Technical Information
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50097005

Electromagnetic Flow Measuring System – Two-wire, loop-powered *PROline promag 23 P*

Flow rate measurement in chemical or process applications

Features and benefits
- Nominal diameters DN 25...200
- PFA or PTFE lining
- PFA for high-temperature applications up to +180 °C (Ex: up to +150 °C)
- Fitting lengths to DVGW and ISO
- Measuring accuracy: ± 0.5%
- Robust field housing, IP 67, with separate terminal compartment
- "Touch control": operation without opening the housing - also for Ex-rated applications
- Communication: HART is standard
- Intrinsically safe Ex ia for installation in zone 1 (ATEX, FM, CSA, etc.)
- Transmitter supply:
  – Non-Ex environment: 12...30 V DC
  – Ex environment: 13.9...30 V DC
- Connecting to all mainstream transmitter power supplies and input cards of process control systems
- Reduced installation and operation costs

Application
All fluids with a minimum conductivity of ≥ 50 µS/cm can be measured:
- acids
- alkalis
- paints, lacquers
- water, etc.

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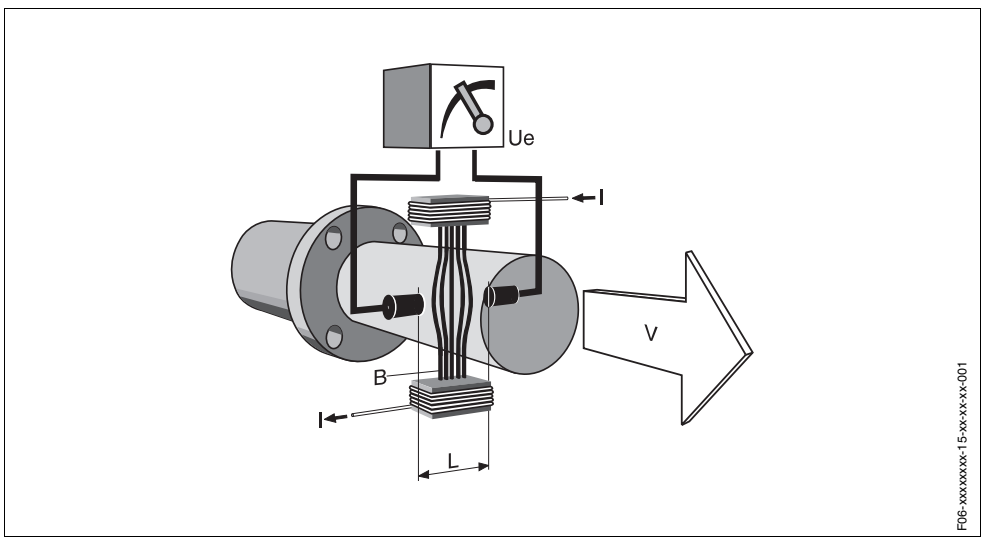
Function and system design

Measuring principle

Faraday's law of induction states that a voltage is induced in a conductor moving in a magnetic field.
In electromagnetic measuring, the flowing medium corresponds to the moving conductor. The induced voltage is proportional to the flow velocity and is detected by two measuring electrodes and transmitted to the amplifier. Flow volume is computed on the basis of the pipe's diameter. The constant magnetic field is generated by a switched direct current of alternating polarity.



$Ue = B \cdot L \cdot v$
$Q = A \cdot v$

Ue = induced voltage
B = magnetic induction (magnetic field)
L = electrode gap
v = flow velocity
Q = volume flow
A = pipe cross-section
I = current strength

Measuring system

The measuring system consists of a transmitter and a sensor.
Compact version: transmitter and sensor form a single mechanical unit.

- Transmitter:
Promag 23 ("Touch Control" without opening the housing, four-line display)

- Sensor
Promag P (DN 25...200)

Input

Measured variable

Flow rate (proportional to induced voltage)

Measuring range

Typically v = 0.01...10 m/s with the specified measuring precision

Operable flow range

Over 1000 : 1

Output

Output signal

- Current output:
  Applied direct current 4...20 mA, input from DC voltage source.
  Terminal voltage: 12...30 V DC, 13.9...30 V DC (Ex i)

- Frequency output:
  Open collector, passive, galvanically isolated, 30 V DC, 100 mA (250 mA / 20 ms)

  Optional configurable as:
  – Frequency output:
  Full scale frequency 500...10000 Hz (f_{max} = 12.5 Hz)
  or
  – Pulse output:
  Pulse value and pulse polarity adjustable, pulse width adjustable (0.01...10 s), pulse frequency max. 50 Hz
  or
  – Status output:
  E.g. for error messages, Empty Pipe Detection, flow direction recognition, limit value configurable

- Ex i version:
  – Power-supply, signal circuits and pulse output with "intrinsically safe" protection rating, EEx ia IIC and EEx ia IIB, only for connection to certified, intrinsically safe circuits with the following maximum values: U_i = 30 V, I_i = 150 mA, P_i = 810 mW
  Effective internal inductance: negligible
  Effective internal capacitance: $C_i \leq 25$ nF
  – Pulse output:
  Maximum values: U_i = 30 V, I_i = 10 mA, P_i = 1 W
  Effective internal inductance: negligible
  Effective internal capacitance: negligible

Signal on alarm

- Current output → failure response selectable
- Pulse/frequency output → failure response selectable
- Status output → “non-conductive” by fault or power supply failure

Load

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Low flow cut off

Switch points for low flow cut off are selectable.

Galvanic isolation

Outputs are galvanically isolated from sensor and from each other.

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