ENKO-POMIAR Sp. z o.o.

ELECTROMAGNETIC FLOWMETER MPP® 8

Installation and operating manual

1.00.00

1. INTRODUCTION

Thank you for choosing and purchasing our device. We would like to assure you that we make every effort not to disappoint the trust we have been placed in.

The operating manual is intended for installers and users of the MPP® 8 electromagnetic flowmeter.

The instruction manual acquaints the user with the principles of installation and operation, the flowmeter design, the principle of operation and measurement, as well as the basic technical parameters. Please read this manual carefully before installing the device in order to ensure its correct installation and use in accordance with its intended use.

The flow meter meets the requirements of PN-EN 61326: 2013 "Electrical equipment for measurement, control and use in laboratories - Requirements for electromagnetic compatibility (EMC)"

Each manufactured flow meter is checked and calibrated on a test stand.

The manufacturer reserves the right to change the design of the product without prior notice.

2. SAFETY INSTRUCTIONS

The flow meter has been designed and manufactured based on the current state of knowledge in order to ensure safe use and maintenance. In this respect, it meets the requirements of the standard PN EN 61010 "Safety requirements for electrical measuring instruments, automation and laboratory devices".

The "Warning" symbol draws your attention to steps or procedures, the non-observance of which may endanger safety.

To ensure safety, follow the instructions in this manual when installing the flowmeter. In addition, pay attention to:

- ensuring adequate space, free from obstacles and other elements that may pose a threat to people who install the device
- special care should be taken when filling the pipeline after installing the sensor, as there may be leaks at the connections with the installation
- it is recommended to first fill the pipeline with a non-aggressive liquid, e.g. cold water, in order to avoid possible risks caused by leakage of hot or aggressive media
- caution when moving the flowmeter sensor, sensors from DN 150 on are equipped with handles for their transport
- electrical connections must be made by properly authorized personnel
- in the case of performing welding work on the installation, it is not allowed to ground the welding equipment via the flowmeter sensor
- in the case of disassembly of the device for inspection or repair, before sending it, thoroughly clean the flowmeter sensor from the residues of substances posing a threat to safety and health, e.g. flammable, toxic, corrosive substances, etc.

3. INTENDED USE AND SCOPE OF APPLICATION

The MPP® 8 electromagnetic flow meter is a measuring instrument designed to measure the flow of liquids in closed pressure and non-pressure pipeline systems. It measures the flow of clean and polluted, aggressive and chemically inert electrically conductive liquids as well as electrically conductive mixtures and pulps, for example:

- drinking water, sewage and sewage sludge
- milk, juices, beer, wine
- acids, alkalis

Flowmeters can be equipped with two temperature measurement paths and an analogue input 0/4-20 mA enabling the connection of an external probe for measuring additional parameters of the measured medium, e.g. pressure, conductivity, pH or others. In some cases, one temperature probe can be integrated with the flowmeter sensor. The measured parameters can be displayed locally on the transducer display and read remotely via the RS-485 communication interface.

3.1. Fluid flow

The MPP® 8 electromagnetic flowmeter measures, with a given accuracy class, the flow of liquids with a linear velocity from 0.1 [m / s] to 10 [m / s] in the standard version. The measurement is made in two directions: forward (F) and reverse (R). The flows (measuring ranges) for all sizes of the flowmeter sensor are given later in this manual.

3.2. Electrical conductivity of the liquid

The liquid flowing through the flow meter sensor should have a specific conductivity> 5 [µS / cm]. Examples of liquid conductivity [µS / cm]:

drinking water - 200÷800 milk – 200 ÷ 300 juices – 400 ÷ 1000

beer – 600 ÷ 1000 acids - $10x10^2 \div 80x10^4$ alkaline - $8x10^4 \div 30x10^4$

3.3. Full cross-section flow

The way of installing the flowmeter sensor in the installation should ensure the flow through the full cross-section of the sensor's pipe.

The electromagnetic flow meter measures the volumetric flow of a flowing liquid, including the solids it contains.

4. COMPLETENESS

The complete set of the electromagnetic flow meter consists of the elements presented in table 1.

Table 1.

No	Element	Quantity	Remarks
1.	CP sensor…	1 piece	
2.	MPP® converter…	1 piece	
3.	signal cable YPMY 3 x 0,35 mm^2	x m	as ordered (when compact cable is done – not delivered)
4.	reference potential flange	1 piece	upon request
5.	user manual	1 piece	
6.	warranty card	1 piece	
7.	protocol of checking on the measuring stand	1 piece	upon request

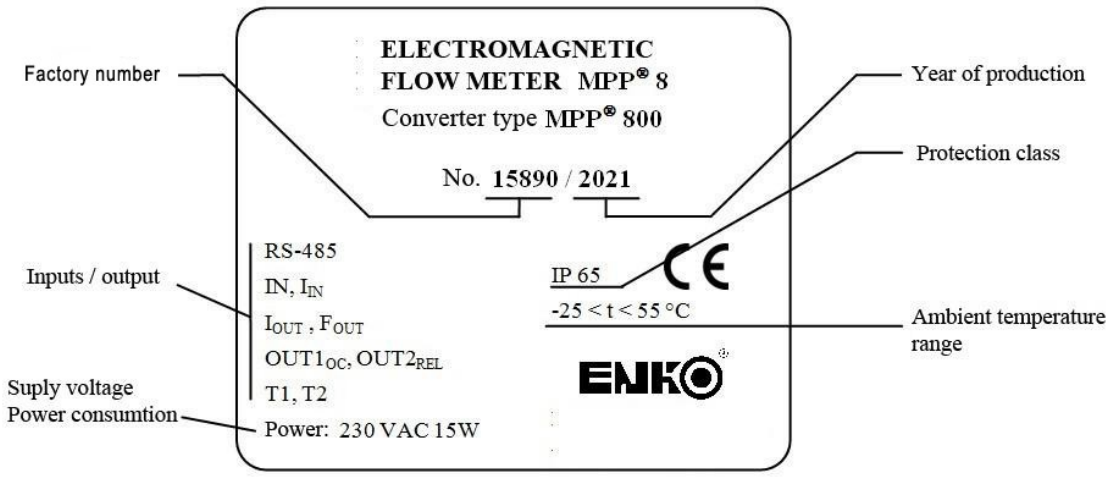
4.1. Identification

The MPP® 8 flow meter consists of:

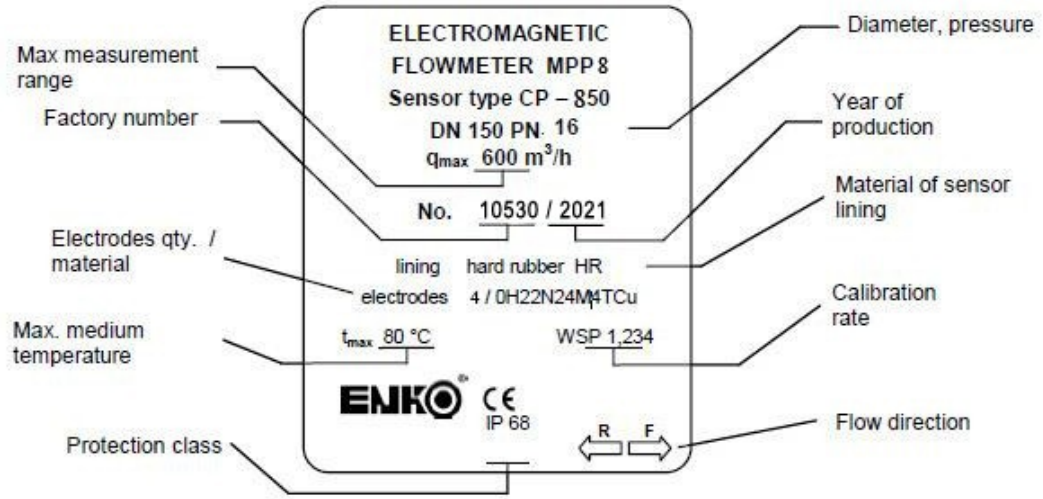
- flow sensor type CP 850, CP 860, CP 880, CP 870 or CP 8XX
- measuring transducer type MPP®800, MPP®800 IP, MPP®810 or MPP®820

The flow meter can be made in a separate or compact version. In the remote version, the sensor and converter are installed separately and are connected to each other by electric cables. However, in the compact version, they mechanically form a single whole.

Converter rating plate



Sensor rating plate



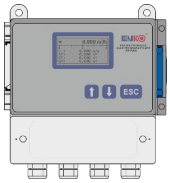
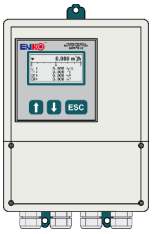
The flow meter is sold as a set and the sensor and converter are marked with the same serial number. The converter is programmed for work with the given sensor**, in order to work with another sensor, it must be reprogrammed.**

Each sensor has a specific WSP sensitivity factor ranging from 0.1 to 10, which is determined during the calibration process. Replacing a sensor or converter with a new one requires entering the new WSP value into the flowmeter converter. The factor is written under the WSP index on the terminal board in the sensor and on its nameplate.

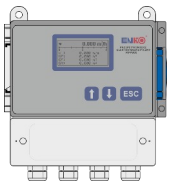
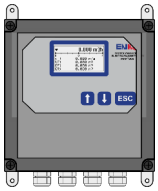
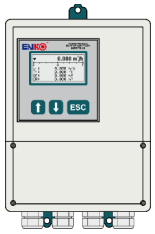
5. TECHNICAL DATA

5.1. MPP® converter

Table 2.

	MPP® 800	MPP® 800 IP	MPP® 810	MPP® 820
				
type of housing	wall mounted (option: compact)	wall mounted (option: compact)	wall mounted	panel
housing material	PC polycarbonate	PC polycarbonate	aluminum alloy	noryl
size [mm]	195x210x105	180x218x65	164x265x71	96x96x185
weight [kg]	~ 1.0	~ 1.0	~1,7	~0,5
level of security	IP65	IP67	IP67	IP40 (IP65 from front)
maximum measurement error*	0,5% of the actual flow in the range of 0,5 ÷ 10 m/s 1% of the actual flow within 0,1 ÷ 0,5 m/s 1% ±1mm/s of the current flow in the range of 0 ÷ 0,1 m/s			
power	230 V AC; 15W			
option	12 V DC or 24 V DC or 10..36 V AC/DC; 10 W			
ambient temperature	during operation -25 ÷ 55 °C during storage -40 ÷ 70 °C (recommended +15°C)			
display	backlit, graphic with a resolution of 128 x 64. Five configurable lines for indications and additional functions			
functions	flow indication, flow direction, one-way or two-way measurement, six volume counters, empty pipeline signaling, reports, dosing, alarms, pulse outputs, operation errors, registration of power failures, clock, printouts (cooperation with a printer), self-diagnosis			
option	measurement of pressure or other physico-chemical parameters two temperature measurement paths, Pt 100 sensors			
volume counters	9 digits, 3 duplicate counters (main and running) for forward, backward and difference measurements			
active current output	0-20 mA or 4 - 20 mA (configurable); load resistance <800 Ω			
digital outputs	5-15Hz, 0-1 / 5 / 10kHz frequency with 50% duty cycle (only OUT1 output in transistor version)			
OUT1, OUT2 outputs	transistor 40mA / 30V DC or (option) relay max. 2A / 30V DC, non-inductive load character			

* under maintained measurement conditions; including laminar flow, 100% filling, etc.

	MPP® 800	MPP® 800 IP	MPP® 810	MPP® 820
				
analog input passive	4 - 20 mA for additional measuring probes, e.g. pressure, conductivity			
digital input IN	24 VDC, 15 mA, activation time <100 ms			
communication	RS-485, MODBUS RTU protocol			
option	Profibus DP V0*			
isolation	all inputs and outputs are galvanically isolated			
communication language	Polish, English			
clock	real-time clock power supply - lithium battery type CR1220			

* PROFIBUS DP interchangeable with RS485

5.2. CP sensor

Table 3.

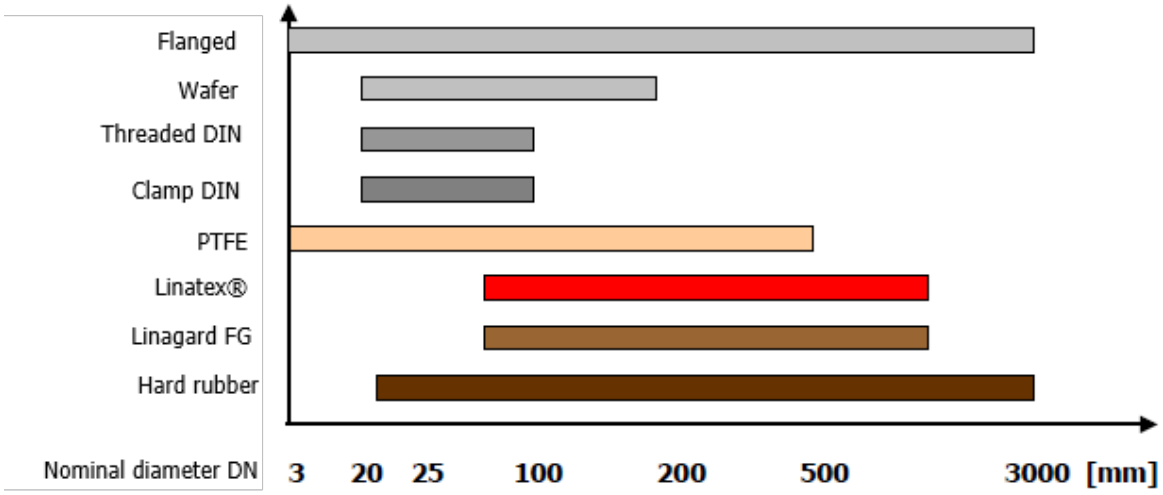
	CP 850	CP 870	CP 860	CP 880
connections	flanged (standard according to PN-EN 1092-1: 2007)	wafer type	threaded DIN 11851	Tri-Clamp clamps
nominal diameter DN	3 ÷ 3000	20 ÷ 200	10 ÷ 150	
types of lining	hard rubber Linagard FG Linatex® PTFE (Teflon, Tarflen)		PTFE (Teflon, Tarflen)	
electrodes	standard: stainless steel 316L (1.4404) option: Hastelloy C-276, Tantalum, Tytan, Monel or others according to the order option: conical electrode			
material of connections and housing	standard: 18G2A steel + epoxy coating		stainless steel 0H18N9 (1.4301)	
	option: stainless steel 0H18N9 (1.4301)			
junction box	polyester		polyester	
IP protection class according to PN-EN 60529	standard: IP 65 option: IP68 (10m H_2O, no time limits)			

	CP 850	CP 870	CP 860	CP 880
lining	temperature of the medium			
hard rubber	0 ÷ 80 °C		-	-
Linagard FG	0 ÷ 70 °C	-	-	-
Linatex®	-40 ÷ 70 °C	-	-	-
PTFE	-40 ÷ 80 °C (option -40 ÷ 100 or 180 °C)			
	Ambient temperature			
remot type	-40 ÷ 70 °C			
compact	-25 ÷ 55 °C			
dimensions *, weight, nominal pressure	table 5 fig. 1	table 6 fig. 2	on request	on request

* Sensor lengths are in accordance with ISO 13359: 1998 Measurement of conductive liquid flow in closed conduits - Flanged electromagnetic flowmeters - Overall length

CP8XX sensor – special execution

Table 4. Types of connections and linings available for a given sensor diameter



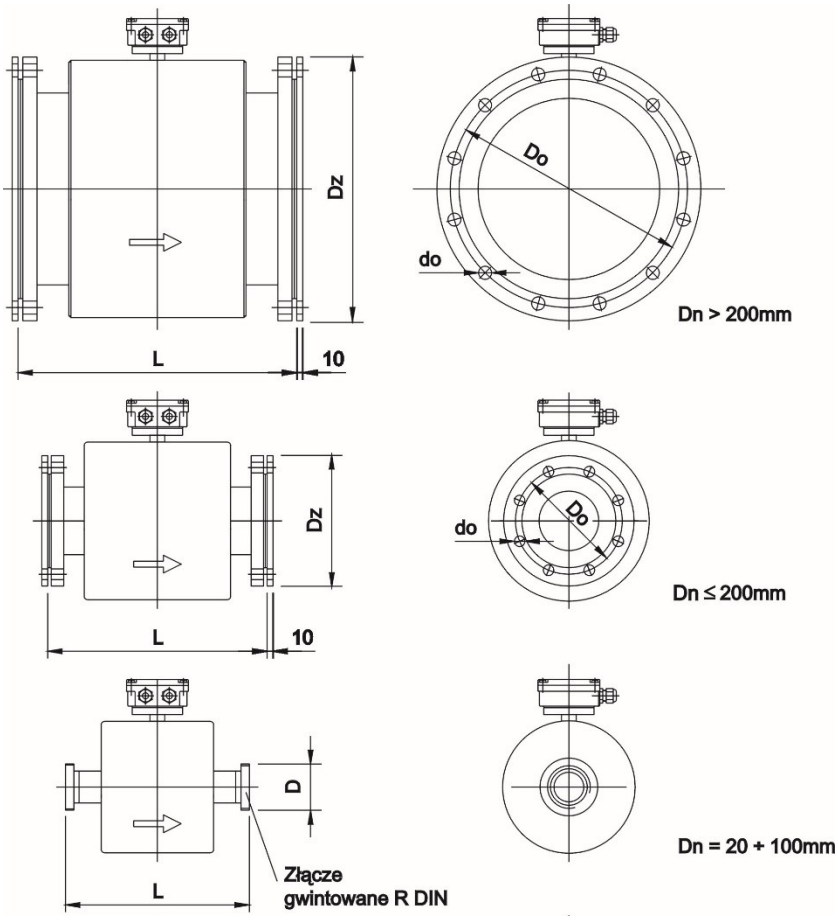


Fig . 1. Sensor dimension

Table 5. Dimensions - CP 850 sensors, with flange connections according to PN-EN 1092-1: 2007

Dn (mm)	Dz (mm)	Do (mm)	do (mm)	Bolting		L (mm)	Nominal pressure PN	Weight (kg)
				No	Size			
3, 4, 6, 8, 10	90	60	14	4	M12	200	40	< 10
15	95	65	14	4	M12	200	40	9
20	105	75	14	4	M12	200	40	9
25	115	85	14	4	M12	200	40	10
32	140	100	18	4	M16	200	40	11
40	150	110	18	4	M16	200	40	12
50	165	125	18	4	M16	200	40	13
65	185	145	18	8	M16	200	40	15
80	200	160	18	8	M16	200	40	16
100	220	180	18	8	M16	250	16	18
125	250	210	18	8	M16	250	16	25
150	285	240	22	8	M20	300	16	28
200	340	295	22	8	M20	350	10	36
200	340	295	22	12	M20	350	16	38
250	395	350	22	12	M20	400	10	61
250	405	355	26	12	M24	450	16	65
300	445	400	22	12	M20	500	10	83
350	505	460	22	16	M20	550	10	125
400	565	515	26	16	M24	600	10	135
450	615	565	26	20	M24	600	10	160
500	670	620	26	20	M24	600	10	185
600	780	725	30	20	M27	600	10	221
700	895	840	30	24	M27	700	10	292
800	1015	950	33	24	M30	800	10	330
900	1115	1050	33	28	M30	900	10	525
1000	1230	1160	36	28	M33	1000	10	720
1200	1455	1380	39	32	M36	1200	10	1100
1400	1630	1560	36	36	M33	1400	6	1350
1600	1830	1760	36	40	M33	1600	6	1650
1800	2045	1970	39	44	M36	1800	6	2000
2000	2265	2180	42	48	M39	2000	6	2400
2200	2475	2390	42	52	M39	2200	6	2850
2400	2685	2600	42	56	M39	2400	6	3300
2600	2905	2810	48	60	M45	2600	6	3800
2800	3115	3020	48	64	M45	2800	6	4300
3000	3315	3220	48	68	M45	3000	6	4900

The table shows the typical versions of the sensors.
Other pressure ranges according to PN-EN 1092-1: 2007 available on demand.
On request, sensors with lengths according to customer's requirements are available.

Table 6. Dimensions - CP 870 sensors without flange – „wafer type”

Dn (mm)	D (mm)	L (mm)	PN (bar)	Masa (kg)
20	62	74	40	1
25	72	104	40	2
32	82	104	40	2
40	92	104	40	2
50	107	104	40	3
65	127	104	16	3
80	142	104	16	4
100	162	104	16	4
125	192	134	16	6
150	218	134	16	8
200	274	219	16	10

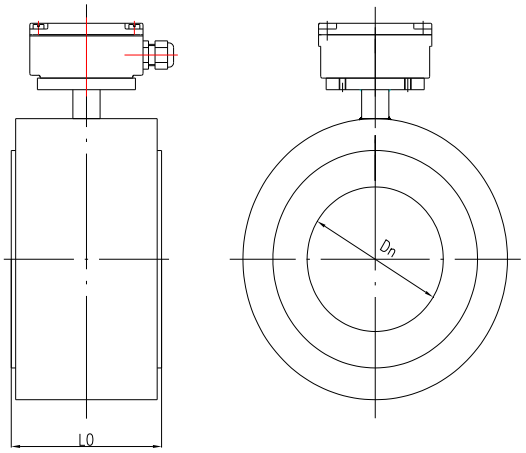


Fig . 2. Dimensions of sensors type CP 870

6. ASSEMBLY AND OPERATING CONDITIONS

6.1. Selection of sensors

Table 7. Relation between the flow velocity V and the flow Q and the nominal diameter DN

Diameter nominal DN [mm]	Flow value Q_{min} velocity V=0,1 [m/s]			Flow value Q_t velocity V=0,5 [m/s]			Flow value Q_{max} velocity V=10 [m/s]		
	q [l/s]	q [l/min]	q [m^3/h]	q [l/s]	q [l/min]	q [m^3/h]	q [l/s]	q [l/min]	q [m^3/h]
3	0,0006	0,04	0,0024	0,003	0,2	0,012	0,067	4	0,24
4	0,0013	0,08	0,0048	0,007	0,4	0,024	0,13	8	0,48
6	0,0033	0,20	0,012	0,017	1,0	0,06	0,33	20	1,2
8	0,0050	0,30	0,018	0,025	1,5	0,09	0,50	30	1,8
10	0,0075	0,45	0,027	0,037	2,3	0,13	0.75	45	2,7
15	0,0167	1,0	0,060	0,083	5,0	0,30	1,67	100	6
20	0,0250	1,5	0,090	0,13	7,5	0,45	2,50	150	9
25	0,0333	2	0,12	0,17	10	0,6	3,33	200	12
32	0,0666	4	0,24	0,33	20	1,2	6,66	400	24
40	0,1000	6	0,36	0,50	30	1,8	10,00	600	36
50	0,1667	10	0,6	0,83	50	3	16,67	1000	60
65	0,333	20	1,2	1,67	100	6	33,3	2000	120
80	0,500	30	1,8	2,50	150	9	50,0	3000	180
100	0,667	40	2,4	3,33	200	12	66,7	4000	240
125	1,167	70	4,2	5,83	350	21	116,7	7000	420
150	1,667	100	6,0	8,33	500	30	166,7	10000	600
200	3,00	180	10,8	15,00	900	54	300	18000	1080
250	5,00	300	18	25,00	1500	90	500	30000	1800
300	6,67	400	24	33,33	2000	120	667	40000	2400
350	9,17	550	33	45,83	2750	165	917	55000	3300
400	12,50	750	45	62,50	3750	225	1250	75000	4500
450	15,83	950	57	79,17	4750	285	1583	95000	5700
500	18,33	1100	66	91,67	5500	330	1833	110000	6600
600	26,67	1600	96	133,33	8000	480	2667	160000	9600
700	36,67	2200	132	183,33	11000	660	3667	220000	13200
800	50,00	3000	180	272,20	16333	980	5000	300000	18000
900	66,67	4000	240	333,33	20000	1200	6667	400000	24000
1000	75,00	4500	270	375	22500	1350	7500	450000	27000
1200	116,67	7000	420	583	35000	2100	11667	700000	42000
1400	153,89	9233	554	769	46140	2769	15389	923300	55400

When selecting the nominal diameter of the sensor, the diameter of the pipeline and the flow rate should be taken into account. In the case of very low flows, it may be necessary to narrow the pipeline to maintain measurement accuracy.

It is recommended to choose the sensor so that the flow value is within 0.5 ÷ 5 [m / s]. At lower flow rates, the measurement error increases and higher flows can cause turbulence on the system components.

6.1.1. Selection of the sensor lining

Type of floor covering	Characteristics, application
hard rubber	general purpose, high abrasion resistance, water and sewage measurement
Linagard FG	drinking water, PZH approval
Linatex®	the material shows very high abrasion resistance. Measurement of media containing abrasive materials, sludge. Application in mining, ore processing
PTFE, Teflon	chemical neutrality, very low coefficient of friction, high temperature applications, aggressive chemicals, chemical and food industries

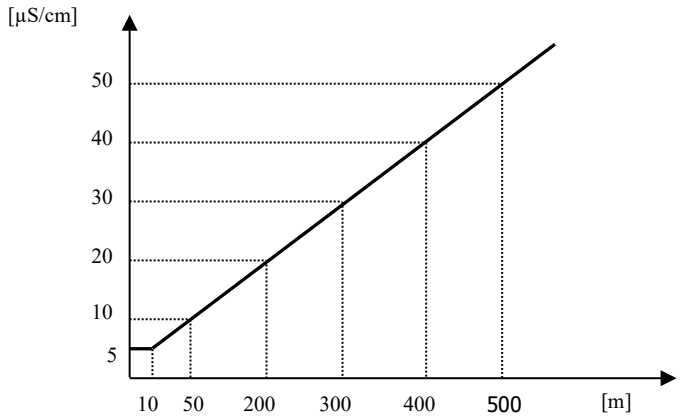
6.1.2. Electrode selection

Type of electrodes	Usage
stainless steel 316L (1.4404)	General use
Hastelloy C-276	General purpose, high resistance to many chemicals, salt
Titanium	Nitric and chromic acid, chlorine, chlorites
Tantalum	Acids (e.g. hydrochloric and sulfuric acid)
Monel	Salts, brine and alkaline solutions
Conical	electrodes (materials as above)

6.2. Cable length

The length of the cables between the converter and the sensor in a remote version depends on the electrical conductivity of the measured medium. The permissible cable lengths are shown in the diagram below.

In the case of the flowmeter with the function of empty sensor detection, the minimum conductivity of the liquid should exceed 20 [µS / cm], and the length of the wires should not exceed 50 meters.



6.3. Mounting the converter

When installing the converter, the given environmental conditions, in which the given model may operate, should be taken into account.

The converter must not be exposed to vibrations or direct sunlight.

The MPP®800 converter is designed to be mounted on a wall or on a TS 35 mounting rail. The converter set includes two brackets for mounting eg on a wall or, on request, two catches for mounting on a rail.

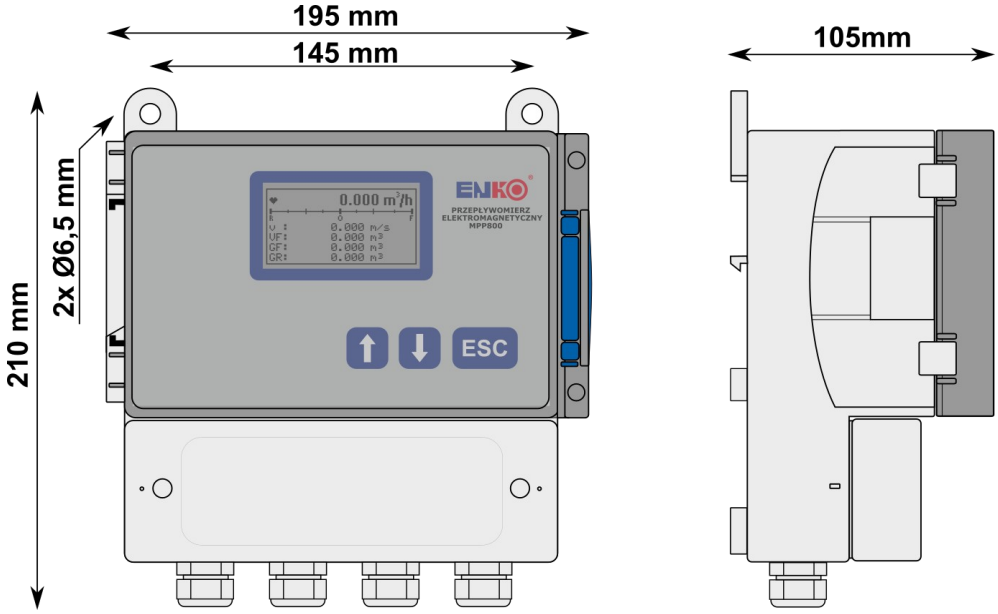


Fig . 3. External dimensions of the MPP®800 converter

The MPP®800 IP converter is designed for wall mounting.

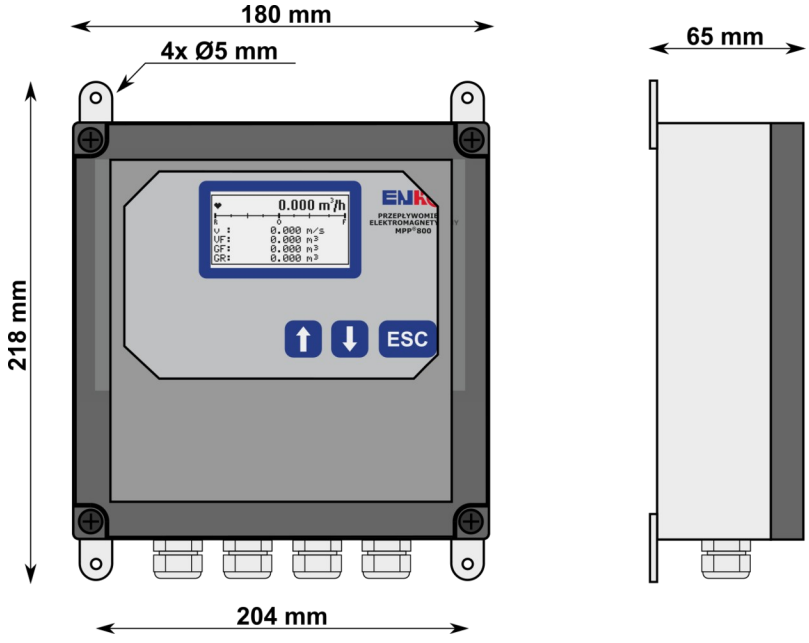


Fig . 4. External dimensions of the MPP®800 IP converter

The MPP®800 and MPP® 800 IP converter can be mounted on sensor as a compact.

The MPP®810 converter is designed for wall mounting.

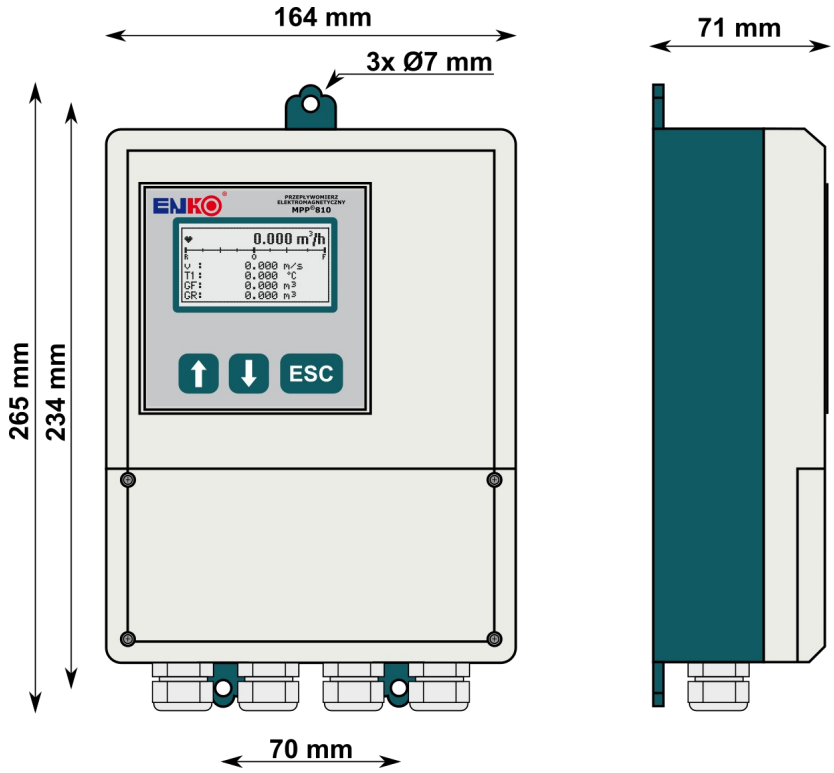


Fig . 5. External dimensions of the MPP®810 converter

The MPP®820 converter is designed for wall mounting.

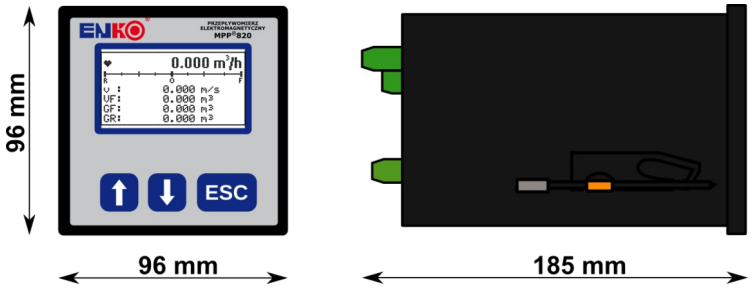


Fig . 6. External dimensions of the MPP®820 converter

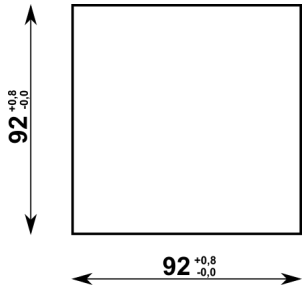


Fig . 7. MPP®820 converter MPP mounting hole dimensions

7. ELECTRICAL CONNECTIONS

Converter power supply

DANGER: Hazardous supply voltage can shock or cause death.

WARNING: Disconnect power before making connections.

WARNING

The AC and DC units have different components. Do not connect AC power to a DC monitor and viceversa.

Check carefully needed power supply. Converter power supply (terminals 1, 2, 3) can be made with any cable with a cross-section of 3x1,0 mm^2.

1	2	3
+	–	PE
24V AC/DC		

1	2	3
L	N	PE
230V AC		

Coil power cable

The connection of the sensor coil power supply circuit (terminals 29, 30) can be made with any cable with a cross-section of 2x0.75 mm2.

In cases of particular exposure to interference (e.g. proximity to the inverter installation), it is recommended to use a shielded cable.

Signal cable

The signal cable is delivered by the manufacturer together with the flow meter in the ordered quantity. The cable has a double shielding, it is made of three separately shielded cores and a common shielding braid.

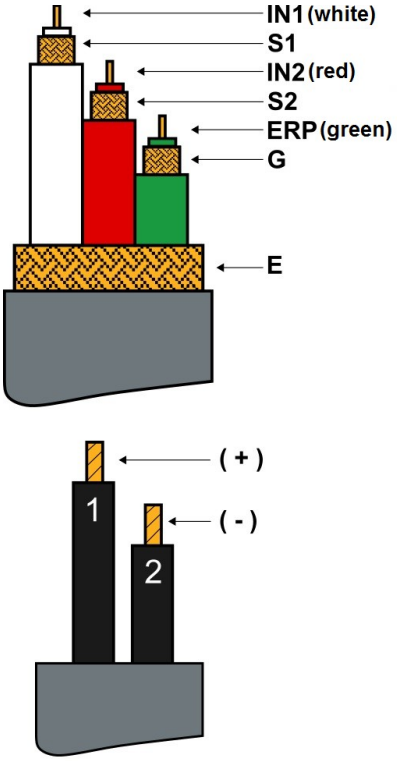


Fig . 8. Description of connecting cables IP68 flow meters

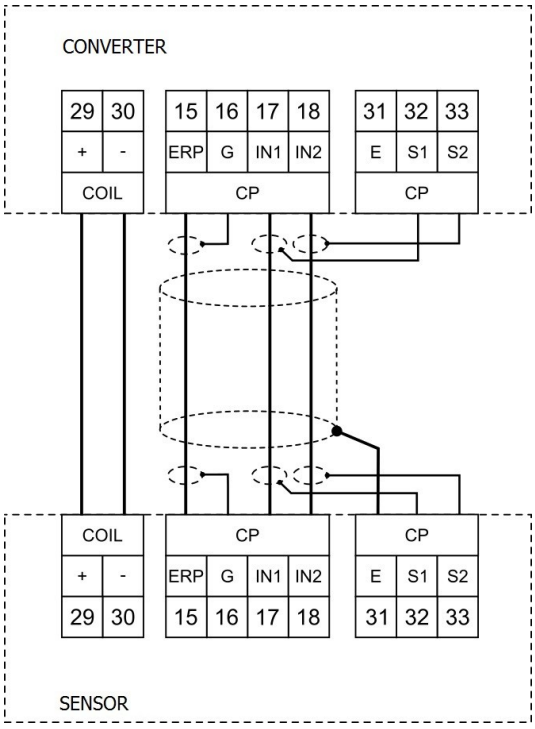


Fig . 9. External connections sensor and converter

Normally, the external shield of the signal cable is not connected from the converter side, but sometimes in environments with strong electromagnetic interference it is recommended to connect the shield in the converter to the ground terminal.

Particular attention should be paid to the careful preparation of the cable ends. It is recommended to tin them or crimp the sleeves.

In IP68 flow meters, the coil power cable and the signal cable are permanently connected to the sensor.

Cables should be run in protective pipes.

4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
A	B	G	+	-	+	-	TZ+	TS+	TS-	TZ-	ERP	G	IN1	IN2
RS-485			OUT 4-20mA		IN 4-20mA		T1 PT-100				CP			

19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
+	-	+	-	+	-	TZ+	TS+	TS-	TZ-	+	-	E	S1	S2
IN		OUT1		OUT2		T2 PT-100				COIL		CP		

Fig . 10. MPP®8 Transducer I/O terminal block

Electrical connections must be made by properly authorized personnel. There is a risk of electric shock. Turn off the power before opening the converter cover. Connections can not be made while the device is powered.

After connecting the wires, carefully tighten the cable glands of the sensor and converter. The cables should be arranged in such a way that there is no possibility of water flowing down them to the glands.

The flow meters with ERP empty pipe detection are characterized by the fact that the sensors have four measuring electrodes. This information can be read from the nameplate on the sensor. In the electrode field, the first digit indicates their number.

7.1. Mounting the sensor

When determining the place of installation, the chemical, thermal and mechanical resistance of the sensor pipe lining and the measuring electrodes should be taken into account in order to prevent its damage and the leakage of the medium outside the installation.

The flow meter sensor should be mounted on the pipeline in a way that ensures the liquid flow through the full cross-section of the sensor pipe. Air into the installation should not be allowed as this may interfere with the measurement. The sensor must always be completely filled with liquid. In the case of installations with the possibility of periodic emptying, an ERP flow meter should be used - detection of empty sensor pipe. The sensor in this version is equipped with an additional electrode for detecting the lack of liquid or the flow with incomplete cross-section.

Mounting materials, such as bolts, nuts, seals, etc. are not included in the scope of delivery, so please have them available.

Particular attention should be paid to the axial mounting of the sensor in relation to the gaskets and flanges of the pipeline. If the gaskets are not installed carefully, swirls may appear on their protruding edges, which then result in an unstable measurement.

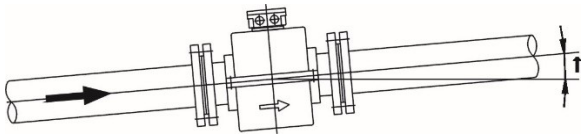
The flow meter sensor should not be installed in a place with strong electromagnetic fields.

In the case of a pipeline with strong vibrations, provide supports near the sensor installation site or mechanical damping elements. In this case, a remote version of the flow meter should be used.

Caution is advised when moving the sensor. Sensors with a nominal diameter greater than DN 150 are equipped with handles intended for their transport by means of belts. The sensor placed on the floor with its housing should be secured (e.g. with wedges) against unexpected rotation around its axis.

Mounting the sensor in the direction of the arrow on the sensor housing ensures correct identification of the flow direction through the flow meter transducer. An arrow marked "F" signifies the forward flow direction, an arrow marked "R" signifies a reverse flow direction. If the sensor is mounted upside down, the correct identification of the flow direction can be ensured by changing the order of the coil circuit wires (terminals 21,22).

A slight pipeline inclination (approximately 3%) is recommended to prevent gas accumulation inside the sensor.



In order to obtain the maximum accuracy of the measurement, it is necessary to provide straight sections of the installation with the dimension of five nominal diameters of the sensor upstream and two downstream of the sensor. In the case of installations where there may be strong disturbances in the flow caused, for example, by a pump pumping sludge, gravel, etc., it is recommended to double the straight sections before and after the flow meter as compared to those given in Fig. 7. When measuring mixtures of various substances, which may react with each other, a flow meter should be installed upstream of the place of their mixing or at a suitable distance downstream from this place (min. 25 x DN).

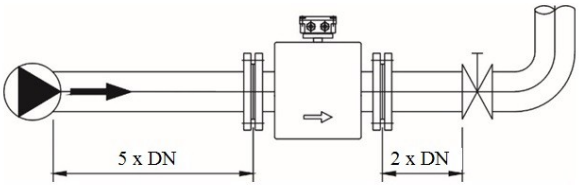


Fig . 11.

If the sensor is mounted on a horizontal section of the pipeline, it should be mounted as shown in the drawing. By turning the sensor by 90° or 180°, the measuring electrodes will be located in the upper and lower part of the sensor, which will expose them to air and silt respectively.

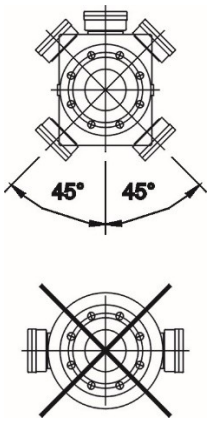


Fig . 12.

Avoid mounting the sensor at the highest point of the installation and mounting it on a vertical section of the pipeline with a free flow.

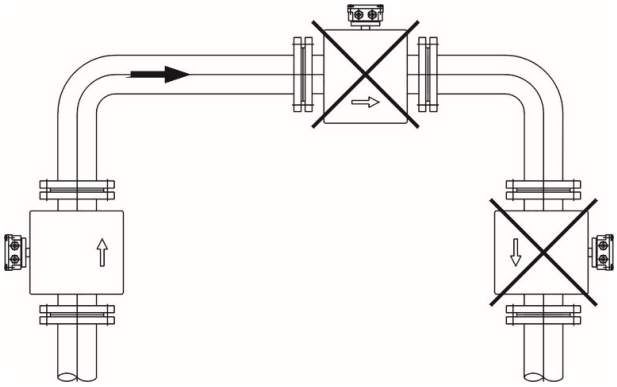
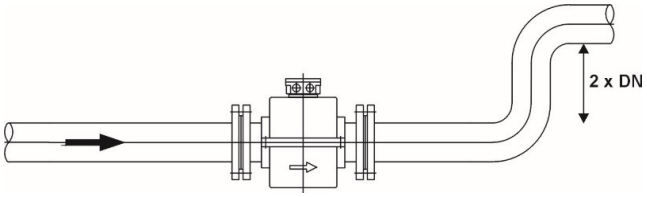


Fig . 13.

The sensor in a free discharge line should be mounted as shown in the figure.



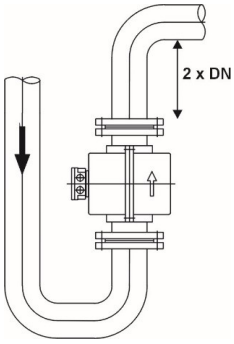


Fig . 14.

In the case of partially filled pipelines or with gravity flow, installation in a siphon should be used to ensure that the flow meter sensor is always filled with liquid.

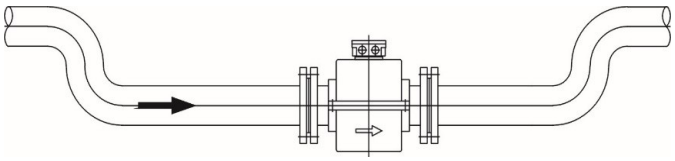


Fig . 15.

If the sensor is installed on a vertical section of the pipeline, the flow direction should be from bottom to top to ensure correct measurement. This will ensure the flow through the full section of the pipeline and eliminate the negative impact on the measurement of air (gas) bubbles.

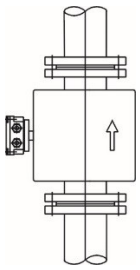


Fig . 16.

A bypass line can be used to facilitate periodic disassembly of the sensor for e.g. calibration or when mechanical cleaning is required to ensure uninterrupted fluid flow.

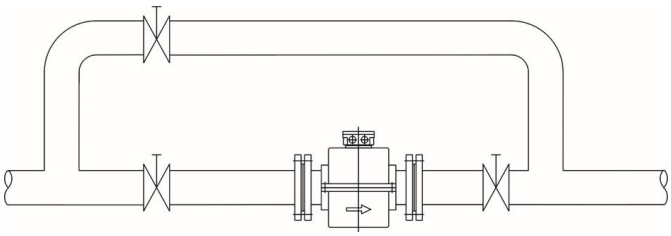


Fig . 17.

In pipelines with larger diameters with low flow velocities, reduction fittings (reducers) should be used. For example, in the case of gravity flow, mounting the sensor between the orifices will increase the flow rate and thus greater measurement accuracy. A constriction with a slope of up to 8° can be regarded as a straight segment.

The pressure drop caused by the reduction of the cross-section of the pipeline is shown in Fig. 14. The nomogram presented on it is applicable for liquids with a viscosity close to that of water.

In order to determine the pressure drop on the applied reduction, determine the ratio d / D, and then read the value of the pressure drop for the given flow velocity.

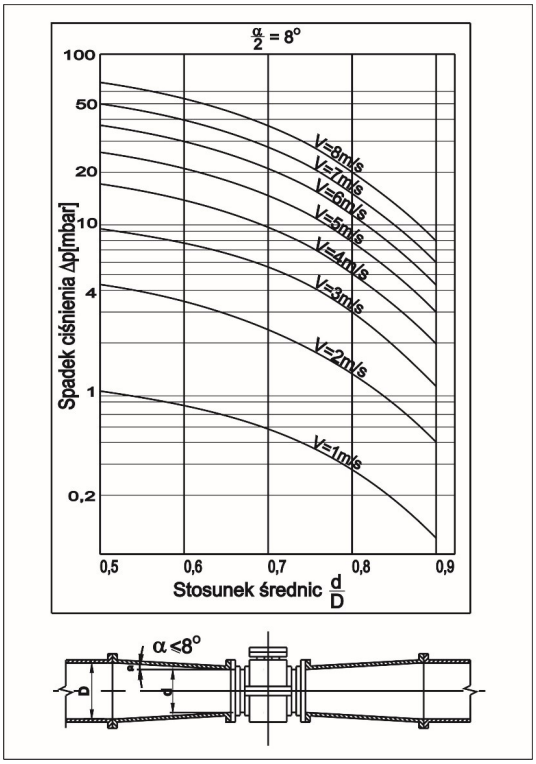
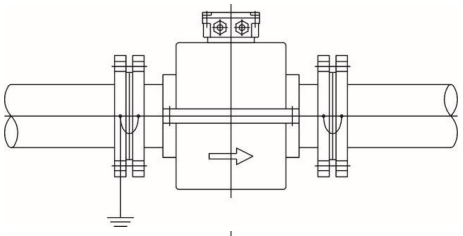


Fig . 18.

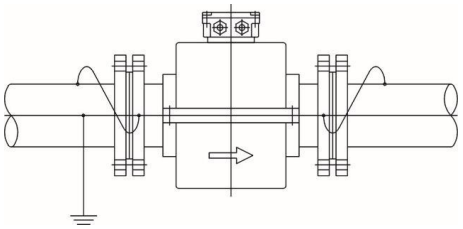
7.2. Potential equalization

To ensure correct operation of the flow meter, the sensor must have the same electrical potential as the measured liquid, and the pipeline must be earthed.

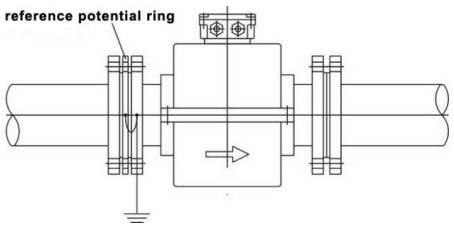
If the pipeline is made of steel, connect the sensor equalizer lines to the pipeline flanges. Equipotential bonding pipes are terminated with ends with an eyelet Ø 6, therefore, in the pipeline flanges, the thread for the M6 bolt should be prepared or studs with the M6 thread should be welded.



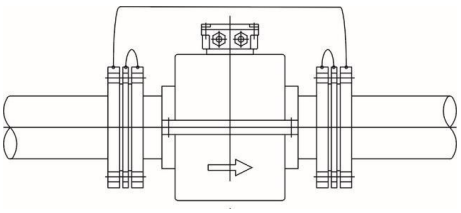
If the pipeline is made of metal, but with flanges electrically insulated from the pipeline, pins should be welded to the pipeline and an equipotential bonding should be made with a conductor of 4mm2 cross-section.



If the pipeline and flanges are electrically insulated from the medium (plastic pipeline or with internal lining), a reference potential rig should be used and the equalizing conductor of the sensor should be connected to it. If stray currents occur in the pipeline, it is recommended to use two rings - on both sides of the sensor.



If the pipeline has cathodic corrosion protection, the sensor must be installed to ensure electrical insulation between it and the pipeline. The converter must be powered by an isolating transformer.



In the case of electrically insulated pipelines, instead of the potential reference ring, a flow meter sensor with an additional potential reference electrode can be used. All sensors in ERP design (empty sensor detection) have a potential reference electrode as standard. In the presence of electromagnetic disturbances or stray currents in the installation, it may be necessary to use a reference potential flange.

Sensors with process connectors are provided with potential equalization via these connectors. There is no need for additional equalizing bonding.

8. MENU DESCRIPTION

8.1. Keyboard

The user has at his disposal a 3-key keyboard for setting the flow meter parameters.

The keys designation and function:

Function:

- enter to main menu
- leave current level of back to previous menu (or main screen)
- leave editable parameter without change

Function:

- scroll through the positions UP
- edition of the selected parameter UP, increase the underlined number

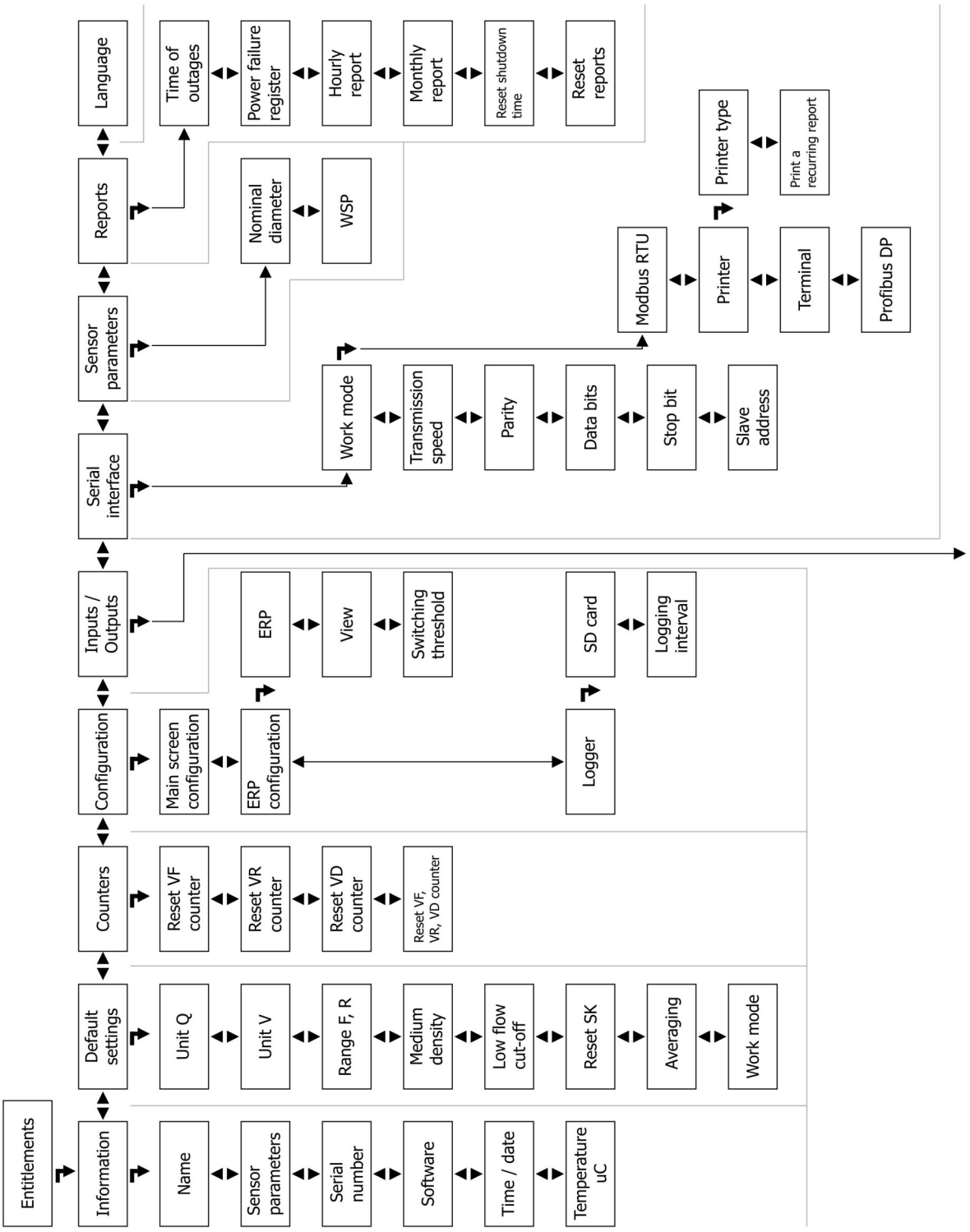
Function:

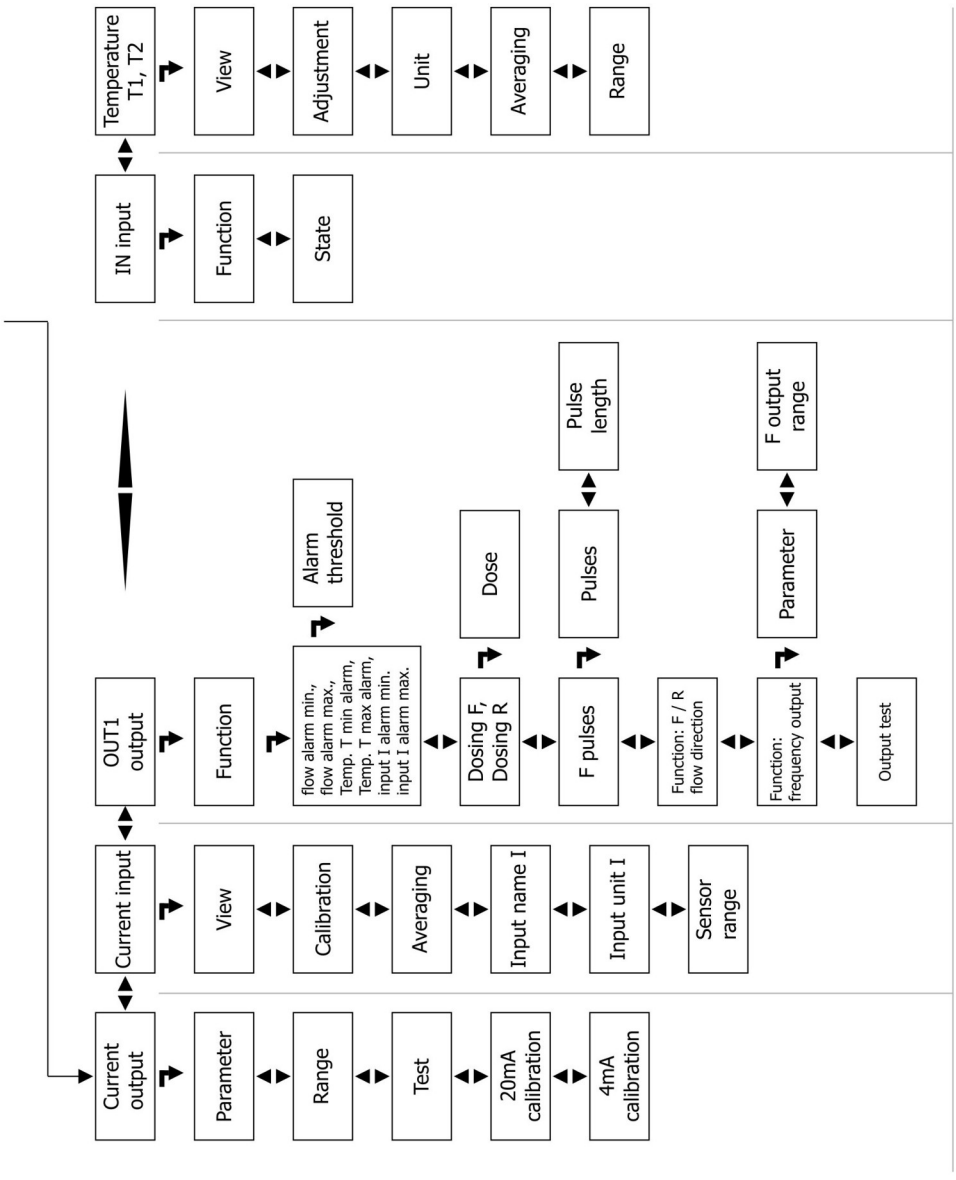
- scroll through the positions DOWN, decrease the underlined number
- change editable parameter for previous
- move cursor for next editable sign

Function:

- simultaneous pressing of the keys causes the transition to edition of the selected parameter and acceptance (saving) of the newly entered value
- go to submenu

8.2. Menu structure




Current output
Parameter
Range
Test
20mA calibration
4mA calibration
Current input
View
Calibration
Averaging
Input name I
Input unit I
Sensor range
OUT1 output
Function
flow alarm min., flow alarm max., Temp. T min alarm, Temp. T max alarm, input I alarm min, input I alarm max.
Alarm threshold
Dosing F, Dosing R
Dose
F pulses
Pulses
Pulse length
Function: F / R flow direction
Function: frequency output
Parameter
F output range
Output test
IN input
Function
State
Temperature T1, T2
View
Adjustment
Unit
Averaging
Range

8.3. MENU - DESCRIPTION

8.3.1. Entitlements

The authorization level granted by the administrator allows you to edit the parameters or only review the basic functions. Higher levels of privileges protected by a password.

After entering the appropriate password, you get access to the functions and parameters assigned to a given level.

List of entries for the MPP®8 electromagnetic flow meter	
Permission level	password
Operator	12345
Administrator	12358

8.3.2. Information

Minimum permission level for viewing: none

The minimum level of editing rights: operator

8.3.2.1. Name

It allows you to give your own names to individual devices, eg "SUW No. 1". The name may appear in one of the auxiliary lines.

8.3.2.2. Sensor parameters

Information about the sensor diameter and the WSP calibration factor.

8.3.2.3. Serial number

Information about the serial number of the flow meter.

8.3.2.4. Program version

Contains information about the installed software version.

8.3.2.5. Time / Date

Date and time setting.

8.3.2.6. Temperature uC

Information about the temperature inside the converter housing.

8.3.3. Basic settings

Minimum authorization level: operator

8.3.3.1. Q unit

Unit of the value of the flow. In the selected unit, all parameters related to the flow will be displayed, e.g. alarm thresholds for OUT1, OUT2 outputs.

Available units: %, m/s, l/s, l/min, l/h, m³/s, m³/min, m³/h, kg/s, kg/min, kg/h, T/s, T/min, T/h.

8.3.3.2. Unit V

Volume unit in which the counter readings will be displayed. The selected unit will also display parameters related to the volume unit, e.g. doses for the dispensing function.

Available units: l, m³, kg, T.

8.3.3.3. Range F, R

The measuring ranges represent 100% of the flow values set by the user separately for the forward (F) and backward (R) flow. The parameter also sets a lower / upper limit for the current output and the frequency output.

8.3.3.4. The density of the medium

This parameter is used to convert volume units to mass units. Necessary when displaying the flow rate in units: kg / s, kg / min, kg / h, T / s, T / min, T / h and volume meters in kg, T.

8.3.3.5. Cut-off point

Defines the threshold below which the flow is not measured. It is set as a percentage with respect to the forward measuring range (F). This threshold applies to both the forward and backward movement of the medium. This function enables the elimination of disturbances caused, for example, by fluctuations in the liquid in the pipeline. The default value is 1%.

8.3.3.6. Reset SK

Establishing the zero point of the flow meter

Attention!

> The zeroing of the correction constant should be performed when the flow meter shows the flow despite its actual absence after filling the sensor with liquid. The zeroing of the correction constant should be performed when, after filling the sensor with liquid and stopping the liquid flow, the device indicates the flow value different from zero. Make sure the system is free of flow and the sensor is completely full of liquid before attempting to zero.

Zeroing may be subject to a deviation of ± 1 m / s. Larger deviation (in the absence of flow)

cannot be reset - it may be caused by improper installation of the flow meter or its damage.

8.3.3.7. Averaging

Averaging (smoothing) the measurement in the range from 1 to 200 seconds. Entering zero means no averaging. The current and frequency outputs are also averaged.

8.3.3.8. Work mode

The flow meter measures the flow in two directions. Fluid flow in the direction of the arrow (on the sensor nameplate) marked F indicates forward flow. On the other hand, the flow in the direction of the arrow marked R is "reverse".

When the operating mode is changed to unidirectional, the reverse flow is not measured.

8.3.4. Counters

Minimum permission level: administrator

The converter is equipped with six independent counters that count the amount of the flowing medium in units of volume or mass.

Counters can be divided into two groups: erasable (current - marked with the letter "V") and non-erasable (main - marked with the letter "G"). Those from the first group can be deleted. Additionally, the running counters can be reset by giving an impulse to the binary input IN. (see inputs / outputs Input IN).

8.3.4.1. Reset VF counter

Clears the current VF volume counter for the forward flow.

8.3.4.2. Reset VR Counter

Reset current VR volume counter for reverse flow.

8.3.4.3. Clear differential counter VD

Resets the current differential volume counter VD.

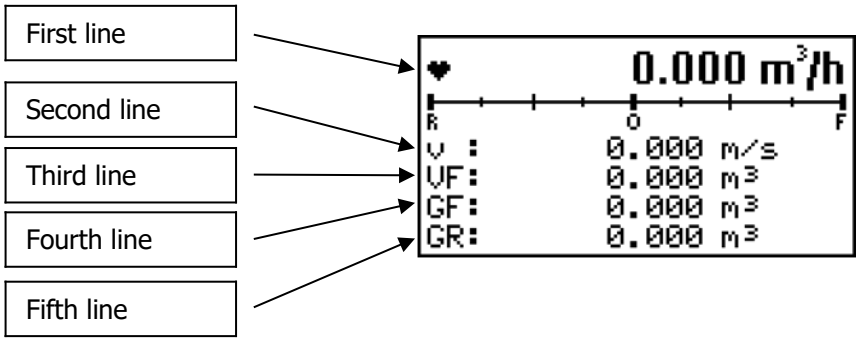
8.3.4.4. Reset VF, VR, VD counter

Reset all running counters.

8.3.5. Configuration

Minimum authorization level: operator

8.3.5.1. Home screen configuration



In the Screen Configuration menu, you can select the information to be shown on the selected line on the main screen of the flow meter display.

Possible information:

- first line:

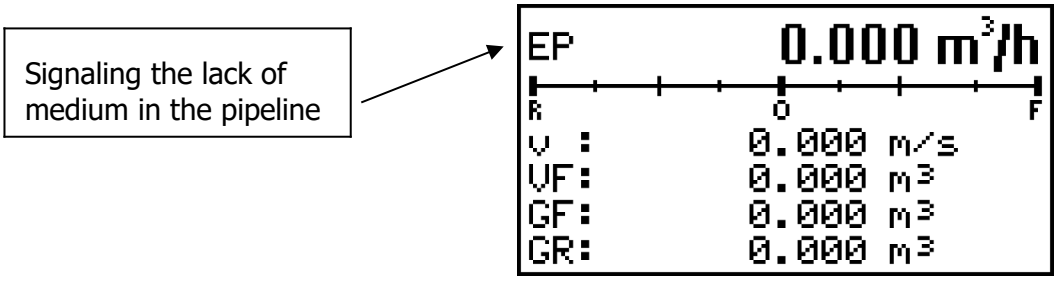
  flow velocity, volume flow, temperature T1, temperature T2, temperature difference ΔT, current input (the name of the parameter will appear as defined in the input / output menu-> current input-> name e.g. Pressure),

- remaining lines:

  flow velocity, volume flow, temperature T1, temperature T2, temperature difference ΔT, current inputs (the name of the parameter will appear as defined in the input / output menu-> current input-> name e.g. Pressure), main counter GF, main counter GR, counter GD differential, VF running

counter, VR running counter, VD differential running counter, OUT1 output dosing counter, OUT2 dosing counter, name, blank line.

8.3.5.2. ERP configuration



8.3.5.2.1. ERP

Enable / disable the empty pipe detection function.

Before enabling the ERP function, make sure that the sensor has 4 electrodes. For information on the number of electrodes see the sensor nameplate.

8.3.5.2.2. Preview

Value currently measured by the empty pipe detection sensor. Indications from 0 to 1024.

See ERP Calibration.

8.3.5.2.3. Switching threshold

Value below which the ERP sensor detects the lack of medium in the pipeline.

8.3.5.3. Logger configuration

Minimum authorization level: operator

Converter MPP®800 i MPP®800IP can optionally be equipped with a logger function to record measured data and alarms on a nonvolatile memory SD card.

Data is stored as .tsv files on the memory card (one file per month for ease of data treatment).

Note!

A memory of 2 Gb will store up to 13 years of data at a 1 minute logging interval.

Important Note

Use memory cards purchased from ENKO-POMIAR only. Other manufacturer's cards or cards with other capacities may lead to partial or complete loss of data.

Install a SD card

Insert the SD card to the SD card slot.

Make sure the SD card is inserted correctly (push-push system) and tightly. A small "click" will assure proper fitting.

Note:!

The SD card can be inserted in one way only, incorrect plugging is going to be avoided due to mechanical construction of the slot. Do not apply any force to insert card. If the card does not fit properly, rotate the card and find the right positioning.

Fig . 19. SD card slot

To remove the SD card, push on the card and the slot will release it.

Important Note!

The SD card can be removed when the function „REMOVE" is selected or when the power supply to the flow meter is disconnected. Otherwise, it may lead to data loss and damage to the SD card.

8.3.5.3.1. SD card

Allows you to view the data logger status and safely remove the SD card.

- NOT IN – no card in the slot or card inserted incorrectly
- REMOVE – it is possible to safely remove the card from the SD card slot
- WORK – card inserted correctly; data can be written to the SD card

8.3.5.3.2. Logging interval

Allows the user to specify the data logging interval. Logging interval choice between (1 min., 2 min., 3 min., 4 min., 5 min., 10 min., 15 min., 30 min. and 60 min.)

8.3.6. Inputs / Outputs

The MPP®8 series converters are equipped with a number of communication paths with the environment. Some functions appear depending on the configuration that should be specified at the ordering stage.

8.3.6.1. Current output

The active 0 / 4-20 mA current output is available on terminals 7 (+), 8 (-) of the flow meter converter.

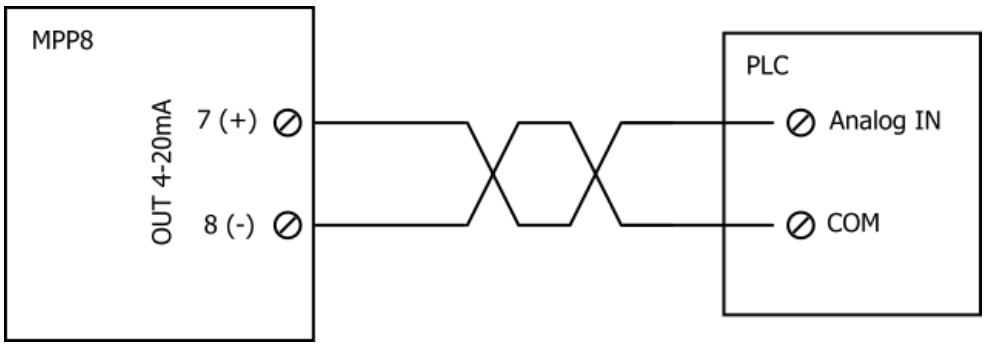


Fig . 20. An example of connection of the flow meter converter with a PLC controller

8.3.6.1.1. Parameter

Minimum authorization level: operator

The quantity measured by the flow meter that will be mapped to the 0 / 4- 20mA output.

Parameters available:

Parameter	Value for 0 / 4mA	Value for 20mA
volume flow F	0 m^3/h	Range F
volume flow R.	0 m^3/h	Scope of R
volume flow F… R	Scope of R	Range F
temperature T1	0°C	Range T1
temperature T2	0°C	Range T2
temperature difference ΔT	- Range T1	Range T1

8.3.6.1.2. Output range I

Minimum authorization level: operator

Working range of the current output (0-20mA or 4-20mA)

8.3.6.1.3. Output test

Minimum authorization level: operator

Setting the output current value for testing.

8.3.6.1.4. 20mA calibration

Minimum permission level: administrator

The parameter enables the calibration of the upper value of the 20 mA current output. See the current output calibration manual.

8.3.6.1.5. 4mA calibration

Minimum permission level: administrator

The parameter enables the calibration of the lower value of the 4 mA current output. See the current output calibration manual.

8.3.6.2. Current input

The 4-20 mA current input enables the connection of an external pressure sensor or another measuring sensor with an analog 4-20 mA output. The input is available in two versions: Passive (external power source required) or Active (power source built into the converter). Information about the type of current input you have can be found on the rating plate of the transducer.

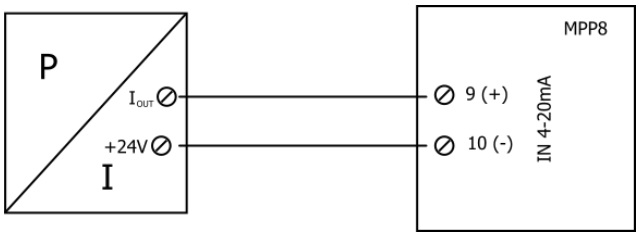


Fig . 21. Example connection of a pressure sensor with a MPP®8 series converter equipped with current input A (active)

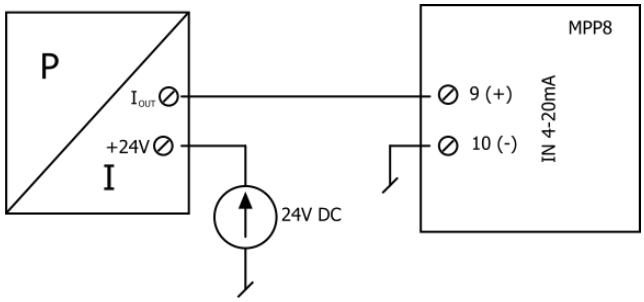


Fig . 22. Example connection of a pressure sensor with a MPP®8 series converter equipped with a current input P (passive)

8.3.6.2.1. Preview

Minimum authorization level: operator

Preview of the currently measured value on the current input (IN 4-20mA).

8.3.6.2.2. Calibration

Minimum permission level: administrator

Starting the calibration procedure of the IN 4-20mA input. See 4-20mA Calibration Procedure.

8.3.6.2.3. Averaging

Minimum authorization level: operator

Averaging (smoothing) of the measurement from the current input in the range from 1 to 10 seconds. Entering zero means no averaging.

8.3.6.3. Input name I

Minimum permission level: Administrator

Name of the measured sensor parameter connected to the IN 4-20mA input, eg pressure.

8.3.6.3.1. Input unit I

Minimum permission level: Administrator

Unit of the measured parameter, e.g. bar

8.3.6.3.2. Sensor range

Minimum permission level: Administrator

Measuring range of the sensor connected to the IN 4-20mA input.

In order to correctly calculate the value of the current for the value of the measured parameter, the range should correspond to the value of 20mA. For example, a pressure sensor with a range of 10 bar.

8.3.6.4. OUT1, OUT2 output

Minimum authorization level: operator

The MPP®8 series converters can be equipped with two independent two-state outputs realized on relays or optocouplers.

8.3.6.4.1. Function

Selection of the function performed by the OUT1 or OUT2 outputs.

Functions available for the outputs:

Function	OUT1		OUT2	
	relay	optocoupler	relay	optocoupler
flow alarm min.	+	+	+	+
alarm flow max.	+	+	+	+
Temp. T1 alarm min.	+	+	+	+
Temp. T1 alarm max.	+	+	+	+
Temp. T2 alarm min.	+	+	+	+
Temp. T2 alarm max.	+	+	+	+
input I alarm min.	+	+	+	+
input I alarm max.	+	+	+	+
dosing F	+	+	+	+
dosing R	+	+	+	+
F pulses	+	+	+	+
R pulses	+	+	+	+
F / R flow direction	+	+	+	+
Frequency output	-	+	-	-

8.3.6.4.1.1. Function: flow alarm min. ...

The function enables signaling through the OUT1 and OUT2 outputs that the selected parameter changes beyond the set threshold. Signaling works with 5% hysteresis.

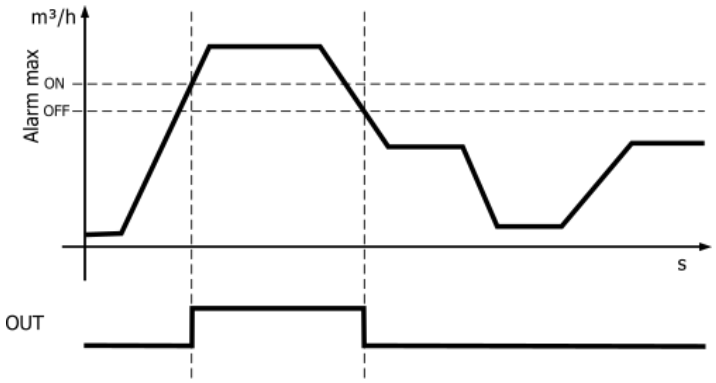


Fig . 23. Alarm function max

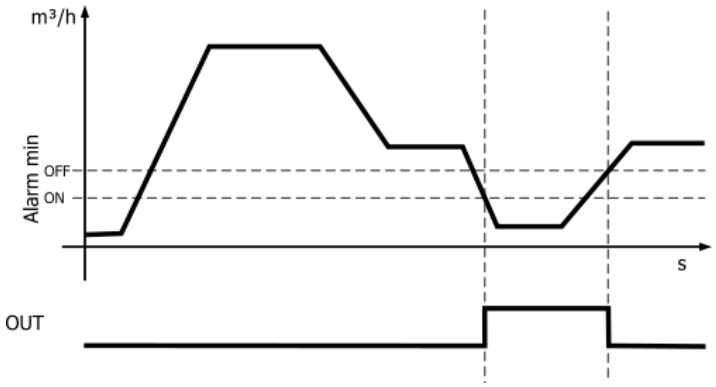


Fig . 24. Alarm function min

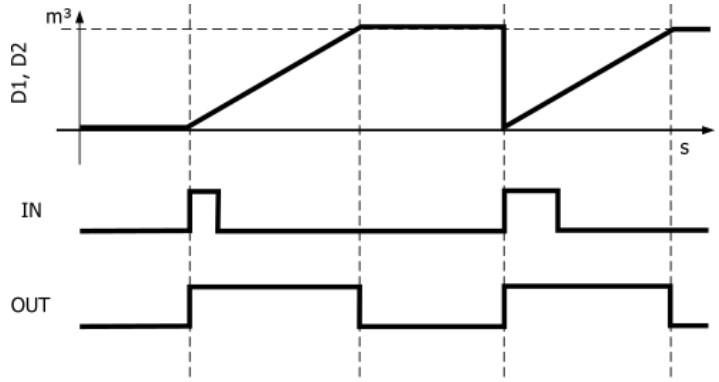
8.3.6.4.1.1.1. Alarm threshold

For the alarm max function - the alarm threshold above which the selected OUT output will be activated.

For the alarm function min. - alarm threshold below which the selected OUT output will be activated.

8.3.6.4.1.2. Function: dosing F, dosing R

The MPP®8 flow meter is capable of counting doses, i.e. measuring the set volume (mass) of the medium and, on the basis of this, controlling the OUT1 or OUT2 outputs. See "Flow meter Configuration for Dosing".

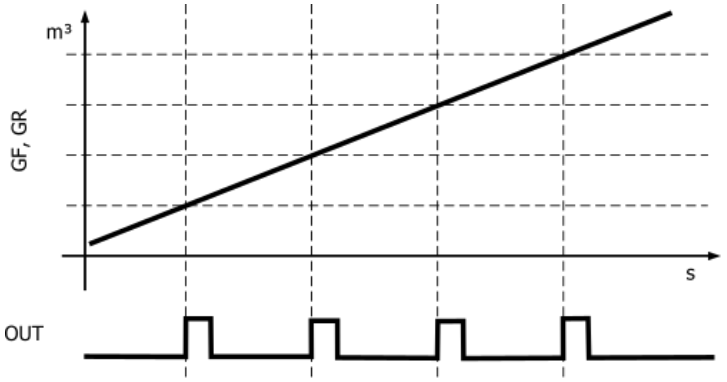


8.3.6.4.1.2.1. Dose

Amount of the dosed dose. The unit of measure is the unit set for the volume meters.

8.3.6.4.1.3. Function: F pulses, R pulses

The function enables generating pulses after measuring the preset volume (mass) of the medium. The converter enables the generation of maximum 1 pulses per second for the output version with a relay and 10 pulses per second for the optocoupler output.



8.3.6.4.1.3.1. Pulses

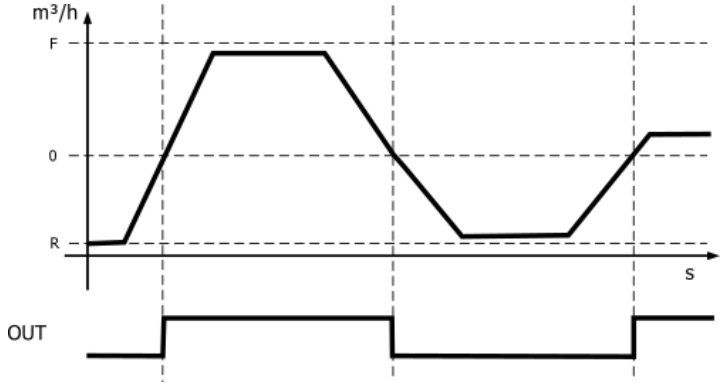
This parameter defines the value of the volume after which the pulse is generated on the OUT1 or OUT2 output. The unit of measure is the unit set for the volume meters.

8.3.6.4.1.3.2. Pulse length

The parameter determines the duration of the pulse generated on the OUT output.

8.3.6.4.1.4. Function: F / R flow direction

This function enables the signaling of the flow direction.



8.3.6.4.1.5. Function: frequency output

The OUT1 output in the version with an optocoupler enables the generation of a square wave with a variable frequency depending on the selected parameter.

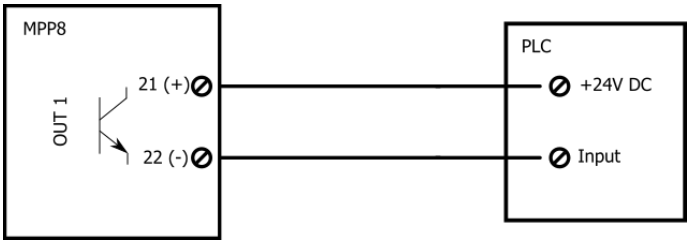


Fig . 25. An example of connection of the frequency output of the flow meter converter with a PLC controller

8.3.6.4.1.5.1. Parameter

The quantity measured by the flow meter that will be mapped to the frequency output.

Parameters available:

Parameter	**Value for 0Hz / 5Hz**	**Value for 15Hz / 1kHz / 5kHz / 10kHz**
volume flow F	0 m^3/h	Range F
volume flow R.	0 m^3/h	Scope of R
volume flow F… R	Scope of R	Range F
temperature T1	0°C	Range T1
temperature T2	0°C	Range T2
temperature difference ΔT	- Range T1	Range T1

8.3.6.4.1.5.2. F output range

Working range of the frequency output.

Parameters available:

- 5- 15Hz
- 0- 1kHz
- 0- 5kHz
- 0- 10kHz

8.3.6.4.1.6. Output test

For the function frequency output - Set the percentage of the frequency output range for testing.

For other functions - Enables the OUT1 or OUT2 output to be activated for testing.

8.3.6.5. IN input

Two-state input activated with external voltage of 24V DC.

8.3.6.5.1. Function

This parameter allows you to assign a function to be performed by the flow meter after activating the IN input.

Function	Description
Measurement permission	The medium is measured only when the input is active. The lock is signaled on the main screen by the flashing symbol "EL"
D1 counting start	Dosing starts at the OUT1 output
D2 counting start	Dosing starts at the OUT2 output
D1, D2 counting start	Dosing is started at the OUT1 output, and after it is finished, dosing is started at the OUT2 output
Reset VF counter	Resets the current counter forward
Reset VR counter	Resets the current counter backwards
Reset VD counter	Resets the current differential counter
Reset VF, VR, VD counter	Reset all running counter
Print report	Starts report printout on the printer connected to the converter serial interface

8.3.6.5.2. State

It allows to view the current state of the IN input

8.3.6.6. Temperature T1, T2

The MPP®8 series converter can be equipped with two paths for temperature measurement with PT100 sensors.

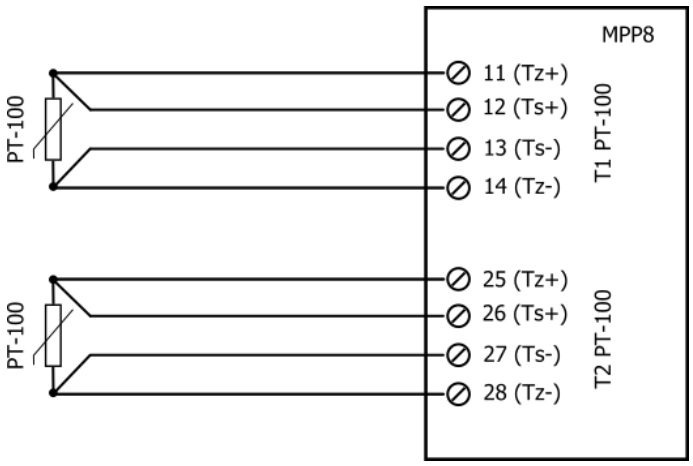


Fig . 26. Connecting temperature sensors to the converter

8.3.6.6.1. T1, T2 preview

Preview of the currently measured resistance / temperature of the PT100 sensor

8.3.6.6.2. Adjustment

Minimum permission level: Administrator

Correction factor for temperature measurement

8.3.6.6.3. Unit

Unit of measured temperature.

Available units: °C, °F, K.

8.3.6.6.4. Averaging

Averaging (smoothing) the temperature measurement in the range from 1 to 10 seconds. Entering zero means no averaging.

8.3.6.6.5. Range

The measuring ranges represent 100% of the measured temperature value. The parameter also sets the upper limit for the current output and the frequency output.

8.3.7. RS485 serial interface

The converter is equipped with a serial interface (EIA) RS-485 or optionally with Profibus DP V0.

8.3.7.1. Type of work

8.3.7.1.1. Operation type: Modbus RTU

The serial interface works as a slave unit of the Modbus RTU protocol. The map of the registers can be found in the appendix.

Supported function codes:

- "Read Input Registers" function code 0x04
- "Read Holding Registers" function code 0x03
- "Write Single Register" function code 0x06
- "Write Multiple Registers" function code 0x10

8.3.7.1.2. Type of work: printer

The flow meter with RS-485 interface can work with a printer with RS-232 interface. It allows to print current flow values, volume counters, and volume growth reports.

8.3.7.1.2.1. The type of the printer

The flow meter is currently prepared for cooperation with a Mini Mouse type printer.

8.3.7.1.2.2. Print a recurring report

Selection of the type of cyclic report to be printed:

- Hourly - report printed every hour

- Daily - report printed every day at 00:00:00
- Monthly - report printed on the first day of the month at 00:00:00

8.3.7.1.3. Type of work: terminal

The flow meter converter works in the terminal service.

8.3.7.1.4. Type of work: Profibus DP

The serial interface works as a slave unit of the Profibus DP V0 protocol.

The GSD configuration file can be downloaded from our website.

Attention:

In the case of a converter equipped with a Profibus communication module, it is impossible to use the RS485 interface in work as Modbus RTU, Terminal, Printer

8.3.7.2. Transmission speed

Serial interface baud rate. Available speeds are 1200, 2400, 4800, 9600, 19200 bps.

8.3.7.3. Parity

Parity check bit:

- None – no testing
- Even – parity check
- Odd – odd parity check

8.3.7.4. Data bits

Number of data bits. Always 8 bits.

8.3.7.5. Stop bit

Number of stop bits. 1 or 2 to choose from.

8.3.7.6. Slave address

Unique address of the "slave" station for the modus, profibus protocol.

8.3.8. Sensor parameters

8.3.8.1. Nominal diameter

Nominal diameter of the measuring sensor.

8.3.8.2. WSP

Correction factor of the measuring sensor.

8.3.9. Reports

8.3.9.1. The sum of the switch-off times

Readout of the total time of all interruptions in the device's operation due to lack of supply voltage.

8.3.9.1.1. Power decay register

Detailed reading of information about the last 40 power failures.

8.3.9.1.2. Hourly report

The hourly report allows to read the flow meter status up to 48 hours back.

The report is updated every hour and the oldest entries are deleted.

8.3.9.1.3. Monthly report

The monthly report allows to read the flow meter status up to 12 months back.

The report is updated on the first day of the month, the oldest entries are deleted.

8.3.9.1.4. Reset shutdown time

Minimum permission level: Administrator

Clears the memory of "Total shutdown times" and "Power decay register".

8.3.9.1.5. Clear reports

Minimum permission level: Administrator

Clears the report memory.

8.3.10. Language

Menu language selection.

NOTES

Attachment 1. Modbus Registers

List of Modbus registers of the MPP electromagnetic flow meter®8 Read-only registers "Read Input Registers - 0x04"				
Dec.	**Address**	**Description**	**Register**	**Data type**
0	0x0000	Flow	low	float
1	0x0001		high	
2	0x0002	VF- Running counter forward	low	float
3	0x0003		high	
4	0x0004	VR- Running counter backwards	low	float
5	0x0005		high	
6	0x0006	VD- Differential counter	low	float
7	0x0007		high	
8	0x0008	GF- Main counter forward	low	float
9	0x0009		high	
10	0x000A	GR- Main counter backwards	low	float
11	0x000B		high	
12	0x000C	GD- Main differential counter	low	float
13	0x000D		high	
14	0x000E	D1- dosing counter for OUT1 output	low	float
15	0x000F		high	
16	0x0010	D2- dosing counter for OUT2 output	low	float
17	0x0011		high	
18	0x0012	Current input	low	float
19	0x0013		high	
20	0x0014	Temperature input T1	low	float
21	0x0015		high	
22	0x0016	Temperature input T2	low	float
23	0x0017		high	
24	0x0018	Temperature difference ΔT = T1-T2	low	float
25	0x0019		high	

List of Modbus registers of the electromagnetic flow meter MPP ®8 Read / write registers "Read Holding Registers - 0x03", "Write Single Register - 0x06", "Write Multiple Registers - 0x10"					
Dec.	**Address**	**Description**	**Register**	**Data type**	**Write function**
1000	0x03E8	Permission to write - enter the value 0xABCD	-	word	0x06
1001	0x03E9	Density	low	float	0x010
1002	0x03EA		high		
1003	0x03EB	Flow averaging	-	word	0x06
1004	0x03EC	Unit of flow Q 0- %, 1- m/s, 2- l/s, 3- l/min, 4- l/h 5- m^3/s, 6- m^3/min, 7- m^3/h 8- kg/s, 9- kg/min, 10- kg/h 11- T/s, 12- T/min, 13- T/h	-	word	0x06
1005	0x03ED	Volume unit V. 0- l, 1- m3, 2- kg, 3- T	-	word	0x06
1006	0x03EE	T1 input unit 0- °C, 1- K, 2- °F	-	word	0x06
1007	0x03EF	T2 input unit 0- °C, 1- K, 2- °F	-	word	0x06