NEW!

MAG-Flow-Meter FMA

Range of Applications
- flow meter for all fluids, mashes and pastes
- product conductivity > 5 µS/cm
- exact measurement of media with solid content (content <5%)
- monitoring, controlling, indication, registration of processes
- batching and filling applications
- quantity measurement

Application Examples
- quantity measurement in CIP applications
- process control in breweries
- quantity measurement in dairies
- monitoring and controlling of mixing processes
- exact batching of media
- control of filling machines

Hygienic Design / Process Connection
- CIP-/ SIP-cleanable up to 140°C / 30min.
- measurement tube of PFA (FDA listed); R_a < 0,8µm; pigable
- optionally R_a < 0,6µm with certificate
- electrodes of stainless steel 1.4539 or Hastelloy, optionally with 3.1.B
- pipe connections of stainless steel 1.4404, optionally 1.4435 with 3.1.B
- process connections: welding connections; dairy flange DIN11851; hygienic thread connection DIN11864; TriClamp; APV- and DIN-flange

FMA-w / DIN C / 1/2" / tc

Features of the Sensor
- configuration via magnetic pen - no need to open the housing
- free flow diameter, optimal for media with solid content
- low pressure drop
- PFA measurement tube for max. resistence against aggressive media
- vacuum stable measurement tube
- rotary connection head with display (2 lines)
- suitable for high temperatures and temperature gradients
- nonwearing, inductive measurement principle
- measurement principle independent of pressure, density, temperature
- high accuracy, repeatability and long time stability
- minimum service investment

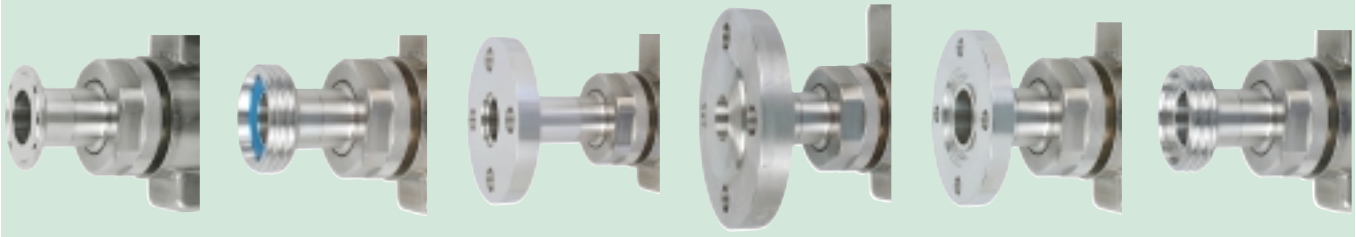
FMA-w / DIN 2 / 50 / tc

FMA-g / DIN 1 / 25 / ss

Highlights of the Specification

Material	completely made of SS 316L in standard	
Outputs	pulse output	0-10kHz free scaleable
	analogue output	4-20mA
2 status in- / outputs	many functions free selectable	
Accuracy	>0,7m/s	<0,5% of meas. value

Modulare Process Connections



TriClamp	dairy flange (DIN 11851)	e.g. Connect S	DIN-flange	APV-flange	SMS thread connection
tc	gg	custom spec.	df	af	sms

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Instruction Book acc. to the pressure equipment directive (ped) 97/23/EG for MAG-Flow-Meter FMA

- Please read this handbook accurately, to enable a save function of the meter and keep it for further usage -

Directory

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Safety standard of this device

This device is classified in accordance with the pressure equipment directive for group 1 fluids.
For nominal diameters less than or equal to DN25 this metering device is covered by Article 3 Subsection 3 and does not bear a CE symbol.

For nominal diameters greater than DN25 and up to DN100 this device is classified as category 1 and has a CE symbol.

The conformity assessment procedure that has been applied is: Module A.

Utilization in conformity with the intended use

This device is for the purpose of transmitting fluid, pulpy or pasty substances with electrical conductivity for the metering of the operational volume flow.

Utilization in compliance with the intended use includes the following:
- Compliance with the technical limit values set out in these instructions
- Observance of and compliance with the directions provided in these operating instructions

This device is not suitable for the metering of
- pulsating flows
- media with solids content
- interval metering

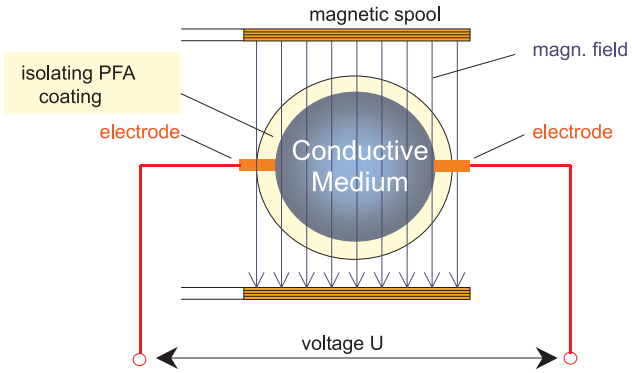
CAUTION:

This device can present the following dangers:

- Electric shock, if the electronics enclosure is not opened properly
- Burns, if any hot pipes are touched
- Scalding or chemical burns, if the piping system is not opened properly

Function principle

The function is based on the law of induction of Faraday.
If an electric conductor is moved through a magnetic field, a voltage is induced in it. In practice the electric conductor is the medium which should be measured. The faster the medium is, the higher is the induced voltage.



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Specification FMA

Materials	pipe connections	SS 316L (1.4404)
	sealing rings	EPDM
	housing	SS 1.4571
	connection head	SS 1.4305
	lid	SS 1.4305
	window	PMMA (acryl glass)
	M12 plug	SS 1.4305
	measurement tube	PFA (vacuum stable) R_a <0,8µm
	electrodes	SS 1.4539 optionally Hastelloy C4
Temperature ranges	storage	-20...+70°C
	ambient	-20...+50°C
	process	-25...+130°C
	CIP-/ SIP-cleaning	up to 140°C / 30 min
Pressure range		-1 ... max. 10bar
Protection type		IP69K
Sensor	measurem. principle	magnetic-inductive
	measurem. range	0,2l/min...240m³/h
	diameter	DN03...DN100
	min. conductivity	>5µS/cm (20µS/cm for ultra pure water)
	solid content	concentration <5% size <10% of diameter
Pipe connections	standard	DIN11850 Reihe1&2 DIN11866 Reihe A,B,C ISO2037
Process connections	standard	welding connection, DIN11851 DIN11866 TriClamp SMS DIN-flange APV-flange

Pipe connections, materials and certificates

Material (standard)	DIN 11850 R. 1 u. 2	SS (1.4404)
pipe connections	DIN 11866 R. A, B, C	SS (1.4435) with 3.1.B.
	OD- Tube	SS (1.4404)
	ISO 2037	SS (1.4404)

Transport and Storage

Avoid shocks!	
Avoid damages in the measurement tube!	
Ambient for the storage	dry and powder free
Ambient temperature for the storage	-20...+70°C

Scope of delivery

The unit is delivered completely with magnetic pen.

Transmitter	LCD-display	2x8-fields with backlight
Electr. connection	2xM12-plug-in	
	power supply	18...30VDC
	power consumption (without consumer load)	< 5W
Pulse output (quantity measurem.)	open collector (NPN) (short circuit proofed) based on GND of power supply	0...10kHz free scaleable
	nominal demand	5...24VDC 0...500mA
	maximum demand	40VDC / 1A
Analogue output (flow speed or rate)	active (short circuit proofed)	4...20mA free scaleable (max. 22mA)
	error out	3,6mA
	burden	max. 800 Ohm
	accuracy	<1% f.s.
Status in- / outputs	quantity	2 free programable
	function	selectable: in- / output
	function range (per in- / output one function selectable)	**issuance of:** error warning flow direction **input for:** start / stop hold reset counter reset error
	status outputs	
	open collector (NPN) (short circuit proofed) based on GND of power supply	5...24VDC 0...500mA
	maximum demand	40VDC / 1A
	status inputs	
	passive (short circuit proofed)	0...24VDC 0...500mA
	R_i based on GND of power supply	50kOhm
	pulse width	min. 20ms
	U_{switch}	12V
	hysteresis	± 2V
Accuracy	>0,7m/s	<0,5% of meas. value

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Mechanical connection / installation directions

This device has to be installed so that the measuring tube is always completely filled! Only then is correct metering possible. Accumulations of gas and air as well as fouling deposits have to be avoided.
No reaction forces of the pipe on the fittings are allowed!

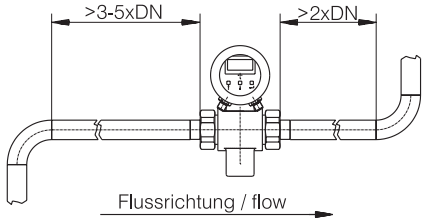

Fig. 1

Correct installation:

+ the infeed segment before any valves, T-pieces, elbows etc. should be at least 3-5 times as big as the nominal diameter and the outfeed segment should be 2-times the nominal diameter (Fig. 1)
+ before or into a rising line (Fig. 2 and 3)
+ in horizontal lines the electrode axis should be as horizontal as possible
+ in the case of long horizontal lines the metering shall be performed in a short riser (Fig. 4)
+ in the case of partially filled pipes a culvert-like method of installation shall be provided (Fig. 3)
+ valves and controls have to be installed behind the metering device
+ maximum permissible vibration 15 m/s (10 - 150 Hz)
+ in the case of downpipes over 5 m in length a siphon or venting valve has to be provided
+ the flow rate can be increased by means of reducer fittings

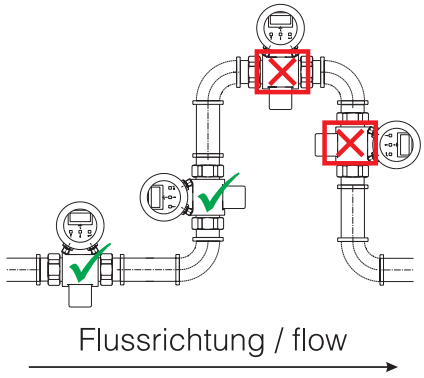

Fig. 2

Wrong installation:

- do not install at the highest point (Fig. 2 and 3)
- not immediately before a free pipe outlet (Fig. 5)
- not in or immediately before a downpipe (Fig. 2 and 3)
- not on the intake face of the pump

Please observe the adjacent drawings when performing the installation work.

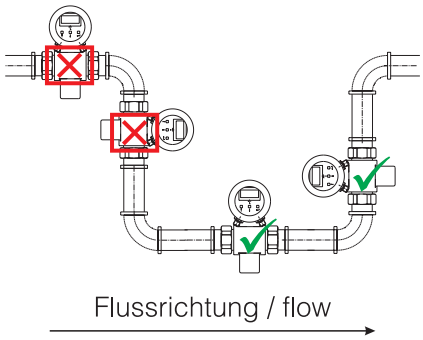

Fig. 3

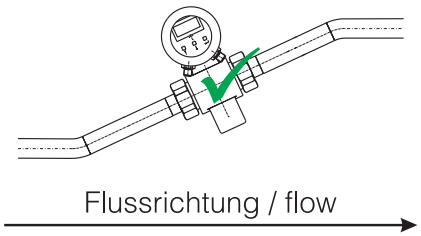

Fig. 4

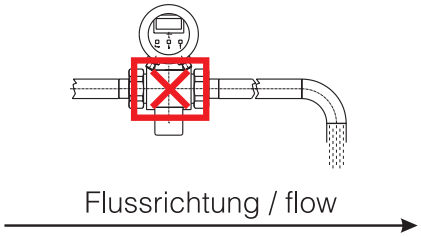

Fig. 5

Turning the display

(Fig. 6 and 7)

1. Loosen the grub screws (2) on the left and right.
2. Turn the head to the desired position. (turning is possible only in 90° steps)
3. Alignment: Align the mark (1) with the grub screws (2) or positioning screw (3).
4. Tighten the two grub screws (2).

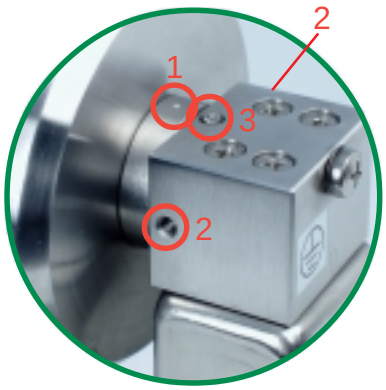

Fig. 6

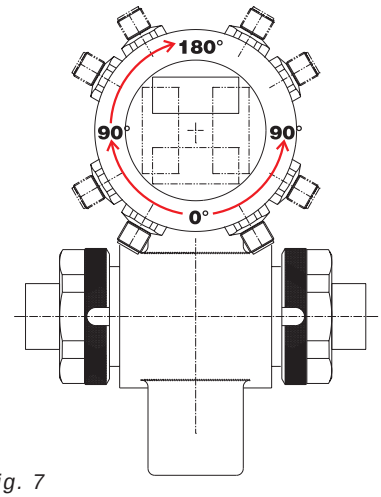

Fig. 7

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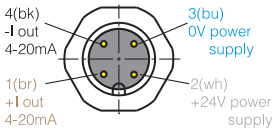
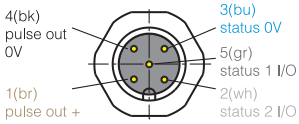
Electrical connection

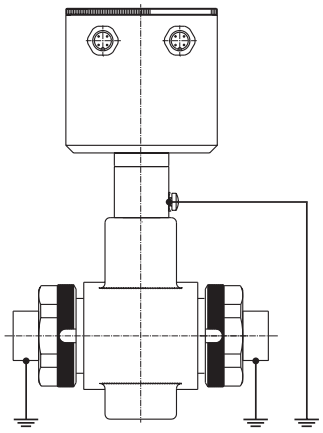
CAUTION: This device may be put into operation by competent personnel only!

left M12 plug-in (4-pin)
power supply / output 4-20mA



right M12 plug-in (5-pin)
output for pulse / status I/O



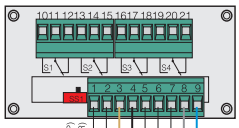


Equipotential bonding

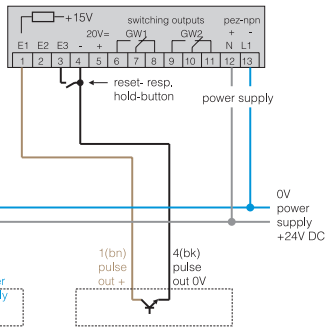
To ensure dependable functioning of the FMA, the housing of the sensor must be switched to the same potential as the pipe. To do so, use the earthing screw on the device (see adjacent drawing).

Connection example

Connection to a digital display (e.g. dpm)



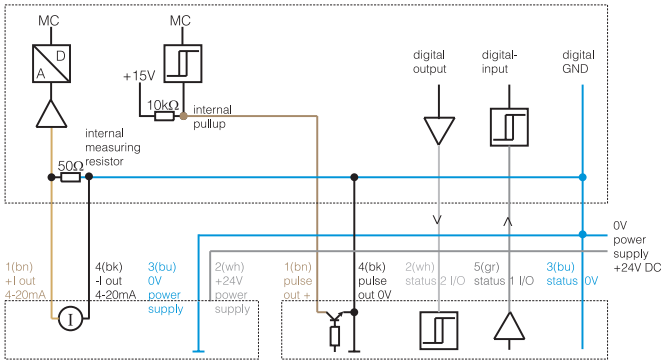
Connection to a meter with NPN input (e.g. PEZ)



4-pin M12 connector

5-pin M12 connector

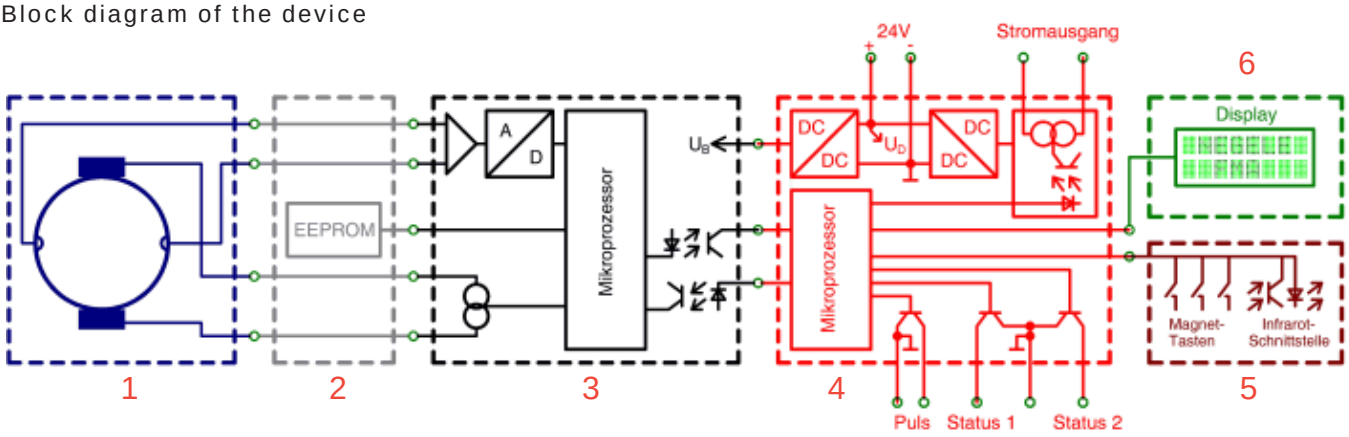
Connection to a PLC



4-pin M12 connector

5-pin M12 connector

Block diagram of the device



The FMA is subdivided into 6 subassemblies. The first subassembly is the sensor (1). It consists of the coil package and the two electrodes. It is in electrical contact with the base plate of the electronics (2). It is firmly mounted in the housing and bears two EEPROM's with the sensor's calibration data, the content of the electronic meter and the setting parameters of the metering point (the customer's parameters). If electronics are changed, these data remain in the device and no resetting of the parameters is necessary. In the third subassembly (3) the electrode signal is amplified and digitalized. The metered electrode signal is filtered by the microprocessor and then transferred serially to the fourth subassembly. Furthermore, the microprocessor controls the power supply to the coil. In the fourth subassembly (4) the flow signal detected is converted into values for the current output, the pulse output, the two status outputs and for the display. This microprocessor also triggers the two last subassemblies. The fifth subassembly consists of the magnetic keys and an infrared interface for contactless data transfer with external devices such as a laptop. The last subassembly is the illuminated, two-line LC display with 8 characters per line.

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During operation the technical limit values (see page 4) must be observed without fail!

Information about the design

The conversion table and the flow nomogram show the optimal nominal diameter for each flow rate. At low flow rates the pipe must be reduced to a suitable FMA-diameter. In the case of sensors of DN03 to DN10 the reduction is already integrated into the connection fittings of the FMA. When ordering please do not fail to take into consideration the dimension tables on pages 10 and 11!

In the case of abrasive media as low a flow rate as possible should be selected. This can be achieved by selecting a large sensor diameter.
In addition the installation of a vertical riser is recommended in this case.

In the event of intensely adhering media, the deposits and adhesions can be reduced by a high flow rate. The flow rate can be increased by selecting a smaller sensor diameter.

In the case of media that form a film and have a high fat content, e.g. cream, tapered electrodes are suitable (non-standard version).

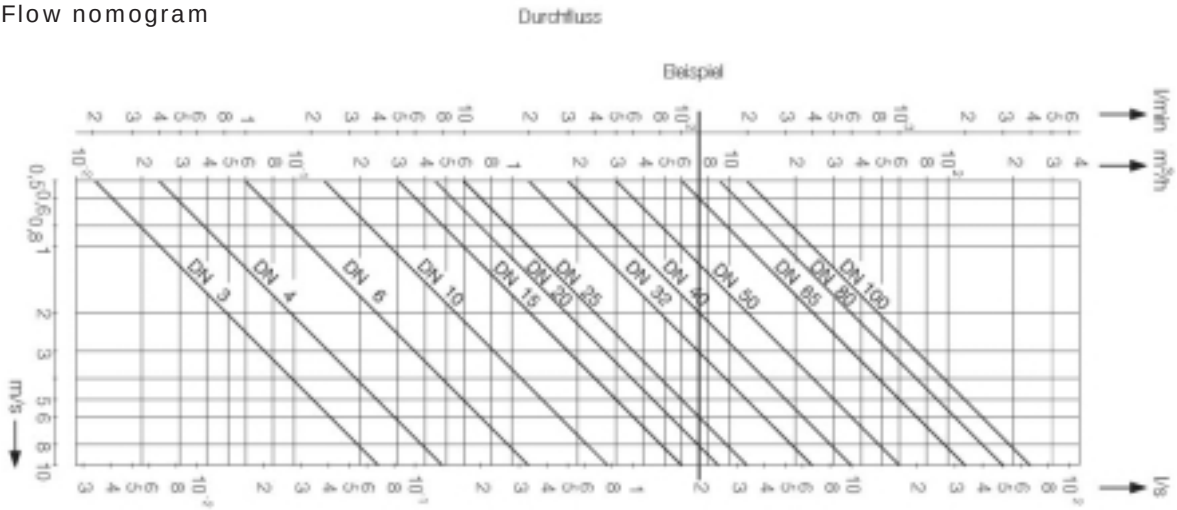
The use of a vacuum is allowed for cleaning and draining.

Flow conversion table (l/min to m/s depending on the nominal diameter)

Meas.Tube DN	3 1/8"	4 3/16"	6 1/4"	8 5/16"	10 3/8"	15 1/2"	20 3/4"	25 1"	32 11/4"	40 11/2"	50 2"	65 21/2"	80 3"	100 4"
Flow	in liter/min													
0,20 m/s	0,08	0,15	0,34	0,60	0,94	1,59	3,05	5,43	8,48	12,21	20,81	36,21	51,58	86,81
0,40 m/s	0,17	0,30	0,68	1,21	1,88	3,18	6,10	10,85	16,96	24,42	41,62	72,42	103,17	173,63
0,60 m/s	0,25	0,45	1,02	1,81	2,83	4,78	9,16	16,28	25,43	36,62	62,43	108,63	154,75	260,44
0,80 m/s	0,34	0,60	1,36	2,41	3,77	6,37	12,21	21,70	33,91	48,83	83,24	144,84	206,34	347,26
1,00 m/s	0,42	0,75	1,70	3,01	4,71	7,96	15,26	27,13	42,39	61,04	104,04	181,05	257,92	434,07
1,25 m/s	0,53	0,94	2,12	3,77	5,89	9,95	19,08	33,91	52,99	76,30	130,05	226,32	322,40	542,59
1,50 m/s	0,64	1,13	2,54	4,52	7,07	11,94	22,89	40,69	63,59	91,56	156,07	271,58	386,88	651,11
1,75 m/s	0,74	1,32	2,97	5,28	8,24	13,93	26,71	47,48	74,18	106,82	182,08	316,84	451,36	759,63
2,00 m/s	0,85	1,51	3,39	6,03	9,42	15,92	30,52	54,26	84,78	122,08	208,09	362,10	515,84	868,15
2,25 m/s	0,95	1,70	3,82	6,78	10,60	17,91	34,34	61,04	95,38	137,34	234,10	407,37	580,32	976,67
2,50 m/s	1,06	1,88	4,24	7,54	11,78	19,90	38,15	67,82	105,98	152,60	260,11	452,63	644,80	1085,18
2,75 m/s	1,17	2,07	4,66	8,29	12,95	21,89	41,97	74,61	116,57	167,86	286,12	497,89	709,28	1193,70
3,00 m/s	1,27	2,26	5,09	9,04	14,13	23,88	45,78	81,39	127,17	183,12	312,13	543,16	773,76	1302,22
4,00 m/s	1,70	3,01	6,78	12,06	18,84	31,84	61,04	108,52	169,56	244,17	416,18	724,21	1031,68	1736,29
5,00 m/s	2,12	3,77	8,48	15,07	23,55	39,80	76,30	135,65	211,95	305,21	520,22	905,26	1289,60	2170,37
6,00 m/s	2,54	4,52	10,17	18,09	28,26	47,76	91,56	162,78	254,34	366,25	624,26	1086,31	1547,52	2604,44
7,00 m/s	2,97	5,28	11,87	21,10	32,97	55,72	106,82	189,91	296,73	427,29	728,31	1267,37	1805,44	3038,52
8,00 m/s	3,39	6,03	13,56	24,12	37,68	63,68	122,08	217,04	339,12	488,33	832,35	1448,42	2063,36	3472,59
10,00 m/s	4,24	7,54	16,96	30,14	47,10	79,60	152,60	271,30	423,90	610,42	1040,44	1810,52	2579,20	4340,74

The measuring accuracy is optimal within the green range.

Flow nomogram



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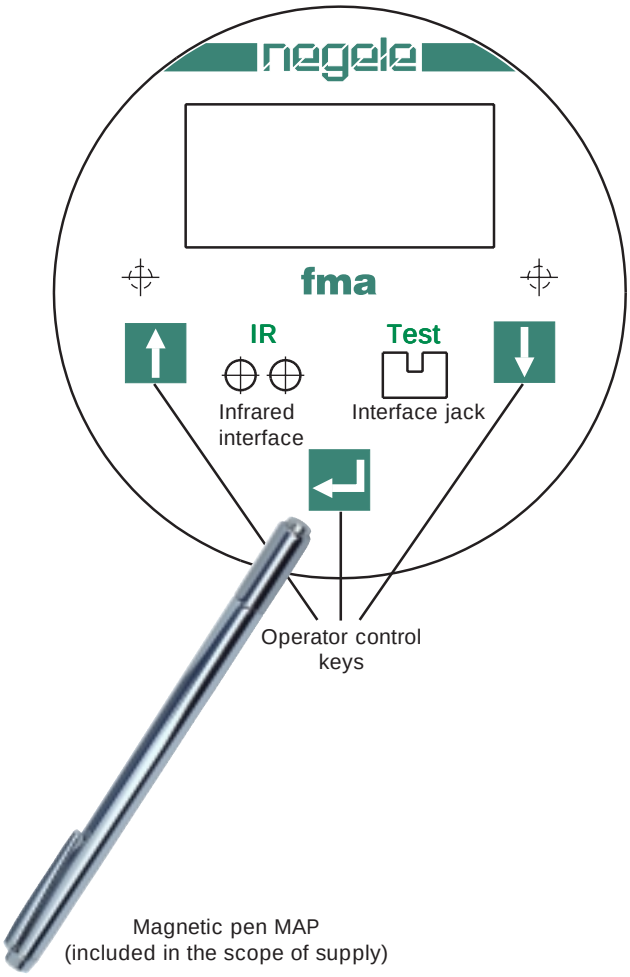
Operation of the FMA

To operate the metering device you require only the magnetic pin provided with the device. It is not necessary to open the metering device.

Operation is performed via the sight glass in the housing. To do so, guide the magnetic side of the pin to the position of the relevant operator control key that you would like to actuate

Front view of the FMA



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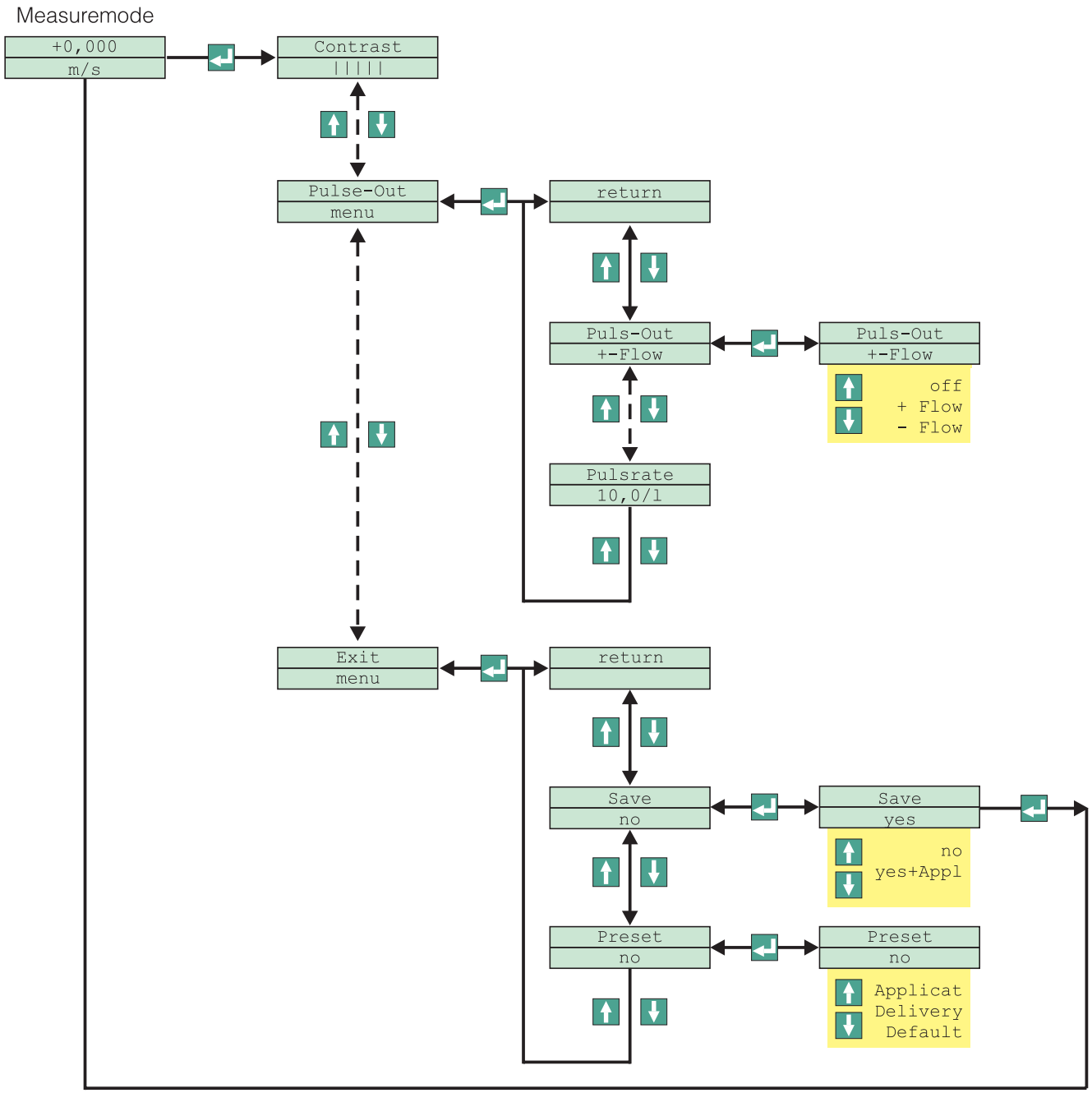
FMA operator control diagram

Navigation example



Information on operator control of the FMA

To quit the menu, in ”Exit Menu” always select the path via ”Save (yes / no / yes+Appl.)”.

Any changes made in the menu will not become effective until the menu is quitted via ”Save / yes”!

If the menu is quitted via ”Save / yes+Appl.”, the settings made will be stored and can be re-invoked at a later point in time - independently of any other changes - via ”Preset / Applicat”.

You will find the complete menu in the corresponding order on pages 10 to 13.

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General

During operator control of the metering device all signal outputs and the two internal meters continue to run. An internal restart with the new parameters is not performed until operator control is quitted with simultaneous storage of the data. The device requires approx. three seconds for storage with restart.

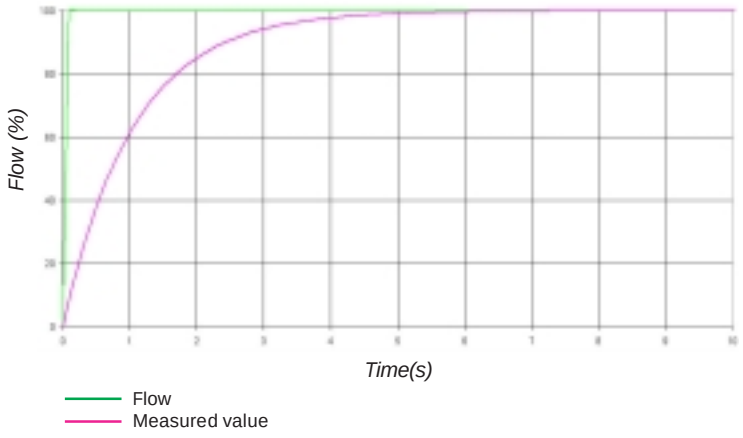
1	1st line 2nd line	Contrast xxx	Contrast [8-Bargraph]	
2	1st line 2nd line	Language xxx	Language German English	
3	1st line 2nd line	Sensor menu	return	
4	1st line 2nd line		Units V/Time	V/Time cm³/s cm³/min l/s l/min hl/min m³/h gal/min
5	1st line 2nd line		EndRange xxx	EndRange [digit w. comma]
6	1st line 2nd line		Damping xxx s	Damping [1s...60s]
7	1st line 2nd line		Low-Flow xxx %	Low-Flow [1...15%]
8	1st line 2nd line		0-Point xxx	0-Point remain set new reset
9	1st line 2nd line		Flow Dir ection	Flow Dir remain invert

The contrast of the LC display is specified with this menu option. The contrast is dependent firstly on the current temperature in the housing and secondly on personal perception. The value can be altered in eight stages. The stage that is set is displayed in the form of a bar.

At present two languages are available for selection. Language changeover is performed immediately when the button "¬" is pressed. Other languages are in preparation.

The parameters for calculation of the flow are specified in the **"Sensor Menu" "3"** to **"9"**. The metering range's final value **(MBE) "5"** together with the **unit "4"** specifies the level control range for the current output. Furthermore, this value serves as the basis for all percentage inputs and outputs (low-flow suppression, limit values, volume flow indication etc.). The input is limited to a flow rate range of 0.3 m/s to 12 m/s. If the limits are exceeded or underachieved, the possible setting is displayed flashing. The input format of the decimal places before and after the decimal point is determined automatically depending on the unit and on the nominal diameter. **Damping "6"** is a time constant function that smooths the measured value. High time constants are always wise in the case of deployments with very unsettled measured values (e.g. low conductivity) or a pulsating flow. The value range is between 0.2 s and 60.0 s. This specification relates to the response time for erratic flow changes. The adjacent graph shows the behaviour with a damping of 1 s and a flow jump of 0 % to 100 %.

Jump response with 1 s damping



At a flow jump of 0 % to 100 % the measured value for the damping time setting is approx. 63 % of the flow. After 5-times the time period the output value will have approached the flow to within 1 % and after 7-times the time period to within 0.1 %. The damped measured value is used for the current output, the volume flow indicator and as the basis for the switch outputs (limit value and flow direction).
Low-flow suppression "7" is for the purpose of smoothing the measured value in zero point vicinity. (Siehe Grafik Seite 11). The hysteresis for the switching-on and switching-off points is +/- 25 % of the preset value. Once the switching-off point is reached, the measured value is set to zero. All outputs and the display are affected by this.

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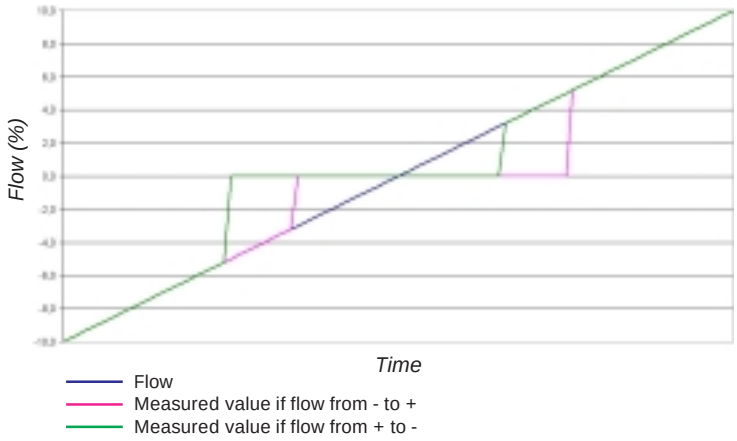
Measured value progression with a low-flow amount of 4 %



The zero point is calibrated ex-factory prior to the dispatch of each FMA. A **zero point adjustment "8"** can still be wise for some applications. To do so, the liquid must be standing absolutely still in the sensor. The function is then invoked. The progress of the automatic zero point metering is recognizable by the number of asterisks shown on the display. At the end the zero point value determined is shown on the dispShould the sensor have been installed turned through 180° or if mounting in the prestipulated direction is not possible, the sensor can be turned virtually with the function **measuring direction "9"**. All direction specifications are then inverse to the direction shown on the sticker on the sensor.

10	1st line 2nd line	Puls-Out menu	return	
11	1st line 2nd line		Puls-Out xxx	Puls-Out off pos Flow neg Flow +/- Flow
12	1st line 2nd line		P-Width xxx	P-Width auto. 30ms 50ms 100ms
13	1st line 2nd line		Units Pulsrate	Units cm³ l hl m³ gal
14	1st line 2nd line		Pulsrate xxx/***	Pulsrate [0,01...100]/***

The pulse output is configured with the **pulse output menu "10"** to **"14"**.
The **output of pulses** is defined with menu option **"11"**. With **"pos Flow"** an output of pulses is performed only if the flow direction is in compliance with the direction arrow shown on the sensor (provided that the **direction** has not been turned with **function "9"**).The same thing applies to **"neg Flow"**, but in the opposite direction. With **"+/- Flow"** an output of the pulses is performed regardless of the flow direction. If the pulse output is switched off, the following menu options (”12” to ”14”) are not selectable.
A defined **pulse width "12"** is important when using electromechanical meters. In most other cases the device can calculate the pulse width automatically from the input values of the pulse valency and of the measuring range’s final value. Should the output rate of the pulses be faster than the pulse width allows, the **"warning pulse"** appears on the display in metering mode.
Scaling of the pulses is effected with menu options **"13" and "14"**.

The physical unit for the **scaling** is defined with **"13"**. The **assignment of the valency** that the pulses should have is effected in point **"14"**.

15	1st line 2nd line	4...20mA menu	return	
16	1st line 2nd line		4...20mA xxx	4...20mA off pos Flow neg Flow +/- Flow
17	1st line 2nd line	1. I/O menu	return	
18	1st line 2nd line		1. I/O xxx	1. I/O output input
19	1st line 2nd line		O-Funct xxx	O-Funct Flow dir Error Warning LimitVal
20	1st line 2nd line		LimitVal Thresh	Thresh [-120% - 120%]
21	1st line 2nd line		Mode xxx	Mode Minimum Maximum

The **current output menu "15"** and **"16"** consists only of the selection of the desired dependency on the flow direction. In this case the same thing applies as for the pulse output in point ”11”. The level control range of the current output is 4 mA to 21.5 mA. Upon attainment of the upper value **"warning current"** is output on the display in metering mode.

The FMA has two randomly configurable **inputs and outputs**, **"17"** to **"22"** and **"23"** to **"28"**.
In the **first step "18"** it is defined whether the input or output will be used. Depending on the selection the following menu changes.
If the function output is selected, in the second step the **output function "19"** is selected. For **"Flow dir"** the flow direction of the fluid is output at the output. The output transistor switches to ground, if the flow is contrary to the specified direction. For the selection **"Error"** the output transistor is always switched to ground, if the FMA is operating fault-free. (In this way failure of the operating voltage can also be assessed as a fault by the external unit). Statuses that can be eliminated only by user intervention are designated as faults.

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22	1st line 2nd line		I-Funct xxx	I-Funct Inhibit Hold CountRes ErrorRes
23	1st line 2nd line	2. I/O menu	return	
24	1st line 2nd line		2. I/O xxx	2. I/O output input
25	1st line 2nd line		O-Funct xxx	O-Funct Flow dir Error Warning LimitVal
26	1st line 2nd line		LimitVal Thresh	Thresh [-120% - 120%]
27	1st line 2nd line		Mode xxx	Mode Minimum Maximum
28	1st line 2nd line		I-Funct xxx	I-Funct Inhibit Hold CountRes ErrorRes
29	1st line 2nd line	Display menu	return	
30	1st line 2nd line		V/Time xxx	V/Time off Units percent
31	1st line 2nd line		V-Count xxx	V-Count off positiv negativ sum pos/neg
32	1st line 2nd line		Units xxx	Units cm³ l hl m³ gal
33	1st line 2nd line		Flowrate xxx	Flowrate off xxx
34	1st line 2nd line		Warnings xxx	Warnings off on
35	1st line 2nd line		Disp-Scan xxx s	Disp-Scan [2..10s]

These include, e.g., illegal parameters. For **"Warning"** the same applies as for **"Error"**, just that additional events are now shown at the output.
Warnings can occur in the device and with time can also disappear again. Examples of this are saturations of the pulse and/or current outputs. A switching value can be stipulated as a further selection option. In this case two other **input functions "20"** and **"21"** appear.
The **limit value threshold "20"** can be input within a range of -120 % to +120 % of the measuring end range value. The hysteresis is +/-1 5.
With **menu option "21"** it is selected whether the output transistor should switch to ground upon exceeding (Maximum) or dropping below (Minimum) the threshold value.

See description 1. I/O Menu

Sequential representation of the values on the display during metering mode is defined with the **display menu "29"** to **"35"**.
The **volume flow display "30"** can be indicated in physical units or percentually relative to the preset measuring end range value. Display of the value ceases, if **"off"** is selected.
Two independent electronic meters are integrated into the device. There is one for each of the two flow directions. They meter the volume that has flowed through them. The result is stored every 10 seconds in the EEPROWhich of the two volumes is to be displayed, is defined with the **function "31"**. If **"sum"** is selected, the difference between the positive and negative meters is displayedIn the case of **"pos/neg"**, display of the positive and negative meters is sequential.
The physical unit of the measured value is selected with **function "32"**If display of the flow rate is required, this can be activated with **function "33"**.
If the device detects any warnings, e.g. saturation of the current output, these can be displayed, if **"on"** is activated in **menu option "34"**. Fault messages cannot be switched off and are always displayed when they The display time for the individual values can be selected between 2 and 10 seconds with **function "35"**.
If all display values are switched off, the text **"Metering Mode"** appears on the display.

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36	1st line 2nd line	Exit menu	return
37	1st line 2nd line		Save yes no
38	1st line 2nd line		Preset no Applicat Delivery

"Exit menu" "36" to **"38"** is for the purpose of returning to metering mode or for the loading of other data records.
To quit operator control you change to **menu option "37"**. Here there is an option between saving the data in the active data record or additionally saving the data in the application data area. Operator control is quitted with **"no"**, without the data being changed. All inputs made, the determination of a new zero point or deletion of the internal meter are also rejected.
The active data record can be overwritten with the application data record or delivery data record with **function "38"**. If one of these functions is executed by mistake, you can recreate the old status by quitting operator control with **"Save no"** and then calling it up again.

39	1st line 2nd line	Info menu	return
40	1st line 2nd line		Diameter xxx mm
41	1st line 2nd line		Cal. Cs xxx
42	1st line 2nd line		Cal. Cs xxx
43	1st line 2nd line		f Mag. xxx
44	1st line 2nd line		SoftVer. x.x.x.x.
45	1st line 2nd line		act.Temp xxx C
46	1st line 2nd line		max.Temp xxx C
47	1st line 2nd line		Lifetime xxx h

In the **information menu "39"** to **"47"** values only are displayed. There is no change facility.
Menu option "40" displays the nominal diameter of the sensor in millimetresThe values **"Cal.Cs" "41"** and **"Cal.Cz" "42"** are sensor-specific calibration values.
The frequency of the magnetic field **"43"** is also sensor-specific. The updating frequency of the measured values is twice as high as the magnetic field frequency.
The software versions of the two microprocessors can be read out with **function "44"**. The first two digits relate to the measured value acquisition and the last two to the output unit.
With **"45"** the current temperature of the electronics is displayed. The data have been determined on the measured value acquisition pcb. This value is polled only once by the output unit upon entry into the operator control menu. The maximum temperature **"46"** is also acquired and stored permanently in the EEPROM.
The number of operating hours of the device is displayed with **menu option "47"**.

48	1st line 2nd line	Test menu	return
49	1st line 2nd line		Test I off 0%Flow 10%Flow 50%Flow 100%Flow 110%Flow
50	1st line 2nd line		Test F off 0%Flow 10%Flow 50%Flow 100%Flow 110%Flow
51	1st line 2nd line		Test IO1 off on
52	1st line 2nd line		Test IO2 off on

The **test menu "48"** to **"52"** is for the functional testing of the connected evaluation devices.
Menu "49" is provided for the current output. The currents are set in compliance with the selected flow.
For the pulse output there is a **test menu "50"** with the same structure. **Inputs and outputs "51"** and **"52"** can also be simulated. Once the input function has been selected, the status of the input is displayed. With the output function you can now switch between **"on"** and **"off"**.

53	1st line 2nd line	V-Count reset	reset no no

To delete the two internal meters, **"yes"** must be selected in **menu option "53"** and operator control must be quitted with save data. Otherwise the meter statuses are retained.

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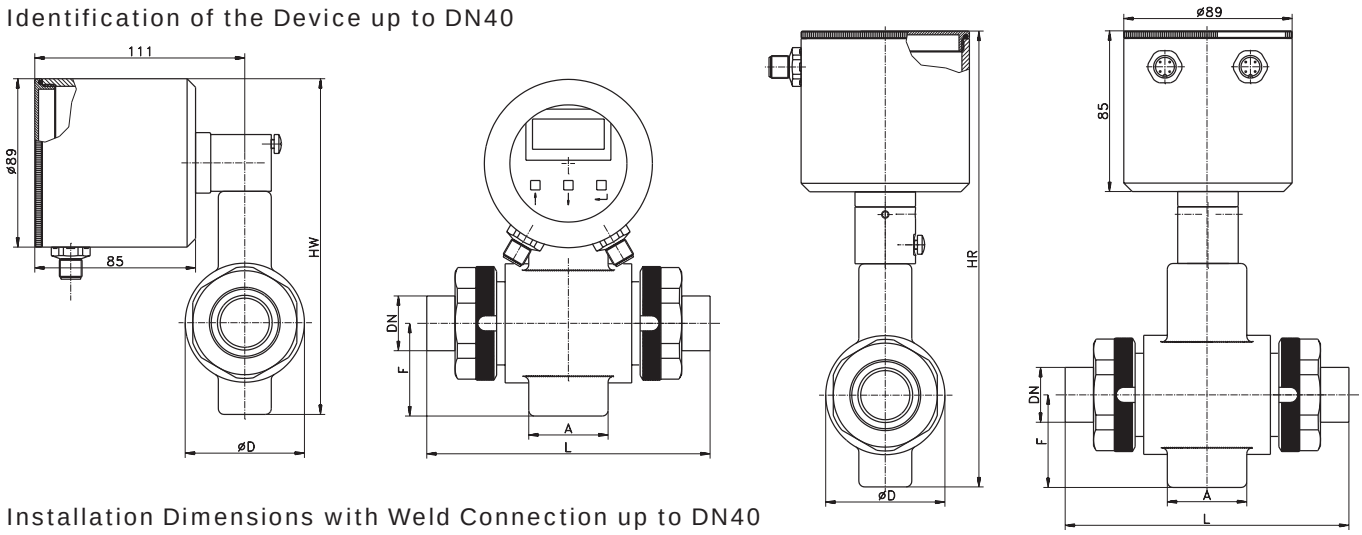
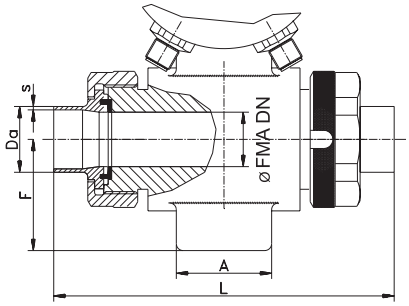
Identification of the Device up to DN40



Installation Dimensions with Weld Connection up to DN40

	Universal Dimensions				
Ø FMA DN	D [mm]	HR [mm]	HW [mm]	A [mm]	F [mm]
3	44	248	185	37	62
4	44	248	185	37	62
6	44	248	185	37	62
8	44	248	185	37	62
10	44	248	185	37	62
15	44	223	160	37	40
20	63	241	177	42	49
25	63	241	177	42	49
32	78	263	200	42	59
40	78	263	200	42	59



	DIN11850 Line 1			DIN11850 Line 2 / DIN11866 Line A			DIN11866 Line B (ISO1127)			OD-Tube / DIN11866 Line C			ISO2037		
Ø FMA DN	Dia-meter DN	Pipe Dim. Da x S [mm]	Length L [mm]	Diameter DN	Pipe Dim. Da x S [mm]	Length L [mm]	Dia-meter DN	Pipe Dim. Da x S [mm]	Length L [mm]	Diameter DN	Pipe Dim. Da x S [mm]	Length L [mm]	Dia-meter DN	Pipe Dim. Da x S [mm]	Length L [mm]
3	10	12x1	127	6* 8* 10	6x1* 8x1* 13x1,5	127	6 8	10,2x1,6 13,5x1,6	126,6	1/4" 3/8" 1/2"	6,35x0,89 9,53x0,89 12,7x1,65	118,2	-	-	-
4	10	12x1		6* 8* 10	6x1* 8x1* 13x1,5		6 8	10,2x1,6 13,5x1,6		1/4" 3/8" 1/2"	6,35x0,89 9,53x0,89 12,7x1,65		-	-	-
6	10	12x1		6* 8* 10	6x1* 8x1* 13x1,5		6 8	10,2x1,6 13,5x1,6		1/4" 3/8" 1/2"	6,35x0,89 9,53x0,89 12,7x1,65		-	-	-
8	10	12x1		8* 10	8x1* 13x1,5		6 8	10,2x1,6 13,5x1,6		3/8" 1/2"	9,53x0,89 12,7x1,65		-	-	-
10	10	12x1		10	13x1,5		8	13,5x1,6		1/2"	12,7x1,65		-	-	-
15	15	18x1		15	19x1,5		10	17,2x1,6		3/4"	19,05x1,65		-	-	-
20	20	23x1	132	20	23x1,5	132	15	21,3x1,6					-	-	-
25	25	28x1	149	25	29x1,5	149	20	26,9x1,6		1"	25,4x1,65	132,6	25	25x1,2	149
32	32	34x1	166	32	35x1,5	166	25	33,7x2,0	224				32	33,7x1,2	166
40	40	40x1	171	40	41x1,5	171	32	42,4x2,0		1 1/2"	38,1x1,65	224	40	38x1,2	171

*only DIN 11866 Line A

Dimension Tables of Process Connections up to DN40

DIN 11850 Line 2 / DIN 11866 Line A						
	Total Length [mm]					
Process Connection	DN3...DN10	DN15	DN20	DN25	DN32	DN40
TriClamp DIN32676	163	163	168	192	209	214
Diary Flange DIN11851 threaded connector end*	169	169	180	207	230	237
Hygienic thread conn. DIN 11864-1 thread. conn. end	165	165	174	201	226	233
APV nut flange*	-	-	-	197	-	219

*only for DIN 11850 Line 2

OD Tube / DIN11866 Line C						
	Total Length [mm]					
Process Connection	1/4"	3/8"	1/2"	3/4"	1"	1/1/2"
TriClamp inch	-	-	143,6	143,6	175,6	267
Diary Flange DIN11851 threaded connector end*	-	-	-	-	191	290
Hygienic thread conn. DIN 11864-1 thread. conn. end	-	-	200,2	200,2	184,6	286
SMS threaded connector end*	-	-	-	-	162,6	264,0

*only for OD-Tube

DIN 11866 Line B (ISO1127)					
	Total Length [mm]				
Process Connection	DN3...DN10	DN15	DN20	DN25	DN32
TriClamp ISO	162,6	162,6	169,6	267	267
Hygienic thread conn. DIN 11864-1 thread. conn. end	168,6	168,6	178,6	284	286

ISO 2037						
	Total Length [mm]					
Process Connection	DN3...DN10	DN15	DN20	DN25	DN32	DN40
SMS threaded connector end	-	-	-	179	200	211

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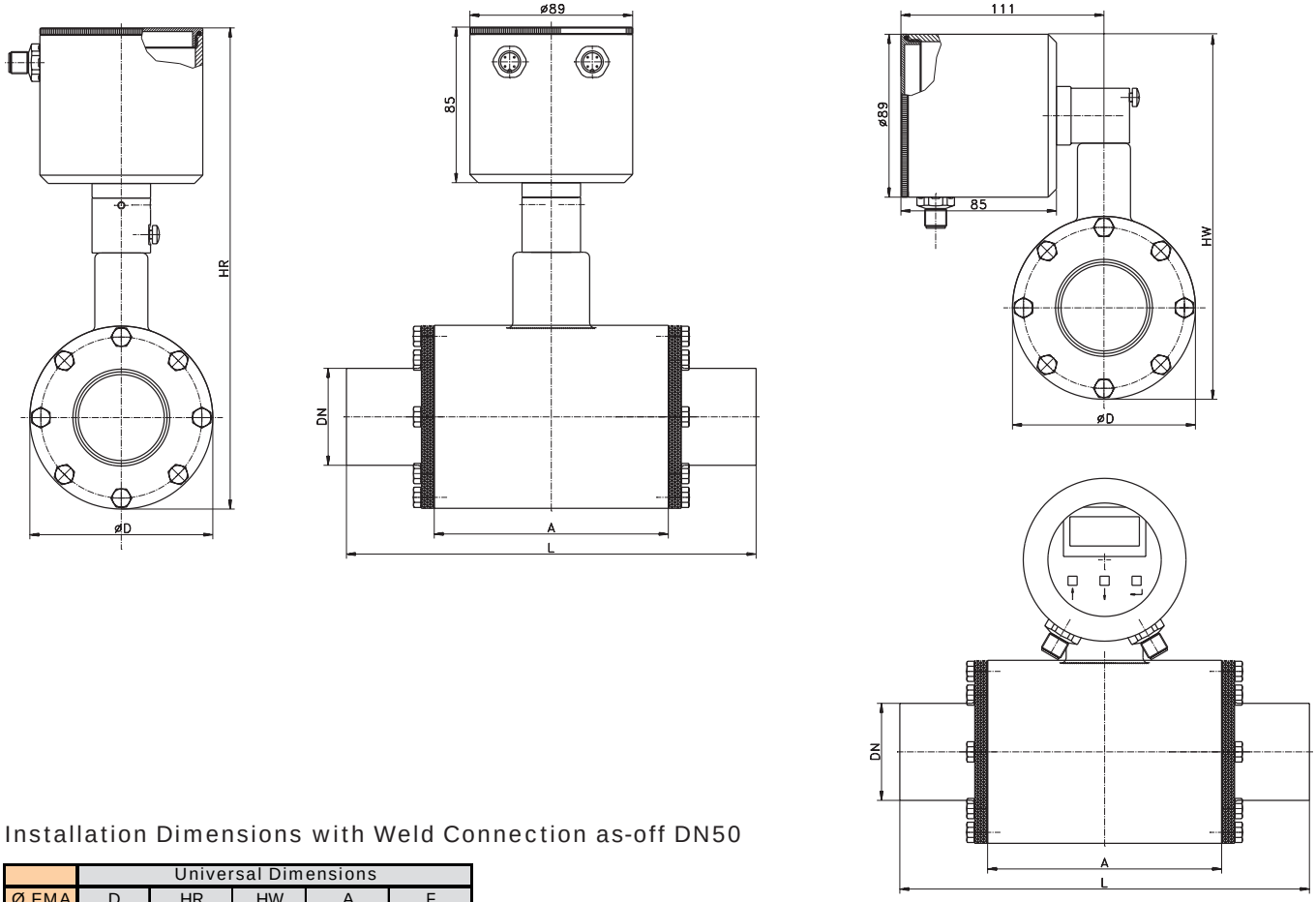
Identification of the Device from DN50



Installation Dimensions with Weld Connection as-off DN50

	Universal Dimensions				
Ø FMA DN	D [mm]	HR [mm]	HW [mm]	A [mm]	F [mm]
50	100	263	200	128	-
65	116	286	223	114	-
80	133	299	236	114	-
100	160	333	270	144	-

	DIN11850 Line 1			DIN11850 Line 2 / DIN11866 Line A			DIN11866 Line B (ISO1127)			OD-Tube / DIN11866 Line C			ISO2037		
Ø FMA DN	Dia-meter DN	Pipe Dim. Da x S [mm]	Length L [mm]	Diameter DN	Pipe Dim. Da x S [mm]	Length L [mm]	Dia-meter DN	Pipe Dim. Da x S [mm]	Length L [mm]	Diameter DN	Pipe Dim. Da x S [mm]	Length L [mm]	Dia-meter DN	Pipe Dim. Da x S [mm]	Length L [mm]
50	50	52x1	173	50	53x1,5	173	40	48,3x2,0	224	2"	50,8x1,65	224	50	51x1,2	173
65	65	see Line 2		65	70x2	165	50	60,3x2,0		2 1/2"	63,5x1,65		65	63,5x1,6	165
80	80			80	85x2	169	65 80	76,1x2,0 88,9x2,3	169	3"	76,2x1,65	169	80	76,1x1,6	169
100	100			100	104x2	199	-	-	-	4"	101,6x2,11	199	100	101,6x2	199

Dimension Tables of Process Connections from DN50

DIN 11850 Line 2 / DIN 11866 Line A				
	Total Length [mm]			
Process Connection	DN50	DN65	DN80	DN100
TriClamp DIN32676	216	221	225	255
Diary Flange DIN11851 threaded connector end*	243	245	259	307
Hygienic thread conn. DIN 11864-1 thread. conn. end	235	237	253	299
APV nut flange*	221	213	217	247

*only for DIN 11850 Line 2

OD Tube / DIN11866 Line C				
	Total Length [mm]			
Process Connection	2"	21/2"	3"	4"
TriClamp inch	267	280	225	255
Diary Flange DIN11851 threaded connector end*	294	304	249	307
Hygienic thread conn. DIN 11864-1 thread. conn. end	286	296	253	299
SMS threaded conn. end*	264,0	272,0	217,0	269,0

*only for OD-Tube

DIN 11866 Line B (ISO1127)					
	Total Length [mm]				
Process Connection	DN40	DN50	DN65	DN80	DN100
TriClamp ISO	267	280	225	225	-
Hygienic thread conn. DIN 11864-1 thread. conn. end	286	296	253	269	-

ISO 2037				
	Total Length [mm]			
Process Connection	DN50	DN65	DN80	DN100
SMS threaded conn. end	213	213	217	269

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Classification acc. to the pipe standard

for pipes DIN 1 (DIN 11850 Line 1) - mainly suitable for food applications, also suitable for pharma

FMA- connection head

DIN 11850 Line 1

w angeled
g straight
0 only process connection (only specify pipe standard and diameter, diameter of measurem. tube,process connection)

pipe standard
DIN 1

pipe diameter
10
15
20
25
32
40
50

diameter of measurement tube
3 (only for pipe diameter DN10)
4 (only for pipe diameter DN10)
6 (only for pipe diameter DN10)
8 (only for pipe diameter DN10)
X (standard - same as pipe diameter)

process connection
ss (welding connections)

form of the electrodes
fb (front flush)
se (pointed - as-off measurement tube DN10 possible)

material of the electrodes
1.4539
Hastelloy C

Example:

FMA- g / DIN 1 / 10 / 3 / ss / fb / 1.4539

for pipes DIN 2 (DIN 11850 Line 2) - mainly suitable for food applications, also suitable for pharma

FMA- connection head

DIN 11850 Line 2

w angeled
g straight
0 only process connection (only specify pipe standard and diameter, diameter of measurem. tube,process connection)

pipe standard
DIN 2

pipe diameter
10
15
20
25
32
40
50
65
80
100

diameter of measurement tube
3 (only for pipe diameter DN10)
4 (only for pipe diameter DN10)
6 (only for pipe diameter DN10)
8 (only for pipe diameter DN10)
X (standard - same as pipe diameter)

process connection
ss (welding connection)
tc (TriClamp)
gg (dairy flange DIN 11851 - thread side)
hh (hygienic thread connection DIN 11864-1 - thread side)
af (APV-flange - possible as-off DN25 not for DN32)

form of the electrodes
fb (front flush)
se (pointed - as-off measurement tube DN10 possible)

material of the electrodes
1.4539
Hastelloy C

Example:

FMA- g / DIN 2 / 10 / 3 / ss / fb / 1.4539

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for pipes DIN A (DIN 11866 Line A) - mainly suitable for pharma applications

DIN 11866 Line A

FMA-

connection head
w angeled
g straight
0 only process connection (only specify pipe standard and diameter, diameter of measurem. tube,process connection)

pipe standard
DIN A

pipe diameter
6
8
10
15
20
25
32
40
50
65
80
100

diameter of measurement tube
3 (only for pipe diameter DN 6; 8;10)
4 (only for pipe diameter DN 6; 8;10)
6 (only for pipe diameter DN 6; 8;10)
8 (only for pipe diameter DN 8; 10)
X (standard - fits to pipe diameter)

process connection
ss (welding connection)
tc (TriClamp)
hh (hygienic thread connection DIN 11864, thread side)

form of the electrodes
fb (front flush)
se (pointed - as-off measurement tube DN10 possible)

material of the electrodes
1.4539
Hastelloy C

Example:

FMA-	g /	DIN A /	10 /	3 /	ss /	fb /	1.4539

for pipes DIN B (DIN 11866 Line B, ISO 1127) - mainly suitable for pharma applications

DIN 11866 Line B, ISO 1127

FMA-

connection head
w angeled
g straight
0 only process connection (only specify pipe standard and diameter, diameter of measurem. tube,process connection)

pipe standard
DIN B

pipe diameter
6
8
10
15
20
25
32
40
50
65
80

diameter of measurement tube
3 (only for pipe diameter DN 6; 8)
4 (only for pipe diameter DN 6; 8)
6 (only for pipe diameter DN 6; 8)
8 (only for pipe diameter DN 6; 8)
X (standard - fits to pipe diameter)

process connection
ss (welding connection)
tc (TriClamp)
hh (hygienic thread connection DIN 11864, thread side)

form of the electrodes
fb (front flush)
se (pointed - as-off measurement tube DN10 possible)

material of the electrodes
1.4539
Hastelloy C

Example:

FMA-	g /	DIN B /	10 /	3 /	ss /	fb /	1.4539

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for pipes DIN C (DIN 11866 Line C) - mainly suitable for pharma applications

DIN 11866 Line C

FMA-

connection head
w angeled
g straight
0 only process connection (only specify pipe standard and diameter, diameter of measurem. tube,process connection)

pipe standard
DIN C

pipe size
1/4"
3/8"
1/2"
3/4"
1"
1 1/2"
2"
2 1/2"
3"
4"

diameter of measurement tube
3 (only for pipe size 1/4"; 3/8"; 1/2")
4 (only for pipe size 1/4"; 3/8"; 1/2")
6 (only for pipe size 1/4"; 3/8"; 1/2")
8 (only for pipe size 3/8"; 1/2")
X (standard - fits to pipe size)

process connection
ss (welding connection)
tc (TriClamp, as-off pipe size 1/2")
hh (hygienic thread connection DIN 11864-1 - thread side, as-off pipe size 1/2")

form of the electrodes
fb (front flush)
se (pointed - as-off measurement tube DN10 possible)

material of the electrodes
1.4539
Hastelloy C

Example:

FMA-	g /	DIN C / 1" /	X /	ss /	fb /	1.4539

for pipes ODT (OD-Tube) - mainly suitable for food applications, also suitable for pharma

OD-Tube

FMA-

connection head
w angeled
g straight
0 only process connection (only specify pipe standard and diameter, diameter of measurem. tube,process connection)

pipe standard
ODT

pipe size
1/4"
3/8"
1/2"
3/4"
1"
1 1/2"
2"
2 1/2"
3"
4"

diameter of measurement tube
3 (only for pipe size 1/4"; 3/8"; 1/2")
4 (only for pipe size 1/4"; 3/8"; 1/2")
6 (only for pipe size 1/4"; 3/8"; 1/2")
8 (only for pipe size 3/8"; 1/2")
X (standard - fits to pipe size)

process connection
ss (welding connection)
tc (TriClamp, as-off pipe size 1/2")
gg (dairy flange DIN 11851 - thread side, as-off pipe size 1")
hh (hygienic thread connection DIN 11864-1 - thread side, as-off pipe size 1/2")

form of the electrodes
fb (front flush)
se (pointed - as-off measurement tube DN10 possible)

material of the electrodes
1.4539
Hastelloy C

Example:

FMA-	g /	ODT / 1" /	3 /	ss /	fb /	1.4539

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for ISO-pipes (ISO 2037) - mainly suitable for food applications, also suitable for pharma

ISO 2037

FMA- connection head
- w angeled
- g straight
- 0 only process connection (only specify pipe standard and diameter, diameter of measurem. tube,process connection)

pipe standard
- ISO

pipe standard
- 25
- 32
- 40
- 50
- 65
- 80
- 100

process connection
- ss (welding connection)
- sms (thread connection)

form of the electrodes
- fb (front flush)
- se (pointed - as-off measurement tube DN10 possible)

material of the electrodes
- 1.4539
- Hastelloy C

Exampel:

FMA- g / ISO / 50 / ss / fb / 1.4539

Specifications on the label

Name and Adress of the Producer:

Negele Messtechnik GmbH
Raiffeisenweg 7
D-87743 Egg an der Günz

Year of production

Label for the device FMA up to DN25 (without CE-mark)

Label for the device FMA as-off DN32 (with CE-mark)

Maintenance and Inspection

The flow meter is nearly maintenance-free.

Anyhow a yearly check should be done. Please check:
- Ambient conditions (e.g. humidity)
- Thightness of the process connections
- Cable connections and lid
- function safety of the power supply
- connection to Ground

Attention: The inspection needs to be done by a professional!

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Option

Surface roughness $R_a \leq 0{,}6\mu m$

Features

- for all FMA in the pipe standards 11866 Line A, B and C
- as-off a diameter of the measurement tube of at least DN06
- with 4 measuring points in the PFA measurement tube
- with 2 measurement points in the pipe connections

Order code:	Certificate $R_a \leq 0{,}6\mu m$ FMA

To oder that option please always specify the corresponding position of your order!

Accessories

PVC-cable (with fitting M12-coupler of SS, IP69K)

Order Code:

M12-PVC / 4-5m	PVC-cable, 4-pole, 5m, cord set
M12-PVC / 4-10m	PVC-cable, 4-pole, 10m, cord set
M12-PVC / 5-5m	PVC-cable, 5-pole, 5m, cord set
M12-PVC / 5-10m	PVC-cable, 5-pole, 10m, cord set
M12-K / 4	M12-coupler 4-pole
M12-K / 5	M12-coupler 5-pole

Magnetic pen (for the configuration of the FMA)

Details

Telescope pen	extendable	up to 63cm
Permanent magnet	payload	up to 1,5kg
removable		
integrated pen		

Order code:	MAP

Counter Display pez (with npn-input)

Compendium of the specification

Input		npn-, pnp-initiator
Indication range	free scaleable	-19999...+19999
Outputs	2 relay	250VAC / 3A
	optionally: analogue	0/4-20mA
power supply		24V DC
		24V, 115V, 230V AC

Order example:	pez-sa / npn / m³ / 230VAC

Universal Display dpm-gs (with analogue input)

Compendium of the specification

Input	current / voltage	0/4-20mA / 0-1/10V
Indication range	free scaleable	-1999...+1999
Outputs	2 / 4 relay	250VAC / 3A
(optionally)	analogue output	0/4-20mA, 0-10VDC
power supply		20...30V DC
		230V AC

Order example:	dpm-gs / l/h / 230VAC

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