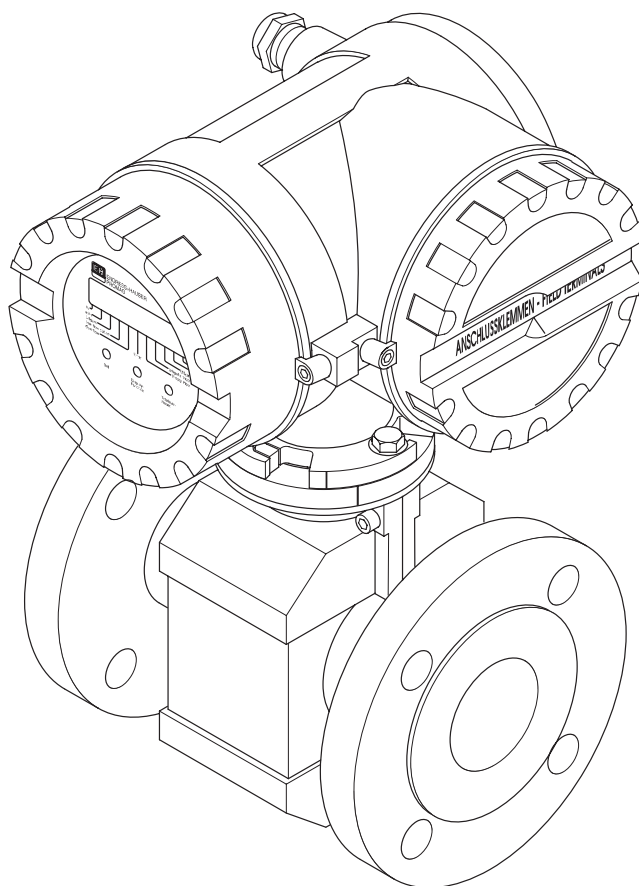
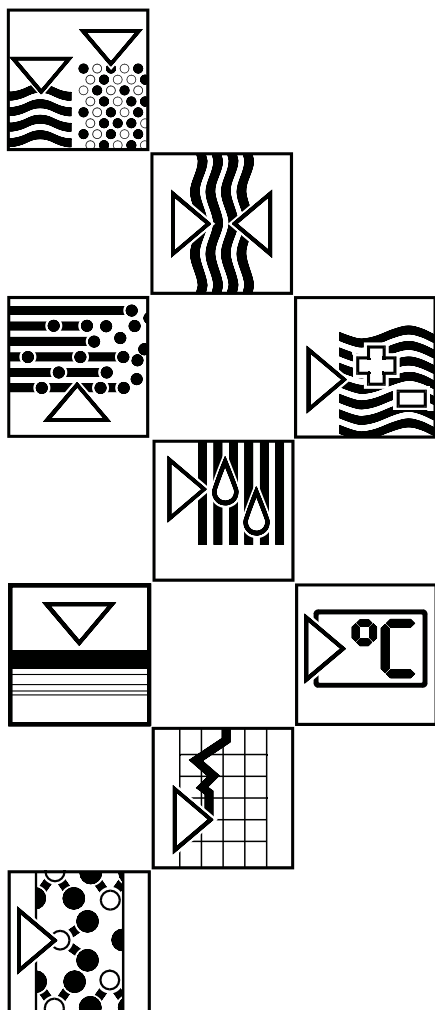


BA 008D/06/e/06.96
No. 50063716

valid from software version
V3.01.XX (measuring amplifier)

promag 30 **Electromagnetic Flow Measuring System**

Operating Manual



Endress+Hauser

Nothing beats know-how





Safety Instructions

Please observe without fail the safety instructions in Chapter 1 (page 5).

Documentation for Ex instruments



Instruments which are used in the explosion hazardous area are supplied with a separate “Ex documentation”, which is an *integral part of this Operating Manual*.



The instructions and connected loads provided in this supplement must absolutely be observed.



An appropriate icon is shown on the front of this document according to the approval given and the test centre.



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1. Safety Instructions

1.1 Correct Usage

- The Promag 30 is only to be used for measuring the flow of conductive fluids.
- The manufacturer assumes no liability for damage caused by incorrect use of the instrument.

1.2 Dangers and Notes

All instruments are designed to meet state-of-the-art safety requirements, have been tested, and have left the works in an operationally perfectly safe condition. The devices were developed according to EN 61010 "Protection Measures for Electronic Equipment for Measurement, Control, Regulation and Laboratory Procedures". A hazardous situation may occur if the flowmeter is not used for the purpose it was designed for or is used incorrectly. Please carefully note the information provided in this Operating Manual indicated by the pictograms:

Warning!

A "warning" indicated actions or procedures which, if not performed correctly, may lead to personal injury or a safety hazard.
Please strictly observe the instructions supplied and proceed carefully.



Caution!

A "caution" indicates actions or procedures which, if not performed correctly, may lead to faulty operations or the destruction of the instrument.
Please strictly observe the respective instructions.



Note!

A "note" indicates actions or procedures which, if not performed correctly, may indirectly affect operations or lead to an unexpected instrument response.



1.3 Personnel for Installation, Start-up and Operation

- Mounting, electrical installation, start-up and maintenance of the instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must absolutely and without fail read and understand this Operating Manual before carrying out its instructions.
- The instrument may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed without fail.
- With special fluids incl. those used for cleaning, E+H will be pleased to supply information concerning the chemical resistance properties of wetted parts.
- The installer has to make sure that the measuring system is correctly wired up according to the wiring diagrams. The measuring system is to be grounded.



Danger of electrical shock!

With the housing cover removed, protection against accidental contact is no longer present. Components with high voltages are exposed below the local display. When programming according to section 5.3, avoid any contact with the electronic components which lie below the local display, and do not use any electrically conductive object to depress the programming keys.

- Please observe all provisions valid for your country and pertaining to the opening and repairing of electrical devices.

1.4 Repairs, Dangerous Chemicals

The following procedures must be carried out before a Promag 30 is sent to Endress+Hauser for repair:

- A note must always be enclosed with the instrument, containing a description of the fault, the application, and the chemical and physical properties of the product being measured.
- Remove all residue which may be present. Pay special attention to the gasket grooves and crevices where fluid may be present. This is especially important if the fluid is dangerous to health, e.g. corrosive, poisonous, carcinogenic, radioactive, etc.
- No instrument should be returned to us without all dangerous material being removed first (e.g. in scratches or diffused through plastic).

Incomplete cleaning of the instrument may result in waste disposal or cause harm to personnel (burns, etc). Any costs arising from this will be charged to the owner of the instrument.

1.5 Technical Improvements

The manufacturer reserves the right to modify technical data without prior notice. Your local E+H Sales Office will supply you with all current information and any updates to this Operating Manual.

2. System Description

2.1 Fields of application

With the Promag 30 measuring system it is possible to obtain precise magneto-inductive measurements of flow at low cost. All liquid media with a minimum conductivity of 5 $\mu\text{S}/\text{cm}$ can be measured, e.g.:

- acids, alkalis, pastes, pulps
- drinking water, waste water, sewage sludge
- milk, beer, wine, mineral water, yoghurt, molasses

2.2 Principle of measurement

In accordance with Faraday's law of induction, a voltage is induced in a conductor that is moved through a magnetic field. In the magneto-inductive principle of measurement the flowing medium represents the moving conductor. The induced voltage is proportional to the flow velocity and is fed to the measuring amplifier by a pair of electrodes. Across the cross-section of the pipe the flow volume is calculated. The DC magnetic field is generated by a switched direct current of alternating polarity. Together with the patented "Integrated Autozero Circuit" this assures a stable zero point and makes the measurement independent of the medium and insensitive to entrained solid particles. In our works every unit is calibrated on modern calibrating facilities, referable to international standards. There is no need for it to be adapted to suit changing media.

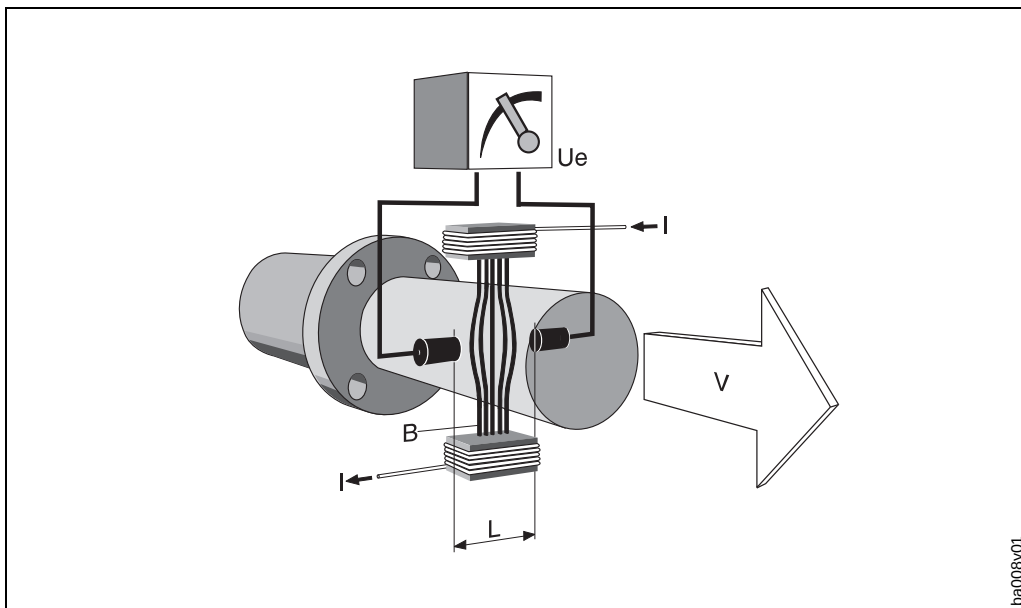


Fig. 1

$$U_e = B \cdot L \cdot v$$

$$Q = v \cdot A$$

U_e = induced voltage

B = magnetic induction

L = distance between electrodes

v = flow velocity

Q = volume flow

A = pipe cross-section

2.3 The Promag 30 measuring system

The Promag measuring system is fully modular, both mechanically and electrically. The equipment can be extended by exchanging electronic boards. Thus the measuring point can be optimally equipped and updated. The illustration below gives an overview of the complete Promag 30 measuring system.

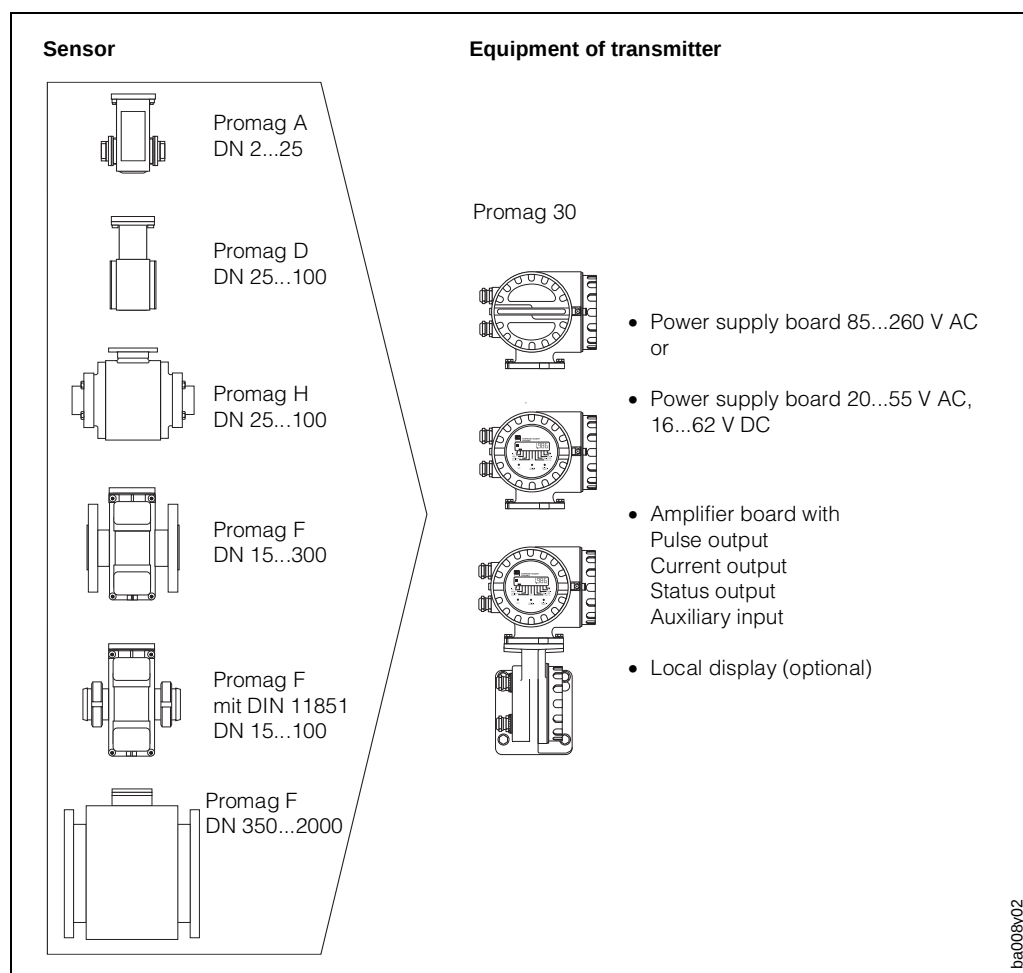


Fig. 2



Note!

Note!

The Promag 33 system enhances the advantages of Promag 30 by providing the following properties:

- E+H matrix-driven operation (12 languages)
- Two-line, illuminated display
- Batching with integral preset counter
- Ability to communicate
- Empty pipe detection (EPD)

You can find information on the special properties of the Promag 33 measuring system in the "Technical Information Promag 33" TI No. 027D/06/e.

Caution!

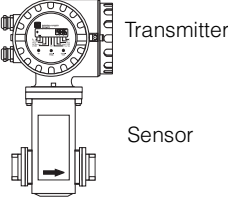
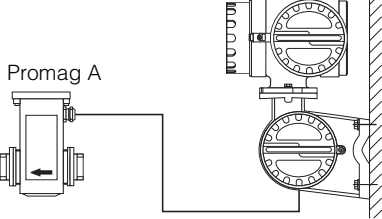
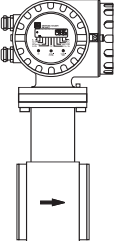
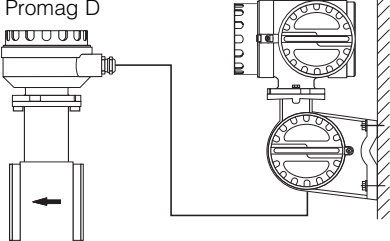
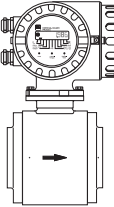
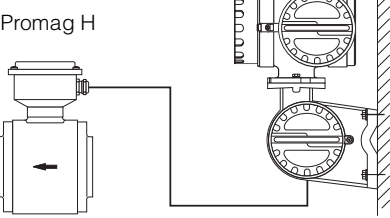
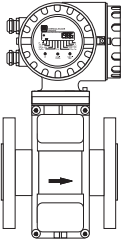
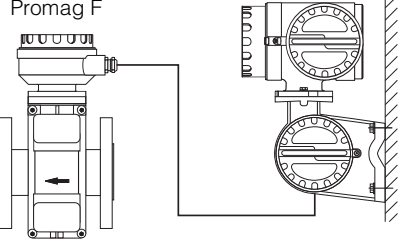
The Promag 30 and the Promag 33 measuring systems are available with various hazardous area approvals. Your E+H representative will be pleased to supply further information on the available approvals. Approval relevant information can be found in the supplement to this operating manual which can also be ordered from your E+H representative.



Caution!

The measuring equipment comprises:

- Transmitter Promag 30 and
- Sensor Promag A, D, F or H

Compact version The Promag 30 transmitter and the sensor together form a mechanical unit.	Remote-mounted version (FS version or FL version) The transmitter is mounted remote from the sensor: <i>FS version</i> • Up to 10 m distance medium conductivity min. 5 µS/cm • From 10...200 m distance max. cable length in terms of the medium conductivity (5...200 µS/cm) <i>FL version</i> • Max. cable length 200 m, not dependent on conductivity. • No EPD available. • The electrical connection between transmitter and sensor is made in the connection housing (exception: Promag A). The wall mounting bracket for the transmitter is supplied.
Promag 30 A 	Promag 30 
Promag 30 D 	Promag 30 
Promag 30 H 	Promag 30 
Promag 30 F 	Promag 30 

ba08y03

Fig. 3

2.4 Design of the measuring system

(considering Promag 30 F as example)

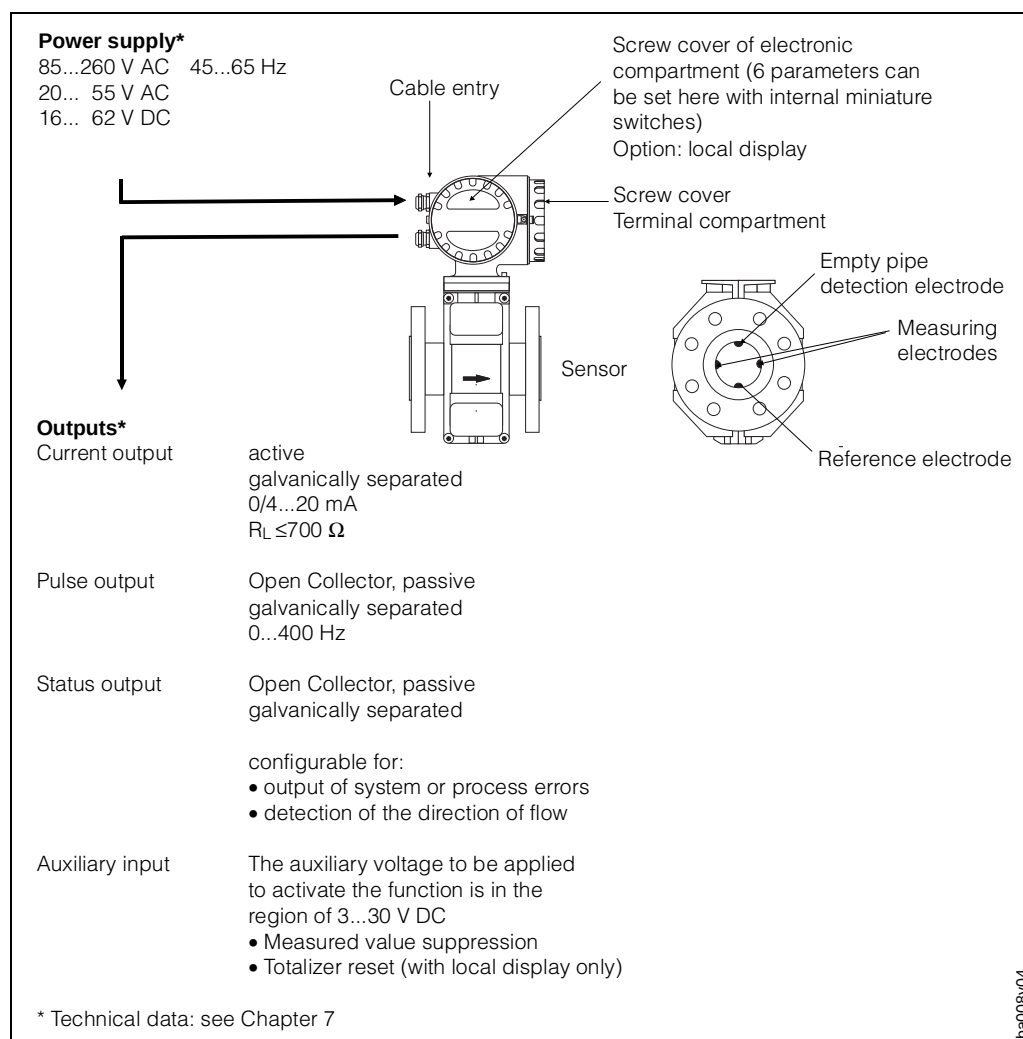


Fig. 4

Operation/Local display

Inside the housing of the transmitter there are miniature switches with which altogether six operating parameters can be set (see page 37):

- Current range 0/4...20 mA
- Full-scale value scaling (volume/time), 8 steps
- Pulse weighting in decadic steps (volume), 8 steps
- Engineering units
- Function of the status output
 - Output of system/process errors
 - Flow direction recognition
- Creep suppression (on/off)

Using the Promag 30 local display, important parameters can be read off and controlled at the measuring point directly:

- Flow rate and/or totaliser value
- Technical units (SI/US units)
- Process variables (e.g. creep rate, partial pipe filling)
- Error messages

Using the three operating keys, it is also possible to select and activate various functions. A small pin is used to press the keys down (keep pressed for approx. 0.5...0.8 s).

Dynamic response

The Promag 30 measuring amplifier has a very high dynamic response of over 1000:1. It measures at medium velocities from less than 10 mm/s to over 10 m/s with the specified accuracy. When the flow is pulsating, the amplifier is not over-driven even above the end value setting at maximum speeds up to 12.5 m/s. There is then no falsification of the measured value, provided the outputs are not over-driven.

Memory (DAT)

DAT is an exchangeable memory module. Stored in it are all characteristic data of the sensor, such as calibrated quantities, nominal diameter, sensing rate, version, serial number. When the transmitter has been changed, the previous DAT memory is inserted in the new transmitter. When the measuring system is started, the measuring point continues to operate with the data stored in the DAT memory. Thus the DAT concept assures maximum safety and optimum ease of operation when components of the equipment are exchanged.

Safety

- A comprehensive self-monitoring facility of the measuring system assures high safety. Any system error messages (coil-current error, amplifier error, DAT error, EEPROM error, ROM error, RAM error) or a power supply failure that do occur are emitted at the configured status output.
- In the event of a power supply failure all data of the measuring system are securely stored in the EEPROM (without a backup battery).
- The Promag 30 measuring system fulfils the safety requirements according to EN 61010 "Protection Measures for Electronic Equipment for Measurement, Control, Regulation and Laboratory Procedures", and the general requirements for electromagnetic compatibility (EMC) according to EN 50081 Part 1 and 2 / EN 50082 Part 1 and 2 as well as the NAMUR recommendations.
- IP 67 protection (EN 60529) is standard for the transmitter and sensor (remote or compact version). The sensor is also optionally available in IP 68.

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