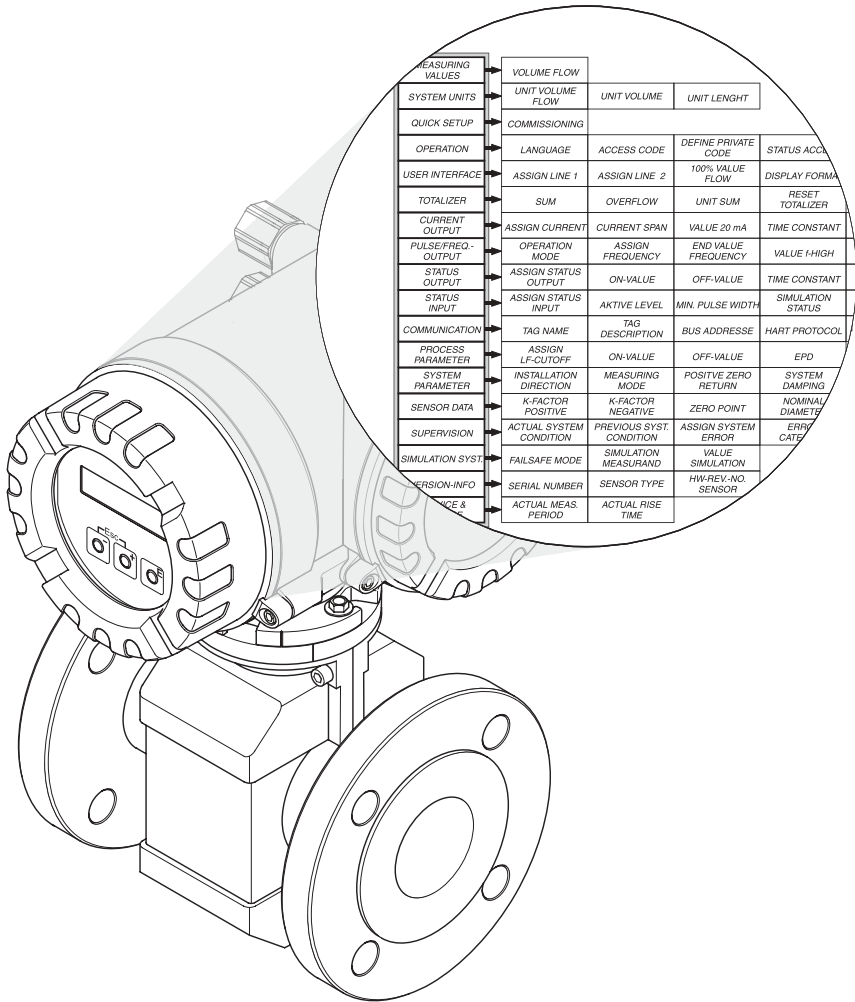


valid as of software version:
V 1.02.XX (amplifier)
V 1.02.XX (communication)

PROline promag 50

Electromagnetic Flow Measuring System

Description of Device Functions



Endress + Hauser

The Power of Know How



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1 Function matrix PROline Promag 50

1.1 The function matrix: layout and use

The function matrix is a two-level construct: the groups form one level and the groups' functions the other.

The groups are the highest-level grouping of the operating options for the measuring device.

A number of functions is assigned to each group.

You select a group in order to access the individual functions for operating and parameterizing the measuring device.

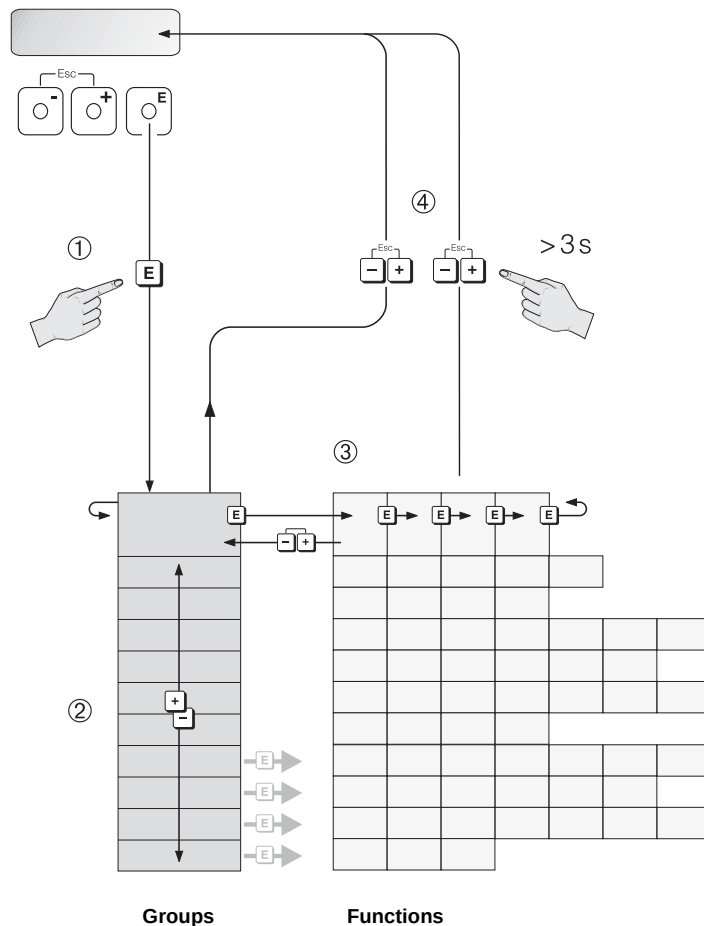
An overview of all the groups available is provided in the table of contents on page 3 and in the graphical representation of the function matrix on page 6.

An overview of all the functions available is provided on page 6, complete with page references to the detailed function descriptions.

The descriptions of the individual functions start on page 7.

Example of how to parameterize a function (in this case changing the language for the UI):

- ① Enter into the function matrix (E-key).
- ② Select the OPERATION group.
- ③ Select the LANGUAGE function, change the setting to a different language.
 and save (E) (all text on the display now appears in that language).
- ④ Exit the function matrix (ESC > 3 seconds).



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1.2 Illustration of the function matrix

Function groups	Functions →	
	MEASURING VALUES (p. 7)	VOLUME FLOW (p. 7)
SYSTEM UNITS (p. 8)		UNIT VOL. FLOW (p. 8)
QUICK SETUP (p. 10)		UNIT VOLUME (p. 9)
		UNIT LENGTH (p. 9)
		QS COMMISSION (p. 10)
OPERATION (p. 11)		LANGUAGE (p. 11)
		ACCESS CODE (p. 11)
		PRIVATE CODE (p. 12)
USER INTERFACE (p. 13)		STATUS ACCESS (p. 12)
		ASSIGN LINE 1 (p. 13)
		ASSIGN LINE 2 (p. 13)
		100% VALUE (p. 13)
		FORMAT (p. 13)
		DISPL. DAMPING (p. 14)
		CONTRAST LCD (p. 14)
		DISPLAY TEST (p. 14)
TOTALIZER (p. 15)		SUM (p. 15)
		OVERFLOW (p. 15)
		UNIT TOTALIZER (p. 15)
		RESET TOTALIZ. (p. 15)
		FAILSAFE MODE (p. 16)
CURRENT OUTPUT (p. 17)		ASSIGN CURRENT OUTP. (p. 17)
		CURRENT RANGE (p. 17)
		VALUE 20 mA (p. 18)
		TIME CONSTANT (p. 18)
		FAILSAFE MODE (p. 18)
		ACTUAL CURRENT (p. 19)
		SIMUL. CURRENT (p. 19)
		VALUE SIM. CURRENT (p. 19)
PULSE/FREQ. OUTP. (p. 20)		OPERATION MODE (p. 20)
		ASSIGN FREQ. (p. 20)
		END VALUE FREQ. (p. 20)
		VALUE+1 HIGH (p. 21)
		OUTPUT SIGNAL (p. 21)
		TIME CONSTANT (p. 22)
		FAILSAFE MODE (p. 22)
		FAILSAFE VALUE (p. 22)
		ACTUAL FREQ. (p. 23)
		SIMUL. FREQ. (p. 23)
		VALUE SIM. FREQ. (p. 23)
		ASSIGN PULSE (p. 24)
		PULSE VALUE (p. 24)
		PULSE WIDTH (p. 25)
		OUTPUT SIGNAL (p. 26)
		FAILSAFE MODE (p. 26)
STATUS OUTPUT (p. 27)		ASSIGN STATUS (p. 27)
		ON-VALUE (p. 27)
		OFF-VALUE (p. 28)
		TIME CONSTANT (p. 28)
		ACTUAL STATUS (p. 28)
		SIM. STATUS INP. (p. 32)
		VAL. SIM. SWIT. PT. (p. 29)
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		MIN. PULSE WIDTH (p. 32)
		ACTUAL STATUS (p. 32)
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		HART PROTOCOL (p. 34)
		MANUFACT. NO. (p. 34)
		DEVICE ID (p. 34)
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		ON-VALUE (p. 35)
		OFF-VALUE (p. 35)
		EPD/OED MODE (p. 36)
		EPD/OED ADJ. (p. 37)
		ECC (p. 38)
		ECC RECOVERY TIME (p. 38)
		ECC DURATION (p. 38)
		FAILSAFE VALUE (p. 22)
		ACTUAL FREQ. (p. 23)
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		SENSOR TYPE (p. 48)
		HW REV. SENS. (p. 48)
		SW REV. NO. S-DAT (p. 48)
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		I/O MODULE TYPE (p. 48)
		HW REV. I/O MOD. (p. 48)
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2 Group MEASURING VALUES

Function description MEASURING VALUES	
 Note! • The engineering unit of the measured variable displayed here can be set in the SYSTEM UNITS group, (see page 8). • If the fluid in the pipe flows backwards, a negative sign prefixes the flow reading on the display.	
VOLUME FLOW	The volume flow currently measured appears on the display. User interface: 5-digit floating-point number, including unit and sign (e.g. 5.5445 dm³/min; 1.4359 m³/h; -731.63 gal/d; etc.)

3 Group SYSTEM UNITS

Function description SYSTEM UNITS	
Use this function group to select the unit for the measured variable.	
UNIT VOLUME FLOW	Use this function to select the unit for displaying the volume flow. The unit you select here is also valid for: • Current output • Frequency output • Switch points (limit value for volume flow, flow direction) • Low flow cut off Options: Metric: Cubic centimeter → cm³/s; cm³/min; cm³/h; cm³/day Cubic decimeter → dm³/s; dm³/min; dm³/h; dm³/day Cubic meter → m³/s; m³/min; m³/h; m³/day Milliliter → ml/s; ml/min; ml/h; ml/day Liter → l/s; l/min; l/h; l/day Hectoliter → hl/s; hl/min; hl/h; hl/day Megaliter → Ml/s; Ml/min; Ml/h; Ml/day US: Cubic centimeter → cc/s; cc/min; cc/h; cc/day Acre foot → af/s; af/min; af/h; af/day Cubic foot → ft³/s; ft³/min; ft³/h; ft³/day Fluid ounce → oz f/s; oz f/min; oz f/h; oz f/day Gallon → gal/s; gal/min; gal/h; gal/day Million gallons → Mgal/s; Mgal/min; Mgal/h; Mgal/day Barrel (normal fluids: 31.5 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (beer: 31.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (petrochemicals: 42.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (filling tanks: 55.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Imperial Gallon → gal/s; gal/min; gal/h; gal/day Mega gallon → Mgal/s; Mgal/min; Mgal/h; Mgal/day Barrel (beer: 36.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (petrochemicals: 34.97 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Factory setting: Depends on nominal diameter and country (dm³/min...m³/h or US-gal/min...US-Mgal/day), corresponding to the factory setting of the full scale value, (see page 49 forward.).

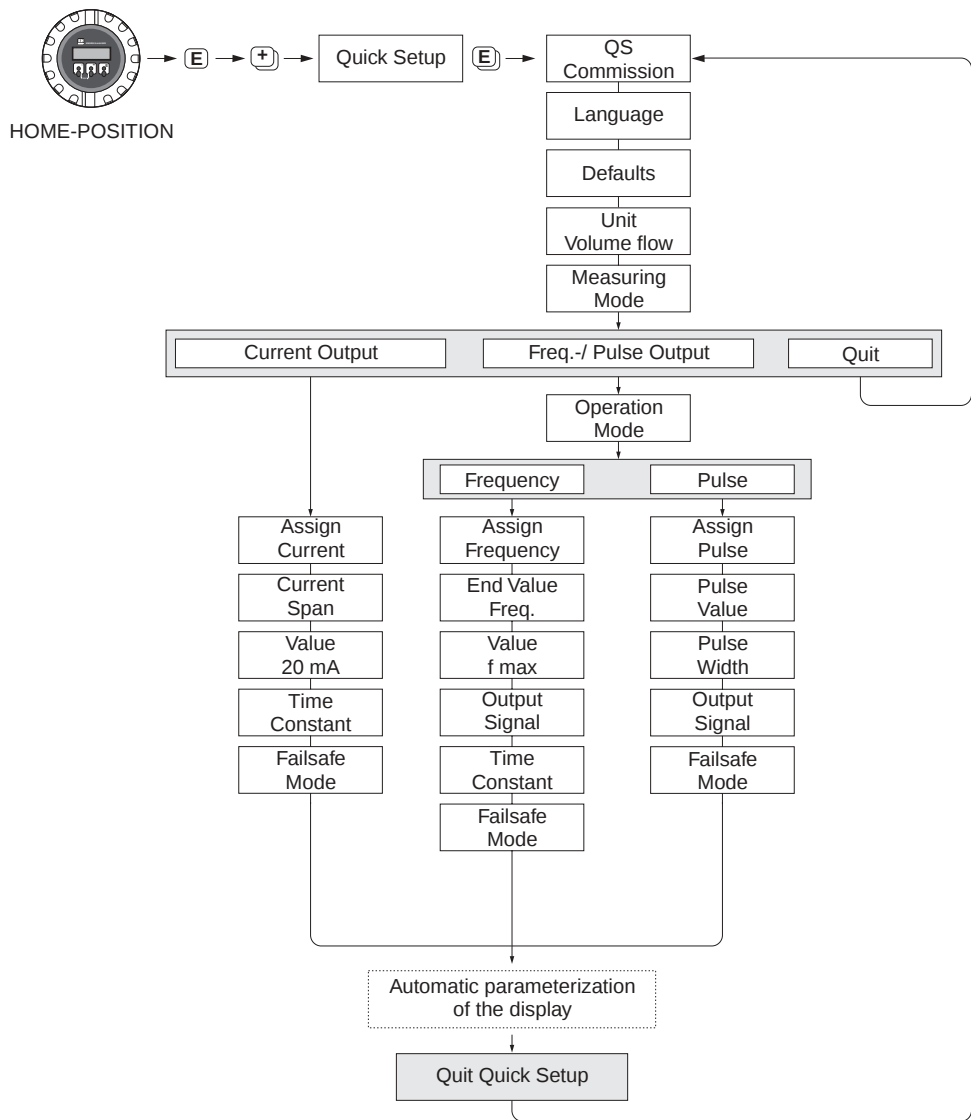
Function description SYSTEM UNITS	
UNIT VOLUME	Use this function to select the unit for displaying the volume. The unit you select here is also valid for: Pulse weighting (e.g. m³/p) Options: Metric → cm³; dm³; m³; ml; l; hl; Ml US → cc; af; ft³; oz f; gal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals) → bbl (filling tanks) Imperial → gal; Mgal; bbl (beer); bbl (petrochemicals) Factory setting: Depends on nominal diameter and country (dm³...m³ or US-gal...US-Mgal), corresponding to the totalizer unit factory setting (see page 49 forward.).  Note! The unit of the totalizers is independent of your choice here. The unit for each totalizer is selected separately for the totalizer in question.
UNIT LENGTH	Use this function to select the unit for displaying the length of the nominal diameter. The unit you select here is also valid for: Nominal diameter of sensor, (see function NOMINAL DIAMETER on page 43) Options: MILLIMETER INCH Factory setting: Country-dependent (MILLIMETER or INCH), see factory setting page 49 forward.

4 Group QUICK SETUP

Function description QUICK SETUP	
QS COMMISSION	Use this function to start the Quick Setup menu for commissioning. Options: YES NO Factory setting: NO



Note!
The display returns to the QUICK SETUP COMMISSION cell if you press the ESC key combination during the setup process.



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5 Group OPERATION

Function description OPERATION	
LANGUAGE	Use this function to select the language for all texts, parameters and messages shown on the local display. Options: ENGLISH DEUTSCH FRANCAIS ESPANOL ITALIANO JAPANESE (syllabary) Factory setting: Country-dependent, see factory setting page 49 forward.  Note! If you press the  keys at startup, the language defaults to "ENGLISH".
ACCESS CODE	All data of the measuring system are protected against inadvertent change. Programming is disabled and the settings cannot be changed until a code is entered in this function. If you press the  keys in any function, the measuring system automatically goes to this function and the prompt to enter the code appears on the display (when programming is disabled). You can enable programming by entering your personal code, (factory setting = 50, see function PRIVATE CODE on page 12) User input: max. 4-digit number: 0 - 9999  Note! • The programming levels are disabled if you do not press a key within 60 seconds following automatic return to the HOME position. • You can also disable programming in this function by entering any number (other than the defined private code). • The Endress+Hauser service organization can be of assistance if you lose your personal code.

Function description OPERATION	
PRIVATE CODE	Use this function to enter a personal code number for enabling programming. User input: 0 - 9999 (max. 4-digit number) Factory setting: 50  Note! • Programming is always enabled with the code "0". • Programming has to be enabled before this code can be changed. When programming is disabled this function is not available, thus preventing others from accessing your personal code.
STATUS ACCESS	Use this function to check the access status for the function matrix. User interface: ACCESS CUSTOMER (parameterization possible) LOCKED (parameterization disabled)

6 Group USER INTERFACE

Function description USER INTERFACE	
ASSIGN LINE 1	Use this function to define which display value is assigned to the main line (top line of the local display) for display during normal measuring operation. Options: OFF VOLUME FLOW VOLUME FLOW IN % Factory setting: VOLUME FLOW
ASSIGN LINE 2	Use this function to define which display value is assigned to the additional line (bottom line of the local display) for display during normal measuring operation. Options: OFF VOLUME FLOW VOLUME FLOW IN % VOLUME FLOW BARGRAPH IN % TOTALIZER TAG NAME OPERATING/SYSTEM CONDITION FLOW DIRECTION Factory setting: TOTALIZER
100% VALUE	 Note! This function is only available if VOLUME FLOW IN % or VOLUME FLOW BARGRAPH IN % was selected in the function ASSIGN LINE 1 or ASSIGN LINE 2. Use this function to define the flow value to be shown on the display as the 100% value. User input: 5-digit floating-point number Factory setting: Depends on nominal diameter and country, [value] / [dm³...m³ or US-gal...US-Mgal], corresponding to the factory setting for the full scale value (see page 49 forward.).
FORMAT	Use this function to define the maximum number of places after the decimal point displayed for the reading in the main line. Options: XXXXX. - XXXX.X - XXX.XX - XX.XXX -X.XXXX Factory setting: X.XXXX  Note! - Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. - The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → gal/hr), indicating that the measuring system is computing with more decimal places than can be shown on the display.

Function description USER INTERFACE	
DISPLAY DAMPING	Use this function to enter a time constant defining how the display reacts to severely fluctuating flow variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). User input: 0 - 100 seconds Factory setting: 1 s  Note! Setting the time constant to zero seconds switches off damping.
CONTRAST LCD	Use this function to optimize display contrast to suit local operating conditions. User input: 10 - 100% Factory setting: 50%
DISPLAY TEST	Use this function to test the operability of the local display and its pixels. Options: OFF ON Factory setting: OFF Test sequence: 1. Start the test by selecting ON. 2. All pixels of the main line and additional line are darkened for at least 0.75 seconds. 3. The main line and additional line show an "8" in each field for at least 0.75 seconds. 4. The main line and additional line show a "0" in each field for at least 0.75 seconds. 5. The main line and additional line show nothing (blank display) for at least 0.75 seconds. When the test is completed the local display returns to its initial state and the setting changes to OFF.

7 Group TOTALIZER

Function description TOTALIZER	
SUM	The total for the totalizer's measured variable accumulated since measuring commenced appears on the display. This value can be positive or negative, depending on the direction of flow. User interface: max. 7-digit floating-point number, including sign and unit (e.g. 15467.04 gal)  Note! The totalizer's response to faults is defined in the function "FAILSAFE MODE", (see page 16).
OVERFLOW	The total for the totalizer's overflow accumulated since measuring commenced appears on the display. Total flow quantity is represented by a floating-point number consisting of max. 7 digits. You can use this function to view higher numerical values (>9,999,999) as overflows. The effective quantity is thus the total of the function OVERFLOW plus the value displayed in the function SUM. Example: Reading for 2 overflows: 2 E7 gal (= 20,000,000 gal) The value displayed in the function "SUM" = 196,845.7 gal Effective total quantity = 20,196,845.7 gal User interface: Integer with exponent, including sign and unit, e.g. 2 E7 gal
UNIT TOTALIZER	Use this function to define the unit for the totalizer. Options: Metric → cm³; dm³; m³; ml; l; hl; Ml US → cc; af; ft³; oz f; gal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals); bbl (filling tanks) Imperial → gal; Mgal; bbl (beer); bbl (petrochemicals) Factory setting: Depends on nominal diameter and country (dm³...m³ or US-gal...US-Mgal), corresponding to the totalizer unit factory setting (see page 49 forward.).
RESET TOTALIZER	Use this function to reset the sum and the overflow of the totalizer to "zero" (= RESET). Options: NO YES Factory setting: NO  Note! If the device is equipped with a status input and if it is appropriately configured, totalizer resetting can also be triggered by a pulse.

Function description TOTALIZER	
FAILSAFE MODE	Use this function to define the response of the totalizer to fault. Options: STOP The totalizer is paused until the fault is rectified. ACTUAL VALUE The totalizer continues to count on the basis of the current flow measuring value. The fault is ignored. HOLD VALUE The totalizer continues to count the flow on the basis of the last valid flow measuring value (before the fault occurred). Factory setting: STOP

8 Group CURRENT OUTPUT

Function description CURRENT OUTPUT	
ASSIGN CURRENT OUTPUT	Use this function to assign a measured variable to the current output. Options: OFF VOLUME FLOW Factory setting: VOLUME FLOW  Note! If you select OFF, the only function shown in this group is the function (ASSIGN CURRENT OUTPUT).
CURRENT RANGE	Use this function to define the current range. You can configure the current output either in accordance with the NAMUR recommendation (max. 20.5 mA) or for a maximum drive of 25 mA. Options: - NAMUR-compliant: 0-20 mA 4-20 mA 4-20 mA HART - not NAMUR-compliant: 0-20 mA (25 mA) 4-20 mA (25 mA) 4-20 mA (25 mA) HART Factory setting: 4-20 mA HART ① = Scaled full scale value Q = Flow  Note! When switching from an active to a passive output signal, select a current range of 4-20 mA (see Operating Instructions <i>PROline promag 50</i>, BA 046D/24/ae).

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Function description CURRENT OUTPUT	
VALUE 20 mA	Use this function to assign the 20 mA current a full scale value. Positive and negative values are permissible. The required measuring range is defined by defining the VALUE 20 mA. In the SYMMETRY measuring mode, (see page 40), the value assigned applies to both flow directions; in the STANDARD measuring mode it applies only to the flow direction selected. User input: 5-digit floating-point number, with sign Factory setting: Depends on nominal diameter and country, [value] / [dm³...m³ or US-gal...US-Mgal], corresponding to the factory setting for the full scale value (see page 49 forward.).  Note! • The appropriate unit is taken from the group SYSTEM UNITS, (see page 8). • The value for 0 or 4 mA always corresponds to the zero flow (0 [unit]). This value is fixed and cannot be edited.
TIME CONSTANT	Use this function to enter a time constant defining how the current output signal reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). User input: fixed-point number 0.01 - 100.00 s Factory setting: 1.00 s
FAILSAFE MODE	For safety reasons it is advisable to ensure that the current output assumes a predefined state in the event of a fault. The setting you select here affects only the current output. It has no effect on other outputs and the display (e.g. totalizers). Options: MIN. CURRENT Depends on the setting selected in the function CURRENT RANGE. If the current range is: 0-20 mA (25 mA) → Output current = 0 mA 4-20 mA (25 mA) → Output current = 2 mA 4-20 mA (25 mA) HART → Output current = 2 mA 0-20 mA → Output current = 0 mA 4-20 mA → Output current = 2 mA 4-20 mA HART → Output current = 2 mA MAX. CURRENT Depends on the setting selected in the function CURRENT RANGE. If the current range is: 0-20 mA (25 mA) → Output current = 25 mA 4-20 mA (25 mA) → Output current = 25 mA 4-20 mA (25 mA) HART → Output current = 25 mA 0-20 mA (NAMUR) → Output current = 22 mA 4-20 mA (NAMUR) → Output current = 22 mA 4-20 mA HART (NAMUR) → Output current = 22 mA HOLD VALUE Measuring value output is based on the last measuring value saved before the error occurred. ACTUAL VALUE Measuring value output is based on the current flow measurement. The fault is ignored. Factory setting: MIN. CURRENT

Function description CURRENT OUTPUT	
ACTUAL CURRENT	Use this function to view the computed actual value of the output current. User interface: 0.00 - 25.00 mA
SIMULATION CURRENT	Use this function to activate simulation of the current output. Options: OFF ON Factory setting: OFF  Note! • The "SIMULATION CURRENT OUTPUT" notice message indicates that simulation is active. • The measuring device continues to measure while simulation is in progress, i.e. the current measuring values are output correctly via the other outputs.  Caution! The setting is not saved if the power supply fails.
VALUE SIMULATION CURRENT	 Note! This function is not available unless the function SIMULATION CURRENT is active (= ON). Use this function to define a selectable value (e.g. 12 mA) to be output at the current output. This value is used to test downstream devices and the measuring device itself. User input: Floating-point number: 0.00 - 25.00 mA Factory setting: 0.00 mA  Caution! The setting is not saved if the power supply fails.

9 Group PULSE/FREQUENCY OUTPUT

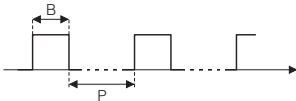
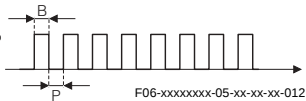
Function description PULSE/FREQUENCY OUTPUT	
This group is not available unless the measuring device is equipped with a pulse/frequency output.	
OPERATION MODE	Use this function to configure the output as a pulse output or frequency output. The functions available in this function group vary, depending on which option you select here. Options: PULSE FREQUENCY Factory setting: PULSE
ASSIGN FREQUENCY	 Note! This function is not available unless the FREQUENCY setting was selected in the function OPERATION MODE. Use this function to assign a measured variable to the frequency output. Options: OFF VOLUME FLOW Factory setting: VOLUME FLOW  Note! If you select OFF, the only functions shown in this function group are the functions ASSIGN FREQUENCY and OPERATION MODE.
END VALUE FREQUENCY	 Note! This function is not available unless the FREQUENCY setting was selected in the function OPERATION MODE. Use this function to define a full scale frequency for the frequency output. You define the associated measured value of the measuring range in the function VALUE-f HIGH on page 21. User input: 4-digit fixed-point number 2 - 1250 Hz Factory setting: 1000 Hz Example: • VALUE-f HIGH = 264 gal/hr, end frequency = 1000 Hz: i.e. at a flow of 264 gal/hr, a frequency of 1000 Hz is output. • VALUE-f HIGH = 951 gal/hr, end frequency = 1000 Hz: i.e. at a flow of 951 gal/hr, a frequency of 1000 Hz is output.  Note! • In the FREQUENCY operating mode the output signal is symmetrical (on/off ratio = 1:1). At low frequencies the pulse duration is limited to a maximum of 2 seconds, i.e. the on/off ratio is no longer symmetrical. • The initial frequency is always 0 Hz. This value is fixed and cannot be edited.

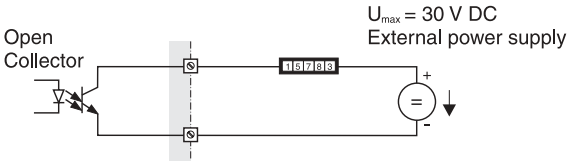
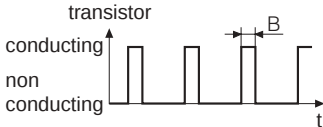
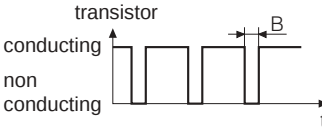
Function description PULSE/FREQUENCY OUTPUT	
VALUE-f HIGH	Note! This function is not available unless the FREQUENCY setting was selected in the function OPERATION MODE. Use this function to assign a value to the end value frequency. Positive and negative values are permissible. The required measuring range is defined by defining the VALUE-f HIGH. In the SYMMETRY measuring mode, (see page 40), the value assigned applies to both flow directions; in the STANDARD measuring mode it applies only to the flow direction selected. User input: 5-digit floating-point number Factory setting: Depends on nominal diameter and country, [value] / [dm³...m³ or US-gal...US-Mgal], corresponding to the factory setting for the full scale value (see page 49 forward.). Freq. [%] 125 100 0 ① 0 ② Q ① = VALUE-f HIGH, ② = Measuring range Q = Flow (positive / negative) Note! - The appropriate unit is taken from the group SYSTEM UNITS, (see page 8). - The value f-min. for the initial frequency always corresponds to the zero flow (0 [unit]). This value is fixed and cannot be edited.
OUTPUT SIGNAL	Note! This function is not available unless the FREQUENCY setting was selected in the function OPERATION MODE. Use this function to select the polarity of the frequency signal. Options: PASSIVE - POSITIVE PASSIVE - NEGATIVE Factory setting: PASSIVE-POSITIVE Open Collector 15705 U_{rmax} = 30 V DC External power supply F06-xxxxxxx-04-xx-xx-en-000 Note! For continuous currents up to 25 mA (I_{max} = 250 mA / 20 ms) PASSIVE-POSITIVE transistor conducting non conducting t PASSIVE-NEGATIVE transistor conducting non conducting t F-xxxxxxx-05-xx-xx-en-002

Function description PULSE/FREQUENCY OUTPUT	
TIME CONSTANT	 Note! This function is not available unless the FREQUENCY setting was selected in the function OPERATION MODE. Use this function to enter a time constant defining how the frequency output signal reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). User input: Floating-point number 0.00 - 100.00 s Factory setting: 0.00 s
FAILSAFE MODE	 Note! This function is not available unless the FREQUENCY setting was selected in the function OPERATION MODE. For safety reasons it is advisable to ensure that the frequency output assumes a predefined state in the event of a fault. Use this function to define this state. The setting you select here affects only the frequency output. It has no effect on other outputs and the display (e.g. totalizers). Options: FALLBACK VALUE Output is 0 Hz. FAILSAFE LEVEL Output is the frequency specified in the FAILSAFE VALUE function. HOLD VALUE Measuring value output is based on the last measuring value saved before the error occurred. ACTUAL VALUE Measuring value output is based on the current flow measurement. The fault is ignored. Factory setting: FALLBACK VALUE
FAILSAFE VALUE	 Note! This function is not available unless FREQUENCY was selected in the OPERATION MODE function and FAILSAFE LEVEL was selected in the function FAILSAFE MODE. Use this function to define the frequency that the measuring device should output in the event of a fault. User input: max. 4-digit number: 0 - 1250 Hz Factory setting: 1250 Hz

Function description PULSE/FREQUENCY OUTPUT	
ACTUAL FREQUENCY	 Note! This function is not available unless the FREQUENCY setting was selected in the function OPERATION MODE. Use this function to view the computed value of the output frequency. User interface: 0 - 1250 Hz
SIMULATION FREQUENCY	 Note! This function is not available unless the FREQUENCY setting was selected in the function OPERATION MODE. Use this function to activate simulation of the frequency output. Options: OFF ON Factory setting: OFF  Note! • The "SIMULATION FREQUENCY OUTPUT" notice message indicates that simulation is active. • The measuring device continues to measure while simulation is in progress, i.e. the current measuring values are output correctly via the other outputs.  Caution! The setting is not saved if the power supply fails.
VALUE SIMULATION FREQUENCY	 Note! This function is not available unless FREQUENCY was selected in the OPERATION MODE function and the function VALUE SIMULATION FREQUENCY is active (= ON). Use this function to define a selectable frequency value (e.g. 500 Hz) to be output at the frequency output. This value is used to test downstream devices and the measuring device itself. User input: 0 - 1250 Hz Factory setting: 0 Hz  Caution! The setting is not saved if the power supply fails.

Function description PULSE/FREQUENCY OUTPUT	
ASSIGN PULSE	 Note! This function is not available unless the PULSE setting was selected in the OPERATION MODE function. Use this function to assign a measured variable to the pulse output. Options: OFF VOLUME FLOW Factory setting: VOLUME FLOW  Note! If you select OFF, the only functions shown in this function group are the functions ASSIGN PULSE and OPERATION MODE.
PULSE VALUE	 Note! This function is not available unless the PULSE setting was selected in the OPERATION MODE function. Use this function to define the flow at which a pulse is triggered. These pulses can be totalled by an external totalizer and in this way the total flow since measuring commenced can be registered. User input: 5-digit floating-point number, [unit] Factory setting: Depends on nominal diameter and country, [value] [dm³...m³ or US-gal...US-Mgal] / pulse; corresponding to the factory setting for the pulse value (see page 49 forward.).  Note! The appropriate unit is taken from the group SYSTEM UNITS (see page 8).

Function description PULSE/FREQUENCY OUTPUT	
PULSE WIDTH	Note! This function is not available unless the PULSE setting was selected in the OPERATION MODE function. Use this function to enter the maximum pulse width of the output pulses. User input: 0.5 - 2000 ms Factory setting: 100 ms Pulse output is always with the pulse width (B) entered in this function. The intervals (P) between the individual pulses are automatically configured. However, they must at least correspond to the pulse width (B = P). B P B < P  B P B = P  F06-xxxxxxxx-05-xx-xx-xx-012 B = Pulse width entered (the illustration applies to positive pulses) P= Intervals between the individual pulses Caution! If the pulse number or frequency resulting from the pulse value entered, (see function PULSE VALUE on page 24), and from the current flow is too large to maintain the pulse width selected (interval P is smaller than the pulse width B entered), a system error message (pulse memory) is generated after buffering/ balancing time.

Function description PULSE/FREQUENCY OUTPUT	
OUTPUT SIGNAL	Note! This function is not available unless the PULSE setting was selected in the function OPERATION MODE. Use this function to configure the output in such a way that it matches an external counter, for example. Depending on the application, you can select the direction of the pulses here. Options: PASSIVE - POSITIVE PASSIVE - NEGATIVE Factory setting: PASSIVE - POSITIVE PASSIVE: Open Collector  Note! For continuous currents up to 25 mA ($I_{\max} = 250 \text{ mA} / 20 \text{ ms}$) PASSIVE-POSITIVE pulses  PASSIVE-NEGATIVE pulses  B = Pulse width
FAILSAFE MODE	Note! This function is not available unless the PULSE setting was selected in the function OPERATION MODE. For safety reasons it is advisable to ensure that the pulse output assumes a predefined state in the event of a fault. Use this function to define this state. The setting you select here affects only the pulse output. It has no effect on other outputs and the display (e.g. totalizers). Options: FALLBACK VALUE Output is 0 pulse. HOLD VALUE Measuring value output is based on the last measuring value saved before the error occurred. ACTUAL VALUE Measuring value output is based on the current flow measurement. The fault is ignored. Factory setting: FALLBACK VALUE

10 Group STATUS OUTPUT

Function description STATUS OUTPUT	
This group is not available unless the measuring device is equipped with a status output.	
ASSIGN STATUS OUTPUT	Use this function to assign a switching function to the status output. Options: OFF ON (operation) FAULT MESSAGE NOTICE MESSAGE FAULT MESSAGE or NOTICE MESSAGE EPD/OED (empty pipe detection/open electrode detection, only if active) FLOW DIRECTION VOLUME FLOW LIMIT VALUE Factory setting: FAULT MESSAGE  Note! - The behavior of the status output is a normally closed behavior, in other words the output is closed (transistor conductive) when normal, error-free measuring is in progress. - It is very important to read and comply with the information on the switching characteristics of the status output, (see page 30). - If you select OFF, the only function shown in this function group is the function ASSIGN STATUS OUTPUT.
ON-VALUE	 Note! This function is not available unless LIMIT VALUE or FLOW DIRECTION was selected in the function ASSIGN STATUS OUTPUT. Use this function to assign a value to the switch-on point (status output pulls up). The value can be equal to, greater than or less than the switch-off point. Positive and negative values are permissible. User input: 5-digit floating-point number, [unit] Factory setting: 0 [unit]  Note! - The appropriate unit is taken from the group SYSTEM UNITS, (see page 8). - Only the switch-on point is available for flow direction output (no switch-off point). If you enter a value not equal to the zero flow (e.g. 5), the difference between the zero flow and the value entered corresponds to half the switch-over hysteresis.

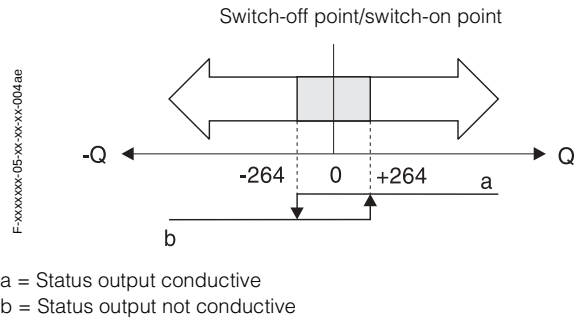
Function description STATUS OUTPUT	
OFF-VALUE	 Note! This function is not available unless LIMIT VALUE was selected in the function ASSIGN STATUS OUTPUT. Use this function to assign a value to the switch-off point (status output drops out). The value can be equal to, greater than or less than the switch-on point. Positive and negative values are permissible. User input: 5-digit floating-point number, [unit] Factory setting: 0 [unit]  Note! • The appropriate unit is taken from the group SYSTEM UNITS, (see page 8). • If SYMMETRY is selected in the function MEASURING MODE (page 40) and values with different signs are entered for the switch-on and switch-off points, the notice message "INPUT RANGE EXCEEDED" appears.
TIME CONSTANT	Use this function to enter a time constant defining how the measuring signal reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). The purpose of damping, therefore, is to prevent the status output changing state continuously in response to fluctuations in flow. User input: fixed-point number 0.00 - 100.00 s Factory setting: 0.00 s
ACTUAL STATUS OUTPUT	Use this function to check the current status of the status output. User interface: NOT CONDUCTIVE CONDUCTIVE
SIMULATION SWITCH POINT	Use this function to activate simulation of the status output. Options: OFF ON Factory setting: OFF  Note! • The "SIMULATION STATUS OUTPUT" message indicates that simulation is active. • The measuring device continues to measure while simulation is in progress, i.e. the current measuring values are output correctly via the other outputs.  Caution! The setting is not saved if the power supply fails.

Function description STATUS OUTPUT	
VALUE SIMULATION SWITCH POINT	Note! This function is not available unless the function SIMULATION SWITCH POINT is active (= ON). Use this function to define the switching response of the status output during the simulation. This value is used to test downstream devices and the measuring device itself. Options: NOT CONDUCTIVE CONDUCTIVE Factory setting: NOT CONDUCTIVE Caution! The setting is not saved if the power supply fails.

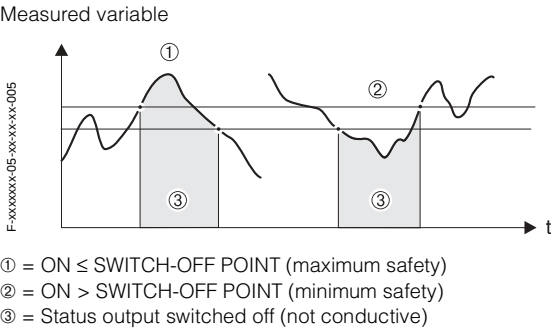
10.1 Information on the response of the status output

General
If you have configured the status output for "LIMIT VALUE" or "FLOW DIRECTION", you can configure the requisite switch points in the functions ON-VALUE and OFF-VALUE. When the measured variable in question reaches these predefined values, the status output switches as shown in the illustrations below.

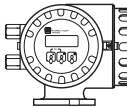
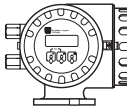
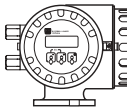
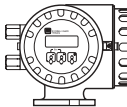
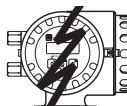
Status output configured for flow direction
The value entered in the function SWITCH-ON POINT defines the switch point for the positive and negative directions of flow. If, for example, the switch point entered is = 264 gal/hr, the status output switches off at -264 gal/hr (not conductive) and switches on again at +264 gal/hr (conductive). Set the switch point to 0 if your process calls for direct switchover (no switching hysteresis). If low flow cut off is used, it is advisable to set hysteresis to a value greater than or equal to the low flow cut off rate.



Status output configured for limit value
The status output switches as soon as the measured variable undershoots or overshoots a defined switch point.
Application: Monitoring flow or process-related boundary conditions.



10.2 Switching response of the status output

Function	Status		Open collector response (transistor)
ON (operation)	System in measuring mode		conductive 
	System not in measuring mode (power supply failed)		not conductive 
Fault message	System OK		conductive 
	(System or process error) Fault → Error response of outputs/inputs and totalizer		not conductive 
Notice message	System OK		conductive 
	(System or process error) Fault → Continuation of measuring		not conductive 
Fault message or notice message	System OK		conductive 
	(System or process error) Fault → Response to error or Note → Continuation of measuring		not conductive 
Empty pipe detection (EPD) / Open electrode detection (OED)	Measuring tube full		conductive 
	Measuring tube partially filled / empty measuring tube		not conductive 

Function	Status	Open collector response (transistor)
Flow direction	Forward	conductive
	Reverse	not conductive
Limit value Volume flow	Limit value not overshoot or undershot	conductive
	Limit value overshoot or undershot	not conductive

11 Group STATUS INPUT

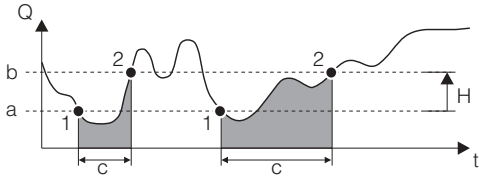
Function description STATUS INPUT	
This group is not available unless the measuring device is equipped with a status input.	
ASSIGN STATUS INPUT	Use this function to assign a switching function to the status input. Options: OFF RESET TOTALIZER POSITIVE ZERO RETURN Factory setting: OFF  Note! Positive zero return is active as long as the active level is available at the status input (continuous signal). All other assignments react to a change in level (pulse) at the status input.
ACTIVE LEVEL	Use this function to define whether the assigned switch function, (see function ASSIGN STATUS INPUT) is released or sustained when the level is present (HIGH) or not present (LOW). Options: HIGH LOW Factory setting: HIGH
MINIMUM PULSE WIDTH	Use this function to define a minimum pulse width which the input pulse must achieve in order to trigger the selected switching function. User input: 20 - 100 ms Factory setting: 50 ms
ACTUAL STATUS	Use this function to view the current level of the status input. User interface: HIGH LOW
SIMULATION STATUS INPUT	Use this function to activate simulation of the status input, i.e. to trigger the function assigned to the status input, (see function ASSIGN STATUS INPUT on page 27). Options: OFF ON Factory setting: OFF  Note! • The "SIMULATION STATUS INPUT" notice message indicates that simulation is active. • The measuring device continues to measure while simulation is in progress, i.e. the current measuring values are output correctly via the outputs.  Caution! The setting is not saved if the power supply fails.

Function description STATUS INPUT	
VALUE SIMULATION STATUS INPUT	 Note! This function is not available unless the function SIMULATION STATUS INPUT is active (=ON). Use this function to select the level to be simulated at the status input. Options: HIGH LOW Factory setting: LOW  Caution! The setting is not saved if the power supply fails.

12 Group COMMUNICATION

Function description COMMUNICATION	
TAG NAME	Use this function to enter a tag name for the measuring device. You can edit and read this tag name at the local display or via the HART protocol. User input: max. 8-character text, permitted characters are: A-Z, 0-9, +, -, punctuation marks Factory setting: "-----" (no text)
TAG DESCRIPTION	Use this function to enter a tag description for the measuring device. You can edit and read this tag description at the local display or via the HART protocol. User input: max. 16-character text, permitted characters are: A-Z, 0-9, +, -, punctuation marks Factory setting: "-----" (No text)
BUS ADDRESS	Use this function to define the address for the exchange of data with the HART protocol. User input: 0 - 15 Factory setting: 0  Note! Addresses 1 - 15: a constant 4 mA current is applied.
HART PROTOCOL	Use this function to display if the HART protocol is active. User interface: OFF = HART protocol not active ON = HART protocol active  Note! The HART protocol is activated by selecting 4-20 mA HART or 4-20 mA (25 mA) HART in the function CURRENT RANGE (see page 17).
MANUFACTURER NO.	Use this function to view the manufacturer number in decimal numerical format. User interface: 17 (≅ 11 hex) for Endress+Hauser
DEVICE ID	Use this function to view the device ID in hexadecimal numerical format. User interface: 41 (≅ 65 dez) for Promag 50

13 Group PROCESS PARAMETER

Function description PROCESS PARAMETER	
ASSIGN LOW FLOW CUT OFF	Use this function to assign the switch point for low flow cut off. Options: OFF VOLUME FLOW Factory setting: VOLUME FLOW
ON-VALUE LOW FLOW CUT OFF	Use this function to enter the switch-on point for low flow cut off. Low flow cut off is active if the value entered is not equal to 0. The sign of the flow value is highlighted on the display to indicate that low flow cut off is active. User input: 5-digit floating-point number, [unit] Factory setting: Depends on nominal diameter and country, [value] / [dm³...m³ or US-gal...US-Mgal], corresponding to the factory setting for the low flow cut off (see page 49 for- ward.).  Note! The appropriate unit is taken from the group SYSTEM UNITS (see page 8).
OFF-VALUE LOW FLOW CUT OFF	Use this function to enter the switch-off point for low flow cut off. Enter the switch-off point as a positive hysteresis value from the switch-on point. User input: Integer 0...100% Factory setting: 50% Example:  Q = Flow [volume/time] t = Time H = Hysteresis a = ON-VALUE LOW FLOW CUT OFF = 52.8 gal/hr b = OFF-VALUE LOW FLOW CUT OFF = 10% c = Low flow cut off active 1 = Low flow cut off is switched on at 52.8 gal/hr 2 = Low flow cut off is switched off at 58.1 gal/hr

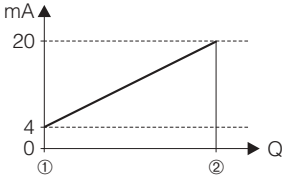
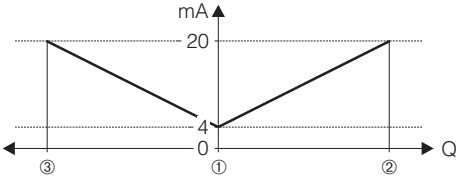
Function description PROCESS PARAMETER	
EPD/OED MODE	Use this function to activate empty pipe detection (EPD) or open electrode detection (OED). Options: OFF EPD (empty pipe detection) OED (open electrode detection) Factory setting: OFF  Note! - The EPD option is not available unless the sensor is equipped with an EPD electrode. - The default setting for the EPD/OED functions when the device is delivered is OFF. The functions must be activated as required. - The EPD/OED function is calibrated at the factory with potable water (500 µS/cm). If the conductivity of certain fluids deviates from this reference, empty pipe/full pipe adjustment, (see function EPD/OED ADJUSTMENT on page 37), must be performed on site. - The adjustment coefficients must be valid before switching on the EPD or OED. If these coefficients are not available, the function EPD/OED ADJUSTMENT (see page 37), is displayed. - The following alarm messages might appear on the display in the event of incorrect adjustment: - ADJUSTMENT FULL = EMPTY: The adjustment values for empty pipe and full pipe are identical. - ADJUSTMENT NOT OK: Adjustment is not possible as the fluid conductivity values are outside the permitted range. In such instances, empty pipe adjustment or full pipe adjustment must be carried out again. Notes on empty pipe detection (EPD) - Flow cannot be measured correctly unless the measuring pipe is completely full. This status can be monitored at all times by means of the EPD. - An empty or partially filled pipe is a process error. A default factory setting defines that a notice message is issued and that this process error has no effect on the outputs. - The EPD process error can be output via the configurable status output. - Use the function ASSIGN PROCESS ERROR, see page 45, to define whether a notice message or fault message should be triggered. Response to partially filled pipe If the EPD is switched on and responds to a partially filled or empty pipe, the notice message "EMPTY PIPE" appears on the display. If the pipe is partially empty and the EPD is not switched on, the response can vary in identically configured systems: - Flow reading fluctuates - Zero flow - Excessively high flow values Notes on open electrode detection (OED) Open electrode detection (OED) functions like the optional empty pipe detection (EPD). In contrast to the EPD where the measuring device must be equipped with a separate (optional) electrode, the OED detects partial filling (fluid no longer covers the measuring electrodes) by means of the two measuring electrodes which are present as standard. Open electrode detection can also be used if: - the sensor is not installed in the optimal position for using EPD (optimal = installed horizontally). - the sensor is not equipped with an additional (optional) fluid electrode.

Function description PROCESS PARAMETER	
EPD/OED ADJUSTMENT	Use this function to activate adjustment for an empty or full measuring tube. Options: OFF EPD FULL PIPE ADJUST EPD EMPTY PIPE ADJUST OED FULL PIPE ADJUST OED EMPTY PIPE ADJUST Factory setting: OFF Procedure for EPD or OED empty-pipe / full-pipe adjustment 1. Empty the piping. For empty pipe adjustment, the walls of the measuring tube should still be coated with fluid. 2. Start empty pipe adjustment: Select "EMPTY PIPE ADJUST" and press [E] to confirm. 3. Fill piping with fluid. 4. Start full-pipe adjustment with fluid at a standstill: Select "FULL PIPE ADJUST" and press [E] to confirm. 5. Terminate the adjustment procedure by selecting "OFF" and pressing [E] to confirm. 6. When the adjustment procedure is complete, switch on the detection system: Select "EPD" or "OED" (flashing) and press [E] to confirm.
EPD/OED RESPONSE TIME	 Note! The function is not available unless EPD or OED was selected in the function EPD/OED MODE. Use this function to enter the time span for which the criteria for an "empty" pipe have to be satisfied without interruption before a notice message or fault message is generated. The setting defined here is used by the active empty pipe detection (EPD) or open electrode detection (OED). User input: fixed-point number 1.0 - 100 s Factory setting: 1.0 s

Function description PROCESS PARAMETER	
ECC	 Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to activate cyclical electrode cleaning. Options: OFF ON Factory setting: ON (only if the optional electrode cleaning function ECC is available) Notes on electrode cleaning (ECC) Conductive deposits on the electrodes and on the walls of the measuring tube (e.g. magnetite) can falsify measurement values. The Electrode Cleaning Circuitry (ECC) was developed to prevent such conductive deposits building up in the vicinity of the electrodes. ECC functions as described above for all available electrode materials except tantalum. If tantalum is used as the electrode material, the ECC protects the electrode surface only against oxidation.  Caution! If the ECC is switched off for a prolonged period in applications with conductive deposits, a layer forms inside the measuring tube and this can falsify measurement values. If the layer is allowed to build up beyond a certain level, it might no longer be possible to remove it by switching on the ECC. If this happens the measuring tube must be cleaned and the layer removed.
ECC DURATION	 Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to specify the electrode cleaning duration. User input: fixed-point number 0.01 - 30.0 s Factory setting: 2.0 s
ECC RECOVERY TIME	 Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to specify the recovery time for which the last flow value measured prior to cleaning is retained. A recovery time is necessary as the signal outputs can fluctuate after electrode cleaning on account of electrochemical interference voltages. User input: max. 3-digit number: 1 - 600 s Factory setting: 5 s  Caution! The last value measured prior to cleaning is output for the duration of the recovery time (max. 600 s). This in turn means that the measuring system does not register changes in flow, e.g. stoppage, during this time span.

Function description PROCESS PARAMETER	
ECC CLEANING CYCLE	 Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to specify the cleaning cycle for electrode cleaning. User input: Integer: 30 - 10080 min Factory setting: 30 min

14 Group SYSTEM PARAMETERS

Function description SYSTEM PARAMETERS	
INSTALLATION DIRECTION SENSOR	Use this function to reverse the sign of the flow quantity, if necessary. Options: NORMAL (flow as indicated by the arrow) INVERSE (flow opposite to direction indicated by the arrow) Factory setting: NORMAL  Note! Ascertain the actual direction of fluid flow with reference to the direction indicated by the arrow on the sensor (nameplate).
MEASURING MODE	Use this function to select the measuring mode for all outputs and for the internal totalizer. Options: STANDARD SYMMETRY Factory setting: STANDARD The responses of the individual outputs and the internal totalizer in each of the measuring modes are described in detail on the following pages: Current output and frequency output STANDARD Only the flow components for the selected flow direction are totalled, (positive or negative full scale value ② = flow direction). Flow components in the opposite direction are not taken into account (suppression). Example for current output:  SYMMETRY The output signals of the current and frequency outputs are independent of the direction of flow (absolute amount of the measured variable). The "VALUE 20 mA" or "VALUE-f HIGH" ③ (e.g. backflow) corresponds to the mirrored VALUE 20 mA or VALUE-f HIGH ② (e.g. flow). Positive and negative flow components are taken into account. Example for current output:   Note! The direction of flow can be output via the configurable status output. (continued on next page)

Function description SYSTEM PARAMETERS	
MEASURING MODE (continued)	Pulse output STANDARD Only positive flow components are totalled. Negative components are not taken into account. SYMMETRY Positive and negative flow components are taken into account. Note! The direction of flow can be output via the configurable status output. Status output Note! The information is only applicable if LIMIT VALUE was selected in the function ASSIGN STATUS OUTPUT. STANDARD The status output signal switches at the defined switch points. SYMMETRY The status output signal switches at the defined switch points, irrespective of the sign. In other words, if you define a switch point with a positive sign, the status output signal switches as soon as the value is reached in the negative direction (negative sign), (see illustration). Example for the SYMMETRY measuring mode: Switch-on point: Q = 4 Switch-off point: Q = 10 ① = Status output switched on (conductive) ② = Status output switched off (not conductive) The graph shows a fluctuating flow signal Q over time t. The y-axis ranges from -10 to 10 with major ticks at -10, -4, 0, 4, and 10. The x-axis represents time t. Two horizontal dashed lines are drawn at Q=4 and Q=10. Two vertical shaded gray regions represent periods where the status output is switched on (conductive). The first shaded region starts when Q reaches 10 and ends when Q drops to 4. The second shaded region starts when Q reaches -10 and ends when Q rises to -4. Below the x-axis, arrows indicate the status output state: ① (conductive) for the first shaded region, ② (not conductive) for the unshaded regions, and ① (conductive) for the second shaded region.
	Totalizer STANDARD Only positive flow components are totalled. Negative components are not taken into account. SYMMETRY The positive and negative flow components are balanced. In other words, net flow in the flow direction is registered.

Function description SYSTEM PARAMETERS	
POSITIVE ZERO RETURN	Use this function to interrupt evaluation of measured variables. This is necessary when a piping system is being cleaned, for example. This setting acts on all function and outputs of the measuring device. Options: OFF ON → Signal output is set to the "ZERO FLOW" value. Factory setting: OFF
FLOW DAMPING	Use this function to set the filter depth of the digital filter. This reduces the sensitivity of the measuring signal to interference peaks (e.g. high solids content, gas bubbles in the fluid, etc.). The system reaction time increases with the filter setting. User input: 0 - 15 Factory setting: 7  Note! The system damping acts on all functions and outputs of the measuring device.
INTEGRATION TIME	Use this function to set the integration time. Under normal circumstances it is not necessary to change the factory settings. User input: 3.3 - 65 ms Factory setting: 20 ms at 50 Hz → power frequency (e.g. Europe) 16.7 ms at 60 Hz → power frequency (e.g. USA)  Note! The integration time defines the duration of internal totaling of the induced voltage in the fluid (measured by the measuring electrode), i.e. the time in which the measuring device records the true flow (afterwards the magnetic field for the next integration is created from the opposite pole).

15 Group SENSOR DATA

Function description SENSOR DATA	
All sensor data (calibration factors, zero point and nominal diameter etc.) are set at the factory and saved on the S-DAT sensor memory chip.  Caution! Under normal circumstances you should not change the following parameter settings, because changes affect numerous functions of the entire measuring facility in general and the accuracy of the measuring system in particular. For this reason, the functions described below cannot be changed even when you enter your personal code. Contact the E+H service organization if you have any questions about these functions.	
K-FACTOR POSITIVE	Use this function to display the current calibration factor (positive flow direction) for the sensor. The calibration factor is determined and set at the factory. User interface: 5-digit fixed-point number: 0.5000 - 2.0000 Factory setting: Depends on nominal diameter and calibration  Note! This value is also provided on the sensor nameplate.
K-FACTOR NEGATIVE	Use this function to display the current calibration factor (negative flow direction) for the sensor. The calibration factor is determined and set at the factory. User interface: 5-digit fixed-point number: 0.5000 - 2.0000 Factory setting: Depends on nominal diameter and calibration  Note! This value is also provided on the sensor nameplate.
ZERO POINT	This function shows the current zero-point correction value for the sensor. Zero-point correction is determined and set at the factory. User interface: max. 4-digit number: -1000 to +1000 Factory setting: Depends on nominal diameter and calibration  Note! This value is also provided on the sensor nameplate.
NOMINAL DIAMETER	This function shows the nominal diameter for the sensor. The nominal diameter depends on the size of the sensor and is set at the factory. User interface: 2 - 2000 mm or 1/12 - 78" Factory setting: Depends on the size of the sensor  Note! This value is also provided on the sensor nameplate.

Function description SENSOR DATA	
MEASURING PERIOD	Use this function to set the time for a full measuring period. The duration of the measuring period is calculated from the rise time of the magnetic field, the brief recovery time, the integration time (which can be set) and the empty pipe detection time. User input: 0.0 - 1000 ms Factory setting: Depends on nominal diameter  Note! The system checks the time entered and sets the measuring period which is actually used internally to a plausible value. If you enter 0 ms, the system automatically computes the shortest time.
OVERVOLTAGE TIME	Use this function to specify the time in which overvoltage is applied to the coil circuit in order to build up the magnetic field as fast as possible. The overvoltage time is adjusted automatically while measuring is in progress. The overvoltage time depends on the sensor type and the nominal diameter and is set at the factory. User interface: 4-digit floating-point number: 0.0 - 100.0 ms Factory setting: Depends on nominal diameter
EPD ELECTRODE	Use this function to check whether the sensor is equipped with an EPD electrode. User interface: YES NO Factory setting: YES → Electrode fitted as standard
POLARITY ECC	Use this function to display the actual current polarity for optional electrode cleaning (ECC). Electrode cleaning uses either a positive or negative current, depending on the electrode material. The measuring device automatically selects the correct polarity on the basis of the electrode-material data stored in the S-DAT™. User interface: POSITIVE → for electrodes made of: 1.4435, Hastelloy C, platinum NEGATIVE → for electrodes made of: tantalum  Caution! If the incorrect current is applied to the electrodes, the electrode material is destroyed.

16 Group SUPERVISION

Function description SUPERVISION	
CURRENT SYSTEM CONDITION	Use this function to check the present system status. User interface: "SYSTEM OK" or the fault / notice message with the highest priority.
PREVIOUS SYSTEM CONDITIONS	Use this function to view the 15 most recent fault and notice messages since measuring last started. User interface: The last 15 fault/notice messages appear on the display
ASSIGN SYSTEM ERROR	Use this function to view all system errors and the associated error categories (fault message or notice message). If you select a single system error you can change its error category. User interface: CANCEL List of system errors with an icon preceding each entry.  Note! • Press the  key twice to call up the ERROR CATEGORY function. • Use the  key combination or select "CANCEL" in the system error list to exit the function. • A list of possible system errors is provided in the Operating Instructions <i>PROline promag 50</i>, BA 046D/24/ae.
ERROR CATEGORY	Use this function to define whether a system error triggers a notice message or a fault message. If you select FAULT MESSAGES, all outputs respond to an error in accordance with their defined error response patterns. Options: NOTICE MESSAGES (display only) FAULT MESSAGES (outputs and display)  Note! Press the  key twice to call up the ASSIGN SYSTEM ERROR function.
ASSIGN PROCESS ERROR	Use this function to view all process errors and the associated error categories (fault message or notice message). If you select a single process error you can change its error category. User interface: CANCEL List of process errors with an icon preceding each entry.  Note! • Press the  key twice to call up the ERROR CATEGORY function. • Use the  key combination or select "CANCEL" in the process error list to exit the function. • A list of possible process errors is provided in the Operating Instructions <i>PROline promag 50</i>, BA 046D/24/ae.

Function description SUPERVISION	
ERROR CATEGORY	Use this function to define whether a process error triggers a notice message or a fault message. If you select FAULT MESSAGES, all outputs respond to an error in accordance with their defined error response patterns. Options: NOTICE MESSAGES (display only) FAULT MESSAGES (outputs and display)  Note! Press the  key twice to call up the ASSIGN PROCESS ERROR function.
ALARM DELAY	Use this function to define a time span in which the criteria for an error have to be satisfied without interruption before an error or notice message is generated. Depending on the setting and the type of error, this suppression acts on: • Display • Status output • Current output • Frequency output User input: 0 - 100 s (in steps of one second) Factory setting: 0 s  Caution! If this function is activated error and notice messages are delayed by the time corresponding to the setting before being forwarded to the higher-order controller (process controller, etc.). It is therefore imperative to check in advance in order to make sure whether a delay of this nature could affect the safety requirements of the process. If error and notice messages cannot be suppressed, a value of 0 seconds must be entered here.
SYSTEM RESET	Use this function to perform a reset of the measuring system. Options: NO RESTART SYSTEM (restart without interrupting power supply) Factory setting: NO
TROUBLESHOOTING	Use this function to rectify errors in the EEPROM. The EEPROM is divided into a number of blocks. Only blocks in which an error has occurred are shown. To rectify the error, select the block in question and press the  key to acknowledge the error.  Caution! When you clear an error in a block, the parameters of the block you select are reset to their factory settings. Options: CANCEL "Faulty Block"

17 Group SIMULATION SYSTEM

Function description SIMULATION SYSTEM	
SIMULATION FAILSAFE MODE	Use this function to set all inputs, outputs and the totalizer to their defined failsafe modes, in order to check whether they respond correctly. During this time, the words "SIMULATION FAILSAFE MODE" appear on the display. Options: ON OFF Factory setting: OFF
SIMULATION MEASURED VARIABLE	Use this function to set all inputs, outputs and the totalizer to their defined flow-response modes, in order to check whether they respond correctly. During this time, the words "SIMULATION MEASURAND" appear on the display. Options: OFF VOLUME FLOW Factory setting: OFF  Caution! • The measuring device cannot be used for measuring while this simulation is in progress. • The setting is not saved if the power supply fails.
VALUE SIMULATION MEASURED VARIABLE	 Note! This function is not available unless the SIMULATION MEASURED VARIABLE function is active (= VOLUME FLOW). Use this function to specify a selectable value (e.g. 500 gal/s). This value is used to test downstream devices and the measuring device itself. User input: 5-digit floating-point number, [unit] Factory setting: 0 [unit]  Caution! The setting is not saved if the power supply fails.  Note! The appropriate unit is taken from the group SYSTEM UNITS, (see page 8)

18 Group SENSOR VERSION

Function description SENSOR VERSION	
SERIAL NUMBER	Use this function to view the serial number of the sensor.
SENSOR TYPE	Use this function to view the sensor type.
HARDWARE REVISION NUMBER SENSOR	Use this function to view the hardware revision number of the sensor.
SOFTWARE REVISION NUMBER S-DAT	Use this function to view the software revision number of the software used to create the content of the S-DAT.

19 Group AMPLIFIER VERSION

Function description AMPLIFIER VERSION	
HARDWARE REVISION NUMBER AMPLIFIER	Use this function to view the hardware revision number of the amplifier.
SOFTWARE REVISION NUMBER AMPLIFIER	Use this function to view the software revision number of the amplifier.
I/O MODULE TYPE	Use this function to view the configuration of the I/O module complete with terminal numbers.
HARDWARE REVISION NUMBER I/O MODULE	Use this function to view the hardware revision number of the I/O module.
SOFTWARE REVISION NUMBER I/O MODULE	Use this function to view the software revision number of the I/O module.

20 Factory settings

20.1 SI units (not for USA and Canada)

20.1.1 Low flow cut off, full scale value, pulse value, totalizer

Nominal diameter		Low flow cut off		Full scale value		Pulse value		Totalizer
[mm]	[inch]	(approx. v = 0.04 m/s)		(approx. v = 2.5 m/s)		(approx. 2 pulses/sec- ond at v = 2.5 m/s)		
2	1/12"	0.01	dm ³ /min	0.5	dm ³ /min	0.005	dm ³	dm ³
4	5/32"	0.05	dm ³ /min	2	dm ³ /min	0.025	dm ³	dm ³
8	5/16"	0.1	dm ³ /min	8	dm ³ /min	0.10	dm ³	dm ³
15	1/2"	0.5	dm ³ /min	25	dm ³ /min	0.20	dm ³	dm ³
25	1"	1	dm ³ /min	75	dm ³ /min	0.50	dm ³	dm ³
32	1 1/4"	2	dm ³ /min	125	dm ³ /min	1.00	dm ³	dm ³
40	1 1/2"	3	dm ³ /min	200	dm ³ /min	1.50	dm ³	dm ³
50	2"	5	dm ³ /min	300	dm ³ /min	2.50	dm ³	dm ³
65	2 1/2"	8	dm ³ /min	500	dm ³ /min	5.00	dm ³	dm ³
80	3"	12	dm ³ /min	750	dm ³ /min	5.00	dm ³	dm ³
100	4"	20	dm ³ /min	1200	dm ³ /min	10.00	dm ³	dm ³
125	5"	30	dm ³ /min	1850	dm ³ /min	15.00	dm ³	dm ³
150	6"	2.5	m ³ /h	150	m ³ /h	0.025	m ³	m ³
200	8"	5.0	m ³ /h	300	m ³ /h	0.05	m ³	m ³
250	10"	7.5	m ³ /h	500	m ³ /h	0.05	m ³	m ³
300	12"	10	m ³ /h	750	m ³ /h	0.10	m ³	m ³
350	14"	15	m ³ /h	1000	m ³ /h	0.10	m ³	m ³
400	16"	20	m ³ /h	1200	m ³ /h	0.15	m ³	m ³
450	18"	25	m ³ /h	1500	m ³ /h	0.25	m ³	m ³
500	20"	30	m ³ /h	2000	m ³ /h	0.25	m ³	m ³
600	24"	40	m ³ /h	2500	m ³ /h	0.30	m ³	m ³
700	28"	50	m ³ /h	3500	m ³ /h	0.50	m ³	m ³
–	30"	60	m ³ /h	4000	m ³ /h	0.50	m ³	m ³
800	32"	75	m ³ /h	4500	m ³ /h	0.75	m ³	m ³
900	36"	100	m ³ /h	6000	m ³ /h	0.75	m ³	m ³
1000	40"	125	m ³ /h	7000	m ³ /h	1.00	m ³	m ³
–	42"	125	m ³ /h	8000	m ³ /h	1.00	m ³	m ³
1200	48"	150	m ³ /h	10000	m ³ /h	1.50	m ³	m ³
–	54"	200	m ³ /h	13000	m ³ /h	1.50	m ³	m ³
1400	–	225	m ³ /h	14000	m ³ /h	2.00	m ³	m ³
–	60"	250	m ³ /h	16000	m ³ /h	2.00	m ³	m ³
1600	–	300	m ³ /h	18000	m ³ /h	2.50	m ³	m ³
–	66"	325	m ³ /h	20500	m ³ /h	2.50	m ³	m ³
1800	72"	350	m ³ /h	23000	m ³ /h	3.00	m ³	m ³
–	78"	450	m ³ /h	28500	m ³ /h	3.50	m ³	m ³
2000	–	450	m ³ /h	28500	m ³ /h	3.50	m ³	m ³

20.1.2 Language

Country	Language
Austria	Deutsch
Belgium	Francais
Denmark	English
England	English
Finland	English
France	Francais
Germany	Deutsch
Holland	English
Hong Kong	English
Instruments International	English
Italy	Italiano
Japan	Japanese
Malaysia	English
Norway	English
Singapore	English
South Africa	English
Spain	Espanol
Sweden	English
Switzerland	Deutsch
Thailand	English

20.1.3 Length

	Unit
Length	mm

20.2 US units (only for USA and Canada)

20.2.1 Low flow cut off, full scale value, pulse value, totalizer

Nominal diameter		Low flow cut off		Full scale value		Pulse value		Totalizer
[inch]	[mm]	(approx. v = 0.1 ft/s) (approx. v = 0.04 m/s)		(approx. v = 3 ft/s) (approx. v = 2.5 m/s)		(approx. 2 pulses/s at v = 3 ft/s [2.5 m/s])		
1/12"	2	0.002	gpm	0.1	gpm	0.001	gal	gal
5/32"	4	0.008	gpm	0.5	gpm	0.005	gal	gal
5/16"	8	0.025	gpm	2	gpm	0.02	gal	gal
1/2"	15	0.10	gpm	6	gpm	0.05	gal	gal
1"	25	0.25	gpm	18	gpm	0.20	gal	gal
1 1/4"	32	0.50	gpm	30	gpm	0.20	gal	gal
1 1/2"	40	0.75	gpm	50	gpm	0.50	gal	gal
2"	50	1.25	gpm	75	gpm	0.50	gal	gal
2 1/2"	65	2.0	gpm	130	gpm	1	gal	gal
3"	80	2.5	gpm	200	gpm	2	gal	gal
4"	100	4.0	gpm	300	gpm	2	gal	gal
5"	125	7.0	gpm	450	gpm	5	gal	gal
6"	150	12	gpm	600	gpm	5	gal	gal
8"	200	15	gpm	1200	gpm	10	gal	gal
10"	250	30	gpm	1500	gpm	15	gal	gal
12"	300	45	gpm	2400	gpm	25	gal	gal
14"	350	60	gpm	3600	gpm	30	gal	gal
16"	400	60	gpm	4800	gpm	50	gal	gal
18"	450	90	gpm	6000	gpm	50	gal	gal
20"	500	120	gpm	7500	gpm	75	gal	gal
24"	600	180	gpm	10500	gpm	100	gal	gal
28"	700	210	gpm	13500	gpm	125	gal	gal
30"	–	270	gpm	16500	gpm	150	gal	gal
32"	800	300	gpm	19500	gpm	200	gal	gal
36"	900	360	gpm	24000	gpm	225	gal	gal
40"	1000	480	gpm	30000	gpm	250	gal	gal
42"	–	600	gpm	33000	gpm	250	gal	gal
48"	1200	600	gpm	42000	gpm	400	gal	gal
54"	–	1.3	Mgal/d	75	Mgal/d	0.0005	Mgal	Mgal
–	1400	1.3	Mgal/d	85	Mgal/d	0.0005	Mgal	Mgal
60"	–	1.3	Mgal/d	95	Mgal/d	0.0005	Mgal	Mgal
–	1600	1.7	Mgal/d	110	Mgal/d	0.00075	Mgal	Mgal
66"	–	2.2	Mgal/d	120	Mgal/d	0.00075	Mgal	Mgal
72"	1800	2.6	Mgal/d	140	Mgal/d	0.00075	Mgal	Mgal
78"	–	3.0	Mgal/d	175	Mgal/d	0.001	Mgal	Mgal
–	2000	3.0	Mgal/d	175	Mgal/d	0.001	Mgal	Mgal

20.2.2 Language, length

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Length	mm

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Greenwood, IN 46143
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1440 Graham's Lane, #1, Burlington
Ont. Canada L7S 1W3
Return Authorization number:

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