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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 ≥5 µS/cm:
- Drinking water
- Wastewater
- Wastewater sludge

- Flow measurement up to 110,000 m^3/h
- Fluid temperature up to +80 °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

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Endress+Hauser
People for Process Automation

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

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.
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

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

Output

Output signal	**Promag 50** 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./°C (o.r. = of reading), resolution: 0.5 µA ■ 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: passive, open collector, 30 V DC, 250 mA, galvanically isolated. ■ Frequency output: full scale frequency 2...1000 Hz (f_{max} = 1250 Hz), on/off ratio 1:1, pulse width max. 10 s. ■ Pulse output: pulse value and pulse polarity selectable, max. pulse width configurable (0.5...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: 1 x analog input, 3 x totalizer ■ Output data: volume flow, totalizer ■ 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

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 µA
- 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

Signal on alarm

- Current output → failure response selectable (e.g. in accord. with NAMUR Recom. NE 43)
- Pulse/frequency output → failure response selectable
- Status output (Promag 50) → non-conductive by fault or power supply failure
- Relay output (Promag 53) → de-energized by fault or power supply failure

Load

See “Output signal”

Switching output

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.

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.

Low flow cutoff

Switch points for low flow cutoff are selectable

Galvanic isolation

All circuits for inputs, outputs, and power supply are galvanically isolated from each other.

Power supply

Electrical connection
Measuring unit

Anschließen des Messumformers, Leitungsquerschnitt max. 2,5 mm²

A *View A (field housing)*
B *View B (stainless steel field housing)*
C *View C (wall-mount housing)*

**)* *not changeable communication board*
***)* *changeable communication board*
a *Cover of the connection compartment*
b *Cable for power supply: 85...260 V AC, 20...55 V AC,16...62 V DC*
Terminal No. 1: L1 for AC, L+ for DC
Terminal No. 2: N for AC, L- for DC
c *Ground terminal for protective conductor*
d *Signal cable: see Terminal assignment → Page 7 ff.*
Fieldbus cable:
Terminal No. 26: DP (A) / PA (+) / FF (+) / MODBUS RS485 (A) / (PA, FF: with reverse polarity protection)
Terminal No. 27: DP (B) / PA (-) / FF (-) / MODBUS RS485 (B) / (PA, FF: with reverse polarity protection)
e *Ground terminal for signal-cable shield / Fieldbus cable / RS485 line*
f *Service connector for connecting service interface FXA 193 (Fieldcheck, Tof Tool - Fieldtool Package)*
g *Signal cable: see Terminal assignment → Page 7 ff.*
Cable for external termination (only for PROFIBUS DP with fixed assignment communication board):
Terminal No. 24: +5 V
Terminal No. 25: DGND

Terminal assignment, Promag 50

Order variant	Terminal No. (inputs / outputs)			
	20 (+) / 21 (–)	22 (+) / 23 (–)	24 (+) / 25 (–)	26 (+) / 27 (–)
50***-**********W	–	–	–	Current output HART
50***-**********A	–	–	Frequency output	Current output HART
50***-**********D	Status input	Status output	Frequency output	Current output HART
50***-**********H	–	–	–	PROFIBUS PA
50***-**********J	–	–	+5 V (external termination)	PROFIBUS DP
50***-**********S	–	–	Frequency output Ex i, passive	Current output Ex i active, HART
50***-**********T	–	–	Frequency output Ex i, passive	Current output Ex i passive, HART
Ground connection, power supply → Page 6				

Terminal assignment, Promag 53

The inputs and outputs on the communication board can be either permanently assigned or variable, depending on the version ordered (see table). Replacements for modules which are defective or which have to be replaced can be ordered as accessories.

Order variant	Terminal No. (inputs / outputs)			
	20 (+) / 21 (–)	22 (+) / 23 (–)	24 (+) / 25 (–)	26 (+) / 27 (–)
Fixed communication boards (fixed assignment)				
53***-**********A	–	–	Frequency output	Current output HART
53***-**********B	Relay output 2	Relay output 1	Frequency output	Current output HART
53***-**********F	–	–	–	PROFIBUS PA Ex i
53***-**********G	–	–	–	FOUNDATION Fieldbus, Ex i
53***-**********H	–	–	–	PROFIBUS PA
53***-**********J	–	–	–	PROFIBUS DP
53***-**********K	–	–	–	FOUNDATION Fieldbus
53***-**********Q	–	–	Status input	MODBUS RS485
53***-**********S	–	–	Frequency output Ex i	Current output Ex i active, HART
53***-**********T	–	–	Frequency output Ex i	Current output Ex i passive, HART
Flexible communication boards				
53***-**********C	Relay output 2	Relay output 1	Frequency output	Current output HART
53***-**********D	Status input	Relay output	Frequency output	Current output HART
53***-**********L	Status input	Relay output 2	Relay output 1	Current output HART

Order variant	Terminal No. (inputs / outputs)			
	20 (+) / 21 (–)	**22 (+) / 23 (–)**	**24 (+) / 25 (–)**	**26 (+) / 27 (–)**
53***-**********M	Status input	Frequency output	Frequency output	Current output HART
53***-**********N	Current output	Frequency output	Status input	MODBUS RS485
53***-**********P	Current output	Frequency output	Status input	PROFIBUS DP
53***-**********V	Relay output 2	Relay output 1	Status input	PROFIBUS DP
53***-**********2	Relay output	Current output	Frequency output	Current output HART
53***-**********4	Current input	Relay output	Frequency output	Current output HART
53***-**********7	Relay output 2	Relay output 1	Status input	MODBUS RS485
Ground connection, power supply → Page 6				

Electrical connection remote version

F06-5xFxxxxx-04-xx-xx-en-001

n.c. = isolated cable shields, not connected

Cable entry

Power-supply and signal cables (inputs/outputs):
- Cable entry M20 x 1.5 (8…12 mm)
- Sensor cable entry for armoured cables M20 x 1.5 (9.5...16 mm)
- Threads for cable entries 1/2" NPT, G 1/2"

Connecting cable for remote version:
- Cable entry M20 x 1.5 (8…12 mm)
- Sensor cable entry for armoured cables M20 x 1.5 (9.5...16 mm)
- Threads for cable entries 1/2" NPT, G 1/2"

Cable specifications remote version

Coil cable:
- 2 x 0.75 mm^2 PVC cable with common, braided copper shield (Ø approx. 7 mm)
- Conductor resistance: ≤ 37 Ω/km
- Capacitance: core/core, shield grounded: ≤ 120 pF/m
- Permanent operating temperature: –20…+80 °C
- Cable cross-section: max. 2.5 mm^2

Signal cable:
- 3 x 0.38 mm^2 PVC cable with common, braided copper shield (Ø approx. 7 mm) and individually shielded cores.
- With Empty Pipe Detection (EPD): 4 x 0.38 mm^2 PVC cable with common, braided copper shield (Ø approx. 7 mm) and individually shielded cores.
- Conductor resistance: ≤ 50 Ω/km
- Capacitance: core/shield: ≤ 420 pF/m
- Permanent operating temperature: –20…+80 °C
- Cable cross-section: max. 2.5 mm^2

a = signal cable, b = coil current cable (cross-section: max. 2.5 mm^2)
1 = core, 2 = core insulation, 3 = core shield, 4 = core jacket, 5 = core strengthening,
6 = cable shield, 7 = outer jacket

Optionally, Endress+Hauser also supplies reinforced connecting cables with an additional, metal strenghtening braid. We recommend such cables for the following cases:
- Cables laid underground
- Danger of rodent attack
- Device used with ingress protection IP 68

Operation in zones of severe electrical interference:
The measuring device complies with the general safety requirements in accordance with EN 61010, the EMC requirements of EN 61326/A1, and NAMUR Recommendation NE 21.

Caution!
Grounding is by means of the ground terminals provided for the purpose inside the connection housing. Keep the stripped and twisted lengths of cable shield to the terminals as short as possible.

Supply voltage

85…260 V AC, 45…65 Hz
20…55 V AC, 45…65 Hz
16…62 V DC

PROFIBUS PA and FOUNDATION Fieldbus
Non-Ex: 9...32 V DC
Ex i: 9...24 V DC
Ex d: 9...32 V DC

Power consumption

AC: <15 VA (including sensor)
DC: <15 W (including sensor)

Switch-on current:
- max. 13.5 A (< 50 ms) at 24 V DC
- max. 3 A (< 5 ms) at 260 V AC

Power supply failure

Lasting min. 1 power cycle:
- EEPROM or T-DAT (Promag 53 only) retain the measuring system data in the event of a power supply failure
- S-DAT: exchangeable data storage chip which stores the data of the sensor (nominal diameter, serial number, calibration factor, zero point etc.)

Potential equalisation

Standard case
Perfect measurement is only ensured when the medium and the sensor have the same electrical potential. Most Promag sensors have a standard installed reference electrode which guarantees the required connection. This usually means that additional potential matching measures are unnecessary.

Note!
For installation in metal pipes, it is advisable to connect the ground terminal of the transmitter housing to the piping. Also, observe company-internal grounding guidelines.

A0004375

Caution!
For sensors without reference electrodes or without metal process terminals, carry out potential matching as per the instructions for special cases described below. These special measures are particularly important when standard grounding practice cannot be ensured or extremely strong matching currents are expected.

Metal, ungrounded piping
In order to prevent outside influences on measurement, it is advisable to use ground cables to connect each sensor flange to its corresponding pipe flange and ground the flanges. Connect the transmitter or sensor connection housing, as applicable, to ground potential means of the ground terminal provided for the purpose.

Caution!
Also, observe company-internal grounding guidelines.

Note!
The ground cable for flange-to-flange connections can be ordered separately as an accessory from Endress+Hauser.
- DN ≤ 300: The ground cable is in direct connection with the conductive flange coating and is secured by the flange screws.
- DN ≥ 350: The ground cable connects directly to the metal transport bracket.

A0004376

Plastic pipes and isolating lined pipes
Normally, potential is matched using the reference electrodes in the measuring tube. However, in exceptional cases it is possible that, due to the grounding plan of a system, large matching currents flow over the reference electrodes. This can lead to destruction of the sensor, e.g. through electrochemical decomposition of the electrodes. In such cases, e.g. for fibre-glass or PVC piping, it is recommended that you use additional ground disks for potential matching.

When using ground disks, note the following points:
- Ground disks (DN 15...300) can be ordered separately from Endress+Hauser as an accessory.
- Ground disks (incl. seals) increase the installation length. You can find the dimensions of ground disks on Page 30.

Caution!
- Risk of damage from electrochemical corrosion. Note the electrochemical insulation rating, if the ground disks and measuring electrodes are made of different materials.
- Also, observe company-internal grounding guidelines.

A0004377

Pipes with cathodic protection
In such cases, install the measuring instrument without potential in the piping:
- When installing the measuring device, make sure that there is an electrical connection between the two piping runs (copper wire, 6 mm^2).
- Make sure that the installation materials do not establish a conductive connection to the measuring device and that the installation materials withstand the tightening torques applied when the threaded fasteners are tightened.
- Also comply with the regulations applicable to potential-free installation.

A0004378

1 = isolating transformer, 2 = electrically insulated

Performance characteristics

Reference operating conditions

To DIN EN 29104 and VDI/VDE 2641:
- Medium temperature: +28 °C ± 2 K
- Ambient temperature: +22 °C ± 2 K
- Warm-up period: 30 minutes

Installation:
- Inlet run >10 x DN
- Outlet run > 5 x DN
- Sensor and transmitter grounded.
- Sensor centred relative to the pipe.

Maximum measured error

Promag 50:
Pulse output: ± 0.5% o.r. ± 1 mm/s (o.r. = of reading)
Current output: plus typically ± 5 µA

Promag 53:
Pulse output: ± 0.2% o.r. ± 2 mm/s (o.r. = of reading)
Current output: plus typically ± 5 µA

Supply voltage fluctuations have no effect within the specified range.

Max. measured error in % of reading

Repeatability

max. ± 0.1% o.r. ± 0.5 mm/s (o.r. = of reading)

Operating conditions

Installation conditions

Installation instructions

Mounting location

Correct measuring is possible only if the pipe is full. Avoid the following locations:
- Highest point of a pipeline. Risk of air accumulating
- Directly upstream of a free pipe outlet in a vertical pipe.

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Installation of pumps

Do not install the sensor on the intake side of a pump. This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube. Information on the lining's resistance to partial vacuum can be found on Page 20.

It might be necessary to install pulse dampers in systems incorporating reciprocating, diaphragm or peristaltic pumps. Information on the measuring system's resistance to vibration and shock can be found on Page 20.

F06-5xxxxxxx-11-00-00-xx-001

Partially filled pipes
Partially filled pipes with gradients necessitate a drain-type configuration. The Empty Pipe Detection (EPD) function offers additional protection by detecting empty or partially filled pipes.

Caution!
Risk of solids accumulating. Do not install the sensor at the lowest point in the drain. It is advisable to install a cleaning valve.

F06-5xxxxxxx-11-00-00-xx-002

Vertical pipes
Install a siphon (b) or a vent valve (a) downstream of the sensor in vertical pipes longer than 5 meters. This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube. These measures also prevent the system losing prime, which could cause air inclusions. Information on the lining's resistance to partial vacuum can be found on Page 20.

F06-5xxxxxxx-11-00-00-xx-003

a = vent valve, b = siphon

Orientation

An optimum orientation helps avoid gas and air accumulations and deposits in the measuring tube. Promag, nevertheless, supplies a range of options and accessories for correct measuring of problematic mediums:

- Electrode Cleaning Circuitry (ECC) to remove electrically conductive deposits in the measuring tube, e.g. in accretive mediums.
- Empty Pipe Detection (EPD) for recognition of partially filled measuring tubes, or for degassing mediums or for applications with fluctuating process pressure.
- Exchangeable measuring electrodes for abrasive mediums.

Vertical orientation:

This orientation is ideal for self-emptying piping systems and for use in conjunction with Empty Pipe Detection.

F06-5xxxxxxx-11-00-00-xx-004

Horizontal orientation:

The measuring electrode-plane should be horizontal. This prevents brief insulation of the two electrodes by entrained air bubbles.

Caution!

Empty Pipe Detection functions correctly only when the measuring device is installed horizontally and the transmitter housing is facing upward. Otherwise there is no guarantee that Empty Pipe Detection will respond if the measuring tube is only partially filled or empty.

F06-5xxxxxxx-11-00-xx-xx-000

1 = EPD electrode (Empty Pipe Detection)
2 = Measuring electrodes (signal detection)
3 = Reference electrode (potential equalisation)

Vibrations
Secure the piping and the sensor if vibration is severe.

Caution!
It is advisable to install sensor and transmitter separately if vibration is excessively severe. Information on resistance to vibration and shock can be found on page 20.

F06-5xxxxxxx-11-00-00-xx-006

Foundations, supports
If the nominal diameter is DN ≥ 350, mount the transmitter on a foundation of adequate load-bearing strength.

Caution!
Do not allow the casing to take the weight of the sensor. This would buckle the casing and damage the internal magnetic coils.

F06-5xFxxxxx-11-05-xx-xx-000

Inlet and outlet runs

If possible, install the sensor well clear of fittings such as valves, T-pieces, elbows, etc. Compliance with the following requirements for the inlet and outlet runs is necessary in order to ensure measuring accuracy:
- Inlet run ≥ 5 x DN
- Outlet run ≥ 2 x DN

F06-5xxxxxxx-11-00-00-xx-005

Adapters

Suitable adapters to DIN EN 545 (double flange junction sections) can be used to install the sensor in larger-diameter pipes. The resultant increase in the rate of flow improves measuring accuracy with very slow-moving fluids.
The nomogram shown here can be used to calculate the pressure loss caused by reducers and expanders. The nomogram applies only to fluids of viscosity similar to water.

1. Calculate the ratio of the diameters d/D.
2. From the nomogram read off the pressure loss as a function of flow velocity (downstream from the reduction) and the d/D ratio.

F06-5xxxxxxx-05-05-xx-xx-000

Length of connecting cable

Permissible cable length Lmax depends on the conductivity of the medium. A minimum conductivity of 20 µS/cm is required for measuring demineralized water.

F06-5xxxxxxx-05-xx-xx-xx-006

Gray shaded area = permissible range for medium conductivity
Lmax = length of connecting cable in [m]
Medium conductivity in [µS/cm]

In order to ensure measuring accuracy, moreover, comply with the following instructions when installing the remote version:
- Secure the cable run or route the cable in a conduit. Movement of the cable can falsify the measuring signal, particularly if the conductivity of the medium is low.
- Route the cable well clear of electrical machines and switching elements.
- Ensure potential equalisation between sensor and transmitter, if necessary.

Environment

Ambient temperature

Transmitter:
- Standard: –20...+60 °C
- Optional: –40...+60 °C

Note!
At ambient temperatures below –20 °C the readability of the display may be impaired.

Sensor:
- Flange material carbon steel: –10...+60 °C
- Flange material stainless steel: –40...+60 °C

Caution!
It is not allowed to use the device beyond the min. and max. lining specified temperature values (→ "Medium temperature range").

Note the following points:
- Install the device at a shady location. Avoid direct sunlight, particularly in warm climatic regions.
- If both fluid and ambient temperatures are high, install the transmitter at a remote location from the sensor (→ "Medium temperature range").

Storage temperature

- The storage temperature corresponds to the ambient temperature range of the transmitter and sensor (see "Ambient temperature").
- The measuring device must be protected against direct sunlight during storage in order to avoid unacceptably high surface temperatures.
- Choose a storage location where moisture does not collect in the measuring device. This will help prevent fungus and bacteria infestation which can damage the liner.
- Do not remove the protective plates or caps on the process connections until you are ready to install the device.

Degree of protection

- Standard: IP 67 (NEMA 4X) for transmitter and sensor
- Optional: IP 68 (NEMA 6P) for sensor in remote version

Shock and vibration resistance

Acceleration up to 2 g by analogy with IEC 60068-2-6.

Electromagnetic compatibility (EMC)

To EN 61326/A1 and NAMUR recommendation NE 21.

Process conditions

Medium temperature range

The permissible medium temperature depends on the measuring-tube lining:
- 0...+80 °C for hard rubber (DN 65...2000)
- –20...+50 °C for polyurethane (DN 25...1000)

Conductivity

Minimum conductivity:
≥ 5 µS/cm for liquids generally
≥ 20 µS/cm for demineralised water

Note that in the case of the remote version, the minimum conductivity is also influenced by the length of the connecting cable → see "Length of connecting cable"

Medium pressure range (nominal pressure)

EN 1092-1 (DIN 2501):
PN 6 (DN 1200…2000)
PN 10 (DN 200…2000)
PN 16 (DN 65…2000)
PN 25 (DN 200...1000)
PN 40 (DN 25…150)

ANSI B16.5:
Class 150 (1…24")
Class 300 (1…6")

AWWA:
Class D (28…78")

JIS B2238:
10K (DN 50…300)
20K (DN 25…300)

AS 2129:
Table E (DN 80, 100, 150...400, 500, 600)

AS 4087:
Cl. 14 (DN 80, 100, 150...400, 500, 600)

Pressure tightness (liner)

Nominal diameter		Measuring tube lining	Resistance to partial vacuum of measuring tube lining Limit values for abs. pressure [mbar] at various fluid temperatures						
[mm]	[inch]		25 °C	50 °C	80 °C	100 °C	130 °C	150 °C	180 °C
25…1000	1…40"	Polyurethane	0	0	–	–	–	–	–
65…2000	3…78"	Hard rubber	0	0	0	–	–	–	–

Limiting flow

The diameter of the pipe and the flow rate determine the nominal diameter of the sensor. The optimum velocity of flow is 2...3 m/s. The velocity of flow (v), moreover, has to be matched to the physical properties of the medium:

- v < 2 m/s: for abrasive mediums such as potter's clay, lime milk, ore slurry, etc.
- v > 2 m/s: for accretive mediums such as wastewater sludge, etc.

Flow characteristics (SI units)

Nominal diameter		Recommended flow rate	Factory settings		
[mm]	[inch]	Min./max. full scale value (v ~ 0.3 or 10 m/s)	Full scale value (v ~ 2.5 m/s)	Pulse weighting (~ 2 pulse/s)	Creepage (v ~ 0.04 m/s)
25	1"	9…300 dm^3/min	75 dm^3/min	0.50 dm^3	1 dm^3/min
32	1 1/4"	15…500 dm^3/min	125 dm^3/min	1.00 dm^3	2 dm^3/min
40	1 1/2"	25…700 dm^3/min	200 dm^3/min	1.50 dm^3	3 dm^3/min
50	2"	35…1100 dm^3/min	300 dm^3/min	2.50 dm^3	5 dm^3/min
65	2 1/2"	60…2000 dm^3/min	500 dm^3/min	5.00 dm^3	8 dm^3/min
80	3"	90…3000 dm^3/min	750 dm^3/min	5.00 dm^3	12 dm^3/min
100	4"	145…4700 dm^3/min	1200 dm^3/min	10.00 dm^3	20 dm^3/min
125	5"	220…7500 dm^3/min	1850 dm^3/min	15.00 dm^3	30 dm^3/min
150	6"	20…600 m^3/h	150 m^3/h	0.025 m^3	2.5 m^3/h
200	8"	35…1100 m^3/h	300 m^3/h	0.05 m^3	5.0 m^3/h
250	10"	55…1700 m^3/h	500 m^3/h	0.05 m^3	7.5 m^3/h
300	12"	80…2400 m^3/h	750 m^3/h	0.10 m^3	10 m^3/h
350	14"	110…3300 m^3/h	1000 m^3/h	0.10 m^3	15 m^3/h
400	16"	140…4200 m^3/h	1200 m^3/h	0.15 m^3	20 m^3/h
450	18"	180…5400 m^3/h	1500 m^3/h	0.25 m^3	25 m^3/h
500	20"	220…6600 m^3/h	2000 m^3/h	0.25 m^3	30 m^3/h
600	24"	310…9600 m^3/h	2500 m^3/h	0.30 m^3	40 m^3/h
700	28"	420…13500 m^3/h	3500 m^3/h	0.50 m^3	50 m^3/h
–	30"	480…15000 m^3/h	4000 m^3/h	0.50 m^3	60 m^3/h
800	32"	550…18000 m^3/h	4500 m^3/h	0.75 m^3	75 m^3/h
900	36"	690…22500 m^3/h	6000 m^3/h	0.75 m^3	100 m^3/h
1000	40"	850…28000 m^3/h	7000 m^3/h	1.00 m^3	125 m^3/h
–	42"	950…30000 m^3/h	8000 m^3/h	1.00 m^3	125 m^3/h
1200	48"	1250…40000 m^3/h	10000 m^3/h	1.50 m^3	150 m^3/h
–	54"	1550…50000 m^3/h	13000 m^3/h	1.50 m^3	200 m^3/h
1400	–	1700…55000 m^3/h	14000 m^3/h	2.00 m^3	225 m^3/h
–	60"	1950…60000 m^3/h	16000 m^3/h	2.00 m^3	250 m^3/h
1600	–	2200…70000 m^3/h	18000 m^3/h	2.50 m^3	300 m^3/h
–	66"	2500…80000 m^3/h	20500 m^3/h	2.50 m^3	325 m^3/h
1800	72"	2800…90000 m^3/h	23000 m^3/h	3.00 m^3	350 m^3/h
–	78"	3300…100000 m^3/h	28500 m^3/h	3.50 m^3	450 m^3/h
2000	–	3400…110000 m^3/h	28500 m^3/h	3.50 m^3	450 m^3/h

Flow characteristics (US units)					
Nominal diameter		Recommended flow rate	Factory settings		
[inch]	[mm]	Min./max. full scale value (v ~ 0.3 or 10 m/s)	Full scale value (v ~ 2.5 m/s)	Pulse weighting (~ 2 pulse/s)	Creepage (v ~ 0.04 m/s)
1"	25	2.5…80 gal/min	18 gal/min	0.20 gal	0.25 gal/min
1 1/4"	32	4…130 gal/min	30 gal/min	0.20 gal	0.50 gal/min
1 1/2"	40	7…190 gal/min	50 gal/min	0.50 gal	0.75 gal/min
2"	50	10…300 gal/min	75 gal/min	0.50 gal	1.25 gal/min
2 1/2"	65	16…500 gal/min	130 gal/min	1 gal	2.0 gal/min
3"	80	24…800 gal/min	200 gal/min	2 gal	2.5 gal/min
4"	100	40…1250 gal/min	300 gal/min	2 gal	4.0 gal/min
5"	125	60…1950 gal/min	450 gal/min	5 gal	7.0 gal/min
6"	150	90…2650 gal/min	600 gal/min	5 gal	12 gal/min
8"	200	155…4850 gal/min	1200 gal/min	10 gal	15 gal/min
10"	250	250…7500 gal/min	1500 gal/min	15 gal	30 gal/min
12"	300	350…10600 gal/min	2400 gal/min	25 gal	45 gal/min
14"	350	500…15000 gal/min	3600 gal/min	30 gal	60 gal/min
16"	400	600…19000 gal/min	4800 gal/min	50 gal	60 gal/min
18"	450	800…24000 gal/min	6000 gal/min	50 gal	90 gal/min
20"	500	1000…30000 gal/min	7500 gal/min	75 gal	120 gal/min
24"	600	1400…44000 gal/min	10500 gal/min	100 gal	180 gal/min
28"	700	1900…60000 gal/min	13500 gal/min	125 gal	210 gal/min
30"	–	2150…67000 gal/min	16500 gal/min	150 gal	270 gal/min
32"	800	2450…80000 gal/min	19500 gal/min	200 gal	300 gal/min
36"	900	3100…100000 gal/min	24000 gal/min	225 gal	360 gal/min
40"	1000	3800…125000 gal/min	30000 gal/min	250 gal	480 gal/min
42"	–	4200…135000 gal/min	33000 gal/min	250 gal	600 gal/min
48"	1200	5500…175000 gal/min	42000 gal/min	400 gal	600 gal/min
54"	–	9…300 Mgal/d	75 Mgal/d	0.0005 Mgal	1.3 Mgal/d
–	1400	10…340 Mgal/d	85 Mgal/d	0.0005 Mgal	1.3 Mgal/d
60"	–	12…380 Mgal/d	95 Mgal/d	0.0005 Mgal	1.3 Mgal/d
–	1600	13…450 Mgal/d	110 Mgal/d	0.0008 Mgal	1.7 Mgal/d
66"	–	14…500 Mgal/d	120 Mgal/d	0.0008 Mgal	2.2 Mgal/d
72"	1800	16…570 Mgal/d	140 Mgal/d	0.0008 Mgal	2.6 Mgal/d
78"	–	18…650 Mgal/d	175 Mgal/d	0.001 Mgal	3.0 Mgal/d
–	2000	20…700 Mgal/d	175 Mgal/d	0.001 Mgal	3.0 Mgal/d

Pressure loss

- No pressure loss if the sensor is installed in a pipe of the same nominal diameter.
- Pressure losses for configurations incorporating adapters to DIN EN 545 → Page 18

Measuring-tube specifications

Nominal Diameter		Pressure rating						Inside diameter of measuring tube	
[mm]	[inch]	EN (DIN) [bar]	AS 2129	AS 4087	ANSI [lbs]	AWWA	JIS	Hard rubber	Polyure-thane
25	1"	PN 40	–	–	Cl 150	–	20K	–	24
32	–	PN 40	–	–	–	–	20K	–	32
40	1 1/2"	PN 40	–	–	Cl 150	–	20K	–	38
50	2"	PN 40	–	–	Cl 150	–	10K	–	50
65	–	PN 16	–	–	–	–	10K	66	66
80	3"	PN 16	Table E	Cl.14	Cl 150	–	10K	79	79
100	4"	PN 16	Table E	Cl.14	Cl 150	–	10K	102	102
125	–	PN 16	–	–	–	–	10K	127	127
150	6"	PN 16	Table E	Cl.14	Cl 150	–	10K	156	156
200	8"	PN 10	Table E	Cl.14	Cl 150	–	10K	204	204
250	10"	PN 10	Table E	Cl.14	Cl 150	–	10K	258	258
300	12"	PN 10	Table E	Cl.14	Cl 150	–	10K	309	309
350	14"	PN 10	Table E	Cl.14	Cl 150	–	–	342	342
400	16"	PN 10	Table E	Cl.14	Cl 150	–	–	392	392
450	18"	PN 10	–	–	Cl 150	–	–	437	437
500	20"	PN 10	Table E	Cl.14	Cl 150	–	–	492	492
600	24"	PN 10	Table E	Cl.14	Cl 150	–	–	594	594
700	28"	PN 10	–	–	–	Class D	–	692	692
–	30"	–	–	–	–	Class D	–	742	742
800	32"	PN 10	–	–	–	Class D	–	794	794
900	36"	PN 10	–	–	–	Class D	–	891	891
1000	40"	PN 10	–	–	–	Class D	–	994	994
–	42"	–	–	–	–	Class D	–	1043	1043
1200	48"	PN 6	–	–	–	Class D	–	1197	1197
–	54"	–	–	–	–	Class D	–	1339	1339
1400	–	PN 6	–	–	–	–	–	1402	1402
–	60"	–	–	–	–	Class D	–	1492	1492
1600	–	PN 6	–	–	–	–	–	1600	1600
–	66"	–	–	–	–	Class D	–	1638	1638
1800	72"	PN 6	–	–	–	Class D	–	1786	1786
2000	78"	PN 6	–	–	–	Class D	–	1989	1989

Mechanical construction

Design / dimensions

Dimensions: Wall-mount housing (non hazardous area and II3G / zone 2)

A0001150

Dimensions: Remote field housing (II2GD / zone 1)

A0002128

There is a separate mounting kit for the wall-mounted housing. It can ordered from Endress+Hauser as an accessory. The following installation variants are possible:
- Panel-mounted installation
- Pipe mounting

Panel-mounted installation

A0001131

Pipe mounting

A0001132

Compact version DN ≤ 300

F06-53Fxxxxx-06-00-xx-xx-000

DN		L	A	B	C	K	E
EN (DIN) / JIS / AS* [mm]	ANSI [inch]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25	1"	200	341	257	84	120	94
32	–	200	341	257	84	120	94
40	1 1/2"	200	341	257	84	120	94
50	2"	200	341	257	84	120	94
65	–	200	391	282	109	180	94
80	3"	200	391	282	109	180	94
100	4"	250	391	282	109	180	94
125	–	250	472	322	150	260	140
150	6"	300	472	322	150	260	140
200	8"	350	527	347	180	324	156
250	10"	450	577	372	205	400	156
300	12"	500	627	397	230	460	166

The fitting length (L) is always the same, regardless of the pressure rating.
* Only DN 80, 100 and 150...300 are available if flanges according to AS are used.

Remote version DN ≤ 300

A0003219

DN		L	A	B	C	K	E
EN (DIN) / JIS / AS* [mm]	ANSI [inch]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25	1"	200	286	202	84	120	94
32	–	200	286	202	84	120	94
40	1 1/2"	200	286	202	84	120	94
50	2"	200	286	202	84	120	94
65	–	200	336	227	109	180	94
80	3"	200	336	227	109	180	94
100	4"	250	336	227	109	180	94
125	–	250	417	267	150	260	140
150	6"	300	417	267	150	260	140
200	8"	350	472	292	180	324	156
250	10"	450	522	317	205	400	156
300	12"	500	572	342	230	460	166

The fitting length (L) is always the same, regardless of the pressure rating.
* Only DN 80, 100 and 150...300 are available if flanges according to AS are used.

Compact version DN ≥ 350

F06-xxFxxxxx-06-05-xx-xx-000

DN		L	A	B	C	K	E
EN (DIN) / AS [1] [mm]	ANSI / AWWA [2] [inch]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
350	14"	550	738.5	456.5	282.0	564	276
400	16"	600	790.5	482.5	308.0	616	276
450	18"	650	840.5	507.5	333.0	666	292
500	20"	650	891.5	533.0	358.5	717	292
600	24"	780	995.5	585.0	410.5	821	402
700	28"	910	1198.5	686.5	512.0	1024	589
750	30"	975	1198.5	686.5	512.0	1024	626
800	32"	1040	1241.5	708.0	533.5	1067	647
900	36"	1170	1394.5	784.5	610.0	1220	785
1000	40"	1300	1546.5	860.5	686.0	1372	862
1050	42"	1365	1598.5	886.5	712.0	1424	912
1200	48"	1560	1796.5	985.5	811.0	1622	992
1350	54"	1755	1998.5	1086.5	912.0	1824	1252
1400	56"	1820	2148.5	1161.5	987.0	1974	1252
1500	60"	1950	2196.5	1185.5	1011.0	2022	1392
1600	64"	2080	2286.5	1230.5	1056.0	2112	1482
1650	66"	2145	2360.5	1267.5	1093.0	2186	1482
1800	72"	2340	2550.5	1362.5	1188.0	2376	1632
2000	78"	2600	2650.5	1412.5	1238.0	2476	1732

The fitting length (L) is always the same, regardless of the pressure rating.
[1] Only DN 350, 400, 500 and 600 are available if flanges according to AS are used.
[2] DN < 700 only to ANSI, DN > 600 only to AWWA.

Remote version DN ≥ 350

A0003220

DN		L	A	B	C	K	E
EN (DIN) / AS [1] [mm]	ANSI / AWWA [2] [inch]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
350	14"	550	683.5	401.5	282.0	564	276
400	16"	600	735.5	427.5	308.0	616	276
450	18"	650	785.5	452.5	333.0	666	292
500	20"	650	836.5	478.0	358.5	717	292
600	24"	780	940.5	530.0	410.5	821	402
700	28"	910	1143.5	631.5	512.0	1024	589
750	30"	975	1143.5	631.5	512.0	1024	626
800	32"	1040	1186.5	653.0	533.5	1067	647
900	36"	1170	1339.5	729.5	610.0	1220	785
1000	40"	1300	1491.5	805.5	686.0	1372	862
1050	42"	1365	1543.5	831.5	712.0	1424	912
1200	48"	1560	1741.5	930.5	811.0	1622	992
1350	54"	1755	1943.5	1031.5	912.0	1824	1252
1400	56"	1820	2093.5	1106.5	987.0	1974	1252
1500	60"	1950	2141.5	1130.5	1011.0	2022	1392
1600	64"	2080	2231.5	1175.5	1056.0	2112	1482
1650	66"	2145	2305.5	1212.5	1093.0	2186	1482
1800	72"	2340	2495.5	1307.5	1188.0	2376	1632
2000	78"	2600	2595.5	1357.5	1238.0	2476	1732

The fitting length (L) is always the same, regardless of the pressure rating.
[1] Only DN 350, 400, 500 and 600 are available if flanges according to AS are used.
[2] DN < 700 only to ANSI, DN > 600 only to AWWA.

Ground disk (DN 25...300)

A0003221

DN [1]		di	B	D	H
EN (DIN) / JIS / AS [4] [mm]	ANSI [inch]	[mm]	[mm]	[mm]	[mm]
25	1"	26	62	77.5	87.5
32	–	35	80	87.5	94.5
40	1 1/2"	41	82	101	103
50	2"	52	101	115.5	108
65	–	68	121	131.5	118
80	3"	80	131	154.5	135
100	4"	104	156	186.5	153
125	–	130	187	206.5	160
150	6"	158	217	256	184
200	8"	206	267	288	205
250	10"	260	328	359	240
300 [2]	12" [2]	312	375	413	273
300 [3]	12" [3]	310	375	404	268

[1] Ground disks can, with the exception of DN 300, be used for all flange norms / pressure ratings.
[2] PN 10/16, Cl. 150
[3] PN 25, JIS 10K/20K
[4] DN 32, 40, 65 and 125 are not available if flanges according to AS are used.

Weight

Weight data in kg

Nominal diameter		Compact version						Remote version (without cable)						
														Wall housing
								Sensor						
[mm]	[inch]	EN (DIN) / AS*		JIS		ANSI/AWWA		EN (DIN) / AS*		JIS		ANSI/AWWA		
25	1"	PN 40	7.3	10K	7.3	Class 150	7.3	PN 40	5.3	10K	5.3	Class 150	5.3	6.0
32	1 1/4"	PN 40	8.0	10K	7.3	Class 150	–	PN 40	6.0	10K	5.3	Class 150	–	6.0
40	1 1/2"	PN 40	9.4	10K	8.3	Class 150	9.4	PN 40	7.4	10K	6.3	Class 150	7.4	6.0
50	2"	PN 40	10.6	10K	9.3	Class 150	10.6	PN 40	8.6	10K	7.3	Class 150	8.6	6.0
65	2 1/2"	PN 16	12.0	10K	11.1	Class 150	–	PN 16	10.0	10K	9.1	Class 150	–	6.0
80	3"	PN 16	14.0	10K	12.5	Class 150	14.0	PN 16	12.0	10K	10.5	Class 150	12.0	6.0
100	4"	PN 16	16.0	10K	14.7	Class 150	16.0	PN 16	14.0	10K	12.7	Class 150	14.0	6.0
125	5"	PN 16	21.5	10K	21.0	Class 150	–	PN 16	19.5	10K	19.0	Class 150	–	6.0
150	6"	PN 16	25.5	10K	24.5	Class 150	25.5	PN 16	23.5	10K	22.5	Class 150	23.5	6.0
200	8"	PN 10	45	10K	41.9	Class 150	45	PN 10	43	10K	39.9	Class 150	43	6.0
250	10"	PN 10	65	10K	69.4	Class 150	75	PN 10	63	10K	67.4	Class 150	73	6.0
300	12"	PN 10	70	10K	72.3	Class 150	110	PN 10	68	10K	70.3	Class 150	108	6.0
350	14"	PN 10	115			Class 150	175	PN 10	113			Class 150	173	6.0
400	16"	PN 10	135			Class 150	205	PN 10	133			Class 150	203	6.0
450	18"	PN 10	175			Class 150	255	PN 10	173			Class 150	253	6.0
500	20"	PN 10	175			Class 150	285	PN 10	173			Class 150	283	6.0
600	24"	PN 10	235			Class 150	405	PN 10	233			Class 150	403	6.0
700	28"	PN 10	355			Class D	400	PN 10	353			Class D	398	6.0
–	30"	PN 10	–			Class D	460	PN 10	–			Class D	458	6.0
800	32"	PN 10	435			Class D	550	PN 10	433			Class D	548	6.0
900	36"	PN 10	575			Class D	800	PN 10	573			Class D	798	6.0
1000	40"	PN 10	700			Class D	900	PN 10	698			Class D	898	6.0
–	42"	PN 6	–			Class D	1100	PN 6	–			Class D	1098	6.0
1200	48"	PN 6	850			Class D	1400	PN 6	848			Class D	1398	6.0
–	54"	PN 6	–			Class D	2200	PN 6	–			Class D	2198	6.0
1400	–	PN 6	1300			Class D	–	PN 6	1298			Class D	–	6.0
–	60"	PN 6	–			Class D	2700	PN 6	–			Class D	2698	6.0
1600	–	PN 6	1700			Class D	–	PN 6	1698			Class D	–	6.0
–	66"	PN 6	–			Class D	3700	PN 6	–			Class D	3698	6.0
1800	72"	PN 6	2200			Class D	4100	PN 6	2198			Class D	4098	6.0
–	78"	PN 6	–			Class D	4600	PN 6	–			Class D	4598	6.0
2000	–	PN 6	2800			Class D	–	PN 6	2798			Class D	–	6.0

Transmitter Promag (compact version): 3.4 kg
(Weight data valid for standard pressure ratings and without packaging material)
* Only DN 80, 100, 150...400, 500 and 600 are available if flanges according to AS are used.

Materials

Transmitter housing:
- Compact housing: powder coated die-cast aluminium
- Wall-mounted housing: powder coated die-cast aluminium

Sensor housing:
- DN 25…300: powder-coated die-cast aluminium
- DN 350…2000: painted steel (Amerlock 400)

Measuring tube:
- DN < 350: stainless steel 1.4301 or 1.4306/304L; non-stainless flange material with Al/Zn protective coating
- DN > 300: stainless steel 1.4301/304; non-stainless flange material with Amerlock 400 paint

Flange:
- EN 1092-1 (DIN 2501): 316L / 1.4571; RSt37-2 (S235JRG2) / C22 / FE 410W B (with flanges made of carbon steel: DN < 350 with Al/Zn protective coating; DN > 300 with Amerlock 400 paint)
- ANSI: A105, F316L (with flanges made of carbon steel: DN < 350 with Al/Zn protective coating; DN > 300 with Amerlock 400 paint)
- AWWA: 1.0425 (with Amerlock 400 paint)
- JIS: RSt37-2 (S235JRG2) / H II / 1.0425 / 316L (with flanges made of carbon steel: DN < 350 with Al/Zn protective coating; DN > 300 with Amerlock 400 paint)
- AS 2129: (DN 150, 200, 250, 300, 600) A105 or RSt37-2 (S235JRG2) (DN 80, 100, 350, 400, 500) A105 or St44-2 (S275JR) (with flanges made of carbon steel: DN < 350 with Al/Zn protective coating; DN > 300 with Amerlock 400 paint)
- AS 4087: A105 or St44-2 (S275JR) (with flanges made of carbon steel: DN < 350 with Al/Zn protective coating; DN > 300 with Amerlock 400 paint)

Ground disks: 1.4435/316L or Alloy C-22
Electrodes: 1.4435 or Alloy C-22, tantalum
Seals: Seals to DIN EN 1514-1

Material load diagrams

Caution!
The following diagrams contain material load curves (reference curves) for various process connections relating to the fluid temperature. But the maximal permissible fluid temperature always depends on the lining material of the sensor and/or of the sealing material (Page 20).

Flange connection to EN 1092-1 (DIN 2501)
Material: RSt37-2 (S235JRG2) / C22 / FE 410W B

F06-xxFxxxxx-05-xx-xx-xx-000

Flange connection to EN 1092-1 (DIN 2501)
Material: 316L / 1.4571

F06-xxFxxxxx-05-xx-xx-xx-001

Flange connection to ANSI B16.5
Material: A105

A0003226

Flange connection to ANSI B16.5
Material: F316L

F06-xxFxxxxx-05-xx-xx-xx-002

Flange connection to AWWA C 207, Class D
Material: 1.0425

F06-xxFxxxxx-05-xx-xx-xx-004

Flange connection to JIS B2238
Material: RSt37-2 (S235JRG2) / H II / 1.0425

A0003228

Flange connection to AS2129 Table E or AS4087 Cl. 14
Material: A105 / RSt37-2 (S235JRG2) / St44-2 (S275JR)

F06-xxFxxxxx-05-xx-xx-xx-010

Fitted electrodes

Measuring, reference and EPD electrodes:
- Standard with: 1.4435, Alloy C-22, tantalum
- Optional: exchangeable measuring electrodes made of 1.4435 (DN 350...2000)

Process connection

Flange connection:
- EN 1092-1 (DIN 2501), < DN 350 Form A, > DN 300 Form B
  (dimensions acc. to DIN 2501; DN 65 PN 16 and DN 600 PN 16 exclusively to EN 10921)
- ANSI B16.5
- AWWA C 207, Class D
- JIS B2238
- AS2129 Table E
- AS4087 Cl. 14

Surface roughness

- Electrodes:
  – 1.4435, Alloy C-22, Tantalum: 0.3...0.5 µm

(all data relate to parts in contact with the medium)

Human interface

Display elements

- Liquid-crystal display: backlit, two lines (Promag 50) or four lines (Promag 53) with 16 characters per line
- Custom configurations for presenting different measured-value and status variables
- Totalizer:
  Promag 50: 2 totalizers
  Promag 53: 3 totalizers

Operating elements

Unified operation concept for both types of transmitter:

Promag 50:
- Local operation with three push buttons (–, +, E)
- Quick Setup menus for straightforward commissioning

Promag 53:
- Local operation with three optical keys (–, +, E)
- Application-specific Quick Setup menus for straightforward commissionig

Language group

Language groups available for operation in different countries:

Promag 50, Promag 53:
- Western Europe and America (WEA):
  English, German, Spanish, Italian, French, Dutch and Portuguese
- Eastern Europe and Scandinavia (EES):
  English, Russian, Polish, Norwegian, Finnish, Swedish and Czech
- South and east Asia (SEA):
  English, Japanese, Indonesian

Promag 53:
- China (CIN):
  English, Chinese

You can change the language group via the operating program “ToF Tool – Fieldtool Package.”

Remote operation

Promag 50: Remote control via HART, PROFIBUS DP/PA
Promag 53: Remote control via HART, PROFIBUS DP/PA, MODBUS RS485, FOUNDATION Fieldbus

Certificates and approvals

Ex approvals	Information about currently available Ex versions (ATEX, FM, CSA) can be supplied by your Endress+Hauser Sales Centre on request. All explosion protection data are given in a separate documentation which is available upon request.
CE mark	The measuring system is in conformity with the statutory requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.
C-Tick mark	The measuring system is in conformity with the EMC requirements of the Australian Communications Authority (ACA).
Pressure Equipment Directive	Flow meters with a nominal diameter smaller or equal DN 25 are covered by Art. 3(3) of the European directive 97/23/EG (Pressure Equipment Directive) and are designed according to sound engineer practice. For larger nominal diameter, optional approvals according to Cat. III are available when required (depends on fluid and process pressure).
PROFIBUS DP/PA certification	The flow device has successfully passed all the test procedures carried out and is certified and registered by the PNO (PROFIBUS User Organisation). The device thus meets all the requirements of the following specifications: ■ Certified to PROFIBUS PA, profile version 3.0 (device certification number: on request) ■ The device can also be operated with certified devices of other manufacturers (interoperability)
FOUNDATION Fieldbus certification	The flow device has successfully passed all the test procedures carried out and is certified and registered by the Fieldbus Foundation. The device thus meets all the requirements of the following specifications: ■ Certified to FOUNDATION Fieldbus Specification ■ The device meets all the specifications of the FOUNDATION Fieldbus H1. ■ Interoperability Test Kit (ITK), revision status 4.0 (device certification number: on request) ■ The device can also be operated with certified devices of other manufacturers ■ Physical Layer Conformance Test of the Fieldbus Foundation
MODBUS certification	The measuring device meets all the requirements of the MODBUS/TCP conformity test and has the “MODBUS/TCP Conformance Test Policy, Version 2.0”. The measuring device has successfully passed all the test procedures carried out and is certified by the “MODBUS/TCP Conformance Test Laboratory” of the University of Michigan.
Other standards, guidelines	EN 60529: Degrees of protection by housing (IP code) EN 61010: Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures. EN 61326/A1 (IEC 6326): Electromagnetic compatibility (EMC requirements) NAMUR NE 21: Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment. NAMUR NE 43: Standardisation of the signal level for the breakdown information of digital transmitters with analogue output signal. NAMUR NE 53: Software of field devices and signal-processing devices with digital electronics.

Ordering information

The Endress+Hauser service organisation can provide detailed ordering information and information on the order codes on request.

Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the sensor. The Endress+Hauser service organisation can provide detailed information on request.

Supplementary documentation

- Flow Measurement (FA005D/06/en)
- Operating Instructions Promag 50 (BA046D/06/en, BA049D/06/en)
- Operating Instructions Promag 50 PROFIBUS PA (BA055D/06/en, BA056D/06/en)
- Operating Instructions Promag 53 (BA047D/06/en, BA048D/06/en)
- Operating Instructions Promag 53 PROFIBUS DP/PA (BA053D/06/en, BA054D/06/en)
- Operating Instructions Promag 53 FOUNDATION Fieldbus (BA051D/06/en, BA052D/06/en)
- Operating Instructions Promag 53 MODBUS (BA117D/06/en und BA118D/06/en)
- Supplementary documentation on Ex-ratings: ATEX, FM, CSA, etc.

Registered trademarks

HART®
Registered trademark of HART Communication Foundation, Austin, USA

PROFIBUS®
Registered trademark of the PROFIBUS User Organisation, Karlsruhe, Germany

FOUNDATION™ Fieldbus
Registered trademark of the Fieldbus FOUNDATION, Austin, USA

MODBUS®
Registered trademark of the MODBUS Organisation

HistoROM™, S-DAT®, T-DAT™, F-CHIP®, ToF Tool - Fieldtool® Package, Fieldcheck®, Applicator®
Registered or registration-pending trademarks of Endress+Hauser Flowtec AG, Reinach, CH

Subject to modification

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