OPERATING INSTRUCTIONS

MECON
SAFETY CONTROL

mag-flux® T4

Magnetic flow meter
compact and remote

IMPRINT

Contents

1 SAFETY INSTRUCTIONS

1.1 Intended use

Magnetic flow meters (MD) are precision measuring instruments and suitable for the linear flow measurement of almost all electrically conductive liquids. Due to the magnetic field, they can be used for flow velocities of up to 10 m/s (32.8 ft/s) and where there is a minimum conductivity of 20 µS/cm when using a synchronized static field.

Proper use in accordance with the VdS guidelines does not permit this magnetic flow sensor (MD) to be used to regulate the process.

The complete measuring system consists of a flow sensor and its associated transducer.

Warning!

The operator of these measuring devices is solely responsible for the suitability, intended use and corrosion resistance of the selected materials. In particular. it must be ensured that the materials selected for the wetted parts of the flow meter are suitable for the process media to be measured.

The meter must not be exposed to external loads. These flow meters are primarily designed for static applications.

Hot process media can lead to hot surfaces! There is a risk of burns where the surface temperatures are above +70 °C.

Suitable protective measures should be taken, e.g. protection to prevent contact.

The contact protection must be designed such that the maximum ambient temperature around the equipment is not exceeded.

The equipment may only be operated within the pressure and voltage limits stated on the nameplate. Before replacing the equipment, it is essential to check that the flow meter is free of hazardous media and pressure.

If you return mag-flux® sensors back to MECON GmbH, please take note of the "Return equipment Form" which can be found on the Internet at www.mecon.de/en/device-returns /. Without this completed form, no repair or testing can be carried out by MECON GmbH.

1.2 Certifications

CE marking

By affixing the CE mark, the manufacturer certifies that the mag-flux® T4 MD, where appropriate, complies with the legal requirements of the following EU Directives:

» Directive 2014/30/EU (EMC Directive)
» Low Voltage Directive 2014/35/EU

VdS certification

» VdS recognition: 2344, 2100-29
» VdS approval number: G419006

1.3 Manufacturer's safety instructions

The manufacturer is not liable for damages of any kind caused by the use of the equipment, including, but not limited to, direct, indirect, incidental, punitive and consequential damages.

The warranty applies to every product purchased from the manufacturer, according to the relevant product documentation and the valid terms and conditions.

The manufacturer reserves the right to revise the content of the documents, including this disclaimer, without notice, and is not liable in any way for possible consequences of such changes.

The responsibility that the instruments are suitable for the particular application rests solely with the operator. MECON GmbH assumes no liability for the consequences of misuse, modifications or repairs that have been carried out by the customer without prior consultation.
In case of a complaint the contested elements must be cleaned of hazardous substances

and returned to the manufacturer, unless otherwise agreed.

To prevent injury to the user or damage to the unit, it is necessary that you read these operating instructions carefully before starting to use the equipment.

The operating instructions are intended for the correct installation, operation and maintenance of the equipment.

Special designs for special applications and custom models are not covered by this documentation.

2 DEVICE DESCRIPTION

2.1 Scope of delivery

① mag-flux® T4 flow meter
② Operating Instruction
③ Calibration certificate

Fig. 1: Scope of delivery

2.2 Nameplates

Nameplate mag-flux® M1 transducer

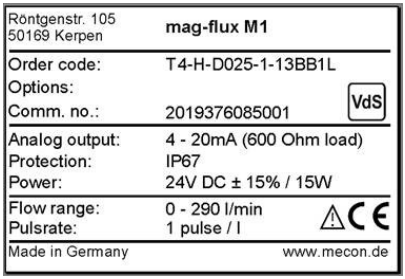


Fig. 2: Nameplate mag-flux® M1 transducer

	Equipment type
Order code:	Description code
Options:	Options
Serial no.:	Serial number
Analogue output:	Analogue output
Protection:	Protection class
Power:	Power supply
Flow range:	Flow range

Nameplate mag-flux® T4 sensor

Fig. 3: Nameplate mag-flux® T4 sensor

	Equipment type
Order code:	Description code
Options:	Options
Serial no.:	Serial number
Connection:	Process connection
Electrodes:	Electrode material
Lining:	lining
Protection:	Protection class
Op. pressure max.:	Operating pressure (max.)
Op. temp. max.:	Operating temp. (max.)
ZPH/CFH:	Calibration factors

The operating pressure and temperature depend on the lining material and must be taken from the operating instructions.

3 INSTALLATION AND MODE OF OPERATION

The principle of flow measurement is based on Faraday's law of electro-magnetic induction, where the sensor converts the flow into a voltage that is proportional to the flow rate.

3.1 Measuring principle

In 1832, Faraday proposed the application of the principle of electrodynamic induction for measuring flow velocity. His experiments in the Thames were not successful due to superimposed polarisation effects, but are considered to be the first experiment in the field of magnetic-inductive flow measurement. According to Faraday's law of induction,a conductive liquid flowing through a magnetic field B with a velocity of v results in an electric field E according to the vector product E = [v x B].

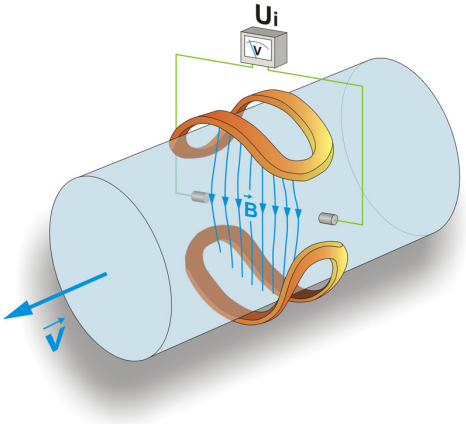


Fig. 4: Principle of magnetic inductive flow measurement

In a tubular measuring tube, provided with an electrically insulating lining and where a liquid flows through with a velocity v and flow Q, a magnetic field B is generated perpendicular to the flow direction by the two excitation coils giving a measurement voltage at the two electrodes. The magnitude of this measurement voltage is proportional to the average flow velocity and the volume flow.

3.2 System Design

The meter consists of a flow sensor and a transducer. The flow sensor is used to measure liquid media. The transducer generates the coil current required for the magnetic field and creates the conditions for the induced voltage applied to the electrodes.

The meter can be supplied both in a compact form (transducer and flow sensor are directly connected) and separately (both components are connected via a cable). If strong vibrations occur in a particular application, a separate design should be installed.

3.3 Installation notes

Information!

All instruments are carefully checked for proper function before shipment. On receipt, immediately check the outer packing carefully for damage or signs of improper handling.
Report damage to the carrier and your local sales staff. In such cases, a description of the defect, the type and the serial number of the device is indicated.

Unpack the unit carefully to avoid damage.

Check the delivery against the packing list for completeness. Check the name plate, if the delivered flow meter according to your order. Check that the correct voltage supply is specified.

Special requirements VdS: The version with rolled grooved ends may only be used in combination with VdS-approved pipe couplings manufactured by Anvil (all Gruvlok mechanical grooved couplings), Jinan Meide (casting couplings type 1G), Minimax, Modgal, Tyco (Grinnell Mechanical and G-Fire steel IPS couplings) and Victaulic (except pipe couplings of the type 009N).

3.4 Installation instructions

In general, the measuring principle is independent of the flow profile.

The ideal installation location is in a pipeline with a sufficiently straight section of pipe in front of and behind the measuring point. An inlet of min. 5 x DN and an outlet of min. 2 x DN is required. Where non-stationary vortices extend into the measuring zone (e.g. following elbows, tangential inlets or a half-open valve in front of the sensor), measures to normalise the flow profile are required. Here suitable measures include:

» Enlarging the inlet and outlet sections
» Use of flow straighteners
» Reduction of the pipe cross section

Please note Victaulic type "009N" creates due to the crosssection limitation in the gasket a pressure loss and turbulances. This could have an impact of a propper flow measurment!

Installation can be horizontal as well as vertical (fig. 5). However, make sure that the axes of the electrodes run in a horizontal direction (direction arrow indicates the electrode axes) to avoid incorrect measurements due to deposits or air bubbles on the electrodes.

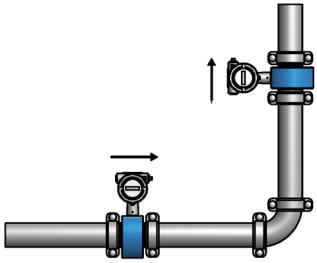


Fig. 5: Installation in horizontal and vertical pipelines

Where there is a free pipe outlet, the sensor should not be installed in a section of pipe that can run empty (e.g. downpipes, Fig. 6). For installations in a downpipe, ensure that the pipeline is always 100 % filled with the medium (Fig. 7).

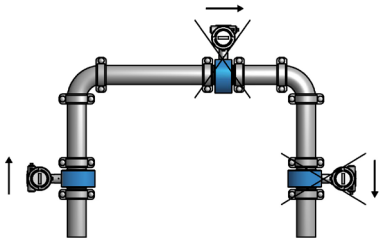


Fig. 6: Installation in rising and falling pipes

The sensor must be installed so that the measuring tube can not run empty and is always filled with the medium. If the pipeline is not full or if there is only a free-flow line (drain), the sensor must be installed in a culvert. (Fig. 7)

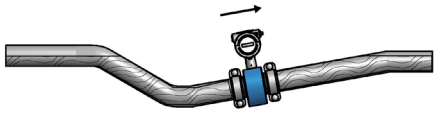
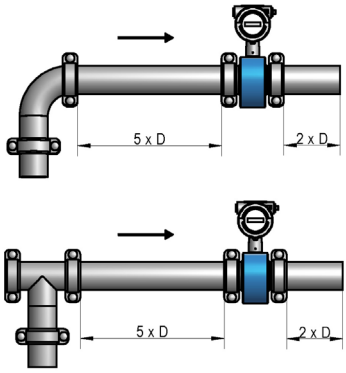


Fig. 7: Installation with piping that is always filled

It is vital to ensure straight inlet and outlet sections. If this cannot be achieved, flow straighteners must be used or alternatively the measuring cross-section must be reduced.



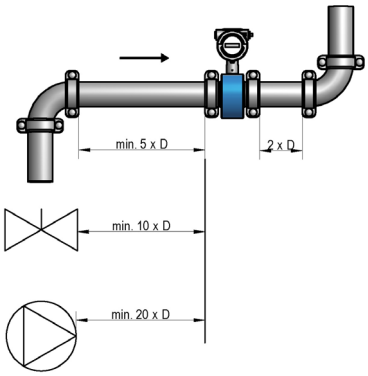


Fig. 8: Installation between elbows, valves and pumps (D = DN)

If several sensors are connected in series, the distance between the individual sensors must be at least one sensor length. If two or more sensors are mounted side by side, the minimum distance is 1 m.

Avoid any buildup of gas at the highest point in the pipeline. (Fig. 9)

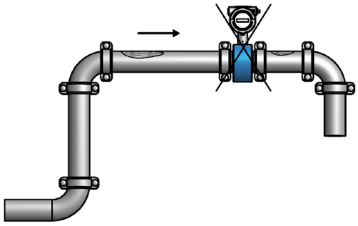


Fig. 9: Installation at the highest point

To ensure trouble-free operation, avoid direct magnetic fields outside the unit.

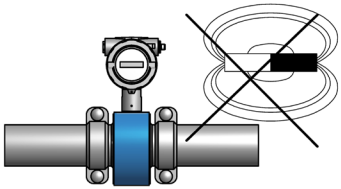


Fig. 10: Avoid magnetic fields

Avoid vibrations and shocks to ensure the long-term functionality of the device.

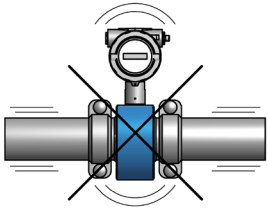


Fig. 11: Avoid shocks

3.5 Assembly

When installing the magnetic inductive flow sensor, both regulations and the instructions in the corresponding operating instructions must be followed. In particular, the regulations for earthing, potential equalisation and connecting a functional earth must be observed.

Potentials

The signal outputs (process outputs) and the mains supply of the mag-flux® M1 transducer are galvanically insulated from each other and from the measuring circuit. The housing and the noise filters of the mains connection are connected with PE. The electrodes and the measuring electronics are based on the potential of the functional earth FE of the sensor. The FE is not connected to the PE, but these may be connected together in the sensor connection. If the sensor is earthed using earthing rings, these must be connected to the functional earth FE.

Cathodic protection

When using cathode protection devices which apply a voltage to the pipe wall to prevent corrosion, they must be connected to FE.

The measuring electronics and all operating elements within the transducer now have this potential too.

Installation and repair

Installation or repair may only be carried out by specially trained personnel, i.e. trained electronics technicians or service technicians from MECON GmbH.

Warning!

Before such interventions, the equipment must be completely switched off, all external devices be disconnected and it must be verified that the system is no longer live! Only original parts may be used for repair.

MECON GmbH assumes no liability for any damages caused by improper repairs, use of replacement parts, external electrical or mechanical influences, overvoltages or lightning. Under such circumstances the warranty is invalid. Likewise, no liability whatsoever is accepted for any resulting consequential damages.

If there is a fault, the service department at MECON GmbH is available to help you

Tel: +49 (0)2237 - 6 00 06 - 0
E-mail: info@mecon.de

Our customer service is at your disposal to provide coordination and assistance with any necessary diagnostic and repair measures required

Safety instructions for the user

This documentation contains the information required for the intended use of the product described therein. It is intended for qualified personnel. Within the meaning of the safety instructions in this documentation or the product itself, qualified personnel are those persons who

» either as an electronics technician or
» a member of maintenance personnel

are familiar with the safety regulations that apply to electrical and automation engineering and the regulations applicable in your country. They must be authorized by the plant operator for installation, commissioning, maintenance or repair.

These qualified personnel must have read and understood these operating instructions and obey the instructions in them!

Hazard Warnings

The following instructions are for your personal safety and also for avoiding damage to the described product or any connected devices.

Safety instructions and warnings to prevent danger to the life and health of users or maintenance personnel, or to prevent damage to property, are highlighted in this documentation with the terms used in signals that are defined here. These terms are used in the sense of the documentation and the references to the products themselves, and have the following meaning:

Danger!

This means that death, serious injury or significant damage to property will occur if the appropriate precautions are not taken!

Warning!

This means that death, serious injury or significant damage to property can occur if the appropriate precautions are not taken!

Attention!

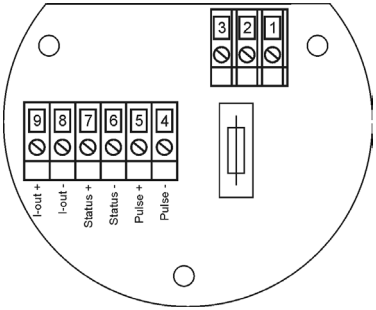
This means that slight physical injuries or damage to property may occur if the appropriate precautions are not taken!

Information!

This is important information about the product, the handling of the product or the relevant part of the documentation, to which particular attention should be given.

3.6 Electrical connection

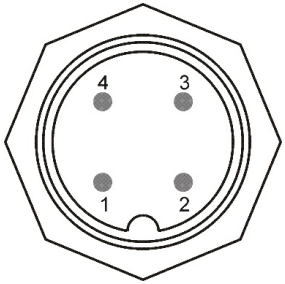
Connection using a cable gland



Terminal	Designation	Function
1	PE	Protective conductor
2	N	Mains
3	L	Mains (phase)
4	Impulse -	Pulse output (passive)
5	Impulse +	Pulse output (passive)
6	Status -	Status output (passive)
7	Status +	Status output (passive)
8	Power -	Power output (active)
9	Power +	Power output (active)

Tab. 1: Terminal connection diagram

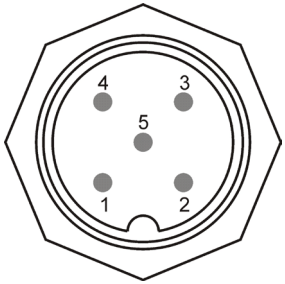
Connection of the transducer with a 230 V / 115 V (4-pin) plug



Pin	wire colour (Connection cable)	Function
1	brown	L / phase
2	white	PE
3	blue	N / neutral conductor
4	black	not used

Tab. 2: Pin assignment Power supply 230 V / 115 V

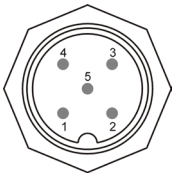
Analogue output 230 V / 115 V (5-pin):



Pin	wire colour (Connection cable)	Function
1	brown	not used
2	white	not used
3	blue	Earth / 0 V
4	black	not used
5	grey	Analogue output 4 - 20 mA

Tab. 3: Connector assignment, Analogue output

Connection of transducer with 24 V plug



Pin	wire colour (Connection cable)	Function
1	brown	+24 V
2	white	not used
3	blue	Earth / 0 V
4	black	not used
5	grey	Analogue output 4 - 20 mA

Tab. 4: Connector assignment Analogue output

Connection of sensor / transducer (with separate design)

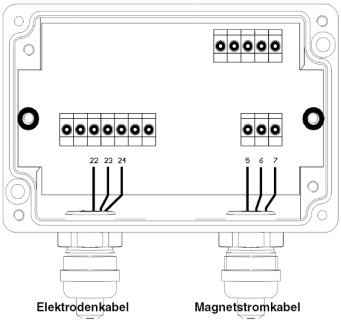


Fig. 12: Electr. connections of the sensor mag-flux® T4

Pin	wire colour (Connection cable)	Function
5	brown	Magnetic current 1
6	white	Magnetic current 2
7	green yellow	Potential equalisation / PE
Electrode cable (5-core)		
22	red	Measuring earth
23	brown	Electrode 1
24	white	Electrode 2
* The green-yellow and blue wires are not connected		

Tab. 5: Cable connections with separate design

Connection of solenoid and electrode cables (with separate design)

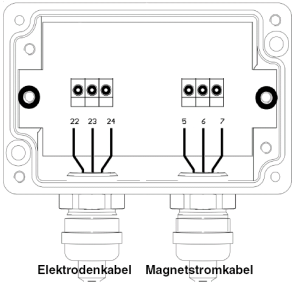


Fig. 13: Sensor connection of the mag-flux® M1 sensor

Changing the orientation of the transducer housing (compact design only)

With a compact design, the transducer housing is not rigidly connected to the sensor, but can be extended by max. ± 180°.

In the as delivered condition, the transducer housing is mounted in such a way that the display can be read in the correct position with a horizontal installation position and a direction of flow from left to right.

To change the orientation of the transducer housing, the following steps are required (see also Fig. 14).

1. Loosen the two set screws.
2. The transducer housing must be placed in the desired position.
3. Re-tighten the two set screws.

Fig. 14: Position of the set screws for turning the transducer housing (mag-flux® A compact)

Information!

For further information on the mag-flux® M1 transmitter, please find the separate operating instructions enclosed.

4 START-UP

The operating instructions are to be read completely before installation and start-up. Only trained personnel are permitted to carry out installation and repair work! The mag-flux® T4 transducer described in these operating instructions may only be used to measure the volumetric flow rate of electrically conductive liquids!

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Great care has been taken in the development and preparation of this manual. Nevertheless, mistakes cannot always be avoided. Companies, programmers and authors do not assume any legal or any other liability for incorrect functions or information, or for any consequences.

MECON GmbH makes no warranty, express or implied, as to its suitability for any purpose other than as described in this manual.

We reserve the right to change technical data as a result of developmental progress. The latest information about this product can be found on the Internet at the homepage www.mecon.de. You can also contact our sales department via e-mail at info@mecon.de.

5 SERVICE

5.1 Storage

Store the emptied device in a dry and dust-free place. Keep away from direct sunlight and heat. Avoid external loads being placed on the equipment. The permissible storage temperature is -20 °C to 60 °C.

5.2 Maintenance

The magnetic-inductive measuring device mag-flux® T4 is maintenance-free.

5.3 Returning the equipment to the manufacturer

Thanks to careful manufacturing processes and final checks on the equipment, trouble-free use of the mag-flux® T4 can be expected during installation and during operation in accordance with these operating instructions.

Should you nevertheless need to return a device to MECON GmbH please observe the following points:

Attention!

For reasons of environmental protection and safeguarding the health and safety of our personnel, all equipment sent to MECON GmbH to be repaired must be free of any toxic and hazardous substances. This also applies to cavities in the equipment. If necessary, the customer is kindly requested to neutralize or rinse the devices before returning them to MECON GmbH. The customer must confirm this by completing and submitting the returns form on the MECON GmbH website Can be found at:

» ***https://www.mecon.de/en/device-returns/***

5.4 Disposal

Attention!

When disposing of equipment, please comply with the regulations in your country.

6 FAULT MESSAGES

List of fault messages - self-test faults

If a self-test fault occurs during operation, it will be displayed as a plain text fault message in the 2nd line of the LCD display of the transducer. Depending on the preset language, the message is output in German (default) or English.

Notification on the display	Description	Possible cause of fault and its rectification
Tube empty	Empty pipe detection is switched on. Pipe is empty.	Ensure it is filled.
Coil current	Line interruption to the field coil. The signal outputs are set to zero.	Send mag-flux® T4 back to MECON GmbH
Overdriven measuring circuit	The measured electrode voltage is too large. The signal outputs are set to zero.	Flow is too great. V >10 m/s
Power overdriven	The output of the current interface is overdriven.	Flow is too great. V >10 m/s
ext. EEPROM is missing	The data storage module (DSB) with the calibration data and settings of the transducer is not plugged in.	Send mag-flux® T4 back to MECON GmbH

Tab. 6: Fault messages

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