Электромагнитные расходомеры Proline Promag 51P, 51W

Технические характеристики

По вопросам продаж и поддержки обращайтесь:

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Ангарск (3955)60-70-56
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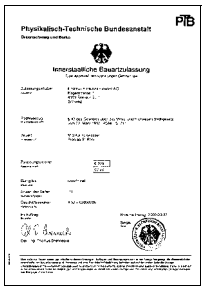
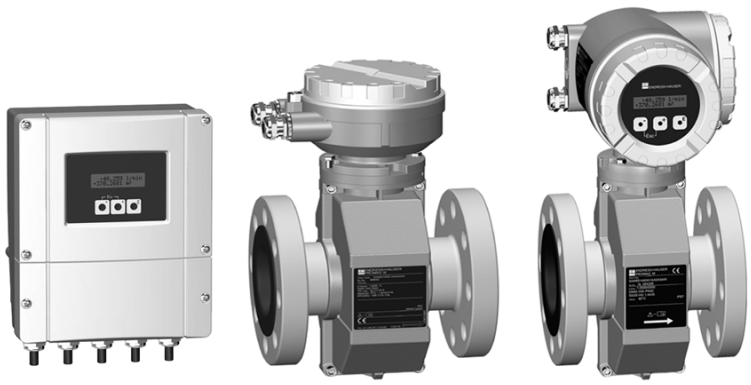
Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Proline Promag 51P, 51W

Electromagnetic Flow Measuring System
For custody transfer with cold water





Application
Electromagnetic flowmeter for custody transfer with cold water:
- Flow measurement up to 110,000 m^3/h
- Fluid temperature (for a certified device) up to +30 °C
- Process pressures up to 40 bar
- Fitting lengths to DVGW/ISO
- PTB approval
- Metrological Classes A and B
- With national type examination for cold water (GER)
- Continous operation at Q_{max} possible

Application-specific lining materials:
- Polyurethane, hard rubber, PFA and PTFE

Approvals for hazardous area:
- ATEX

Lined measuring pipes with materials approved for drinking water:
- KTW, WRAS, ACS, etc.

Application-specific measurement output:
- With a certified totalizer display and pulse output

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
- 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

see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)

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 51

Sensor:
- Promag W: DN 25…2000, hard rubber or polyurethane lining
- Promag P: DN 15…600, PFA or PTFE lining

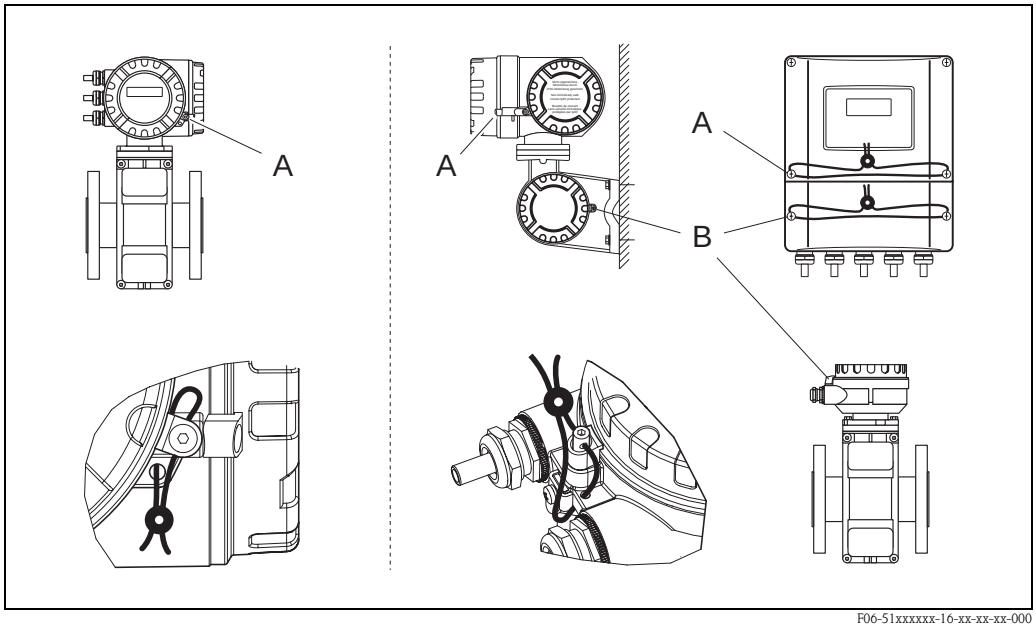
Custody transfer mode

Measuring points for custody transfer for water are considered or approved by the certifying authorities as "entire plants". Promag 51 including the inlet and outlet sections are, therefore, considered as a part of this entire plant. To ensure correct measurement in custody transfer procedures, the piping and the measuring tube must always be filled with liquid.

When installing a certified measuring system, please also note the regulations for custody transfer (Deutscher Eichverlag GmbH – Braunschweig):
- Allgemeine Vorschriften (AV) zur Eichordnung (EO)
- Anlage 6 zur Eichordnung (EO 6-1): Vorschriften für Volumen-Messgeräte für strömendes Wasser
- PTB-A6.1: Volumen-Messgeräte für Kaltwasser

Suitability for custody transfer / Custody transfer approval

With flowmeters *suitable* for custody transfer, approval by the standards authorities has not yet been carried out. Flowmeters suitable for custody transfer may not be used for custody transfer procedures until approved. However, such flowmeters can either be *approved* at a later date by a certification body or, with the agreement of the authorities, calibrated for custody transfer on site. The leaded seal of the certified instruments confirms this status (see following Figure).



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Sealing of a certified Promag 51 measuring system by standards authorities

Left: Compact version / Right: Remote version (Ex zone 1 housing and standard housing)
A = Sealing of the electronics compartment
B = Sealing of the connection housing (remote version) after installation

Note!
- In collaboration with the standards authorities, Promag 51 instruments are sealed before delivery.
- With the remote version, the connection between sensor and transmitter is to be sealed on site.

Reapproval

The operator of an approved Promag 51 measuring system is required to apply for reapproval and to comply with current regulations set by the standards authorities. The date for reapproval (year number) is given on a special seal.

Special features of custody transfer

Approved Promag 51 flowmeters differ from non-approved flowmeters as follows:
- Flowmeters suitable for custody transfer are technically identical to flowmeters approved for "custody transfer".
- Only flowmeters approved by the standard authorities may be used for regulatory fiscal metering.
- Flowmeters with a max. flow rate of $Q_{max} = 2 \times Q_n > 2000\ m^3/h$ are exempted from custody transfer approval. Such instruments are not approved but however can still be used as suitable for custody transfer measurement.
- In contrast to mechanical counters, magnetic flowmeters approved by the standards authorities may be in continuous operation at Q_{max} (= 100%).
- After official approval or leaded sealing, configuration can no longer be carried out using the local display.
- Approved flowmeters totalize bidirectional flow, i.e. all outputs consider flow shares in positive (forward) and negative (backward) flow direction.
- The wiring of the status input must be done by the user of the system.
- Instruments suitable for custody transfer and for certifying at a later date are normally removed from the piping.

Definitions in custody transfer

Cold water

Fluid temperature between 0...+30 °C

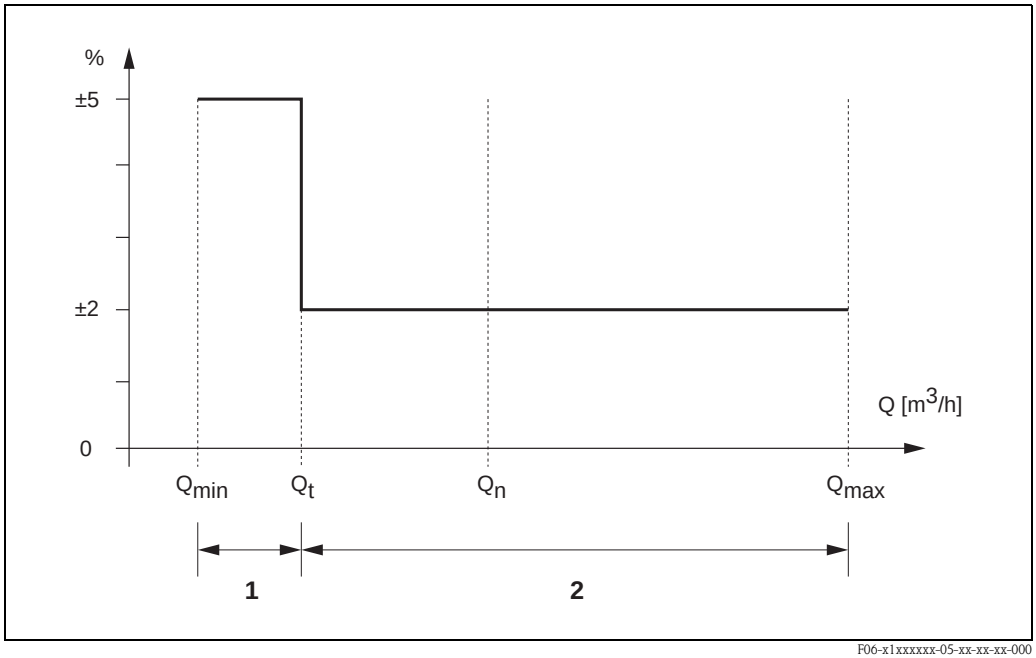
Flow ranges

Q_{max} Maximum flow of the flowmeter without exceeding the maximum permissible error.

Q_n Nominal flow rate is half the value of the maximum flow rate Q_{max} and characterises the flowmeter (see Page 7, “Limiting flow”).

Q_{min} Minimum flow rate above which the totalizer is within the error limits.
Q_{min} is dependent on the nominal flow rate (Q_n) and the metrological class.

Q_t “Transitional flow rate”, which separates the lower from the upper maximum permissible range. Lower or upper range differ from each other by the permitted error limits for custody transfer measurements:
- Lower range (Q_{min}...Q_t) → Error limits: ±5%
- Upper range (Q_t...Q_{max}) → Error limits: ±2%



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Flow ranges and error limits in custody transfer mode for cold water

1 = Lower range (error limit: ±5%)
2 = Upper range (error limit: ±2%)

Metrological classes

Metrological classes A / B indicate the range in which the approved custody transfer flowmeter can measure, from full scale value (Q_{max}) down to Q_{min}. The error limits within this range are set by the standards authorities and must not be exceeded.

	Nominal flow rate Q_n	
	< 15 m³/h	**≥ 15 m³/h**
Class A	$Q_{min} = Q_n \times 0.04$ $Q_t = Q_n \times 0.10$	$Q_{min} = Q_n \times 0.08$ $Q_t = Q_n \times 0.30$
Class B	$Q_{min} = Q_n \times 0.02$ $Q_t = Q_n \times 0.08$	$Q_{min} = Q_n \times 0.03$ $Q_t = Q_n \times 0.20$

Input

Measured variable	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Measuring range	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Operable flow range	Not in custody transfer mode → 1000 : 1 In custody transfer mode → max. 250 : 1 (corresponding to 0.04...10 m/s)
Input signal	■ see TI046D/06/en (Promag W) and TI047D/06/en (Promag P) ■ With custody transfer measurement, error messages can only be reset and a display test function activated via the status input!

Output

Output signal	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Signal on alarm	Certifiable instruments: ■ Current output → failsafe mode selectable ■ Pulse/frequency output → failsafe mode selectable ■ Status output → "non-conductive" by fault or power supply failure Certified instruments: ■ Current output → failsafe mode selectable ■ Pulse/frequency output → fallback value (only with certified pulse output) ■ Status output → "non-conductive" by fault or power supply failure. Switching response selectable
Load	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Switching output	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Low flow cutoff	■ see TI046D/06/en (Promag W) and TI047D/06/en (Promag P) ■ In custody transfer mode, the switch points for low flow cutoff are permanently set (On at 0.02 m/s; Off at 0.04 m/s)
Galvanic isolation	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)

Power supply

Electrical connection	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Supply voltage	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Cable entry	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Cable specifications remote version	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Power consumption	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Power supply failure	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Potential equalisation	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)

Performance characteristics

Reference operating conditions	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Max. measured error	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Repeatability	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)

Operating conditions

Installation

Installation instructions	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Inlet and outlet runs, Adapters	The inlet run and the outlet run must have the same nominal width as the flowmeter! ▪ Inlet run: typically ≥ 5 x DN ▪ Outlet run: typically ≥ 2 x DN Caution! This data is applicable even with the use of adapters to DIN EN 545 (double-flange reducers) to increase fluid velocity.
Length of connecting cable	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)

Environment

Ambient temperature	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Storage temperature	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Degree of protection	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Shock resistance	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Vibration resistance	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Electromagnetic compatibility (EMC)	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)

Process

Medium temperature range	Certifiable instrument: see TI046D/06/en (Promag W) and TI047D/06/en (Promag P) Certified instrument: 0...+30 °C
Medium pressure range (nominal pressure)	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Pressure tightness (liner)	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Conductivity	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P): ≥ 5 µS/cm → for cold water ≥ 20 µS/cm → for demineralised water

Limiting flow

The diameter of the pipe usually governs the nominal diameter of the sensor. The plant should be designed so that under "normal" operating conditions, the optimum flow rate lies between 2...3 m/s.
If it is necessary to increase the flow velocity, this can be done by reducing the nominal diameter of the sensor.

Nominal flow rate Q_n in [m^3/h]						
Nominal diameter DN	**Metrological class A**			**Metrological class B**		
[mm]	Q_n (min)		Q_n (max)	Q_n (min)		Q_n (max)
15	0.8	$Q_{min} : Q_n = 1 : 25$	3.0	1.6	$Q_{min} : Q_n = 1 : 50$	3.0
25	2.2		8.8	4.4		8.8
32	3.6		14.0	7.2		14.0
40	5.6		22.6	11.3		22.6
50	9.0		35.0	15.0 *	$Q_{min} : Q_n = 1 : 33$	35.0
65	15.0		60.0	20.0		60.0
80	15.0 *	$Q_{min} : Q_n = 1 : 12.5$	90.0	30.0		90.0
100	18.0		140.0	46.0		140.0
125	28.0		220.0	73.0		220.0
150	40.0		320.0	105.0		320.0
200	70.0		550.0	190.0		550.0
250	110.0		880.0	290.0		880.0
300	160.0		1250	420.0		1250
350	215.0		1700	570.0		1700
400	280.0		2200	750.0		2200
500	440.0		3000	1170		3000
600	640.0		3000	1700		3000
700...2000	Diameters DN 700...2000 can also be approved. However, measuring points with these diameters are not normally subject to metrological regulations (Q_{max} = 2 x Q_n > 2000 m^3/h).					

* Limit range Q ≥ 15 m^3/h (see also Table on Page 4)

Q_n (min) = lowest nominal flow rate with reference to Q (min), v = 0.5 m/s
Q_n (max) = highest nominal flow rate with reference to Q (max), v = 5 m/s

Definitions → Page 4

Please indicate the following data in all requests and orders for certified devices:

Nominal flow rate (Q_n) for Class A or B
This information is shown on the nameplate and must be given in the order text.
Q_n must lie between the corresponding Q_n (min) and Q_n (max) valid for Class A or B.

Current output / pulse output
For scaling the current output, the full scale value must be given, and will then set at the factory. If a certified pulse output is required for the custody transfer mode, the following information is required in the purchase order: Pulse value, pulse width, output signal type (passive-positive, passive-negative). Corresponding tables can be found in both documentations, TI046D/06/en (Promag W) and TI047D/06/en (Promag P).
The full scale value and the value Q_n are two different values. For example, the full scale value can be higher than the defined Q_n. In extreme cases, it is double the value of Q_n (max) and lies at 10 m/s.

Pressure loss

see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)

Mechanical construction

Design / dimensions	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Weight	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Materials	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Material load diagrams	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Fitted electrodes	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Process connection	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Surface roughness	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)

Human interface

Display elements	see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)
Operating elements	
Language group	Operation of Promag 51:
Remote operation	After official approval or leaded sealing, configuration can no longer be carried out using the local display!

Certificates and approvals

Ex approval

Information about currently available Ex versions (ATEX, FM, CSA, etc.) can be supplied by Sales Centre on request. All explosion protection data are given in a separate documentation which is available upon request.

Custody transfer

PTB approval for custody transfer with cold water.

PTB

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

Innerstaatliche Bauartzulassung

Type-approval certificate under German law

Zulassungsinhaber: *Issued to:*	Endress + Hauser Flowtec AG Kägenstrasse 7 4153 Reinach BL 1 Schweiz
Rechtsbezug: *In accordance with:*	§ 13 des Gesetzes über das Mess- und Eichwesen (Eichgesetz) vom 23. März 1992 (BGBl. I S. 711)
Bauart: *In respect of:*	MID für Kaltwasser Promag 51 P/W
Zulassungszeichen: *Approval mark:*	6.221 02.20
Gültig bis: *Valid until:*	unbefristet
Anzahl der Seiten: *Number of pages:*	11
Geschäftszeichen: *Reference No.:*	1.32 – 02000088

Im Auftrag
By order

Dipl.-Ing. Thomas Brennecke

Braunschweig, 2002-03-27

Siegel
Seal

PHYSIKALISCH-TECHNISCHE BUNDESANSTALT 53

394 00 c-rb

Merkmale zur Bauart sowie ggf. inhaltliche Beschränkungen, Auflagen und Bedingungen sind in der Anlage festgelegt, die Bestandteil der innerstaatlichen Bauartzulassung ist. Hinweise und eine Rechtsbehelfsbelehrung befinden sich auf der ersten Seite der Anlage.

Characteristics of the instrument type approved, restrictions as to the contents, special conditions and approval conditions, if any, are set out in the Annex which forms an integral part of the type-approval certificate under German law. For notes and information on legal remedies, see first page of the Annex.

CE approval

The measuring system is in conformity with the statutory requirements of the EC Directives.

C-Tick mark

The measuring system is in conformity with the EMC requirements of the Australian Communications Authority (ACA).

Sanitary compatibility

Drinking water suitability, WRAS – Approved Product, KTW (for hard rubber)

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).

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.

Regulations for custody transfer (see Page 2)

Ordering information

The following values are to be stated when ordering an instrument with “custody transfer approval”:
- Nominal flow rate Q_n → Page 7
- Metrological Class → Page 4, 7
- If a certified pulse output is required for the custody transfer mode:
  Pulse value, pulse width, output signal type (passive-positive, passive-negative)

The flowmeter is delivered with appropriate factory settings if no information is given on the full scale value for current output, the current range (0/4...20 mA), pulse value, display mode or totalizer units!

Factory settings for full scale values and pulse values can be found in the following documentations: TI046D/06/en (Promag W) and TI047D/06/en (Promag P).

Accessories

Documentation

- Flow Measurement (FA005D/06/en)
- Technical Information Promag 50W, 53W (TI046D/06/en)
- Technical Information Promag 50P, 53P (TI047D/06/en)
- Operating Instructions Promag 51 (BA080D/06/en)
- Description of Device Functions Promag 51 (BA081D/06/en)
- Supplementary documentation on Ex-ratings: ATEX, FM, CSA, etc.

Registered trademarks

see TI046D/06/en (Promag W) and TI047D/06/en (Promag P)

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