Fig 1 Transmitter *max-flux M1*

Application domain

The *mag-flux M1* is a microprocessor controlled and programmable transmitter that can be customized using control unit (option). Although basic configuration settings such as transmitter calibration are realized at the factory, other settings such as those for measurement data processing, analysis, display and output are user definable.

Measurement data from sensors of series *mag-flux are* processed by the transmitter (hereinafter referred to as *mag-flux M1*). It can be installed directly on the sensor (compact version) or be mounted separately (remote version) and it is designed for flow velocities up to 10 m/s.

A remote version is available for sensor *mag-flux* A, *mag-flux* S, *mag-flux* F5 and also for probes *mag-flux* MIS 1/D and *mag-flux* MIS 2/15.
A compact version is only available for sensor *mag-flux* A.

The transmitter *mag-flux M1* is communication enabled and supports optional the HART® protocol.

Special features

- High-speed signal processing by 16-bit Microcontroller
- Easy multilingual menu navigation with a two-line display (Option)
- Self-monitoring system
- Internal simulation for all output values
- Analog output (0/4-20 mA)
- Digital outputs (pulse, frequency, alarm, forward and reverse flow, MIN / MAX flow rate)
- User settings protected by user definable password

Introduction

I. Shipping, storage and product inspection

Shipping and storage
The device is to be safeguarded against dampness, dirt, impact and damage.

Product inspection
Upon receipt of the product, check the contents of the box and the product particulars against the information on the delivery slip and order form so as to ensure that all ordered components have been supplied. Notify us of any shipping damage immediately upon receipt of the product. Any damage claim received at a later time will not be honored.

II. Warranty

Your flowmeter was manufactured in accordance with the highest quality standards and was thoroughly tested prior to shipment. However, in the event any problem arises with your device, we will be happy to resolve the problem for you as quickly as possible under the terms of the warranty which can be found in the terms and conditions of delivery. Your warranty will only be honored if the device was installed and operated in accordance with the instructions for your device. Any mounting, commissioning and/or maintenance work is to be carried out by qualified and authorized technicians only.

III. Repair

It is important that you do the following before shipping your flowmeter to MECON GmbH for repair:

- Enclose a description of the problem with your device. Describe in as much detail as possible the application and the physical and chemical properties of the fluid.
- Remove any residues from the device and be sure to clean the seal grooves and recesses thoroughly. This is particularly important if the fluid is corrosive, toxic, carcinogenic, radioactive or otherwise hazardous.
- The operator is liable for any substance removal or personal damage costs arising from inadequate cleaning of a device that is sent for repair.

IV. Using HART® hand-held terminal

For information regarding operation of the transmitter using the HART® hand-held terminal, see "Operation of the *mag-flux M1* transmitter using the HART® hand-held terminal."

Steps prior to operation

It is essential that you read these operating instructions before installing and operating the device. The device is to be installed and serviced by a qualified technician only. The *mag-flux M1* transmitter is to be used exclusively to measure volume flow of liquids in conjunction with a sensor of series *mag-flux*.

or otherwise, without the prior written permission of MECON GmbH.

Although the materials in the present document were prepared with extreme care, errors cannot be ruled out. Hence, neither the company, the programmer nor the author can be held legally or otherwise responsible for any erroneous information and/or any loss or damage arising from the use of the information enclosed.

MECON GmbH extends no express or implied warranty in regard to the applicability of the present document for any purpose other than that described.

We try hard to optimize and improve the products and particularly we appreciate any suggestions for improvement made by our customers. If you have any recommendation for improving our products please send your suggestions to the following address:

Mecon GmbH
Dept. Development
Headword: mag-flux M1
Zieglerstraße 10-16
D-52078 Aachen

or:

via fax: **+49 (0)241 – 41369 – 40**
via email: **customerservice@mecon.de**

We reserve the right to change the technical data in this manual in the light of any technical progress that might be made. For updates regarding this product, visit our website at www.mecon.de, where you will also find contact information for the MECON distributor nearest to you. For information regarding our own sales operations, contact us at customerservice@mecon.de.

Installation and servicing

The devices described in this manual are to be installed and serviced only by qualified technical personnel such as a qualified MECON GmbH electronics engineer or service technician.

Caution
Before servicing the device, it must be completely switched off, and disconnected from all peripheral devices. The technician must also check to ensure that the device is completely off-circuit. Only original replacement parts are to be used.

MECON GmbH accepts no liability for any loss or damage of any kind arising from improper operation of any product, improper handling or use of any replacement part, or from external electrical or mechanical effects, overvoltage or lightning. Any such improper operation, use or handling shall automatically invalidate the warranty for the product concerned.

In the case of a problem with your device, please contact us using one of the following numbers:

Phone: +49 (0)241 - 41369 - 0
Fax: +49 (0)241 - 41369 - 40

Contact our customer service department if your device needs repair or if you need assistance in diagnosing a problem with your device

Safety advisory for the user

The present document includes all information you need for proper operation of the product. The document is intended for use by qualified personnel. This means personnel who are qualified to operate the device described herein safely, including

- electronics engineers,
- electrical engineers
- service technicians

who are conversant with the safety regulations pertaining to the use of electrical and automated technical devices and with the applicable laws and regulations in their own country. The personnel must be authorized by the facility operator to install, commission and service the product described herein, and are to read and understand the contents of the present operating instructions before working with the device.

Hazard warnings

The purpose of the hazard warnings listed below is to ensure that device operators and maintenance personnel are not injured and that the flowmeter and any devices connected to it are not damaged.

The safety advisories and hazard warnings in the present document to avoid injury of placing operators and maintenance personnel and to avoid material damage are prioritized using the terms listed below, which are defined as follows

Danger

means that failure to take the prescribed precautions **will result** in death, severe bodily injury, or substantial material damage!

Warning

means that failure to take the prescribed precautions **could result** in death, severe bodily injury, or substantial material damage!

Caution

means that failure to take the prescribed precautions could result light severe bodily injury or material damage!

Note

means that the accompanying text includes important information about the product, handling the product or about a section of the documentation that is of particular importance.

Proper use of the device

Caution
The operator is responsible for ensuring that the material used in the sensor and housing is suitable and that such material meets the requirements for the fluid being used and the ambient site conditions. The manufacturer accepts no responsibility in regard to such material and housing.

Caution
In order for the device to perform correctly and safely, it must be shipped, stored, set up, mounted operated and maintained properly.

Return for servicing or calibration

Before returning your flowmeter for servicing or calibration, make sure it is completely clean. Any residues of substances that could be hazardous to the environment or human health are to be removed from all crevices, recesses, gaskets, and cavities of the housing before the device is shipped!

Caution
The operator is liable for any loss or damage of any kind, including personal injury, decontamination measures, removal operations and the like that are attributable to inadequate cleaning of the device.
Any device returned for servicing is to be accompanied by a certificate as specified in „Product return form"!

The device is to be accompanied by a document describing the problem. Please also quote the name of a contact person. This will help to repair your device as expeditiously as possible and therefore minimize the cost of repairing it.

Replacement of the transmitter electronics

Before replacing the transmitter electronics, read the safety instructions in Section „ Replacement of transmitter electronic" on page 12.

Caution
Make sure that you obey the applicable standards and regulations pertaining to electrical devices, device installation and process technology when replacing the transmitter electronics. The highly integrated electronic components of the device are ESD sensitive.

Caution
The complete unit has to be replaced with all of its printed boards (except for the memory chip (DSM)). The specified precision and interchangeability of the electronics are only guaranteed if the complete insert is replaced.

Identifikation

Manufacturer	Mecon GmbH Zieglerstraße 10-16 D-52078 Aachen Phone: +49 (0)241 4 13 69 – 0 Fax: +49 (0)241 4 13 69 – 40 Internet: http://www.mecon.de email: customerservice@mecon.de
Product type	Transmitter for magnetic-inductive flow-meters
Product name	Transmitter Type *mag-flux M1*, suitable for magnetic-inductive flowmeters series *mag-flux*
Versions-Nr.	2.2 vom 08.01.2010

Commissioning

Installation of magnetic-inductive flowmeters

At the installation of the magnetic-inductive flow sensor the instructions and notes of the assembly instructions and operating manuals have to be followed. Also, abserve the regulations of grounding, potential equalization and company-internal grounding guidelines.

Potentials

All outputs are electrically isolated from the auxiliary power, the sensor circuit and from each other. The housing and the interference suppression filters of the power supply are connected to PE.

The electrodes and measuring electronics are related to the potential of the function earth FE of the sensor. FE is not connected to PE, but may be connected with each other in the sensor junction box. If the sensor is grounded by using ground disks (earthing rings), these must in connected with the function earth FE.

At a separate assembly of sensor and transmitter the outer screen of the connecting cable is connected to the transmitter housing and has PE potential. The inner screens of the electrode line are connected to FE inside the junction box of the sensor and to the mass (GND) of the transmitters electronic.

Details of all wirings, terminals and drawing can be found in the chaper „Wiring diagrams" starting at page 9.

Cathodic protective units

Using a cathodic protective unit to avoid corosion, which put a voltage to the tube wall, it must be connected to terminal FE. The transmitter boards, control panal and internal switches are on the same potential as FE.

Caution
According to EN 50178:1997 all electrical circuits with „protectiv safety isolation without any protection against contacts" must observe the following maximum voltages:

- Maximum AC voltage (V_{eff}) 25 V
- Maximum DC voltage 60 V

It is strictly forbidden to connect FE to any higher voltage!

Zero point calibration

In order to ensure that precise measurements are obtained, zero point calibration is to be realized the first time the device is put into operation and before any regular operations are carried out. Zero point calibration is to be carried out using a fluid.

The zero calibration procedure is as follows:

- Install the sensor as described in the manual.
- Check to ensure that the sensor is completely filled with fluid and that there are no gas bubbles in the flow tubes.
- Set the process conditions such as pressure, temperature and density.
- Close the cut-off device behind the sensor.
- Operate the transmitter in accordance with the instructions in chapter „Zero point adjustment" on page 11for the basic version or chapter „Zero point calibration" on page 20 for the version with the control panel.
- Make sure that sufficient time is allowed for the electronics to warm up.
- Allowing fluid to flow through the sensor during the zero calibration procedure will skew the zero point and result in false readings.

Startup conditions

The device is not subject to specific startup conditions. However, pressure surges should be avoided.

Commisioning the *mag-flux* flow probes

In order to be able to calculate the volume flow when using the *mag-flux* flow probes correctly from the measured flow velocity, the installation requirements must be kept regarding position and mounting depth correctly.

Transmitter settings must be made as specified in chapter „Operating the *mag-flux* flow probes with the *mag-flux M1*" on page 6 to ensure the correct operation!

Particularly for existing installations after replacements or modifications e.g. tubing diameter.

Arbeitsweise und Systemaufbau

Measuring principle

It was back in 1832 that Faraday suggested utilizing the principle of electrodynamic induction for measuring flow velocities. His experiments in the Thames, though unsuccessful due to superimposed polarization effects, are nonetheless regarded as the first experiment in the field of magnetic-inductive flow measurement. According to Faraday's law of electromagnetic induction, an electrical field E is produced in a conductive liquid moving through a magnetic field B at a velocity v in accordance with the vector product E = [v x B].

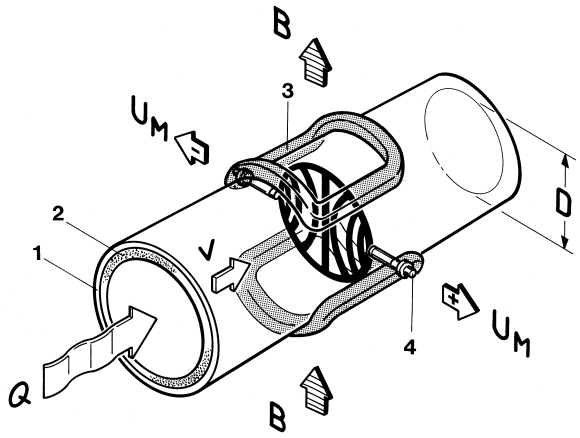

Fig 2 Principle of the magnetic-inductive flow measurement

Through a meter tube provided with an insulating lining a liquid flows at velocity v and a flow rate Q, producing a measuring-circuit voltage Um at the two electrodes at right angles to the direction of flow. The size of this measuring-circuit voltage is proportional to the mean flow velocity and the volume flow rate.

System design

The meter consists of a *mag-flux M1* transmitter and a sensor e.g. mag-flux series. The device can be used to perform measurements with any liquid, conductive media, providing that the sensor's material is suitable for the product being used.

The *mag-flux M1* transmitter generates the inductive current necessary for the magnetic field and preprocesses the induced voltage at the electrodes.

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Basic version *mag-flux M1*
An analog 0/4...20 mA current output (active), a pulse or frequency output and a status output are standard features of the device.

A green LED is an operational readiness indicator, error are indicated by a red light and reverse flow by a yellow light.

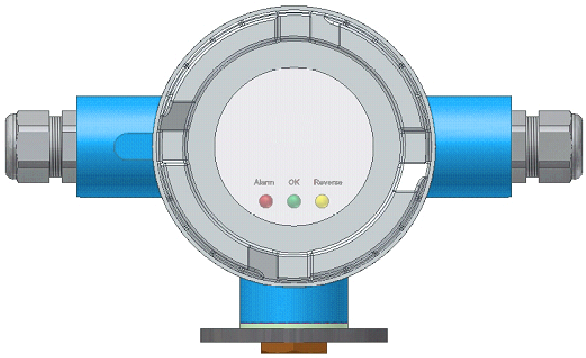

Fig 3 Basic version of the transmitter *mag-flux M1*

HART®-interface (Option)

An analog 0/4–20 mA output is a standard feature and digital data transmission via HART® protocol as an optional feature of the device.

A retrofit by customer is not possible.

LCD display (Option)

Instead of the three light indicators, a LCD display with backlight is an optional feature. The display shows measured values as well as diagnostics. With 6 keypads customers are able to configure comfortable and simple the transmitter without any other tool.

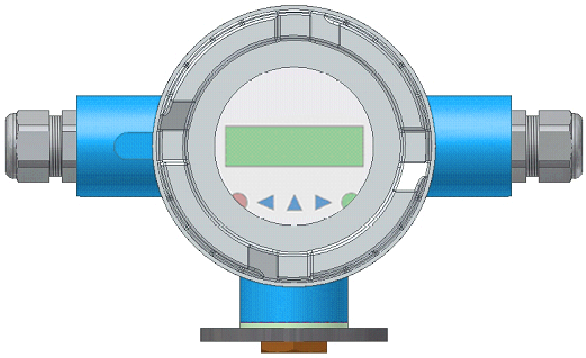

Fig 4 Transmitter with integrated LCD display

Empty pipe detection

Transmitters, which are equipped with a LCD display, have the ability for a empty pipe detection. The operating reliability depends on the conductivity of the liquid medium and the cleanliness of the electrodes. As higher the conductivity is, as more reliable operates the empty pipe detection.

Insulation coatings on the electrodes surface worse the empty pipe detection.

Data memory chip (DSM)

The replaceable data memory chip (DSM) is an EEPROM device in DIL-8 housing, located in a socket on the power supply board. It includes all characteristic data of the sensor e.g. sensor constant, version or serial number. Consequently, the memory module is linked to the sensor and in case of a transmitter replacement it has to remain by the sensor!

After replacing the transmitter or its electronics, the DSM will be installed in the new transmitter. After the measuring system has been started, the measuring point will continue working with the characteristic values stored in the DSM. Thus, the DSM offers maximum safety and high comfort when exchanging device components.

Slot DSM

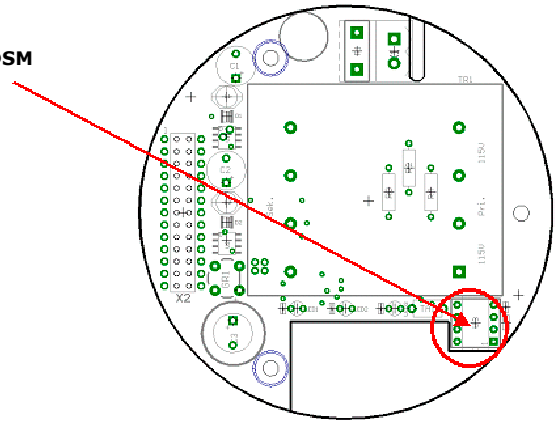

Fig 5 Electronic, Power supply board *mag-flux M1*

At any exchange observe the polarity of the memory chip. Pin 1 is signed by a dot or a notch.

Safety of operation

A comprehensive self-monitoring system ensures maximum safety of operation.

- Potential errors can be reported immediately via the configurable status output. The corresponding error messages will also be displayed on the transmitter display. A failure of the auxiliary power can also be detected via the status output.
- When the auxiliary power fails, all data of the measuring system will remain in the DSM (without back-up battery).
- All outputs are electrically isolated from the auxiliary power, the sensor circuit and from each other.

Input

Measured variable

Mass flow rate, temperature, density and volume flow (calculated from the preceding measured variables).

Measuring range

The measuring range, which varies according to which sensor is used, can be found on the relevant data sheet or rating plate.

Operating the *mag-flux* flow probes with the *mag-flux M1*

The flow probes *mag-flux* MIS 1/D und *mag-flux* MIS 2/15 are calibrated for flow velocity. In order to display the measured value in volume flow units, it must be converted using the flow velocity and the inside diameter of the tube. The following parameters must be set at the *mag-flux M1*:

1. At the functional level SENSORSETTINGS + M1 set the sensor type *mag-flux MIS*. The dimension of the sensor constants will be automatically adapted.
2. Setting of the sensor constant.
3. Set the Inside diameter of the tube in xxx mm.

> **Important**
> The actual diameter has to be set, not the nominal diameter of the tube!

4. At the functional class FLOW, set the desired unit of volume flow.
5. Using the function VOLUME FLOW UPPER-RANGE VALUE set the upper-range value

Output

Output signal

All signal outputs

Electrically isolated from each other and from ground (PE).

Analog output

- 0/4-mA current output, electrically isolated, optional with HART®
- Volume flow or flow speed
  (Using the HART®-protocol the current output has to be assigned to volume flow in the mode of 4-20mA)

Pulse-/Frequency output

- Pulse duration adjustable range is 0,1 ... 2000 ms
  (default value 50 ms)

  (Mark-to-space ratio is 1:1, if the set pulse duration is not reached.)

> **Important**
> When programming the pulse duration, a plausibility check is carried out. If the selected pulse duration is too long for the set upper range value, an error message will be displayed.

- frequency output max. 1 kHz
- passive via optocoupler

  U_N = 24V
  U_{max} = 30 V
  I_{max} = 60 mA
  P_{max} = 1,8 W

Pulse value

The pulse value can be multiplied by a factor between 0.001-100.0 (decade increments) of the selected pulse unit (e.g. m³)

Default: 1 pulse/unit

Status output

- for: - forward and reverse flow,
  - MIN flow rate
  - MAX flow rate
  - alarm
- passive via optocoupler

  U_N = 24 V
  U_{max} = 30 V
  I_{max} = 60 mA
  P_{max} = 1,8 W

Failure signal

A failure in the meter can be indicated via the current output or the status output. The current output ca be set to a failure signal (alarm) of I < 3.8 mA or I > 22 mA.

The status output can be configured as N/O or N/C contact.

Load for the current output

Standard version:	≤ 600 Ohm
HART® (minimum load)	> 250 Ohm

Damping

Programmable from 0 to 60 seconds

Low flow cut-off

The low-flow cut-off can be set to values between 0 and 20%. The set value refers to the upper range value. If the measured value is lower than the set volume, the flow rate will set to 0.0 (l/h). This results in the analog output being set to 0/4 mA, and the pulse output will stop generating pulses.

The configurable hysteresis takes effect only one side while exceeding this limit.

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Technical data

Reference conditions

In conformity with IEC 770:

temperature:	T = 20°C
relative humidity:	rH = 65%,
air pressure:	p = 101,3 kPa

Measuring tolerance

See characteristic values of the corresponding sensor.

Repeatability

See characteristic values of the corresponding sensor.

Influence of ambient temperature

- For the pulse output: ± 0,05 % per 10 K.
- For the current output: ± 0,1 % per 10 K.

Operating conditions

Installation conditions

Caution

Additional cable glands (not contained):
The operator is responsible for that fact that according to the enclosure and ignition enclosure certified cable glands or screws are used. The kind of threads is stamped on the rating plate.
At the connection between sensor and transmitter a metalized cable gland must be used for the screen.
(See chapter „Connection of the magnetic current and electrode line on page 9)

Compact version

For the compact version the transmitter housing is mounted on the sensor. Therefore no cable is necessary between sensor and transmitter.

Remote version

The transmitter needs to be mounted separately from the sensor if:

- the mounting area is difficult to access,
- there is a lack of space,
- medium and ambient temperatures are extremely high,
- there is strong vibration.

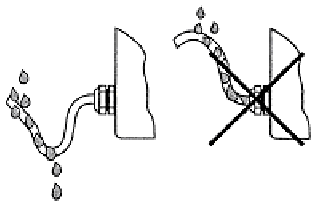

Fig 6 Proper installation of cables at high humidity and wet conditions

The *mag-flux M1* transmitter has to be mounted free of vibrations!

Caution:

For the separate version, the minimum permissible conductivity of the medium is determined by the distance between the sensor and the transmitter. The maximum cable length to ensure accuracy is 200 m. For the cable type see chapter „cable specification" on page 9.

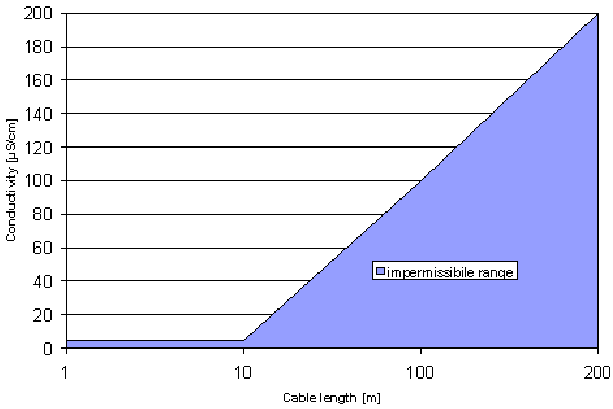

Fig 7 Cable length for remote version

Important

- The electrode cable must be fixed. If the conductivity of the medium is low, cable movements may change the capacity considerably and thus disturb the measuring signal.
- Do not lay the cables close to electrical machines and switching elements.
- Equipotential bonding must be ensured between sensor and transmitter.

Caution

Do not connect or disconnect the field coil cable before the primary power of the meter has been disconnected!

Environmental conditions

Ambient temperature range

- 20 °C to + 60 °C (-4°F to 140°F).

Below 0 °C the readability of the LCD display will be limited.

In the case of an outdoor installation, the device must be protected against direct solar irradiation with a weather shield

Storage temperature

- 25 °C to + 60 °C (-13 °F to 140 °F)

Degree of protection

IP67.

Caution

Ingress protection IP 67 is only achieved if suitable and tightly screwed down cable glands or conduits are used. If the cable glands are only tightened manually water may leak into the terminal compartment in the housing.

Danger

Particular care must be taken if the front window of the housing becomes fogged over or discolored because moisture, water or product might seep through the wire sheath into the terminal compartment in the housing!

Caution

Electromagnetic compatibility is only achieved if the electronics housing is closed. Leaving the enclosure open can lead to electromagnetic disturbances.

Process conditions

Fluid temperature

The data sheet/rating plate of the connected transmitter is binding. With directly mounted transmitter on the sensor (compact version) the heat entry from the process to the transmitter must be considered.

Phase of Medium

Liquid.

Viscosity

No restrictions.

The data sheet/rating plate of the connected sensor is binding.

Fluid temperature limit

The data sheet/rating plate of the connected sensor is binding.

Flow rate limit

The data sheet/rating plate of the connected sensor is binding.

Pressure drop

The data sheet/rating plate of the connected sensor is binding.

Empty pipe detection

Transmitters, which are equipped with a LCD display, have an selectable empty pipe detection. The operating reliability depends on the conductivity of the liquid medium and the cleanliness of the electrodes.

Construction details

Type of construction / dimensions

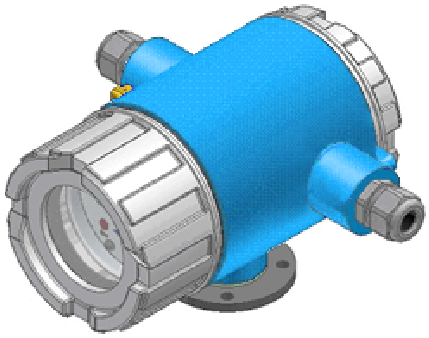

Fig 8 Transmitter housing – compact version

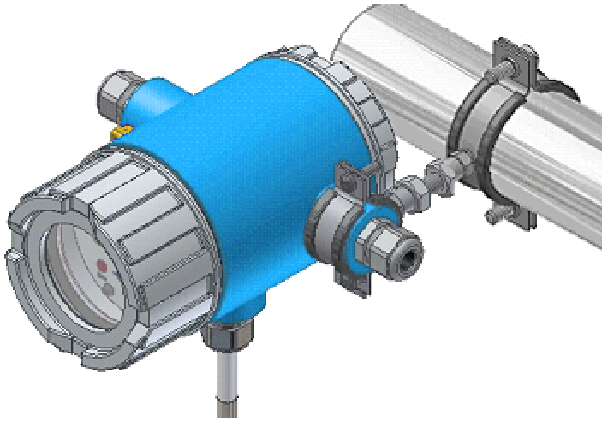

Fig 9 Transmitter housing – pipe mounting

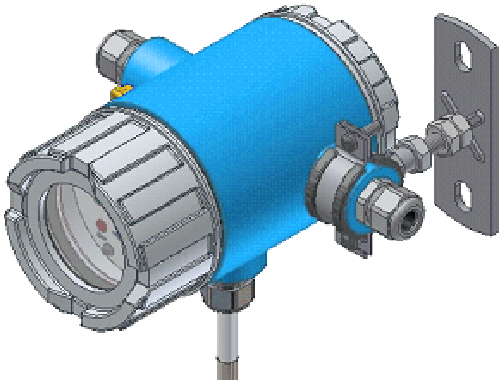

Fig 10 Transmitter housing - wall mounting

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Technical data mag-flux M1

Weight:	2,4 kg
Material:	aluminum die-cast housing, powder-coated
Process connection:	Directly mounted on the sensor (compact version) or connected via cable (remote version).
Electrical connection:	Mains 230 V AC, -15%/+10%, 50/60 Hz 115 V AC; -15%/+10%, 50/60 Hz or 24 V DC; ±15 %
Power consumption:	10 VA
Mains fuse:	5 x 20mm (acc. DIN 41571-3) Rated voltage: 250V AC Braking capacity: 80A@250V AC

Mains	Rated current
250 V AC	100 mA (T)
115 V AC	100 mA (T)
24 V DC	1 A (T)

Electrical terminals

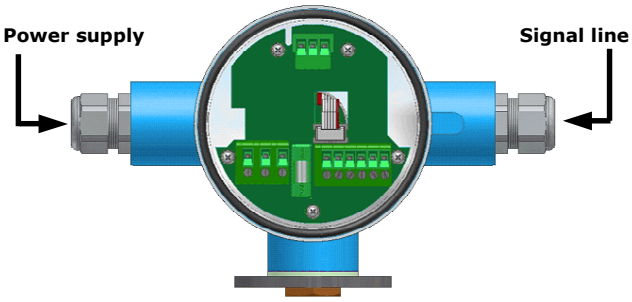

Fig 11 Electrical connections of the transmitter *mag-flux M1*

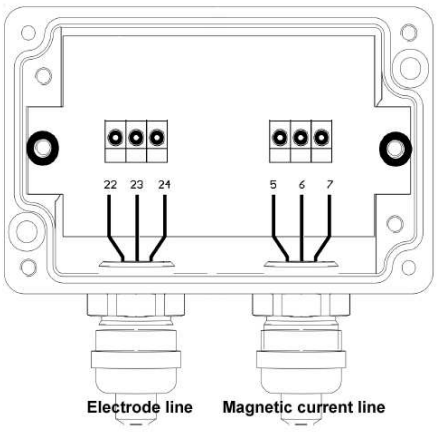

Fig 12 Electrical connection of the *mag-flux M1* (remote version only)

Cable specification

If the transmitter is mounted separately from the sensor, the following cables must be used:

Electrode cable and field coil cable

as shielded twisted pair. In order to protect the cable from external interference, the twisted-pair wires are covered by an additional, overall shield.

Cable length	wire cross section	Example
≤ 10 m	≥ 0,25 mm²	LIYCY-CY TP 2x2x0,25 mm².
> 10 m	≥ 0,75 mm²	SLIYCY-C11Y (2x(2x0,75 mm²)).

The outer shield is groundet by means of special EMC-compliant cable glands at both ends of the cable.

Wiring diagrams

Connection of the signal cables

- Lay the signal cables separately from cables with voltages > 60 V.
- Only use signal cables as specified in chapter „Electrode cable and field coil cable".
- Avoid laying signal cables close to large electrical installations or use – if possible – only shielded cables.
- A load at least 250 Ω must exist in the signal circuit for error free communication via the HART® protocol.

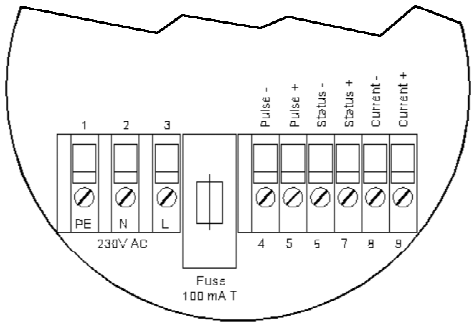

Fig 13 Mains and signal terminals of the transmitter *mag-flux M1*

Terminal	Label	Function
1	PE	Protective conductor
2	N	Mains
3	L	Mains
4	Pulse -	Pulse output (passive)
5	Pulse +	Pulse output (passive)
6	Status -	Status output (passive)
7	Status +	Status output (passive)
8	Current -	Current output (aktive)
9	Current +	Current output (aktive)

Connection of the magnetic current and electrode line (remote version only)

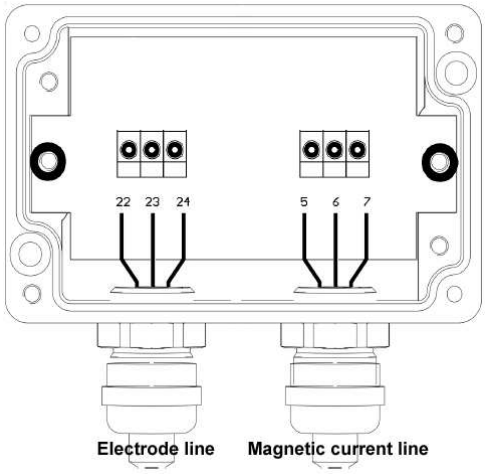

Fig 14 Connection diagram for sensor cable of the *mag-flux M1*

Terminal	Function
5	Magnetic field current 1
6	Magnetic field current 2
7	Potential equilization / PE
22	Measuring ground
23	Electrode 1
24	Electrode 2

For cable specifications see chapter „Electrode cable and field coil cable" on page 9.
The outer shield is grounded by means of special EMC-compliant cable glands at both ends of the cable, the inner shields are connected to terminal 7 and 22 respectively.

For terminal assignments see „Electrical terminals" on page 9.

Caution

Do not connect or disconnect the field coil cable before the primary power of the meter has been disconnected!

Please observe also the advices in chapter „**Cable specification**" on page 9

Connection of the sensor mag-flux A

The remote version of the sensor *mag-flux A* has a terminal box as shown in Figure 15.

Feed the electrode line through the left gland and the magnetic current line through the right gland and connect the cables as shown in Figure 15.

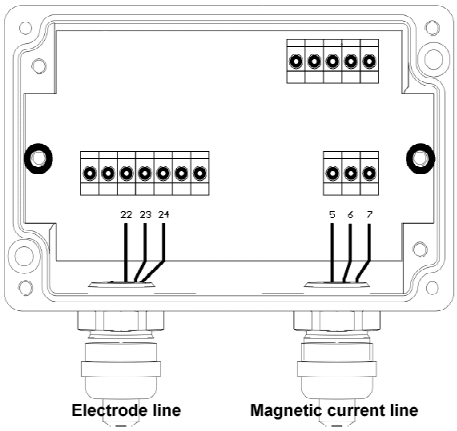

Fig 15 Electrical connections of the *mag-flux* A sensor

Connection of the sensor *mag-flux* F5

Feed the electrode line through the lower gland as shown in Figure 16 and the magnetic current line through the upper gland (see Figure 17) and connect the cables.

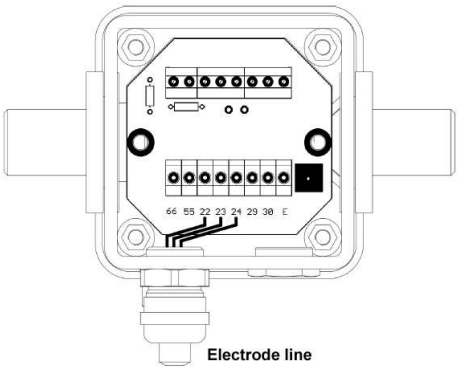

Fig 16 Electrical connections of the *mag-flux* F5 sensor (bottom)

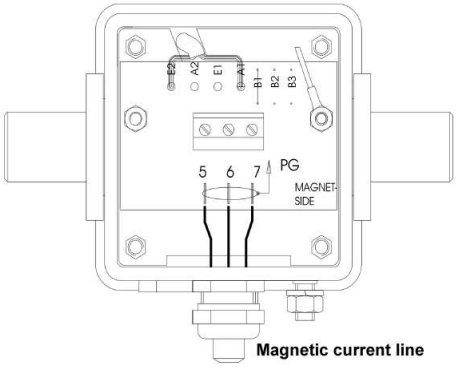

Fig 17 Electrical connections of the *mag-flux* F5 sensor (top)

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Connection of the sensor *mag-flux* S and the flow probes *mag-flux* MIS

These sensors are equipped with a pre-assembled cable ex-factory. This cable is permanently connected to the sensor at one end. The end leading to the transmitter is fitted with a cable gland and pre-prepared cable ends for connection. The attached wire numbers serve for orientation.

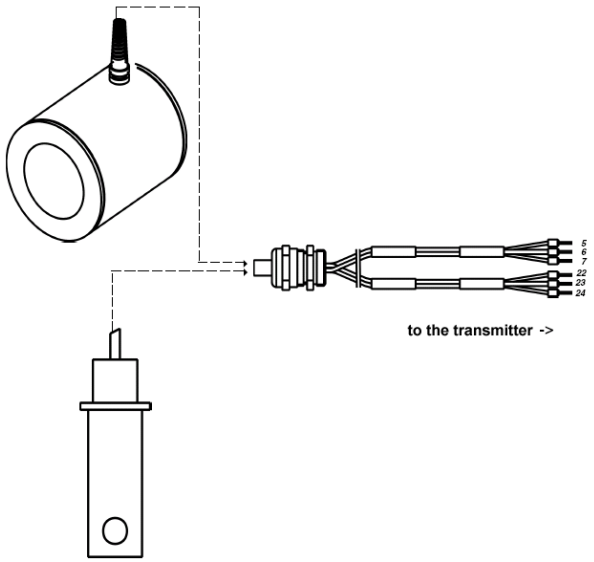

Fig 18 Connections of the sensor *mag-flux* S and the probes

Anschluss HART®

A number of options are available for HART® communication. However, for all these options loop resistance must be less than the maximum load specified in Chapter „Outputs" (see page 6). The HART®-Interface is connected via terminals 8 and 9 of the (active) current output.
The minimum load impedance is 250Ω.
.

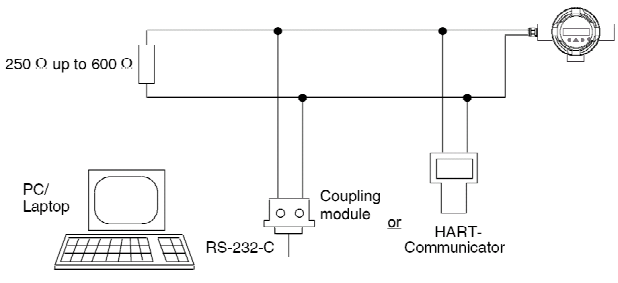

Fig 19 Electrical connection for HART® communication, schematic diagram

Display and operator interface (basic version)

Zero point adjustment

Below the mains transformer, next to the lights and the data storage module (DSB), there is a switch for adjusting the zero point. In order to reach the switch, the transducer must be opened by unscrewing the front cover and removing the decoration foil.
For processing the zero point adjustment please observe the advices in Section "Zero point calibrationon" on page 4.

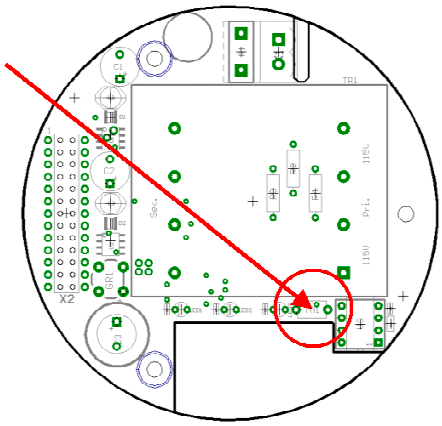

Fig 20 Switch for zero point adjustment

LED display

The actual operating status information of the *mag-flux M1* is displayed by three LED for the basic version:

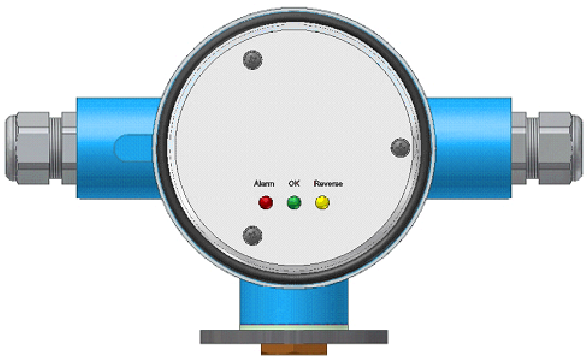

Fig 21 Status-LED of the *mag-flux M1* (basic version)

green LED	off	Not powered
	flashing	Power on
yellow LED	off	Flow direction forward
	on	Flow direction reverse
red LED	off	Normal operation
	flashing	Limit exceeded
	on	Malfunktion

Maintenance and repair

The transmitter *mag-flux M1* is designed for maintenance-free performance. It contains no parts, which have to be replaced or adjusted cyclically.

While commissioning or maintenance, mains power must be switched off. Do not connect or disconnect the wiring between sensor and transmitter while power is on!

Mains fuse

The mains fuse is located in the terminal compartment. Before replacing the fuse, the power has to be switched off. Check carefully that the transmitter is voltage free. The fuse may only be replaced by the exactly same type of fuse! (See also chapter „Technical data *mag-flux M1*"on page 9).

Replacement of terminal board

The terminal board is located in the terminal compartment. Before replacing the board, the power has to be switched off. Check carefully that the transmitter is voltage free. The board may only be replaced by the exactly same type of board.

To replace the terminal board, all pluggable connectors have to be released first and the 4 fixing screws have to be loosened.

For the assembly of the new board ensure, that the screws are secured again by toothed washers. Only after all connectors are plugged in, the power can be switched on again

Replacement of transmitter electronic

The transmitter electronic may be replaced only as complete module. With the exchange of individual components the transmitter is afterwards no longer calibrated neither regarding its measuring characteristics nor its analog outputs. The exchange has to be done as described in the following:

1. Switch off the power supply.
2. Open the terminal compartment and unplug the 6-pole connector.
3. Open the front cover and remove the decoration foil by loosing the three mounting screws and if necessary the display board inside the electronic compartment by loosing the three thread bolts.
4. Unplug the green connector on the power supply board
5. Screw out the 3 thread bolts and after that extract the power supply board carefully.
6. Disconnect the sensor's wires on the main board. Please memorize the correct order of the wires.
7. Screw out the 3 thread bolts and extract the main board carefully – please take special care of the flatcable leading to the terminal compartment.
9. The data memory chip (DSM) has to be changed over to the new electronic stack (see also chapter „data memory chip (DSM)" on page 5).
10. Insert the new main board and feed the flatcable through the hole in the compartment partitions wall.
11. Assemble the transmitter reverse to items 1 to 7 of this list.
12. Before powering on, check all connectors to be plugged in correctly and all wires and devices are fixed.

After the exchange the transmitter is calibrated by the take-over of the data memory chip (DSM) for the sensor. All totalized counts and settings are taken on.

mag-flux M1 control unit (Option)

Introduction

The transmitter *mag-flux M1* can be operated depending on configuration by using a control unit or via a HART® interface.

Below the operation and parameterization of the transmitter is described using the control unit. It is located in the electronic compartment and covered by an inspection window.

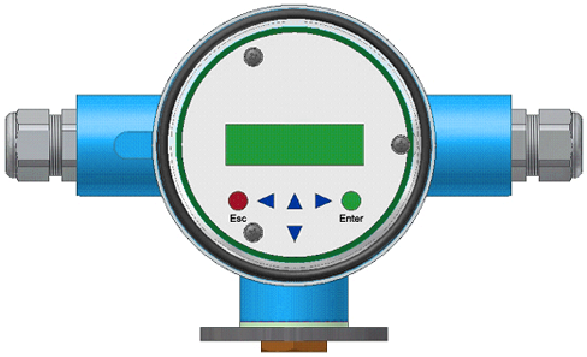

Fig 22 Transmitter *mag-flux M1* with control unit (optional)

Display

The control unit in the *mag-flux M1* has an integrated back lighted, alphanumeric display with two 16-character lines (format 16 x 60 mm). Measurement data and settings can be read directly from this display.

The LCD display is designed to be operated at temperatures ranging from – 20 °C to + 60 °C (-4° F to 140 °F) without being damaged. However, near-freezing temperatures the display becomes slow and the readability of the measured values is reduced. At temperatures below – 10 C° (14 °F), only static values (parameter settings) can be displayed. At temperatures exceeding 60 C° (140 °F), contrast decreases substantially on the LCD and the liquid crystals can dry out.

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