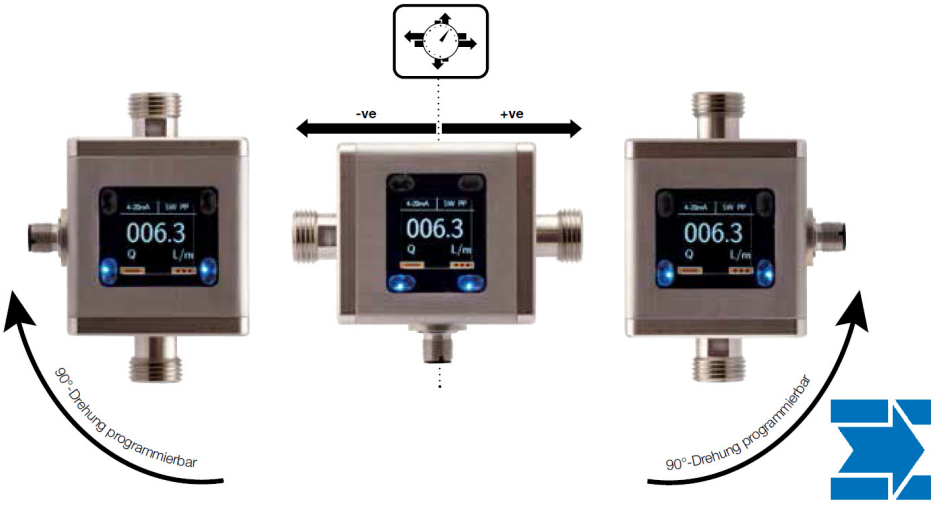
Operating Instructions

for

Electromagnetic Flowmeter

Model: MIM



We don’t accept warranty and liability claims neither upon this publication nor in case of improper treatment of the described products.

The document may contain technical inaccuracies and typographical errors. The content will be revised on a regular basis. These changes will be implemented in later versions. The described products can be improved and changed at any time without prior notice.

1. Contents

Manufactured and sold by:

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2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.
The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EC-machine guidelines.

as per PED 2014/68/EU
In acc. with Article 4 Paragraph (3), "Sound Engineering Practice", of the PED 2014/68/EU no CE mark.
Diagram 8, Pipe, Group 1 dangerous fluids

3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.
Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

Scope of delivery:
The standard delivery includes:

- Electromagnetic Flowmeter model: MIM
- Operating Instructions

4. Regulation Use

The MIM flowmeter has been specially developed for the measurement, display and transmission of both, flow rates and temperature of conductive liquids. The instrument has a graphic TFT display, rotatable in 90 ° steps and can display flow rate, temperature, daily volume counter (resettable) and total volume counter in the units of measurement selected by the operator. A clear menu guides the user through the parameterization of the device, which largely eliminates the need to look into the operating instructions.
Any use of the magnetic flowmeter, model: MIM, which exceeds the manufacturer’s specification, may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

5. Environment

The MIM device with stainless steel housing and stainless steel electrodes is weatherproof and conforms to protection class IP67. The meter is designed for harsh indoor or outdoor environments and complies with Directive 2014/30/EU (Electromagnetic Compatibility).

6. Operating principle

6.1 General

The new KOBOLD MIM Flowmeter is designed to measure and monitor small and medium flows of conductive fluids in piping.
The device works on the magnetic-inductive measuring principle. According to Faraday's law of induction, a voltage is induced in a conductor moving in a magnetic field. The electrically conductive measuring medium corresponds to the moving conductor in the process. The voltage induced by the measuring medium is proportional to the flow rate and thus a measure of the volume throughput. Prerequisite is a minimum electrical conductivity of the flowing medium. The induced voltage is fed to a measuring amplifier via two electrodes, which are in conductive contact with the medium. The volume flow is calculated via the defined pipe diameter.
The measurement is independent of the medium and its physical properties such as density, viscosity and temperature. The device can be configured via the display. There are two outputs available, which can each be configured as alarm, frequency, pulse, voltage, and current outputs.
The device also provides a dosing function. The dosing function can be activated in measuring mode via the four buttons. The dosing function controls simple filling tasks and also measures flow rate and partial amount.

6.2 Minimum electrical conductivity / gas bubbles

For the correct function of the instrument, it is necessary that the flow channel is always completely filled with medium. From a minimum electrical conductivity of 20 µS / cm, the MIM operates within the specified error limits. The conductivity of the medium is constantly monitored by the device electronics. If the electronics detects that the minimum conductivity has fallen below min. value, this is signaled by displaying the error message 'Empty pipe' and the flow rate reading is set to '0'. Air bubbles in the flowing medium or media with varying conductivity in the range of the minimum conductivity can disturb the measuring function and reduce the measuring accuracy of the MIM. Gases contained in the liquid are also measured as a volume flow and lead to measurement errors. If necessary, install appropriate vents in the flow of the unit.

6.3 Deposits

Minor deposits on the measuring tube generally do not affect the measuring accuracy unless their conductivity deviates significantly from the liquid. For liquids that have a tendency to deposit, periodically inspect the meter tube and, if necessary, clean it.

6.4 Measuring electrodes

The MIM uses electrodes with galvanic tapping. They are in direct contact with the medium. The standard electrodes are made of stainless steel 1.4404.

7. Mechanical connection

7.1 Check operating conditions

- flow rate
- max. operating pressure
- max. operating temperature

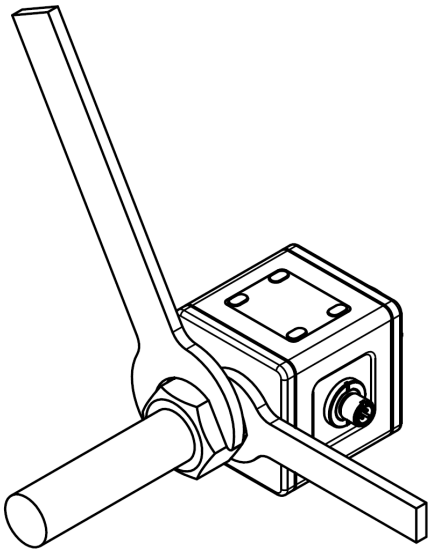
In general, MIM is subjected to the same loads as the piping into which it is installed. The MIM should therefore be kept away from extreme loads, such as pressure surges with strong, dynamic pipe movements, vibrations in the proximity of centrifugal pumps, high temperature media, flooding etc.

7.2 Installation

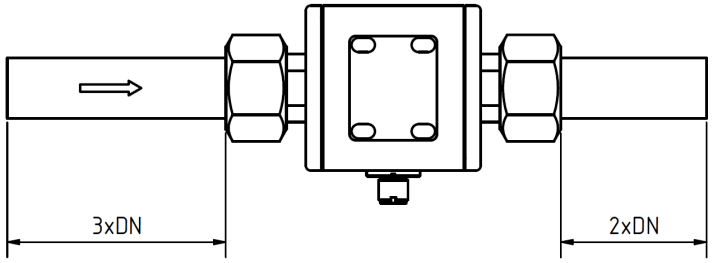
- Remove all packing materials and transport retainers and ensure that no such materials remain in the device.
- It can be installed in vertical, horizontal or rising pipes. Flow in direction of the arrow.
- Avoid pressure and tensile load.
- Mechanically secure the inlet and outlet pipe at a distance of 50 mm from the connections.
- Avoid valves or large reduction on the inlet section (this increases the inaccuracy of measurements).
- Check the leak tightness of the connections.

While mounting MIM hold the flowmeter from spanner surface (not from the housing) with the help of spanner.
Take into account the tightening torque.

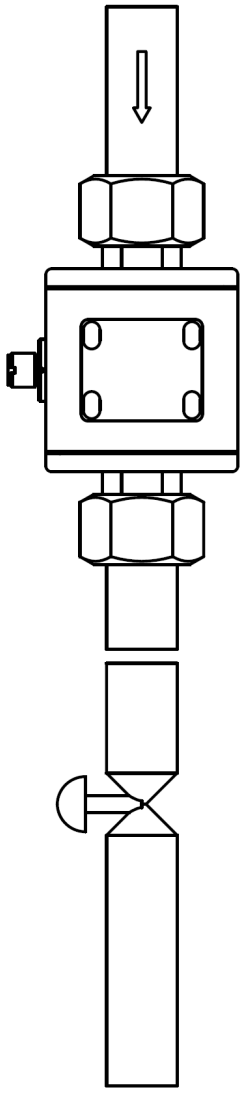
Nominal size	Tightening torque
½“	22 to 24 Nm
¾“	28 to 30 Nm
1“	28 to 30 Nm



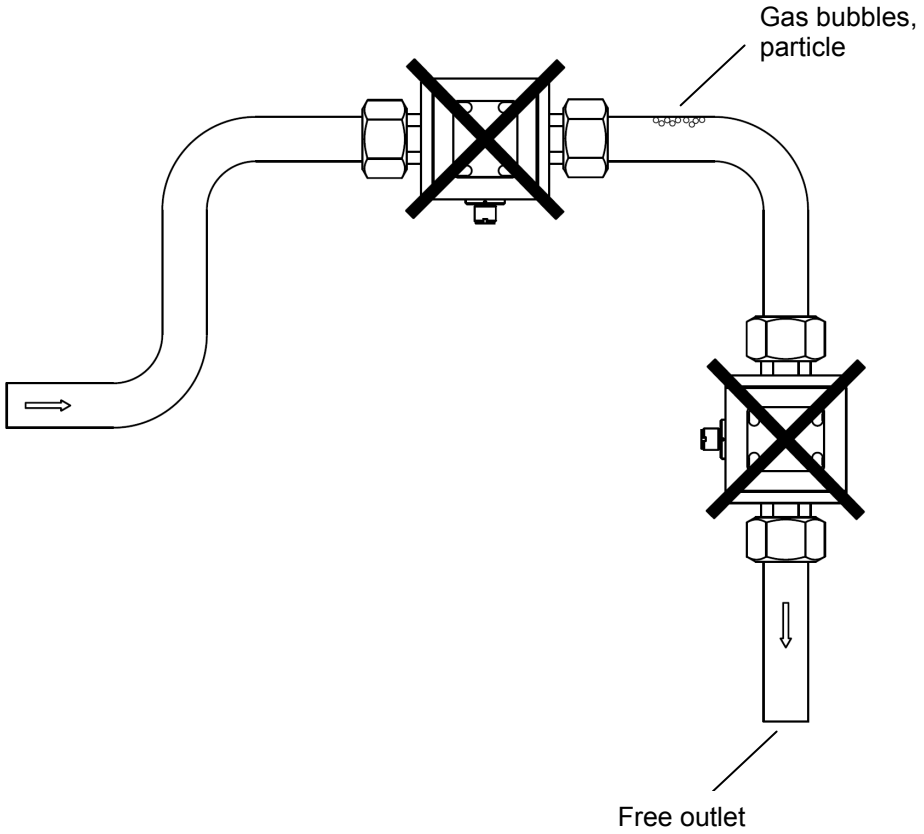
Inlet and outlet run



Installation from top to bottom



avoid these installation locations



8. Electrical Connection

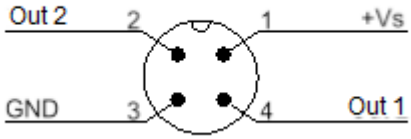
8.1 General

Attention! Make sure that the voltage values of your system correspond with the voltage values of the measuring unit.

- Make sure that the supply wires are de-energised.
- Connect the supply voltage and the output signal **to the plug PIN's as stated below.**
- We recommend the use of wires with cross sectional area of min. 0.25 mm².

Attention! The measuring electrodes are galvanically connected with the reference potential of the supply voltage and the signal output.

8.2 Pin assignment

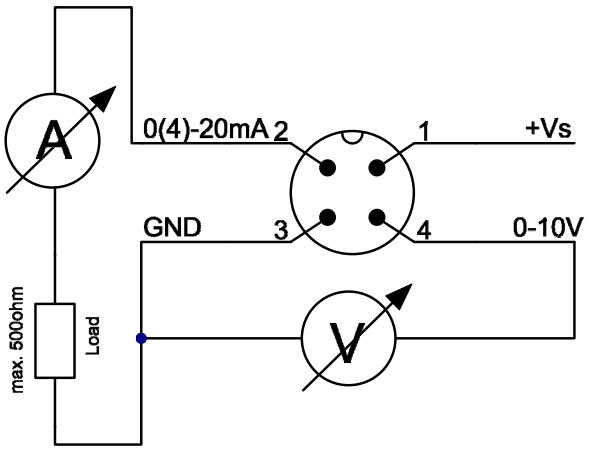


Configurable output functions:

Out 1	Out 2
analogue output 4-20 mA	analogue output 4-20 mA
analogue output 0-20 mA	analogue output 0-20 mA
analogue output 0-10 V	analogue output 0-10 V
alarm output	alarm output
pulse output	pulse output
frequency output	frequency output

Connection example:

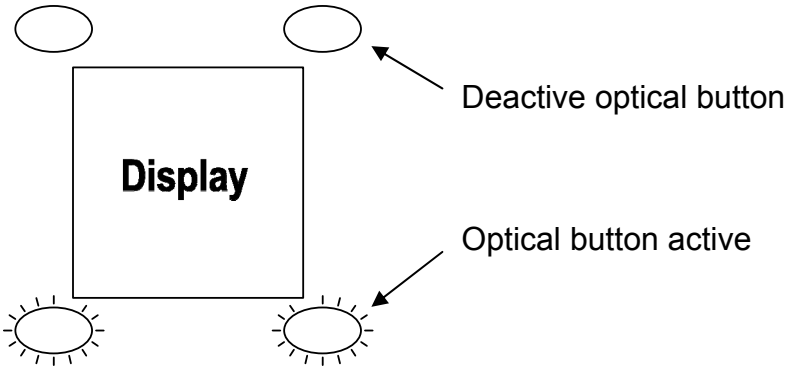
OUT2: analogue output 4-20 mA
OUT1: analogue output 0-10 V



9. Operation and menu structure

9.1 General

9.1.1 Operation of the optical buttons



An optical button is located at each corner of the TFT display. The operability of the respective buttons is signaled by blue backlighting; therefore non-backlit buttons are disabled and cannot be operated. To operate the keys, the finger must be placed on the key-dome and raised again. The orange background of the button symbols is briefly displayed in blue as visual feedback for a detected key press.

To avoid accidental operation in measuring mode, the operator must hold down the menu button for 3-5 seconds to activate the function. If the menu button is held down for more than 3 seconds, the blue backlighting will begin to flash to alert the user to release the button.

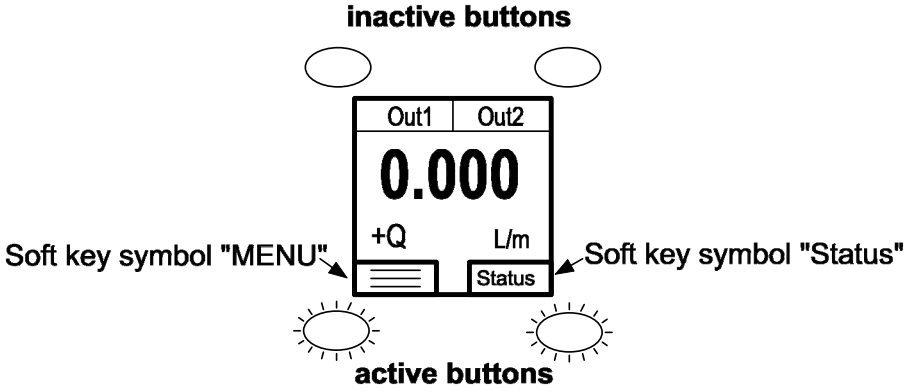
The operation of the optical buttons can also be done with gloves or other optically reflective objects, light dirt on the surface usually does not interfere with the key function.

9.1.2 Function of the control buttons

The function of each control key can be recognized by the respective symbol displayed in the corners of the TFT display.

key symbol	designation	function	
		Measuring mode	menu mode
	menu mode	Activate menu mode hold **3-5 sec.**	-
	info display	opens the info menu	-
	down	-	Scroll down menu / decrease numeric value when entering numeric value

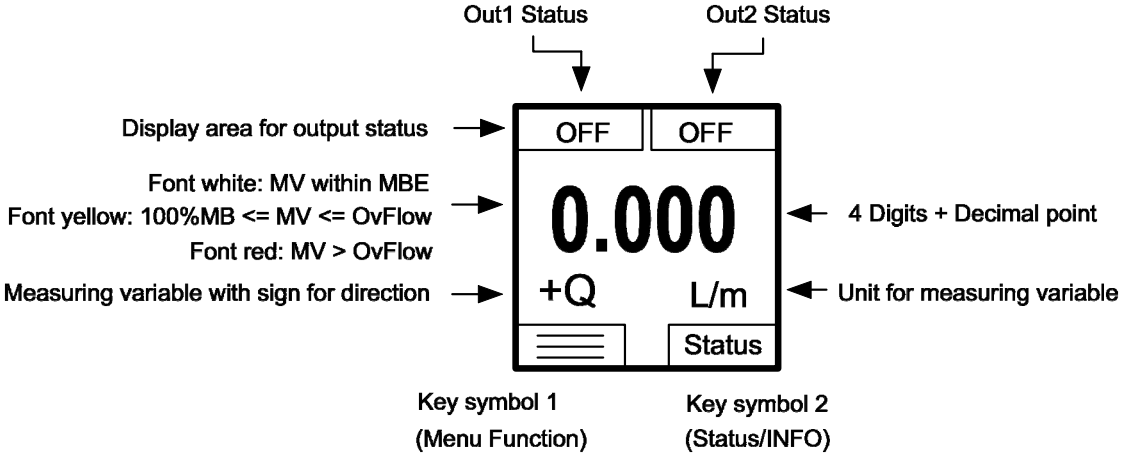
key symbol	designation	function	
		Measuring mode	menu mode
	up	-	Menu scroll up / Increase the number value for numeric value input
	forward	-	Menu level lower / forward (last menu level: Save value)
	backward	-	Menu function: menu level higher / back (last step: exit menu)



9.2 Measuring mode

After applying the supply voltage, the device starts in measuring mode. In this mode, the measured values of the respective measuring variables are continuously recorded; the current instantaneous flow values, temperature values and the volume counter readings are cyclically calculated and displayed according to the type of display.
In addition to the main display, the states and configuration of the outputs are shown in the display. If the corresponding output is configured as an alarm output, the status is also displayed with a green or red background color. If the background color is green, the set threshold value is exceeded; if it is red, the current value is still under threshold.

Measurement Mode Display Layout 'Single'



The measurement variables are represented by their corresponding symbols:

Measuring variables

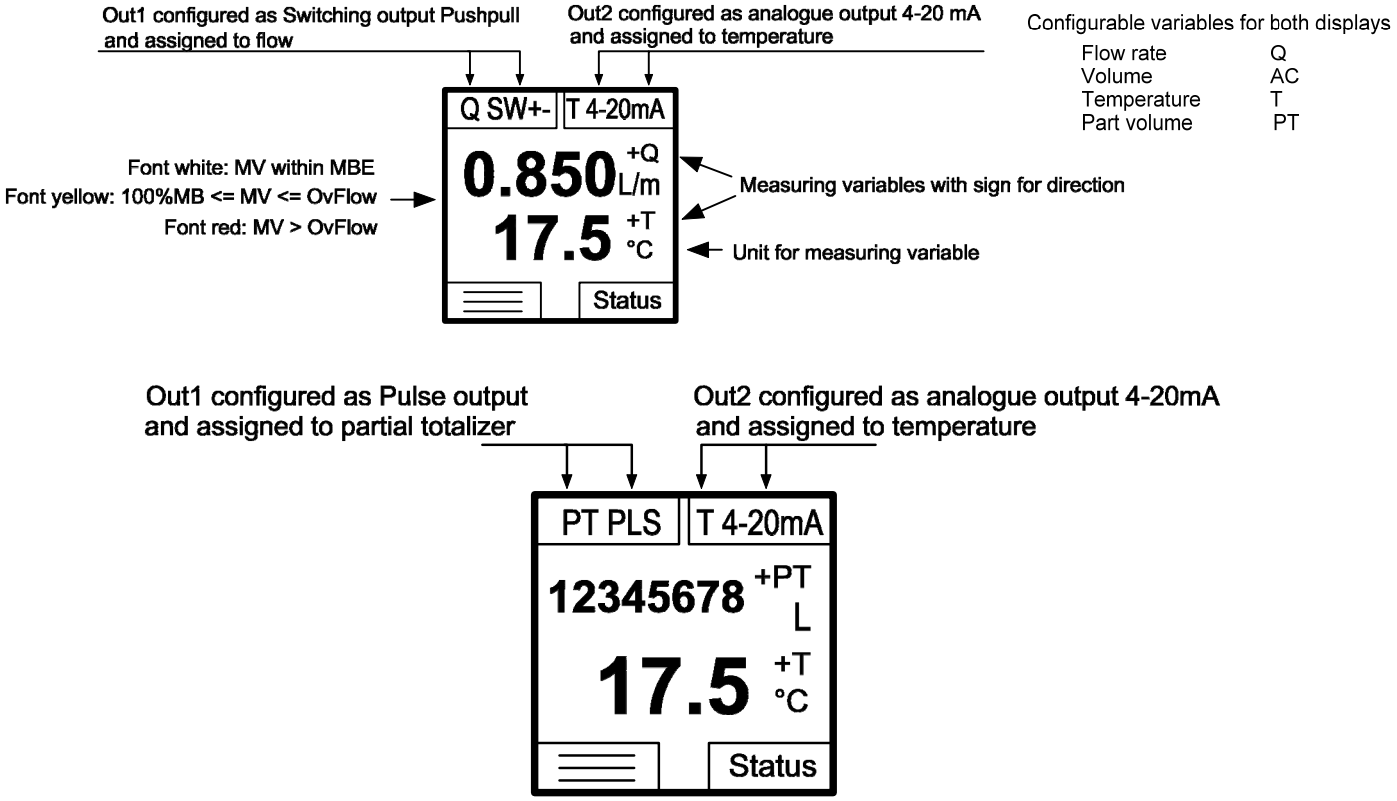
Menu entry	Symbol	Description
Flow	Q	Flow rate
Volume	AC	Accumulated totalizer
Temperature	T	Medium Temperature
Part volume	PT	Partial totalizer

The outputs and their status are shown on the display as follows:

Output function OUT1/2	Symbol
Disable	OFF
Analog output 4-20mA	4-20mA
Analog output 0-20mA	0-20mA
Analog output 0-10V	0-10V
Alarm output PushPull	SW+-
Alarm output PNP	SW+
Alarm output NPN	SW-
Pulse output	PLS
Frequency output	FRQ
Communication mode	COM

The measured variables flow, temperature and volume counter can in principle be assigned to each output function. The assignment of the respective output is indicated by the display of the symbol of the measuring variable. The representation of the assignment is independent of the set display layout (single, dual).

Measurement Mode Display Layout 'Dual'



9.2.1 Display area of the flow meters

The number of digits displayed on the volume counter display (partial and total volumetric counters) is limited to max. 8 digits. The partial and total volumetric meters therefore have a smaller font size than the flow and temperature display. If the 8-digit display range of the meter is exceeded, this is indicated by the display of 8 minus characters (--------). In this case, the meter reading can no longer be read. The user now has the option of bringing the counter reading back into the display area by changing the volume counter unit.

9.3 Menu Mode

In menu mode, all device parameters can be set. The individual parameters are arranged in menu groups by function. While the menu mode is activated, the signal processing and the outputs are still active in the background. However, all display parameters and outputs are updated after exiting the menu mode or in the measuring mode.
Note: The menu mode will not exit automatically after a certain time without using the buttons. The menu mode remains active until the user presses the button to the measuring mode.

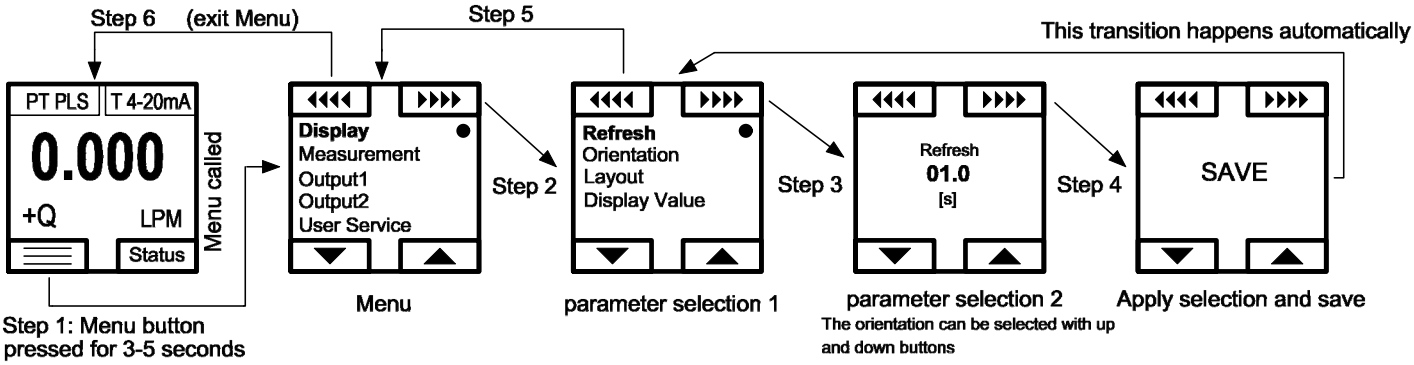
9.3.1 Parameter setting

9.3.1.1 List Selection

Parameters with predefined selection values are defined by means of list selection. The currently selected menu item is displayed in orange text. The selection can be moved with the keys, the key is used to accept the selection.

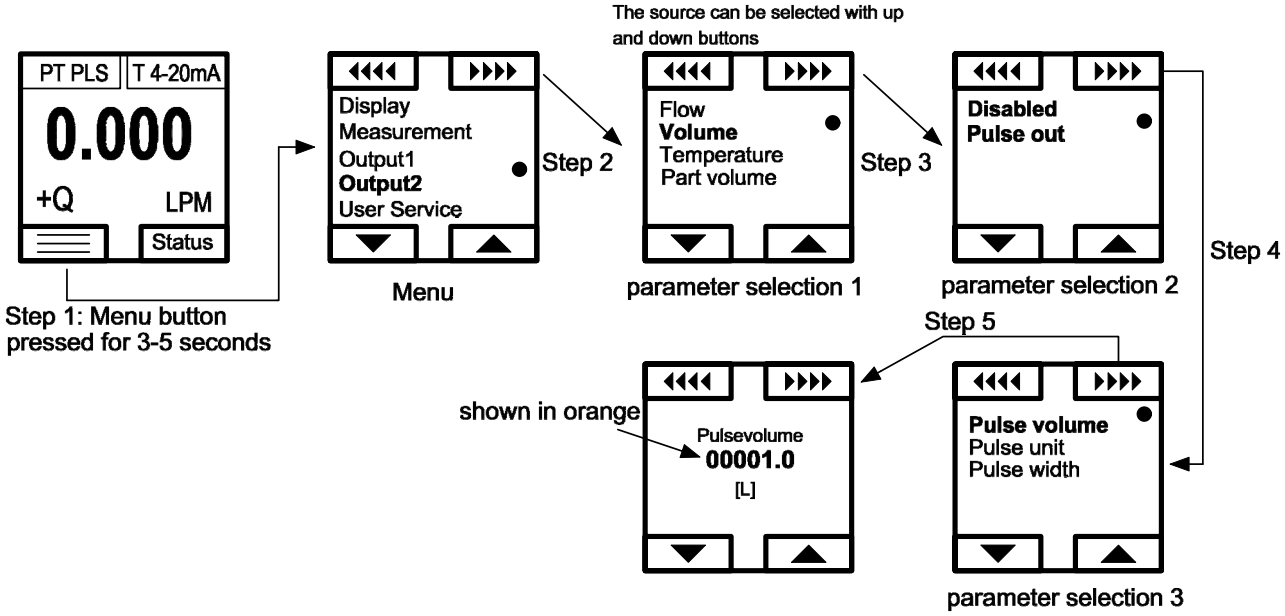
To activate the menu mode, press the button for 3-5 seconds. The parameters are divided into main groups and subgroups.

The buttons are used to select the main groups. In the main menu not all menu groups can be shown on the display at the same time, the list of individual menu items then scrolls up or down when the selection has reached the top or bottom. To choose the selection, the key is pressed and the device jumps to the corresponding submenu or parameter setting level. For selection of predefined parameter values and are used. After changing the value of the parameter and confirming with the parameter is saved and the return to the higher menu level. To return to the main menu or to exit the menu mode, press (repeatedly) .



9.3.1.2 Numerical value input

When setting parameters with a numerical value, the assigned unit is always displayed below the input field in square brackets in the input function. The maximum size and the number of decimal places are fixed and cannot be changed. After calling the input function, first the left, outer digit is displayed in orange. This position can now be adjusted either with the keys [▼] [▲] in the value from 0 to 9. By pressing the key [▶▶▶▶] , the entry point moves to the right and the next digit can be changed. By pressing the key , [◀◀◀◀] the editing point can be moved to the left again. If the editing point is on the far right, the set value is saved by pressing the key again [▶▶▶▶] and switched to the higher-level menu function.



10. Device configuration

10.1 Sequence of device parameterization

The flowmeter MIM is pre-configured in factory. Changing the parameters "Measuring range" and "Sensor constant" or "K factor" is therefore not permitted. The adjustment of these parameters is only possible on the part of Kobold-factory.
In the event of subsequent changes to volume or throughput units, the dependent parameters are converted and adjusted accordingly. However, the limit parameters of the switching outputs must always be checked and adjusted manually when adjusting volume or throughput units - these are not automatically converted.

An accidental change of the parameterization can be revised by the function "Reset factory setting" in the menu Service / User menu / Factory setting.

10.2 Overview of the menu functions / device parameters

The Kobold flowmeter MIM gives user the opportunity to make the parameterization easily via the settings menu. In the following table, the menu structure is structured by level. Using this table, each parameter and function of the device can be set and configured.

Menu level	Sublevel	Parameter level	Subparameter level 1	Sub-parameter level 2	Sub-parameter level 3	Description	Value range	Default value
Display	Refresh	*[sec]*	*n.A.*	*n.A.*	*n.A.*	Sets display refresh rate	*0.5-10*	*0.5 sec*
	Orientation	*rotate CW*				rotates the display 90° clockwise	*n.A*	*n.A*
		rotate CCW				rotates the display 90° counter clockwise		
	Layout	Single				shows only one input variable on the main display	*n.A*	*n.A*
		Dual				shows two input variables on the main display		
	Display value	Upper display	*List selection*			variable to be displayed on main or upper display	*(Variables depend on the type of sensor connected. For MIM 4 Variables available i.e. Flow, Volume, Temperature, Part volume)*	*n.A*
		Lower display	*List selection*			variable to be displayed on lower display		
Measure-ment	Flow	Unit	*List selection*			sets flow units	*ml/m, L/m, L/h, m3/h, galUS/m, galUS/h, galUK/m, galUK/h, User*	*L/m*
		Cut off	*numerical input*			suppresses flow below this value	*0 ≤ **Value** ≤ M. range start*	*0.04*
	Volume	Counting type	absolute/ bidirectional			sets the counting method for accumulated totalizer	*n.A.*	*absolute*
		Unit	List selection			sets volume units	*ml, L, m3, galUS, galUK, User*	*L*
	Temperature	Unit	List selection			sets temperature units	°C, °F, User	*°C*
	Part Volume	Counting type	absolute/ bidirectional			sets the counting method for partial totalizer	*n.A.*	*absolute*
		Unit	*List selection*			sets volume units	ml, L, m3, galUS, galUK, User	*L*
		Memory reset	Yes/No			resets partial totalizer	*n.A.*	*n.A*

Menu level	Sublevel	Parameter level	Subparameter level 1	Sub-parameter level 2	Sub-parameter level 3	Description	Value range	Default value
Output 1/ Output 2	*Hier wird erst die Variable ausgewählt, die ausgegeben werden sollte* *The user is supposed to select the variable he wants to give out as output*	Flow	Alarm Output	Function	*List selection*	sets function of alarm output	*Limit/Window*	*Limit*
				Output Type		sets characteristic of output	*NPN/PNP/PP*	*NPN*
				Switch Function		sets switching function	NO/NC	*NO*
				Threshold	*numerical input*	sets threshold	*M. range start* ≤ ***Value*** ≤ *M. range End*	*1 L/m*
				Hysteresis		sets hysteresis	-9999,0 ≤ ***Value*** ≤ +9999,0	*1 L/m*
				Suppression factor		switching delay factor	0 ≤ ***Value*** ≤ 60	*0*
			4-20 mA	*Value for 4 mA*		sets variable value for 4mA	*M. range start* ≤ ***Value*** < *Value for 20 mA*	*0 L/m*
				Value for 20 mA		sets variable value for 20mA	*Value for 4 mA* <***Value*** ≤ *M. range End*	*100 L/m*
			0-20 mA	*Value for 0 mA*		sets variable value for 0mA	*M. range start* ≤ ***Value*** < *Value for 20 mA*	*0 L/m*
				Value for 20 mA		sets variable value for 20mA	*Value for 0 mA* <***Value*** ≤ *M. range End*	*100 L/m*
			0-10 V	*Value for 0 V*		sets variable value for 0V	*M. range start* ≤ ***Value*** < *Value for 10 V*	*0 L/m*
				Value for 10 V		sets variable value for 10V	*Value for 0 V* <***Value*** ≤ *M. range End*	*100 L/m*
			Frequency output	*max. Frequency*		sets max. frequency to be given out at Full scale	*50-1000 Hz*	*500 Hz*
				Overflow		sets overflow in % of max.freq	1-100	*1%*
				Value for 0 Hz		sets variable value for 0Hz	*M. range start* ≤ ***Value*** < *Value for 0 Hz*	*0 L/m*
				Value for max Hz		sets variable value for max Hz	*Value for 0 Hz* <***Value*** ≤ *M. range End*	*100 L/m*
		Volume	Pulse output	Pulse unit	*List selection*	sets volume units for Pulse volume	ml, L, m3, galUS, galUK, User	*L*
				Pulse volume	*numerical input*	sets volume represented by one pulse	0-999	1 L
				Pulse width		sets width of each pulse	1-20000	1ms

Menu level	Sublevel	Parameter level	Subparameter level 1	Sub-parameter level 2	Sub-parameter level 3	Description	Value range	Default value
		Temperature	Alarm Output	Function	*List selection*	sets function of alarm output	*Limit/Window*	*Limit*
				Output Type		sets characteristic of output	*NPN/PNP/PP*	*NPN*
				Switch Function		sets switching function	NO/NC	*NO*
				Threshold	*numerical input*	sets threshold	*M. range start* ≤ ***Value*** ≤ *M. range End*	*1 L/m*
				Hysteresis		sets hysteresis	-9999,0 ≤ ***Value*** ≤ +9999,0	*1 L/m*
				Suppressionf actor		switching delay factor	0 ≤ ***Value*** ≤ 60	*0*
			4-20 mA	*Value for 4 mA*		sets variable value for 4 mA	*M. range start* ≤ ***Value*** < *Value for 20 mA*	*0 L/m*
				Value for 20 mA		sets variable value for 20 mA	*Value for 4 mA* <***Value*** ≤ *M. range End*	*100 L/m*
			0-20 mA	*Value for 0 mA*		sets variable value for 0 mA	*M. range start* ≤ ***Value*** < *Value for 20 mA*	*0 L/m*
				Value for 20 mA		sets variable value for 20 mA	*Value for 0 mA* <***Value*** ≤ *M. range End*	*100 L/m*
			0-10 V	*Value for 0 V*		sets variable value for 0 V	*M. range start* ≤ ***Value*** < *Value for 10 V*	*0 L/m*
				Value for 10 V		sets variable value for 10 V	*Value for 0 V* <***Value*** ≤ *M. range End*	*100 L/m*
			Frequency output	*max. Frequency*		sets max. frequency to be given out at Full scale	*50-1000 Hz*	*500 Hz*
				Overflow		sets overflow in % of max.freq	1-100	*1%*
				Value for 0 Hz		sets variable value for 0Hz	*M. range start* ≤ ***Value*** < *Value for 0 Hz*	*0 L/m*
				Value for max Hz		sets variable value for max Hz	*Value for 0 Hz* <***Value*** ≤ *M. range End*	*100 L/m*
		Part volume	Pulse output	Pulse unit	*List selection*	sets volume units for Pulse volume	ml, L, m3, galUS, galUK, User	*L*
				Pulse volume	*numerical input*	sets volume represented by one pulse	0-999	1 L
				Pulse width		sets width of each pulse	1-20000	1ms
User Service	Change Password	*numerical input*	*n.A.*			protects user service with password if it is set other than 00000	*00000-99999*	*00000*
	Factory reset	Yes/No				sets all the settings to factory settings	*n.A.*	*n.A.*
	Lock Menu	Lock/Unlock				*locks the menu entry using same password as set under 'Change Password'*		*Unlock*
Factory Service	Password protected							
Device Status	Kobold Logo with Firmware version							

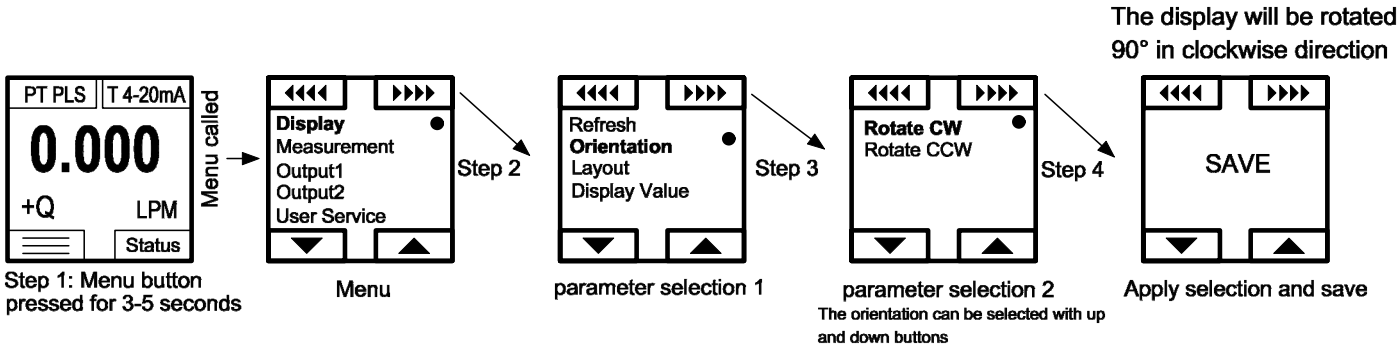
10.3 Display

10.3.1 Refresh

Parameter "Refresh" defines the time interval within which the measuring variables are displayed. The state of the outputs (current output, voltage output, frequency output) is also recalculated after the measuring time has expired.
The "Refreshrate" can be increased in steps of 0.5 sec. to 10 sec. An increase in the refresh rate time causes on one hand an increased "filtering" of the input signals, but also an increased reaction time for the outputs.

10.3.2 Orientation

With the menu item "Orientation" the display can be rotated either clockwise or counterclockwise in 90 ° increments. As the display rotates, both the display contents and the function of the 4 control buttons are turned.



10.3.3 Layout

This parameter can be used to configure the display to either show one measurement variable or two measurement variables.

10.3.4 Display value

With the aid of this parameter, the measurement variables provided by the transmitter can be displayed. Depending on the 'Layout' display, either one or two measuring variables can be displayed.

10.4 Measurement

The Measurement menu lists the measurement variables that the transmitter provides. For magnetic inductive flowmeter, these are:

- Flow
- Volume (total volume counter)
- Temperature
- Part volume

Each measurement variable is still divided into its own submenu. In the submenu, all parameters relating to the respective measuring variables can be adjusted.

10.4.1 Flow

10.4.1.1 Unit

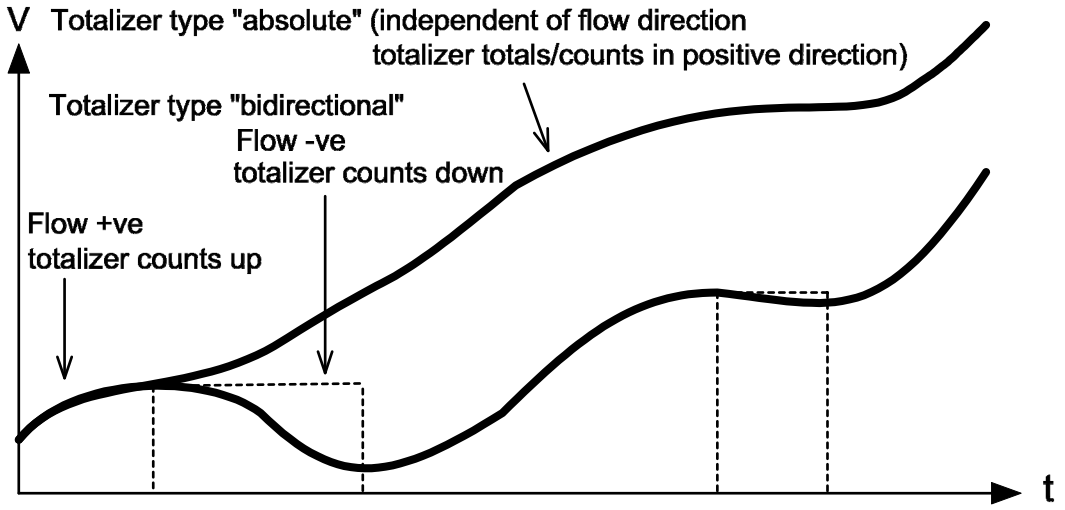
The displayed unit for the flow measurement can be selected from various predefined standard units. It is also possible to define a user-defined unit ("user"), here the "user unit" must be in liters / min. be programmed.
e.g. Unit User = 100 LPM, if Q = 500 LPM then the display shows 5 users.

10.4.2 Volume

10.4.2.1 Counter type

Absolute:
Regardless of the flow direction, the calculated partial volume is added to the counters.
Bidirectional:
Depending on the flow direction, the calculated partial volume is added or subtracted to the counters. If the measured flow value is negative, the volume value goes down from measurement to measurement (possibly into the negative range).

Volume measurement by different totalizer types



10.4.2.2 Volume unit

The parameter "Volume unit" defines the volume unit of all volume meters. The listed volume units are available. When changing the volume unit, the current counter readings are converted to the new volume unit.

10.4.3 Temperature

10.4.3.1 Unit

The displayed unit for the temperature measurement can be selected from various default units. It is also possible to define a user-defined unit ("user"), in which case the "user unit" must be programmed in ° C.

e.g. Unit user = 50 ° C, if T = 50 ° C then the display shows 1 user.

10.4.4 Part Volume

10.4.4.1 Counter type

Absolute:
Regardless of the flow direction, the calculated partial volume is added to the counters.
Bidirectional:
Depending on the flow direction, the calculated partial volume is added or subtracted to the counters. If the measured flow value is negative, the volume value goes down from measurement to measurement (possibly into the negative range).

10.4.4.2 Volume unit

The parameter "Volume unit" defines the volume unit of all volume meters. The listed volume units are available. When changing the volume unit, the current counter readings are converted to the new volume unit.

10.4.4.3 Memory reset

In this menu, the part quantity counter can be reset.

10.5 Outputs

The MIM flowmeter provides a total of 2 outputs that are freely configurable. The configuration of the outputs (output 1 and output 2) is done via a wizard function. The wizard function guides the user step by step through all necessary settings.

Steps:

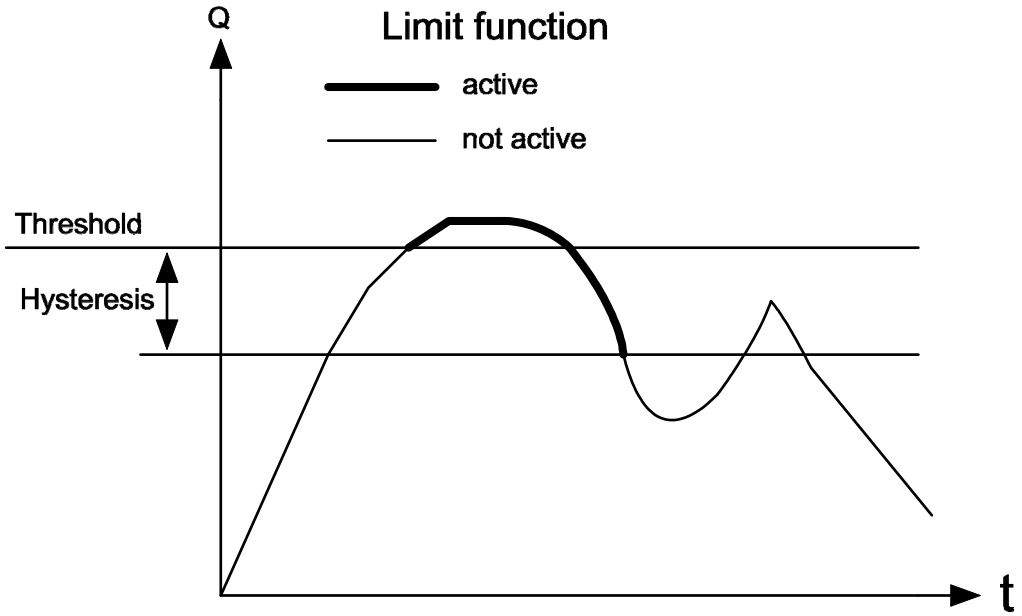
- Select output
- Selection of the source or the measurement variable to be output (Flow, Volume, Temperature, Part volume)
- Selection of an output type (4-20 mA, 0-20 mA, 0-10 V, alarm, pulse, frequency output)
- Setting the output (scaling, thresholds)
- Save the configuration

10.5.1 Alarm output

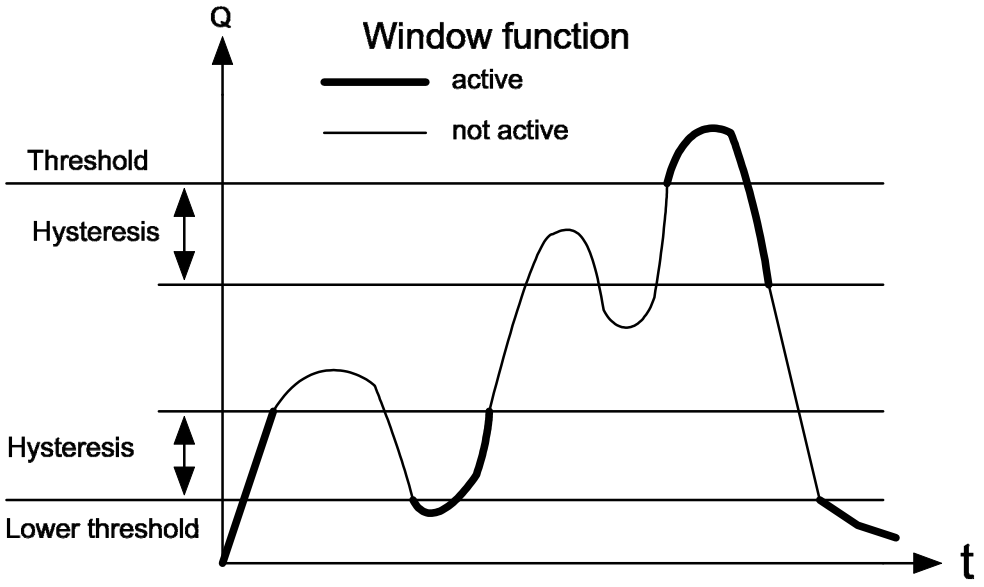
The alarm outputs can be parameterized with a limit value function or a window function.

10.5.1.1 Function

The parameter *"Function"* defines the basic function. Limit value function and window function are available.
Limit value function: The switching output is **active** if the current flow rate value is above the switching threshold. It remains **active** until the measured value has fallen below the switching threshold minus the hysteresis.



Window function: The switching output is **active** if the current flow measured value is outside a window, which is formed by the *"switching threshold"* and the *"lower threshold".* The monitored window decreases in each case by the amount of the *"hysteresis"*. If the switching output is to be **active** within the window, the parameter *"switching function"* must be changed from N/O to N/C.



10.5.1.2 Output type

The parameter *"Output type"* defines the function of the transistor output. NPN, PNP or PP (push-pull) output types are available. The push-pull type combines NPN and PNP and is therefore the best choice for most circuits. All outputs are short circuit and overload protected.

10.5.1.3 Switching function

The *"switching function"* defines the mode of operation of the outputs. In the default setting "normally open", the output becomes active (switched) when the measured value exceeds the switching threshold. This feature is also referred to as N.O.
In the *"Normally closed"* setting, the output below the switching threshold is already active and is deactivated when the measured value exceeds the switching threshold. This function is also referred to as N.C.

10.5.1.4 Threshold

Threshold for limit value function and upper window point for window function.

10.5.1.5 Lower threshold

The "lower threshold" defines the lower limit when using the window function. When using the limit value function, this parameter remains ineffective.
The switching thresholds can be set both positive and negative. The setting of the negative switching thresholds is used for "A-B" function, whereby the flow indicator can be negative. When changing the input type, the switching thresholds must be checked again and corrected if necessary.

10.5.1.6 Hysterese

The appropriate setting of the "hysteresis" parameter ensures that the switching outputs do not switch on and off continuously when the current measured value fluctuates around the switching threshold. The hysteresis value should therefore always be greater than the real measured value fluctuations. As a result, a targeted suppression can be achieved.

10.5.1.7 Interference suppression factor

Further suppression of the switching outputs of fluctuating measuring signals can be achieved by setting the parameter "Suppressor factor". If this parameter is selected greater than one, then the switching threshold must be exceeded in succession with the frequency of the set value before the corresponding switching output is activated. With this function, sporadic limit overruns can be safely suppressed. However, the response time increases according to the level of the "suppression factor".
It is also possible to use the switch outputs with "limit function" for "direction detection". To do this, the "Input type" in the "Signal input" menu must be set to "Direction detection". In this case, both the "switching threshold" and the "hysteresis" must be set to '0'. When changing direction, the switching output switches depending on the "switching function".

10.5.2 Analogue outputs

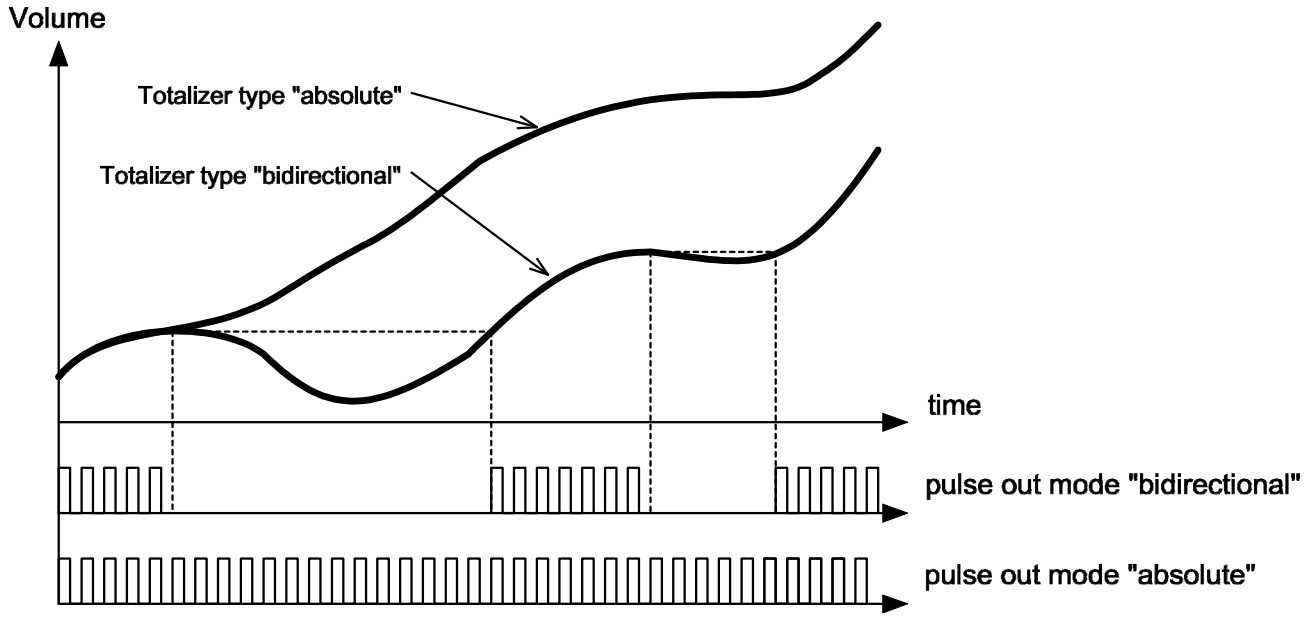
10.5.2.1 Current output 0(4)-20 mA

The current output gives a measured variable (flow or temperature) in scaled form as a 0 (4) -20 mA current signal.
Flow rate for 20 mA
The current output is scaled via the "Value for 20 mA "and" Value for 4 mA "(with current output 0-20 mA" Value for 0mA "). By default, the "Value for 20mA" parameter is set to the value for the end of the measuring range, but can be parameterized as desired within the measuring range, but always >> as the measuring range start value. The parameters "Value for 4mA" / "Value for 0mA" define the measured values for the starting current value, which may also be set freely in the measuring range.
Note 1: If the value is set smaller than the end of the measuring range, the resolution and accuracy of the output voltage value are reduced.

10.5.3 Pulse output

The MIM flowmeter provides a scalable pulse output. When the pulse output is activated, the incoming volume is converted to the output pulse train. The pulse width of the output pulse is adjustable in the range of 1 ms to 20,000 ms.
The electrical output type of the pulse output is push-pull, therefore HIGH and LOW are actively switched through at the output.

Pulse output function with different totalizer types



Behavior on OVERFLOW:
If the volumetric flow measurement is in the OVERFLOW range, the pulse output is switched off and a constant HIGH level is applied to the output.

Generation of the output pulse train:
The maximum adjustable pulse rate at the pulse output is 1000 pulses per liter. That the minimum pulse volume that can be represented with the pulse output is 0.001 L per pulse. Furthermore, the set pulse volume must fulfill the following condition:

$$\frac{\text{Measuring range end} * \left(1 + \frac{\text{Overflow value}}{100}\right)}{60 * \text{Pulsvolumen}} \leq \frac{0{,}5}{Pulsbreite\ (ms)}$$

If the upper condition is not met, it may happen that with low pulse volume the output pulse train lags behind after switching off the input frequency and the user is advised to check the settings again. The following message is displayed: "Lagging possible, please check the setting".

Since the measuring range end value is set at the factory, the user should, when configuring the pulse output, carry out a computational check to see whether the upper condition is fulfilled.
The pulse output only takes place in measuring mode, while the menu mode is active no pulses are given. The pulses accumulated in the menu mode are output as soon as the measuring mode is active again. Depending on the situation, this can also lead to a longer pulse lag.

10.5.3.1 Pulse volume

The parameter "Pulse volume" is defined as volume quantity for the output of a pulse; the unit is corresponding to [volume quantity / pulse]. The likewise common pulse rate [pulse / volume unit] corresponds to the reciprocal of the pulse volume.
Example: Desired pulse rate at the output 10 pulses / liter => pulse volume = 1 / pulse rate = 1/10 L = 0.1 L

10.5.3.2 Volume unit

The volume unit to be set is the input unit for the "Pulse volume" parameter. The definition of a user-defined unit ("user") is also possible and can be programmed in "liters".
Example:
Unit "user" = 10 [L], pulse volume = 2 [user]
The total pulse volume would be 2 * 10 = 20 [L]. After 20 liters, a pulse is output.

10.5.3.1 Pulse width

The pulse width of the pulse output is flexibly adjustable from 1 to 20,000 ms.

10.5.4 Frequency output

The MIM flowmeter provides a scalable frequency output. When this output is activated, the measurement variable (flow or temperature) associated with the frequency output is output proportionally as a frequency with a 1: 1 pulse / pause duration. The output frequency at the end of the measuring range can be set (parameter "maximum frequency"). With the two parameters "Value for 0 Hz" and "Value for max Hz", the frequency output in the measuring range can be freely scaled.
Behavior on OVERFLOW:
If the measured value is in the overflow range, a constant frequency is output at the output with the value of the parameter "Overflow". The parameter "Overflow" must always be greater than the parameter "max. Frequency "
The electrical output type of the frequency output is fixed push-pull, therefore HIGH and LOW are actively switched through at the output.

10.6 User service

The user service provides the user with a reset function and password setting. Together with the activation of a user password, therefore, the menu access for the user on the part of a master user can be blocked.

10.6.1 User service / change password

In the factory setting the user password is set to "00000", the user functions are thus freely accessible. If the user password is changed to other than "00000", the password prompt becomes active the next time the user menu is entered. If the set password is no longer known, a master password can be requested from KOBOLD.

10.6.2 User service / factory setting

By activating this function, the user can reset the device to the factory settings. Any user settings will then be lost and the device will be back in delivery condition.

10.7 Service / Factory service

The factory service function is password protected and not accessible to the user.

10.8 Information

10.8.1 Status

The electromagnetic flowmeter can detect and display various device or application errors.
If there is a status or error message, the STATUS symbol in the display alternately flashes orange / red. To call up the status / error information, the status key must be pressed, then the status window that appears then lists all the messages that have accumulated up to this point in time. By pressing the ·◁◁◁·· key, the user confirms the knowledge of the displayed errors, the status memory is cleared and the status window is closed. If one of the displayed errors persists, it will be reported again by flashing the status icon.
The following status / error messages are generated:

Display text	Description	Debugging
Empty Pipe	Measuring tube is not completely filled with medium or medium with too low conductivity is used.	Check the filling of the measuring circuit or conductivity of the medium (> 20 µs / cm)
Temp Sens Error	Error in the temperature measuring circuit	Repair by KOBOLD Service necessary
Meas saturated	Flow measuring circuit overdriven	Reduce flow rate
No Subslave	Internal hardware error	Repair by KOBOLD Service necessary

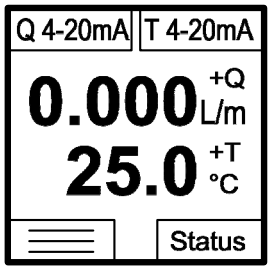
10.8.2 Firmwareversion

The firmware version is displayed at the device test below the manufacturer logo.

10.9 Device default settings

The flowmeter-MIM is delivered from the factory with following settings:

Display – Dual
Upper display – Flow
Lower display – Temperature
Out 1: Q 4-20 mA
Out 2: T 4-20 mA



11. Technical Information

Measurement process:	electromagnetic
Range:	see order details
Media:	conductive fluids
Minimum conductivity:	≥20 µS/cm
Max. medium viscosity:	70 mm^2/s
Max. pressure:	16 bar
Accuracy:	<±(0.8% of reading+ 0.5% of full scale)*
Repeatability:	±0.2% of full scale
Temperature measurement of media:	PT1000, range -20 °C …+70 °C
Response time flow t_{90} (alarm output /pulse output):	<250 ms
Response time temperature t_{90} (signal output):	<20 s
Mounting position:	in all directions
In-/outlet:	3 x DN/2 x DN
Handling:	4 optical touch fields, useable with hand gloves
Housing:	stainless steel 1.4404, display screen PMMA

Wetted parts

Connection fitting and housing:	stainless steel 1.4404
Insulation parts:	PEEK
Elektrodes:	stainless steel 1.4404
Seals:	FKM
Protection:	IP 67
Media temperature:	-20 °C … +70 °C
Ambient temperature:	-20 °C … +60 °C

Electrical data

Supply voltage:	19 - 30 V_{DC}, internal power consumption max. 100 mA (without outputs)
Display:	TFT display, 128 x 128 pixels, 1.4" display orientation in 90° steps adjustable
Display repetition rate:	0.5 ... 10 s, adjustable
Pulse output	Push-Pull, freely scaleable, configurable for partial or accumulated totalizer

Frequenzy output	Push-Pull, freely scaleable, Overflow frequency adjustable
Alarm output:	NPN, PNP, Push-Pull, output) configurable max. 30 V_{DC}, max. 200 mA short-circuit proof
Analogue output:	active, 3 wire, 0(4)-20 mA, max. load 500 Ω or 0-10 V_{DC}, (R_i = 500 Ω)
Electrical connection:	plug M12x1, 4-pin

* Under reference conditions: media temperatur: 15 °C ... 30 °C, 1 cSt, 500 µS/cm, 1 bar ambience temperature: 15 °C ... 30 °C

12. Order Codes

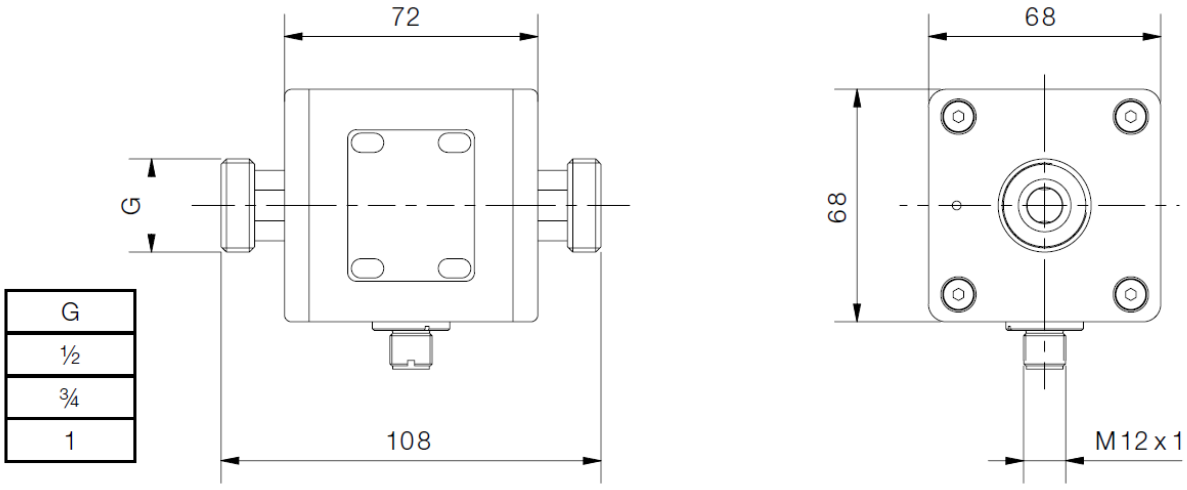
Order Details (Example: **MIM-12 15 G5 C3T 0**)

Model	Range	Connection	Electronics	Special version
MIM-12 = housing/ electrode VA, FKM seal	**05** = 0.04 ... 10 l/min	**G4** = G ½ male, DN5	**C3T** = compact, TFT display, 2 outputs (current/voltage/ pulse/frequency/alarm output configurable), M12x1 plug	**0** = without **Y** = special (please specify in writing)
	10 = 0.1 ... 25 l/min* **15** = 0.2 ... 50 l/min	**G5** = G ¾ male, DN10		
	15 = 0.2 ... 50 l/min* **20** = 0.4 ... 100 l/min	**G6** = G 1 male, DN15		

* In preparation

13. Dimensions

[mm]



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14. EU Declaration of Conformance

We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

Electromagnetic Flowmeter **Model: MIM-...**

to which this declaration relates is in conformity with the standards noted below:

EN 61326-1:2013 Elektrische Mess-, Steuer-, Regel- und Laborgeräte – EMV-Anforderungen, Teil 1: Allgemeine Anforderungen Industrielle Anwendung

EN 60529:2014 Degrees of protection provided by enclosures (IP Code)

EN 50581:2012 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Also the following EC guidelines are fulfilled:

2014/30/EU **EMC Directive**

2011/65/EU **RoHS** (category 9)

Hofheim, 14 Dec. 2017

H. Peters
General Manager

M. Wenzel
Proxy Holder