



Level



Pressure



Flow



Temperature

Liquid  
Analysis

Registration

Systems  
Components

Services



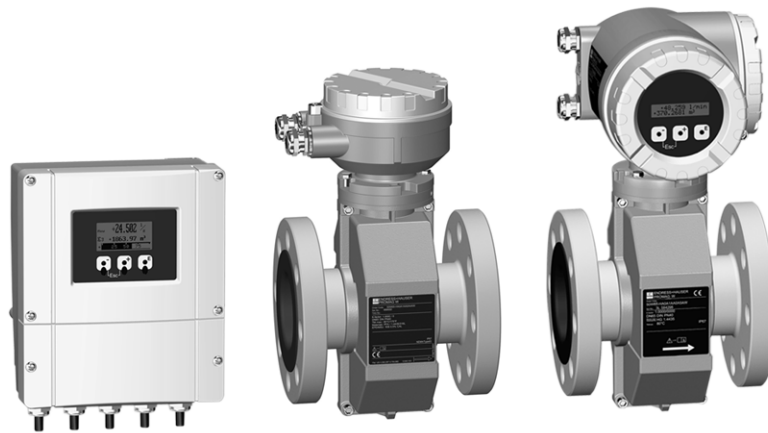
Solutions

## Technical Information

# Proline Promag 50W, 53W

## Electromagnetic Flow Measuring System

### Flow measurement in water or wastewater applications



#### Application

Electromagnetic flowmeter for bidirectional measurement of liquids with a minimum conductivity of  $\geq 5 \mu\text{S}/\text{cm}$ :

- Drinking water
- Wastewater
- Wastewater sludge
- Flow measurement up to  $110,000 \text{ m}^3/\text{h}$
- Fluid temperature up to  $+80 \text{ }^\circ\text{C}$
- Process pressures up to 40 bar
- Fitting lengths to DVGW/ISO

Application-specific lining materials:

- Polyurethane and hard rubber

Approvals for hazardous area:

- ATEX, FM, CSA

Lined measuring pipes with materials approved for drinking water:

- KTW, WRAS, NSF, ACS, etc.

Connection to process control system:

- HART, PROFIBUS DP/PA, FOUNDATION Fieldbus, MODBUS RS485

#### Your benefits

Promag measuring devices offer you cost-effective flow measurement with a high degree of accuracy for a wide range of process conditions.

The uniform **Proline transmitter concept** comprises:

- Modular device and operating concept resulting in a higher degree of efficiency
- Software options for electrode cleaning
- Uniform operating concept

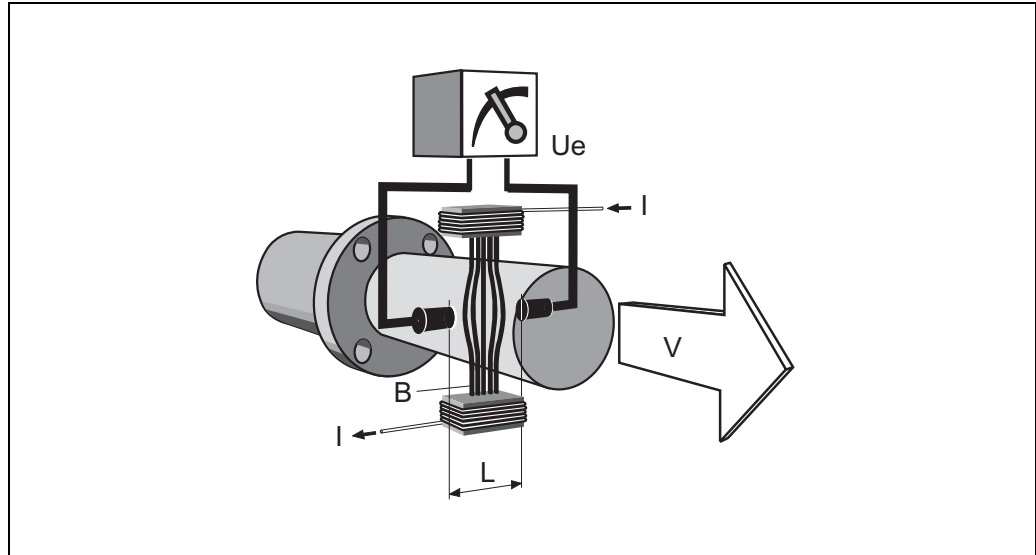
The tried-and-tested **Promag sensors** offer:

- No pressure loss
- Not sensitive to vibrations
- Simple installation and commissioning

## 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.



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

$$Q = A \cdot v$$

$U_e$  = 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.  
 Two versions are available:

- Compact version: transmitter and sensor form a single mechanical unit.
- Remote version: transmitter and sensor are installed separately.

Transmitter:

- Promag 50 (user interface with push buttons for operation, two-line display)
- Promag 53 ("Touch Control" without opening the housing, four-line display)

Sensor:

- DN 25...2000

## Input

<b>Measured variable</b>	Flow rate (proportional to induced voltage)
<b>Measuring range</b>	Typically $v = 0.01 \dots 10$ m/s with the specified measuring accuracy
<b>Operable flow range</b>	Over 1000 : 1
<b>Input signal</b>	<p>Status input (auxiliary input):  <math>U = 3 \dots 30</math> V DC, <math>R_i = 5</math> k<math>\Omega</math>, galvanically isolated.            Configurable for: totalizer(s) reset, measured value suppression, error-message reset.</p> <p>Status input (auxiliary input) with PROFIBUS DP and MODBUS RS485:  <math>U = 3 \dots 30</math> V DC, <math>R_i = 3</math> k<math>\Omega</math>, galvanically isolated            Switching level: <math>3 \dots 30</math> V DC, independent of polarity            Configurable for: totalizer(s) reset, measured value suppression, error-message reset, batching start/stop (optional), batch totalizer reset (optional)</p> <p>Current input (for Promag 53 only):            Active/passive selectable, galvanically isolated, full scale value selectable,            resolution: <math>3 \mu\text{A}</math>, temperature coefficient: typ. 0.005% o.r./<math>^{\circ}\text{C}</math> (o.r. = of reading)            active: <math>4 \dots 20</math> mA, <math>R_i \leq 150 \Omega</math>, <math>U_{\text{out}} = 24</math> V DC, short-circuit-proof            passive: <math>0/4 \dots 20</math> mA, <math>R_i \leq 150 \Omega</math>, <math>U_{\text{max}} = 30</math> V DC</p>

## Output

<b>Output signal</b>	<p><b>Promag 50</b></p> <p>Current output:            active/passive selectable, galvanically isolated, time constant selectable (0.01...100 s),            full scale value selectable, temperature coefficient: typ. 0.005% o.r./<math>^{\circ}\text{C}</math> (o.r. = of reading),            resolution: <math>0.5 \mu\text{A}</math></p> <ul style="list-style-type: none"> <li>■ active: <math>0/4 \dots 20</math> mA, <math>R_L &lt; 700 \Omega</math> (HART: <math>R_L \geq 250 \Omega</math>)</li> <li>■ passive: <math>4 \dots 20</math> mA, operating voltage <math>V_S 18 \dots 30</math> V DC, <math>R_i \leq 150 \Omega</math></li> </ul> <p>Pulse/frequency output:            passive, open collector, 30 V DC, 250 mA, galvanically isolated.</p> <ul style="list-style-type: none"> <li>■ Frequency output: full scale frequency <math>2 \dots 1000</math> Hz (<math>f_{\text{max}} = 1250</math> Hz), on/off ratio 1:1, pulse width max. 10 s.</li> <li>■ Pulse output: pulse value and pulse polarity selectable, max. pulse width configurable (0.5...2000 ms)</li> </ul> <p>PROFIBUS DP interface:</p> <ul style="list-style-type: none"> <li>■ Transmission technology (Physical Layer): RS485 in accordance with ANSI/TIA/EIA-485-A: 1998, galvanically isolated</li> <li>■ Profile version 3.0</li> <li>■ Data transmission rate: 9.6 kBaud...12 MBaud</li> <li>■ Automatic data transmission rate recognition</li> <li>■ Function blocks: 1 x analog input, 3 x totalizer</li> <li>■ Output data: volume flow, totalizer</li> <li>■ Input data: positive zero return (ON/OFF), totalizer control, value for local display</li> <li>■ Cyclic data transmission compatible with previous model "Promag 33"</li> <li>■ Bus address adjustable via miniature switches or local display (optional) at the measuring device</li> </ul>
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## PROFIBUS PA interface:

- Transmission technology (Physical Layer): IEC 61158-2 (MBP), galvanically isolated
- Profile version 3.0
- Current consumption: 11 mA
- Permissible supply voltage: 9...32 V
- Bus connection with integrated reverse polarity protection
- Error current FDE (Fault Disconnection Electronic): 0 mA
- Function blocks: 1 x analog input, 1 x totalizer
- Output data: volume flow, totalizer
- Input data: positive zero return (ON/OFF), control totalizer, value for local display
- Cyclic data transmission compatible with previous model "Promag 33"
- Bus address adjustable via miniature switches or local display (optional) at the measuring device

**Promag 53**

## Current output:

active/passive selectable, galvanically isolated, time constant selectable (0.01...100 s), full scale value selectable, temperature coefficient: typically 0.005% o.r./°C (o.r. = of reading), resolution: 0.5  $\mu$ A

- active: 0/4...20 mA,  $R_L < 700 \Omega$  (HART:  $R_L \geq 250 \Omega$ )
- passive: 4...20 mA, operating voltage  $V_S$  18...30 V DC,  $R_i \leq 150 \Omega$

## Pulse/frequency output:

active/passive selectable, galvanically isolated (Ex i version: only passive)

- active: 24 V DC, 25 mA (max. 250 mA during 20 ms),  $R_L > 100 \Omega$
- passive: open collector, 30 V DC, 250 mA
- Frequency output: full scale frequency 2...10000 Hz ( $f_{\max} = 12500$  Hz), EEx-ia: 2...5000 Hz; on/off ratio 1:1; pulse width max. 10 s.
- Pulse output: pulse value and pulse polarity adjustable, pulse width configurable (0.05...2000 ms)

## PROFIBUS DP interface:

- Transmission technology (Physical Layer): RS485 in accordance with ANSI/TIA/EIA-485-A: 1998, galvanically isolated
- Profile version 3.0
- Data transmission rate: 9.6 kBaud...12 MBaud
- Automatic data transmission rate recognition
- Function blocks: 2 x analog input, 3 x totalizer
- Output data: volume flow, calculated mass flow, totalizer 1...3
- Input data: positive zero return (ON/OFF), totalizer control, value for local display
- Cyclic data transmission compatible with previous model "Promag 33"
- Bus address adjustable via miniature switches or local display (optional) at the measuring device
- Available output combination → Page 7 ff.

## PROFIBUS PA interface:

- Transmission technology (Physical Layer): IEC 61158-2 (MBP), galvanically isolated
- Profile version 3.0
- Current consumption: 11 mA
- Permissible supply voltage: 9...32 V
- Bus connection with integrated reverse polarity protection
- Error current FDE (Fault Disconnection Electronic): 0 mA
- Function blocks: 2 x analog input, 3 x totalizer
- Output data: volume flow, calculated mass flow, totalizer 1...3
- Input data: positive zero return (ON/OFF), totalizer control, value for local display
- Cyclic data transmission compatible with previous model "Promag 33"
- Bus address adjustable via miniature switches or local display (optional) at the measuring device

MODBUS interface:

- Transmission technology (Physical Layer): RS485 in accordance with ANSI/TIA/EIA-485-A: 1998, galvanically isolated
- MODBUS device type: Slave
- Adress range: 1...247
- Bus address adjustable via miniature switches or local display (optional) at the measuring device
- Supported MODBUS function codes: 03, 04, 06, 08, 16, 23
- Broadcast: supported with the function codes 06, 16, 23
- Transmission mode: RTU oder ASCII
- Supported baudrate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud
- Response time:
  - Direct data access = typically 25...50 ms
  - Auto-scan buffer (data range) = typically 3...5 ms
- Available output combination → Page 7 ff.

FOUNDATION Fieldbus interface:

- FOUNDATION Fieldbus H1
- Transmission technology (Physical Layer): IEC 61158-2 (MBP), galvanically isolated
- ITK version 4.01
- Current consumption: 12 mA
- Error current FDE (Fault Disconnection Electronic): 0 mA
- Bus connection with integrated reverse polarity protection
- Function blocks: 5 x analog input, 1 x discrete output, 1 x PID
- Output data: volume flow, calculated mass flow, temperature, totalizer 1...3
- Input data: positive zero return (ON/OFF), reset totalizer
- Link Master (LM) functionality is supported

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<b>Signal on alarm</b>	<ul style="list-style-type: none"> <li>■ Current output → failure response selectable (e.g. in accord. with NAMUR Recom. NE 43)</li> <li>■ Pulse/frequency output → failure response selectable</li> <li>■ Status output (Promag 50) → non-conductive by fault or power supply failure</li> <li>■ Relay output (Promag 53) → de-energized by fault or power supply failure</li> </ul>
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<b>Load</b>	See "Output signal"
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<b>Switching output</b>	<p>Status output (Promag 50, Promag 53):                      Open collector, max. 30 V DC / 250 mA, galvanically isolated.                      Configurable for: error messages, Empty Pipe Detection (EPD), flow direction, limit values.</p> <p>Relay outputs (Promag 53):                      Normally closed (NC or break) or normally open (NO or make) contacts available                      (default: relay 1 = NO, relay 2 = NC),                      max. 30 V / 0.5 A AC; 60 V / 0.1 A DC, galvanically isolated.                      Configurable for: error messages, Empty Pipe Detection (EPD), flow direction, limit values, batching contacts.</p>
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<b>Low flow cutoff</b>	Switch points for low flow cutoff are selectable
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<b>Galvanic isolation</b>	All circuits for inputs, outputs, and power supply are galvanically isolated from each other.

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