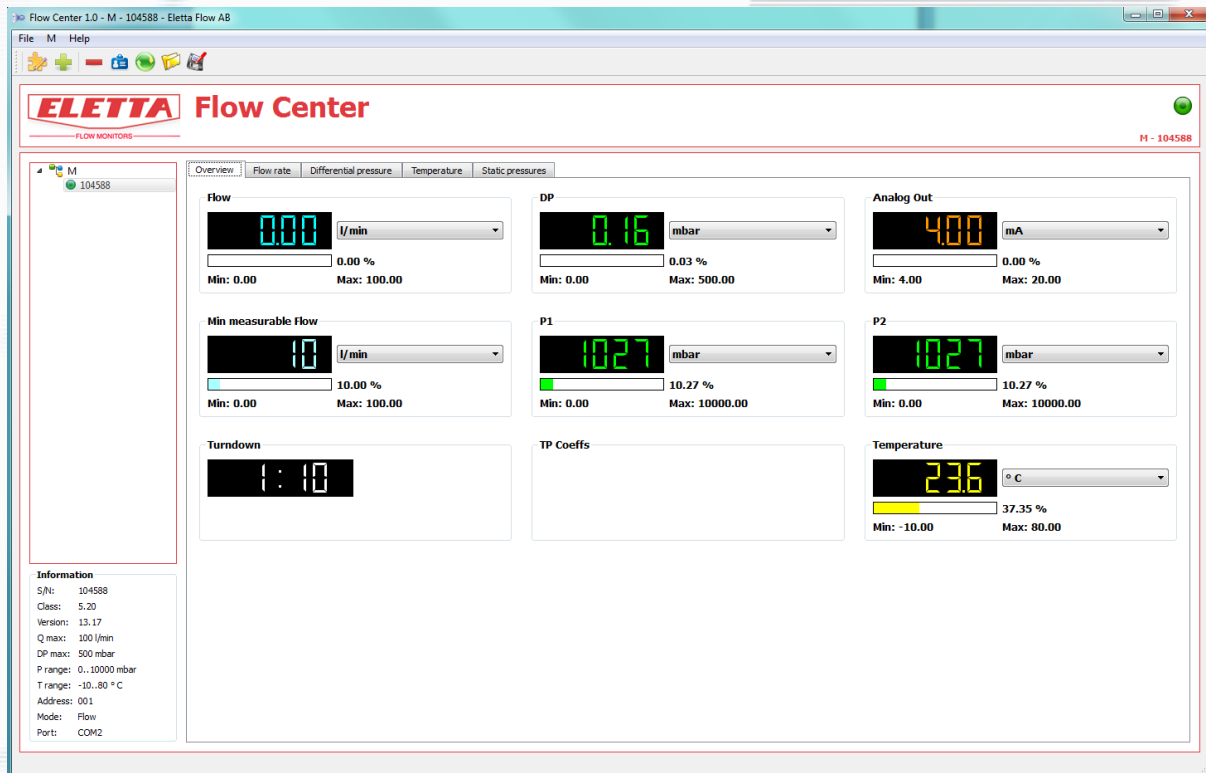


Flow Center User Manual

With plug-in for M3-series



About this Manual

This manual describes how to install and use Flow Center with the M plug-in for the Eletta M3-series Flow Meter.

- The latest version of this manual is available for download on our website www.eletta.com.
- On our website you will also find other information such as leaflets, newsletters, application reports and software download.

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1. General Information

Flow Center is a software developed by Eletta Flow to communicate with the Eletta M3-series Flow Meter. The M3-series Flow Meters is used to measure and control flows of liquids and gases in pipes.

Flow Center is currently only available for use with Microsoft Windows.

The communication between the software and the Flow Meter is bi-directional. This means that the software reads existing data and parameters from the Flow Meter. It also allows you to re-configure the flow meter using the communication cable for M-series.

The communication cable for M-series is a USB cable with a RS 485 converter and is available to purchase from Eletta Flow.

2. Technical specification for communication cable

- Supply via USB for one connected final consumer (U-Out = 11,8 VDC / I-Out max=40 mA)
- Measuring channel: voltage input 0...12 VDC
- Visual status and configuration display (LED)
- Galvanic isolation
- Total length: 1,7 m
- Driver package included with package



3. Installation

Flow Center software, M plug-in and driver K-114B for the communication cable are available for download from <http://www.eletta.se/en/downloads/softwaredrivers/>. Check for the latest versions online.

- 1) Open the "Setup flow_center X.X", choose installer language and follow the setup wizard to install. Available languages are Swedish and English. Run the setup as administrator. If you don't have the necessary privileges, please contact your IT support before installing the software.

- 2) Flow Center does not work without the required plug-in. If you are to communicate with the M3 flow meter, open the "Setup Flow Center M plugin - X.X". Choose installer language and follow the setup wizard to install. Run the setup as administrator. If you don't have the necessary privileges, please contact your IT support before installing the software.

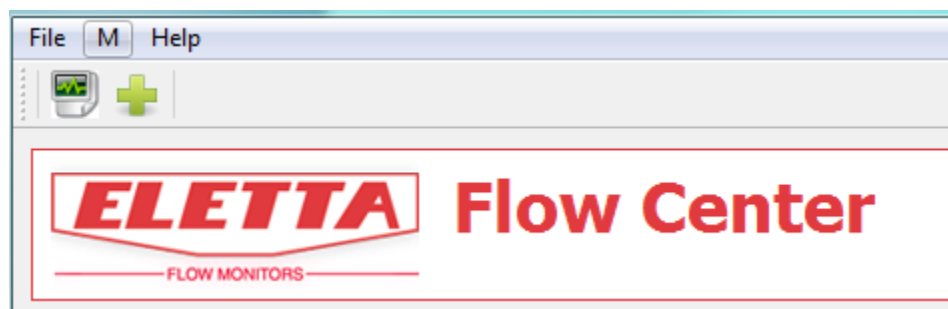
- 3) Install the driver K-114B for the communication cable. The driver for the RS485-USB communication cable is available for download online at Eletta server <http://www.eletta.se/en/downloads/softwaredrivers/>. Run the setup as administrator. If you don't have the necessary privileges, please contact your IT support before installing the software.
Refer to the manual in the package for troubleshooting and system requirements for the USB-RS485 converter.

- 4) Connect the communication cable to any USB port on your computer and the M3 unit.

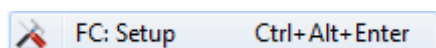
- 5) Run Flow Center X.X

4. Overview

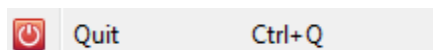
General Functions



File/

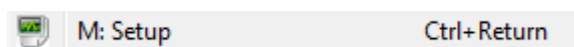


Action: Change language (Program must be restarted)

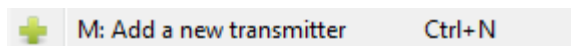


Action: Quit program

M/

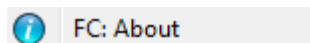


Action: Access log function settings. Also accessible using  button.

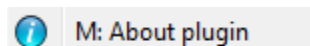


Action: Add a new M to Flow Center Also accessible using  button.

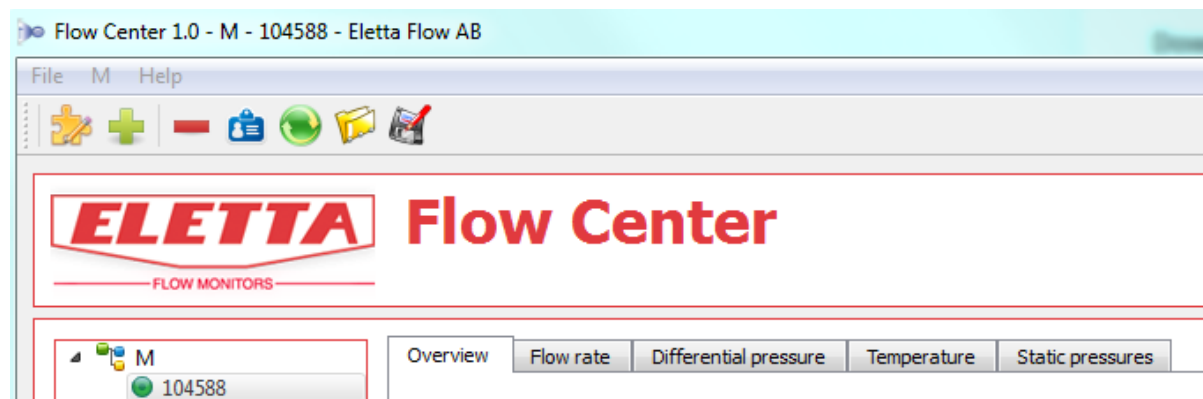
Help/



Action: Info about the software and version



Action: Info about plug in



New functions will first appear when a device is connected with Flow Center.



Action: Configure settings for the device.



Action: Connects a new device to Flow Center.



Action: Disconnects a device.



Action: Allows you to set a specific identification No for each device. *The MODBUS interaction is not yet fully developed and should be used with pre-caution.*



Action: Change the mode you use the M3 device. 4 different modes are supported with the M3 unit.

1. DP (Differential pressure measurement)
2. Flow (Incompressible flow)
3. Gas flow (ABS) Volumetric flow mode.
4. Gas flow (NORM) "Mass flow" mode (*Flow value must be density multiplied real-time wrt current temperature and absolute pressure. Not supported by software*)




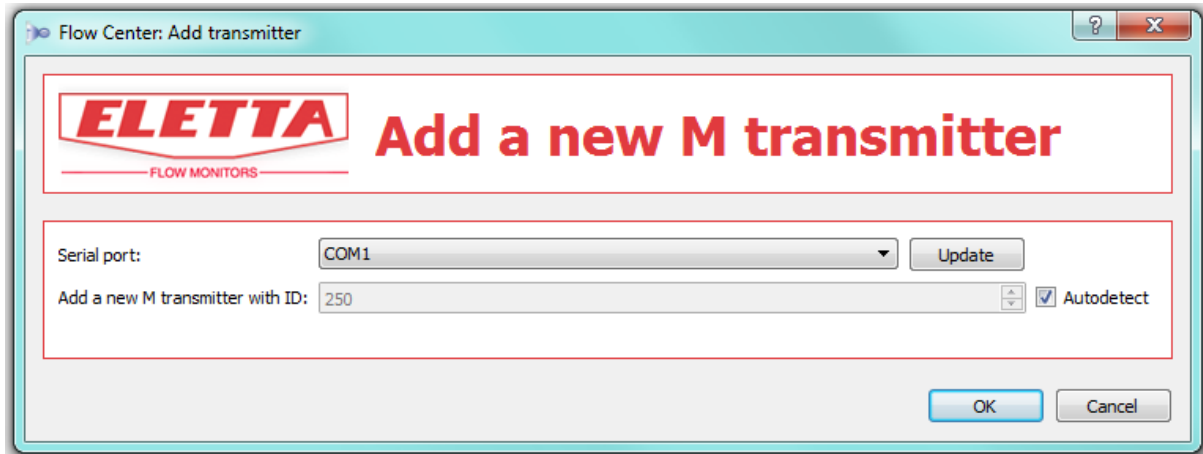
Action: Load previously saved device settings.





Action: Allows you to save device settings.

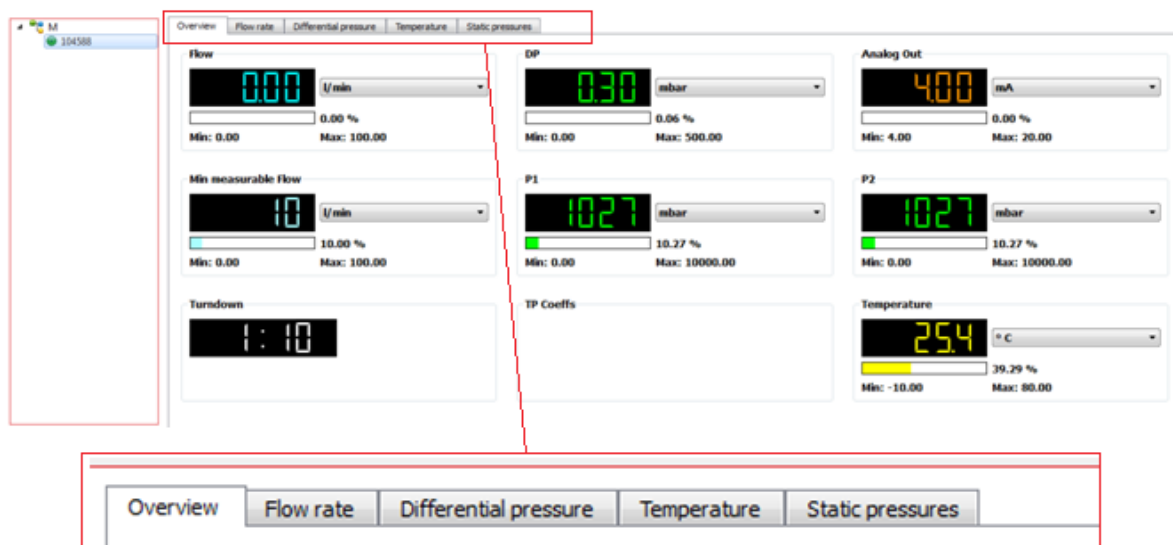
5. Connect a device

Connect the Flow Meter to your PC with the communication cable for M3-series and open Flow Center.  Add new device. The following input box will appear:



Click on **UPDATE** to find all connected/occupied USB ports. Choose the port where the device is connected. Click on **OK** and the device will be uploaded for communication. The **AUTODETECT** can be unchecked to search and communicate with a specific device with a certain Modbus ID. *The MODBUS interaction is not yet fully developed and should be used with pre-caution.*

Once the device is connected it shows up with a green  online icon followed by the units unique S/N. When clicking on the  connected device you enter the read view which consists of 5 different sub pages where you can oversee Overview (Displaying all measurements in one page), Flow rate, Differential pressure, Temperature and Static pressures. Note that the scaling is dependent on the settings saved on the device and measurements will be performed immediately as the unit is connected.



On the left bottom side of the screen is the device information frame.

Information

S/N: 104588

Class: 5.20

Version: 13.17

Q max: 100 l/min

DP max: 0.500 bar

P range: 0..10 bar

T range: -10..80 °C

Address: 001

Mode: Flow

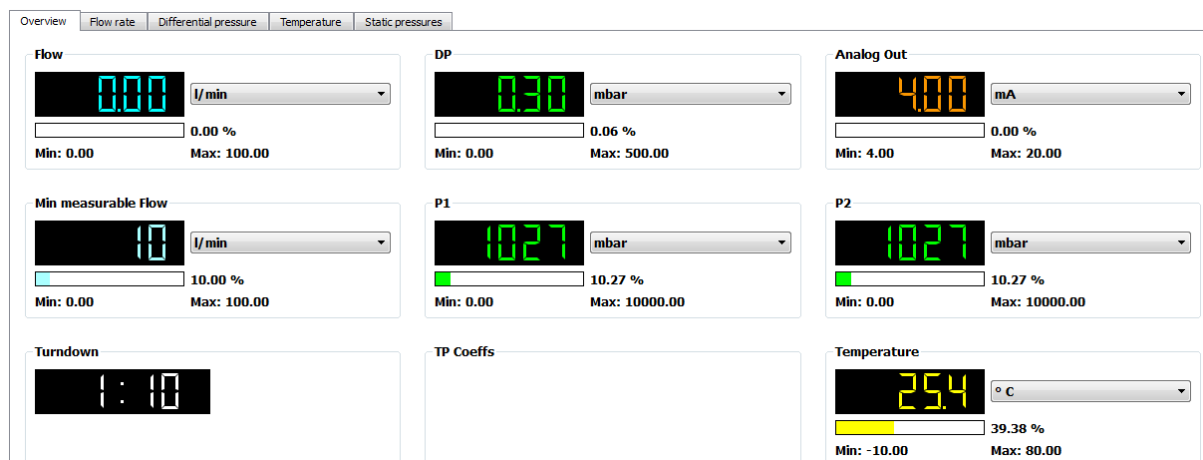
Port: COM2

Here you can see

- S/N: Serial number
- Class: Transmitter class
- Version: Software version written to the sensor card of the device (Keller software)
- Qmax: Maximum flow saved to the unit
- DP max: Differential pressure over orifice to match Qmax
- P range: Static pressure range min..max
- T range: Temperature range min..max
- Address: ModBus ID
- Mode: What mode the device is set to measure and report values for
- Port: What COM port the device is connected to

6. Measurement Sub-pages

6.1 Overview



The screenshot shows the 'Overview' page of the device interface. It features a navigation bar with tabs for 'Overview', 'Flow rate', 'Differential pressure', 'Temperature', and 'Static pressures'. The main content area is divided into several panels:

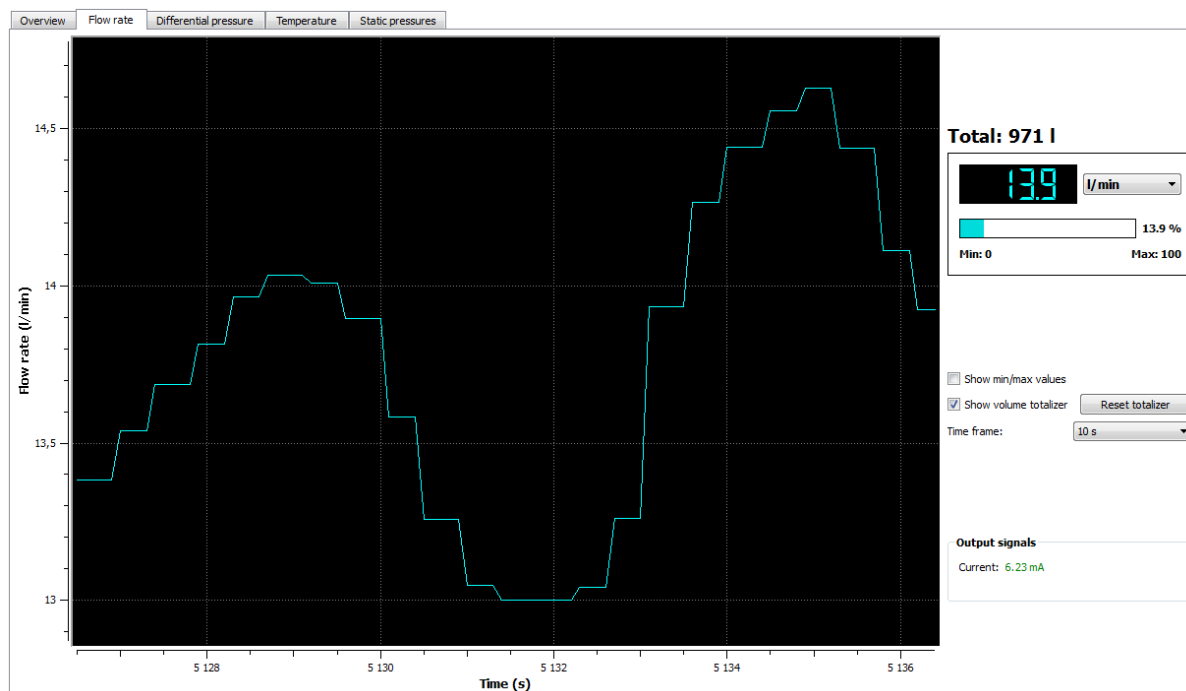
- Flow:** Displays a digital readout of 0.00 l/min with a 0.00% scale bar. Range: Min: 0.00, Max: 100.00.
- DP:** Displays a digital readout of 0.30 mbar with a 0.06% scale bar. Range: Min: 0.00, Max: 500.00.
- Analog Out:** Displays a digital readout of 4.00 mA with a 0.00% scale bar. Range: Min: 4.00, Max: 20.00.
- Min measurable flow:** Displays a digital readout of 10 l/min with a 10.00% scale bar. Range: Min: 0.00, Max: 100.00.
- P1:** Displays a digital readout of 1027 mbar with a 10.27% scale bar. Range: Min: 0.00, Max: 10000.00.
- P2:** Displays a digital readout of 1027 mbar with a 10.27% scale bar. Range: Min: 0.00, Max: 10000.00.
- Turndown:** Displays a digital readout of 1:10.
- TP Coeffs:** This panel is currently empty.
- Temperature:** Displays a digital readout of 25.4 °C with a 39.38% scale bar. Range: Min: -10.00, Max: 80.00.

The overview is a collection of all vital parameters as measured by the device. Here you can check in real-time:

1. Flow (Not active in DP mode)
2. DP
3. Analog out
4. Min measurable flow (As determined by the dynamic turn down)
5. P1 Pressure upstream
6. P2 Pressure downstream
7. Turndown (As determined by the ratio $\text{SQRT}(100\% \text{ FLOW DP}/\text{DPmin device})$)
8. TP Coeffs (Only active for Gas flow mode)
9. Temperature (Measured on the sensor card of the device and not in the media)

Scaling and units can be altered real-time and will be automatically displayed with new settings on the screen. Note that these settings are only changed graphically and not saved to the unit. If the device is disconnected and re-connected, the units and scaling values will be changed to match settings saved on the device.

6.2 Flow rate



The flow rate sub-page is a real-time graphically on-going presentation of the flow in time. The time frame is changeable. There is also the option of showing volume totalizer or not. The output analogue signal is also shown on the page.

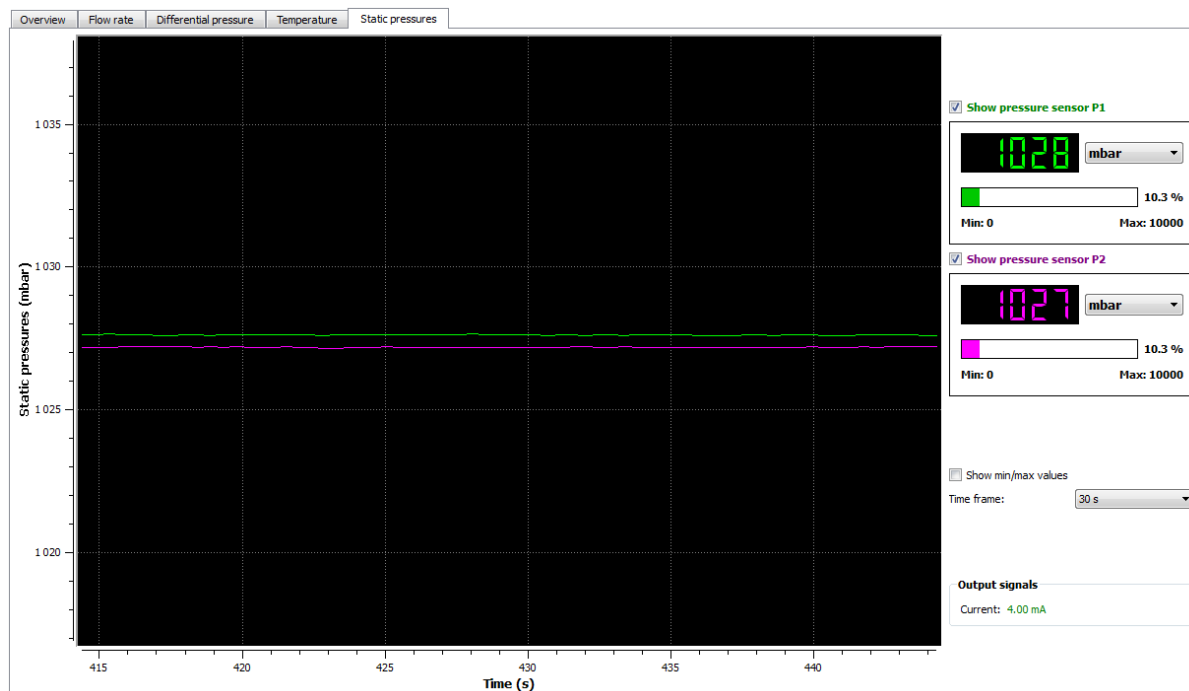
6.3 Differential pressure

The differential pressure sub-page is similar to flow rate sub-page. The output analogue signal is also shown on the page. The time frame is changeable and so also the units. Note that these settings are only changed graphically and not saved to the unit. If the device is disconnected and re-connected, the units and scaling values will be changed to match settings saved on the device.

6.4 Temperature


The temperature sub-page is similar to flow rate sub-page. The output analogue signal is also shown on the page. The time frame is changeable and so also the units. Note that these settings are only changed graphically and not saved to the unit. If the device is disconnected and re-connected, the units and scaling values will be changed to match settings saved on the device.

6.5 Static pressures



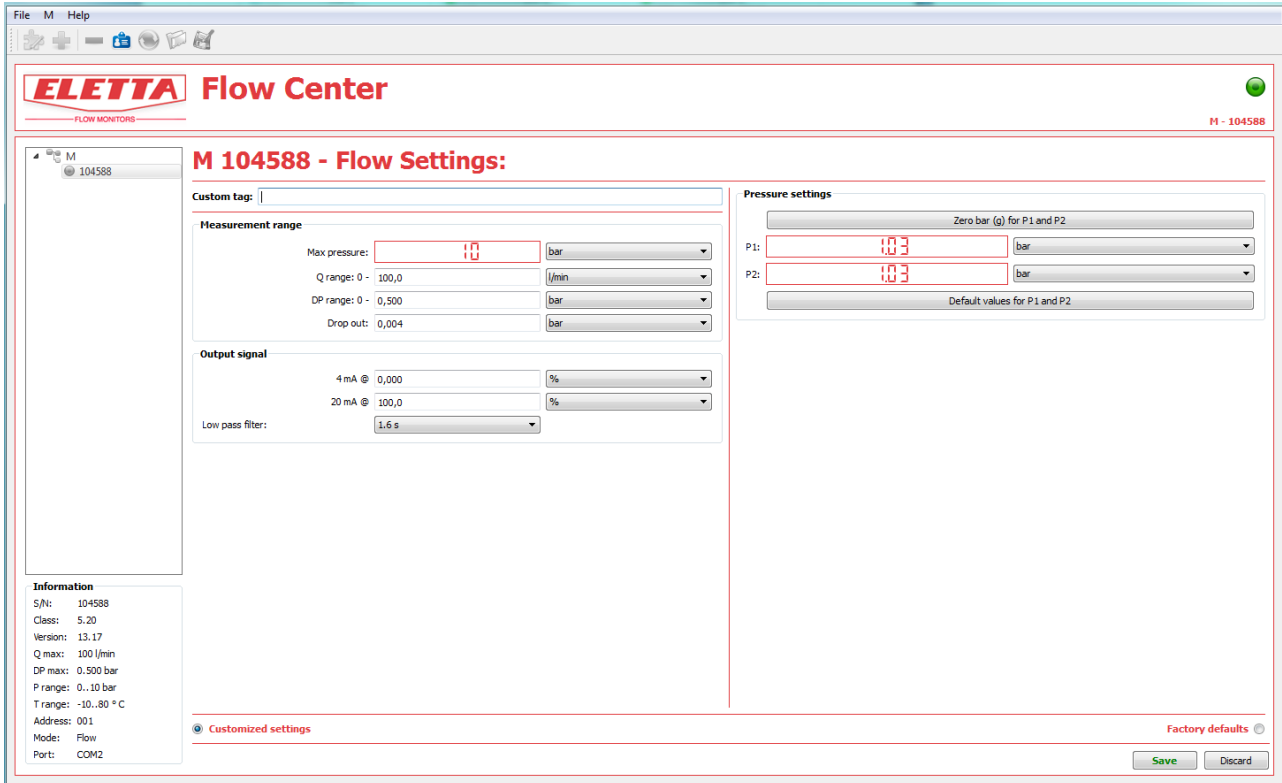
The static pressure sub-page is similar to the other sub-pages. Here you can show both pressure measurements or choose to uncheck one of them. The output analogue signal is also shown on the page. The time frame is changeable and so also the units. Note that these settings are only changed graphically and not saved to the unit. If the device is disconnected and re-connected, the units and scaling values will be changed to match settings saved on the device.

7. Change settings on a device

Push the  Setup button to unlock the settings on the device. The settings loaded will automatically be the settings on the device.

Do not change DP, Q (flow) or Calc. coefficients. They are parameters connected to the bore size of the orifice plate. Changes will cause errors in output.

Q range is set to 100 l/min when delivered from Eletta factory regardless of which flow range the orifice plate is specified for. This means that when you first connect your Flow Meter to Flow Center, the flow rate reading will most likely appear incorrect unless you have a 100 l/min specified orifice plate installed. This does **not** mean that the mA output signal is incorrect. The mA output signal is determined by that the installed orifice plate and the set DP range corresponds. To get a correct reading in Flow Center you need to set Q range to the maximum range of your installed orifice plate.



ELETTA Flow Center
FLOW MONITORS

M 104588

M 104588 - Flow Settings:

Custom tag:

Measurement range

Max pressure: bar

Q range: 0 - 100,0 l/min

DP range: 0 - 0,500 bar

Drop out: 0,004 bar

Output signal

4 mA @ 0,000 %

20 mA @ 100,0 %

Low pass filter: 1,6 s

Pressure settings

Zero bar (g) for P1 and P2

P1: bar

P2: bar

Default values for P1 and P2

Information

S/N: 104588
Class: 5.20
Version: 13.17
Q max: 100 l/min
DP max: 0.500 bar
P range: 0..10 bar
T range: -10..80 °C
Address: 001
Mode: Flow
Port: COM2

Customized settings Factory defaults

7.1 Measurement range

Custom tag:

Measurement range

Max pressure:	<input style="width: 90%;" type="text" value="10000"/>	<input style="width: 80%;" type="text" value="mbar"/>
Q range: 0 -	<input style="width: 80%;" type="text" value="100,0"/>	<input style="width: 80%;" type="text" value="l/min"/>
DP range: 0 -	<input style="width: 80%;" type="text" value="500,0"/>	<input style="width: 80%;" type="text" value="mbar"/>
Drop out:	<input style="width: 80%;" type="text" value="4,000"/>	<input style="width: 80%;" type="text" value="mbar"/>

Here you can change the max flow and corresponding DP range. Note that these values are related to the orifice in the pipe section and should not be changed without ordering a new orifice made according to new settings. The Max pressure is the maximum allowed static pressure. This is defined by the pressure transmitter installed in the Flow Meter. Eletta provides three different transmitters with static pressure limitations of 10, 25 and 50 bar. There is also the option of custom tagging the unit to a specific name.

7.1.1 Q range

States the maximum flow for your specific orifice. The value that is set as Q range will always correspond to 100% of the set DP range.

7.1.2 DP range

Determines the differential pressure span from where the transmitter calculates the flow. The orifice plate installed must be calculated so that 100% flow corresponds to 100% DP that is set in the DP range field. All orifice plates for the M3-series Flow Meter are engraved with the max DP range that corresponds to max flow rate.

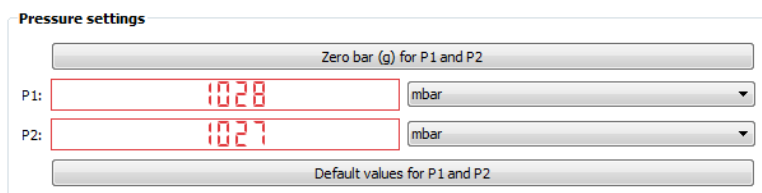
Normally the value in the DP range field is not to be changed. Do **not** change this field without checking the orifice plate versus DP range.

7.1.3 Drop-out

This field shows when the Flow Meter stops to measure. When the differential pressure goes below the set value, the output signal will go down to 4 mA and the indicated flow will go down to zero. This is to prevent the Flow Meter showing erratic flow at zero condition. The default value is set just below 10% of the max DP range. If you see an unstable flow when you have a non-flow condition, you can raise this value to avoid seeing it. For example, vibrations can cause these erratic small values, therefore you might want to cut them off.

7.2 Pressure settings

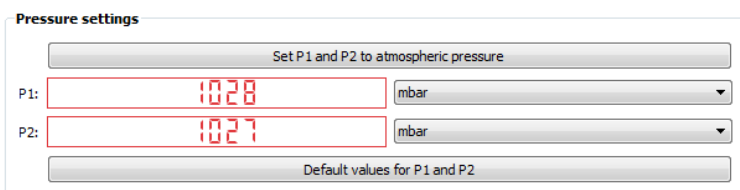
7.2.1 Pressure setting DP/FLOW mode



For incompressible flow and DP mode there is the option of setting the transmitters to gauge pressure. Zero bar (g) will remove the small pressure differences in-between the two transmitters and then set the DP to zero bar (g) as a start value to gauge pressure measurement. The calibration will take some time before stabilizing the values. Click Save when you are satisfied with the calibration. This is done at the factory at the on-site atmospheric condition and will not be representative of the pressure conditions of all customer installations. Always check the pressure settings before starting the measurement. If necessary, zero bar(g), the unit.

Original setting (fabrication settings) values can be retrieved by returning to default values. This is mainly used for troubleshooting and should not be used as a run setting for this mode.

7.2.2 Pressure setting GAS mode



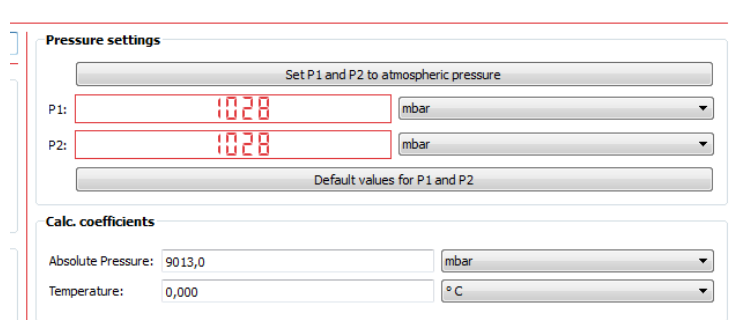
Gauge pressure setting for gas flow is not possible. Here you can either reset the transmitters to default values or re-calibrate and save the current atmospheric pressure condition as measured with the unit. Setting the P1 and P2 to atmospheric pressure condition will do the same as the zero bar (g) action for DP/flow. It will measure the absolute pressures and remove small differences in-between the transmitters. The calibration will take some time before stabilizing the values. Click Save when you are satisfied with the calibration. This is done at the factory at the on-site atmospheric condition and will not be representative of the pressure conditions of all customer installations. Always check the pressure settings before starting the measurement. If necessary, set P1 and P2 to atmospheric pressure.

Original setting (fabrication settings) values can be retrieved by returning to default values. This is mainly used for troubleshooting and should not be used as a setting for this mode.

7.3 Calculation coefficients for GAS mode

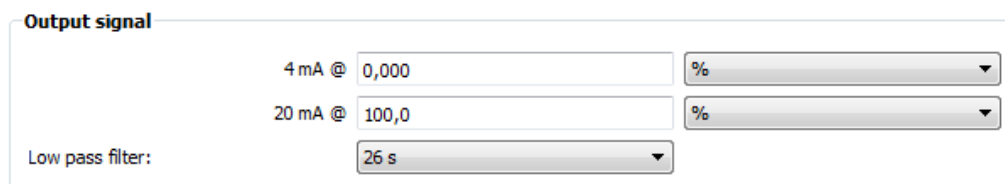
Gas flow modes have an extra setting to define the standard (ordinary or stationary customer operation settings) line pressure and temperature. This is information the device must know in order to have a P/T compensation that will work satisfactory.

Do **not** change these values. They are connected to the orifice bore. Changes will disrupt measurement.



The image shows two configuration panels. The top panel, titled 'Pressure settings', contains a button 'Set P1 and P2 to atmospheric pressure', two input fields for P1 and P2 both showing '1028' with 'mbar' dropdown menus, and a button 'Default values for P1 and P2'. The bottom panel, titled 'Calc. coefficients', contains an 'Absolute Pressure' field with '9013,0' and 'mbar' dropdown, and a 'Temperature' field with '0,000' and '°C' dropdown.

7.4 Output signal



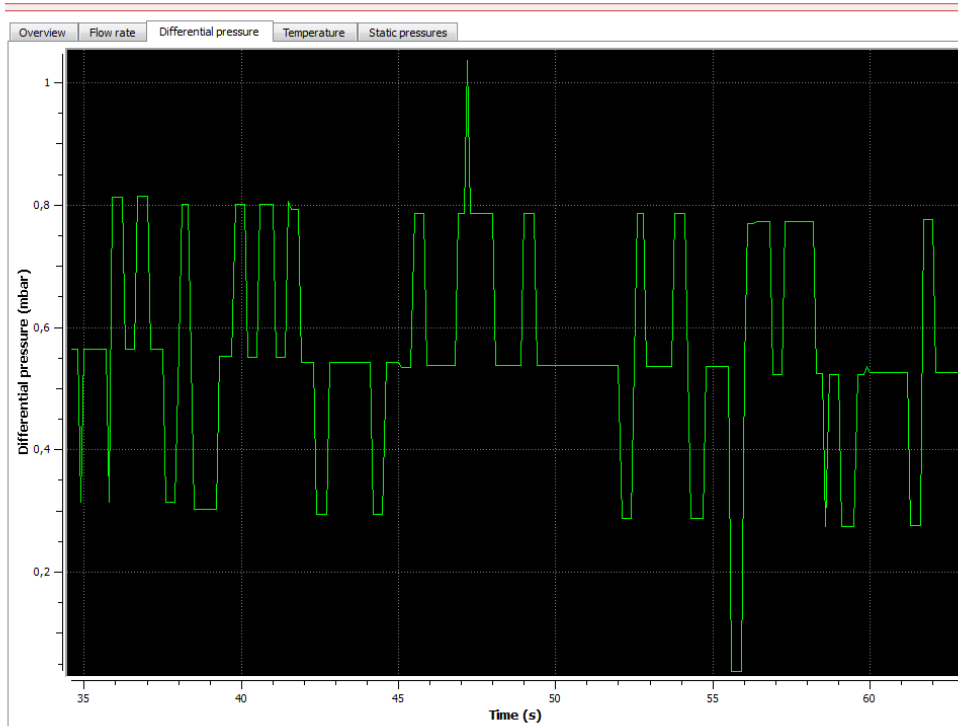
The image shows the 'Output signal' configuration panel. It features two rows of settings: '4 mA @ 0,000' with a '%' dropdown, and '20 mA @ 100,0' with a '%' dropdown. Below these is a 'Low pass filter:' setting with a '26 s' dropdown.

The user can re-scale the 4-20 mA output signal. The output can be set inversely also, letting the 0% flow be 20 mA and 100% flow be 4 mA. You can change the low-pass filter value if there is a need to make the device more sensitive to display changes or to make the unit more slow to detect changes in differential pressure.

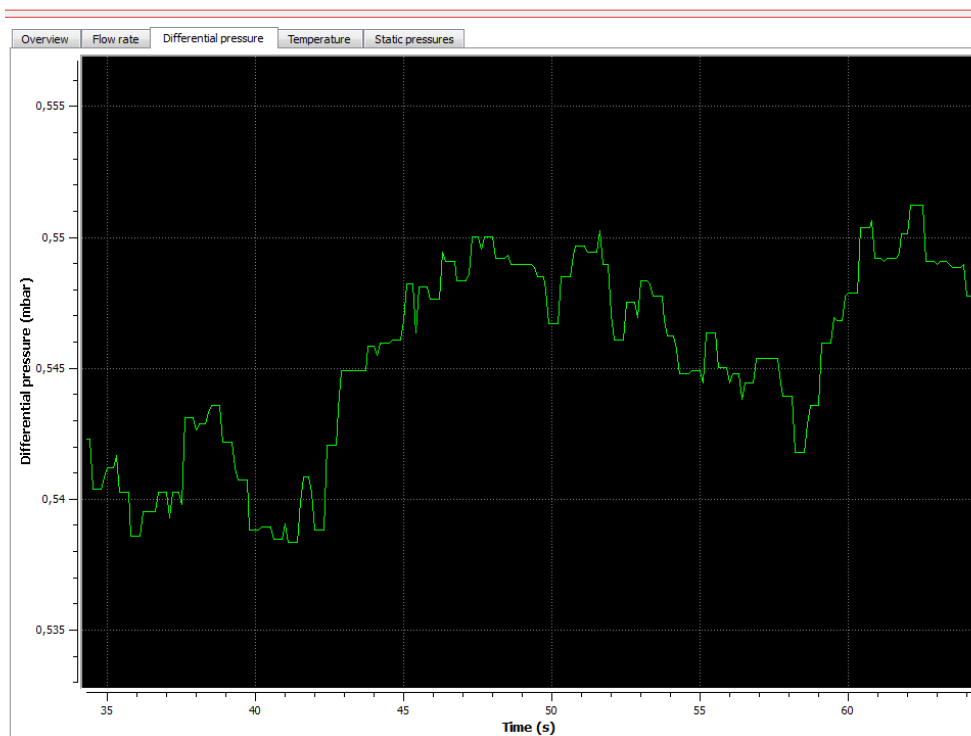
8. Impact of settings

8.1 Low pass filter setting

The low pass filter is a damping that will be applied to the calculation of the output signal. If the filter value is set to 0 there will be no damping of the signal and will thus make the device more sensitive to changes and will detect a more true pressure/flow variation. The signal will vary more in size in-between readings and the device will perhaps be considered restless in output of indicated flow or differential pressure. A high filter value will highly damp the output signal and will not be able to detect large variations in time and will be more or less a mean signal of a 0s filter value even though there will be a small variation in time.



An M310 with filter value of 0s will be more sensitive to detect actual variations.



The same M310 with filter value 26s will highly damp changes/detections of variations.

Default setting from factory is 1,6s damping value. This is a setting which should work for most applications.

8.2 Drop out function and turndown

The drop-out function is a DP value under which the unit should consider measurements as a non zero flow condition. The drop out function is to be considered as a min limit where the PT compensation should stop working and where the meter should interpret the DP signal as a non-flow condition. The drop out value will be set to 4mbar for the M310, 10 mbar for the M325 and 20 mbar for the M350.

This value is somewhat related to the accuracy of the absolute transmitter which is around 0,05% of the pressure rating, which for the M310 will be a measurement of around 5mbar. The 5 mbar will be the DP min device value for calculating the turndown. One can change the drop-out value, but this could affect the displayed Q flow in relation to what the turndown is at the moment. The drop-out is convenient to use as a filter value when there are disturbances in line pressure at a zero flow state. This will set a min dP limit where the flow will start to display. For gas mode there is no actual min gauge value of the static pressure where the unit will not try to compensate. And a small disturbance in line pressure could result in a false detection of flow; especially if the unit is set to gasflow (abs) where a turndown of 1:3 is a normal turndown at atmospheric pressure. The 5 mbar DP value will then represent as much as 33% flow.

The turndown is an accuracy range of the device and should act as a guide of the capacity. This value is a dynamic value which will be automatically re-scaled to represent 100% flow. The M310, M325 and M350 will be from factory always configured for a turndown of 1:10 which for the DP measurement represent a measurement range of 1:100 in DP (5-500 mbar for M310, 12.5-1250 mbar for M325 and 25-2500 mbar for M350). These are the calculation settings for the orifice plate. If the DP range is changed, the turndown will also be re-calculated. An M310 user setting of 100% flow at 250 mbar will result in a turndown of 1:7, where the 5 mbar now will represent a flow of 14% of full scale value.

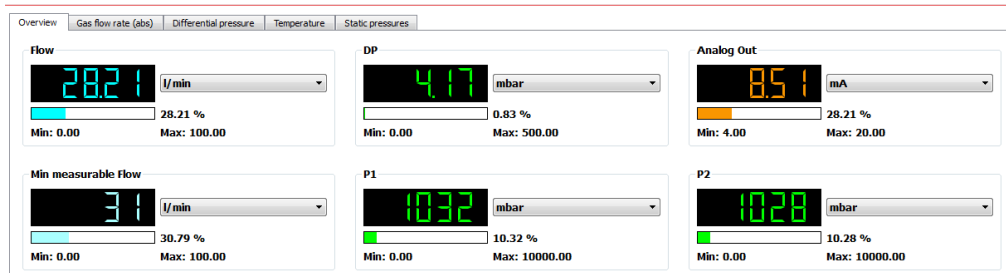
The min measurable flow will be also automatically be re-calculated with changed turndown.

Note that the turndown is rounded up to nearest integer.

Recommended settings are factory default values.

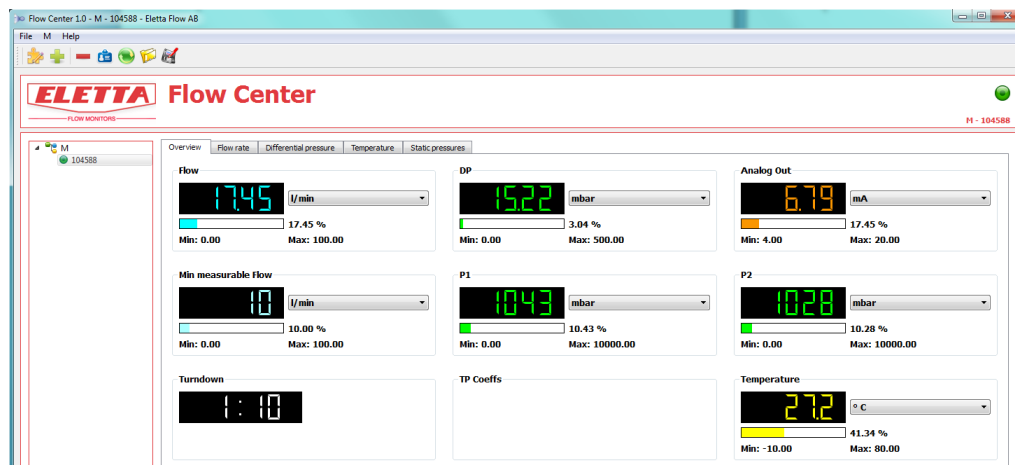
8.2.1 No flow condition but device indicate flow

If the M310 is used for gas flow showing flow when there is no flow in the system, one should tweak the cut-out value. The reason why the device is showing flow is that the device is actually measuring a differential pressure reading, thus interpreting this as a corresponding flow. If the normal running state is say 8 bar(g), gasmode (abs) and the device is kept at atmospheric condition, the device will try to compensate for the change in pressure and re-scale the 100% DP so this state will match the same volumetric flow; now at atmospheric pressure. The 4-5 mbar will now correspond to a much higher flow value than before - around 30%. If the conditions here vary between 0-5 mbar (which could be the case), the device will show flow values 0 and 30% flow - when there is no flow in the system.



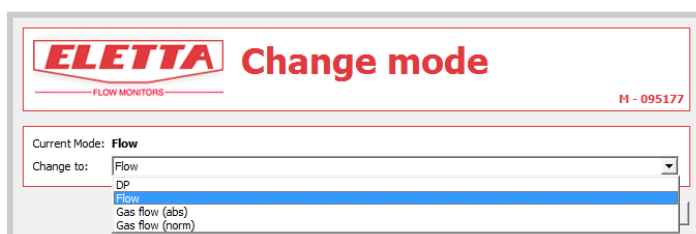
8.2.2 Drop out set too high

If the cut out function is changed to for instance 15 mbar for a M310 with Flow mode setting (For instance to filter out line pressure disturbances at a non zero flow), the min value of the flow will be around 17% of max flow. DP readings below 15 mbar will be considered as false and the unit will show 0% flow. The turndown is 1:10 which should mean that the unit will display flow from 10% up to 100%. But the start min flow value is now limited by the drop out function value.



9. Changing mode of the device

Push the button. An input box will appear.



The user is free of choice to change the mode if this is wanted for any reasons. If this is done, the device must be **restarted(Power off-power on)**. The simplest way is to just disconnect the communication cable and re-attach it and restart the communication with Flow Center. Errors in reading might occur if this is not done. Do not disconnect the unit from Flow Center and connect it again. The unit is still powered up after disconnection to Flow Center.

10. Mode descriptions

10.1 DP Mode

DP Mode configuration is used when you only need to measure the actual differential pressure. Media is less important since you cannot display flow rate. Flow Meters in DP mode is typically not used with our classic pipe sections that includes orifices. We normally provide Flow Meters in DP mode with our connection blocks P8BR and P8SS, more information about our connection blocks can be found in the M3-series manual.

10.2 Flow Mode

Flow mode configuration is used when measuring flows of incompressible liquids, normally water and oil.

10.3 Gas Flow Mode (absolute/norm)

Gas flow mode configuration is used when measuring flows of gases, normally air. When choosing gas flow mode there are two choices, absolute or normalized.

Calculating the orifice plate used for the device when dealing with gases are most of the time related to a STP calculation. STP is Standard conditions for Temperature and Pressure. If a flow value is related to this kind of condition, the flow is always denoted as NI/min or other unit. This relation lock the calculation for a specific volumetric flow of a certain kind of gas with known density at STP state. The STP is different world wide.

The orifice plate used in the device is then calculated with user settings, i.e. calculation settings for temperature and pressure in which the system is working under normal conditions. The device is then locked at this state and will from this Pressure/Temperature compensate due to variations in the process. The M3 unit has 2 different modes as to what the user prefers to compensate for or measure. The denomination used in Flow Center is absolute or normalized flow. Other denominations can be actual/volumetric/ and standard flow.

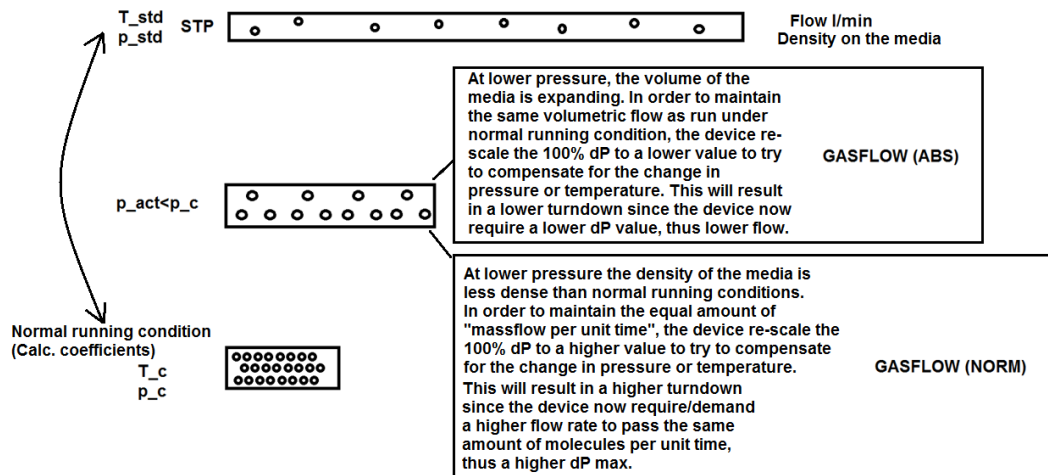
Standard or normalized flow is the equivalent flow rate the gas would be moving if the temperature and pressure were at standard conditions. It is usually the most useful measure of gas flow because it defines the mass flow, number of molecules and heat-carrying capacity of the gas.

Volumetric flow rate or actual flow rate is the actual volume flow of the gas exiting the flow meter.

The M3 device do not have the ability to function directly as a mass flow meter. The summation must be done elsewhere and if necessary also be temperature adjusted if this parameter is not stable in the process. The software has no ability to do this summation.

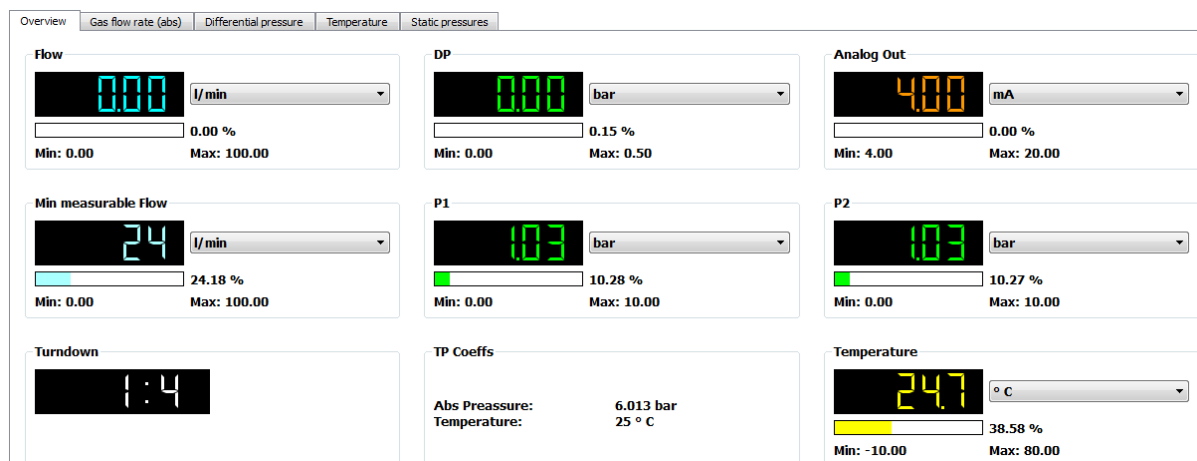
At normal running conditions, the actual and normalized flow rate will be exactly the same. It is only when P/T conditions vary from normal running conditions where they deviate from each other.

It is important to understand that these modes compensate inversely of each other.

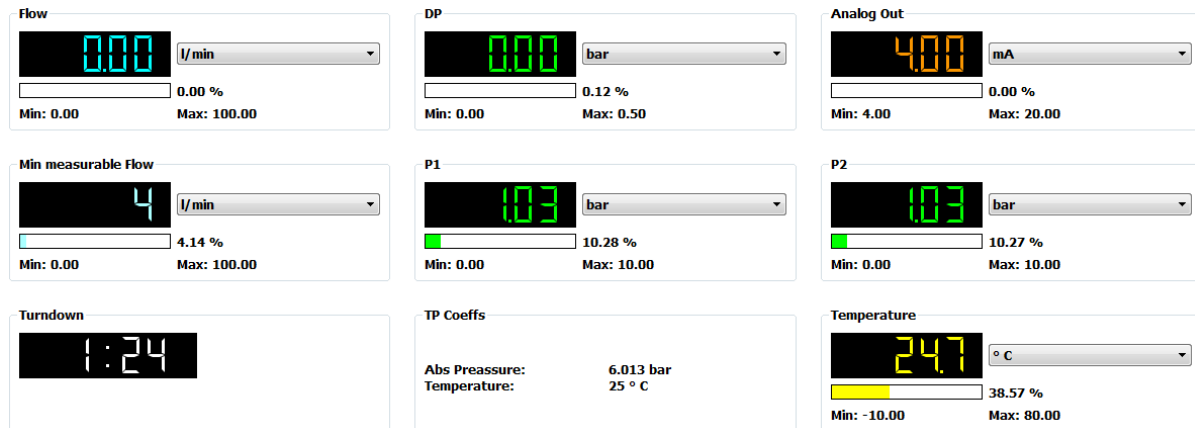


Assume a unit M310 set for normal running conditions at 5 bar (g), 25 deg C and 100 NI/min.

This is the response from Flow Center at atmospheric condition for Gas flow (ABS). The gas will be expanded at this state and will only measure between 5 and around 80 mbar (Turndown 1:4 in Q). The device has been forced to re-scale itself in order to maintain the volumetric flow rate at this pressure to match it to the calculation coefficients. This will affect the units ability to measure flow and the flow range from standard 10-100 NI/min is now 24-100 NI/min. (Remember that the turndown is rounded to nearest integer.)





This is the response from Flow Center at atmospheric condition for Gas flow (NORM). The gas has now become less dense and the device now demands a higher DP in order to maintain the same amount of "mass flow" per unit time. The device will now measure between 5 and 2900 mbar (Turndown 1:24 in Q). This will actually increase the units ability to measure the flow range since the range now is 4-100 NI/min and not 10-100 NI/min.

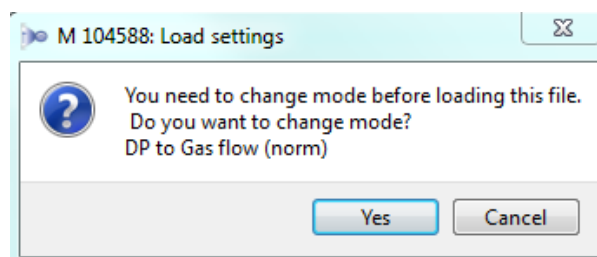


11. Additional Functions

11.1 Save / Load transmitter settings

By clicking on  Save transmitter settings to file you are able to save the configuration from the settings page to a separate file on your computer. This can be convenient to use when there is a need to configure lots of units with the same setting; where the user instead of writing all settings manually instead reads a setting file and save the new settings to the unit.


To load settings from file, click on  Load transmitter settings from file. If the unit is not set to the same mode as to what the setting file was written for, the following will be prompted on the screen:




By clicking no, the action is interrupted.

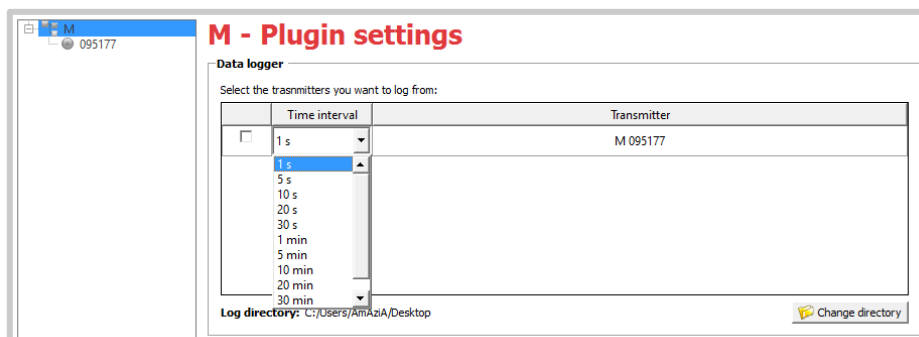
By clicking yes, the unit is only changed to the new flow mode. In order to save new settings the user must re-load the settings file again. Then the unit can be saved with the new settings.


11.2 Change MODBUS ID

Click on  Change MODBUS ID to set a specific identification N° for the transmitter. You can set an ID between 001-250. This is a usable function when you have many Flow Meters connected to your system at the same time using a MODBUS Protocol communication. For more information on how to set up a MODBUS communication, contact Eletta Flow. *The MODBUS interaction is not yet fully developed and should be used with pre-caution.*

11.3 Creating log files

Push  to access the ability to log to file. From here you are able to create log files that will be stored as a .txt file on your computer. At the bottom right you can choose where you want to store the file on your computer. The time interval for each log point can be set between 1 second to 60 minutes. To start logging, check the checkbox located next to the time interval.



The green  online icon changes during the logging session.



The log file information consists of date/time, flow rate, DP, temperature, P1 and P2 static pressures, mA output signal and accumulated volume.

Date and Time	flow rate	DP	Temperature	P1 static	P2 static	mA signal	Acc volume
2014-05-06 12:16:36	0.000000	0.000080	24.327991	-0.000335	-0.000415	4.000000	0.000000
2014-05-06 12:16:37	0.000000	0.000081	24.327991	-0.000365	-0.000447	4.000000	0.000000
2014-05-06 12:16:38	0.000000	0.000045	24.329246	-0.000358	-0.000403	4.000000	0.000000