

FLOSET PROGRAM USER MANUAL

Electromagnetic flowmeters **FLONET FH30xx and FLOTEX FXx11x**



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1. General information

This User Manual contains information on installation, operational start and application of the Floset 4.0 program (Es90597D) intended to facilitate communication via the MODBUS protocol with electromagnetic flowmeters of the type series FLONET FH30xx and FLOTEX FXx11x.

Flowmeters of the type series FLOTEX FXx11x and FLONET FH30xx are supplied with digital serial interfaces RS-485 MODBUS RTU and HART®. Via each of these interfaces the flowmeter can be connected to a computer (personal, notebook or tablet computer) on the plant control level run on the operation system Windows 7 (Linux, iOS) or any higher upgrades thereof, with JAVA 8u40 or higher.

The user is free to select the program communication language.

2. Program installation and operational start

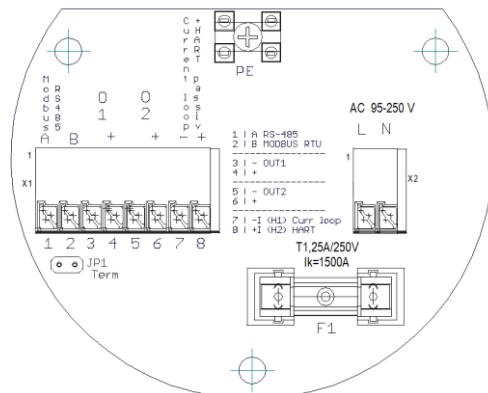
As the program has been written in the Java language, installation is not necessary; only the following files need be loaded in the control computer:

- Service program FLOSET and
- Configuration file *.flo containing data on the flowmeter concerned. This configuration file is used in the meter production and is not encoded. Intended for the customer and user is configuration file *.floc; this file is encoded and cannot be read.

Using this Floset program, it is possible to read and reset the values of the flowmeter parameters as with the meter in the manual control mode of operation.

- The RS-485 interface terminals are found on the meter terminal board. The communication line conductors may be connected to the interface terminals only with the meter power off.

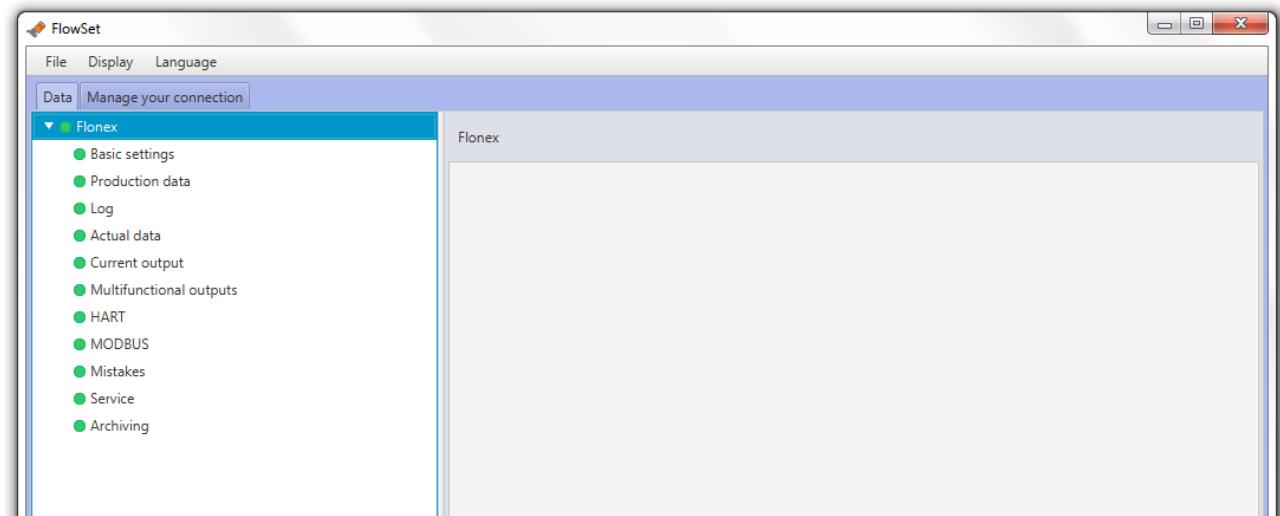
FH30xx	Bar conductor
FXX11x	
1	A
2	B
PE	Shielding



3. Operational start

To run the program, use Floset.jar file. On the computer screen will appear the initial window with the field containing the legend "Open Project" at the centre.

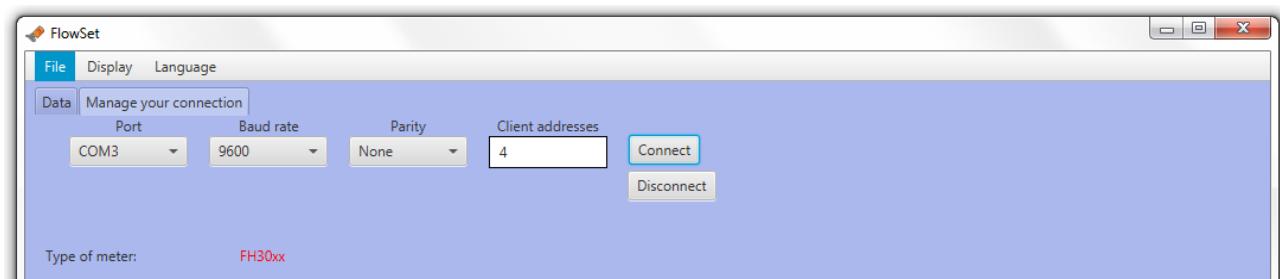
Click with the mouse cursor on this bar to open a directory where you will find the project with the suffix of *.flo (e.g. Flonex_Production.flo). The project may also be open using an alternative procedure, namely clicking on the submenu "File" found on the top bar. This will open a context menu "Open ..." where the user may select and confirm the selection of the required project. The submenu "File" makes it also possible to close the Floset program by clicking on the tab "Close". The same effect will have the clicking on the "x" tab in the top right-hand corner of the screen – closing the window and the current program. In the top right-hand corner of the screen there are two other tabs used to minimise and maximise the size of the current window.



Apart from the tab "File" on the main bar there are two other tabs: "Display" (used to expand the current image onto the whole screen; this selection can be cancelled by the "Escape" key), and the tab "Language" used to select the user communication language.

4. Electromagnetic flowmeter parameter display and setting procedures

Upon the project opening, another bar including the tabs “Data” and “Connection Control” will appear on the screen. To activate communication with the electromagnetic flowmeter, click on the tab “Connection Control”.



Prior to that step, the USB/RS485 converter must be connected to the control PC (with a cable and conductors) and to the communication terminals on the flowmeter terminal board. The flowmeter must be energised.

Specified in the fields below shall be the communication parameters. Among these is the personal (or notebook) computer port number. This number shall be determined using the relevant tools of the PC or notebook operation system. The procedure for Windows 7 is as follows: Control Panels » Equipment Administrator » Ports (COM and LPT) » USB Serial Port (COM16). In our case the Port window setting will be COM16. If it is the very first communication start, the remaining fields will be set as follows: Baud Rate = 9600, Parity = None, Client Addresses = 4.

Having filled in the fields, click on the Connect tab and confirm this selection. If the converter is provided with the IN and OUT communication indication, both these LEDs should flash and, as confirmation of the successful connection, the meter type should be written out on the computer screen. In cases where other communication parameters have been set and stored in the flowmeter, they should be read from the meter display and copied into the Floset program.

With the communication started and verified, click on the Data tab to return to the initial program window. On the left-hand side of the screen will appear a column of tabs. Upon selecting any of these, a context table will appear on the right-hand side of the screen including a detailed description of the selected item. The pre-set values of the associated parameters can then be read and, if need be, modified. In the table, the parameter name is shown on the left and the implicit parameter value in the middle column. Provided a parameter change is permitted (the respective field is backlit), the user may, using the mouse cursor, delete the existing value and write in a new value on the computer keyboard.

To load the new parameter value into the flowmeter, click on the button with the envelope symbol 

If you click on the envelope button at the end of a parameter line, loaded will be the new value of this parameter; if you click on the envelope button above the table, loaded into the meter will be all new parameter values.

The current parameter or selected measured value can be displayed upon clicking on the button . If you click on this button at the end of a parameter / measured quantity line, the value of this parameter / measured quantity will be shown; if you click on the same button above the table, all parameter / measured quantities will be displayed.



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The program makes also possible periodic reading of the selected parameter or measured quantity.

Upon clicking on the button , an empty bar will be displayed next to this button. If you click on this bar, a dialogue window will appear where you may specify the time period for repeated parameter or quantity reading. This is only possible for individual parameter or measured quantity (it will not work with the button above the table). The button displayed at the bottom of the open window and bearing the legend READ can be used for a one-time reading of all values in the table.

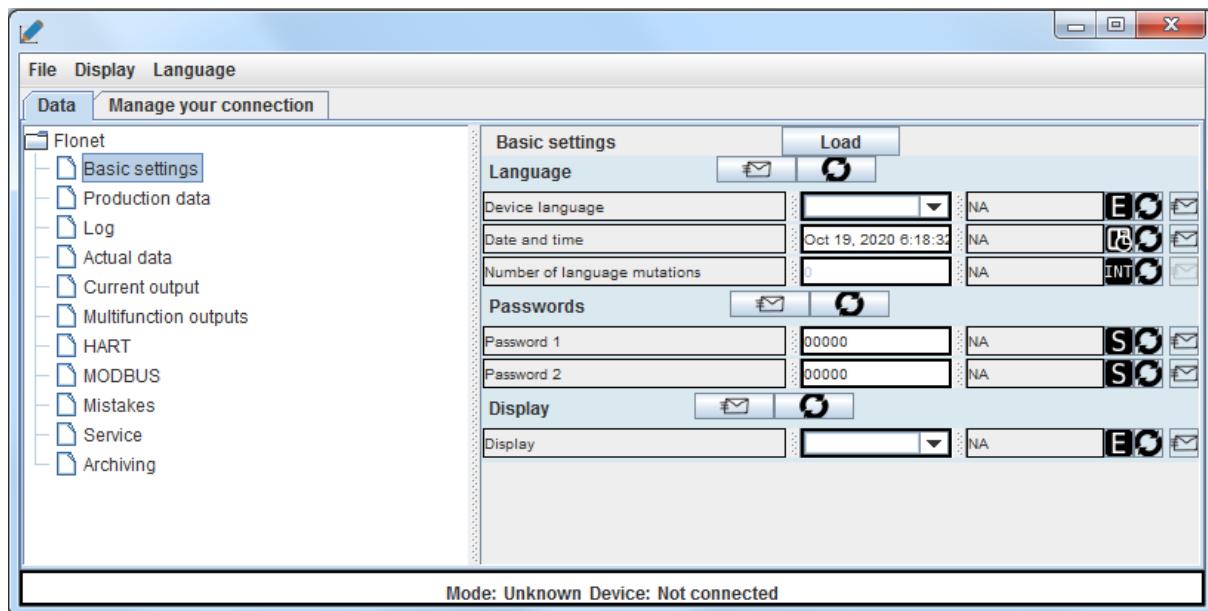
Next to the value column is a button denoted with one of the following symbols:

- F type of parameter/quantity: float
- S type of parameter/quantity: string
- I type of parameter/quantity: integer
- E type of parameter/quantity: enum
- Clock type of parameter: date and time

By placing the cursor on any of these buttons and confirming the selection, displayed will be a window containing information on the given parameter or quantity (the memory address, name, type, access authorisation, pre-set value and length). The following picture shows a parameter of the float type. One value field is backlit and therefore enabled for modification. Use the button STORE to update the data in the table and store the new value in the flowmeter, or the button CLOSE to terminate the operation without any value change.

4.1. BASIC SETTING

Select the item Basic Setting to open the following window:



Basic settings		Load
Language	 	
Device language		NA   
Date and time	19.10.2020 6:18:32	NA  
Number of language mutations	0	NA  
Passwords	 	
Password 1	00000	NA  
Password 2	00000	NA  
Display	 	
Display		NA  

4.1.1. Device Language

The first item in the table makes it possible for the user to select the language of the flowmeter display screens. Open the context menu to see the language options. Select and confirm the selection of the desired language whereby the selected language will appear in the middle column of the table.

4.1.2. Date and Time

This item serves the purposes of checking the current date and time shown on the meter display and performing any necessary new date or time settings or corrections. Displayed in the middle column will be the date and time of the Floset program start (the relevant date and time taken over from the connected PC), in the column to the right the date and time loaded from the meter. In general, the user is free to select any date or time and transfer these to the flowmeter.

4.1.3. Number of Language Mutation

This item informs about the number of currently available program language versions; the user cannot change this information.

4.1.4. Passwords

These two items make it possible to read or reset the existing flowmeter passwords. The implicit setting of each password is 00000.

Password 1 is used to enter the Service Menu (upon depressing the key ESC for 2s) and Password 2 to enter the Production Setting.

4.1.5. Display

The meter display always shows the data on the instantaneous flow rate (lines 1 and 2).

The remaining display lines (3 and 4) are reserved for additional data and information to be selected by the meter user.

The implicit choice of the data to be displayed on lines 3 and 4 is flow volumes passed through the meter in the positive and negative directions.

The context menu includes seven options:

- Flow Volume Q+ and Q-
- Date and Time
- Operation Time and Error Time
- Excitation Current
- Flow Rate in %
- Last Error
- No Data

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By selecting one of the above options, the Floset user will cause the selected additional data/information to appear on the meter display lines 3 and 4 and, in the Basic Setting screen, in the backlit window in the middle column.

The initial (production) setting is for flow volume in the positive and negative directions.

4.1.5.1. Flow Volume Q+ a Q-

For several seconds, displayed on line 3 will be the flow volume passed through the meter in the positive direction and on line 4 the flow volume passed through the meter in the negative direction, to be replaced for several seconds by the display of the respective flow volume units; these two modes of display will then continue to replace one another in a cyclic manner.

4.1.5.2. Date and Time

Line 3 of the meter display shows the running time and line 4 the actual calendar date.

4.1.5.3. Operation Time and Error Time

Line 3 of the meter display shows the meter down time due to error condition and line 4 the aggregate meter operation time (including error times, if any).

4.1.5.4. Excitation Current

Line 3 of the meter display shows the current flowing through the sensor excitation coils (usually 200mA) and line 4 the resistance between the measuring electrodes (in kΩ).

4.1.5.5. Flow Rate in %

Shown on line 3 of the meter display will be the current flow rate value in per cent related to 100 litres per second, on line 4 the symbol of per cent (%).

4.1.5.6. Last Error

Shown on line 3 of the meter display will be the code designation (Exx) of the last meter error and on line 4 the error description. This display mode will be replaced by the time (line 3) and date (line 4) of the last error every few seconds.

Should the meter diagnostic circuits identify a condition that might adversely affect the meter function, shown on line 1 of the meter display next to the instantaneous flow rate value will be the respective error code. In cases of serious error such as ADC failure, open or short excitation circuit, not fully flooded fluid piping, strong electromagnetic interference or the like, the meter will indicate a zero instantaneous flow rate.

4.1.5.7. No Data

No data or information will appear on lines 3 and 4 of the meter display.

4.2. PRODUCTION DATA

Upon selecting the Production Data item, the following table will appear on the computer screen:

Field	Value	Action
Hardware identifier		Load
Meter type	Flonet FH30	Load
System serial number	123456/2018	Load
Serial number of the converter	123456/2018	Load
Serial number of the sensor	123456/2018	Load
Nominal sensor diameter	DN1200	Load
Nominal pressure	PN40	Load
Calibration constant K1	0.2678999900817871	Load
Date of calibration, production	24.10.2018	Load
Version number of the control processor software	v.1.80	Load
The software version number of the measurement module processor	v.08	Load
Billing meter	0	Load
Number of billing meter unlocks	0	Load
CRC32 processor	0	Load
Factory setting		
Insensitivity of flow measurement, suppressed flow [l ...	0.0	Load
Number of samples for flow averaging	45	Load
Display backlight time [s]	60	Load
Flow unit code		Load
Volume unit code		Load
Measurement period [ms]	1000	Load
Last setting change	Oct 19, 2020 6:18:32 AM	Load
User flow conversion factor	1.0	Load
User volume conversion factor	1.0	Load

Mode: Unknown Device: Not connected

Field	Value	Action
Hardware identifier		Load
Meter type	Flonet FH30	Load
System serial number	123456/2018	Load
Serial number of the converter	123456/2018	Load
Serial number of the sensor	123456/2018	Load
Nominal sensor diameter	DN1200	Load
Nominal pressure	PN40	Load
Calibration constant K1	0.2678999900817871	Load
Date of calibration, production	24.10.2018	Load
Version number of the control processor software	v.1.80	Load
The software version number of the measurement module processor	v.08	Load
Billing meter	0	Load
Number of billing meter unlocks	0	Load
CRC32 processor	0	Load

Production parameters can change the producer. An user or a distributor can change following parameters:

- Production series number of a sensor
- Calibration constant K1
- Date of calibration

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All the above data and information need by specified and filled out in the table in production.

4.2.1. Hardware Identifier

This code designation identifies the flowmeter type. The code will be shown on the display upon the meter energising and during the meter tests.

4.2.2. Meter Type

This item is used to confirm connection in Connection Control.

4.2.3. System, Converter and Sensor Production Series Numbers

Are used to identify the given flowmeter and the associated sensor; the meter and sensor are calibrated together where determined for this unique combination is the calibration constant K1.

4.2.4. Rated Sensor Size and Pressure

Are important information for meter application projects.

4.2.5. Calibration Constant K1

Is the key metrological constant. It is determined at a certified metrological station on a combination of the given flowmeter and the associated sensor.

4.2.6. Production / Calibration Date

The date of meter production or calibration. The year shall be given in an abbreviated form (as the two last digits).

4.2.7. Control Processor Software Version Number

Software identification number.

4.2.8. Measuring Module Processor Software Version Number

Software identification number.

4.2.9. Billing meter

Software jumper for flow meters of billing purpose = production parameter

4.2.10. Number of billing meter unlock

It is an automatic counter that records the number of unlocked billing meters

4.2.11. CRC32 processor

Automatic listing of checksum, for billing meters.

Factory setting

Factory setting	
Insensitivity of flow measurement, suppressed flow [l / s]	0.0
Number of samples for flow averaging	45
Display backlight time [s]	80
Flow unit code	
Volume unit code	
Measurement period [ms]	1000
Last setting change	19.10.2020 6:18:32
User flow conversion factor	1.0
User volume conversion factor	1.0

Right side of the screen shows icons for configuration options:

- NA
- FO
- INT
- E
- EO
- INT
- RC
- FO
- FO

4.2.12. Flow Rate Measurement Insensitivity, Suppressed Flow Rate

This parameter defines a range of flow rates (symmetric with respect to zero flow rate) where all outputs (current, OUT1, OUT2 and the instantaneous flow rate value) are set at zero. This arrangement is intended to suppress the effects of interference signals of different kinds.

For any flow rate values in excess of the Suppressed Flow Rate, all output signals and the measured instantaneous flow rate values will correspond to the real current flow rates.

All flow rate values are shown at the units of litre per second.

The suppressed flow rate is usually selected within 0.5% Q₄.

4.2.13. Number of Samples for Flow Averaging

This parameter specifies the number of flow rate measurements from which the floating averages are calculated for the quantities appearing at:

- Current output;
- Impulse outputs OUT1 and OUT2; and
- Instantaneous flow rate values shown on the meter display.

Setting range: 1 – 9,999

The bottom limit of the number of samples depends on the excitation frequency. It is determined automatically.

4.2.14. Display Backlighting Time

This parameter can be set within the range of 0 – 9,999 where the value 0 represents permanent backlighting and the other values are proportional to the length of the backlighting period. Upon actuating any control button, the meter display will light up and after the pre-set time period it will go out again.

4.2.15. Flow Unit Code

In the context menu, the user shall select the desired flow rate unit and load it into the flowmeter. The flow rate values will then be displayed in this unit.

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- Flow Rate Unit Code
 - l/s
 - l/min
 - l/hour
 - MilL/day
 - m3/s
 - m3/min
 - m3/hour
 - m3/day
 - ft3/s
 - ft3/min
 - ft3/hour
 - ft3/day
 - gal/s
 - gal/min
 - gal/hour
 - gal/day
 - MilGal/day
 - bbl/s
 - bbl/min
 - bbl/hour
 - bbl/day
 - ImpGal/s
 - ImpGal/min
 - ImpGal/hour
 - ImpGal/day

4.2.16. Positive Volume Unit Code

Proceed as in the previous section. Select the desired flow volume unit from the context menu and the flow volume passed through the meter in the positive direction will be displayed in this unit.

Positive Flow Volume Unit Code

- l
- m3
- hl
- Gallon
- Imperial Gallon
- Barrel
- Bushel
- Cubic Yard
- Cubic Foot
- Cubic Inch
- Liquid Barrel

4.2.17. Period of Measurement

This parameter cannot be modified. It has been calculated based on the AD converter and filter settings and the number of measurement samples.

4.2.18. Change Setting

This field contains information on the date and time when the meter was calibrated and its parameters were set in the manufacturing plant according to the customer specifications. Any changes in the parameter setting require authorization of the "Production" class.

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4.2.19. User flow conversion factor

Volume units are taken and multiplied by the time unit. For example: **GALLON/h** will be the coefficient **0.264172052358148 * 3600**, i.e. **951.0193884893328**. The default is a factor of **1**. This means that the flow is in units of **l/s**.

4.2.20. User volume conversion factor

Conversion factors for the given units:

GALLON	0.264172052358148
LITTER	1.0
I_GALLON	0.219969248299087
CUBIC_METER	0.001
BARREL	0.00628981077043210
CUBIC_FEET	0.035314666721488
CUBIC_YARD	0.0013079506
CUBIC_INCH	61.0237441
BUSHEL	0.028377593
LIQ_BARREL	0.0083864
HECTOLITER	0.01



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4.3. LOG

Upon selecting the Log item, the following table will appear on the computer screen:

The screenshot shows the FLOSET Program User Manual interface. On the left, there is a navigation tree under the 'Data' tab. The 'Log' node is expanded, showing sub-options: Basic settings, Production data, Log, Actual data, Current output, Multifunction outputs, HART, MODBUS, Mistakes, Service, and Archiving. The main area contains five log tables:

- Hourly logIndex: 0/23**: Displays data for Date and time, Flow [l / s], Q+ [m3], Q- [m3], Operating time [s], and CRC16. The date is Oct 19, 2020 6:18:32 AM. The flow values are 0.0. The operating time is 0. The CRC16 value is 0. There are four rows of icons for each row.
- Daily logIndex: 0/31**: Similar structure to the hourly log, with the date being Oct 19, 2020 6:18:32 AM. Flow values are 0.0. Operating time is 0. CRC16 is 0. Four rows of icons.
- Monthly logIndex: 0/12**: Similar structure to the daily log, with the date being Oct 19, 2020 6:18:32 AM. Flow values are 0.0. Operating time is 0. CRC16 is 0. Four rows of icons.
- Error logIndex: 0/63**: Displays Date, Error, Operating time [sec], and CRC16. The date is Oct 19, 2020 6:18:32 AM. Error values are 0. Operating time is 0. CRC16 is 0. Four rows of icons.
- Audit logIndex: 0/31**: Displays Date, Password, Operating time [sec], and CRC16. The date is Oct 19, 2020 6:18:32 AM. Password values are 0. Operating time is 0. CRC16 is 0. Four rows of icons.

At the bottom, a status bar reads "Mode: Unknown Device: Not connected".



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Log		Load
Hourly logIndex: 0/23		[] [] []
Date and time	19.10.2020 6:18:32	NA [] [] []
Flow [l / s]	0.0	NA [] [] []
Q+ [m³]	0.0	NA [] [] []
Q- [m³]	0.0	NA [] [] []
Operating time [s]	0	NA [] [] []
CRC16	0	NA [] [] []
Daily logIndex: 0/31		[] [] []
Date and time	19.10.2020 6:18:32	NA [] [] []
Flow [l / s]	0.0	NA [] [] []
Q+ [m³]	0.0	NA [] [] []
Q- [m³]	0.0	NA [] [] []
Operating time [s]	0	NA [] [] []
CRC16	0	NA [] [] []
Monthly logIndex: 0/12		[] [] []
Date and time	19.10.2020 6:18:32	NA [] [] []
Flow	0.0	NA [] [] []
Q+ [m³]	0.0	NA [] [] []
Q- [m³]	0.0	NA [] [] []
Operating time [sec]	0	NA [] [] []
CRC16	0	NA [] [] []
Error logIndex: 0/63		[] [] []
Date	19.10.2020 6:18:32	NA [] [] []
Error	0	NA [] [] []
Operating time [sec]	0	NA [] [] []
CRC16	0	NA [] [] []
Audit logIndex: 0/31		[] [] []
Date	19.10.2020 6:18:32	NA [] [] []
Password		NA [] [] []
Operating time [sec]	0	NA [] [] []
CRC16	0	NA [] [] []

4.3.1. Date, Flow Rate, Q+, Q-

Shown in the respective fields are data on flow rate and the flow volumes passed through the meter in both directions in an hour, day and month. These time periods are initially related to the date and time when the Floset program was started.

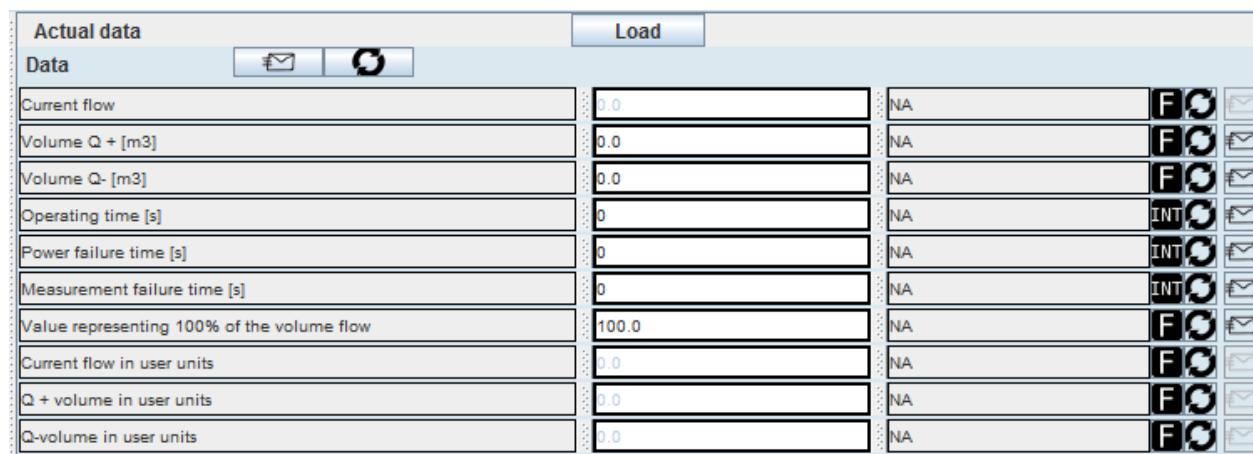
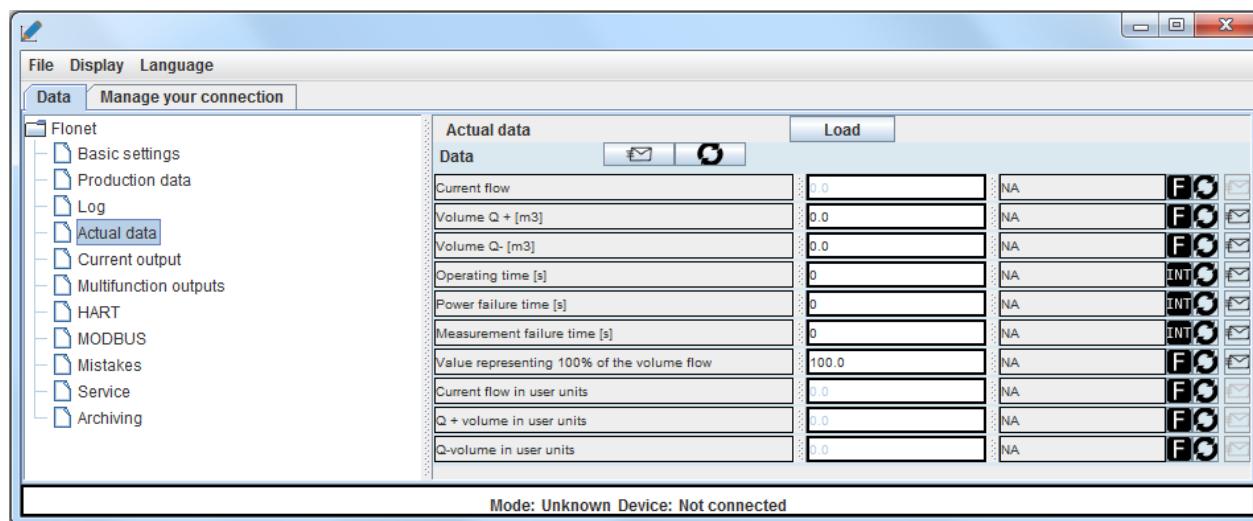
4.3.2. Error Log

This table section makes it possible to review up to 64 recent error conditions registered by the flowmeter. Use the buttons with arrow symbols to go forward or back in the error archive.

4.3.3. Audit Log

History of the recent service menu access actions. Each such action is documented by the date and access password used.

4.4. ACTUAL DATA



4.4.1. Current Flow

This quantity is displayed as measured at the time of the program start. The current flow rate values can be shown at any time by reading the meter output or by selecting the periodic reading mode. The quantity is displayed in the specified flow rate unit.

4.4.2. Volume Q+

Displayed is the flow volume passed through the meter in the positive direction (in the direction of the arrow on the meter sensor). The quantity is displayed in the specified volume unit. Provided the user has the required authorisation, the current reading can be re-set and any new value of the positive flow volume loaded into the meter.

4.4.3. Volume Q-

Displayed is the flow volume passed through the meter in the negative direction (in the opposite direction to the arrow on the meter sensor). The quantity is displayed in the volume unit specified for the positive flow volume. Provided the user has the required authorisation, the current reading can be re-set and any new value of the negative flow volume loaded into the meter.

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4.4.4. Operating Time

Displayed is the time period in seconds elapsed from the first meter start till the current time. During the inoperative periods the data on the current aggregate meter operation time are stored and loaded to the operation time counter upon any new meter energising. The operation time continues to run even when the measurements are suspended due to a meter error condition. Provided the user has the required authorisation, the current reading can be re-set and any new value of the operation time loaded into the meter.

4.4.5. Measurement failure time

Displayed is the time period in seconds during which the measurements were suspended due to a meter error condition. Provided the user has the required authorisation, the current reading can be re-set and any new value of the error time loaded into the meter.

4.4.6. Value Representing 100% Volumetric Flow Rate

The flow rate value (in litres per second) to which the current flow rate in per cent is related (and displayed either in numbers or a bar graph image).

4.4.7. Current flow in user units

If user units are used (coefficient other than 1, see 4.2.19 User flow conversion factor), the value converted to these units will be displayed at this address.

4.4.8. Q + volume in user units

Positive volume in user units

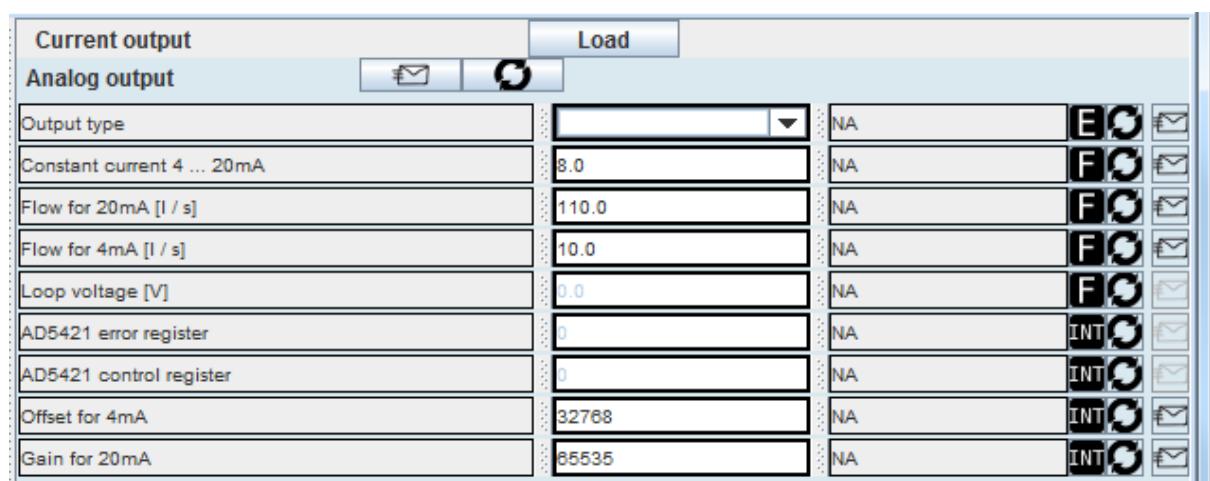
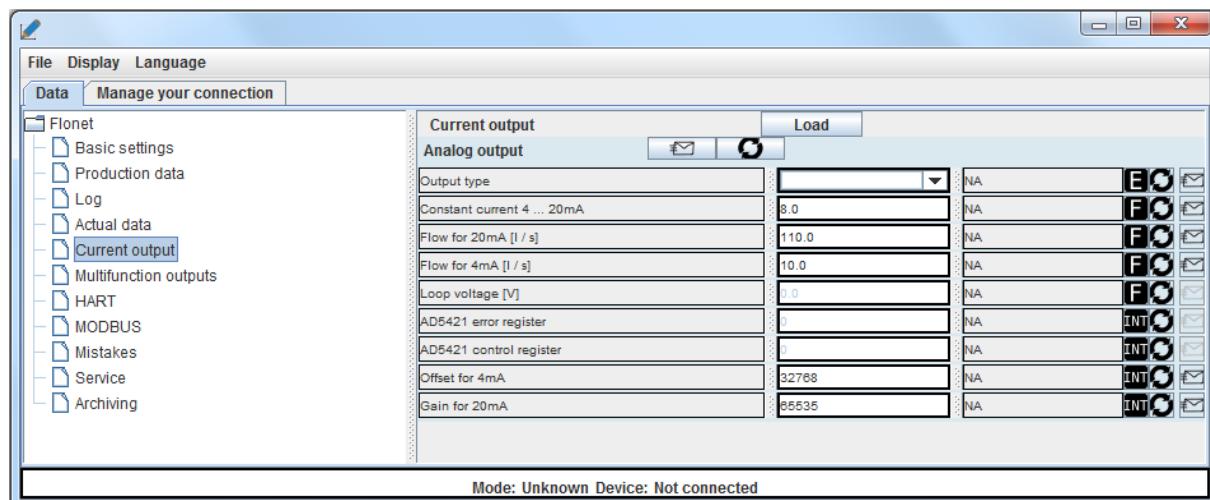
Same binding as 4.4.7, but according to the reference to 4.2.20 User coefficient of volume conversion in the positive direction

4.4.9. Q - volume in user units

Negative volume in user units

Same binding as 4.4.7, but according to the reference to 4.2.20 User coefficient of volume conversion in the negative direction

4.5. CURRENT OUTPUT



4.5.1. Output Type

The user may select any of these output formats:

- Output Q- .. Q+
- Output 0 .. |Q|
- Constant current

The setting of flow rate values for current 4 or 20mA shall always be done in litres per second (l/s).

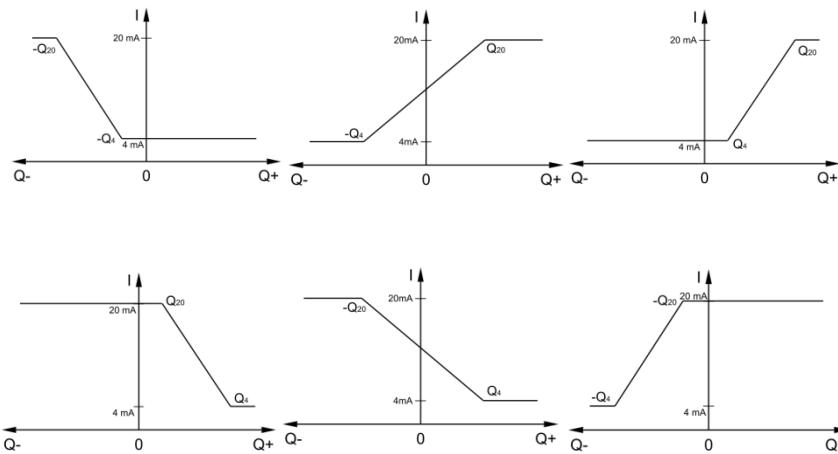
4.5.1.1. Output Q- .. Q+

With this selection, information on the flow rate value is communicated by means of output current between 4 and 20mA. The flow rate values, in litres per second, corresponding to currents 4 and 20mA shall be specified in fields "Flow Rate for 4mA" and "Flow Rate for 20mA", respectively. At the same time, information on flow rate values in digital form is transferred via a current loop in the DART protocol. Parameters for this communication shall be specified in the HART window.

Flow rate values for currents 4 and 20mA can be both positive and negative, and their mutual relationship can be > or <. Theoretically there are up to six possible relationships between the output

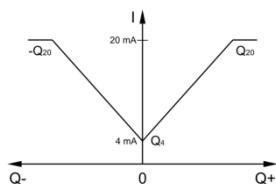
current (I_{OUT}) and the flow rate Q .

Current for $Q_- \dots Q_+$



4.5.1.2. Output 0 ... /Q/

With this selection, the output current ranging from 4 to 20mA carries information on the flow rate value irrespective of the flow direction. The flow rate values, in litres per second, corresponding to currents 4 and 20mA shall be specified in fields "Flow Rate for 4mA" and "Flow Rate for 20mA", respectively.



The parameter setting procedure is essentially the same as described in section "Analog Output $Q_- \dots Q_+$ "; only the flow rate value for 4mA need not be specified.

4.5.2. Constant Current

Here the current output shall be set at the field "Constant Current 4..20mA" and it will remain constant irrespective of the actual flow rate value. This operational mode is used to test the current loop function.

4.5.3. Flow Rate for 20mA (l/s)

The specified flow rate value in litres per second will correspond to the output current of 20mA, one of the two limit values of the measurement range.

4.5.4. Flow Rate for 4mA (l/s)

The specified flow rate value in litres per second will correspond to the output current of 4mA, one of

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the two limit values of the measurement range.

4.5.5. Loop Voltage

This parameter is reserved for servicing purposes in production.

4.5.6. AD5421 Error Register

This parameter is reserved for servicing purposes in production.

4.5.7. AD5421 Control Register

This parameter is reserved for servicing purposes in production.

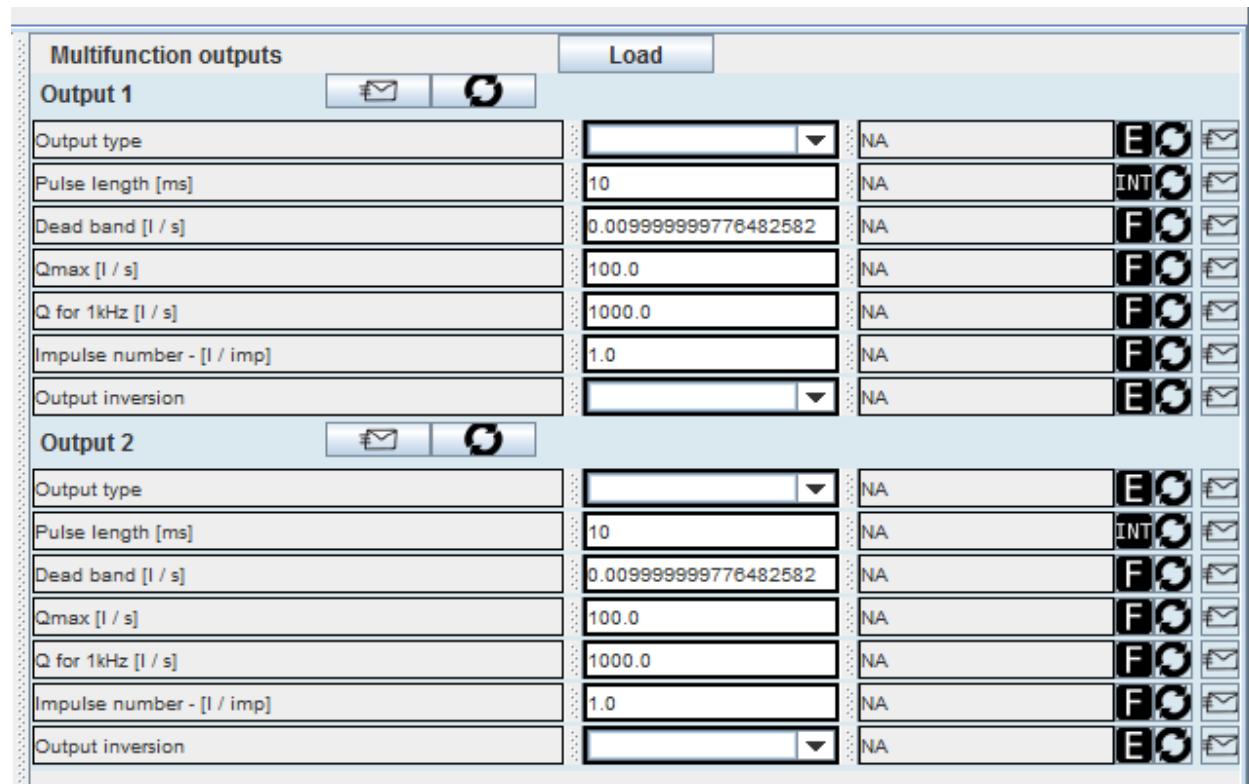
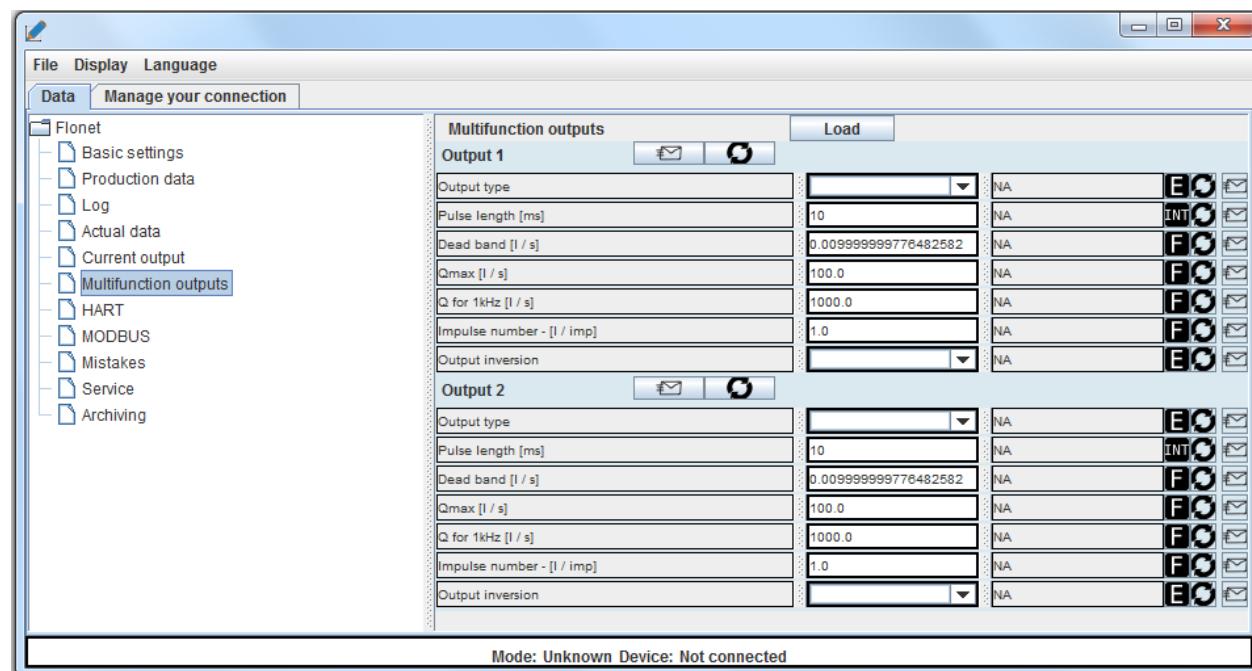
4.5.8. Offset for 4mA

Shift of 4mA value in production according to the reference current source

4.5.9. Offset for 20mA

Shift of 20mA value in production according to the reference current source

4.6. MULTIFUNCTION OUTPUTS



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The above window shows parameter setting fields for two identical outputs. Descriptions and comments below apply to each of the outputs equally.

4.6.1. Output Type

The related context menu permits selection of different types of output function:

- Permanently closed
- Closed for $Q > Q_{max}$
- Closed for $|Q| > Q_{max}$
- Error Condition
- Frequency for Q_+
- Frequency for Q_-
- Frequency for $|Q|$
- Impulses for Q_+
- Impulses for Q_-
- Impulses for $|Q|$

4.6.1.1. Permanently Closed

The output is permanently closed. This operational mode serves primarily the purposes of testing the output itself or the equipment connected to it.

4.6.1.2. Closed for $Q > Q_{max}$

The output will close in cases of flow rate values in excess of Q_{max} . This limit value shall be set (in litres per second) as item "Qmax".

4.6.1.3. Closed for $|Q| > Q_{max}$

The output will close in cases of flow rate values in excess of Q_{max} irrespective of the flow direction. This limit value shall be set (in litres per second) as item "Qmax".

4.6.1.4. Error Condition

With this selection, the output will close if any of the specified error conditions occur.

4.6.1.5. Frequency for Q_+

The output signal will consist of impulses of frequency proportional to the flow rate value in the positive direction. Should the flow direction be negative, there would be no impulses at the output. The reference value shall be set as item "Q for 1kHz" (the flow rate value corresponding to the output frequency of 1kHz).

4.6.1.6. Frequency for Q_-

The output signal will consist of impulses of frequency proportional to the flow rate value in the negative direction. Should the flow direction be positive, there would be no impulses at the output. The reference value shall be set as item "Q for 1kHz" (the flow rate value corresponding to the output frequency of 1kHz).



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4.6.1.7. Frequency for |Q|

The output signal will consist of impulses of frequency proportional to the flow rate value irrespective of the flow direction. The reference value shall be set as item "Q for 1kHz" (the flow rate value corresponding to the output frequency of 1kHz).

4.6.1.8. Impulses for Q+

An impulse will appear at the meter output wherever the flow volume passed through the meter will be equal to the impulse number always provided that the measured fluid flows in the positive direction. This flow volume shall be set as item "Impulse Number (litres per impulse)". Should the flow direction be negative, no impulses will appear at the output. The user shall also specify the impulse widthlength (in milliseconds).

Setting range:

Impulse width (P): 1 to 999ms

Volume per impulse (V): 0.001–1,000 litres

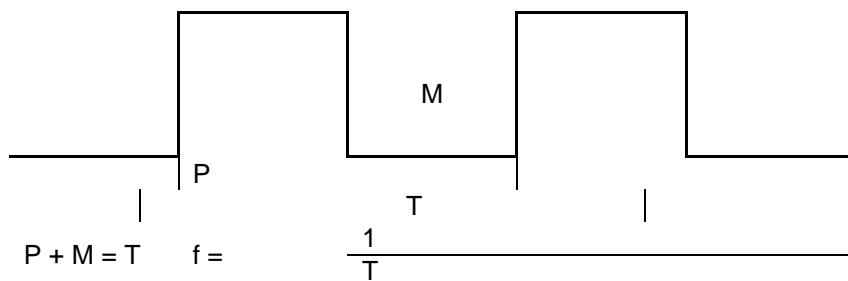
The impulse number determination procedure:

Restrictive conditions in setting the impulse output parameters:

- Maximum output frequency $f_{max} = 100Hz$
- The idle period between impulses M shall be equal to or wider than the impulse width P . Breaching this condition will result in an error message.

It holds:

$$M \square P$$



In selecting the impulse number, the following requirement shall be met:

$$Q_{max} \leq 3.6 \times V \times f_{max} \quad (\text{m}^3/\text{h}, \text{l/imp}, \text{imp/s})$$

Where:
 Q ... fluid flow rate (m³/hour)
 V ... volume per one impulse (litres)
 P ... impulse width/length (s)
 f ... impulse output frequency (Hz)
 T ... cycle length (s)

The flowmeter software permits setting the V values in steps shown in the table below:

V (l)	0.001	0.01	0.1	1	10	100	1,000

In cases of electronic determination of the fluid volume passed through the meter sensor, the impulse length is recommended to be set at $P_{min}=5$ ms, which meets the condition for f_{max} at the impulse

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output equal to 100Hz. In cases of electro-mechanical counters, P_{min} is usually set at 50ms, corresponding to the maximum frequency at the impulse output of 10Hz.

Example:

Assume that a user specified for their flowmeter of DN100 the maximum operating flow rate:

$$Q_{max} = 150 \text{ m}^3/\text{h} \quad (Q_{max} = 41.66 \text{ l/s} \dots v = 5.3 \text{ m/s})$$

For the fluid volume corresponding to one impulse (of length 5 ms and $f_{max} = 100\text{Hz}$) it holds:

$$V \square \frac{Q_{max}}{3.6 \times f_{max}} \quad (\text{l/imp, m}^3/\text{h, Hz})$$

$$V \square 0.416 \quad (\text{l/imp})$$

By selecting the next higher impulse number from the above table (1 litre per impulse) the user will make sure that the impulse output frequency will not exceed (for the specified Q_{max} of 150 m³/hour – DN 100) the value of 100Hz and, at the same time, verify the selection of the impulse length (5ms). The user may choose the V values other than those from the basic selection in the above table, e.g. 0.5 litres/impulse.

4.6.1.9. Impulses for Q-

An impulse will appear at the meter output wherever the flow volume passed through the meter will be equal to the impulse number always provided that the measured fluid flows in the negative direction. This flow volume shall be set as item “Impulse Number (litres per impulse)”. Should the flow direction be positive, no impulses will appear at the output. The user shall also specify the impulse width/length (in milliseconds).

Setting range:

Impulse width (P): 1 to 999ms

Volume per impulse (V): 0.001–1,000 litres

Regarding impulse number determination, see the procedure described in section “Impulses for Q+“.

4.6.1.10. Impulses for |Q|

An impulse will appear at the meter output wherever the flow volume passed through the meter will be equal to the impulse number irrespective of the flow direction. This flow volume shall be set as item “Impulse Number (litres per impulse)”. The user shall also specify the impulse width/length (in milliseconds).

Setting range:

Impulse width (P): 1 to 999ms

Volume per impulse (V): 0.001–1,000 litres

Regarding impulse number determination, see the procedure described in section “Impulses for Q+“.

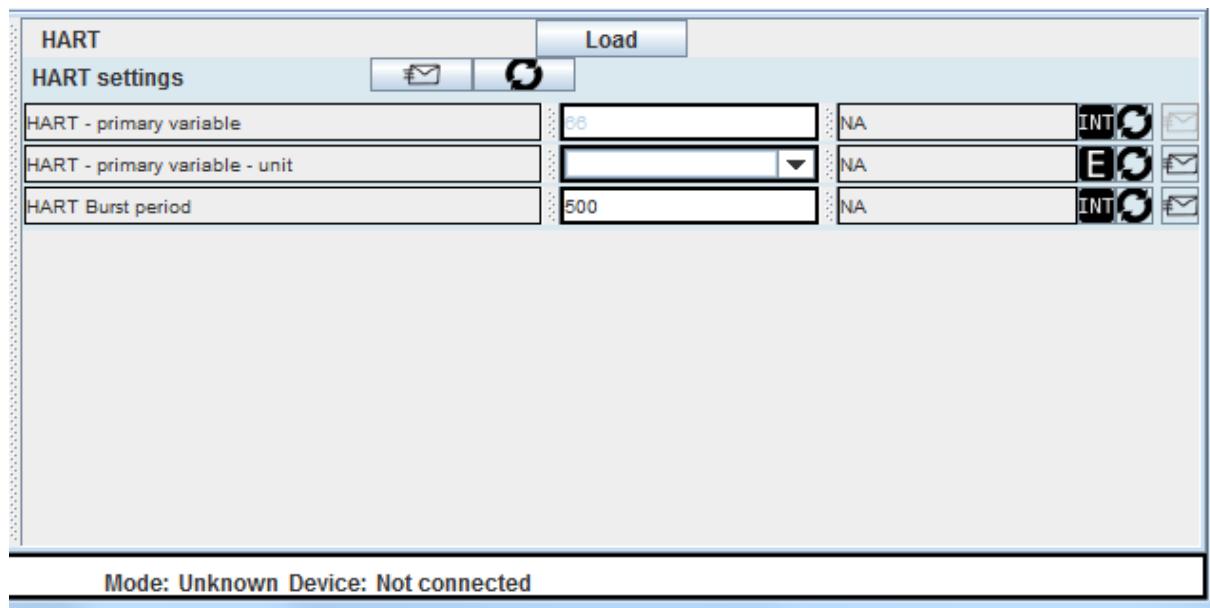
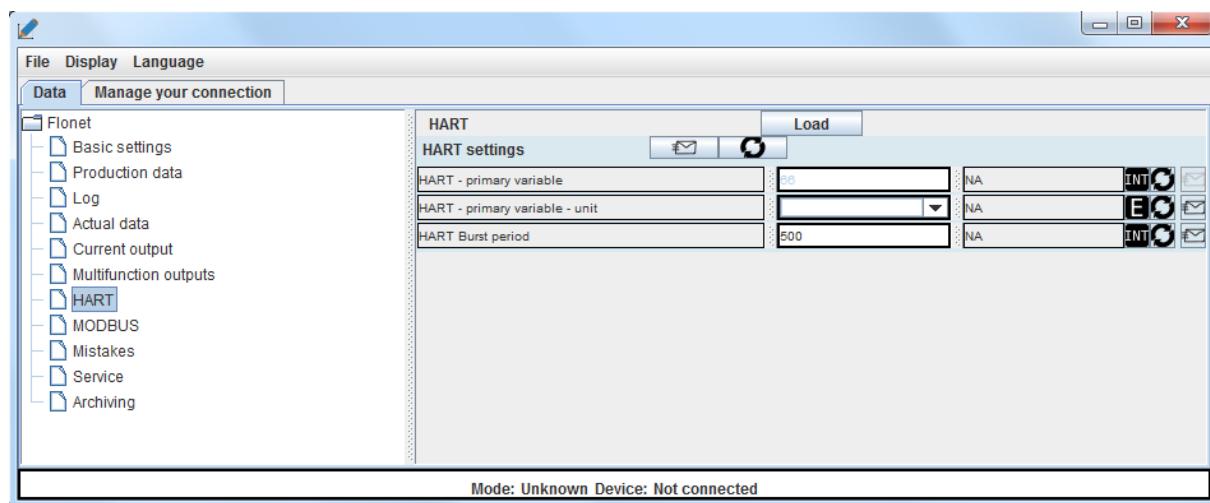
Insensitivity Range is represented by the hysteresis associated with the process of assessing the attainment of the specified flow rate value (see items “Closed for Q >” and “Closed for |Q| >”).

4.6.1.11. “Output Inversion”

Allows for Yes/No selection. With Yes, the output will be inverted.

4.7. HART

HART is a communication protocol compatible with current loop 4 to 20mA primarily used to transfer analog signals from the flowmeter. The same loop can transfer data in the digital form. With HART communication, both analog and digital signal are sent simultaneously via the same cable.



4.7.1. HART – Primary Variable

The set code number 24 cannot be altered; it specifies the fluid flow rate as the primary measured quantity.

4.7.2. HART – Primary Variable Unit

The desired measurement unit can be specified in the context menu.

- The measurement unit selection for the primary measured quantity
 - l/s
 - l/min
 - l/hour



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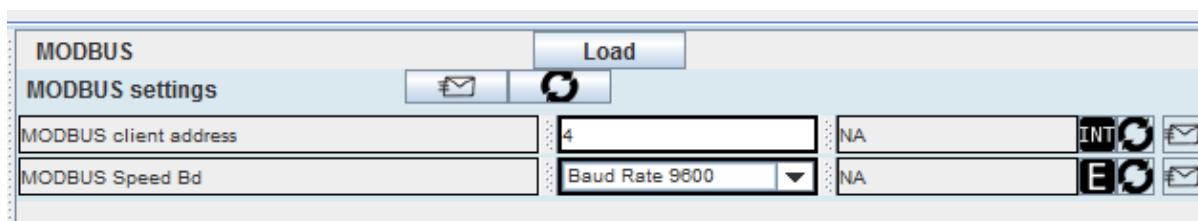
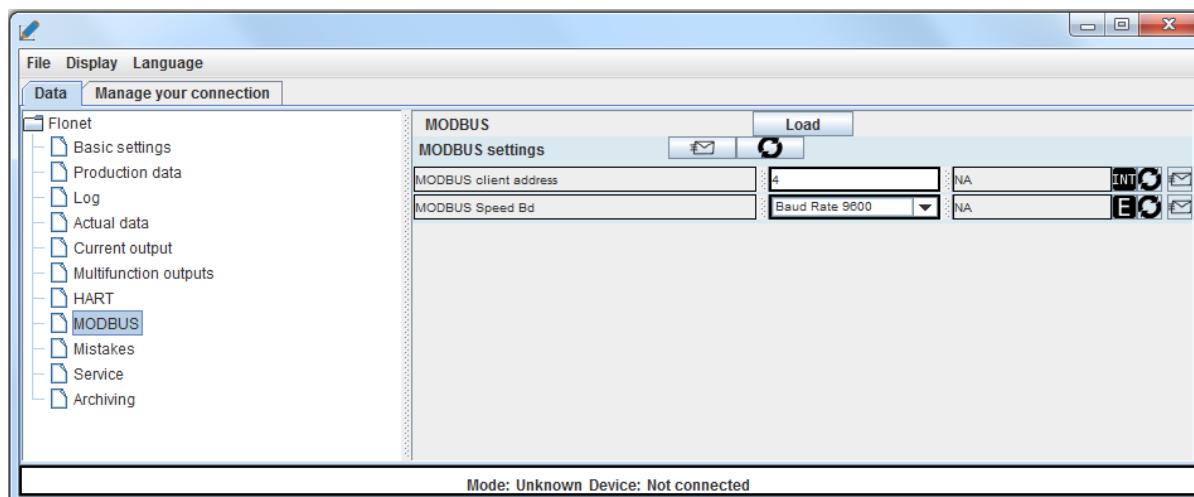
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- MilL/day
- m3/s
- m3/min
- m3/hour
- m3/day
- ft3/s
- ft3/min
- ft3/hour
- ft3/day
- gal/s
- gal/min
- gal/hour
- gal/day
- MilGal/day
- bbl/s
- bbl/min
- bbl/hour
- bbl/day
- ImpGal/s
- ImpGal/min
- ImpGal/hour
- ImpGal/day

4.7.3. HART Burst Period

The setting, in milliseconds, of the burst mode where the slave equipment will send the flow rate value and repeat the sending after a specified time period without any special request from the master equipment.

4.8. MODBUS



4.8.1. MODBUS Client Address

This field is reserved for the meter address in the form of a number from the range of 1 to 247. The initial in-production setting of the meter address for communication via the RS-485 MODBUS RTU serial communication line is 4. Should the meter address be changed, communication with the meter will immediately be disrupted. Information on the LOST connection will appear in the address window. The new address shall be loaded via the Floset "Connection Control" tab with subsequent actuation of the "Connect" button.

As confirmation on the renewed connection the meter type and its ID will appear in red on the line "Meter Type". A failure to renew connection will be demonstrated by the red label of LOST appearing in the Meter Type field.

4.8.2. MODBUS Speed Bd

This item is used to set the serial communication speed (the initial speed value set at production is 9,600Bd). The context menu offers the following Baud rate values:

- Baud Rate 300
- Baud Rate 600
- Baud Rate 1,200
- Baud Rate 2,400
- Baud Rate 4,800
- Baud Rate 9,600
- Baud Rate 19,200
- Baud Rate 38,400
- Baud Rate 57,600

In cases of any change in the Baud rate, communication with the meter will immediately be disrupted. The new communication speed shall be loaded via the Floset "Connection Control" tab and subsequent actuation of the "Connect" button.

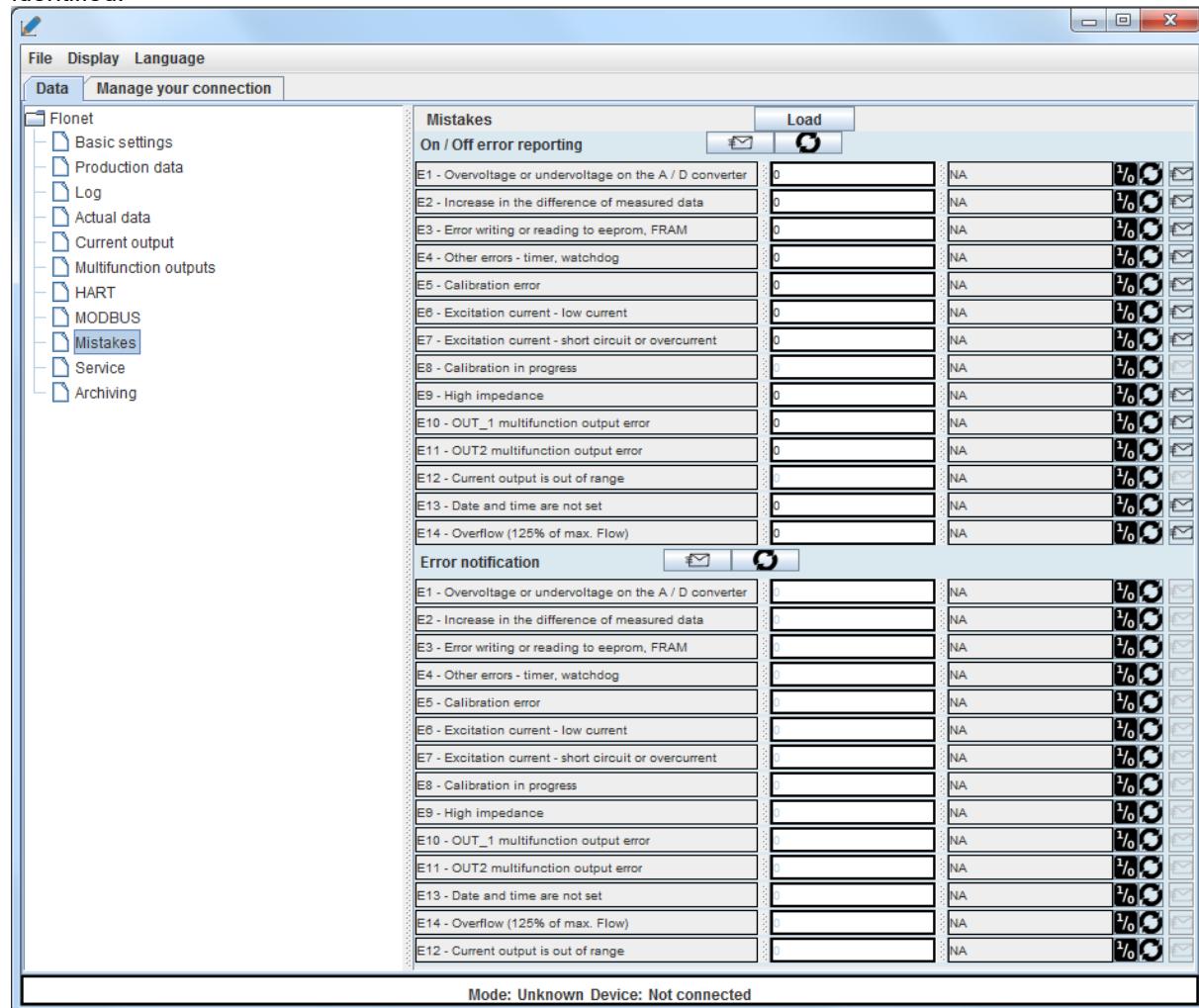
As confirmation on the renewed connection the meter type and its ID will appear in red on the line

"Meter Type". A failure to renew connection will be demonstrated by the red label of LOST appearing in the Meter Type field.

In serial communication, flowmeters of the type series FLOWEX FXx11x and FLOWNET FH30xx do not use the parity control function.

4.9. ERRORS

Upon the flowmeter activation and during its operation, the following errors will be diagnosed and identified:



The screenshot shows the Floset software interface for managing flowmeter connections. The left sidebar lists categories: Flonet, Basic settings, Production data, Log, Actual data, Current output, Multifunction outputs, HART, MODBUS, Mistakes (selected), Service, and Archiving. The main area displays two tables under the 'Mistakes' tab. The top table, 'On / Off error reporting', lists 14 error types (E1-E14) with checkboxes for enabling or disabling reporting. The bottom table, 'Error notification', lists the same 14 error types with checkboxes for selecting notification methods (Email, SMS, etc.). Both tables have a 'Load' button at the top right. At the bottom of the interface, a status bar reads 'Mode: Unknown Device: Not connected'.

Mistakes	On / Off error reporting	Error notification
E1 - Overvoltage or undervoltage on the A / D converter	0	NA
E2 - Increase in the difference of measured data	0	NA
E3 - Error writing or reading to eeprom, FRAM	0	NA
E4 - Other errors - timer, watchdog	0	NA
E5 - Calibration error	0	NA
E6 - Excitation current - low current	0	NA
E7 - Excitation current - short circuit or overcurrent	0	NA
E8 - Calibration in progress	0	NA
E9 - High impedance	0	NA
E10 - OUT_1 multifunction output error	0	NA
E11 - OUT2 multifunction output error	0	NA
E12 - Current output is out of range	0	NA
E13 - Date and time are not set	0	NA
E14 - Overflow (125% of max. Flow)	0	NA



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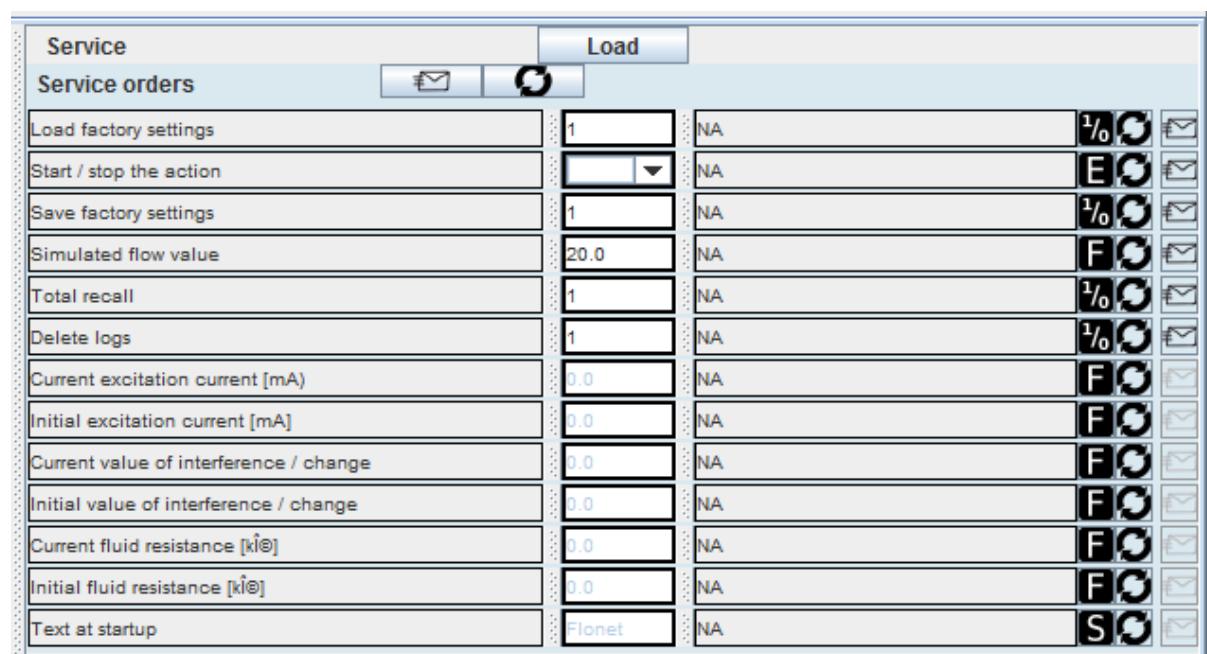
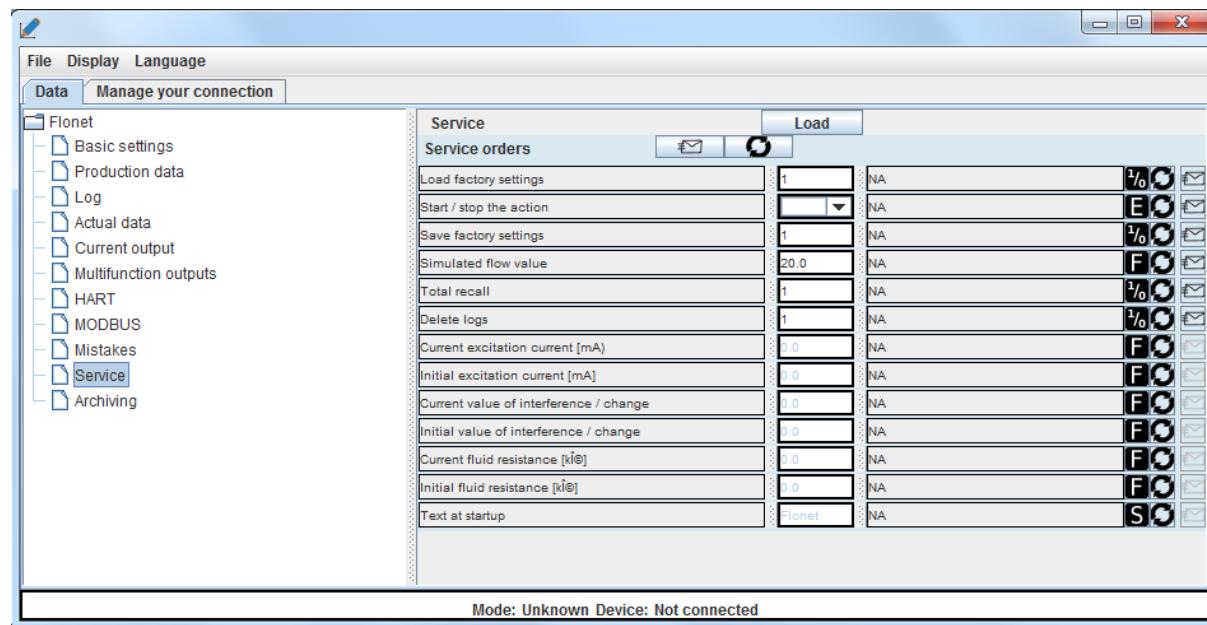
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Mistakes	Load		
E1 - Overvoltage or undervoltage on the A / D converter	0	NA	1% <input checked="" type="checkbox"/>
E2 - Increase in the difference of measured data	0	NA	1% <input checked="" type="checkbox"/>
E3 - Error writing or reading to eeprom, FRAM	0	NA	1% <input checked="" type="checkbox"/>
E4 - Other errors - timer, watchdog	0	NA	1% <input checked="" type="checkbox"/>
E5 - Calibration error	0	NA	1% <input checked="" type="checkbox"/>
E6 - Excitation current - low current	0	NA	1% <input checked="" type="checkbox"/>
E7 - Excitation current - short circuit or overcurrent	0	NA	1% <input checked="" type="checkbox"/>
E8 - Calibration in progress		NA	1% <input checked="" type="checkbox"/>
E9 - High impedance	0	NA	1% <input checked="" type="checkbox"/>
E10 - OUT_1 multifunction output error	0	NA	1% <input checked="" type="checkbox"/>
E11 - OUT2 multifunction output error	0	NA	1% <input checked="" type="checkbox"/>
E12 - Current output is out of range		NA	1% <input checked="" type="checkbox"/>
E13 - Date and time are not set	0	NA	1% <input checked="" type="checkbox"/>
E14 - Overflow (125% of max. Flow)	0	NA	1% <input checked="" type="checkbox"/>

Error notification	Load		
E1 - Overvoltage or undervoltage on the A / D converter	0	NA	1% <input checked="" type="checkbox"/>
E2 - Increase in the difference of measured data		NA	1% <input checked="" type="checkbox"/>
E3 - Error writing or reading to eeprom, FRAM		NA	1% <input checked="" type="checkbox"/>
E4 - Other errors - timer, watchdog		NA	1% <input checked="" type="checkbox"/>
E5 - Calibration error		NA	1% <input checked="" type="checkbox"/>
E6 - Excitation current - low current		NA	1% <input checked="" type="checkbox"/>
E7 - Excitation current - short circuit or overcurrent		NA	1% <input checked="" type="checkbox"/>
E8 - Calibration in progress		NA	1% <input checked="" type="checkbox"/>
E9 - High impedance		NA	1% <input checked="" type="checkbox"/>
E10 - OUT_1 multifunction output error		NA	1% <input checked="" type="checkbox"/>
E11 - OUT2 multifunction output error		NA	1% <input checked="" type="checkbox"/>
E13 - Date and time are not set		NA	1% <input checked="" type="checkbox"/>
E14 - Overflow (125% of max. Flow)		NA	1% <input checked="" type="checkbox"/>
E12 - Current output is out of range		NA	1% <input checked="" type="checkbox"/>

In the section "Error Reporting ON/OFF", the user may activate, by selecting logic "1" by the control button on the right-hand side, any type of error that they may wish to have diagnosed and reported. Listed in the section "Errors Reported" below are the selected types of error. If any of these errors occurs and continues to exist, the legend in the last column will read "True".

4.10. SERVICE



4.10.1. Load factory settings

By selecting logic "1" by the control button on the right-hand side, you will restore the parameter setting to the initial condition as performed in the manufacturing plant according to the customer requirements. The user will find this function useful in cases where they have modified some parameters and wish to return to the original parameter setting.

4.10.2. Start / stop action

- Reset volume
- Run simulation
- End simulation
- Start zeroing (autocalibration).

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4.10.2.1. Reset volumes

It starts the process of zeroing the flow rate.

4.10.2.2. Run the simulation

It starts the process of zeroing the flow rate.

By selecting logic “1” on this line, the meter will, irrespective of the current flow rate value, report the simulated flow rate. Its value had to be set earlier in the item “Simulated Flow Rate Value”. Upon actuating this operation mode, the simulated flow rate will be shown on the meter output and affect other meter functions such as the flow volume measurements. This operation mode is useful in testing the output settings and the connected technologies. The simulation mode can be cancelled by loading the logic “0”. As long as the simulation mode is operative, shown on the meter display next to the specified simulated flow rate value will be the legend “SIM”.

4.10.2.3. End the simulation

It starts the process of zeroing the flow rate.

4.10.2.4. Start zeroing (autocalibration)

It starts the zeroing process (autocalibration). It is necessary to wait until the countdown to the display ends,

During this step, the flow meter must be flooded with liquid and the flow must be stopped !!!

4.10.3. Save Factory Setting

By selecting logic “1”, all current parameter settings will be stored in the meter memory unit. This command can only be used by operators authorized to modify the production or calibration settings.

4.10.4. Simulated Flow Value

This item is used to specify and set the simulated flow rate value (in litres per second).

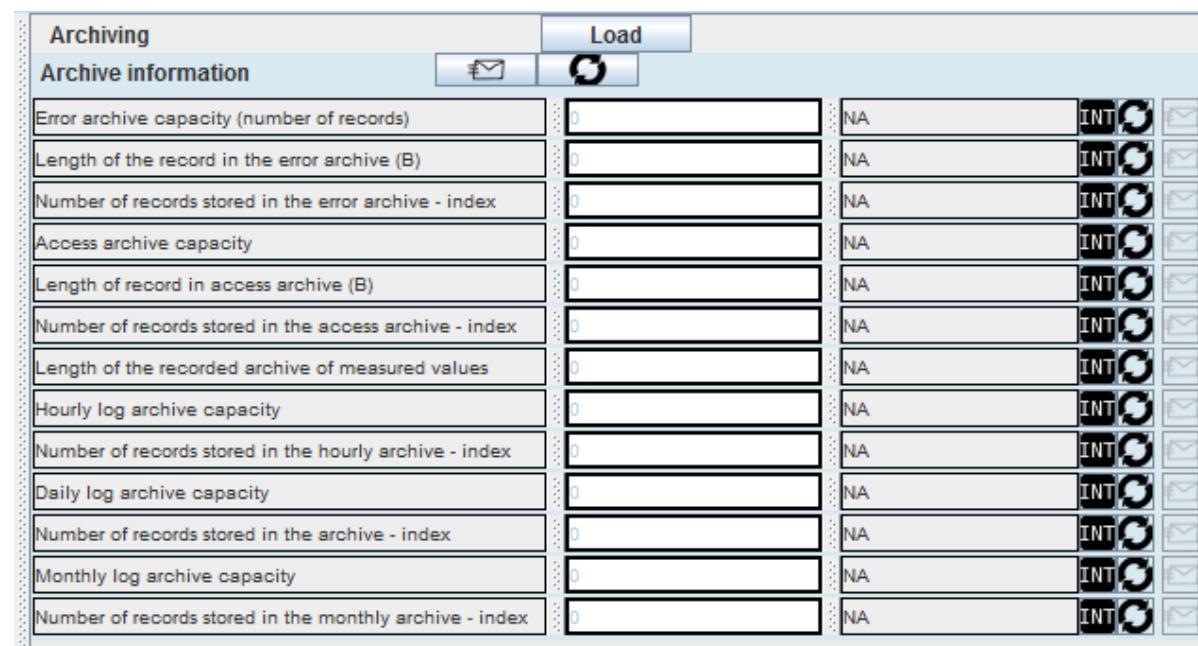
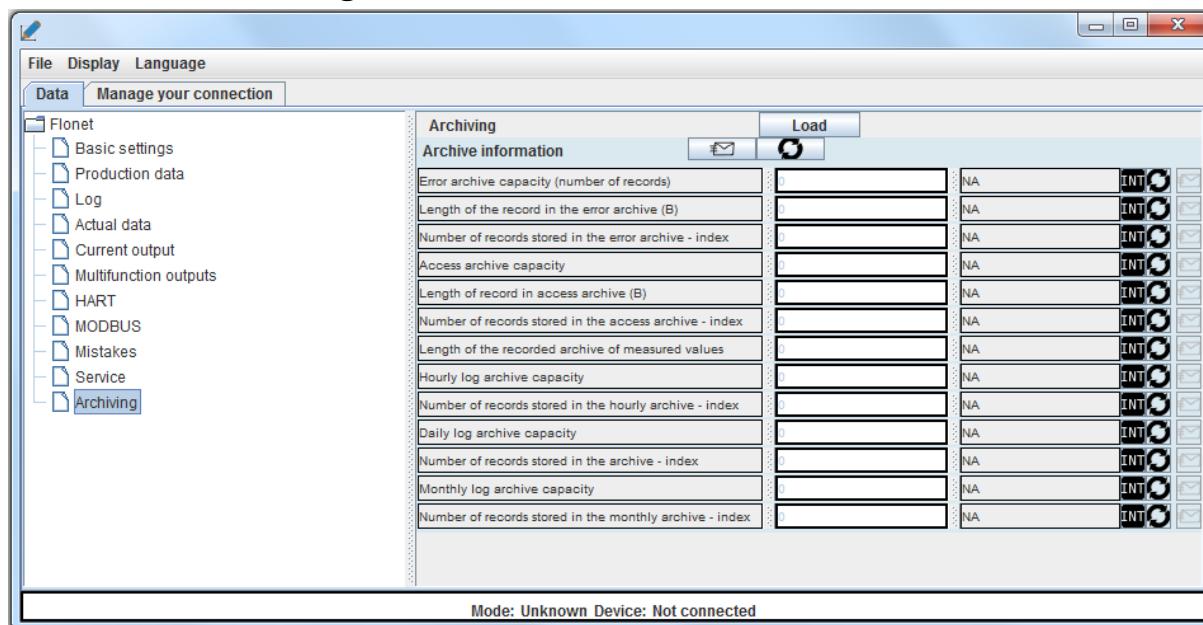
4.10.5. Total Recall

By selecting logic “1”, all meter parameters will be set at their implicit values. This command will recall the initial meter setting in production. At this stage the operator shall also specify the initial legend to appear on the meter display upon actuation. The necessary authorisation to use this function is of the “Production” class.

4.10.6. Delete Log

By selecting logic “1”, all present log records will be deleted. The necessary authorisation to use this function is of the “Production” class.

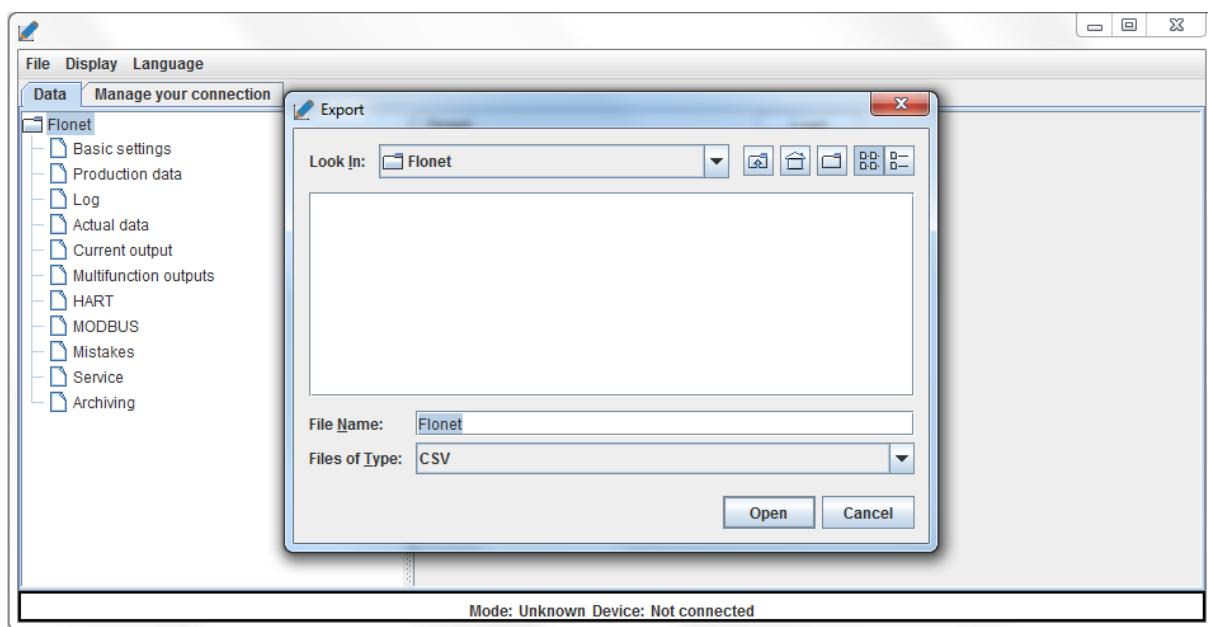
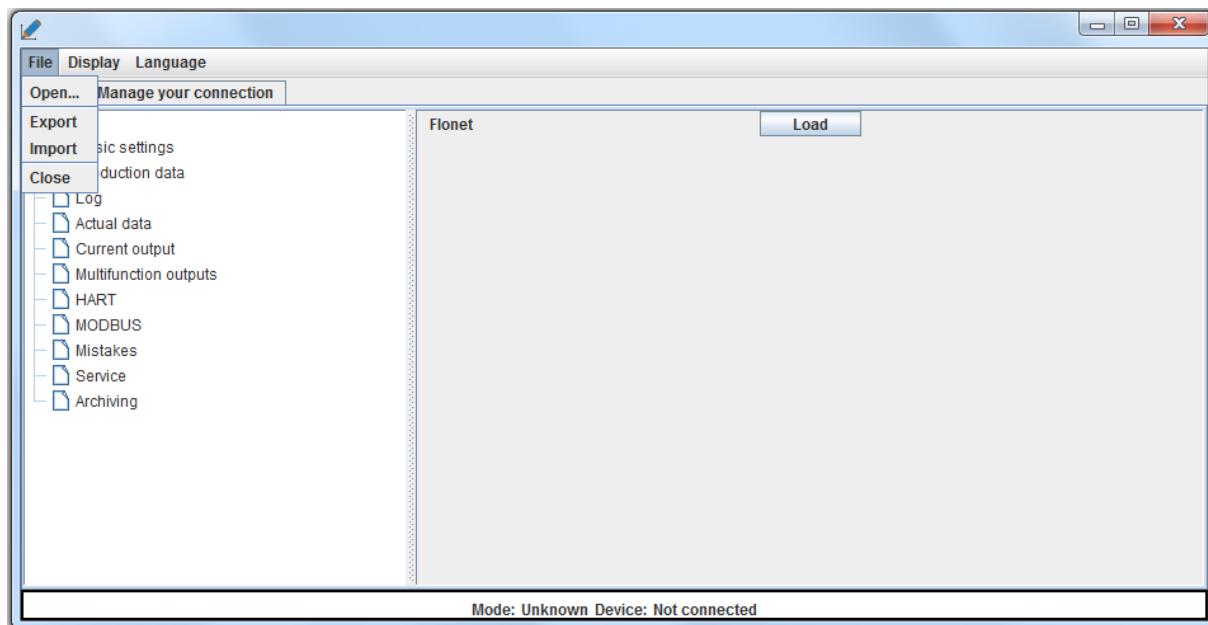
4.11. Data archiving



The above window shows the archive status with the log contents deleted. During the meter operation, the numbers of archived features or events will grow; the above window will show the actual numbers of specific features or events and utilisation of the available memory capacity.

4.12. Flowmeter configuration

After making the device settings, it is possible to export the device settings to a file

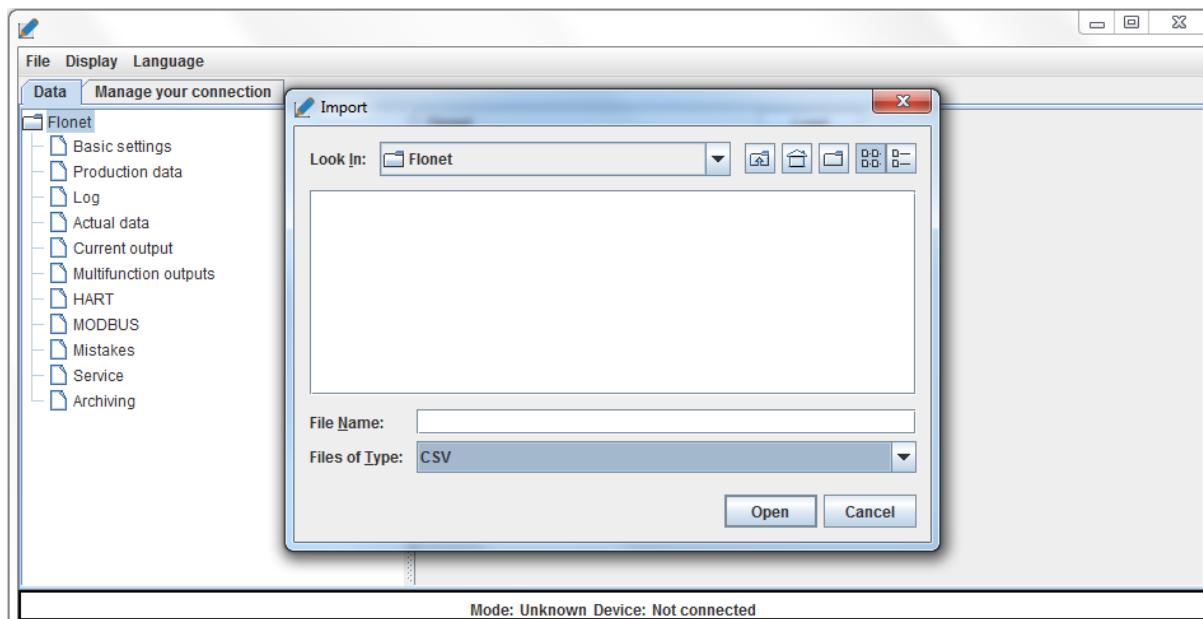
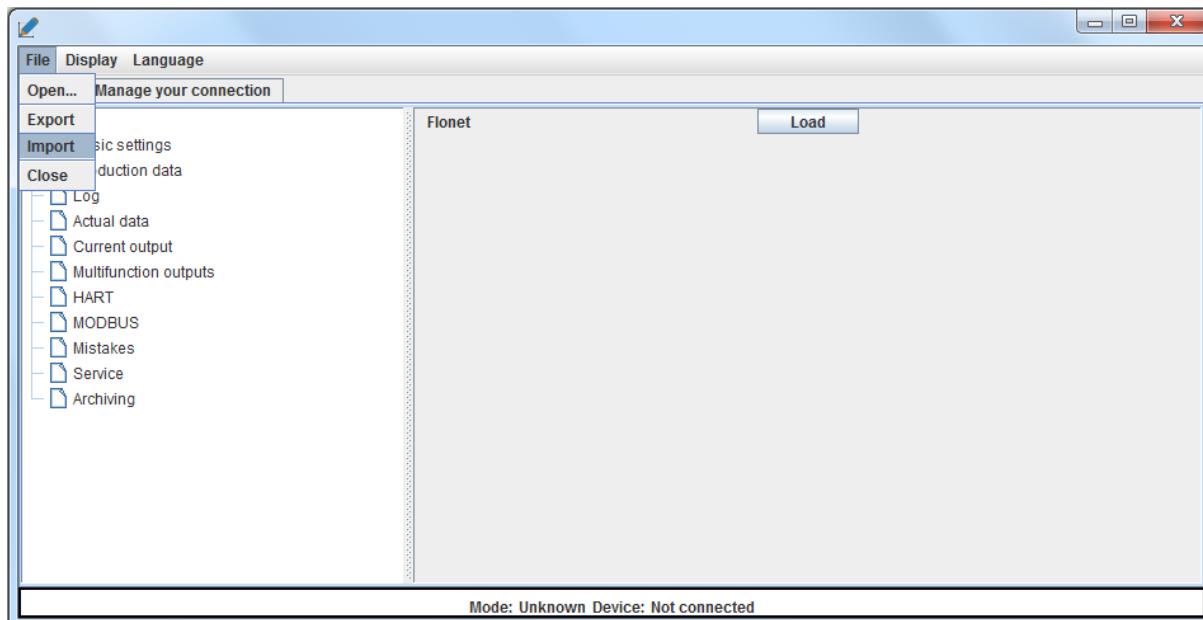


Export File to CSV format

4.13. Restore the flowmeter configuration

The path is the opposite of a backup

CSV import file



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5. Documentation, standards and documents

Normy

EN/IEC 61158-2

Manuály

Es 90678K/a Electromagnetic flowmeter FLONET FH30xx

Es 90686 K/a FLOTEX FXx11x a FLONET FH30xx Control instruction

Es 90694K/b FLOTEX FXx11x a FLONET FH30xx mapping MODBUS

Ronešová, A MODBUS Overview

<http://www.modbus.org>.

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Issue No 1