

AFLOWT



**ELECTROMAGNETIC
FLOW METER**

AFLOWT MF

Modification "Lite M"

**OPERATION MANUAL
PART II**



ISO 9001:2008

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This document covers "AFLOWT MF" Electromagnetic Flow meter, "Lite M" modification, hereinafter referred to as the flow meter and is intended as a guide for its proper use.

Due to continuous improvement of product policy actual flow meter's specifications may differ from the data specified in this manual. However, this will not affect the metrological characteristics and functionality.

LIST OF ABBREVIATIONS

ER	- Error
PC	- Personal Computer

1. CONTROLLING THE FLOW METER

1.1. The flow meter can be controlled from a personal computer (PC) via serial USB or RS-485 ports (Fig.1).

Control options available for the user depend on the actual mode of operation.

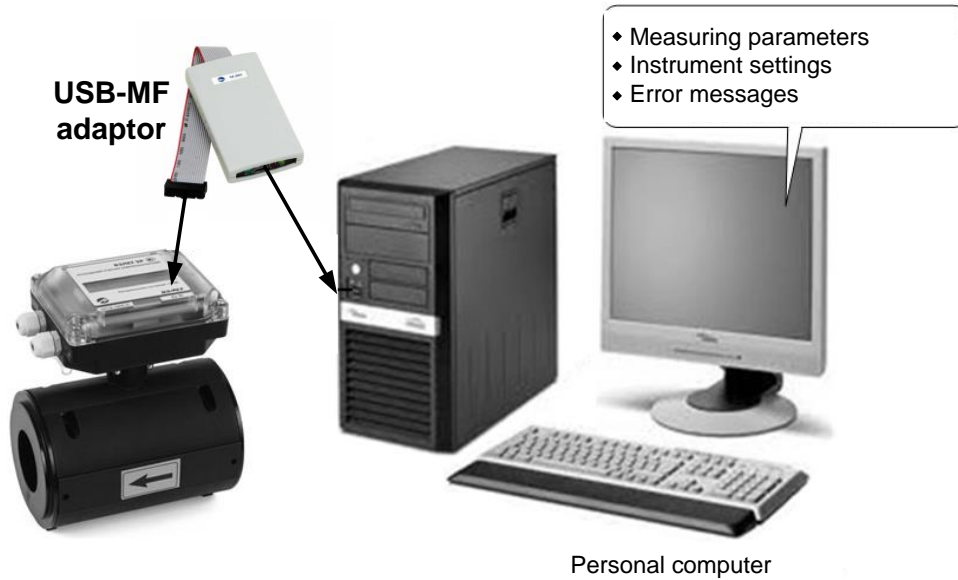


Fig.1. AFLOWT MF control devices

1.2. The flow meter operates in three modes:

- Verification – adjustment and verification
- Service – start-up procedures
- Work – normal operation (user) mode.

Operating modes are set by placing (removing) jumpers on two terminals located on the board of the Processor Module. Combinations of jumpers with regard to operating modes are specified in Table 1 ("+" means that the terminal contacts are closed by a jumper, and "-" means that the terminal contacts are opened).

Table 1

Mode	Terminal		Mode description
	J3	J4	
Verification	-	+	Adjustment and verification
Service	+	-	Preparing for operation
Work	+	+	Operation

- 1.3. In different operating modes the user can modify different settings. Settings are recorded programmatically with use of USB-MF Adaptors or via RS-485 port.
- 1.4. In the "Verification" mode, all of the settings are available for modification. Manufacturer's adjustment and after-calibration adjustment are made in this mode.
- 1.5. In the Service mode the user can modify:
 - Flow cutoffs
 - Settings for the flow rate signal filter and automatic flow rate setup module
 - Settings and operating modes of the universal outputs
 - Display settings.
- 1.6. In the Work mode only the display settings can be modified: set of parameters to be displayed, time for one parameter to be displayed, measurement units, and display cutoffs.

Configuring the settings in the "Service" and "Work" modes does not affect flow meter's measurement accuracy and may be performed on-site, if necessary. In the "Service" and "Work" modes, adjustment and calibration settings are inaccessible.
- 1.7. To control the flow meter from a PC, the user needs to install "UBViewer ModBus" software containing a package of flow meter monitor programs, including "Viewer Aflowt MF" (modification "Lite M") monitor among them.

2. CONFIGURING BEFORE WORK

2.1. Configuring data exchange with PC

2.1.1. Running "Viewer Aflowt MF" (modification "Lite M") program tool

When using the RS-485 interface established on a payment of the module of interfaces, the flow meter is connected to the PC COM port via standard RS-485/RS-232 converter.

USB-MF connection (optional) is made via standard USB port of the personal computer.

NOTE. The USB-MF Adaptor can be used after installing the Adaptor driver from a CD provided in the delivery package and configuring a virtual COM port on a PC.

Launch "UBViewer ModBus" program on a PC. In the window shown in Fig.2 select **Project \Open** option and run "Viewer Aflowt MF" program file (Viewer below).

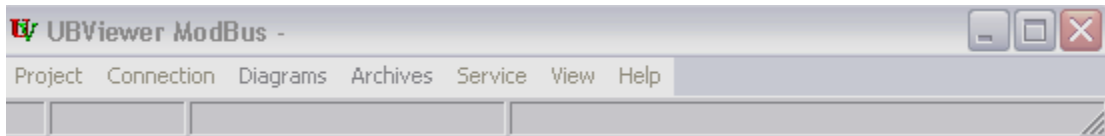


Fig.2. UBViewer ModBus window

The main Viewer window containing tabs with measurement parameters and settings is shown in Fig.3.

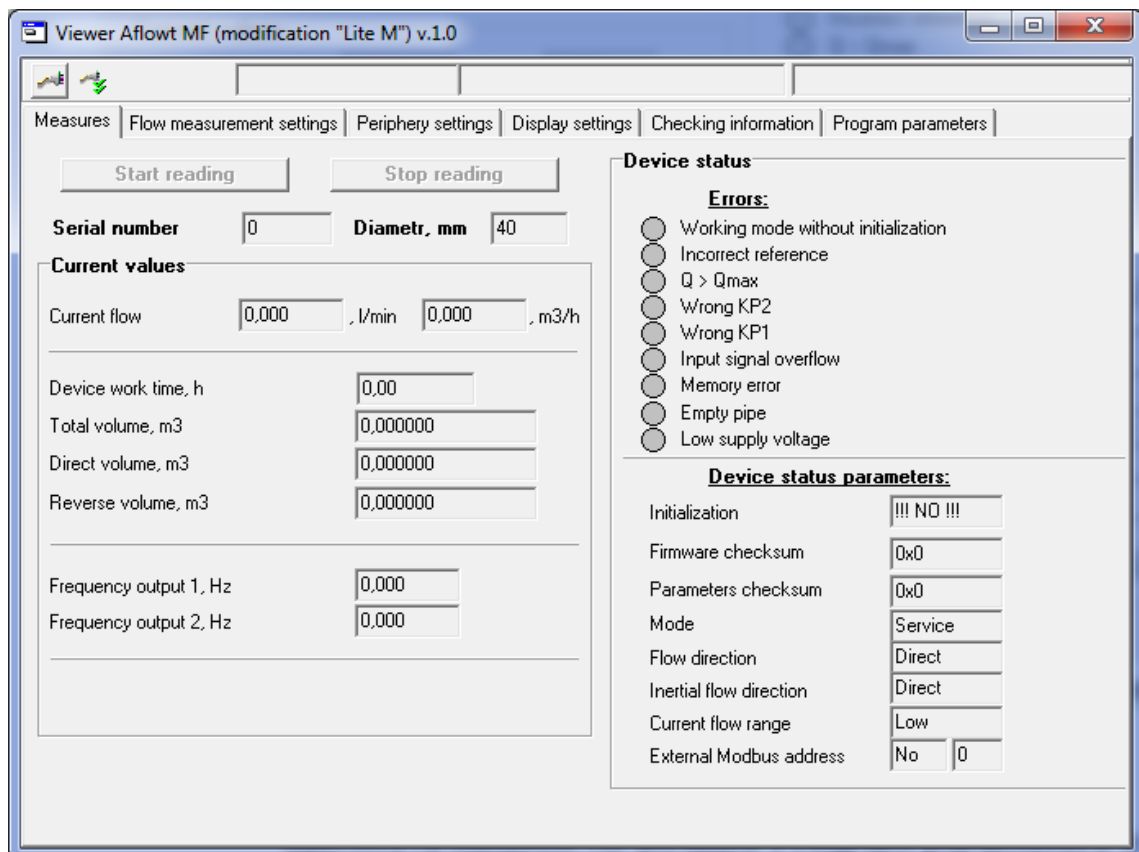


Fig.3. Main window of Viewer Aflowt MF (modification "Lite M")

2.1.2. Configuring Viewer communication parameters

Click on **Program parameters** tab in the Viewer main window. In the **Parameters** panel (Fig.4) type in an address assigned to the flow meter in the **Address** field (an integer number from 1 to 247). The number is read automatically.

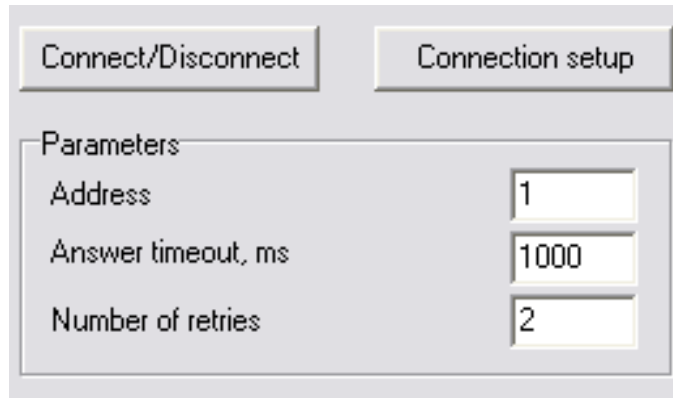


Fig.4 “Program parameters” tab

By default, the address is set to 1.

It is strongly recommended that other configuration settings are changed only by competent users.

2.1.3. Configuring PC COM port

Click on **<Connection setup>** button (Fig.4) and select the required options in the **Options manager** window (Fig.5):

- ◆ **Choice of the transport** – type of interface RS-485
- ◆ **Serial port** – number of COM port in use
- ◆ **Baud rate, bps** – default value is 19200 bps.

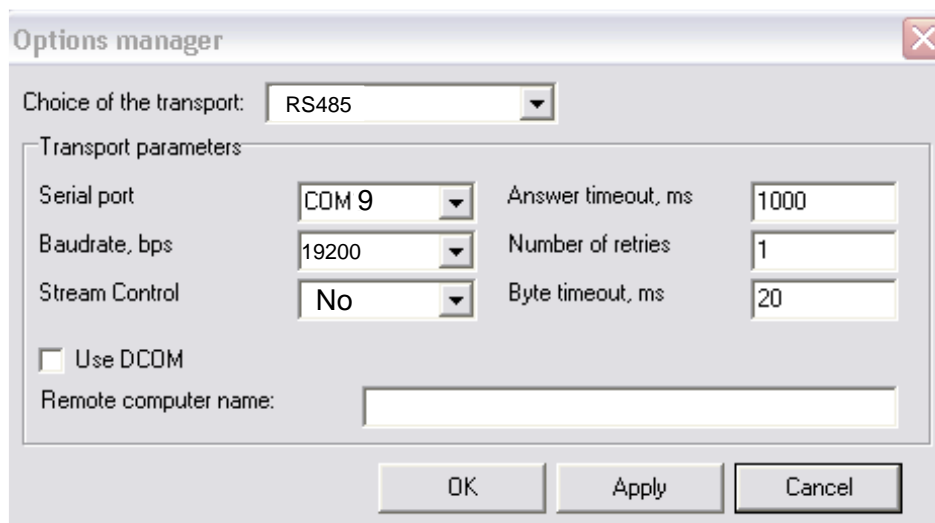

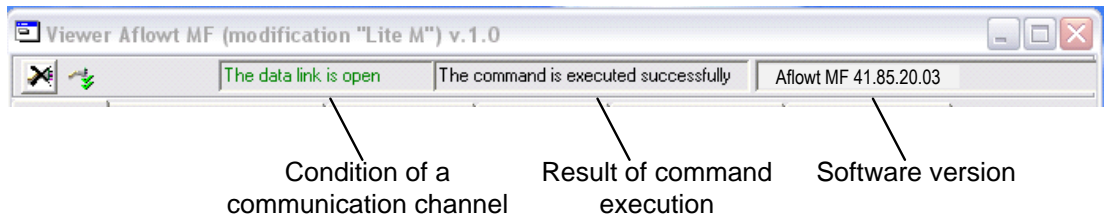


Fig.5. “Options manager” window

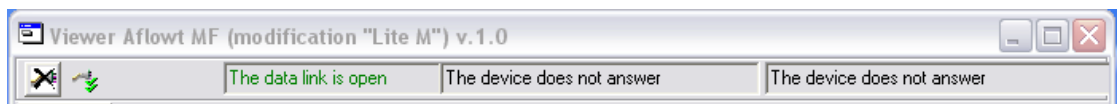
Click **<OK>** to save changes.

2.1.4. Establishing connection with the flow meter

To establish connection between the flow meter and PC, click on **<Connect/Disconnect>** button in the **Program parameters** window (Fig.3) or on  button on the toolbar of the Viewer main window. As soon as the connection has been successfully established, Viewer status line displays messages shown in Fig.6.a.



a) Status line in case of successful connection



b) Status line containing "connection error" messages

Fig.6. Viewer status line


If the connection fails, the program issues messages shown in Fig. 6.b.

In this case, click on **<Connect/Disconnect>** button once again (to close data link), check wiring and contacts between the flow meter and PC and check the communication settings. Primary consideration should be given to the parameters: **Address**, **Choice of transport**, **Serial port**, and **Baud rate**.

After the corrections have been made, repeat actions described in section 2.1.

2.2. Reading and recording settings

2.2.1. As soon as the connection between the flow meter and PC is established, buttons that allow the user to read measurement and configuration settings become active in all tabs in the Viewer main window: **<Start reading>** and **<Read all>**. When the corresponding button is pressed, the values displayed in the associated tab are updated.

2.2.2. To modify any of the settings, enter a new value and click on  or **<Write>** buttons.

NOTE. It is recommended to enable "read" command immediately after the modification to check entered values for correctness.

2.3. Adjusting flow rate measurement settings

2.3.1. **Flow measurements settings** tab is located in the Viewer main window (Fig.7).

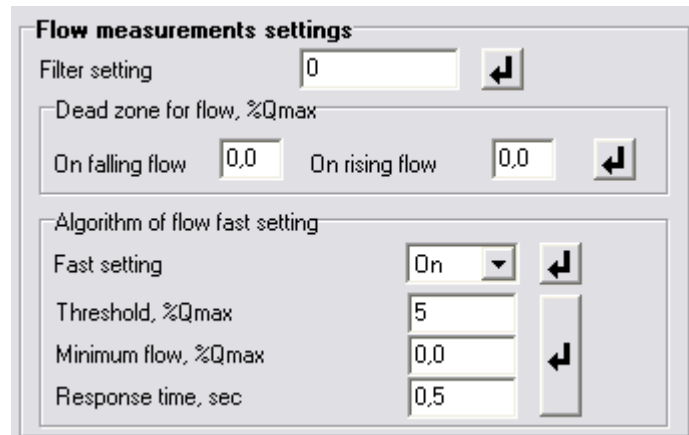


Fig.7. "Flow measurement settings" window

2.3.2. "Filter settings" panel

- ◆ **Filter settings** – determines response time (transient time) for signals on the flow meter's output. Options available are specified in Table 2.

2.3.3. "Dead zone for flow, %Qmax" panel

- ◆ **On falling flow (On rising flow)** options – are meant for threshold values of flow rate, below which (on increasing or decreasing the flow rate value respectively) totalizing of volume and pulse transmission to the universal output are stopped. The flow rate value is displayed as zero. Alarm situations are not detected.

For the reverse (bidirectional) flow, the thresholds (cutoffs) are active for both positive and negative flow directions. The flow direction signal also changes according to the preset cutoffs.

For each cutoff, the default value is set as $0.001 \cdot Q_{max}$ specified for a certain DN.

2.3.4. "Algorithm of flow fast setting" panel

These settings make it possible to control the fast flow rate adjustment algorithm.

- ◆ **Fast setting** – turns the flow fast setting function on/off
- ◆ **Threshold, %Qmax** – difference of flow rates (expressed in percent of maximal flow rate value) indicating that the algorithm of flow fast setting should be activated
- ◆ **Minimum flow, %Qmax** – flow rate value (expressed in percent of maximal value) above which the algorithm of flow fast setting is activated
- ◆ **Response time, sec** – time of actuating the algorithm. The response time is specified in conventional units (1 unit is related to 0.1 s).

By default, the value of filter constant is set to 6, and the Automatic flow rate setup function is enabled with standard settings. Time of response of the flow meter to changes in flow rate with respect to other settings is given in Table 2 (for reference purpose).

Table 2

Constant of Flow Rate Signal filter	Time of fixing flow rate value, s	
	Automatic setup function is on	Automatic setup function is off
0	1	1.5
1	2	3
2	3	6
3	5	12
4	6	24
5	6	48
6	6	96
7	7	192
8	8	384

2.3.5. “Empty pipe detection settings” panel

If the flow meter is expected to work with liquids having other electrical conductivity than mains water, it is recommended to carry out correction of **Empty pipe** threshold according to the following procedure:

- Make sure that the pipeline is fully filled with liquid under control
- In the **Empty pipe detection settings** tab (see Fig.8), take the value of **Reference EP code** setting expressed in conventional units (e.g., 75) and the value of **Current EP code** setting also expressed in conventional units (e.g., 25).

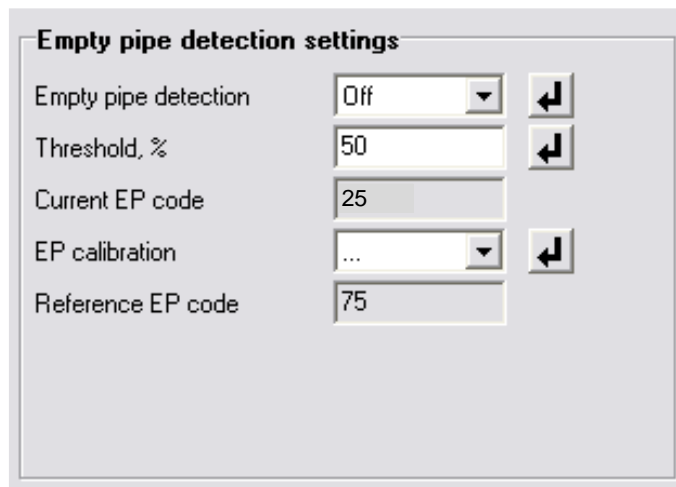


Fig.8. “Empty pipe detection settings” tab

- Calculate a new threshold value for the liquid under control by the formula:

$$N = \frac{K_{cur} + 0,5 \cdot (K_{ref} - K_{cur})}{K_{ref}} \cdot 100\%$$

Where N – new threshold value associated with a signal in empty pipe in percent

K_{ref} – reference (calibration) value of sounding signal displayed in **Reference EP code** field

K_{cur} – current (measurement) threshold value displayed in **Current EP code** field

- Enter the new threshold "empty pipe" value in **Threshold, %** field.

2.4. Adjusting settings for universal outputs

2.4.1. Settings of universal outputs are located in **Periphery settings** tab (**Universal outputs** panel) in Viewer main window (Fig.9).

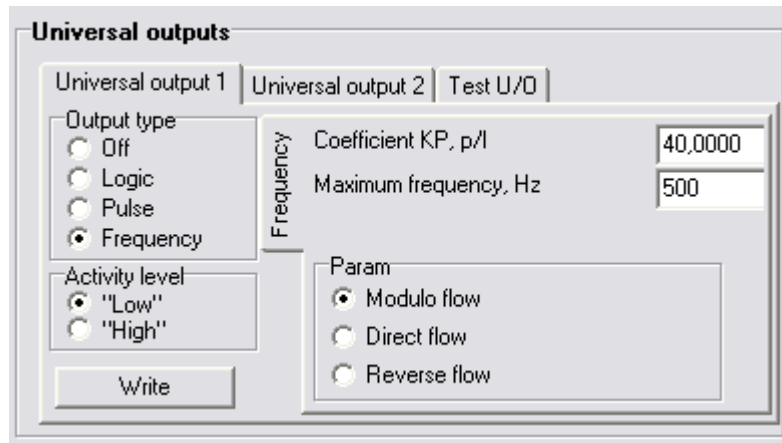


Fig.9. "Universal outputs" panel

Universal output 1 and **Universal output 2** tabs have the same structure. They are used to configure universal output N1 and N2 respectively.

2.4.2. The output mode (**Frequency**, **Pulse**, or **Logic**) is selected in **Output type** panel. With a radio button select the mode and confirm it by clicking **<Write>**.

The parameters located to the right of **Output type** panel are changed in accordance with the selected mode.

2.4.3. Frequency mode (**Output type – Frequency**)

In the frequency mode, the universal output transmits a pulse sequence of meander type with period-to-pulse duration ratio of 2 and standard pulse weight. Pulse repetition rate is proportional to average volumetric flow rate measured over previous 80 ms. Maximal frequency is 500 Hz.

The parameters to be specified: **Coefficient KP (p/l)**, **Maximum frequency (Frequency panel)** and **Activity level**.

- ◆ **Coefficient KP**. By default, universal output N1 is set to the frequency mode and **Coefficient KP** value is set as per Appendix A.

Coefficient KP determines pulse weight in the frequency mode (selectable within 0.0001 to 9999 p/l range).

To determine **Coefficient KP** having regard to the maximal flow rate in the pipeline under control and frequency characteristics of the input receiving the pulse signal, the following formula may be used:

$$\text{Coefficient KP [p/l]} \leq \frac{3,6 \cdot F}{Q_{\max}} = \frac{1,8 \cdot 10^3}{Q_{\max} \cdot \tau_i}$$

Where Q_{max} – maximal flow rate in the pipeline, m³/h

F – maximum flow meter's pulse repetition rate permissible for a receiving input, Hz

$\tau_i = 0.5 \cdot T_i$ – minimal flow meter's pulse duration permissible for a receiving input, ms

T_i – pulse repetition period for the pulses on the flow meter's output, ms.

How to set functions of the outputs in the frequency mode is shown in Table 3.

Table 3

Operating mode of the output	Flow to be controlled	Condition for generating signal / changing logic state
Frequency	Modulo flow	Flow rate for any flow direction
	Direct flow	Flow rate for forward (positive) flow direction
	Reverse flow	Flow rate for reverse (negative) flow direction

- ◆ **Modulo flow** – pulse sequence with pulse repetition rate proportional to the measured flow rate value is generated on the output irrespective of flow direction
- ◆ **Direct flow** – pulse sequence with pulse repetition rate proportional to the measured flow rate value is generated on the output only for forward flow
- ◆ **Reverse flow** – pulse sequence with pulse repetition rate proportional to the measured flow rate value is generated on the output only for reverse flow.

Maximum frequency – frequency associated with maximal flow rate in the pipeline. When signal frequency exceeds **Maximum frequency** value, the flow meter detects an alarm situation associated with incorrect value of output scaling constant specified for this output.

Activity level – signal level (**High** or **Low**) related to the presence of pulse. Description of signal levels and the corresponding electrical values are given in Appendix C, part I of this manual.

2.4.4. Pulse mode (**Output type – Pulse**)

In the pulse mode, the universal outputs also transmit a pulse sequence of meander type with period-to-pulse duration ratio of 2 and standard pulse weight.

The pulse mode means that a burst of pulses is generated on the output within a second, and the number of pulses in the burst (considering pulse weight) corresponds to the flow volume measured over a previous second. In analogy to the frequency mode, maximal pulse repetition rate is 500Hz.

The outputs can be configured for operation in the pulse mode in the **Pulse** tab (Fig.10).

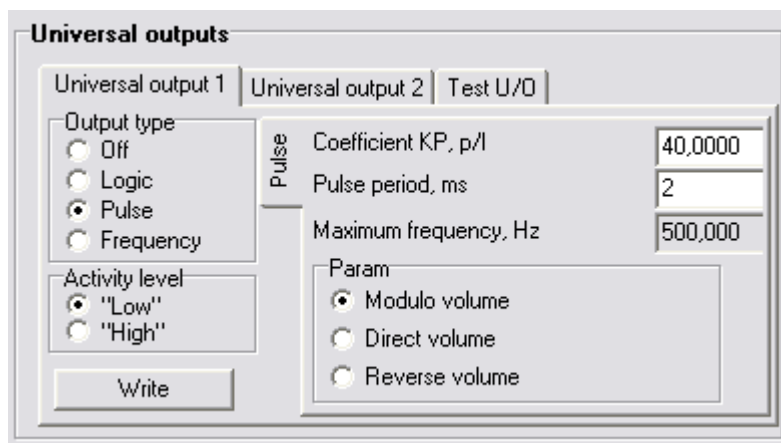


Fig.10. "Pulse" tab

The parameters to be specified: **Pulse period**, **Coefficient KP** (can be calculated according to the formula given for the frequency mode) and **Activity level**.

- ◆ **Pulse period** – pulse repetition period in a burst; selectable within (2 to 1000ms) range which corresponds to (500 to 1 Hz) repetition rate

How to set functions of the outputs in the pulse mode is shown in Table 4.

Table 4

Operating mode of the output	Flow to be controlled	Condition for generating signal / changing logic state
Pulse	Modulo volume	Volume for any flow direction
	Direct volume	Volume for direct flow
	Reverse volume	Volume for reverse flow

- ◆ **Modulo volume** – pulses in a number proportional to the measured value of volume are generated on the output irrespective of flow direction
- ◆ **Direct volume** – pulses in a number proportional to the measured value of volume are generated on the output only for forward flow
- ◆ **Reverse volume** – pulses in a number proportional to the measured value of volume are generated on the output only for reverse flow.

2.4.5. Logic mode (**Output type – Logic**)

In the logic mode, one signal level corresponds to “event” (or its state) and the other level corresponds to “no event” (or another state).

The outputs can be configured for operation in the logic mode in the **Logic** tab (Fig.11).

The settings include selection of the mode and **Activity level**.

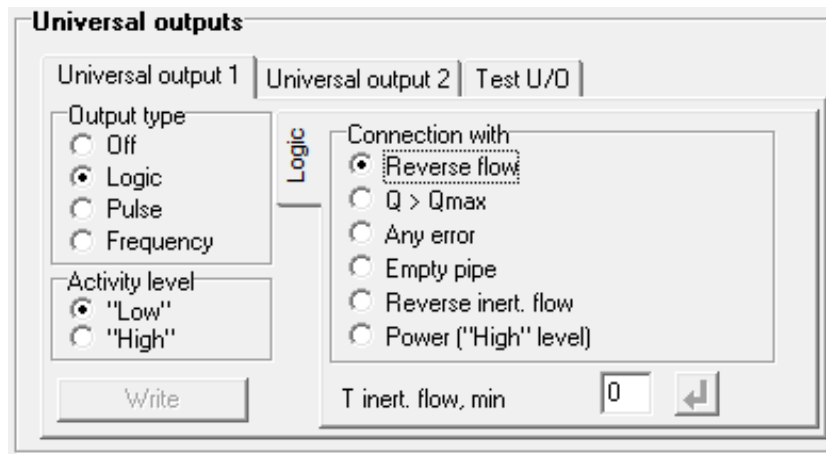


Fig.11. "Logic" tab

How to set functions of the outputs in the logic mode is shown in Table 5.

Table 5

Operating mode of the output	Flow to be controlled	Condition for generating signal / changing logic state
Logic	Reverse flow	Flow direction is changed
	Q > Q_{max}	Q _{max} is exceeded
	Any error	Any error detected by the flow meter
	Power ("High level")	Interruption of power supply
	Empty pipe	Value of resistance exceeds the threshold specified for the pipe filled with liquid
	Reverse inert. flow	Flow direction is changed considering the lag (inertia) time

- ◆ **Reverse flow** – on changing flow direction, signal level on the output is changed without a lag
- ◆ **Q > Q_{max}** – signal level on the output is changed if the actual value of flow rate exceeds Q_{max} for a given DN
- ◆ **Any error** – signal level on the output is changed in case of any alarm situation detected by the flow meter
- ◆ **Power ("High level")** – if the flow meter is powered, signal level on the output is **High**, if power supply voltage drops below the threshold, output signal is absent
- ◆ **Empty pipe** – signal level on the output is changed if "Pipeline filling" function is activated and "partially empty pipe" condition is met
- ◆ **Reverse inert. flow** – signal level on the output is changed if the period of changing flow direction exceeds the preset lag (inertia) time; **T inert. flow** value can be set within (0 to 60) min range; **Activity level** value relates to direct flow.

2.4.6. Testing universal outputs

The universal outputs can be tested in the frequency mode. To select test settings, open **Universal outputs** window, and then **Test U/O** tab (Fig.12).

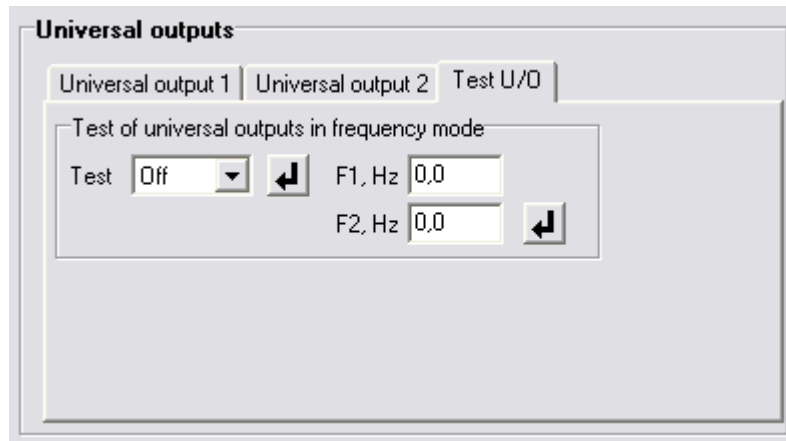



Fig.12. "Test U/O" tab

Test frequency **F1** and **F2** shall not exceed 500Hz for both outputs.

Start testing (**Test On**) by clicking on  button, and then measure frequency of signals on the universal outputs with a frequency meter.

NOTE. To ensure that frequency measurements are correct, it is necessary to set SK1 and SK2 switches on the Processor module to the active mode of operation (see section 1.4.3.2, part I of this manual).

2.5. Quickly configuration of Coefficient KP universal output N1

By default, universal output N2 is set to the modes with the settings listed in Appendix A.

CAUTION! The flow meters with reverse flow function measure flow rate and calculate volume for both forward and reverse flows without considering lag (inertia) time.

J1 and J2 terminals make it possible to quickly configure universal output N1 in the frequency mode. The terminals allow the user to quickly set **Coefficient KP** to a required value. This is done in the Service mode with regard to DN of the flow meter.

CAUTION! By default, **Coefficient KP** is set to a value associated with flow velocity of 5 m/s.

Coefficient KP is set by placing (removing) jumpers between J1 and J2 terminals located on the Processor module. Combinations of jumpers with regard to the value of output scaling constant are specified in Table 6 ("+" means that the terminal contacts are closed by a jumper, and "-" means that the terminal contacts are opened). The preset value of scaling constant is overwritten with a new value associated with the new combination of terminal contacts. The scaling constant can be set programmatically (via interface) to any required value without using jumpers for both universal outputs N1 and N2.

CAUTION! **Coefficient KP** value cannot be changed in the Work mode!

Table 6

Terminals		Scaling constant for universal output N1
J1	J2	
-	-	Can be set via interface
+	-	see table 7
-	+	see table 8
+	+	see table 9

Table 7

DN, mm	20	25	32	40	50	65	80	100	150	200	300
Fmax, Hz	10										
Coefficient KP, p/l	5	3,2	2	1.3	0.8	0.5	0.32	0.2	0.08	0.05	0.02

Table 8

DN, mm	20	25	32	40	50	65	80	100	150	200	300
Fmax, Hz	100										
Coefficient KP, p/l	50	32	20	12.5	8	5	3,2	2	0.8	0.5	0.2

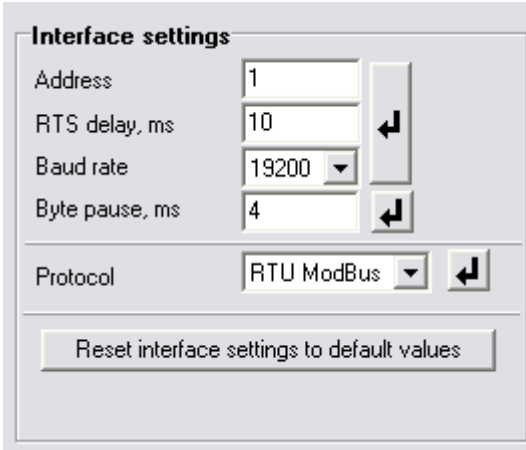
Table 9

DN, mm	20	25	32	40	50	65	80	100	150	200	300
Fmax, Hz	500										
Coefficient KP, p/l	250	160	100	65	40	25	16	10	4	2.5	1

2.6. Connecting flow meters in a network

To configure the flow meter for work in a group of several end users, select the following options from **Interface settings** panel (**Periphery settings** tab, see Fig.13):

- ◆ **Address** – an integer number from 1 to 247
- ◆ **RTS delay** – delay of response via RS-interface, ms
- ◆ **Baud rate** – rate of data exchange in the network (default value – 19200 baud)
- ◆ **Byte pause** – byte timeout, ms
- ◆ **Protocol** – network protocol (RTU ModBus by default).



The screenshot shows a window titled "Interface settings". It contains the following elements:

- Address:** A text input field containing the value "1".
- RTS delay, ms:** A text input field containing the value "10".
- Baud rate:** A dropdown menu currently showing "19200".
- Byte pause, ms:** A text input field containing the value "4".
- Protocol:** A dropdown menu currently showing "RTU ModBus".

Each of the first four input fields has a small button with a right-pointing arrow next to it. Below the dropdown menus, there is a button labeled "Reset interface settings to default values".

Fig.13. "Interface settings" tab

<Reset interface settings to default values> button sets the flow meter to factory-installed data exchange settings.

3. OPERATION PROCEDURE

3.1. Displaying measured values

- 3.1.1. After putting into operation, the flow meter works in the automatic mode. Currently measured values are displayed in **Current values** panel of **Measurement** tab of the Viewer main window.
- 3.1.2. Immediately after launching the Viewer Aflowt MF program (see section 2.1), the fields of **Measurement** tab contain zeroes (Fig.14).

Serial number	0	Diametr, mm	40
Current values			
Current flow	0,000	l/min	0,000
Device work time, h	0,00		
Total volume, m3	0,000000		
Direct volume, m3	0,000000		
Reverse volume, m3	0,000000		
Frequency output 1, Hz	0,000		
Frequency output 2, Hz	0,000		

Fig.14. Part of “Measurement” tab

Clicking on **<Start reading>** button enables readings to be displayed.

- 3.1.3. Measurement results displayed in **Current values** fields are shown in Fig.15.

Serial number	1254217	Diametr, mm	50
Current values			
Current flow	2,058	, l/min	0,123
			, m3/h
Device work time, h	34,26		
Total volume, m3	18,644097		
Direct volume, m3	18,670066		
Reverse volume, m3	0,025969		
Frequency output 1, Hz	1,382		
Frequency output 2, Hz	0,000		

Fig.15. Measurement results

3.1.4. The following flow rate parameters are measured:

- ◆ **Current flow** – volumetric flow rate for any flow direction (l/min, m³/h)
- ◆ **Total volume** – algebraic sum (considering the sign) of volume of forward and reverse flows (m³)
- ◆ **Direct volume** – total volume of direct flow (totalized with "plus" sign) (m³)
- ◆ **Reverse volume** – total volume of reverse flow (totalized with "minus" sign) (m³).

In addition, **Current values** panel displays the values of **Device work time** (h) and frequency of signals on the universal outputs: **Frequency output 1 (2)**, Hz.

3.1.5. **Device status parameters** panel is shown in Fig.16.

Device status parameters:	
Initialization	OK
Firmware checksum	0xCA83
Parameters checksum	0xC975
Mode	Service
Flow direction	Direct
Inertial flow direction	Direct
Current flow range	Low
External Modbus address	No 0

Fig.16. Indication of status

3.1.6. **Device status parameters** are as follows:

- ◆ **Initialization** – indicates the state of flow meter's units, in case of displaying a symbol different from **OK**, the flow meter shall be sent for repair
- ◆ **Firmware checksum** – check sum of flow meter's firmware (CSD)
- ◆ **Parameters checksum** – check sum of flow meter base of settings
- ◆ **Mode** – indicates the currently active mode; **Work** is the mode of normal operation
- ◆ **Flow direction** – direction of the flow in the pipeline
- ◆ **Inertial flow direction** – direction of the flow in the pipeline considering the lag (inertia) time (see section 2.4.5.)
- ◆ **Current flow range** – range of operation (**High, Medium** or **Low**)
- ◆ **External Modbus address** – indicates flow meter's external network address (if specified).

3.2. Display settings

3.2.1. In Aflowt MF-5X0X flow meters, parameters to be displayed are configured in **Display settings** tab shown in Fig.17.

The screenshot shows a software interface for configuring flow meter display settings. At the top, there are two buttons: "Read all" and "Write all". Below these are two main panels. The left panel, titled "Parameters for indication on the display", contains several options with checkboxes and radio buttons. The right panel, titled "Display settings", contains three input fields for numerical values.

Parameter	Value
Indication period, s	3
Display's cutoff, %Qmax	0,0
Contrast	32

Fig.17. Display settings

Parameters to be displayed / hidden are selected by marking/unmarking the checkboxes located next to the corresponding options in **Parameters for indication on the display** panel. In **Display settings** panel, type in required values and click on **<Write all>** button.

3.2.2. **Parameters for indication on the display**

The following parameters can be displayed:

- ◆ **Current flow** – actual value of flow rate; measurement units are selected between **l/min** and **m³/h**
- ◆ **Total volume** – totalized volume
- ◆ **Direct volume** – volume of direct flow

- ◆ **Reverse volume** – volume of reverse flow
Volume measurement units are selected between **l** and **m³**.
- ◆ **Device work time** – total work time
- ◆ **Calibration coefficients K, P** – metrological factors K and P; only coefficients for the active measurement range are displayed
- ◆ **Conversion coefficients for universal outputs KP1, KP2** – **Coefficient KP** parameter is displayed for universal outputs N1 and N2
- ◆ **Checksum of firmware and base of parameters** – checksums of firmware and settings.

3.2.3. Display settings parameters:

- ◆ **Indication period** – measured parameters are cyclically displayed in turn, time of indication of one parameter is selected from 1 to 100 s
- ◆ **Display's cutoff, %Qmax** – threshold (expressed in percent of maximal flow rate) below which measured flow rate values are displayed as zeroes, while calculation of volume and generation of output pulse sequence are being continued
- ◆ **Contrast** – display contrast adjustment (selectable within 8 to 40 conventional units).

3.3. Checking flow meter's operation

3.3.1. The purpose of **Checking information** tab in the Viewer main window is to check metrological parameters of the flow meter and its functioning in real time.

3.3.2. The panel with check data is shown in Fig.18.

Serial number	1254217	Diameter (DN), mm	50
Range limits, %Qmax			
0,00	–	100,00	100,00 – 100,00 100,00 – 100,00
Low flow		Medium flow	
K0+	0,350000	K1+	0,350000
P0+	0,000000	P1+	0,000000
K0-	0,350000	K1-	0,350000
P0-	0,000000	P1-	0,000000
High flow			
K2+	0,350000	K2-	0,350000
P2+	0,000000	P2-	0,000000
Information about user action			
Number of transfers to the mode "Service"	2		
Number of transfers to the mode "Verification"	1		
Number of records in the log of service parameters	25		
Number of records in the log of verification parameters	15		
Firmware information			
Checksum of an executed code (CRC16)	0xDE75		

Fig.18. "Checking information" panel

- 3.3.3. The parameters combined under **Range limits, %Qmax** name show the ranges of flow rate (in percent of maximal value) for which **K** and **P** metrological coefficients displayed in **Low flow**, **Middle flow** and **High flow** are actual.
- 3.3.4. **Information about user action** group informs the users how many times the flow meter has been set to the Service and Verification modes and how many changes have been made in Service and Verification logs.
- 3.3.5. **Checksum of an executed code (CRC16)** field displays flow meter's firmware checksum.
- 3.3.6. Fig. 19 shows the tab with diagnostic parameters that are used by service specialists.

Standard reference	
Reference	1762378
Zero shift	-131
Measure reference	
Reference	1756390
Zero shift	48
Coil resistance	
R initial, Ом	29,4
R current, Ом	31,6

Fig.19. Diagnostic parameters

4. TROUBLESHOOTING

4.1. Alarm (error) situations (ER) are displayed in **Device status** panel (**Measures** tab), see Fig.20.

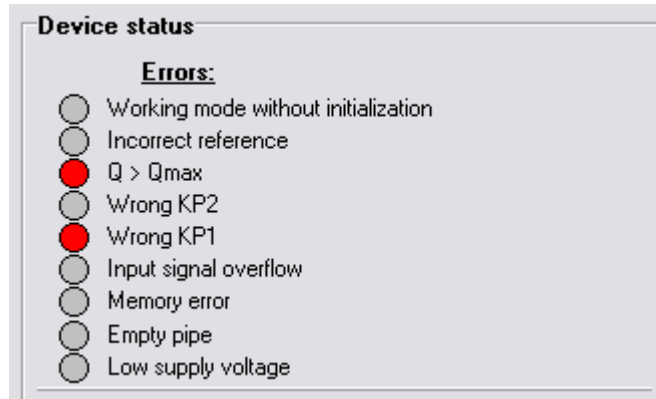


Fig.20. Displaying errors

4.2. ER situation is indicated with ● symbol (red circle) adjacent to the corresponding error in **Errors** panel.

In MF-5X0X flow meters, errors are also displayed in the form of alpha or numeric messages.

Table 10 contains the list of alarm situations.

Table 10

Type of indication		Explanation
On flow meter display	On PC display	
! E	Empty pipe	Value of resistance exceeds the specified "empty pipe" value
! M	Memory error	EEPROM memory error
! 1	Wrong KP1	Incorrect value of Coefficient KP specified for output 1
! 2	Wrong KP2	Incorrect value of Coefficient KP specified for output 2
! O	Input signal overflow	Amplifier gain exceeds the threshold
! Q	Q>Qmax	Actual value of flow rate exceeds Qmax for a given DN
! R	Incorrect reference	No data about reference resistance, hardware failure
! I	Working mode without initialization	Software failure
! P	Low supply voltage	Power supply voltage is below threshold

4.3. On displaying **! R**, **! M** or **! I** symbols on flow meter screen or **Incorrect reference**, **Memory error**, or **Working mode without initialization** messages on PC monitor, the flow meter shall be sent for repair.

4.4. If other error symbols are indicated or no measurement data is displayed, check the following:

- Power supply voltage is applied to the flow meter and secondary power source (if applicable) and conforms to the specifications
- Power circuits are reliably connected
- Liquid is present and running through the pipeline

- Air is not collected in the flow meter's location
- Ambient temperature in the flow meter's location meets the requirements
- Values of **Coefficient KP**, flow rate cutoffs and other settings are correctly specified. Reconfigure the flow meter if necessary.

In case that all of the requirements listed above are met contact the service center (regional dealer) or manufacturer for the information about the device's operability.

NOTE. Under **Memory error** conditions, measurements of flow rate and calculations of volume are being continued. In such a situation it becomes impossible to modify flow meter's settings recorded into the Service log.

- 4.5. If liquid under control flows through the flow meter but the value of measured liquid volume as well as frequency or pulse signal on the output remain the same, check the correspondence between the operation modes of the flow meter's output and the receiving input (see section 2.3.2, part I of this manual).
- 4.6. "AFLOWT MF" flow meter shall be repaired by authorized dealers or by the manufacturer.

APPENDIX A. Standard values for configuration settings

Table A.1

Parameter	Unidirectional flow meter		Bidirectional flow meter	
	Univ. output N1 (<i>XT2</i>)	Univ. output N2 (<i>XT1</i>)	Univ. output N1 (<i>XT2</i>)	Univ. output N2 (<i>XT1</i>) *
1. Operating mode	Frequency	Frequency	Frequency	Logical
2. Application	Forward flow rate	Reverse flow direction	Flow rate (absolute value)	Flow direction used for heat accounting
3. Scaling factor	as per Table A.2	as per Table A.3	as per Table A.2	-----
4. Minimal flow rate cutoffs	$0.001 \cdot Q_{max}$	$0.001 \cdot Q_{max}$	$0.001 \cdot Q_{max}$	-----
5. Maximal frequency	100 Hz (at $0.5 \cdot Q_{max}$)***	500 Hz (at Q_{max})	100 Hz (at $0.5 \cdot Q_{max}$)***	-----
6. Signal level	Low		Low	Low **
7. Lag (inertia) time	-----		-----	10min
8. Output mode	Active		Active	

* - With standard values of configuration settings universal output N2 (for reverse flow) can be used for connection to the logical input of a heat calculating device configured to receive reverse signal

** - For direct flow

*** - Maximal value of output frequency on universal output N1 for default scaling factors is determined at the flow rate value equal to half of maximal flow rate (see table 1, part I of this manual). When the value of flow rate exceeds the preset threshold, the flow meter generates alarm signal **Wrong KP1 (! 1)**.

Table A.2. Standard Coefficient KP values for universal output N1

DN, mm	20	25	32	40	50	65	80	100	150	200	300
Fmax, Hz	100										
Coefficient KP p/l	50	32	20	12.5	8	5	3.2	2	0.8	0.5	0.2

Table A.3. Standard Coefficient KP values for universal output N2

DN, mm	20	25	32	40	50	65	80	100	150	200	300
Fmax, Hz	500										
Coefficient KP p/l	125	80	50	32.5	20	12.5	8	5	2	1.25	0.5