Data Sheet 6.17
Issue A

Electromagnetic Flow Sensor Mag-Flux A & Transmitter Mag-Flux M1

General Description

Electromagnetic flow sensors mag-flux A are precision measuring devices, suitable for determining the flow rate of nearly any electrically conductive fluid, but also for substances such as sludge, pulp and paste.

Due to the magnetic field, the device can be used to measure flow rates up to 10 m/s (32.8 ft/s) and a minimum conductivity of 3 µS/cm, when using a synchronized static field.

The entire measuring device comprises a flow sensor and a dedicated transmitter. Those can be delivered either separately or as a compact unit.

Mode of Operation

The units work on the principle of Faraday's law of induction, whereby, simply stated, the sensor converts the flow into voltage, proportional to the flow rate.

Features

- Solid welded steel design, therefore rugged and fail-safe
- Signal amplifier inside sensor
- Inside diameter of measuring tube from 15 mm (0.591")
- Pressure up to 250 bar
- Liner: hard rubber, soft rubber, PTFE & special linin upon request.
- Various connection types and materials
- Different materials and process connections:

  -Flange DIN, ANSI & JIS

  -Clamp

  -DIN 11851

  -Other upon request

Application

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The entire measuring device comprises a flow sensor and a dedicated transmitter. Those can be delivered either separately or as a compact unit.

Operating Note

- The electromagnetic flow sensor is only intended for measuring the flow of electric conductive, liquid media.
- The operator of these measuring instruments is responsible for suitability, proper use and corrosion resistance of the used materials with regard to the measuring material. It must be ensured that the materials selected for the meter parts in contact with the medium are suitable for the used process media.
- Before replacing the measuring tubes, check that the unit is free of hazardous media and is not pressurized.
- The device may only be used for the pressure and voltage limits specified on the rating plate.
- The flow meter complies with the requirements of the Pressure Equipment Directive 97/23/EC.
- When using flanges made from C22.8 and ST52-3, the lowest permissible temperature is -10°C (14°F).
- The sensor must not be affected by external loads.
- The units are designed for predominantly recumbent load.
- Improper installation or incorrect use of the sensors (units) may null and void any warranty.
- Installation supplies (gaskets/seals, screws, etc.) are not included with the delivery

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Installation

Basically, the measuring principle does not depend on the flow profile.

Ideally, the sensor should be installed in a pipeline with a sufficient straight run, both before and after the measuring point. Experience has shown that an inflow path of 5 x D and an outflow zone of at least 2 to 3 x D is required.

Provided that constant turbulence does not enter the area in which the measurement takes place (e.g. after elbows, during tangential feeds or if the valve in front of the sensor is partially open). However, should this be the case, appropriate actions must be taken to normalize the flow profile. The appropriate steps are:

- Increasing the inflow and outflow zones
- Using flow conditioners
- Reducing the inner diameter of the pipe

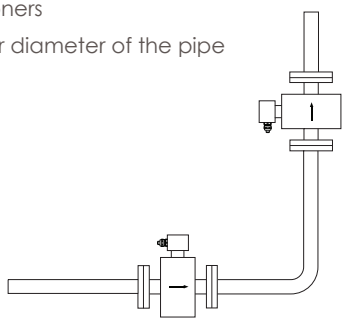

Fig.1 Installation in horizontal and vertical pipeline

The sensors may be installed either horizontally or vertically (Fig. 1); however, it must be ensured, that the axes of the electrodes are running horizontally (see directional arrow on the electrode). This will avoid erroneous measurements due to deposits or air bubbles on the electrodes.

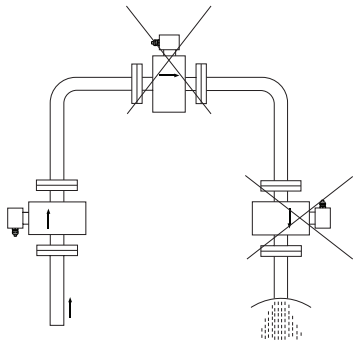

Fig.2 Installation in risers and down pipes

Do not install the sensor in a drainage area of the pipeline (e.g. down pipe). If the sensor must be installed in a down pipe, ensure that portion of the pipeline is always filled 100% with the media.

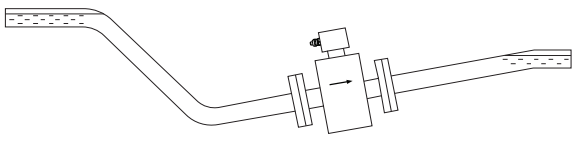

Fig.3 Installation in a pipeline which is always filled with media

The sensor must be installed in an area of the pipe which will always be filled with media. If a pipeline is not always filled, or in case of an open channel (drainage), the sensor must be installed in a siphon (Fig. 3).

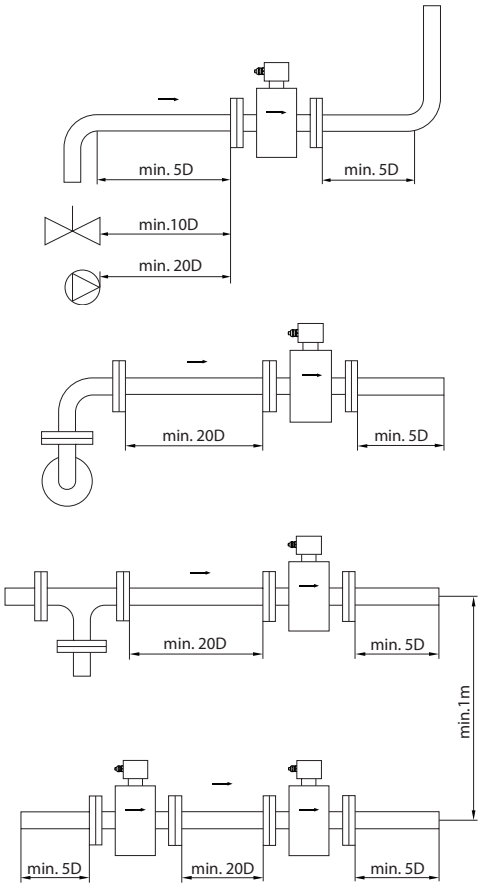

Fig.4 Installation between tees, valves and pumps

Always maintain the distance of the pipe's straight run (Fig. 4). If these distances cannot be maintained, flow conditioners must be installed or pipes with smaller diameter must be used. If several sensors are installed in series, the distance between each sensor must be equal to the length of one sensor. If two or more sensors are to be installed in parallel, the distance between sensors must be at least 1 m.

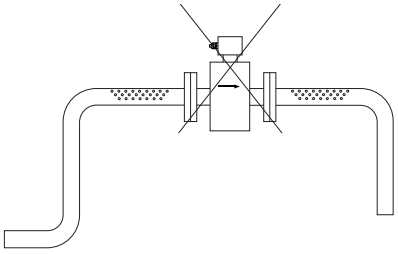

Fig.5 Installation at highest point

Due to possible accumulation of gases, the sensor should not be installed at the highest point of a pipeline.

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Technical Data

Measuring Principle	Pulsed constant field (DC)
Nominal Diametar	DN 15 - DN 600
Process Connections	DIN 2501 ANSI B 16.5 JIS Table Special Connections
Error of Measurement	± 0,5 % of the reading from 0,25 m/s to 10 m/s
Repeat Accuracy	± 0,15 % of the reading from 0,25 m/s to 10 m/s
Max. Operating Temperature with Rubber lining	90°C/194°F; 100°C /212°F optional
Max. Operating Temperature with PTFE lining	180 °C (at 16 bar) 150 °C (at 25 bar) 100 °C (at 40 bar)
Pressure limit with Rubber lining	max. 250 bar
Pressure limit with PTFE lining	depending on ambient temperature
IP Rating	IP67 / IP68
Minimum Conductivity	> 5 µS/cm
Max. Flow Rate	10 m/s
Flow Rate Final Value	0,25 - 10 m/s

Specifications

Design	Welded Steel Housing
Measuring Tube	Stainless Steel
Solenoid Chamber	Steel, Stainless Steel optional
Flange	Steel Stainless Steel Special Materials
Lining of Measuring pipe	Hard Rubber / Soft Rubber PTFE
Electrodes Material	Mat. No 1.4571 (standard) Hastelloy C4 Titanium Tantalum Platinum Monel
Electrodes Design	Mat. No. 1.4571 flat electrodes other point-plane electrodes
Electrodes Sealing	Viton (Standard) EPDM Kalrez

Information for Sensors with PTFE Lining

The mag-flux A sensor with PTFE lining is protected using a protective disc. In order to avoid formation of a vacuum, the sensor should be installed at the lowest point of the pipeline. Do not remove or damage the bead of the lining along the flanges.

Information for Sensors with Soft Rubber Lining

Sensors with soft rubber/neoprene lining are only available from nominal diameter DN 25 mm (1").

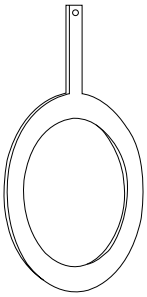
Selection of Nominal Diameters

Sensors with soft rubber/neoprene lining are only available from nominal di

Accessories

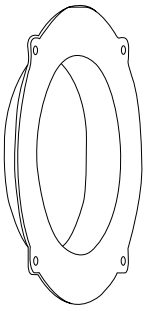
Earthing Washers

Earthing the measurement media. Necessary, if the pipes are either not electroconductive or not lined to conduct electricity (plastic pipes, concrete conduits etc.). All earthing washers must be fastened to the designated earthing screw of the sensor. The wall thickness of the earthing washers is 2 mm.



Protection Rings for Liners

Protection rings prevent damages to the inlet and outlet edges of the sensor, in particular, if abrasive materials are being used (e.g. gravel, sand etc); at the same time, they serve as earthing washer. They are used mainly with sensors having PTFE or soft rubber lining. The protection rings are screwed to the sensor. When used, the installation length of the NW DN 15–150 mm will be increased by 6 mm. When used with the NW 200–600 mm, the installation length increases by 10 mm.



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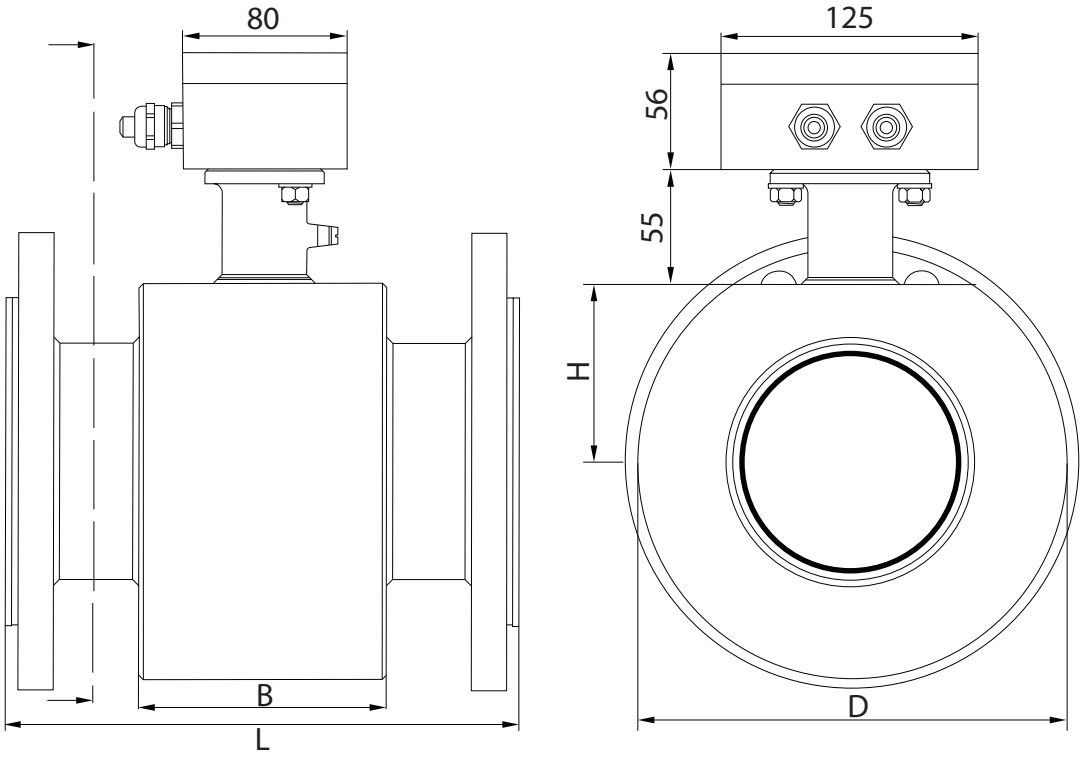

Dimensions

Nominal Diameter				Build in Lenght L				Dimension of Sensor Housing			Weight in kg (DIN Flange)
DIN		ANSI		Hard and Soft Rubber	PTFE Without protection Washer	PTFE With protection Washer	Tolerance	B	D	H	
DN15	PN40	1/2"	150RF	200	200	206	+0 / -3	80	130	53	5
DN25	PN40	1"	150RF	200	200	206	+0 / -3	80	130	53	6
DN32	PN40	1-1/4"	150RF	200	200	206	+0 / -3	80	130	53	7
DN40	PN40	1-1/2"	150RF	200	200	206	+0 / -3	80	130	53	7.5
DN50	PN40	2"	150RF	200	200	206	+0 / -3	80	140	57	9
DN65	PN40	2-1/2"	150RF	200	200	206	+0 / -3	80	155	63	10
DN80	PN40	3"	150RF	200	200	206	+0 / -3	80	170	70	13
DN100	PN40	4"	150RF	250	250	256	+0 / -3	120	210	86	15
DN125	PN40	5"	150RF	250	250	256	+0 / -3	120	240	98	19
DN150	PN40	6"	150RF	300	300	306	+0 / -3	120	285	117	23

Note: Other sizes available on order

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Electromagnetic Flow Sensor Mag-Flux A & Transmitter Mag-Flux M1

General Description

The complete metering system consists of a transmitter and a connected sensor e.g. mag-flux series with pulsed constant field.

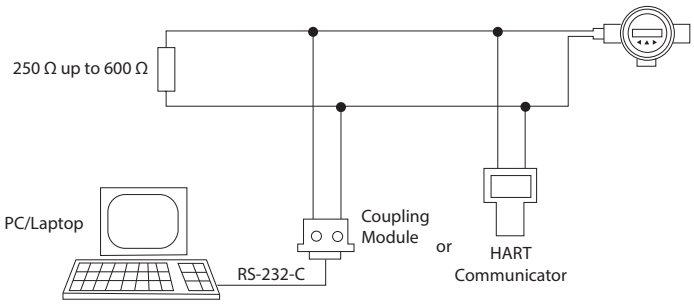
The device mag-flux M1 can be installed directly on the sensor (compact version) or be mounted separately (remote version). The compact design applies to sensor types mag-flux A (DN65 – DN100).

Mode of Operation

According to Faraday's law of electromagnetic induction, an electrical voltage is generated by the sensor which is proportional to the velocity of the liquid inside the measuring tube.

This voltage is gained and processed by the mag-flux M1 and transduced into analog and digital outputs. A control unit is available as an additional option which provides a local display and the opportunity to customize the transmitter's configuration.

The mag-flux M1 is prepared for HART® communication. An appropriate version is available on request.



Application

The mag-flux M1 is a microprocessor controlled and programmable transmitter with pulsed constant field.

Measurement data from sensors of series mag-flux are processed by the transmitter. It is designed for flow velocities up to 10 m/s.

The device can be used to perform measurements with any liquid with a minimum conductivity of 3 µS/cm, providing that the sensor's material is suitable for the fluid.

Features

- High-speed signal processing by 16-bit microcontroller
- Easy navigation with a two-line display (Option)
- Self-monitoring system
- Analog output (0/4-20 mA) and digital outputs (pulse, device status, limit, frequency)
- Internal simulation for all output values
- Multilingual menus

Application Note

- The magnetic-inductive metering system is entirely suitable for the measurement of volume flow rates of conductive liquids.
- Before replacing a compact version of the mag-flux M1 ensure that the meter is pressureless and free from hazardous media.
- The operation of the device is only valid within the temperature range specified on the rating plate.
- The limits for the electrical connections of the transmitter are specified on the rating plate and have to be observed strictly.
- The transmitter is compliant with the EMC Directive 89/336/EEC und low-voltage Directive 73/23/EWG.
- The mag-flux M1 is designed for mainly stationary applications.
- Improper installation and use of the transmitter (metering system) could cause a loss of warranty.

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Technical Data

Measuring Principle	Magnetic inductive with pulsed constant field (PDC)
Magnetic field excitation	Internal clock with DC supply 1,56 Hz / 3,125 Hz / 6,25 Hz / 12,5 Hz / 25 Hz
Electrical isolation	Outputs electrically isolated from each other and from the power supply
Signal Range	0 ... 20 mA / 4 ... 20 mA, selectable
Failure signal	> 22 mA oder < 3,8 mA, can be switched
Output	< 600 Ω
For HART communication	≥ 250 Ω
Communication	Via analog output with PC coupling module or HART Communicator
Design	Optocoupler, passive
Rated values	max. 1,8W, max. 30 V, 60 mA
Significance	≤ 1000 pulses/s
Pulse width	≥ 0,1 ms (max. 2s), selectable
Signal range	0 ... 1 kHz
Output configuration	Status output: forward flow, reverse Flow, MIN, MAX, Alarm (selectable)
Ambient Temperature for Remote/Compact versions	-20 ... +60 °C (-4 ... +140 °F)
Ambient Temperature for Control Unit	0 ... +50 °C (32 ... 122 °F)
Storage	-25 ... +80 °C (-13 ... +176 °F)
IP Rating	IP 67 / NEMA 4X
Weight	2,4 kg (5,3 lb)
Compact Version	Transmitter permanently mounted on measuring tube
Remote Version	Transmitter connected to the sensor by a shielded cable
Maximum line length	200 m (656 ft)* *Line length depends on the conductivity of the media
Housing	Die-cast aluminium, painted
AC Voltage	230 V, ±10 %, 50/60 Hz 115 V. ±10 %, 50/60 Hz
DC Voltage	24 V, ±15 %
Power consumption	approx. 10 VA
Mains fuse AC Voltage	100 mA (T)
Mains fuse DC Voltage	1 A (T)

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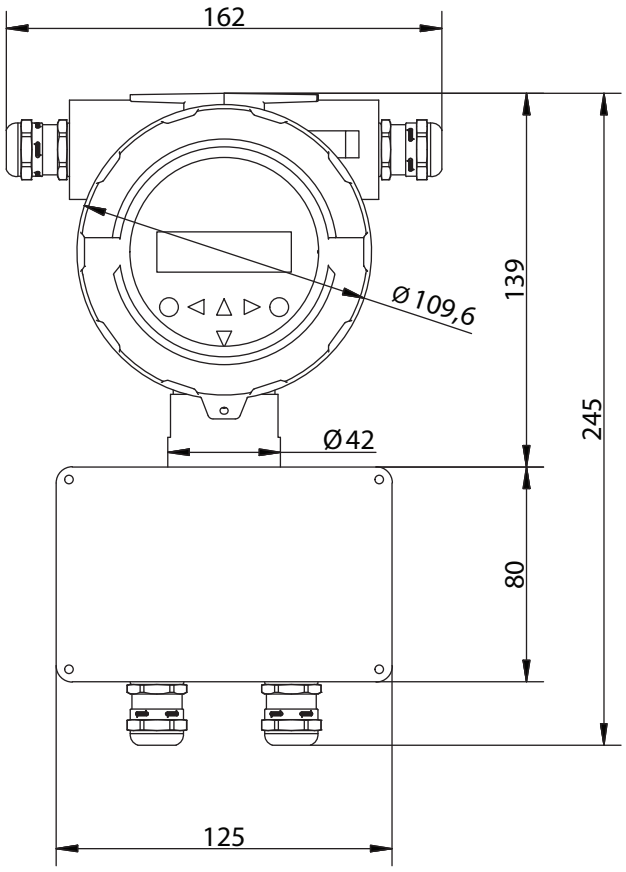
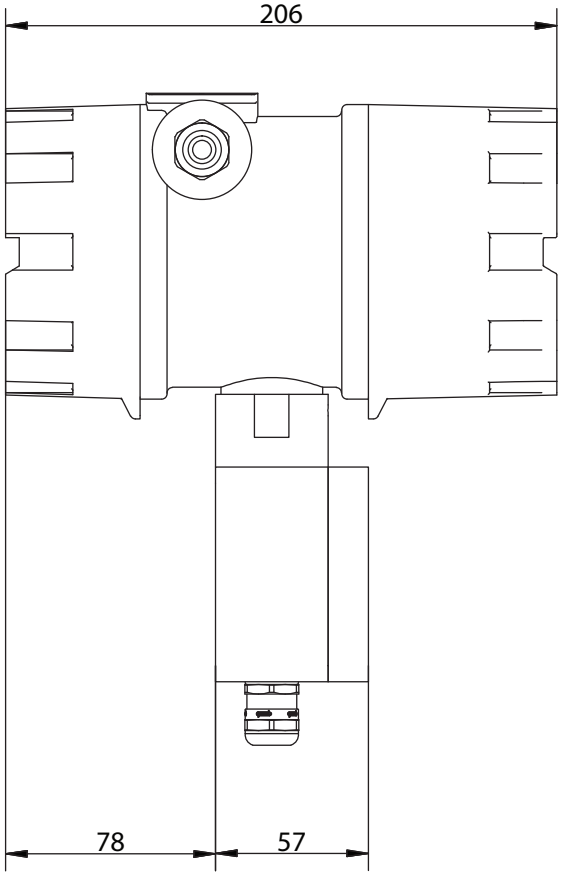
Dimensions





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