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Fluenta source doc. (for translations):		

TABLE OF CONTENTS

1. Purpose

UFM Manager is a software suite which facilitates the setup and management of the Fluenta FGM 160 and FGM 260 flare gas meters. This document gives comprehensive instructions for the use of this software, including access levels only available to Fluenta and to Fluenta-trained partners. This manual should be read in conjunction with the FGM 160/260 operating instructions, available from Fluenta with document control number 72.160.601.

This document is relevant for UFM Manager V3.0.0.

2. Definitions

Transducer	A ultrasonic sensor that converts one type of energy or signal into another.
FGM 160	Flare gas meter supporting a single ultrasonic path
FGM 260	Flare gas meter supporting a dual ultrasonic path

3. Responsibility

The Fluenta Design and Development (D&D) Department is responsible for writing this document and for keeping it up to date.

The D&D Department together with the Marketing and Service departments are responsible for controlling information in this document and providing customer feedback to ensure continuous improvement.

4. Abbreviations

FGM	Flare Gas meter
UFM	Ultrasonic Flare Meter
TD	Transducer
VOS	Velocity of Sound
ID	Internal Diameter

5. Handling User controls

UFM Manager sends all values to a FGM meter using a “write-read” system. When UFM Manager makes a setting change on a FGM, it writes new data to the meter. That data is immediately read back by UFM Manager and the new value is displayed. If the write command was successful, then UFM Manager will display the new setting. Should the write command have been unsuccessful, UFM Manager will not to update the data and continue to display the previous value.

5.1 Communication Controls

Communication controls allow you to monitor and manage UFM Manager communication with a FGM. There are four distinct communication states as follows:

Comm port is closed and communication is disabled.

Comm port is open, communication is enabled, but no data transfer in progress.

Comm port is open, communication is enabled, data transfer in progress.

Comm port is open, communication is enabled, data transfer failed.

Figure 1: *Communication states*.

Communication statistics are displayed at the bottom of the main window. This includes information on data packets sent, packets which failed to deliver, and a percentage delivery success rate.

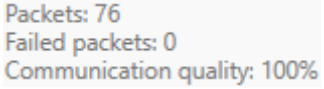


Figure 2: *Communication statistics*.

5.2 Text Boxes

In UFM Manager, text boxes are used mostly for writing values to meter registers or displaying read-back values. The currently selected text box (known as the active box) is highlighted in green, as shown below:

Figure 3: *Text boxes, showing the active box underlined in green.*

Users can interact with text boxes by entering desired values. **All changes must be confirmed by pressing the "Enter" key whilst the text box is marked as active.** Until "Enter" is pressed, the command will not be sent to the FGM.

5.3 Combo Boxes

Another way of interacting with FGMs via UFM Manager is by using Combo Boxes. Combo boxes allow you to select a value from a list of pre-existing options

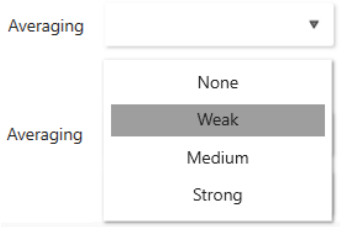


Figure 4: *A combo box, showing three options.*

By clicking arrow on the combo box, a drop-down list will appear. To select a value, click on the option, the drop-down list will close and UFM Manager will send new value to the FGM. Another way to use combo boxes is by using the "Tab" key on your keyboard until the combo box is selected. Using the Up/Down arrow keys, choose your desired option and **confirm your choice by pressing the "Enter" key on your keyboard.**

5.4 Toggle Buttons

Toggle buttons have two states and are typically used for representing FGM options which can either be enabled or disabled.

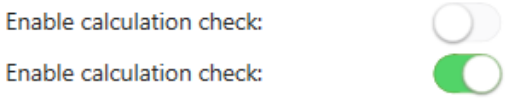


Figure 5: *The toggle button for calculation check, showing off (top) and on (bottom) states.*

You can change the state of a toggle button by clicking on it. The new value will be automatically sent to the FGM.

5.5 Refreshing Values

Refreshing values forces UFM Manger to update all data fields, ensuring that the latest configuration is displayed. There are two methods of doing this

Method 1:

Refresh tab	Clicking this button allows you to update all the values inside single tab

Figure 6: *The Refresh tab button.*

Method 2:

This option allows you to update **all** the values from the meter.

1. Click on the *Refresh All* button.
2. The progress bar will fill.
3. When the bar is full, all values have been updated

Figure 7: *The "Refresh all" button functionality.*

Once this process is complete, you will see one of two messages:

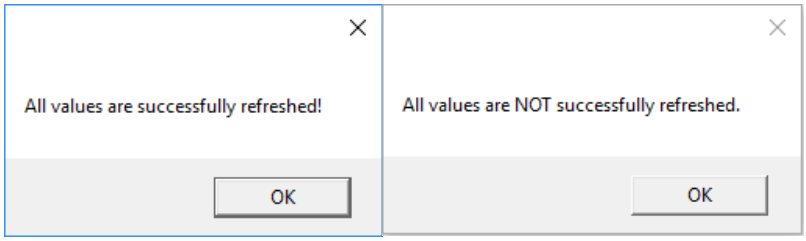


Figure 8: *System messages, showing successful and unsuccessful execution of the "Refresh all" command.*

5.6 Menus and Sub-Menus

There are six different menus displayed to the left of the main window. These menus are used to navigate through UFM Manager.

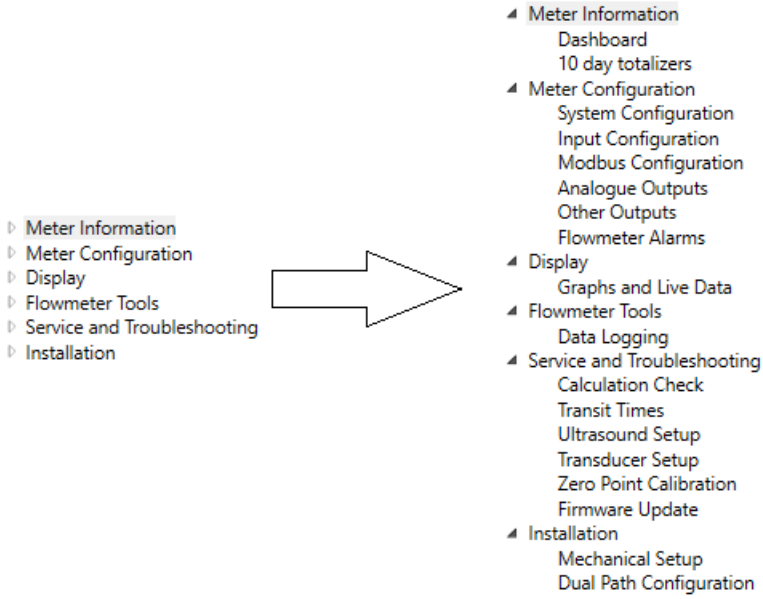


Figure 9: *UFM Manager menu overview.*

Drop down sub-menus will appear when you click on the grey triangle to the left of the title, or when you double-click on the title.

5.7 Live Data Panel

To see the live data panel, click the *Play* logo. The panel will display live data values for the following parameters: Flow velocity, Actual Volume Flow, Standard Volume Flow, Mass Flow, Velocity Of Sound, Density, Pressure, Temperature, Totalized Standard Volume, Totalized Actual Volume and Totalized Mass.

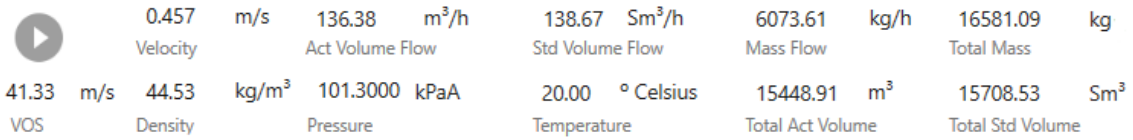


Figure 10: *The live data panel; the "play" logo is shown top-left.*

When the *Pause* logo is displayed, the FGM is polling and will update according to the update rate. When the Play logo is seen, this means that the FGM is not polling. User can switch between both states by clicking on the Play/Pause button.

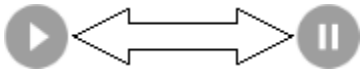


Figure 11: *The "Play" and "Pause" icons.*

6. Getting Started

Upon opening UFM Manager, you will begin at the home screen.

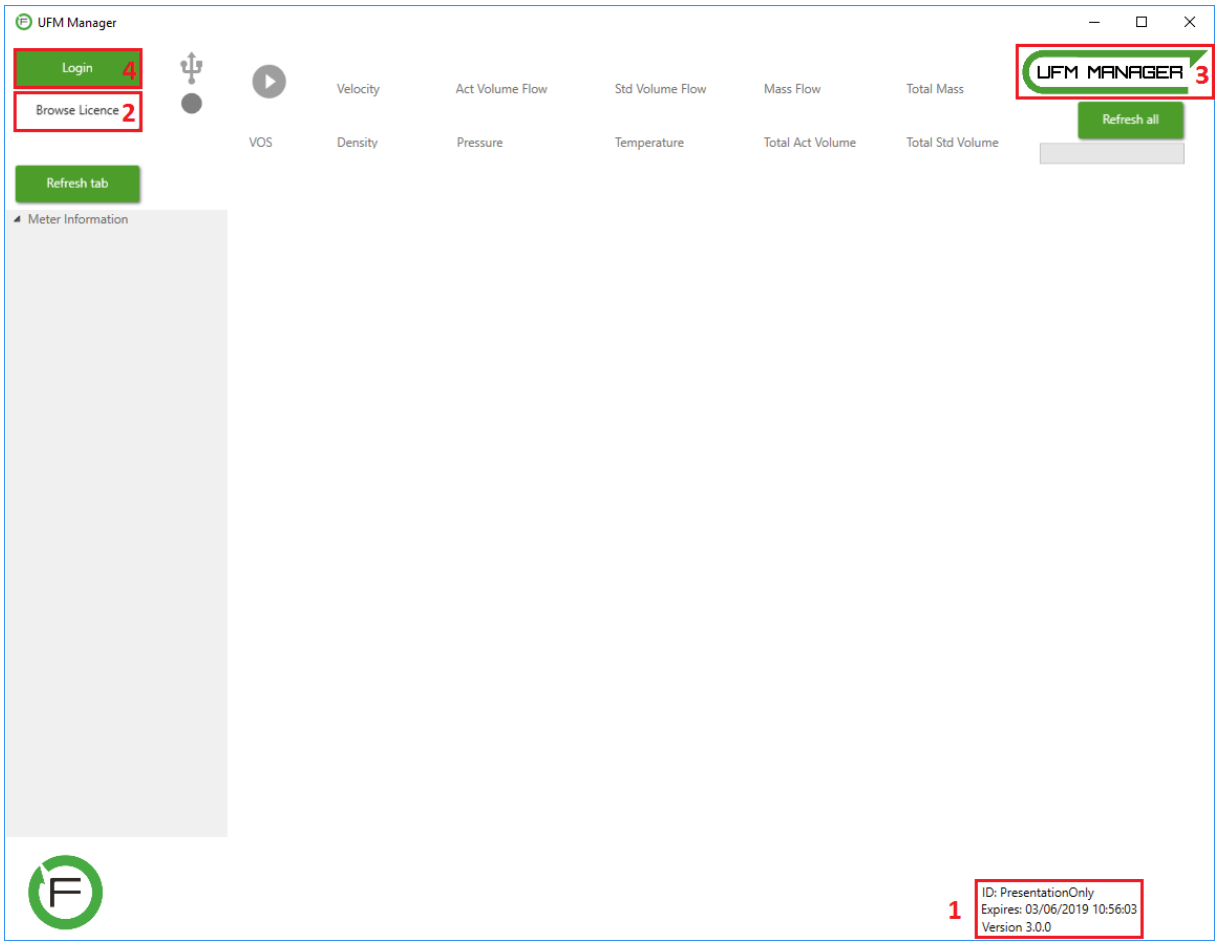


Figure 12. *The UFM Manager home screen.*

The field marked '*1*' in *Figure 12* displays ID and software version information along with the expiry date for the software licence. If the ID field is truncated by the display, hover over it with your mouse cursor to display the full name.

To update your software licence, use the "Browse License" button marked '*2*' in *Figure 12*. This will open file explorer, as depicted in *Figure 13*. Select the new licence file, click open and the new licence will be applied.

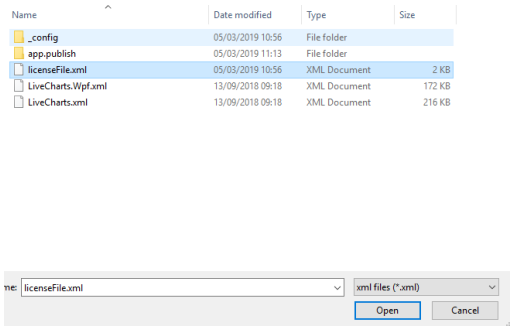


Figure 13: *The license file browser screen.*

6.1 Creating a New User Account

To create new user account, click the logo in the top right corner of the home screen (marked as '*3*' in *Figure 12*). A dialogue window will appear, as shown in *Figure 14*.

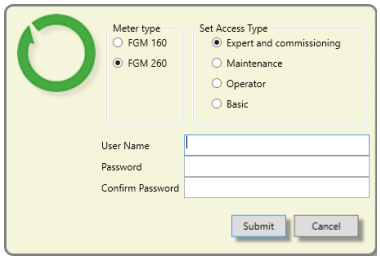


Figure 14: *New user account dialogue.*

To create a user account, first choose the *Meter Type* (FGM160 or FGM260). Then, according to your license level, choose suitable account *Access Type*. Finally, you should enter user credentials (*User Name* and *Password*) make sure that both *Password* and *Confirm Password* field are filled with the same value. If fields are correctly filled, you should see the message as shown in *Figure 15*. If any fields have been incorrectly filled, you will receive an error message explaining how to proceed.

Figure 15: *New user added message.*

6.2 Login

To log in press the "Login" button marked as '*4*' in *Figure 12*. You should see the following dialog window:

Figure 16: *The Sign Up box.*

Once the user account has been successfully created, it can be selected from the combo box “User Name”. Enter your chosen password then choose slave ID (MODBUS device address). The default slave ID is 1. Finally, choose the correct communication port. The COM port is determined during the installation of USB to RS485 converter software. Information about com port settings can be found in Windows device manager.

After clicking the Login button, UFM Manager will check if both the address and communication port were selected correctly. When the user is successfully logged in, the window will close and the software will present the dashboard view.

7. Dashboard

7.1 FGM160

The FGM 160 dashboard displays the following data:

- Serial Number (read only);
- User logged in (read only);
- Company;
- Installation;
- Tag number;
- Description;
- Pipe internal diameter (read only);
- Theoretical transducer distance (read only);
- Meter Alarms (read only).

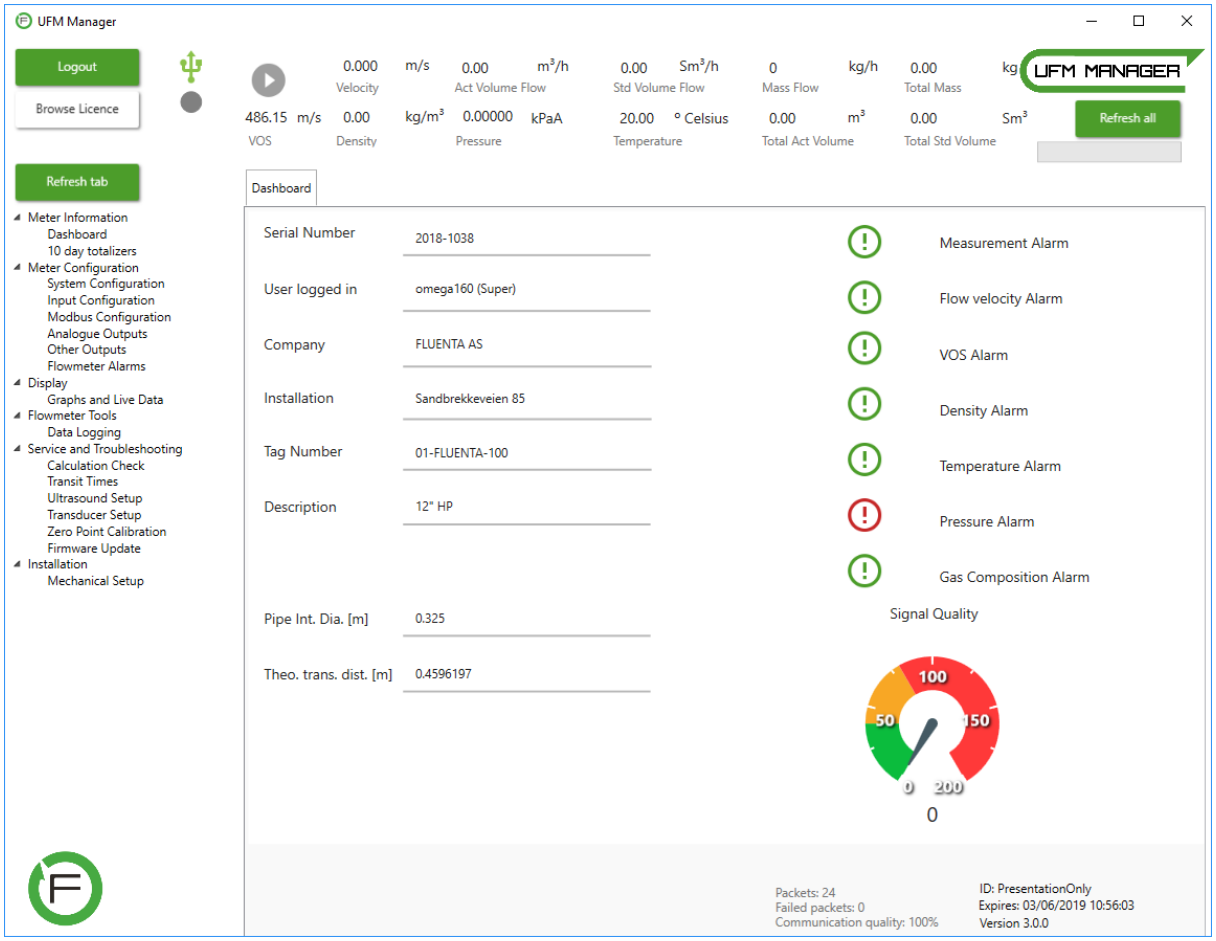


Figure 17: *The FGM 160 dashboard.*

7.2 FGM260

The FGM 260 dashboard displays the following data:

- Serial Number (read only);
- User logged in (read only);
- Company;
- Installation;
- Tag number;
- Description;
- Pipe internal diameter System 1 and System 2 (read only);
- Theoretical transducer distance System 1 and System 2 (read only);
- Meter Alarms (read only);
- Signal Quality System 1 and System 2 (read only) - values can be refreshed independently by double clicking the chart or displayed value.

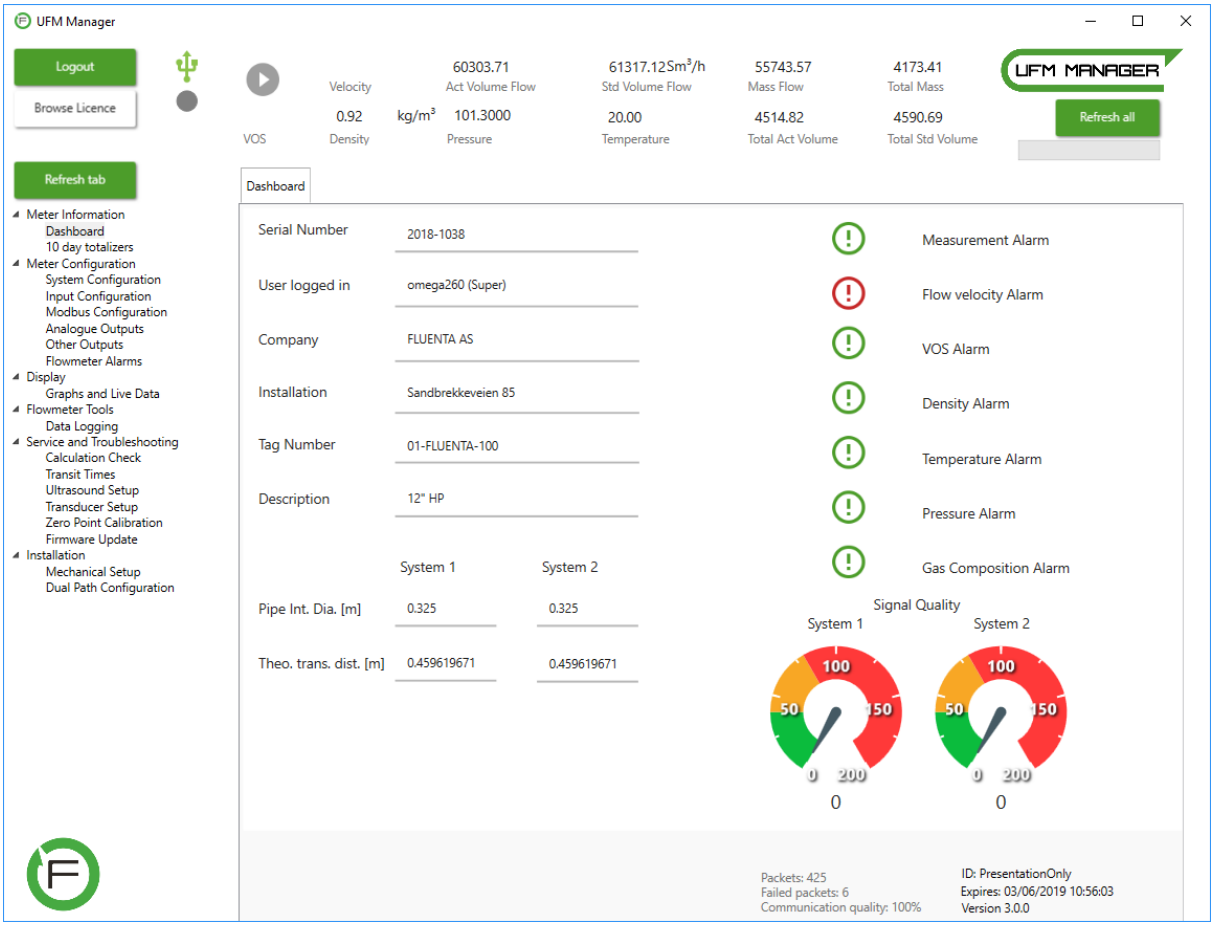


Figure 18: The FGM 260 dashboard.

7.3 Alarms

A green exclamation mark means that the value is within the limits. A red exclamation mark means that the value is outside the limits. If the exclamation mark is red, check the alarm ranges under the flow meter alarms sub-menu.

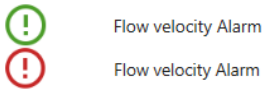


Figure 19: *Examples of alarms.*

8. 10 Day totalizers

The 10 day totalizers tab displays information about accumulated standard volume, actual volume and mass. The start time of each 24 hour period is also displyed. Users can change the 24 hour accumulation reset time.

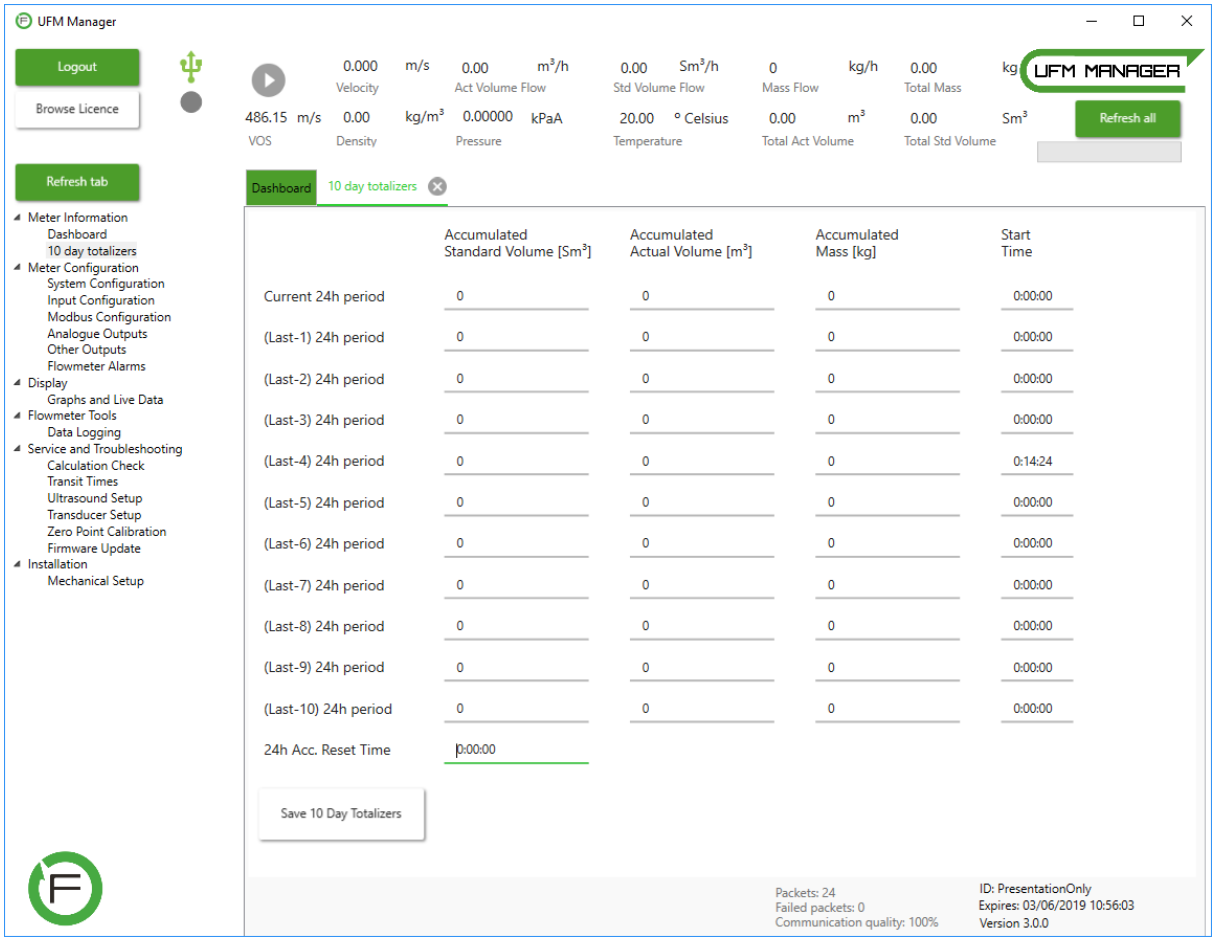


Figure 20: *The 10 day totalizers tab.*

8.1 Save 10 Day Totalizers

To save the 10-day totalizers to a file, simply click the *Save 10-Day Totalizers* button. UFM Manager will begin to collect and save totalizers into a file. When it finishes, following message will be displayed:

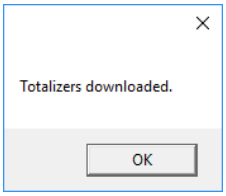


Figure 21: *Totalizers downloaded message.*

Acknowledge the message by clicking OK. A data file with *.csv* extension will then open, containing totalizer data.

	A	B	C	D	E
1	Date:	20190305_032916PM			
2	Serial No	2018-1038			
3	Tag	01-FLUENTA-100			
4	Total Stand	15813.78			
5	Total Actua	15552.42			
6	Total Mass[	21190.84			
7		Accumulate	Accumulate	Accumulate	Start time
8	Current 24h	45924.62	46193.23	60305.03	00:00:00
9	(Last-1) 24h	0	0	0	00:00:00
10	(Last-2) 24h	0	0	0	00:00:00
11	(Last-3) 24h	0	0	0	00:00:00
12	(Last-4) 24h	0	0	0	00:00:00
13	(Last-5) 24h	0	0	0	00:14:24
14	(Last-6) 24h	0	0	0	00:00:00
15	(Last-7) 24h	0	0	0	00:00:00
16	(Last-8) 24h	0	0	0	00:00:00
17	(Last-9) 24h	0	0	0	00:00:00
18	(Last-10) 24	0	0	0	00:00:00

Figure 22: *Example totalizer data.*

If file fails to open, it can be found in the UFM Manager working directory, in folder called *_config*.

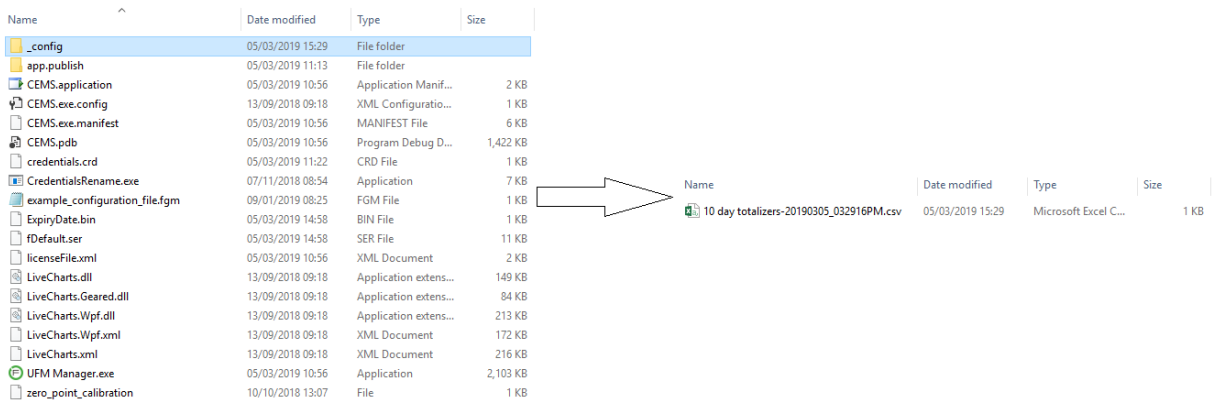


Figure 23: *UFM Manager folder structure, showing the _config folder.*

9. System Configuration

The system configuration tab allows users to:

- Change the flow meter time or synchronize it with PC Time;
- Change the system configuration;
- Change the 24h accumulation reset time;
- Change the measurement units;
- Change the calculation parameters;
- Import register settings from a file.

9.1 FGM 160

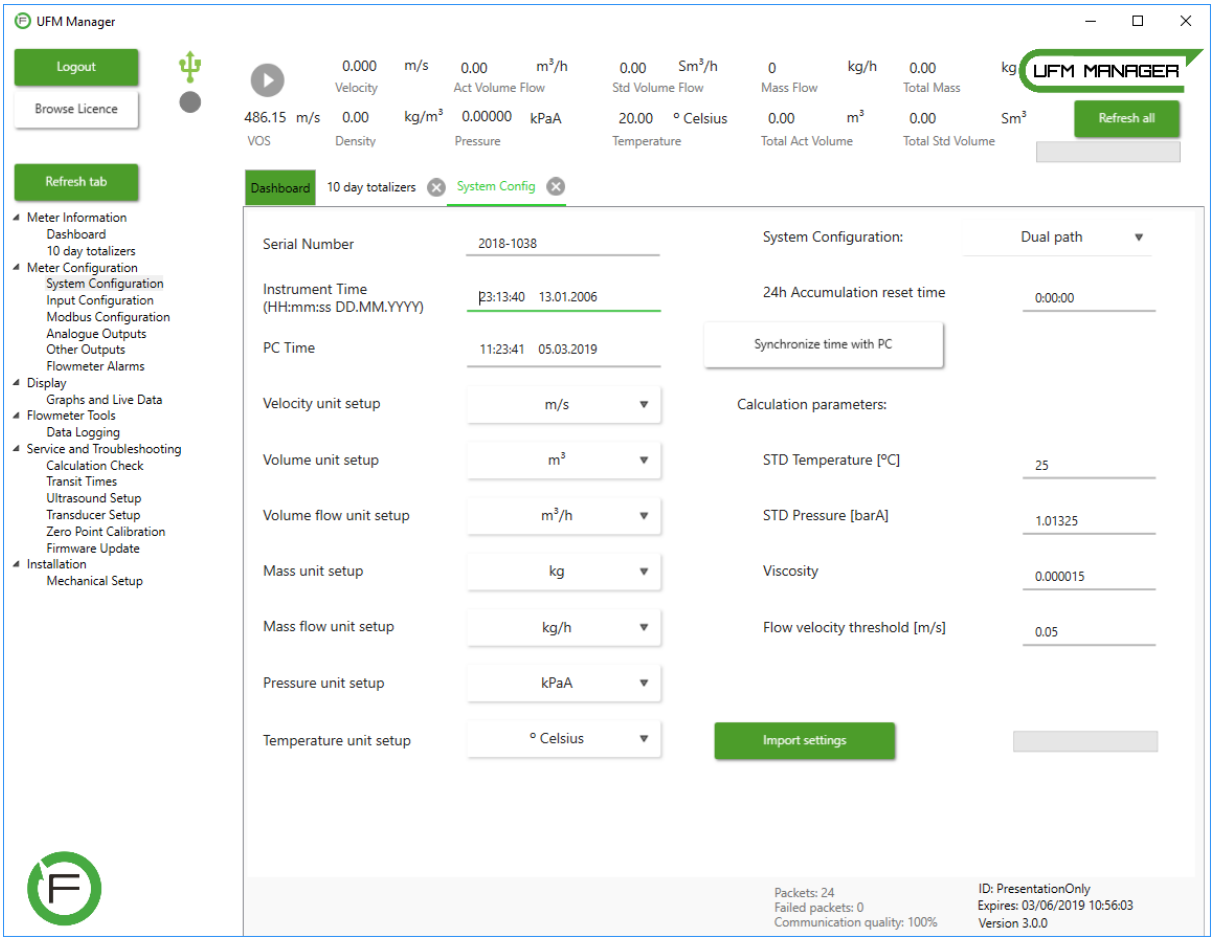


Figure 24: *The FGM 160 system configuration tab.*

9.2 FGM 260

The only difference between the FGM 160 and FGM 260 system configuration tabs is the ability to set a flow velocity threshold value for both systems in the FGM 260 version. All other instructions apply both to the FGM 160 and to the FGM 260.

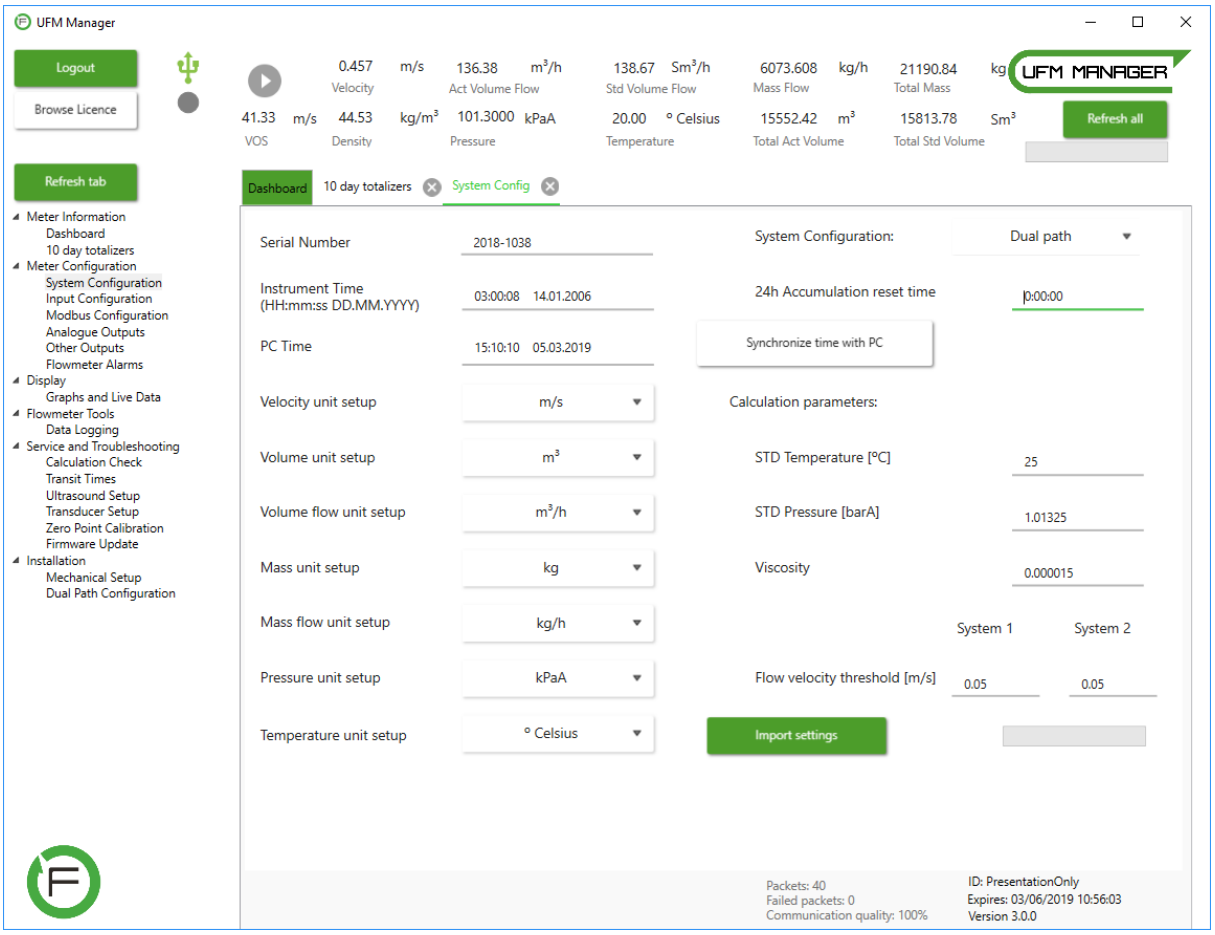


Figure 25: *The FGM 160 system configuration tab.*

9.3 Setting and synchronizing the instrument time

To set the instrument time, the user must enter the desired value in the specified format:

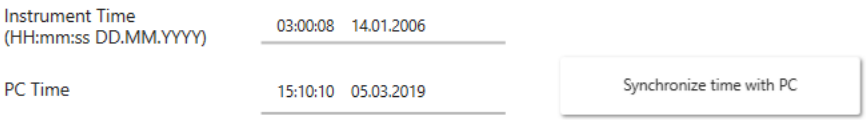


Figure 26: *Setting the instrument time.*

The instrument time can be quickly and simply synchronized to the time on the PC by clicking the *Synchronize time with PC* button as shown in *Figure 26*.

9.4 Changing Units

The user can change measurement units by selecting the desired values in the combo boxes, as shown in

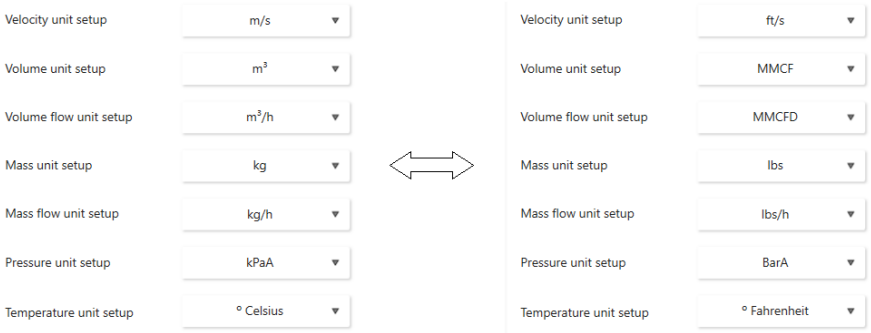


Figure 27: *Units of measurement, showing some of the available units.*

9.5 Calculation Parameters

Gas flow calculation (e.g. for the calculation of gas flow in m^3/hr) parameters can be set by the user:

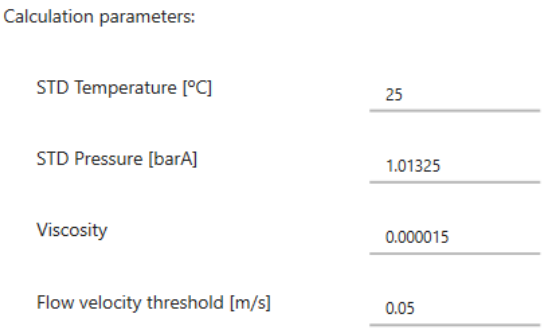


Figure 28: *Calculation parameters.*

The user can also select a flow velocity threshold. If the measured flow velocity drops below this threshold, the system will display a flow velocity of zero.

9.6 System Configuration

Figure 29: *The system configuration combo box.*

The FGM can have one of four different configurations:

- Single system(ch1) – This is the appropriate setting for an FGM 160 meter. This configuration uses a single pair of transducers for the measurement of flow.
- Single system(ch2) – this configuration is not currently supported.
- Dual path – This is the appropriate setting for an FGM 260 meter. This configuration uses two pairs of transducers for the measurement of flow, resulting in higher accuracy and/or redundancy of measurement.
- Double/Twin – this configuration is not currently supported.

CAUTION: Selecting an inappropriate or unsupported configuration may lead to measurement errors and unexpected meter behaviour.

9.7 Import Settings

Figure 30: *The import settings button.*

The Import settings button allows the user to select a file with pre-determined settings which will be uploaded to the FGM. The file must be prepared in a specific format which includes register addresses and values. An example is shown in *Figure 31*.

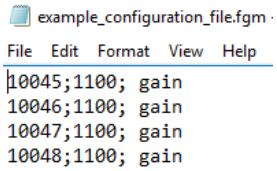


Figure 31: *An example of a configuration file format.*

CAUTION: Changing setting by adjusting raw register values is for qualified users only and should be performed according to the FGM documentation. Inappropriate adjustments can lead to measurement errors and unexpected meter behaviour.

10. Input Configuration

The Input configuration tab allows the user to set up FGM inputs.

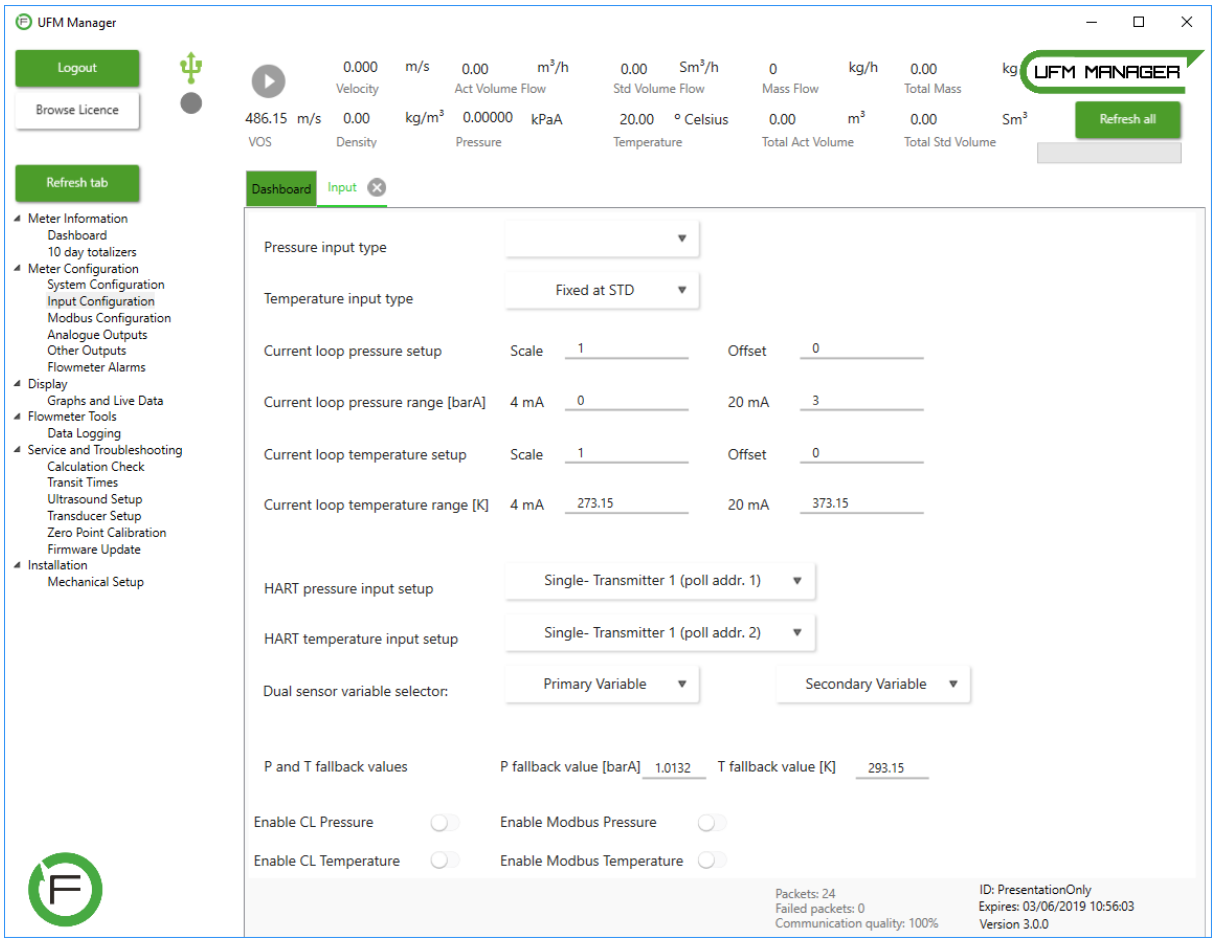


Figure 32: *The input configuration tab.*

10.1 Pressure and Temperature Inputs

The FGM160 has inputs for Pressure and Temperature. Each input can be configured in one of three different ways, shown in *Figure 33*.

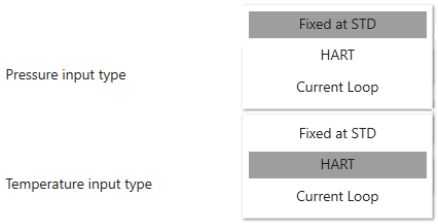


Figure 33: *Pressure and temperature input configuration.*

- The *Fixed at STP* setting fixes the Pressure and Temperature to pre-defined values (Pressure of 14.6959 psiA / 1.01325 barA and Temperature of 68 ºF / 20 ºC).

- The Current loop setting is used to define the 4-20 mA input range. The mA inputs can be calibrated for more accurate readings. The Scale and Offset values will be used for this loop calibration.

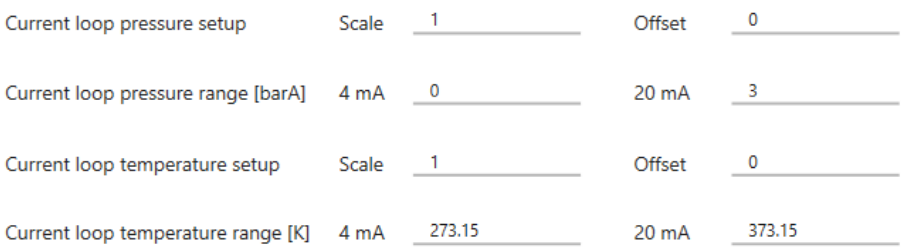


Figure 34: *Current loop settings.*

- HART input types can also be configured, as shown in *Figure 35*.

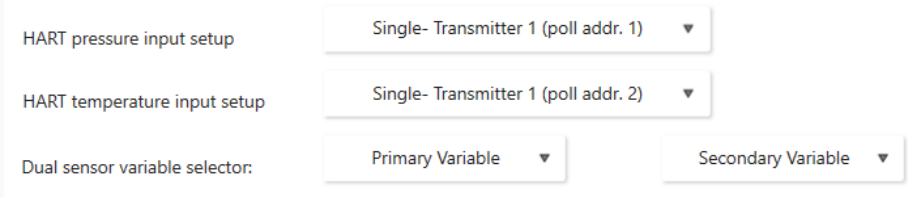


Figure 35: *HART input types.*

To enable each input, the user must check corresponding toggle boxes, as shown in *Figure 36*. Inputs which are enabled are shown with a green icon.

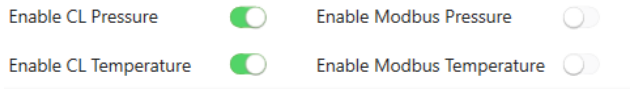


Figure 36: *Settings to enable and disable inputs.*

The user can also define pressure and temperature fallback values. These values are used for calculations in cases where the meter detects an error in reading values from selected inputs.

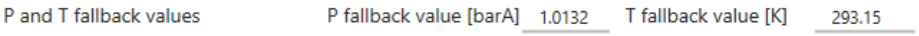


Figure 37: *Pressure and Temperature fallback values.*

11. Modbus Configuration

The Modbus configuration tab allows Modbus outputs to be enabled or disabled. The Modbus mode can be set to RTU or ASCII. Other settings and ranges include the following:

- The Baud rate can be set in a range between 2400-57600;
- The Parity can be Even, Odd, or None;
- The Register base adress can be 1000 or 2000;
- The Byte ordering can be set in one of four different configurations;
- The Register spacing can be one or two;
- The Data/Stop bits can only be changed through the registry. Default is 8/2;
- The DCS port slave address can range from 1-247. 224 is the default.

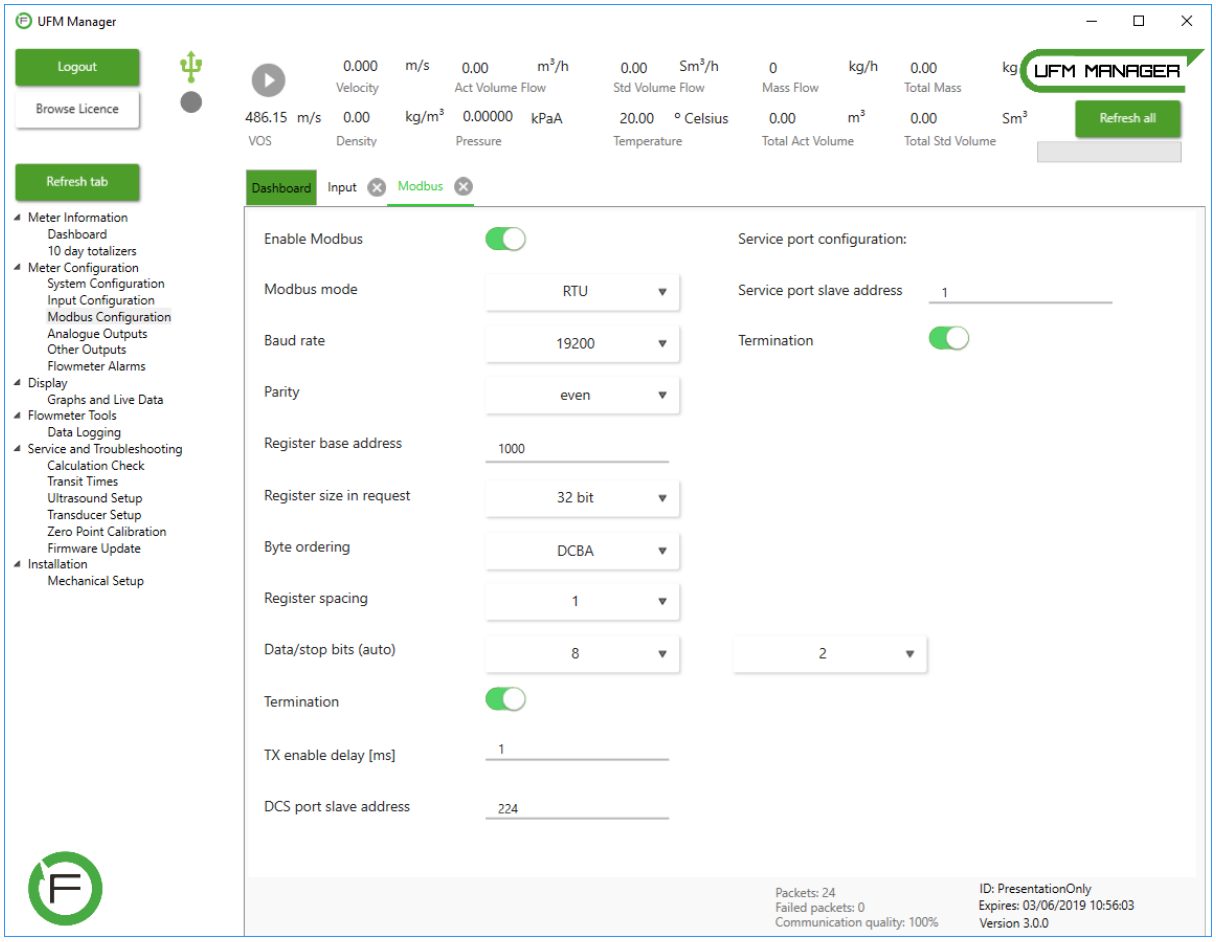


Figure 38: *The Modbus configuration tab.*

12. Analogue Outputs

The FGM 160 has a total of six 4-20mA Analog Outputs. These outputs are Current Loops and are named as CL1 to CL6.

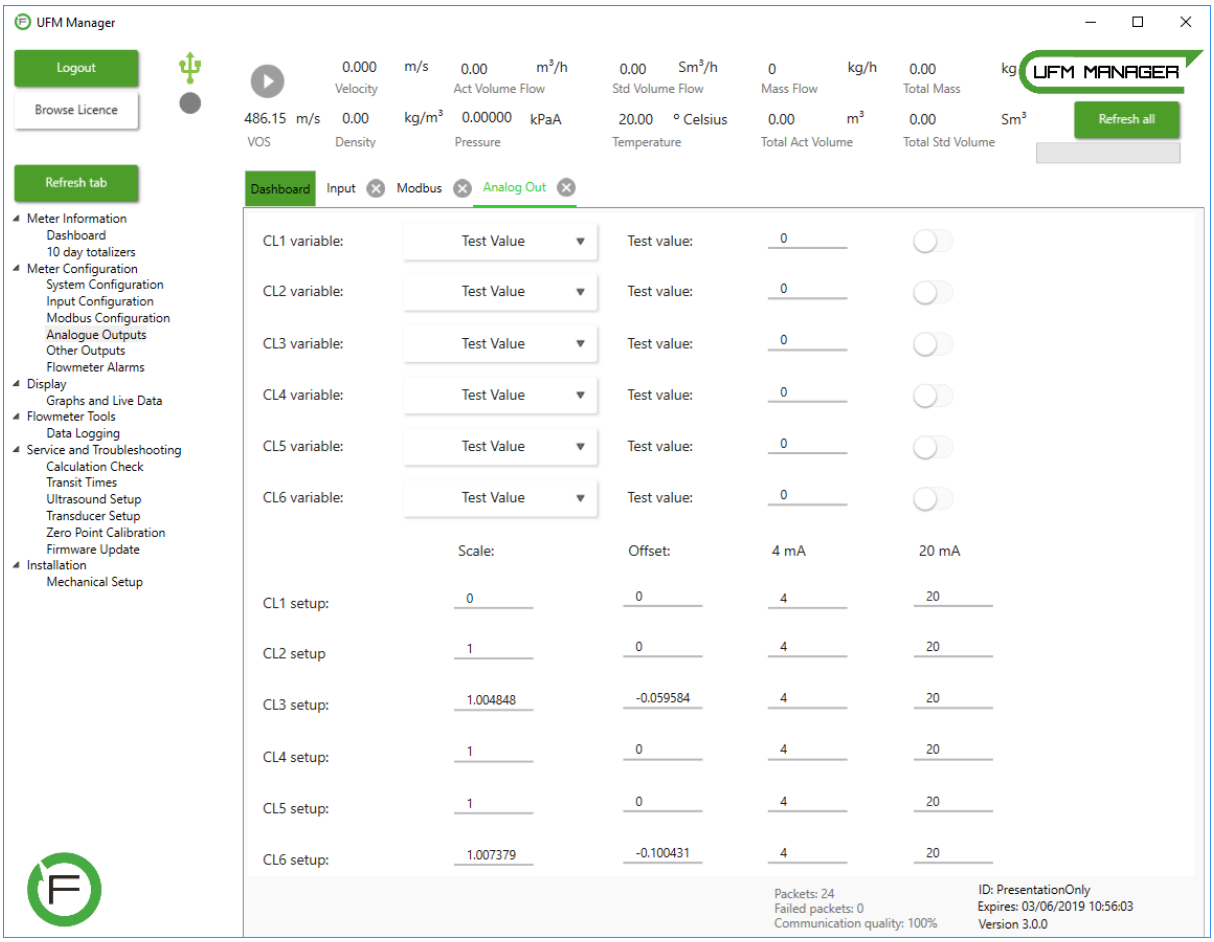


Figure 39: *The Analogue Outputs tab.*

Each output can be set to show one of 9 different variables, as shown in *Figure 40*.

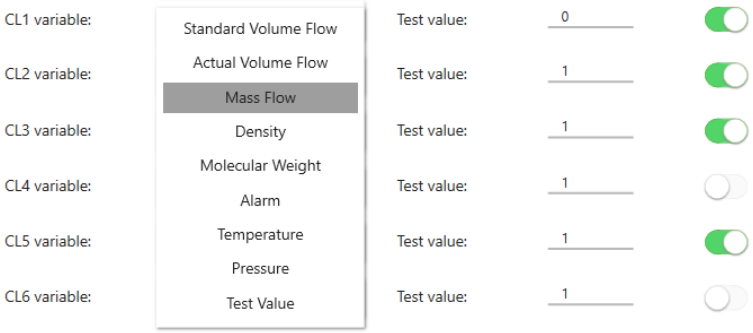


Figure 40: *Current loop output variables.*

CAUTION: Each output must be separately enabled or disabled with a toggle switch. Unless enabled, the output will not function.

12.1 Output Setup

To properly configure each analogue output, the user must provide 4 parameters.

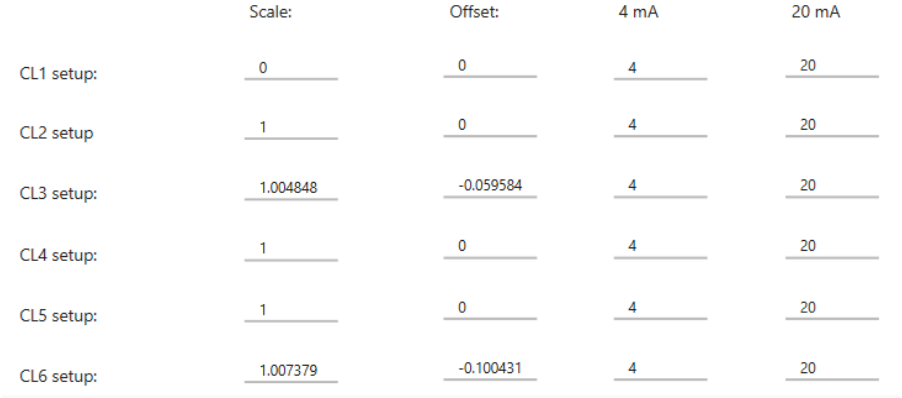
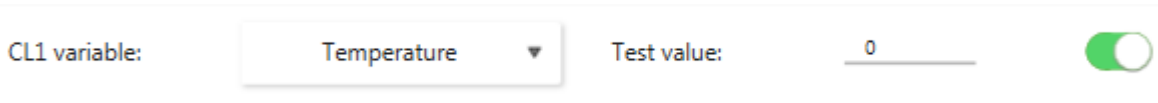


Figure 41: *Current Loop output settings.*

- 4 mA – Lower bound of variable which will be indicated by 4 mA at the output;
- 20 mA – Upper bound of variable which will be indicated by 20 mA at the output;
- Scale – Calibration factor, used for eliminating error of current loop signal generation;
- Offset – Calibration factor, used for eliminating error of current loop signal generation.

As an example, if user wants to monitor Temperature on the CL1 output in range of 0 ºC to 100 ºC, the process is as follows:

1. The ouput must be enabled and the variable must be set.



2. The range must be configured. 0 = 4mA, 100 = 20mA

Figure 42: *An example of current loop settings.*

CAUTION: units of measurement must be specified in the system configuration tab. The scale and offset vales are an effect of the current loop calibration process.

12.2 Test Value

The Analog Output tab also has a “Test Value” function. To utilise this, the channel (CL1) must be set to Test Value and must be enabled. Referring to the example in *Figure 42*, the user would simply change the variable from Temperature to Test Value. The 0-100 range remains the same. The user should be clear that value entered must lie between 0 and 100.

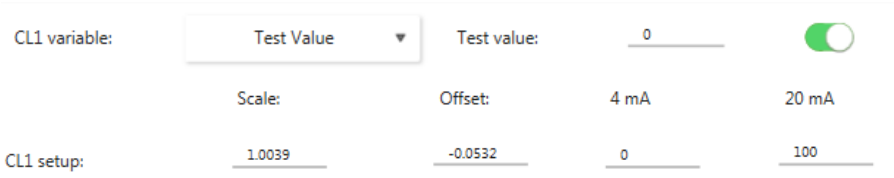


Figure 43: *Current loop test values and settings.*

Once this is complete, the user is able enter a value and compare the entered value with the actual value. The example in *Figure 44* shows a value of 50 . Ensure that the Test Value is reverted back to its original setting once testing has been completed.

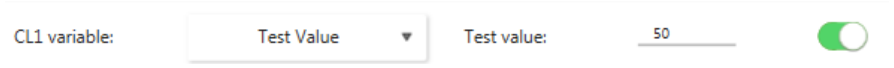


Figure 44: *A current loop test value of 50.*

13. Other Outputs

The other outputs tab allows the user to configure the FGMs Pulse, Frequency, and HART outputs.

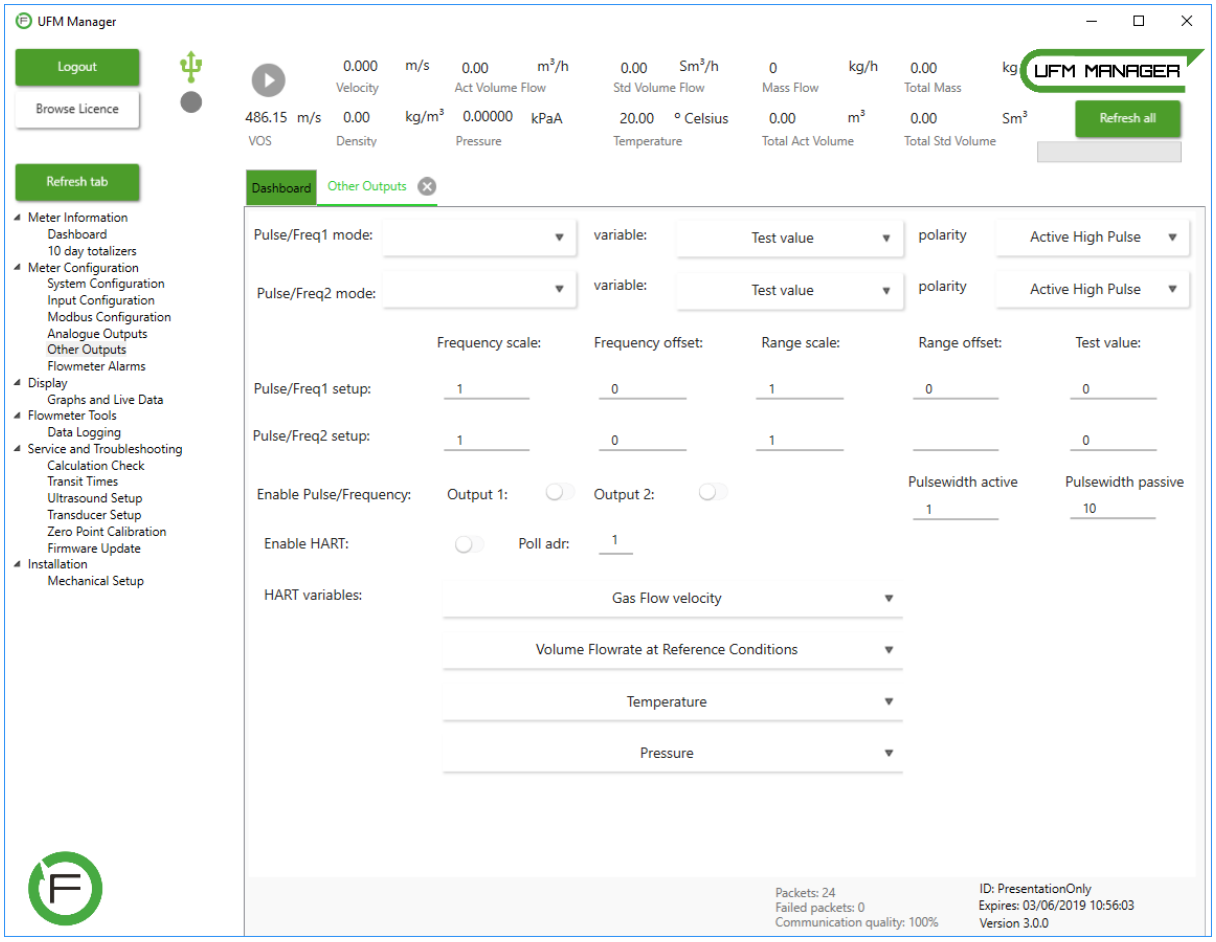


Figure 45: *The other outputs tab.*

13.1 Pulse Output

The Pulse output is a totalized value only. It is not a instantaneous output. The Pulse output can be set to one of 3 totalizers or a test value:

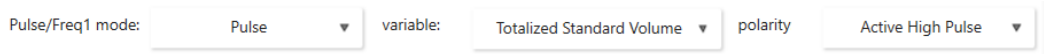
Figure 46: *Pulse output settings.*

13.1.1 Pulse Setup

To set the range for the Pulse, the user needs to know the maximum daily total. As an example 16,632,000 cubic feet per day will be used. 250 pulses per second is the maximum the output rate. to calculate the scale value use the following equation:

$$Scale\ Value = \frac{Maximum\ Daily\ Total}{Max\ Pulse\ Rate} \times (60 \times 24 \times 24) = 0.77$$

In this case the range scale value should be set to 0.77 and the range offset would stay at 0. The software settings woud now look like this.



Range scale is 0.77 and *Range offset* is 0. The first output is also enabled.

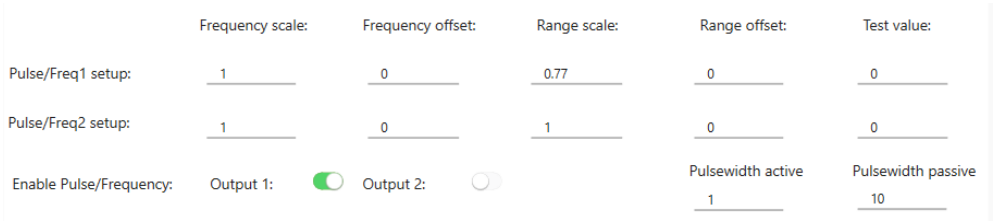


Figure 47: *An example setup for pulse output.*

User can also specify the following pulse signal parameters:

- Polarity: Active High or Active Low;
- Pulsewidth: active or passive.

13.2 Frequency Output

Frequency output can be set to one of the following parameters or a test value:

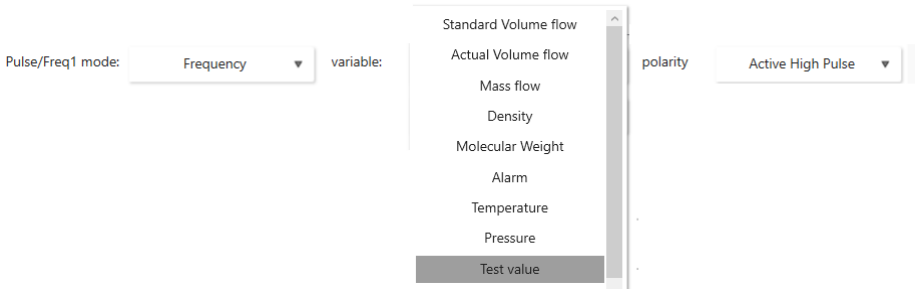


Figure 48: *Frequency output options.*

13.2.1 Frequency Setup

To set the range for the Frequency output the user must provide the minimum and maximum range. The output switch must be enabled. The lower and upper frequency limits for the FGM are 10 Hz and 2500 Hz respectively.

The formulae used will be:

$$Frequency = (Value \times Scale) + Offset$$

$$Offset = 10 - Low\ Value$$

$$Scale = \frac{2500}{High\ Value}$$

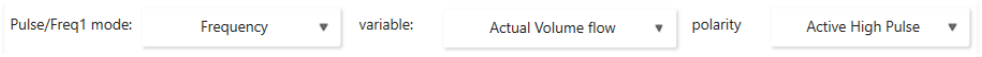
For example:

- Actual Volume Flow range = 0 to 250,000 m^3/h;
- Low value= 0;
- Frequency for lower value = 10Hz;
- High value = 250,000;
- Frequency for higher value = 2500Hz.

$$Offset = 10 - Low\ Value = 10 - 0 = 10$$

$$Scale = \frac{25000}{High\ value} = \frac{25000}{250{,}000} = 0.01$$

This data is now entered into UFM Manager, as per *Figure 49*. The mode is set to Frequency and the variable is Actual Volume Flow, per the data supplied in the example.



The Range scale is 0.01 and Range offset is 10.

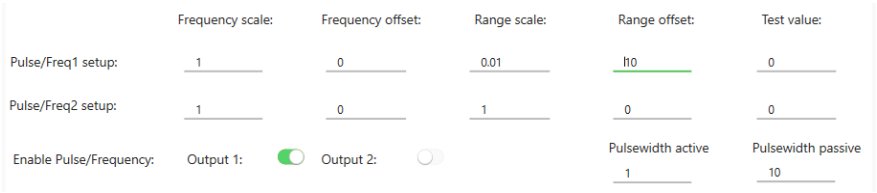


Figure 49: *Example frequency output settings.*

13.3 HART Output

The HART output must only be connected to the CL6 current loop (4-20mA) output of the FGM. No other current loop outputs have HART functionality. The FGM only supports read-only commands.

There are a total of 28 output parameters available to the HART output that can be configured for First, Second, Third, and Fourth variables.

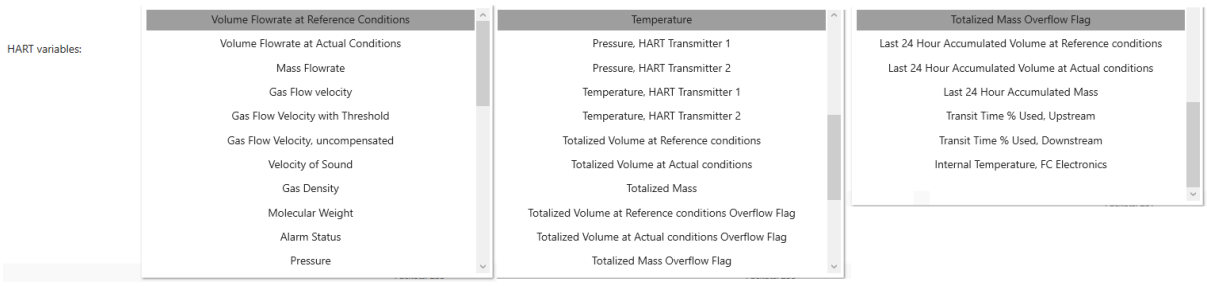


Figure 50: *HART output parameters.*

13.4 HART Output Setup

The enable HART switch must be activated, as shown in *Figure 51*. The FGM can be set up with a HART poll address in the range of 0 to 15. The default HART poll address for the FGM is 1. The FGM supports multidrop mode. If the HART poll address is set to a value other than 0, the analogue current loop signal will be set to a fixed value of 4 mA. The device is then parked and enabled for multidrop operation. If the HART poll address is set to 0, an analogue 4 to 20 mA signal may be used in addition to the HART communication.

An address of 0 has been used in the example shown in *Figure 51*.

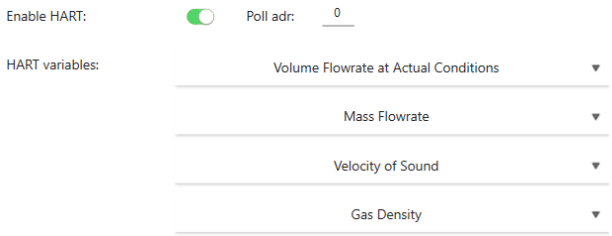


Figure 51: *HART output variables.*

14. Flowmeter Alarms

Engineering units for velocity are m/s, temperature is Kelvin, and the pressure is barA. It is important to configure the alarms correctly. The Maximum and Minimum values for Time-of-Flight (ToF) Downstream and Upstream are calculated based on the specified transducer distance and the max/min alarm values for sound velocity and flow velocity. These values are used internally in the FGM in order to check the validity of the transit time measurements.

14.1 FGM160

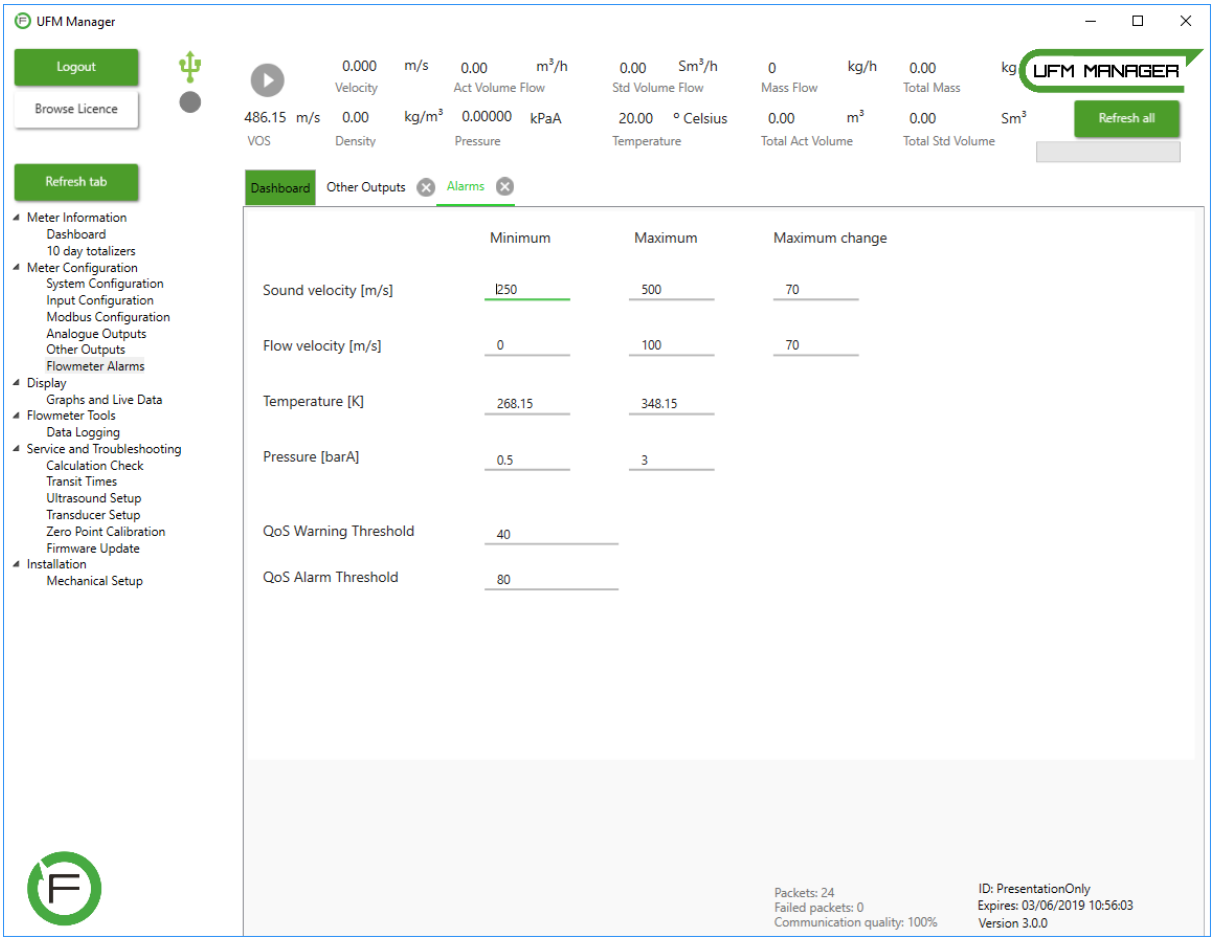


Figure 52: *The FGM 160 alarms tab.*

14.2 FGM260

The FGM 260 mode allows the user to set alarms for both channels independently.

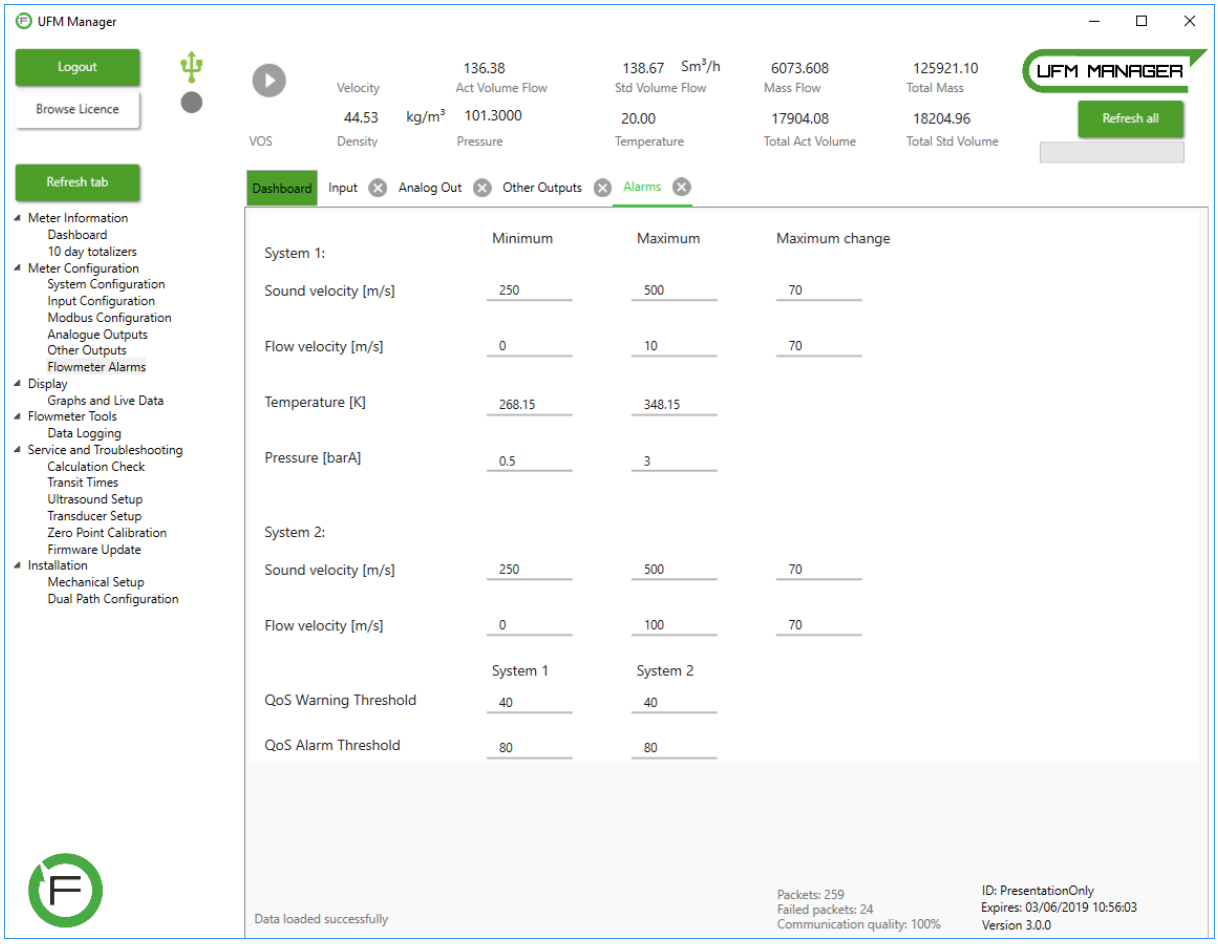


Figure 53: *The FGM 260 alarms tab.*

15. Graphs and Live Data

The UFM Manager *Graphs and Live Data* tab allows the user to download signals from FGM and to visually monitor trends in data.

15.1 FGM 160

After opening the *Graphs and Live Data* tab, the user can choose one of 4 different options:

- Download chirp signals;
- Download continuous wave signals;
- Download correlation;
- Open a panel for monitoring variables.

All three of the signal download options work the same way so one will be described.

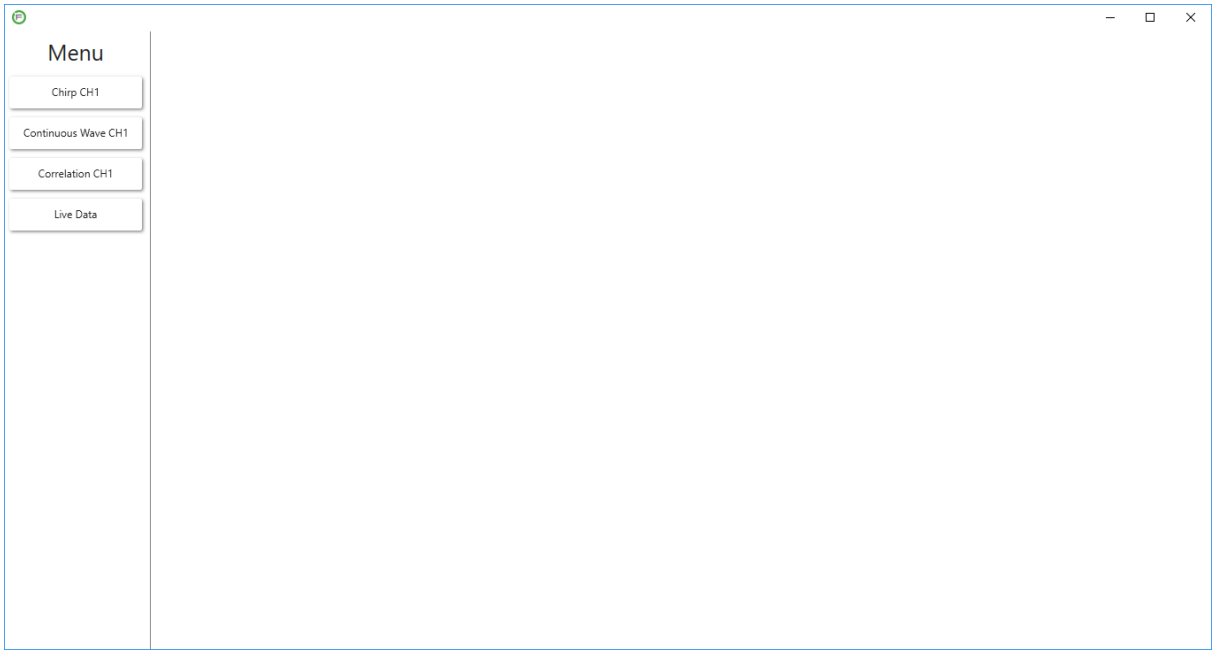


Figure 54: *The FGM 160 graphs and live data menu.*

15.2 FGM 260

In FGM 260 mode, UFM Manager will display additional buttons which allow you to download signals from second channel. All other functionality is identical.

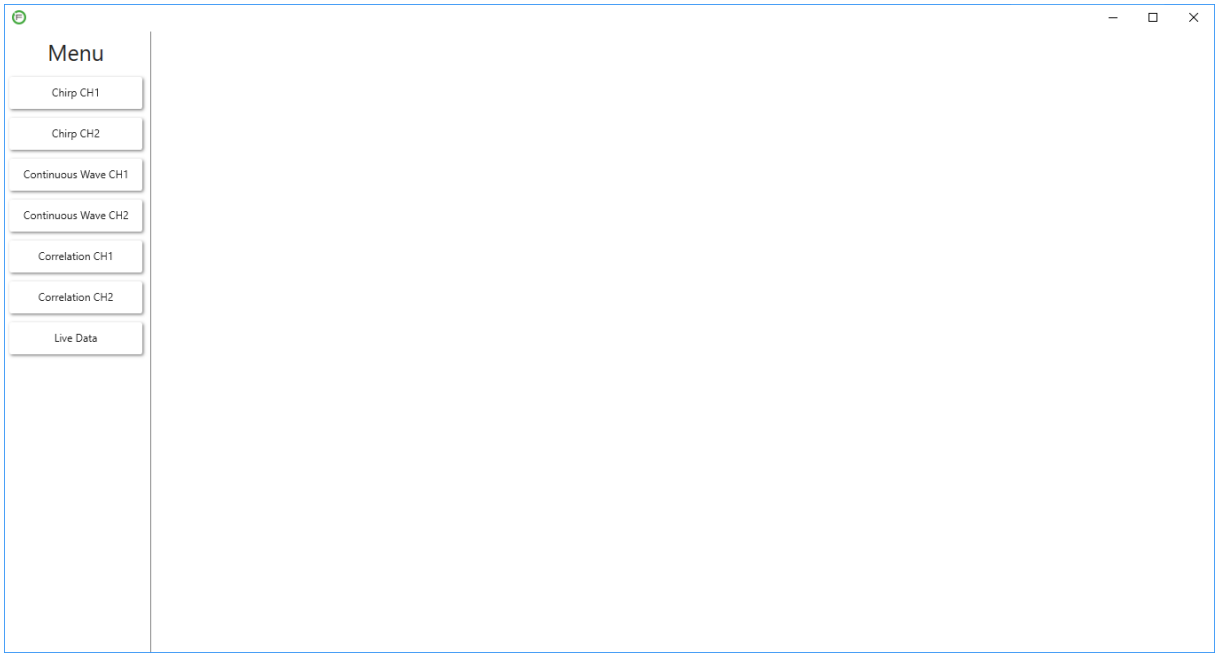


Figure 55: *The FGM 160 graphs and live data menu.*

15.3 Signal Panels

Each signal panel consists of a header and a plot plane.

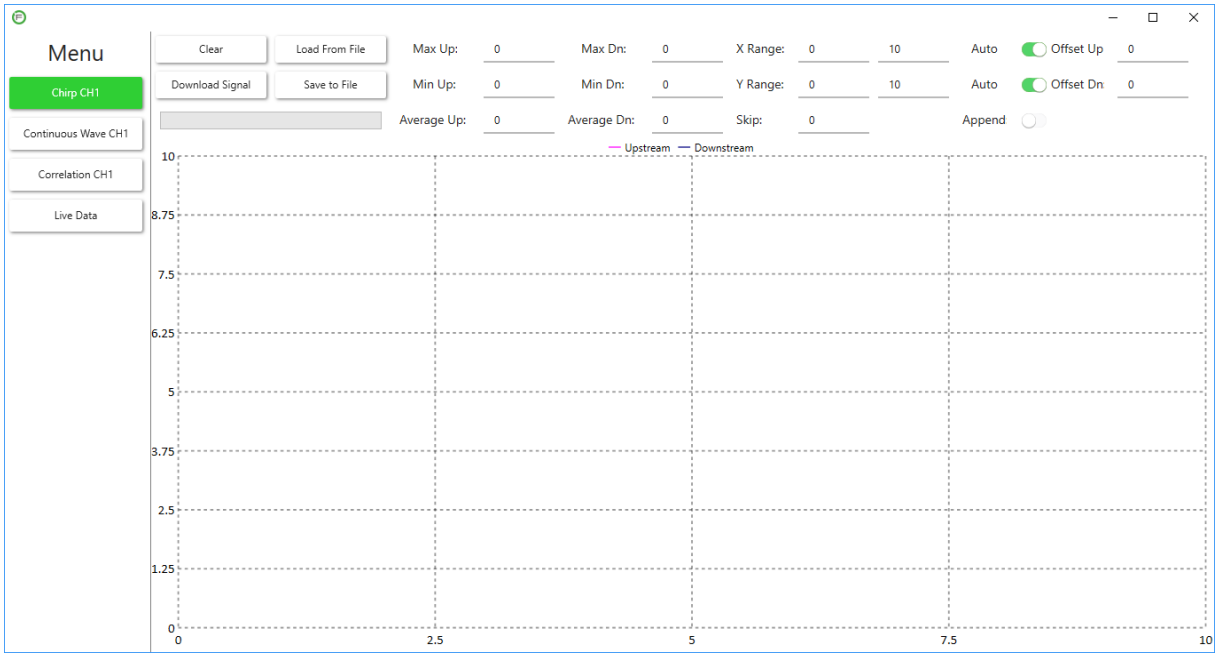


Figure 56: *A signal panel.*

15.3.1 Basic Operations

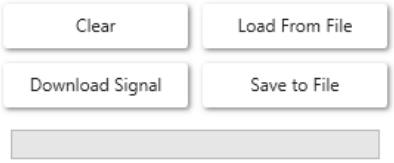


Figure 57: *Signal panel buttons.*

There are 4 basic operations that user can perform using buttons:

- *Clear* – deletes signal from memory and clears the plot plane
- *Download Signal* – initiates the signal downloading procedure and displays the signal once transfer is complete
- *Load From File* – loads signal from file and displays it the plot plane
- *Save to File* – saves signals displayed on the plot plane to a file
  The user can choose either
  - *A .txt* file with ASCII data
  - *A .bmp/.png image* file

There's also progress bar which indicates the download progress:

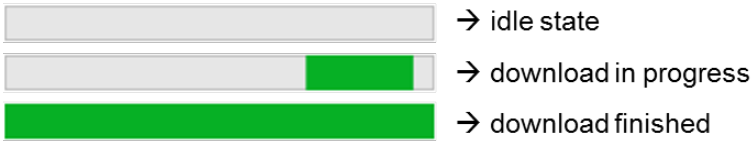


Figure 58: *Data download progress bars.*

15.3.2 Advanced Options and Parameters

The first set of parameters are maximum and minimum signal values which have been recorded during the FGM service life, along with averaged signal value. They are displayed for both the upstream and downstream signal.

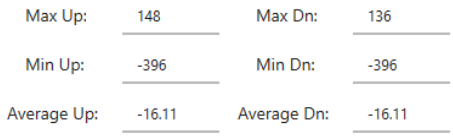


Figure 59: *Maximum and average signal values.*

The second set of parameters allows the user to view or change the X and Y ranges in order to view a desired fragment of the data plot. Editing this fields is only allowed when the *Auto* toggle switch is turned off.

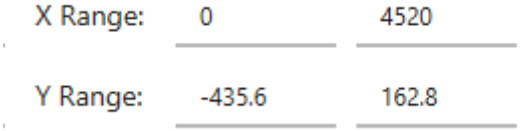


Figure 60: *The X and Y ranges for graph viewing.*

Auto toggle switchs turns on (green) or turns off (gray) auto axis ranging, which will rescale ranges to fit whole signal plot on the plot plane.

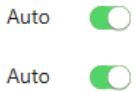


Figure 61: *The auto range toggle switches.*

The Offset Up/Dn settings are used to move specified signal (upstream or downstream) by entered number of samples. It is used when signals have little spacing between them in order make them more visible.

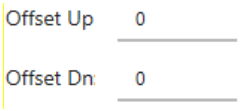


Figure 62: *Offset Up and Dn settings.*

The Skip option allows you to skip a specified number of samples. It is used when graph performance issues occur. For example, a *Skip* value of 4 displays only every forth sample. *The Append* toggle switch turns on or off signal appending. When switch is active (green) it appends a signal which has been downloaded or loaded from file to the end of the current plot. It allows user to view more than one signal at once, or even view chirp, continuous wave and correlation signals on one plot plane.

Figure 63: *The skip and append options.*

15.4 Live Data Panel

The *Live Data* panel allows you to monitor up to 4 variables at once, with different scales.

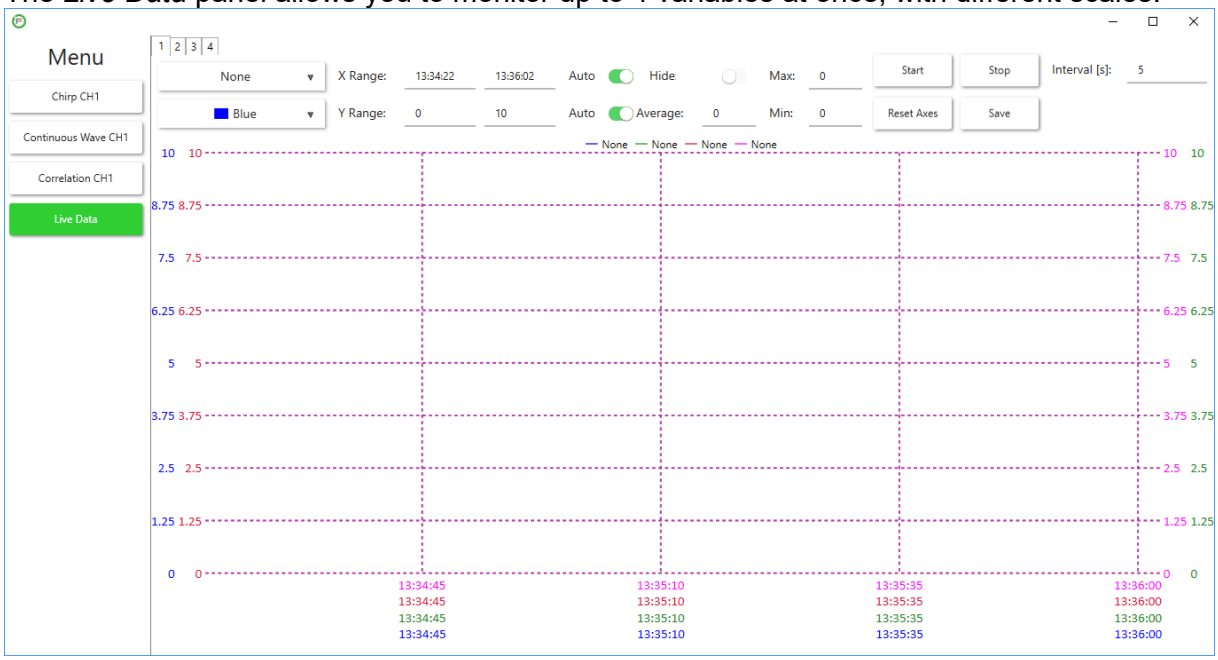


Figure 64: *The live data panel.*

15.4.1 Basic Options

15.4.1.1 Choosing Variables

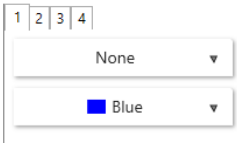


Figure 65: *Graph colour selection.*

The user can choose a colour for each of the four displayed parameters.
The parameters available for monitoring are shown in *Figure 66*.

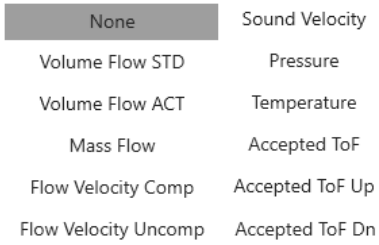


Figure 66: *Live data display panel.*

15.4.1.2 Monitor Controls

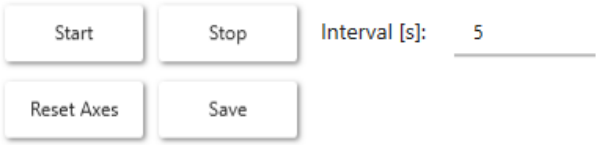


Figure 67: *Monitor control user buttons.*

There are 4 available user buttons:

- *Start* – begins logging variables values from the FGM;
- *Stop* – stops logging variables values from the FGM;
- *Reset Axes* – resets the axes rage for all variables according to auto ranging;
- *Save* – saves the plot as Bitmap [*.bmp*] or Portable Network Graphic [*.png*] file.

The *Interval* Parameter allows the user to adjust the frequency at which UFM Manager will poll the FGM for new samples.

15.4.2 Advanced Options and Parameters

Most of options such as:

- X and Y ranges;
- Auto ranging;
- Min, Max and Average values,

behave the same as those options in signal panels. The only additional option is *Hide* toggle switch. It allows you to turn off variables that you do not want to see on the plot. If the toggle switch is active (green) the variables are hidden, if it is inactive (grey) the variables are shown.

16. Data Logging

The data logging tab allows the user to log specified register values of the FGM, download its configuration and history of register changes. It also provides a tool for reading and writing values directly into FGM registers.

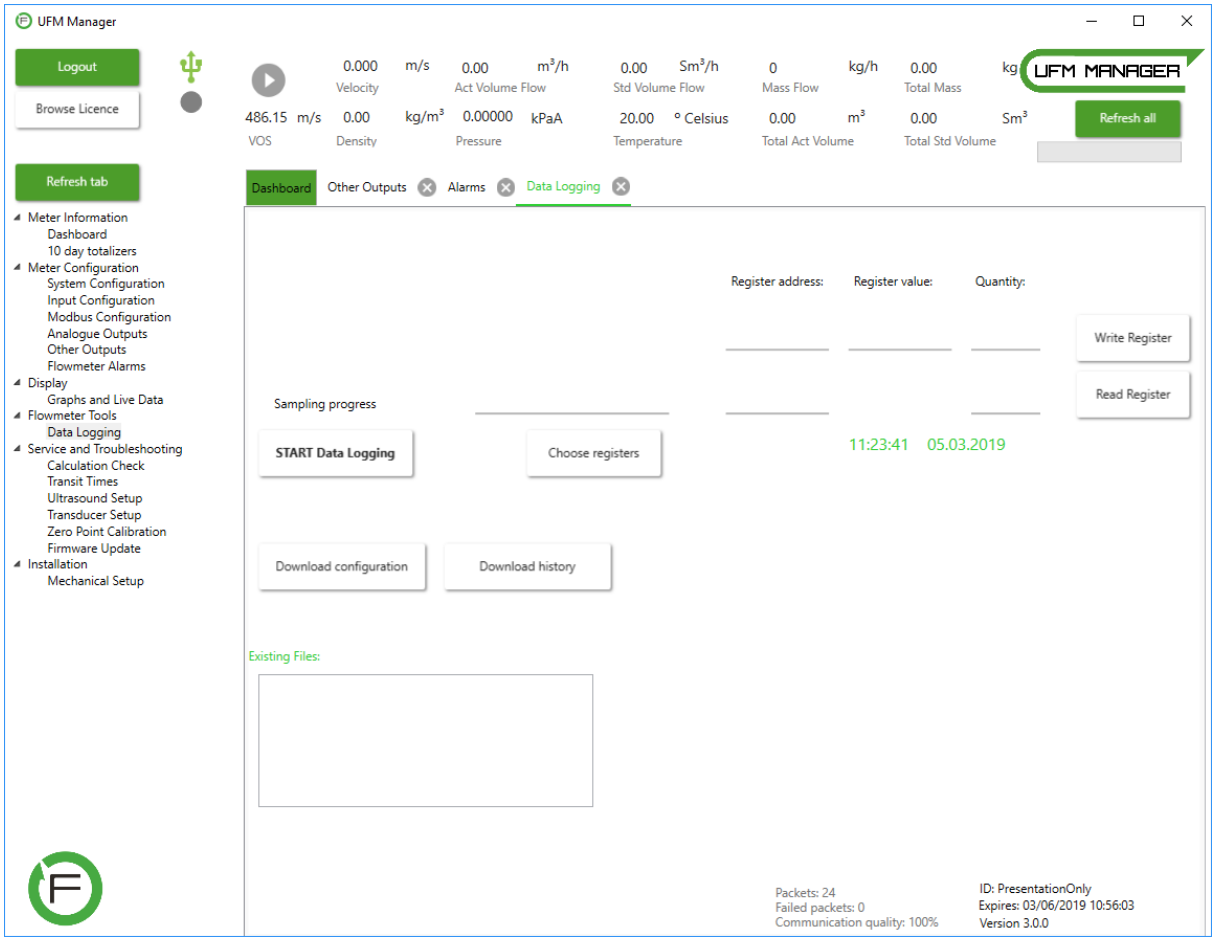


Figure 68: *Data logging tab.*

16.1 Logging

UFM Manager allows the user to log data and save it in *.csv* format. To begin the process, click on the *Choose registers* button and new window should pop up, as shown in *Figure 69*. This window allows the user to select the data registers for logging.

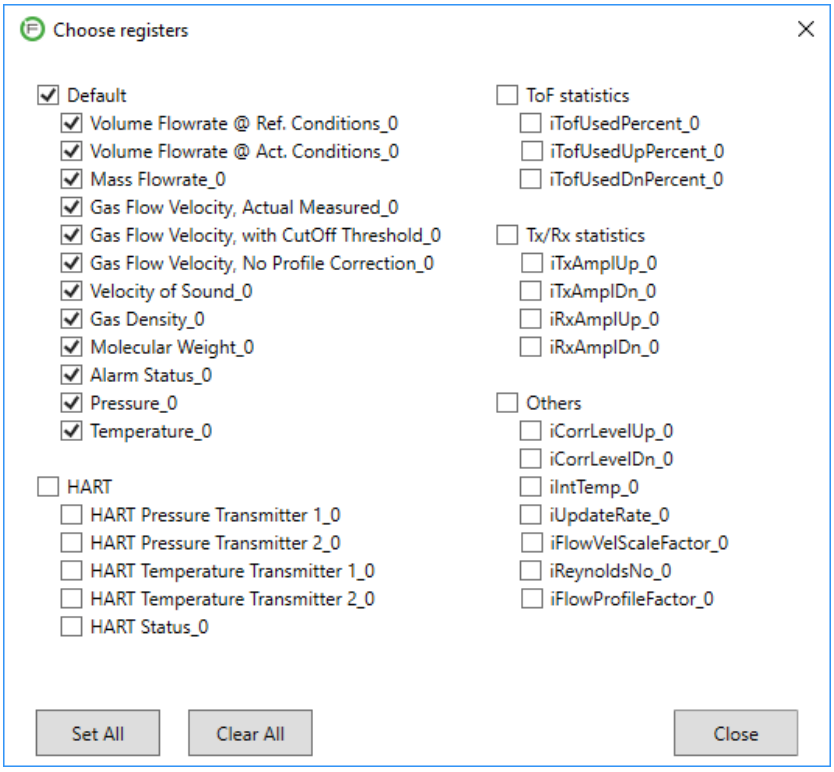


Figure 69: *The choose registers options.*

After selecting the desired values, the user should click on the *START Data Logging* button. The logging process will start, and button state should change (per the bottom of *Figure 70*.

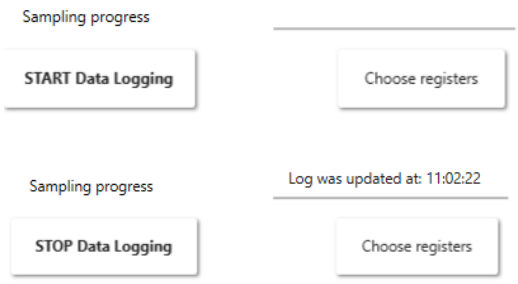


Figure 70: *Start and stop data logging buttons.*

When user stops data logging, UFM will create the log file in UFM Manager's work directory subfolder *_config*. UFM Manager will also display the new log file in the *Existing Files* section, from which users can open the file by double-clicking the filename.

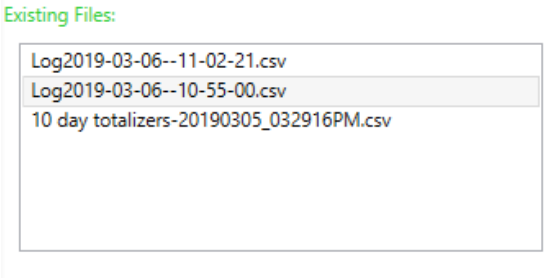


Figure 71: *Existing log files.*

Here is fragment of a log file opened in Microsoft Office Excel:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Time stamp	Volume Flo	Volume Flo	Mass Flowr	Gas Flow Ve	Gas Flow Ve	Gas Flow Ve	Velocity of S	Gas Density	Molecular V	Alarm Statu	Pressure__(	Temperature__0	
2	14/01/2006 22:45	0.117531	0.115589	13390.01	1.498218	1.498218	1.648028	135.5959	44.53466	1071.491	12	1.013	67.99997	
3	14/01/2006 22:45	0.117531	0.115589	13390.01	1.498218	1.498218	1.648028	135.5959	44.53466	1071.491	12	1.013	67.99997	
4	14/01/2006 22:45	0.117531	0.115589	13390.01	1.498218	1.498218	1.648028	135.5959	44.53466	1071.491	12	1.013	67.99997	
5	14/01/2006 22:45	0.117531	0.115589	13390.01	1.498218	1.498218	1.648028	135.5959	44.53466	1071.491	12	1.013	67.99997	

Figure 72: *A log file displayed in MS Excel.*

16.2 Configuration and History

The user can download the FGM current configuration and history of register changes. Click on *Download configuration* button, the downloading process will begin, and user should see the green circle indicator at the bottom of *Figure 73*.

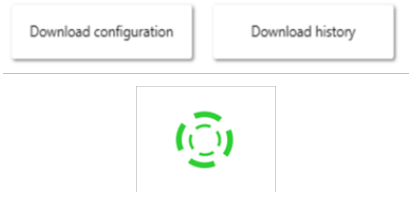
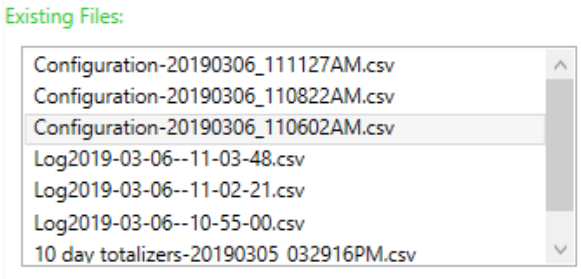


Figure 73: *The download configuration & history buttons and the working indicator.*

When the download process finishes, the new file will be added to the *Existing Files* list. The file can also be found in UFM Manager's working directory's subfolder *_config*.



Here is fragment of result configuration file opened in Microsoft Office Excel:

13	1100	2	VelocityUnit	Velocity unit; DCS regs. (1: m / s; 2: ft / s)	1
14	1101	2	VolumeUnit	Volume unit; DCS regs. (1: m3; 2: MMCF(million cubic feet))	1
15	1102	2	VolFlowUnit	VolumeFlow unit; DCS regs. (1: m3 / h; 2: MMCFD(million cubic feet pr.day))	1
16	1103	2	MassUnit	Mass unit; DCS regs. (1: kg; 2: lbs)	1
17	1104	2	MassFlowUnit	MassFlow unit; DCS regs. (1: kg / h; 2: lbs / h)	1
18	1105	1	PressUnit	Press.unit; DCS regs. (1: BarA; 2:kPaA; 3:psiA; 4:kg / cm2 Abs)	1
19	1106	2	TempUnit	Temp.unit; DCS regs. (1: Celsius; 2:Fahrenheit)	1
20	10000	01-FLUENTA-100	TagNo(char. 1	Tag number; max. 20 characters	-

Procedure for downloading history of changes in the meter is exactly the same.

16.3 Register Read/Write

UFM Manager allows the user to read and write values directly from & to FGM registers.

CAUTION: Writing faulty values to the FGM will lead to measurement errors.

To read values from registers user should first enter register address, then quantity of registers and finally press *Read Register* button, as seen in *Figure 74*. The result of the operation is shown in *Figure 75*.

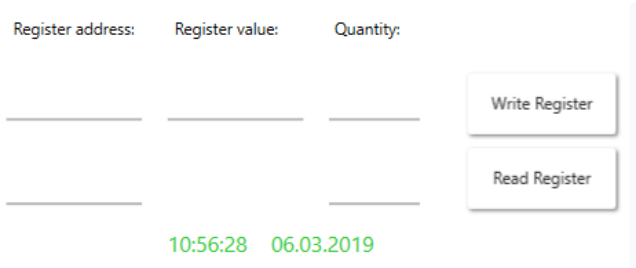


Figure 74: *The register read / write box.*

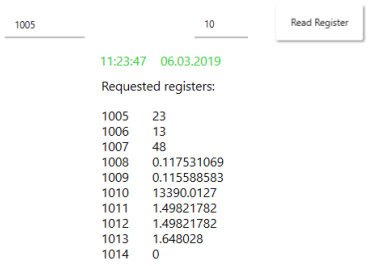


Figure 75: *Read registers output.*

The process of writing values to the FGM very similar. The user should first enter the register address, then its value and then quantity, as shown in the example below:

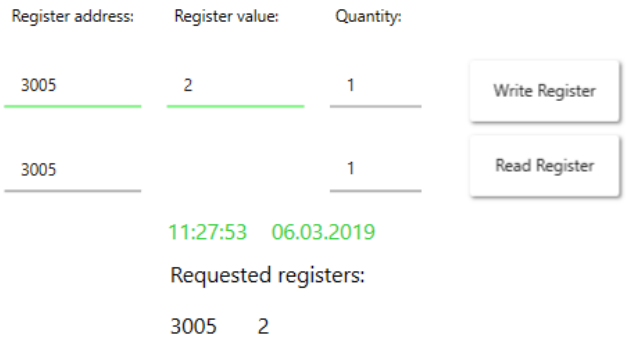


Figure 76: *Writing to registers.*

After pressing the *Write Register* button, UFM Manager will send the requested value to the FGM, and then will attempt to read it from the FGM. The value that has been read should be displayed by UFM below the read/write panel.

17. Calculation Check

NOTE: these functions are only available to authorised service engineers.

In the Service and Troubleshooting menu, the first sub-menu is Calculation Check. When the calculation check is enabled the computer changes the Chirp and CW measurements according to user input, in order to change the flow parameters. This is done to verify the mathematical calculations of the FGM 160. The pressure and temperature values can also be changed when this is mode is activated.

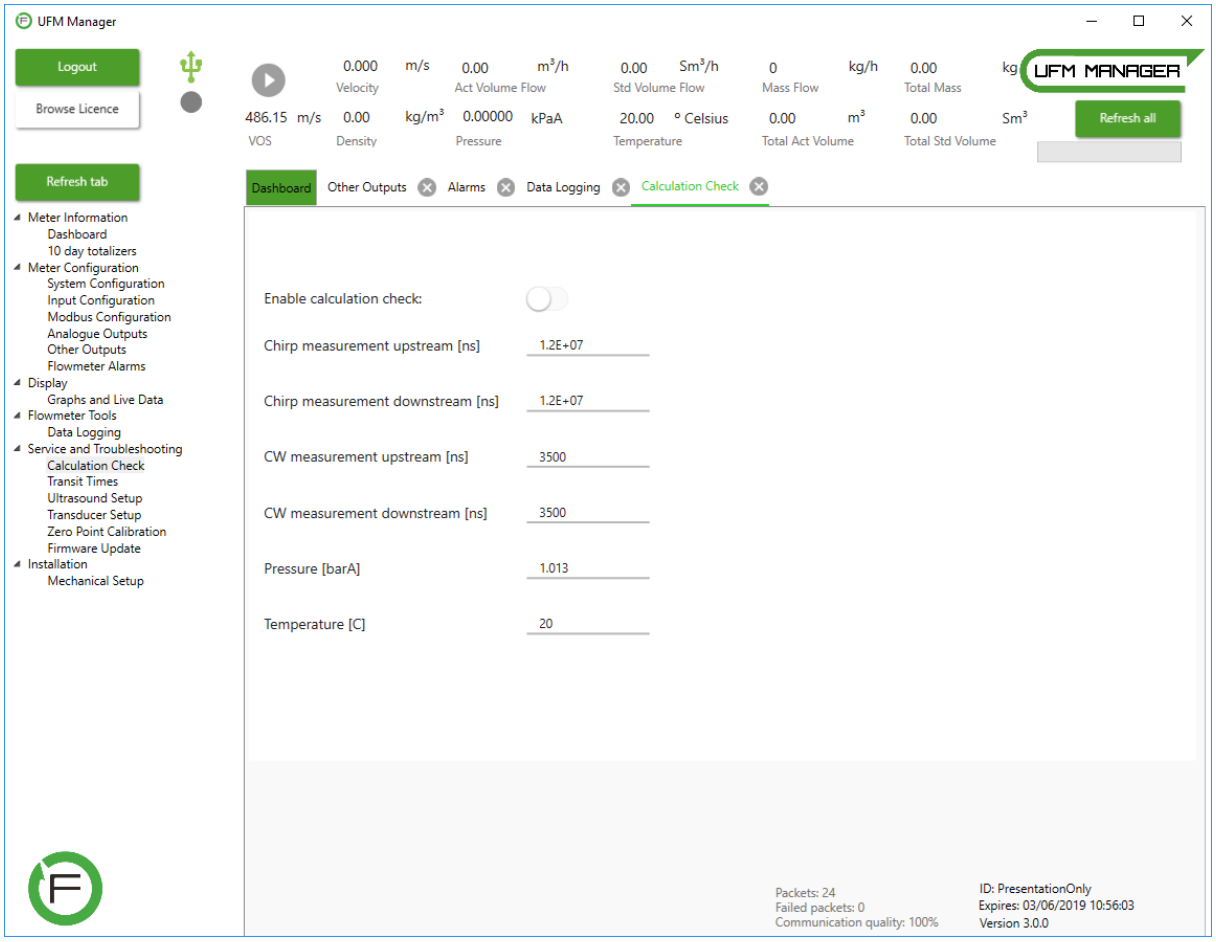


Figure 77: *The calculation check tab.*

18. Transit Times

NOTE: these functions are only available to authorised service engineers.

The transit times tab displays flow and sound velocity measurements. This tab informs the user how many time-of-flight measurements were accepted both for downstream and upstream.

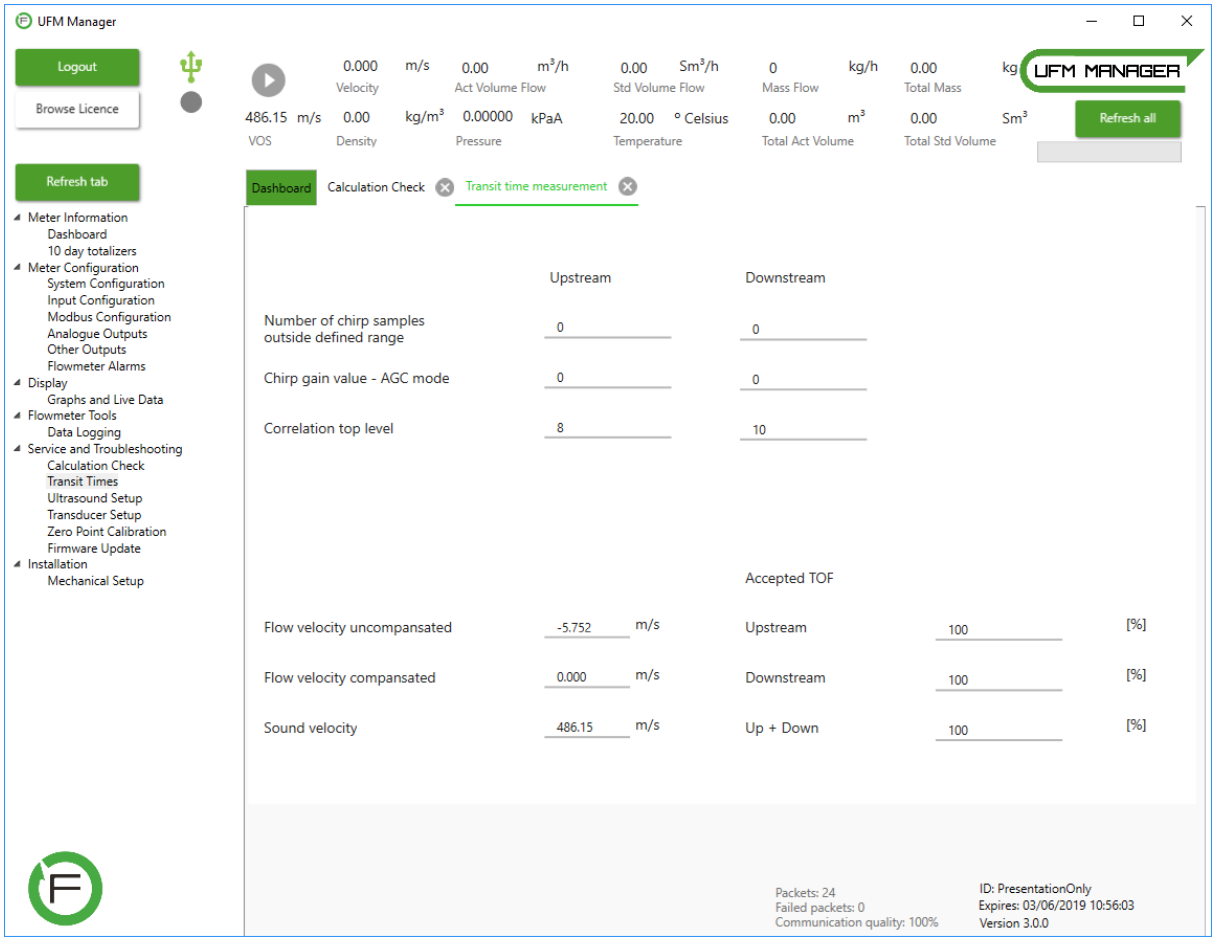


Figure 78: *The transit times tab.*

19. Ultrasound Setup

19.1 FGM 160

The ultrasound setup tab allows the user to adjust the Chirp signal settings, CW signal settings, and the Signal averaging.

NOTE: It is important to always follow the frequency values that are on the transducer calibration certificate.

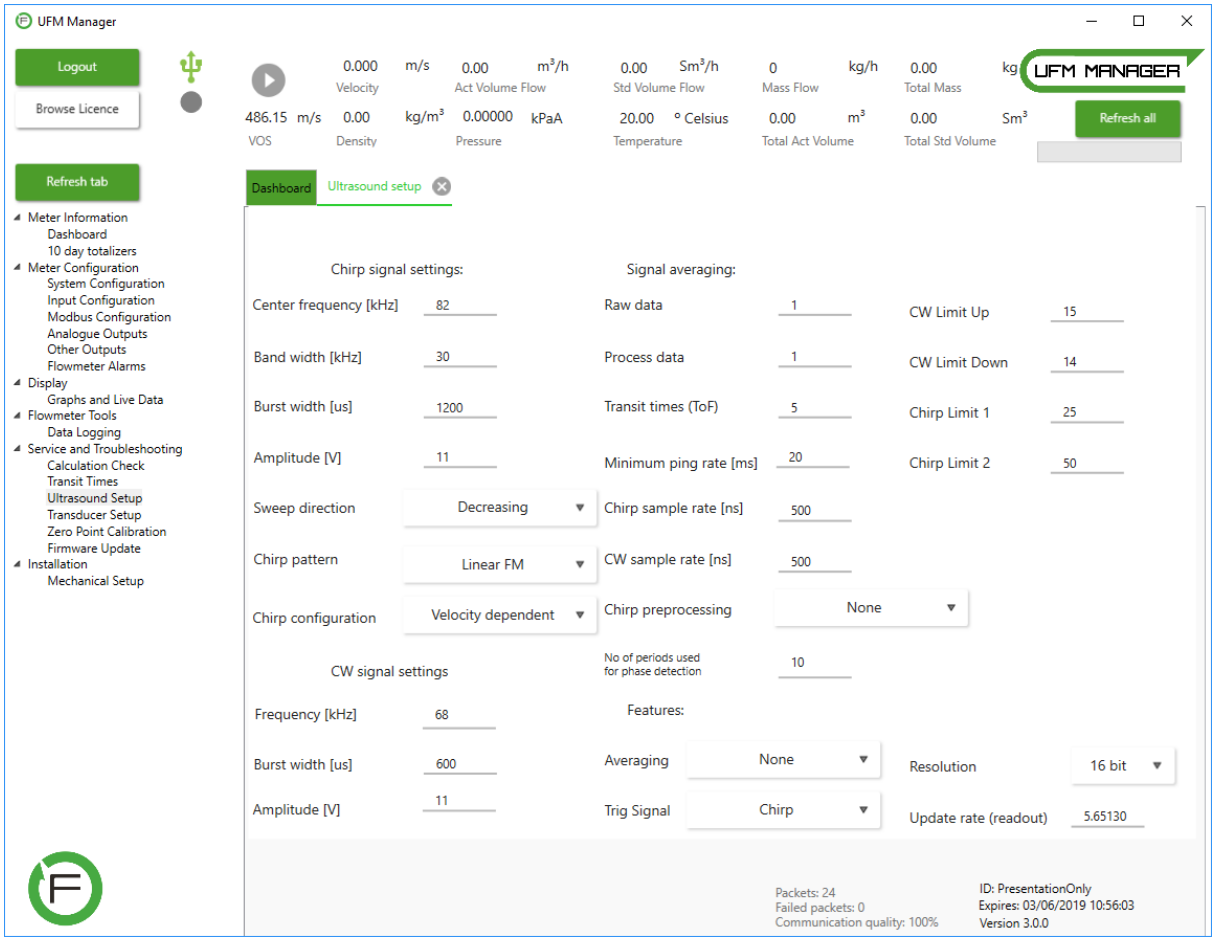


Figure 79: *The FGM 160 ultrasound setup tab.*

19.2 FGM 260

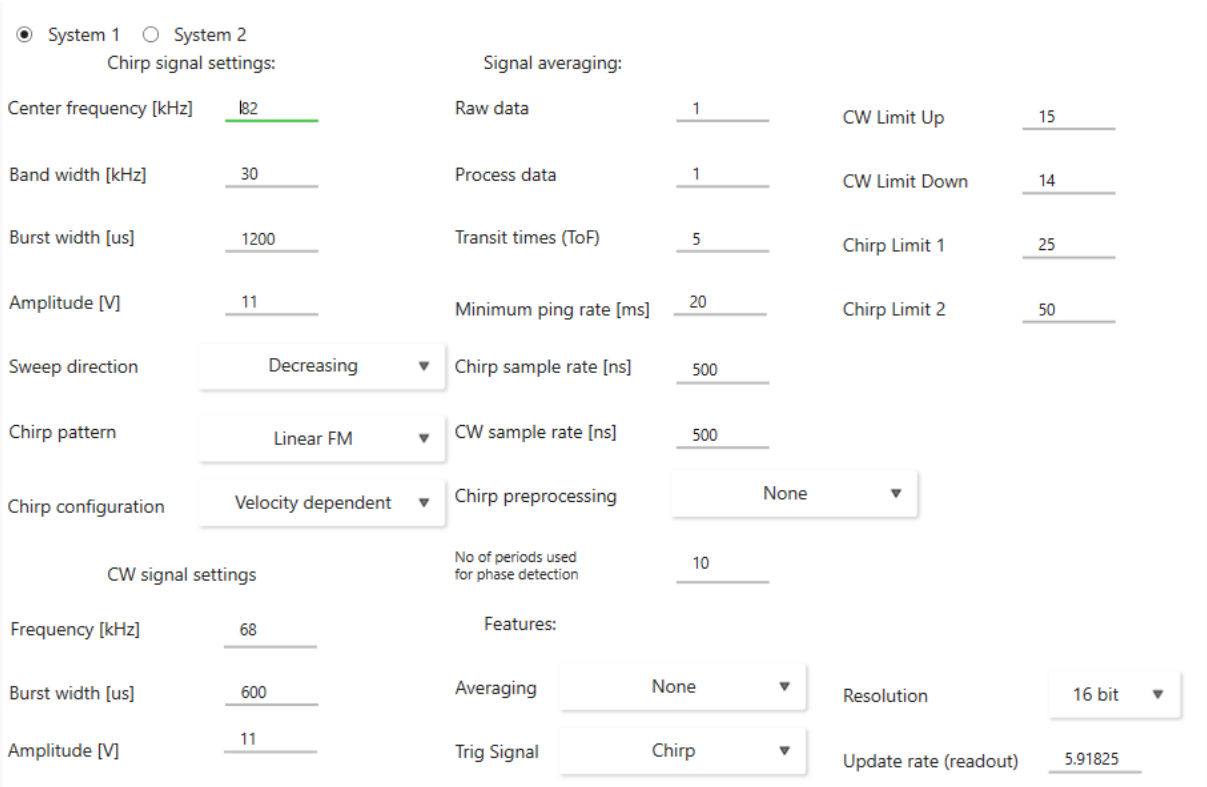


Figure 80: *The FGM 260 ultrasound setup tab.*

The FGM 260 requires the ability to configure both channels. The user can switch between *System 1* and *System 2*, by checking the correct option, as shown at the top left of *Figure 80*. All other options are the same as those in base FGM 160 version.

20. Transducer Setup

The *Transducer Setup* tab allows the user to set the Gain control and adjust its settings. Moreover, it allows you to set serial numbers of transducers.

20.1 FGM160

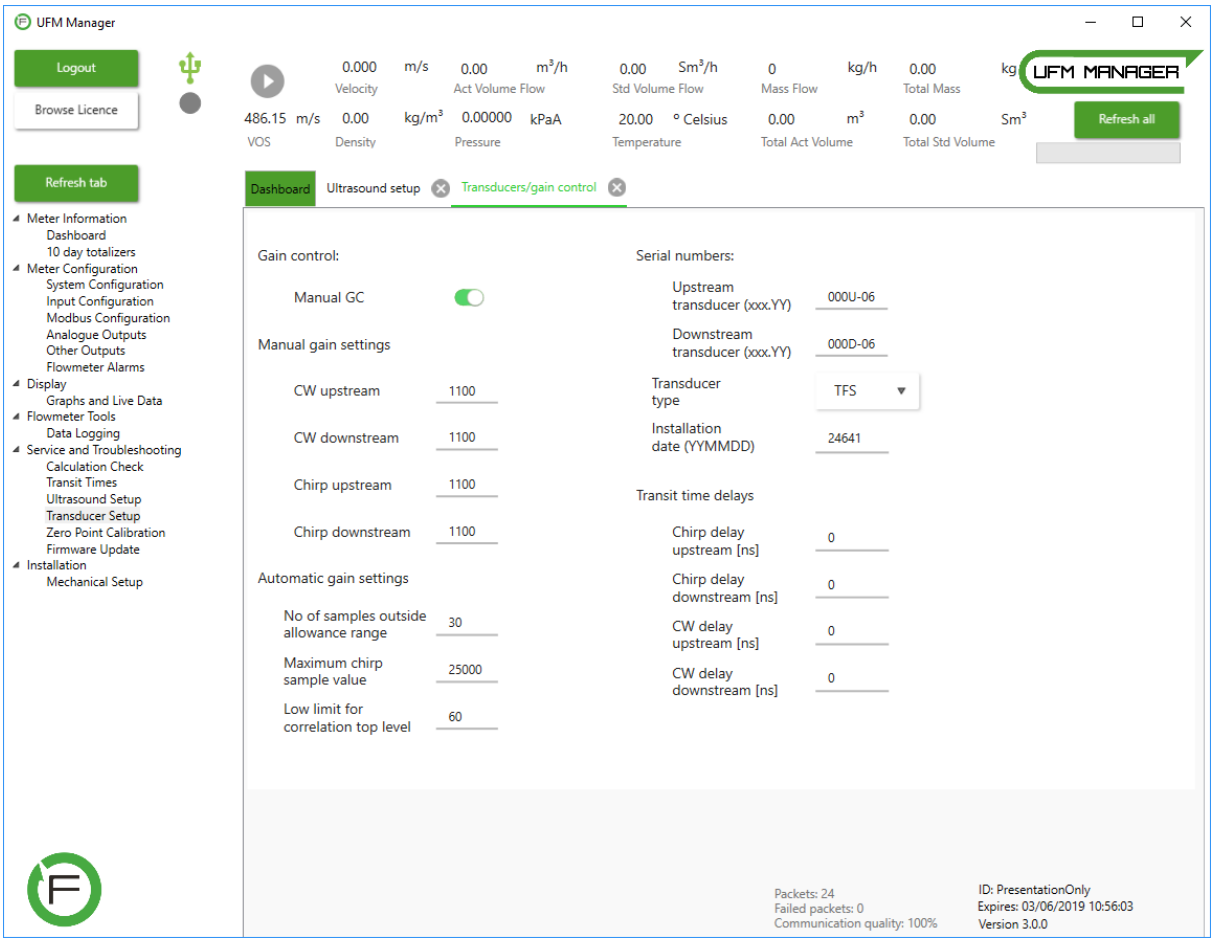


Figure 81: *FGM 160 transducer setup tab.*

20.2 FGM 260

In FGM 260 mode, UFM Manager contains additional columns which allows the user to set gain settings and serial numbers of transducers connected to the second channel. All parameters for the second channel play the same role as parameters for first channel.

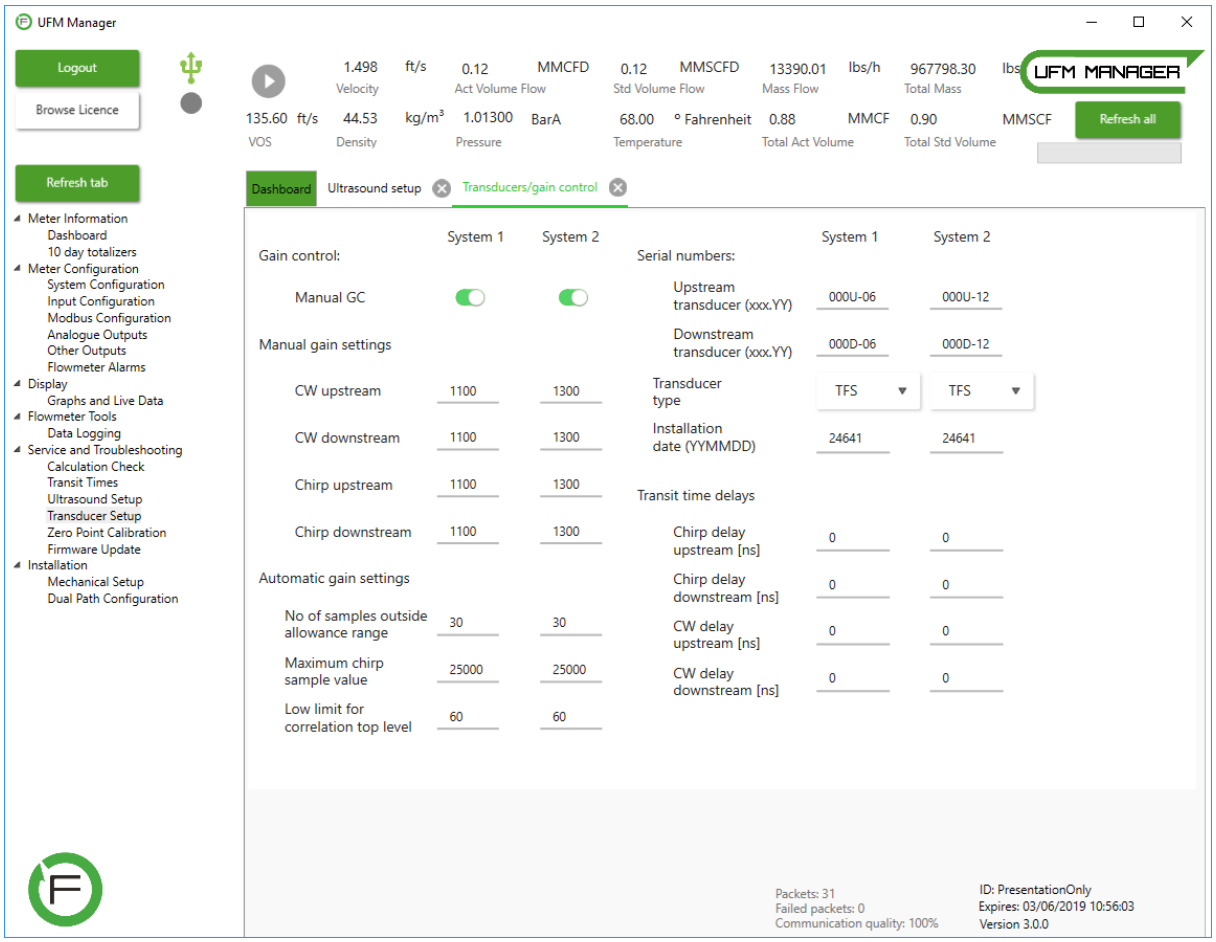


Figure 82: *FGM 260 transducer setup tab.*

20.3 Serial Numbers

The ultrasonic transducer serial number can be recorded in the *Transducer Setup* sub-menu. In this example to enter the serial numbers simply type “160.16” for both, the up and down, followed by the enter key. The computer will automatically insert the U for upstream, and the D for downstream.

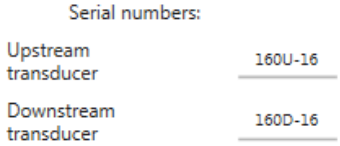


Figure 83: *Transducer serial numbers.*

20.4 Transit Time Delays

It is very important that these transit time delay values are entered exactly as shown on the calibration certificate. The units are nanoseconds.

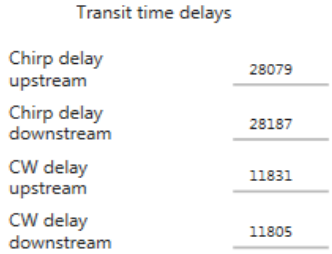


Figure 84: *Transit time delays.*

21. Zero Point Calibration

The *Zero Point Calibration* tab contains all parameters related to zero box calibration.

21.1 FGM 160

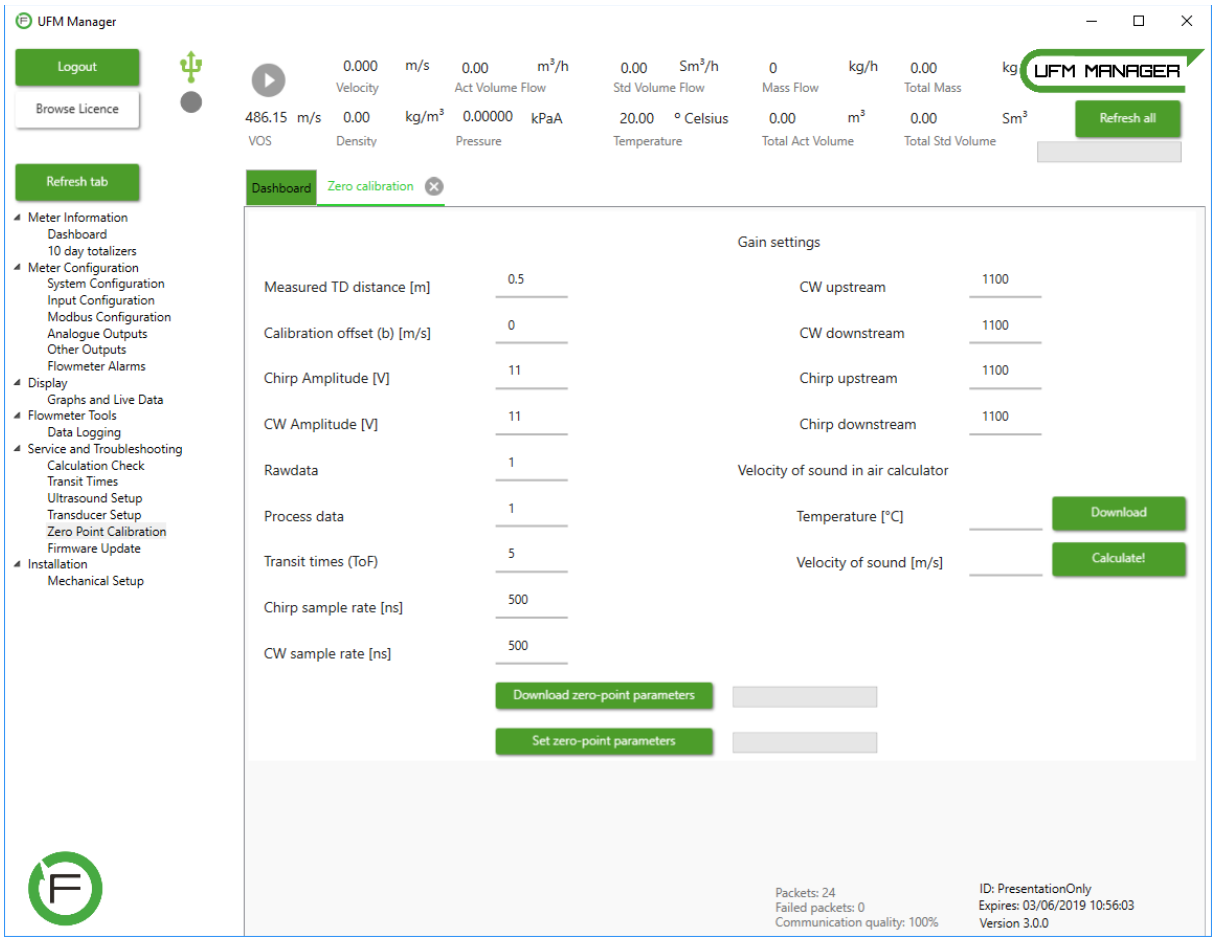


Figure 85: *FGM 160 zero box calibration tab.*

21.2 FGM 260

In FGM 260 mode, UFM Manager displays additional columns which allows the user to set zero box calibration settings for a second channel. All other parameters for second channel play the same role as parameters for first channel.

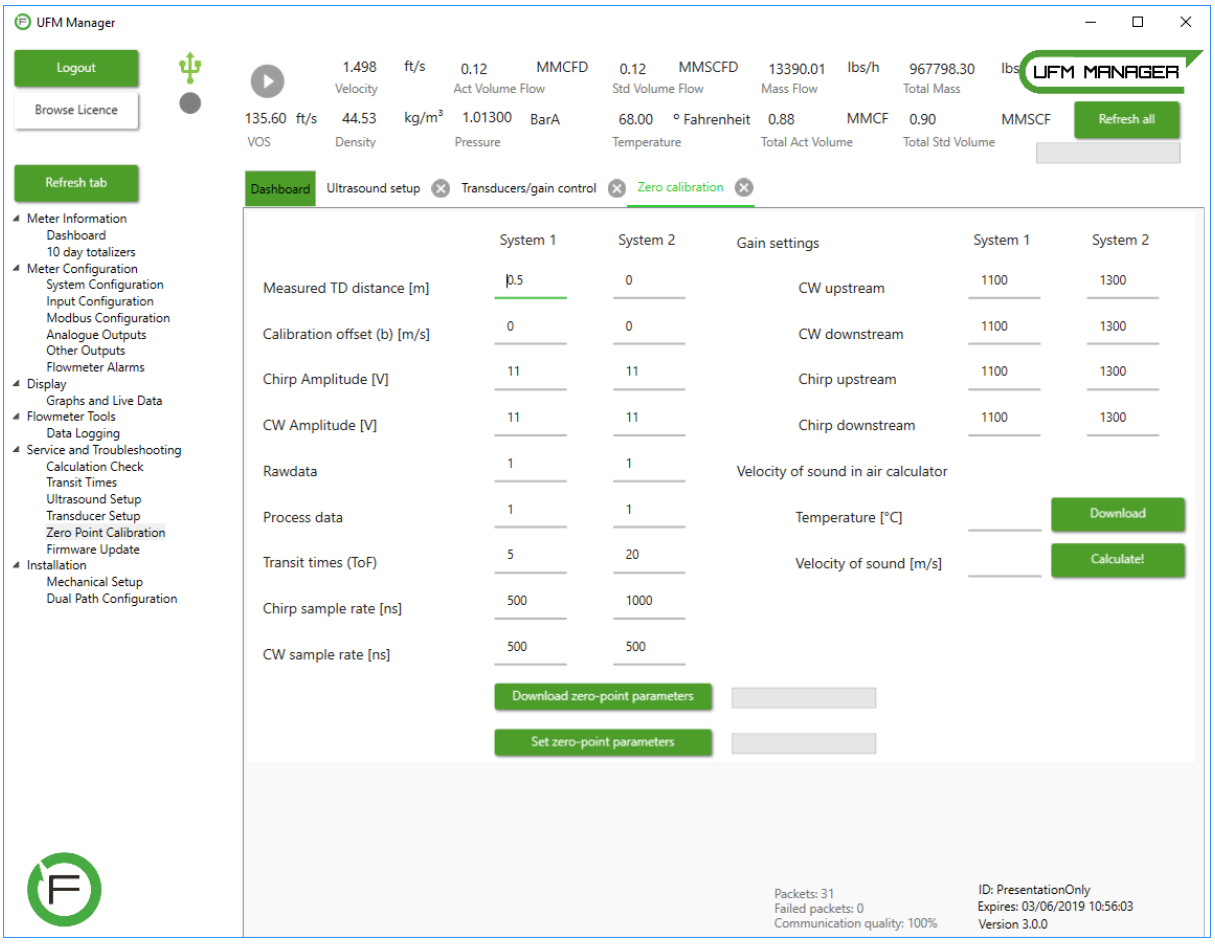


Figure 86: *FGM 160 zero box calibration tab.*

21.3 Measured TD Distance

The default value of *Measured TD* (transducer distance) in the zero box is 0.5m. If this distance is changed in the software but is not adjusted physically in the zero box, an incorrect velocity of sound will be calculated as shown in *Figure 87*.

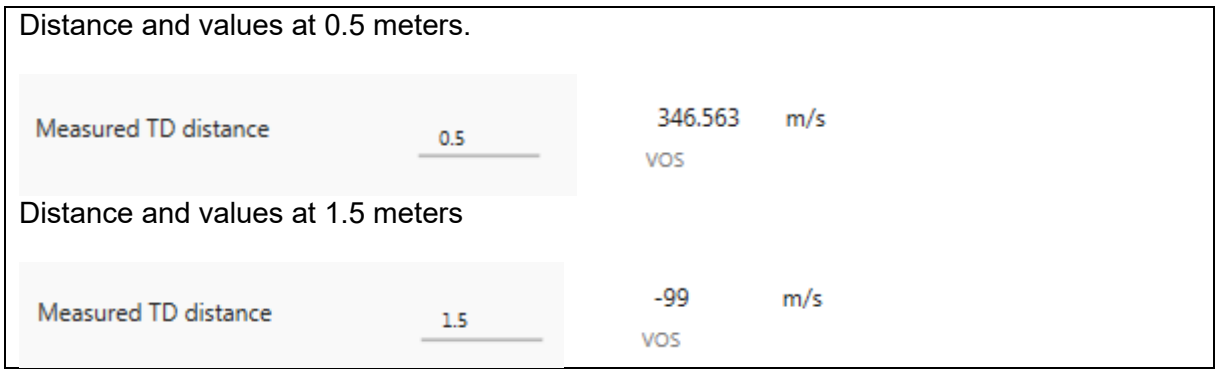


Figure 87: *Demonstrating the effect of changing transducer distance on VoS.*

21.4 Calibration Offset

The calibration offset is adjusted according to the flow velocity. Its default value is 0, as shown in

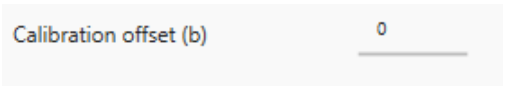


Figure 88: *Calibration offset.*

In this example the flow velocity in the zero box is 0.037250 m/s, therefore the calibration offset should be set to -0.037250 to get it as close to 0.00 as possible.

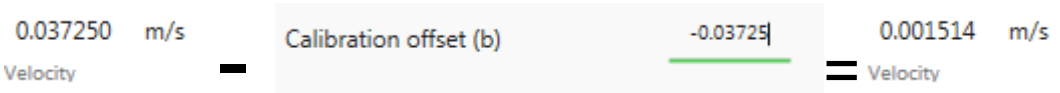


Figure 89: *Implementing a calibration offset.*

NOTE: after applying the calibration offset, the resulting flow velocity will most likely no be precisely 0.00, because of numerical rounding errors. For example, a value of 0.001514 is perfectly acceptable provided there are no drastic fluctuations. Twenty (20) minutes of stable flow readings are needed prior to making changes to the calibration offset.

22. Firmware Update

NOTE: this function is only available to authorised service engineers.

The firmware update tab allows the user to update FGM firmware. In both FGM160 and FGM260 modes there are 3 different options. Users can upload DSP, IO or PT firmware. A progress bar will show uploading progress. Note that after each firmware upload the FGM requires approximately 15 seconds to restart.

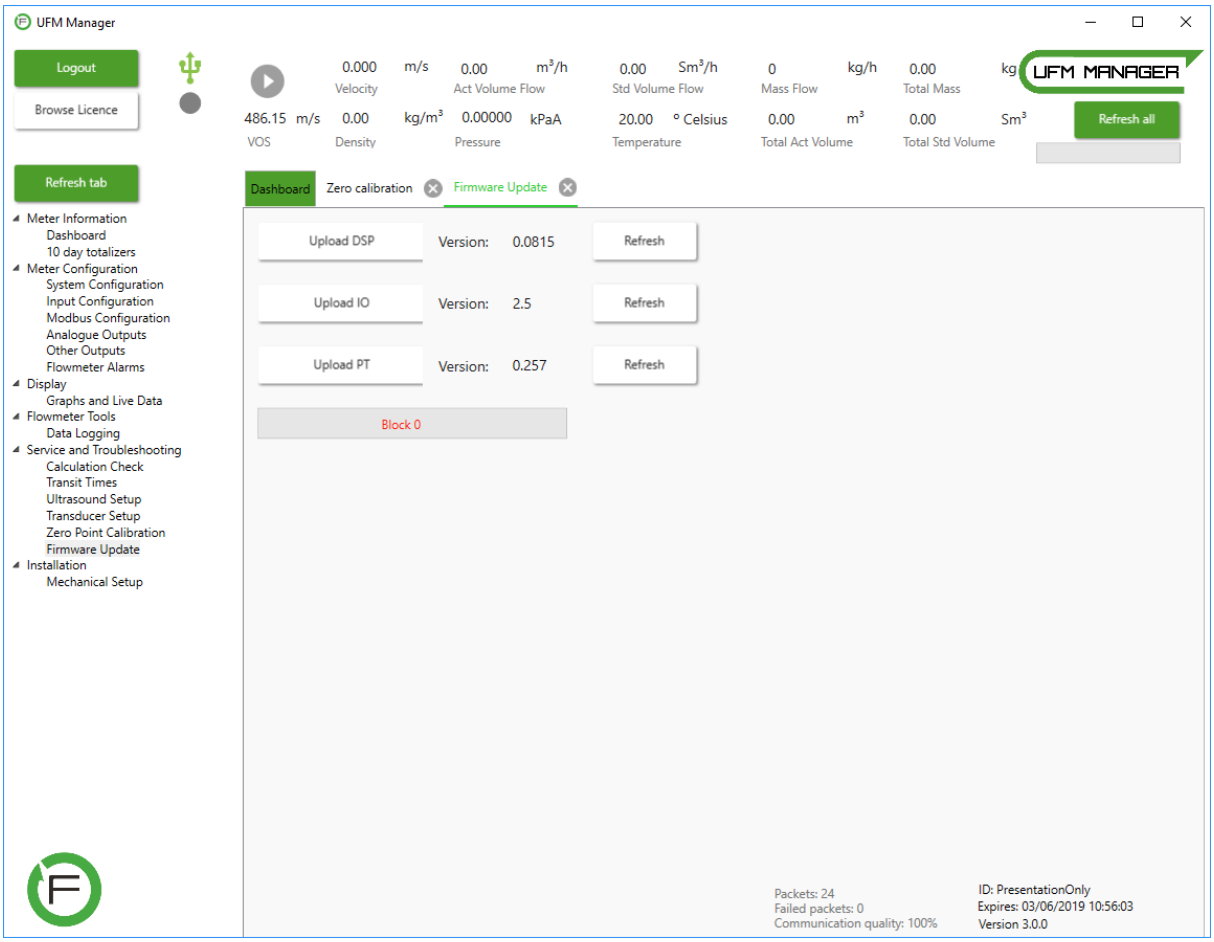


Figure 90: *The firmware update tab.*

22.1 Upload Setup

To upload new firmware the user clicks on whichever of the three firmware types are required, browses to select the correct file, and then and waits for the upload to finish. The following example shows the upload of new DSP firmware.

Begin by clicking on the DSP button.

Figure 91: *Upload DSP firmware button.*

A file browser will pop up. Select the desired file and click open.

The grey loading bar will turn green as the upload progresses.

Figure 92: *Firmware upload progress bar.*

Once the upload is sucessful a pop up window will be displayed. UFM Manager will be locked for 15 seconds while the FGM restarts.

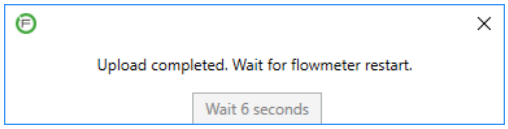


Figure 92: *Firmware upload completed message.*

23. Mechanical Setup

NOTE: these functions are only available to authorised service engineers.

This tab is used for commissioning FGMs. It is crucial to input this data correctly.

23.1 FGM 160

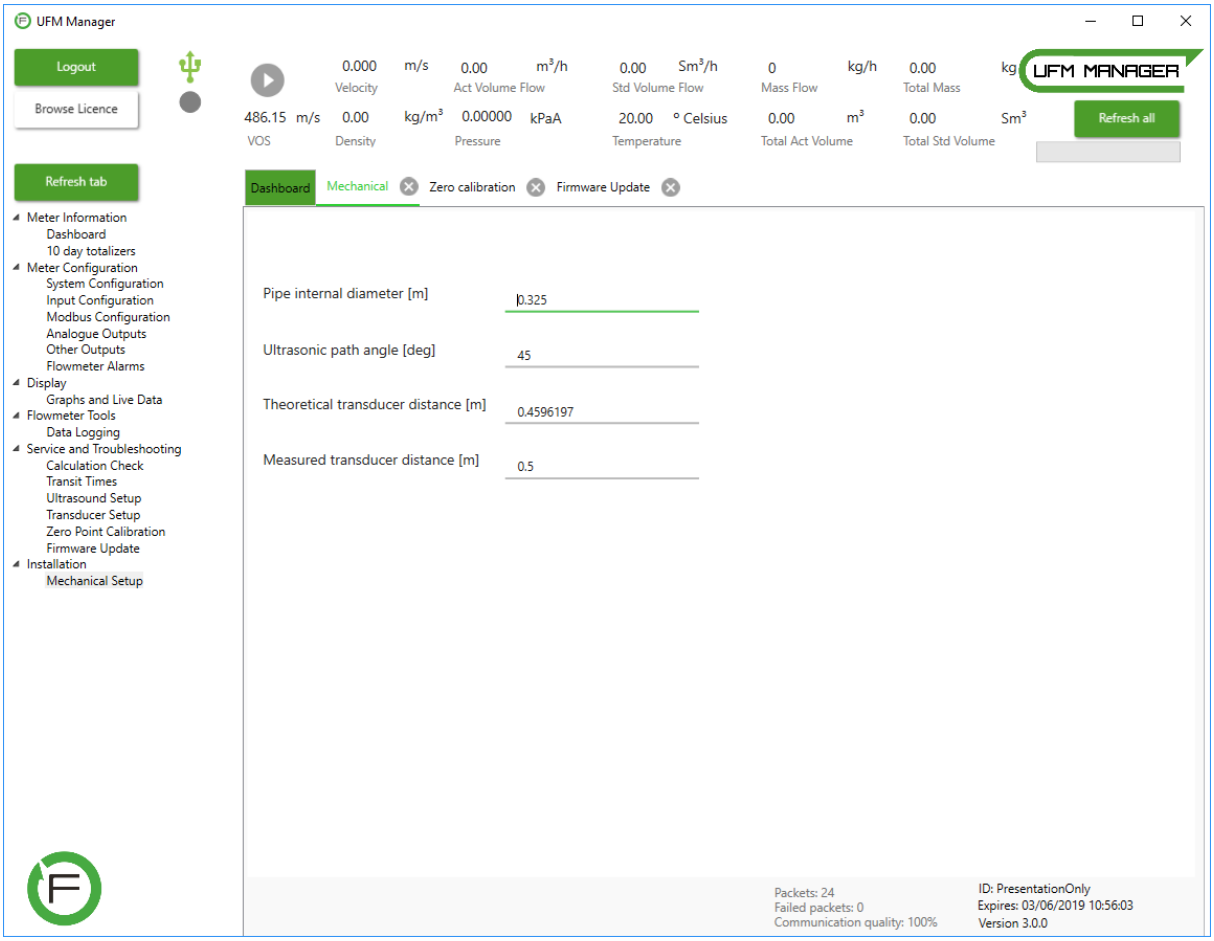


Figure 93: *FGM 160 Mechanical Setup tab.*

23.2 FGM 260

In FGM 260 mode, UFM Manager displays additional columns which allows the user to set mechanical parameters for a second channel. All other parameters for second channel play the same role as parameters for first channel.

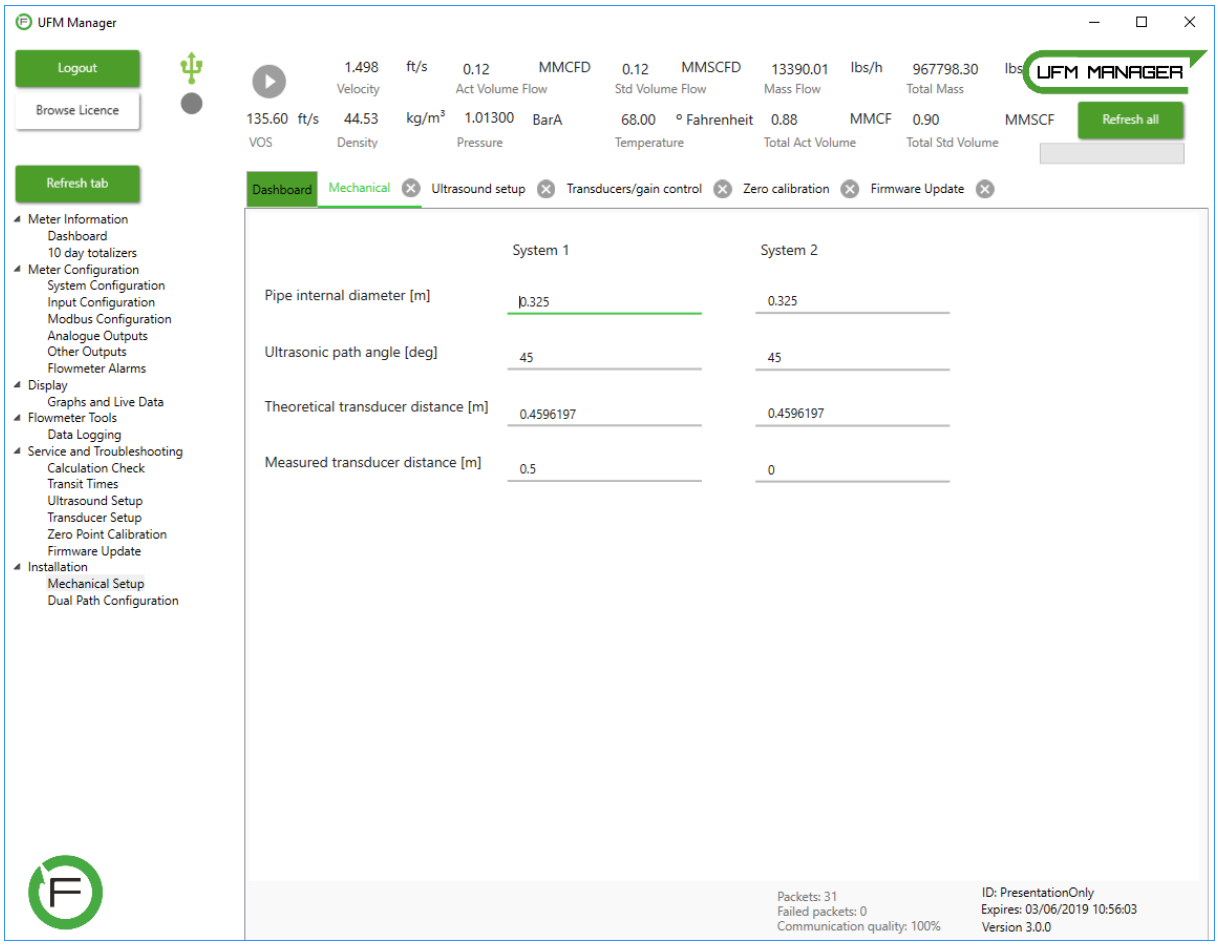


Figure 94: *FGM 260 Mechanical Setup tab.*

23.3 Pipe ID

Always refer to the information tag on the pipe commonly refered to as the “plate” for the pipe inner diameter.

Figure 95: *Pipe internal diameter.*

23.4 Ultrasonic Path Angle

This value is typically 45 degrees.

Figure 96: *Ultrasonic path angle.*

23.5 Theoretical Transducer Distance

The theoretical transducer distance is dependent on the pipe ID value, and path angle.

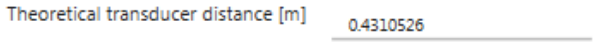


Figure 97: *Theoretical transducer distance.*

23.6 Measured Transducer Distance

The measured transducer distance is also known as the tip to tip distance. This value will always be greater than the theoretical because of the retraction of the transducers. The retraction is performed so that the transducers are not instrusive.

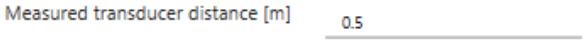


Figure 98: *Measured transducer distance.*

24. Dual Path Configuration

The *Dual Path Configuration* tab provides options for configuration of dual path installations.

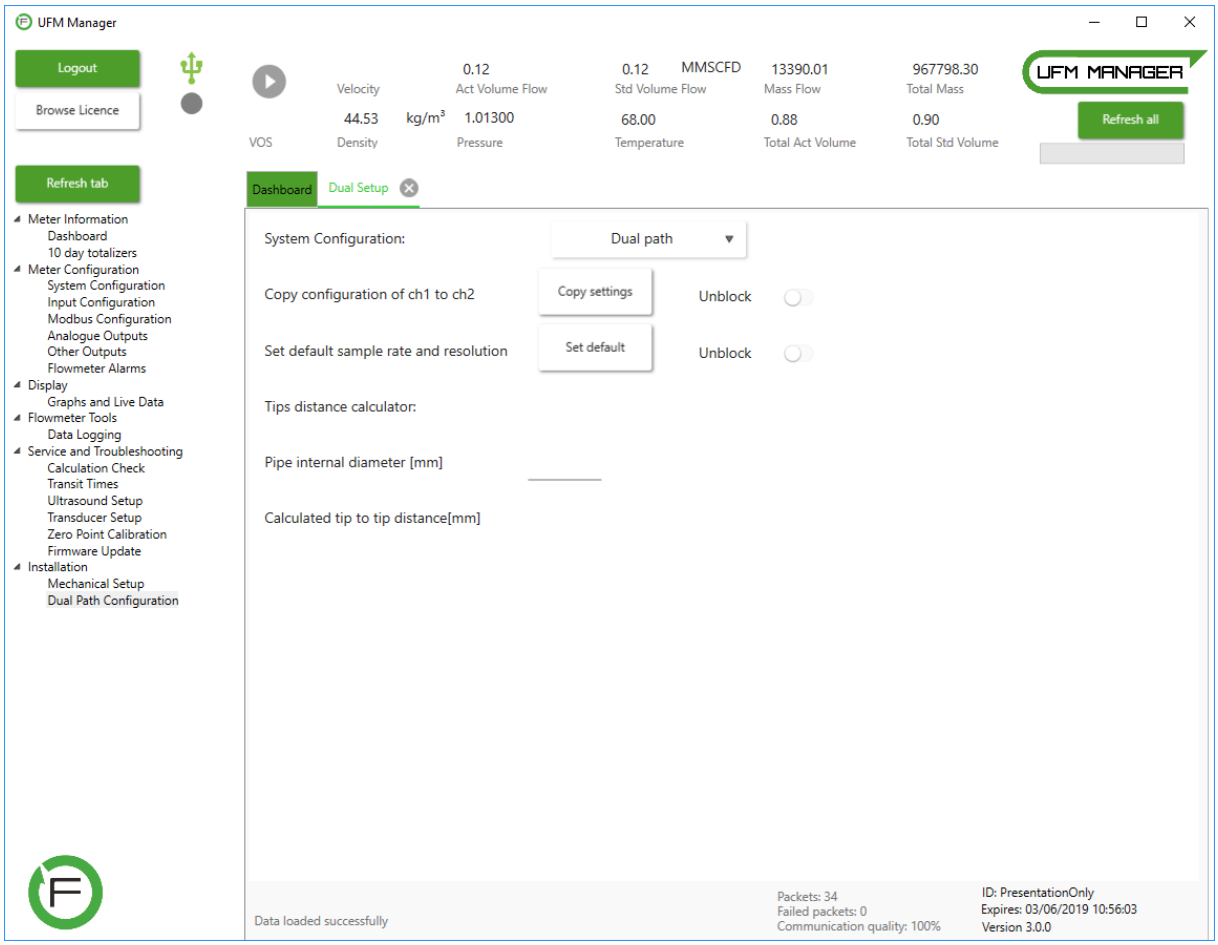


Figure 99: *Dual path configuration tab.*

24.1 System Configuration

System configuration settings on this tab are as described in section 9.6.

24.2 Copy Configuration of Ch1 to Ch2

After setting up channel 1, the user can automatically copy its configuration to channel 2.

Figure 100: *Copy configuration settings, blocked.*

Because this operation is irreversible, its locked by toggle button which must be enabled to begin the procedure, as shown in *Figure 101*.

Figure 101: *Copy configuration settings, unblocked.*

24.3 Tip-to-Tip Distance Calculator

In dual path system the transducers are not positioned on a central diameter of the pipe, but are offset. This data needs to be included in calculations of tip to tip distance. To help the user UFM Manager provides a calculator which will output correct tip to tip distance according to pipe internal diameter.

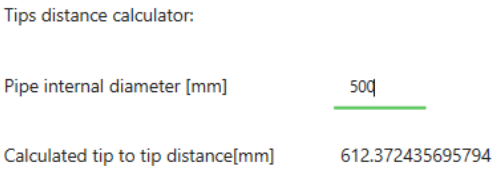


Figure 102: *Tip to tip distance calculator.*