



Fig 1 Magnetic inductive transmitter *mag-flux M1* (remote version)

### Application domain

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  $\mu\text{S}/\text{cm}$ , providing that the sensor's material is suitable for the fluid.

The main applications for the *mag-flux M1* are:

- Water and sewage plants
- Food and beverage industry
- Pulp and paper industry

### Special 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

### System design

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* and *mag-flux S* (DN65 – DN100).

When using the transmitter with *mag-flux S* (DN15 – DN50), *mag-flux F5* or probes *mag-flux MIS 1/D* and *mag-flux MIS 2/15* only the remote version is available.

### Operating principle

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.

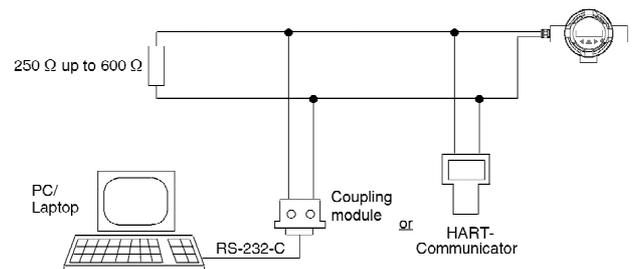


Fig 2 Electrical connection for HART® communication, schematic diagram

### 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 and 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.

## Technical Data

### Mode of operation and design

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

### Outputs

Electrical isolation	outputs electrically isolated from each other and from the power supply
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#### Current output

- Signal
  - Signal range 0 ... 20 mA / 4 ... 20 mA, selectable
  - Failure signal > 22 mA oder < 3,8 mA, can be switched
- Load
  - Output < 600  $\Omega$
  - for HART communication  $\geq$  250  $\Omega$

Communication	via analog output with PC coupling module or HART Communicator HART, version 7.0
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#### Protocol

#### Digital output

- Signal
  - Design Optocoupler, passive
  - Rated values max. 1,8W, max. 30 V, 60 mA

#### Output configuration

- Pulse
  - Significance  $\leq$  1000 pulses/s
  - Pulse width  $\geq$  0,1 ms (max. 2s), selectable
- Frequency
  - Signal range 0 ... 1 kHz

#### Digital output 2

- Signal
  - Design Optocoupler, passive
  - Rated values max. 1,8W, max. 30 V, 60 mA

- Output configuration Status output: forward flow, reverse Flow, MIN, MAX, Alarm (selectable)

### Measuring accuracy (under reference conditions)

Pulse output	Basic accuracy: refer to datasheet of the connected sensor $\pm 0,05$ % per 10 K
Current output	Basic accuracy: refer to datasheet of the connected sensor $\pm 0,1$ % per 10 K
Reproducibility	refer to datasheet of the connected sensor

### Operating conditions

Installation conditions	See also datasheet of the connected sensor
Ambient temperature	
• Remote version	-20 ... +60 °C (-4 ... +140 °F)
• Compact version	-20 ... +60 °C (-4 ... +140 °F) Process temp.: max. 60 °C (104 °F)
• Control unit	0 ... +50 °C (32 ... 122 °F)
Storage	-25 ... +80 °C (-13 ... +176 °F)
Degree of protection	IP 67 / NEMA 4X
Electromagnetic compatibility (EMC)	
• Emitted interference	acc. to EN 61000-6-3:2001 (for use in home and industry)
• Noise immunity	acc. to EN 61000-6-2:1999 (for use in industry) NAMUR NE21 (Ver. 10.02.2004)

### Construction

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

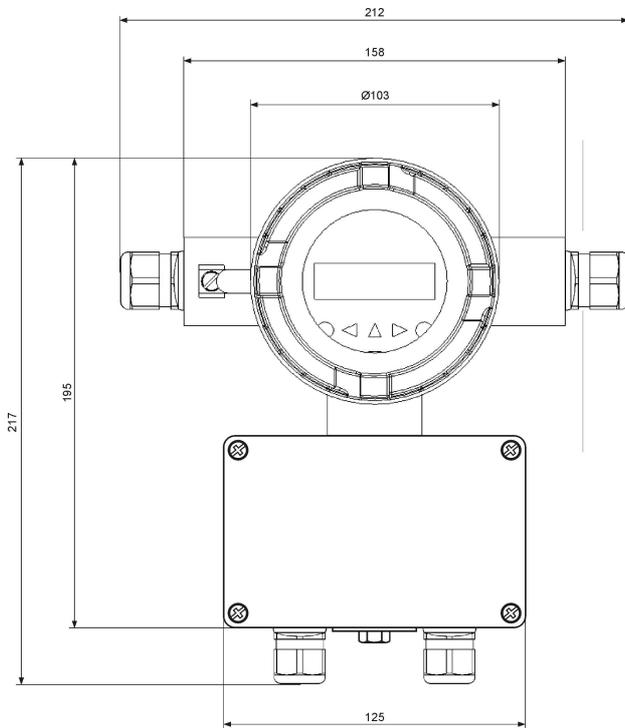
### Control unit (Option)

General display	LCD, background illumination two rows of 16 characters
Multi-display for	flow, volume, flow velocity
Key pad	6 keys for input

### Power supply

	as specified on the rating plate
• AC voltage	230 V, $\pm 10$ %, 50/60 Hz 115 V, $\pm 10$ %, 50/60 Hz
• DC voltage	24 V, $\pm 15$ %
• Power consumption	approx. 10 VA
• Mains fuse	
- AC voltage	100 mA (T)
- DC voltage	1 A (T)

### Dimensions



### Order code

#### Magnetic inductive transmitter mag-flux M1

	M A G 5 0 4 0 -	█	█	█	█	0 -	█	█	█	█	A A 0
		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
<b>Power supply</b>											
• AC 230 V, 50/60 Hz	1										
• AC 115 V, 50/60 Hz	2										
• DC 18-36 V	3										
<b>Output / communication</b>											
• 4 - 20 mA	A										
• 4 - 20 mA with HART protocol	B										
<b>Operator display and keypad</b>											
• without	A										
• with	B										
<b>Cable glands</b>											
• M20/M16 x 1.5	1										
• 1/2" - 14 NPT	2										
<b>Design</b>											
• remote version	1										
• compact version	2										
<b>Other models</b>											
• Rating plate in English	B 1 1										
• Factory acceptance test	F T H										
• Measuring range, specify in plain text	Y 0 1										
• Silicone-free materials	Y 0 4										
• Measuring-point number	Y 1 5										
• Measuring-point description	Y 1 6										
• Stainless steel tag plate	Y 1 7										

