will enter the written characters into the selected field. If you press go without having entered any characters, no changes will be made in the selected field.

7. Software updates

The flosense software is updated by using a USB drive. Updating the software is done as follows:

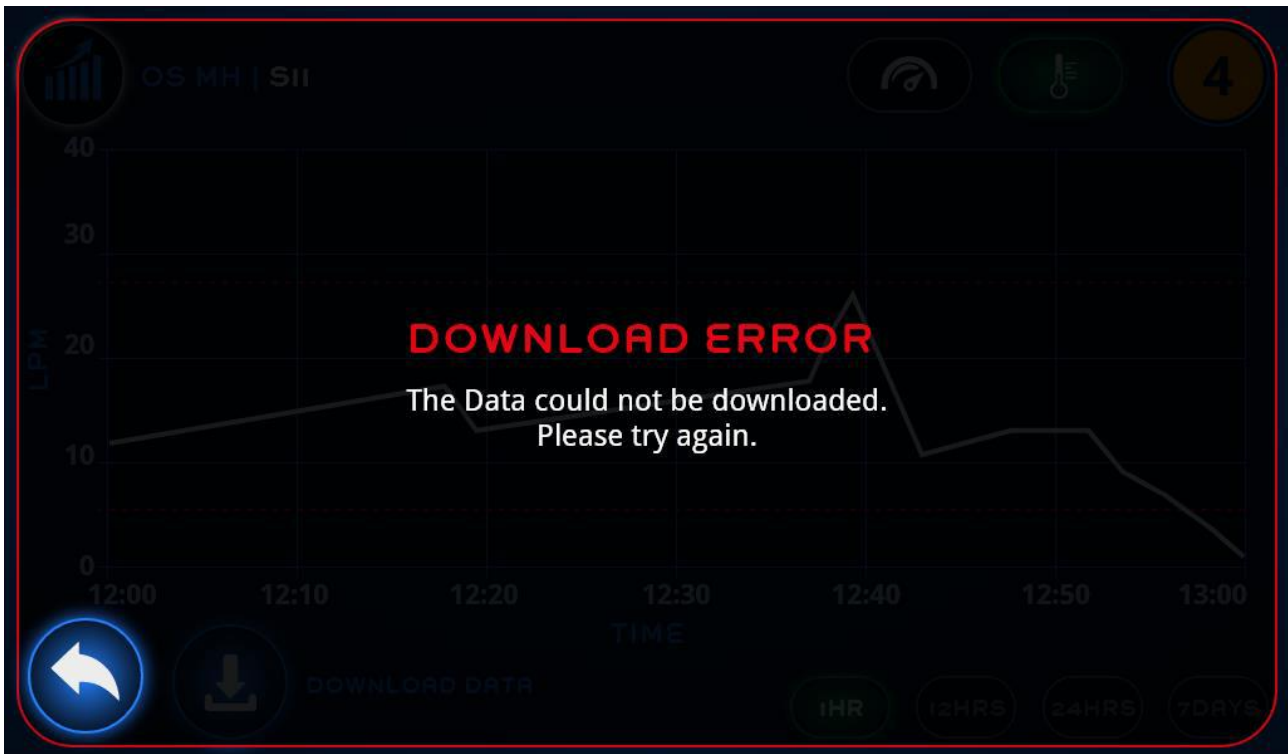
1. Copy the software update file (update.tar.gz) onto an empty USB drive.
2. Safely remove the USB drive.
3. Insert the USB drive into the micro-USB port using a USB to micro-USB adapter.
4. Once the USB has been entered, the software update will start automatically. You will know that the update has started once the software has restarted. Depending on the size of the update, this may take a few seconds, and in this duration the screen will become unresponsive.
5. Once the screen has restarted, a loading bar will appear to indicate the progress of the update. Once the update is finished, the software will automatically launch into the home screen
6. When the update is completed, remove the USB drive from the micro-USB port. For future use, please remove the software update file from the USB

8. Troubleshooting

This section covers common errors or issues, that may occur during the use of the software.

8.1. Download error

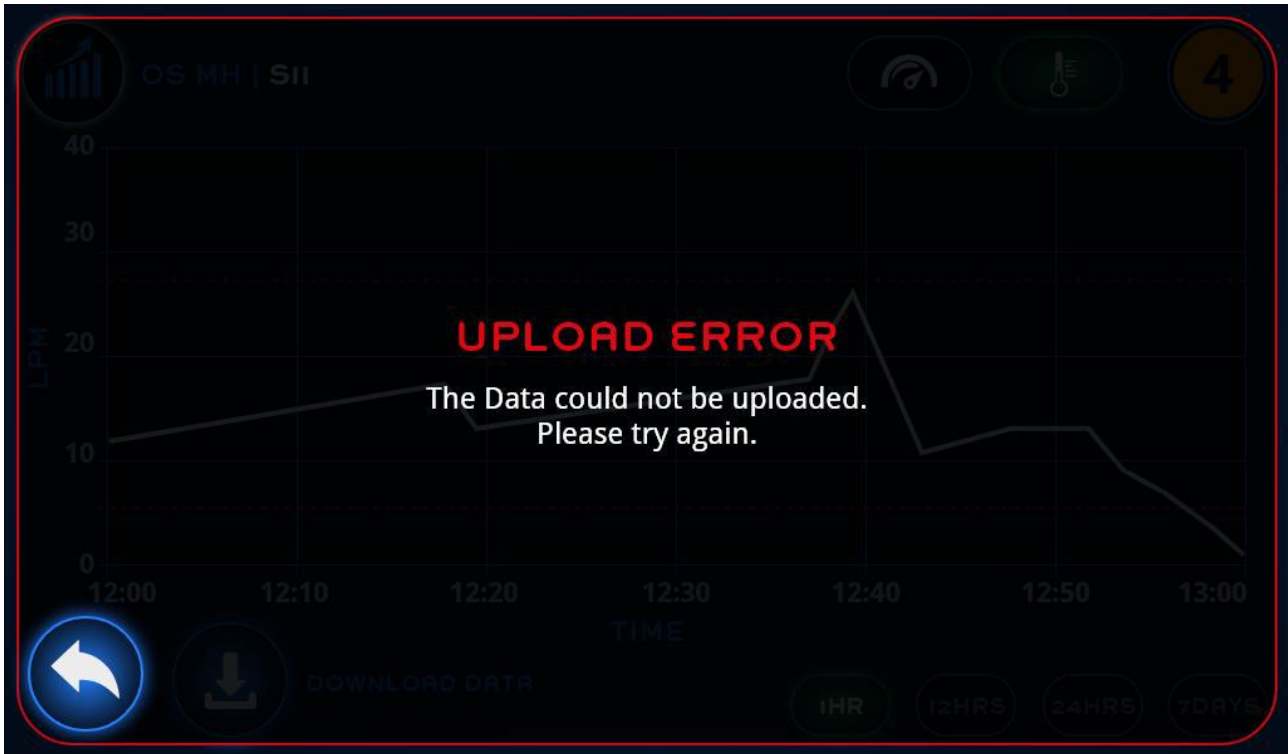
This error occurs when an attempt to download data is made, and the software is unable to do so.



This error can be seen in the plot graph screen (Section 3.5) if the log file cannot be downloaded. It can also occur if a set of configurations (Section 4.7) cannot be downloaded. This is most commonly the case if no USB drive is plugged in. Try connecting a USB drive to the micro-USB port by using a USB to micro-USB adaptor.

8.2. Upload error

This error occurs when an attempt to download data is made, and the software is unable to do so.



This error can be seen if a set of configurations (Section 4.7) cannot be uploaded. This is most commonly the case if no USB drive is plugged in. Try connecting a USB drive to the micro-USB port by using a USB to micro-USB adaptor.

8.3. Config not compatible

If you attempt to activate a configuration which does not match the current settings, you will get a config not compatible error.

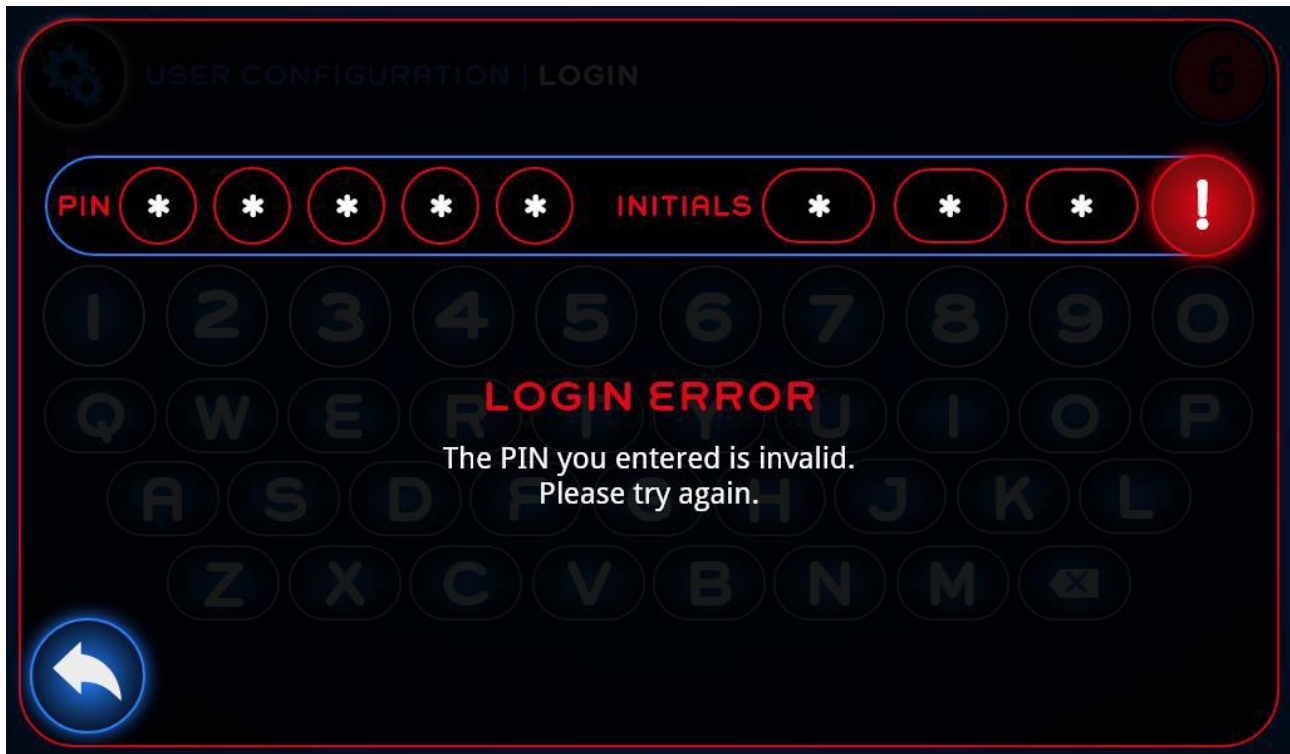


This is the case either because the number of manifold or sensors currently registered does not match the number of manifold or sensors saved in the configuration. If you wish to use this configuration, you need to connect the appropriate manifold and sensors before you can activate the configuration.

If you have the correct number of manifold and sensors connected, you may need to perform a scan in the sensors 1 settings tab (Section 4.4.1) before attempting to activate the configuration again.

8.4. Login Error

This error occurs when an invalid pin has been entered. If the correct pin is entered, this error should not appear.



9. Known Issues

Below you will find a list of known issues which will be fixed in the upcoming version of the software.

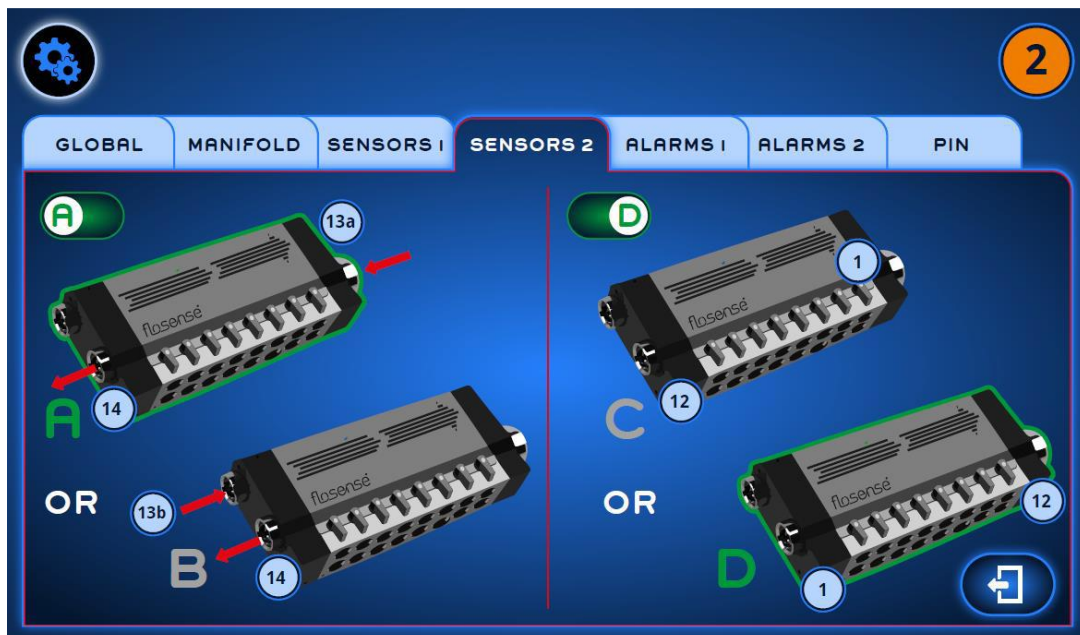
Date: 16-06-2020

Software Version: 4.0.2.4064

Firmware version: 5.0.0.175

9.1. Sensors 2

Currently the arrows on options A and B are wrong. For Option B the arrows point in the opposite directions. For Option A, the outlet needs to be on the adjacent pipe.



9.2. Configurations

The buttons on the bottom of the screen have been rearranged. The figure in the manual needs to be updated.

Additionally, the replace current config message is not showing up when it is supposed to.

10. Updates from previous version

10.1. Download

There was a bug that made the Flosense screen complete a download, even if a USB was not connected. This meant that no error message was showed, and if it was a download of the logged data, it would still delete the stored data, despite not downloading them.

Now an error message is displayed correctly, and the data is not deleted.

10.2. Language

Selecting and changing language now works correctly.

10.3. Audit Log

Audit Log is now available

Change log

Date of change	Change	Version
29-04-2020	Product release	001
16-06-2020	Firmware and software update that improves stability and added some missing features. All updates are listed in section 10	002