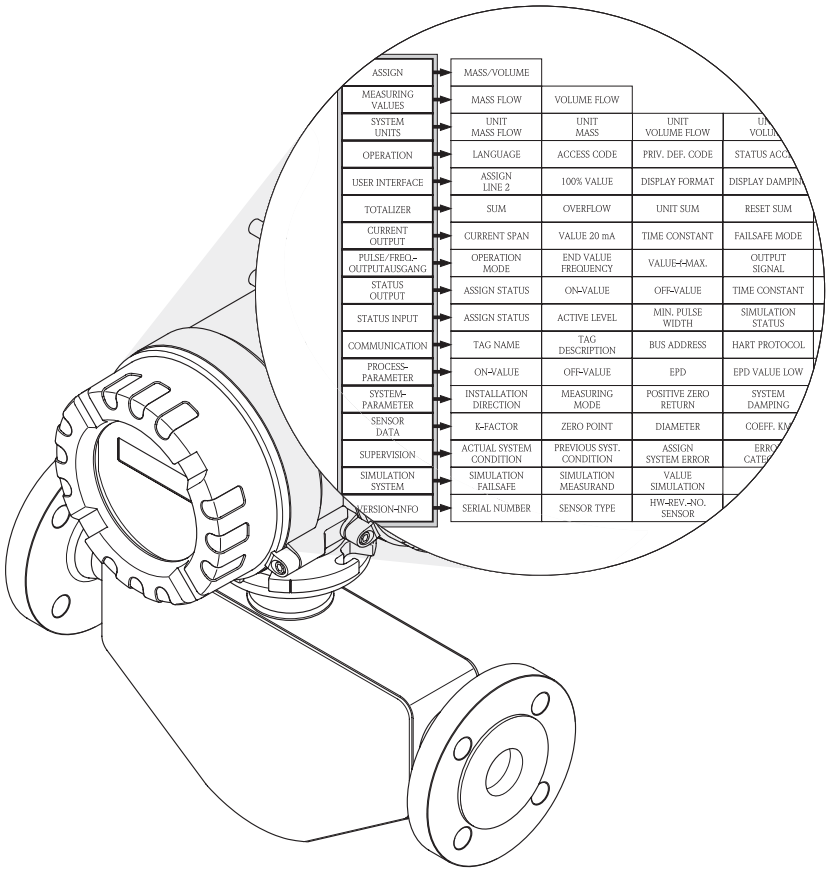
Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Description of Device Functions

Proline Promass 40

Coriolis Mass Flow Measuring System



BA062D/06/en/09.08
71085235

Valid as of version:
V 3.00.XX (device software)

Endress+Hauser
People for Process Automation

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Registered trademarks of Endress+Hauser Flowtec AG, Reinach, CH

1 HART Function Matrix

1.1 The HART function matrix: layout and use

The HART function matrix is a two-level construction: the groups form one level, the functions the other.
The groups are the highest-level grouping of the control options for the measuring device.
Each group comprises a number of functions.
You select a group in order to access the individual functions for controlling or parameterizing the measuring device.

You will find an overview of the groups in the table of contents on Page 3 and in the graphical representation of the HART Function Matrix on Page 6.
You will also find an overview of the functions on Page 6, complete with the page references of the detailed function descriptions.
The descriptions of the individual functions start on Page 7.

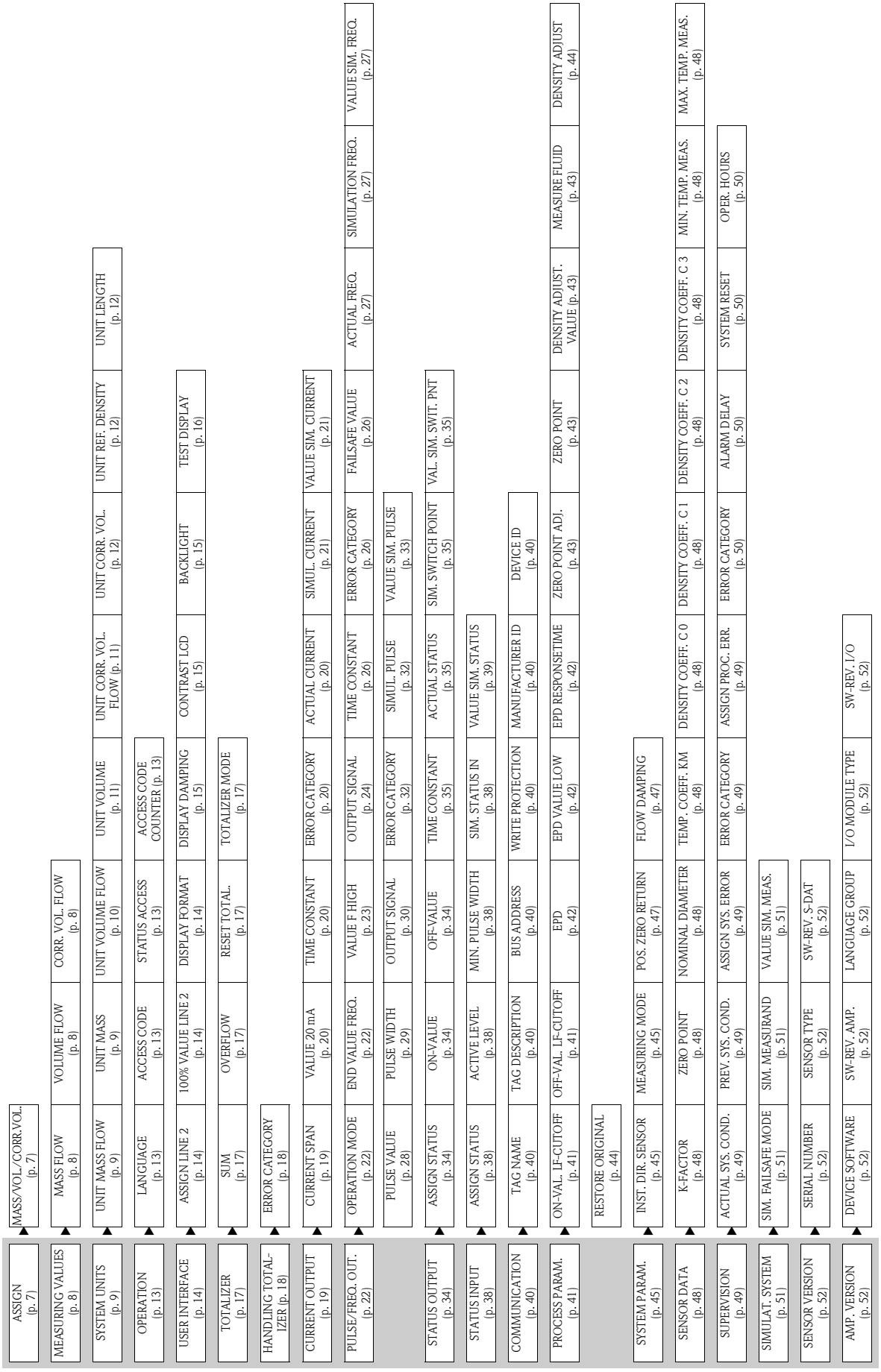
1.2 Operation with the HART protocol

The flowmeter can be parameterized and measured values called up by using the HART protocol. You have the following possibilities for the operation:

- The “HART Communicator DXR375” universal handheld terminal.
- A personal computer using the configuration software “FieldCare” and the “Commubox FXA193” modem.

For a detailed description of the operation with the HART protocol, please refer to the Operating Instructions BA061D/06/en “Promass 40”.

1.3 Graphical illustration of the HART function matrix



2 Group ASSIGN

Function description ASSIGN	
MASS/VOL./CORR.VOL.	Promass 40 can be configured as mass flowmeter, volume flowmeter or corrected volume flowmeter. The measuring mode selection is done in this function. **Options:** MASS (mass flowmeter) VOLUME (volume flowmeter) CORRECTED VOLUME (corrected volume flowmeter) **Factory setting:** MASS Caution! The selection in this function has influence on: ■ the available functions, e.g. assignment of system units (UNIT MASS FLOW, UNIT VOLUME FLOW or UNIT CORRECTED VOLUME FLOW) ■ the available selections within single functions, e.g. assignment of status output (LIMIT MASS or LIMIT VOLUME) In case the measuring mode is changed, the following functions must be checked and adjusted if necessary: 1. In case of changing measuring mode from MASS to (CORRECTED) VOLUME: ■ UNIT VOLUME FLOW ■ UNIT VOLUME ■ 100% VALUE LINE 2 ■ VALUE 20 mA ■ VALUE F HIGH ■ PULSE VALUE ■ ASSIGN STATUS ■ ON-VALUE ■ OFF-VALUE ■ ON VALUE LOW FLOW CUT OFF ■ OFF VALUE LOW FLOW CUT OFF 2. In case of changing measuring mode from (CORRECTED) VOLUME to MASS: ■ UNIT MASS FLOW ■ UNIT MASS ■ 100% VALUE LINE 2 ■ VALUE 20 mA ■ VALUE F HIGH ■ PULSE VALUE ■ ASSIGN STATUS ■ ON-VALUE ■ OFF-VALUE ■ ON VALUE LOW FLOW CUT OFF ■ OFF VALUE LOW FLOW CUT OFF

3 Group MEASURING VALUES

Function description MEASURING VALUES	
✎ Note! ■ The engineering unit of the measured variable shown here can be set in the “SYSTEM UNITS” group. ■ If the fluid in the pipe flows backwards, a negative sign prefixes the flow reading on the display.	
MASS FLOW	✎ Note! This function is not available unless MASS was selected in the MASS/VOL./CORR.VOL. function (see Page 7). Display of the currently measured mass flow. **Display shows:** 5-digits with floating decimal point, including unit and sign (e.g. 462.87 kg/h; –731.63 lb/min; etc.)
VOLUME FLOW	✎ Note! This function is not available unless VOLUME was selected in the MASS/VOL./CORR.VOL. function (see Page 7). Display of the currently measured volumetric flow. **Display shows:** 5-digits with floating decimal point, including unit and sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; –731.63 gal/d; etc.)
CORRECTED VOLUME FLOW	✎ Note! This function is not available unless CORRECTED VOLUME was selected in the MASS/VOL./CORR.VOL. function (see Page 7). Display of the currently measured corrected volume flow. **Display shows:** 5-digits with floating decimal point, including unit and sign (e.g. 1.3549 Nm^3/h; 7.9846 scm/day; etc.)

4 Group SYSTEM UNITS

Function description SYSTEM UNITS	
You can select the unit for the measured variable in this function group.	
UNIT MASS FLOW	✎ Note! This function is not available unless MASS was selected in the MASS/VOL./CORR.VOL. function (see Page 7). Use this function to select the unit for displaying the mass flow (mass/time). The unit you select here is also valid for: ■ Current output ■ Frequency output ■ Status output (limit value for mass flow, flow direction) ■ Low flow cut off **Options:** Metric: gram → g/s; g/min; g/h; g/day kilogram → kg/s; kg/min; kg/h; kg/day Metric ton → t/s; t/min; t/h; t/day US: ounce → oz/s; oz/min; oz/h; oz/day pound → lb/s; lb/min; lb/h; lb/day ton → ton/s; ton/min; ton/h; ton/day **Factory setting:** kg/h
UNIT MASS	✎ Note! This function is not available unless MASS was selected in the MASS/VOL./CORR.VOL. function (see Page 7). Use this function to select the unit for displaying the mass. The unit you select here is also valid for: ■ Pulse value (e.g. kg/p) ■ Totalizer **Options:** Metric → g; kg; t US → oz; lb; ton **Factory setting:** kg

Function description SYSTEM UNITS	
UNIT VOLUME FLOW	✎ Note! This function is not available unless VOLUME was selected in the MASS/VOL./CORR.VOL. function (see Page 7). 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 → cm^3/s; cm^3/min; cm^3/h; cm^3/day Cubic decimeter → dm^3/s; dm^3/min; dm^3/h; dm^3/day Cubic meter → m^3/s; m^3/min; m^3/h; m^3/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 → ft^3/s; ft^3/min; ft^3/h; ft^3/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 gallon → 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:** m^3/h

Function description SYSTEM UNITS	
UNIT VOLUME	✎ Note! This function is not available unless VOLUME was selected in the MASS/VOL./CORR.VOL. function (see Page 7). Use this function to select the unit for displaying the volume. The unit you select here is also valid for: ■ Pulse value (e.g. m^3/p) ■ Totalizer **Options:** Metric → cm^3; dm^3; m^3; ml; l; hl; Ml US → cc; af; ft^3; oz f; gal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals); bbl (filling tanks) Imperial → gal; Mgal; bbl (beer); bbl (petrochemicals) **Factory setting:** m^3
UNIT CORR. VOL. FLOW	Use this function to select the unit for displaying the corrected volume flow (corrected volume/time). The unit you select here is also valid for: ■ Current outputs ■ Frequency outputs ■ Switch points (limit value for corrected volume flow, flow direction) ■ Low flow cut off **Options:** Metric: Nl/s Nl/min Nl/h Nl/day Nm^3/s Nm^3/min Nm^3/h Nm^3/day US: Sm^3/s Sm^3/min Sm^3/h Sm^3/day Scf/s Scf/min Scf/h Scf/day **Factory setting:** Nm^3/h

Function description SYSTEM UNITS	
UNIT CORR. VOLUME	Use this function to select the unit for displaying the corrected volume. The unit you select here is also valid for: ■ Pulse value (e.g. Nm^3/p) ■ Totalizer **Options:** Metric: Nm^3 Nl US: Sm^3 Scf **Factory setting:** Nm^3
UNIT REF. DENSITY	Use this function to select the unit for displaying the reference density. The unit you select here is also valid for: ■ Fixed reference density (for calculation of corrected volume flow) **Options:** Metric: kg/Nm^3 kg/Nl US: g/Scc kg/Sm^3 lb/Scf **Factory setting:** kg/Nl
UNIT LENGTH	Use this function to select the unit for displaying the nominal diameter. The unit you select here is also valid for: ■ nominal diameter of the sensor (see the NOMINAL DIAMETER function on Page 48) **Options:** MILLIMETER INCH **Factory setting:** MILLIMETER (SI units: not for USA and Canada) INCH (US units: only for USA and Canada)

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. ✎ Note! The displayed options depend on the available language group shown in the LANGUAGE GROUP function. **Options:** Language group WEST EU/USA: ENGLISH DEUTSCH FRANCAIS ESPANOL ITALIANO NEDERLANDS PORTUGUESE **Factory setting:** Country-dependent, see factory settings on Page 53
ACCESS CODE	Certain functions are accessible only for service purposes when a special service code is entered. This code is entered in this function by the Endress+Hauser service technician.
STATUS ACCESS	Use this function to check the access status for the function matrix. **Display shows:** ACCESS USER
ACCESS CODE COUNTER	Displays how often the customer code or service code has been entered to gain access to the function matrix. **Display shows:** max. 7-digit number: 0...9999999 **Factory setting:** 0

6 Group USER INTERFACE

Function description USER INTERFACE	
ASSIGN LINE 2	Use this function to define the display value assigned to the additional line (the bottom line of the local display) for display during normal measuring operation. **Options (if the instrument works as mass flowmeter):** OFF MASS FLOW IN % TOTALIZER TAG NAME SYSTEM CONDITION FLOW DIRECTION MASS FLOW BARGRAPH IN % **Options (if the instrument works as volume flowmeter):** OFF VOLUME FLOW IN % TOTALIZER TAG NAME SYSTEM CONDITION FLOW DIRECTION VOLUME FLOW BARGRAPH IN % **Factory setting:** TOTALIZER ✎ Note! The first line is always assigned to the flow value selected in the function MASS/VOL./CORR.VOL. (see Page 7).
100% VALUE LINE 2	✎ Note! This function is not available unless MASS FLOW IN % or MASS FLOW BARGRAPH IN % resp. VOLUME FLOW IN % or VOLUME FLOW BARGRAPH IN % was selected in the ASSIGN LINE 2 function. Use this function to define the flow value to be shown on the display as the 100% value of the variable assigned to line 2. **User input:** 5-digit floating-point number **Factory setting:** ■ 10 kg/s (if the instrument works as mass flowmeter) ■ 10 l/s (if the instrument works as volume flowmeter)
DISPLAY FORMAT	Use this function to define the maximum number of digits 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 these instances an arrow appears on the display between the measured value and the engineering unit (e.g. 1.2 → kg/h), 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 s **Factory setting:** 1 s ✎ Note! Setting the time constant to 0 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%
BACKLIGHT	Use this function to optimize the backlight to suit local operating conditions. **User input:** 0...100% ✎ Note! Entering the value “0” means that the backlight is “switched off”. The display then no longer emits any light, i.e. the display texts can no longer be read in the dark. **Factory setting:** 50%

Function description USER INTERFACE	
TEST DISPLAY	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 minimum 0.75 seconds. 3. Main line and additional line show an “8” in each field for minimum 0.75 seconds. 4. Main line and additional line show a “0” in each field for minimum 0.75 seconds. 5. Main line and additional line show nothing (blank display) for minimum 0.75 seconds. 6. When the test completes the local display returns to its initial state and the setting changes to OFF.

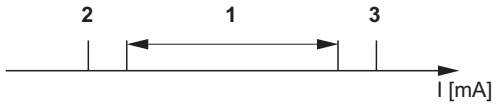
7 Group TOTALIZER

Function description TOTALIZER	
SUM	Use this function to view the total for the totalizer measured variable accumulated since measuring commenced. The value can be positive or negative. **Display shows:** max. 7-digit floating-point number, including sign and unit (e.g. 15467.04 kg) ✎ Note! ■ The totalizer response to faults is defined in the FAILSAFE MODE TOTALIZER function (see Page 18). ■ The unit of the totalizer depends on the selections in the MASS/VOL./CORR.VOL. function and in the SYSTEM UNITS group.
OVERFLOW	Use this function to view the overflow for the totalizer accumulated since measuring commenced. Total flow quantity is represented by a floating decimal 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 OVERFLOW plus the value returned by the SUM function. Example: Reading for 2 overflows: 2 E7 kg (= 20,000,000 kg) The value returned by the SUM function = 196,845.7 kg Effective total quantity = 20,196,845.7 kg **Display shows:** Integer with exponent, including sign and unit, e.g. 2 E7 kg
RESET TOTALIZER	Use this function to reset the sum and the overflow of the totalizer to zero. **Options:** NO - YES **Factory setting:** NO ✎ Note! If the device has a status input and is appropriately configured, a reset for the totalizer can also be triggered by a pulse.
TOTALIZER MODE	Use this function to define how the flow components are to be totalized. **Options:** BALANCE Positive and negative flow components. The positive and negative flow components are balanced. In other words, net flow in the flow direction is registered. FORWARD Only positive flow components are totalized. REVERSE Only negative flow components are totalized. **Factory setting:** Totalizer 1 = BALANCE Totalizer 2 = FORWARD

8 Group HANDLING TOTALIZER

Function description HANDLING TOTALIZER	
ERROR CATEGORY	Use this function to define the totalizer response to fault. **Options:** STOP The totalizer is paused until the fault is rectified. ACTUAL VALUE The totalizer continues to count based on the current flow measured value. The fault is ignored. HOLD VALUE The totalizer continues to count the flow based on the last valid flow value (before the fault occurred). **Factory setting:** STOP

9 Group CURRENT OUTPUT

Function description CURRENT OUTPUT	
The current output is automatically assigned to mass, volume or corrected volume measurement, depending on the selection in the MASS/VOL./CORR.VOL. function (see Page 7).	
CURRENT SPAN	Use this function to define the current span. The selection specifies the operational range and the lower and upper signal on alarm. For the current output 1 the option HART can be defined additionally. **Options:** 4–20 mA HART 4–20 mA HART NAMUR 4–20 mA HART US 4–20 mA (25 mA) HART **Factory setting:** 4–20 mA HART NAMUR ✎ Note! When switching the hardware from an active (factory setting) to a passive output signal select a current span of 4–20 mA (please refer to the Operating Instructions Proline Promass 40, BA 061D/06/en). **Current span, operational range and signal on alarm level**  A0003232 *a = Current span* *1 = Operational range (measuring information)* *2 = Lower signal on alarm level* *3 = Upper signal on alarm level* ✎ Note! ■ If the measured value exceeds the measuring range (as defined in the function VALUE 20 mA) a notice message is generated (#351 current span). ■ In case of a fault the behavior of the current output is according to the selected option in the function ERROR CATEGORY. Change the error category in the function ASSIGN SYSTEM ERROR to generate a fault message instead of a notice message.

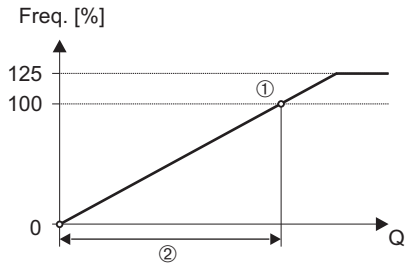
a	1	2	3
4-20 mA HART	4 - 20.5 mA	2	22
4-20 mA HART NAMUR	3.8 - 20.5 mA	3.5	22.6
4-20 mA HART US	3.9 - 20.8 mA	3.75	22.6
4-20 mA (25 mA) HART	4 - 24 mA	2	25

Function description CURRENT OUTPUT	
VALUE 20 mA	Use this function to assign a flow value to the 20 mA current. In the SYMMETRY measuring mode (see Page 45), the value assigned in this way applies to both flow directions; in the STANDARD measuring mode it applies only to positive flow (forward flow). **User input:** 5-digit floating-point number (with sign for the MASS FLOW, VOLUME FLOW, CORRECTED VOLUME FLOW measured variables) **Factory setting:** depends on nominal diameter and country (see Page 53). ✎ Note! The appropriate unit is taken from the corresponding UNIT function in the group SYSTEM UNITS (see Page 9).
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
ERROR CATEGORY	For reasons of safety 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:** MINIMUM CURRENT The current output adopts the value of the lower signal on alarm level (as defined in the function CURRENT SPAN). MAXIMUM CURRENT The current output adopts the value of the upper signal on alarm level (as defined in the function CURRENT SPAN). HOLD VALUE (**not recommended**) Measuring value output is based on the last measuring value saved before the error occurred . ACTUAL VALUE Measured value output on the basis of the current flow measurement. The fault is ignored. **Factory setting:** MINIMUM CURRENT
ACTUAL CURRENT	Use this function to view the computed value of the output current. **Display shows:** 0.00...25.00 mA

Function description CURRENT OUTPUT	
SIMULATION CURR	Use this function to activate simulation of the current output. **Options:** ON OFF **Factory setting:** OFF ✎ Note! The "SIMULATION CURRENT OUTPUT" message indicates that simulation is active. The measuring device continues to measure while simulation is in progress, i.e. the actual measured 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 SIMULATION CURR function 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 flowmeter 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.

10 Group PULSE/FREQUENCY OUTPUT

Function description PULSE/FREQUENCY OUTPUT	
The pulse/frequency output is automatically assigned to mass, volume or corrected volume measurement, depending on the selection in the function MASS/VOL./CORR.VOL. (see Page 7).	
OPERATION MODE	Use this function to configure the output as a pulse or frequency output. The functions available in this function group vary, depending on which option you select here. **Options:** PULSE FREQUENCY **Factory setting:** PULSE
END VALUE FREQ.	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. 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 VALUE F HIGH function described on Page 23. **User input:** 5-digit fixed-point number: 2...1000 Hz **Factory setting:** 1000 Hz Example: ■ VALUE F HIGH = 1000 kg/h, full scale frequency = 1000 Hz: i.e. a frequency of 1000 Hz is output at a flow of 1000 kg/h. ■ VALUE F HIGH = 3600 kg/h, full scale frequency = 1000 Hz: i.e. a frequency of 1000 Hz is output at a flow of 3600 kg/h. ✎ 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 10 seconds, i.e. the on/off ratio is no longer symmetrical.

Function description PULSE/FREQUENCY OUTPUT	
VALUE F HIGH	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. Use this function to assign a flow value to the full scale frequency. Positive and negative values are permissible. You define a measuring range by defining the VALUE F HIGH. **User input:** 5-digit floating-point number **Factory setting:** depends on nominal diameter  A0001224 ① = VALUE F HIGH, ② = Measuring range, Q = Flow (forward/backward) ✎ Note! The appropriate unit is taken from the corresponding UNIT function in the group SYSTEM UNITS (see Page 9).

Function description PULSE/FREQUENCY OUTPUT

OUTPUT SIGNAL

✎ Note!
This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function.

Use this function to select the polarity of the frequency signal.

Options:
PASSIVE – POSITIVE, PASSIVE – NEGATIVE

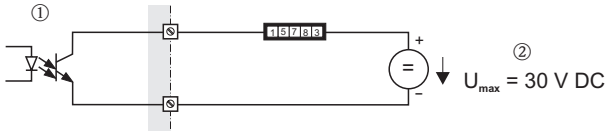
Factory setting:
PASSIVE - POSITIVE

Explanation
- PASSIVE = power is supplied to the frequency output by means of an external power supply.

Configuring the output signal level (POSITIVE or NEGATIVE) determines the quiescent behavior (at zero flow) of the frequency output.
The internal transistor is activated as follows:
- If POSITIVE is selected, the internal transistor is activated with a **positive** signal level.
- If NEGATIVE is selected, the internal transistor is activated with a **negative** signal level (0 V).

✎ Note!
With the passive output configuration, the output signal levels of the frequency output depend on the external circuit (see examples).

Example for passive output circuit (PASSIVE)
If PASSIVE is selected, the frequency output is configured as an open collector.

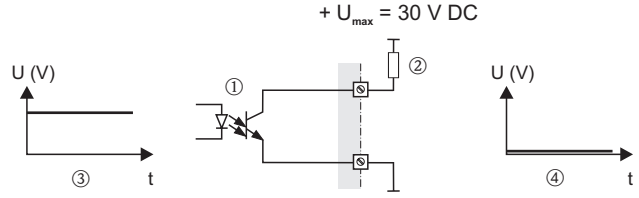


A0001225

① = *Open collector*
② = *External power supply*

✎ Note!
For continuous currents up to 25 mA (I_{max} = 250 mA / 20 ms).

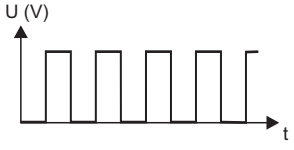
Example for output configuration PASSIVE-POSITIVE:
Output configuration with an external pull-up resistance.
In the quiescent state (at zero flow), the output signal level at the terminals is 0 V.



A0004687

① = *Open collector*
② = *Pull-up resistance*
③ = *Transistor activation in "POSITIVE" quiescent state (at zero flow)*
④ = *Output signal level in quiescent state (at zero flow)*

In the operating status (flow present), the output signal level changes from 0 V to a positive voltage level.



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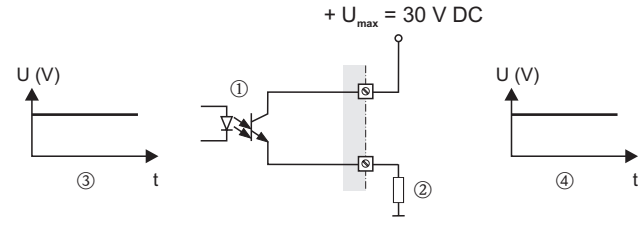
(Continued on next page)

Function description PULSE/FREQUENCY OUTPUT

OUTPUT SIGNAL
(continued)

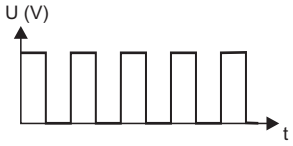
Example for output configuration PASSIVE-POSITIVE:
Output configuration with an external pull-down resistance.
In the quiescent state (at zero flow), a positive voltage level is measured via the pull-down resistance.



A0004689

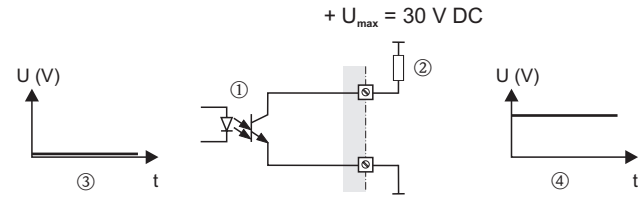
① = *Open collector*
② = *Pull-down resistance*
③ = *Transistor activation in "POSITIVE" quiescent state (at zero flow)*
④ = *Output signal level in quiescent state (at zero flow)*

In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V.



A0001981

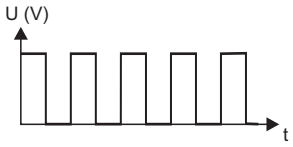
Example for output configuration PASSIVE-NEGATIVE:
Output configuration with an external pull-up resistance.
In the quiescent state (at zero flow), the output signal level at the terminals is at a positive voltage level.



A0004690

① = *Open collector*
② = *Pull-up resistance*
③ = *Transistor activation in "NEGATIVE" quiescent state (at zero flow)*
④ = *Output signal level in quiescent state (at zero flow)*

In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V.

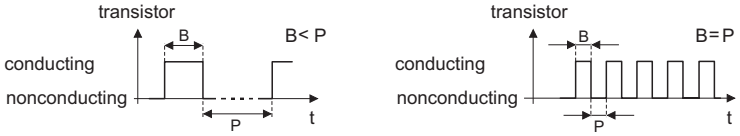


A0001981

Function description PULSE/FREQUENCY OUTPUT	
TIME CONSTANT	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. 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
ERROR CATEGORY	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. 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. totalizer). **Options:** FALLBACK VALUE Output is 0 Hz. FAILSAFE LEVEL Output is the frequency specified in the FAILSAFE VALUE function. HOLD VALUE (**not recommended**) Measuring value output is based on the last measuring value saved before the error occurred . ACTUAL VALUE Measured value output on the basis of 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 ERROR CATEGORY function. Use this function to define frequency that the measuring device outputs 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 OPERATION MODE function. Use this function to view the computed value of the output frequency. **Display shows:** 0...1250 Hz
SIMULATION FREQUENCY	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. Use this function to activate simulation of the frequency output. **Options:** OFF ON **Factory setting:** OFF ✎ Note! ■ The "SIMULATION FREQUENCY OUTPUT" message indicates that simulation is active. ■ The measuring device continues to measure while simulation is in progress, i.e. the actual measured 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 VALUE SIMULATION FREQUENCY function 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 flowmeter 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	
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 totaled by an external totalizer, and the total flow quantity since measuring started can be registered in this way. **User input:** 5-digit floating-point number **Factory setting:** depends on nominal diameter and country (see Page 53). ✎ Note! The appropriate unit is taken from the corresponding UNIT function in the group SYSTEM UNITS (see Page 9).

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 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).  A0001233-EN B = Pulse width entered (the illustration applies to positive pulses) P= Intervals between the individual pulses ✎ Note! When entering the pulse width, select a value that can still be processed by an external totalizer (e.g. mechanical totalizer, PLC, etc.). ☝ Caution! If the pulse number or frequency resulting from the pulse value entered (see function PULSE VALUE on Page 28), 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 OPERATION MODE function.

Use this function to configure the output in such a way that it matches an external totalizer, for example. The direction of the pulses can be selected here, if this feature is supported by the application.

Options:
PASSIVE - POSITIVE, PASSIVE - NEGATIVE

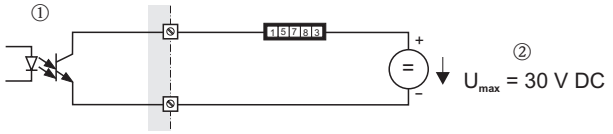
Factory setting: PASSIVE - POSITIVE

Explanation
- PASSIVE = power is supplied to the pulse output by means of an external power supply.

Configuring the output signal level (POSITIVE or NEGATIVE) determines the quiescent behavior (at zero flow) of the pulse output.
The internal transistor is activated as follows:
- If POSITIVE is selected, the internal transistor is activated with a **positive** signal level.
- If NEGATIVE is selected, the internal transistor is activated with a **negative** signal level (0 V).

✎ Note!
With the passive output configuration, the output signal levels of the pulse output depend on the external circuit (see examples).

Example for passive output circuit (PASSIVE)
If PASSIVE is selected, the pulse output is configured as an open collector.

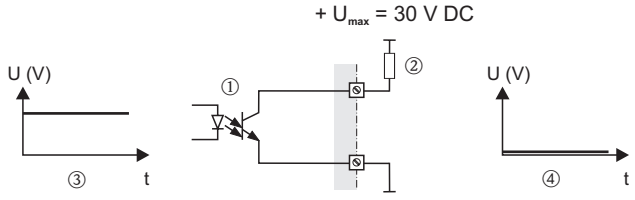


A0001225

① = *Open collector,* ② = *External power supply*

✎ Note!
For continuous currents up to 25 mA (I_{max} = 250 mA / 20 ms).

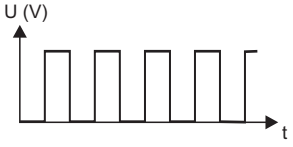
Example for output configuration PASSIVE-POSITIVE:
Output configuration with an external pull-up resistance. In the quiescent state (at zero flow), the output signal level at the terminals is 0 V.



A0004687

① = *Open collector*
② = *Pull-up resistance*
③ = *Transistor activation in "POSITIVE" quiescent state (at zero flow)*
④ = *Output signal level in quiescent state (at zero flow)*

In the operating status (flow present), the output signal level changes from 0 V to a positive voltage level.



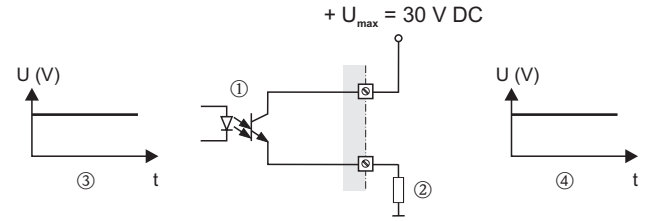
A0001975

(Continued on next page)

Function description PULSE/FREQUENCY OUTPUT

OUTPUT SIGNAL
(continued)

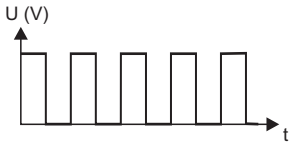
Example for output configuration PASSIVE-POSITIVE:
Output configuration with an external pull-down resistance.
In the quiescent state (at zero flow), a positive voltage level is measured via the pull-down resistance.



A0004689

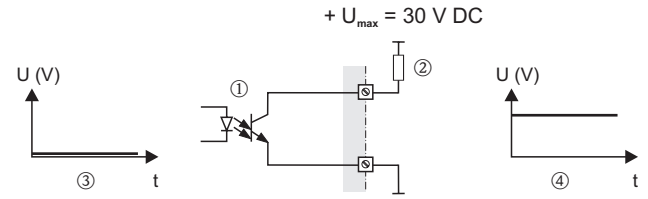
① = *Open collector*
② = *Pull-down resistance*
③ = *Transistor activation in "POSITIVE" quiescent state (at zero flow)*
④ = *Output signal level in quiescent state (at zero flow)*

In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V.



A0001981

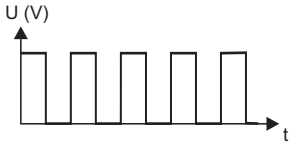
Example for output configuration PASSIVE-NEGATIVE:
Output configuration with an external pull-up resistance.
In the quiescent state (at zero flow), the output signal level at the terminals is at a positive voltage level.



A0004690

① = *Open collector*
② = *Pull-up resistance*
③ = *Transistor activation in "NEGATIVE" quiescent state (at zero flow)*
④ = *Output signal level in quiescent state (at zero flow)*

In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V.



A0001981

Function description PULSE/FREQUENCY OUTPUT	
ERROR CATEGORY	✎ Note! This function is not available unless the PULSE setting was selected in the OPERATION MODE function. 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. totalizer). **Options:** FALLBACK VALUE Output is 0 pulse. HOLD VALUE (**not recommended**) Measuring value output is based on the last measuring value saved before the error occurred . ACTUAL VALUE Measured value output on the basis of the current flow measurement. The fault is ignored. **Factory setting:** FALLBACK VALUE
SIMULATION PULSE	✎ Note! This function is not available unless the PULSE setting was selected in the OPERATION MODE function. Use this function to activate simulation of the pulse output. **Options:** OFF COUNTDOWN The pulses specified in the VALUE SIMULATION PULSE function are output. CONTINUOUSLY Pulses are continuously output with the pulse width specified in the PULSE WIDTH function. ✎ Note! Simulation is started by selecting CONTINUOUSLY. The simulation can be switched off again via the SIMULATION PULSE function. **Factory setting:** OFF ✎ Note! ■ The notice message #631 “SIM. PULSE” indicates that simulation is active. ■ The on/off ratio is 1:1 for both types of simulation. ■ The measuring device continues to measure while simulation is in progress, i.e. the actual measured values are output correctly via the other outputs. ☞ Caution! The setting is not saved if the power supply fails.

Function description PULSE/FREQUENCY OUTPUT	
VALUE SIMULATION PULSE	✎ Note! This function is not available unless the COUNTDOWN option was selected in the SIMULATION PULSE function. Use this function to specify the number of pulses (e.g. 50) which are output during the simulation. This value is used to test downstream devices and the flowmeter itself. The pulses are output with the pulse width specified in the PULSE WIDTH function. The on/off ratio is 1:1. Simulation is started once the specified value is confirmed. The display remains at 0 if the specified pulses have been output. **User input:** 0...10 000 **Factory setting:** 0 ✎ Note! Simulation is started by confirming the simulation value. The simulation can be switched off again via the SIMULATION PULSE function. ☝ Caution! The setting is not saved if the power supply fails.

11 Group STATUS OUTPUT

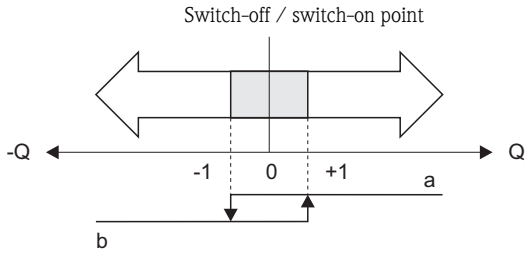
Function description STATUS OUTPUT	
This group is not available unless the measuring device is fitted with a status output.	
ASSIGN STATUS	Use this function to assign a switching function to the status output. **Options:** OFF ON (operation) FAULT MESSAGE NOTICE MESSAGE FAULT MESSAGE or NOTICE MESSAGE EMPTY PIPE DETECTION (only if function is active) FLOW DIRECTION LIMIT MASS FLOW (if the instrument works as mass flowmeter) LIMIT VOLUME FLOW (if the instrument works as volume flowmeter) **Factory setting:** FAULT MESSAGE ✎ Note! ■ The behavior of the status output is of the quiescent-current type, in other words the output is closed (status output conductive) when normal, error-free measuring is in progress. ■ Please read and comply with the information on the switching characteristics of the status output (see Page 36, 37). ■ If you select OFF, the only function shown in this function group is this function, in other words ASSIGN STATUS.
ON-VALUE	✎ Note! This function is not available unless LIMIT MASS FLOW, LIMIT VOLUME FLOW or FLOW DIRECTION was selected in the ASSIGN STATUS function. Use this function to assign a value to the switch-on point (status output conductive). The value can be greater or less than the switch-off point. Positive and negative values are permissible. **User input:** 5-digit floating-point number **Factory setting:** 0 [kg/h] or 0 [m^3/h]
OFF-VALUE	✎ Note! This function is not available unless LIMIT MASS FLOW or LIMIT VOLUME FLOW was selected in the ASSIGN STATUS function. Use this function to assign a value to the switch-off point (status output not conductive). The value can be greater or less than the switch-on point. Positive and negative values are permissible. **User input:** 5-digit floating-point number **Factory setting:** 0 [kg/h] or 0 [m^3/h]

Function description STATUS OUTPUT	
TIME CONSTANT	Use this function to enter a time constant defining how the status output 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:** 5-digit floating-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. **Display shows:** 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 actual measured values are output correctly via the other outputs. ☞ Caution! The setting is not saved if the power supply fails.
VALUE SIMULATION SWITCH POINT	✎ Note! This function is not available unless the SIMULATION SWITCH POINT function 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 flowmeter itself. **User input:** NOT CONDUCTIVE CONDUCTIVE **Factory setting:** NOT CONDUCTIVE ☞ Caution! The setting is not saved if the power supply fails.

11.1 Information on the response of the status output

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

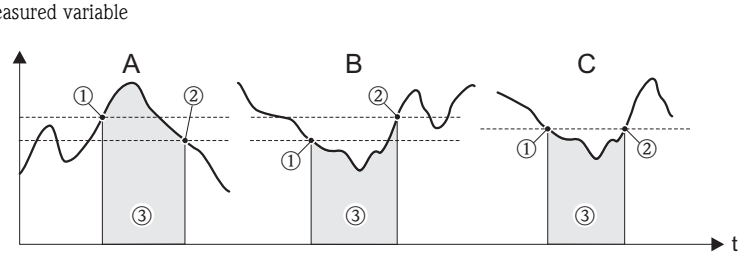
Status output configured for direction of flow
The value you entered in the ON-VALUE function defines the switching points for the positive and negative directions of flow.
If, for example, the switching point you define is = 1 kg/h, the status output is not conductive at –1 kg/h and is conductive at +1 kg/h. Set the switching 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.



A0001236

a = Status output conductive
b = Status output not conductive

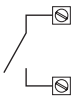
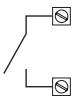
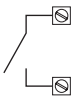
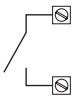
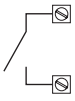
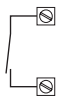
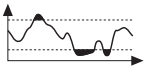
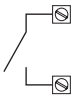
Status output configured for limit value
The status output signal switches as soon as the measured variable falls below or exceeds a defined switching point.
Application: Monitoring flow or process-related boundary conditions.



A0001235

A = Maximum safety → ① OFF-VALUE > ② ON-VALUE
B = Minimum safety → ① OFF-VALUE < ② ON-VALUE
C = Minimum safety → ① OFF-VALUE = ② ON-VALUE (this configuration must be avoided)
③ = Status output switched off (not conductive)

11.2 Switching response of the status output

Function	State		Open Collector (Transistor)
ON (operation)	System in measuring mode		conductive 
	System not in measuring mode (power supply failure)		not conductive 
Fault message	System OK		conductive 
	(System or process error) Fault → Failsafe mode 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 → Failsafe mode or Notice → Continuation of measuring		not conductive 
Empty pipe detection (EPD)	Fluid density above EPD response level, e.g. with full measuring tube		conductive 
	Fluid density below EPD response level, e.g. with a partially filled or an empty measuring tube		not conductive 
Flow direction	forward		conductive 
	reverse		not conductive 
Limit value Mass flow Volume flow	Limit value **not** overshot or undershot		conductive 
	Limit value overshot or undershot		not conductive 

12 Group STATUS INPUT

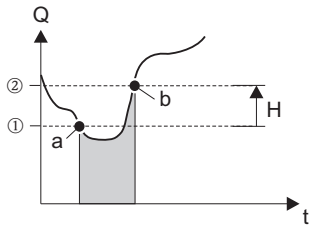
Function description STATUS INPUT	
This group is not available unless the measuring device is fitted with a status input I/O module.	
ASSIGN STATUS INPUT	Use this function to assign a switching function to the status input. **Options:** OFF RESET TOTALIZER POSITIVE ZERO RETURN ZEROPOINT ADJUSTMENT **Factory 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 function (see ASSIGN STATUS INPUT function) is released when the signal level is present (HIGH) or not present (LOW). **Options:** HIGH LOW **Factory setting:** HIGH
MINIMUM PULSE WIDTH	Use this function to define a minimum width which the input pulse must achieve in order to trigger the defined switching function. **User input:** 20...100 ms **Factory setting:** 50 ms
SIMULATION STATUS INPUT	Use this function to activate simulation of the status input, in other words to trigger the function assigned to the status input (see the ASSIGN STATUS INPUT function on Page 38). **Options:** OFF ON **Factory setting:** OFF ✎ Note! The “SIMULATION STATUS INPUT” message indicates that simulation is active. ☝ 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 SIMULATION STATUS INPUT function is active (= ON). Use this function to select the level to be assumed at the status input during the simulation. **Options:** HIGH LOW **Factory setting:** LOW Caution! The setting is not saved if the power supply fails.

13 Group COMMUNICATION

Function description COMMUNICATION	
TAG NAME	Use this function to enter a tag name for the measuring device. **User input:** max. 8-character text, permissible: A-Z, 0-9, +, –, punctuation marks **Factory setting:** "_ _ _ _ _ _ _ _" (without text)
TAG DESCRIPTION	Use this function to enter a tag description for the measuring device. **User input:** max. 16-character text, permissible: A-Z, 0-9, +, –, punctuation marks **Factory setting:** "_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _" (without 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.
WRITE PROTECTION	Use this function to check whether the measuring device can be write accessed. **Display shows:** OFF = Data exchange is possible ON = Data exchange disabled (an activation of the write protection is at present not available) **Factory setting:** OFF
MANUFACTURER ID	Use this function to view the manufacturer ID in decimal numerical format. **Display shows:** 17 (≅ 11 hex) for Endress+Hauser
DEVICE ID	Use this function to view the device ID in hexadecimal numerical format. **Display shows:** 53 (≅ 83 dec) for Promass 40

14 Group PROCESS PARAMETER

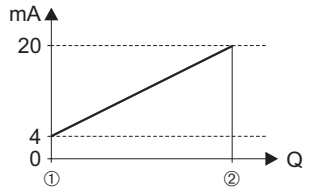
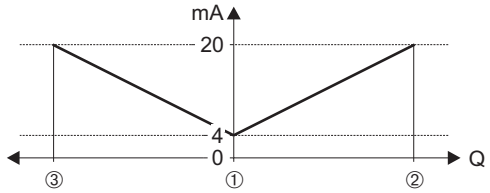
Function description PROCESS PARAMETER	
ON VALUE LOW FLOW CUT OFF	Use this function to assign the on-value for the low flow cut off. Low flow cut off is active if the setting is a value not equal to 0. The sign of the flow value is highlighted on the display to indicate that low flow cut off is active. **User input:** 5-digit floating-point number **Factory setting:** depends on nominal diameter ✎ Note! The appropriate unit is taken from the corresponding UNIT function in the group SYSTEM UNITS (see Page 9).
OFF VALUE LOW FLOW CUT OFF	Enter the off-value (**b**) of the low flow cut off. Enter the switch-off point as a positive hysteresis (H) from the switch-on point (**a**). **User input:** Integer 0 to 100% **Factory setting:** 50%  A0003882 ① = *On-value* ② = *Off-value* *a* *Low flow cut off is switched on* *b* *Low flow cut off is switched off (a + a · H)* *H* *Hysteresis: 0 to 100%* ■ *Low flow cut off active* *Q* *Flow*

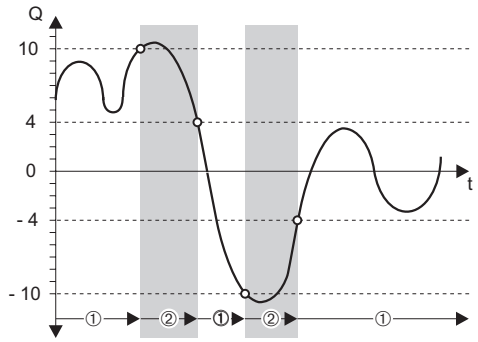
Function description PROCESS PARAMETER	
EMPTY PIPE DETECTION (EPD)	Use this function to activate the empty pipe detection (EPD). With empty measuring tubes the density of the fluid falls below a specified value (see EPD VALUE LOW function). **Options:** OFF ON **Factory setting:** Liquid: ON Gas: OFF Caution! ■ Select a correspondingly low EPD response value so that the difference to the effective density of the fluid is sufficiently large enough. This ensures that totally empty measuring tubes and not partially filled ones are detected. ■ For gas measurement we strongly recommend to switch off empty pipe detection.
EPD VALUE LOW	Note! This function is not available unless the ON selection was selected in the EPD function. Use this function to set a lower threshold for the fluid density value, in order to detect possible problems in the process indicated by too low density. **User input:** 5-digit floating-point number **Factory setting:** 0.2000 kg/l
EPD RESPONSETIME	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. **User input:** Fixed-point number: 1.0...60.0 s **Factory setting:** 1.0 s

Function description PROCESS PARAMETER	
ZEROPOINT ADJUSTMENT	This function enables a zero point adjustment to be automatically carried out. The new zero point determined by the measuring system is adopted by the function ZERO POINT (see Page 43). **User input:** CANCEL START **Factory setting:** CANCEL Caution! Before carrying out the calibration, please refer to BA061D/06/en "Promass 40 Operating Instructions" where a detailed description of the zero point adjustment is given. Note! ■ Programming is locked during zero point adjustment and the display shows: "ZERO ADJUST RUNNING". ■ If the zero point adjustment is not possible, e.g. with a flow velocity > 0.1 m/s, or has been canceled, then the alarm message "ZERO ADJUST NOT POSSIBLE" is shown on the display. ■ If the Promass 40 measuring electronics are fitted with a status input, then the zero point can also be activated by using this input.
ZERO POINT	This function shows the actual zero point.
DENSITY ADJUSTMENT VALUE	In this function, enter the density set value of the particular fluid for which you want to carry out a field density adjustment. **User input:** 5-digit number with floating decimal point, incl. units (corresponding to 0.1...5.9999 kg/l) Note! ■ The preset density entered here should not vary from the actual fluid density by a more than ±10%. ■ The appropriate unit is always g/cc ≅ kg/l.
MEASURE FLUID	In this function the actual density of the fluid is determined for the density adjustment. **Options:** CANCEL START

Function description PROCESS PARAMETER	
DENSITY ADJUST	With this function a density adjustment can be carried out on site. The density set value will thus be recalculated and stored. This ensures that the values dependent on density calculations (e.g. volume flow) are as accurate as possible. Caution! Before carrying out a density adjustment, please refer to BA061D/06/en “Promass 40 Operating Instructions” where a detailed description of the relevant procedure is given. Note! The density adjustment is only required if the characteristics of the fluid are outside the reference conditions under which the flowmeter has been calibrated at the factory. **User input:** CANCEL DENSITY ADJUST **Factory setting:** CANCEL
RESTORE ORIGINAL	With this function the original density coefficients determined at the factory are restored. **User input:** NO YES Factory setting: NO

15 Group SYSTEM PARAMETER

Function description SYSTEM PARAMETER	
INSTALLATION DIRECTION SENSOR	Use this function to reverse the sign of the measured variable, if necessary. ✎ Note! Ascertain the actual direction of fluid flow with reference to the direction indicated by the arrow on the sensor (nameplate). **Options:** NORMAL (flow as indicated by the arrow) INVERSE (flow opposite to direction indicated by the arrow) **Factory setting:** NORMAL
MEASURING MODE	Use this function to define the measuring mode for all outputs and 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 below: **Current and frequency output** STANDARD The output signals of the current and frequency output are proportional to the measured variable. The flow components outside the scaled measuring range (between Q = 0 ① and the VALUE 20 mA or VALUE F HIGH ②) are not taken into account for signal output, but a message “CURRENT OUTPUT AT FULL SCALE VALUE” or “FREQUENCY OUTPUT AT FULL SCALE VALUE” is issued. Example for current output:  A0001248 SYMMETRY The output signals of the current and frequency output 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). Example for current output:  A0001249

Function description SYSTEM PARAMETER	
MEASURING MODE (continued)	**Pulse output** STANDARD Only positive flow components are totaled. 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! Only if in the ASSIGN STATUS function the LIMIT option is selected. STANDARD The status output signal switches at the defined switching points. SYMMETRY The status output signal switches at the defined switching points, irrespective of the sign. In other words, if you define a switching 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 (non-conductive)  A0001247 **Totalizer** STANDARD Only positive flow components are totaled. SYMMETRY The positive and negative flow components are balanced. In other words, net flow in the flow direction is registered.

Function description SYSTEM PARAMETER	
POSITIVE ZERO RETURN	Use this function to interrupt evaluation of measured variables. This is necessary when a piping system is being cleaned, for example. The setting acts on all functions and outputs of the measuring device. **Options:** OFF ON (signal output is set to zero flow value) **Factory setting:** OFF
FLOW DAMPING	✎ Note! System damping acts on all functions and outputs of the measuring device. Using the interference blanking (= time constant for exponential filter) the sensitivity of the flow measurement signal can be reduced with respect to transient flows and interference peaks; e.g. with fluid containing solids or gas bubbles. Small negative components are smoothed. **User input:** 0.00...100 seconds (in 10 ms steps) 0.00 seconds = OFF 100 seconds = extremely high damping **Factory setting:** Liquid: 0.00 seconds Gas: 0.25 seconds

16 Group SENSOR DATA

Function description SENSOR DATA	
All sensor data, including nominal diameter, calibration factor, and zero point, are set at the factory. All the sensor's parameter settings are saved on the S-DAT memory chip.	
K-FACTOR	This function shows the current calibration factor for the sensor. **Factory setting:** depends on nominal diameter and calibration
ZERO POINT	This function shows the current zero-point correction value for the sensor. **Factory setting:** depends on calibration
NOMINAL DIAMETER	This function shows the nominal diameter for the sensor. **Factory setting:** depends on the size of the sensor
TEMPERATURE COEFFICIENT KM	This function shows the temperature coefficient KM.
DENSITY COEFF. C 0	This function shows the actual density coefficient C 0. Caution! A density adjustment can alter the calibration value of this coefficient.
DENSITY COEFF. C 1	This function shows the actual density coefficient C 1. Caution! A density adjustment can alter the calibration value of this coefficient.
DENSITY COEFF. C 2	This function shows the actual density coefficient C 2. Caution! A density adjustment can alter the calibration value of this coefficient.
DENSITY COEFF. C 3	This function shows the actual density coefficient C 3. Caution! A density adjustment can alter the calibration value of this coefficient.
MINIMAL TEMPERATURE MEASURED	This function shows the lowest fluid temperature measured.
MAXIMAL TEMPERATURE MEASURED	This function shows the highest fluid temperature measured.

17 Group SUPERVISION

Function description SUPERVISION	
ACTUAL SYSTEM CONDITION	Use this function to check the current system status. **Display shows:** "SYSTEM OK" or the fault / notice message with the highest priority.
PREVIOUS SYSTEM CONDITION	Use this function to view the 15 most recent fault and notice messages since measuring last started. **Display shows:** The 15 most recent fault or notice messages.
ASSIGN SYSTEM ERROR	Use this function to view all system messages and the associated error categories (fault message or notice message). If you select a single system fault you can change its error category. **Display shows:** List of system errors ✎ Note! ■ Press "ENTER" twice to call the ERROR CATEGORY function. ■ Use "ESC" or select CANCEL in the system error list to exit the function.
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 a fault in accordance with their defined error-response patterns. **Options:** NOTICE MESSAGES (display only) FAULT MESSAGES (outputs and display) ✎ Note! ■ Press "ENTER" twice to call the ASSIGN SYSTEM ERROR function. ■ Use "ESC" to exit the 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. **Display shows:** List of process errors ✎ Note! ■ Press "ENTER" twice to call the ERROR CATEGORY function. ■ Use "ESC" or select CANCEL in the process error list to exit the function.

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 a fault in accordance with their defined error-response patterns. **Options:** NOTICE MESSAGES (display only) FAULT MESSAGES (outputs and display) ✎ Note! ■ Press “ENTER” twice to call the ASSIGN PROCESS ERROR function. ■ Use “ESC” to exit the function.
ALARM DELAY	Use this function to define a time span for 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 fault, this suppression acts on: ■ Display ■ Current output ■ Frequency output ■ Status output **User input:** 0...100 s (in steps of one second) **Factory setting:** 0 s ☝ Caution! If this function is activated fault 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 fault 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 line supply) **Factory setting:** NO
OPERATION HOURS	The hours of operation of the device appear on the display. **Display shows:** depends on the number of hours of operation elapsed: Hours of operation < 10 hours → display format = 0:00:00 (hr:min:sec) Hours of operation 10...10,000 hours → display format = 0000:00 (hr:min) Hours of operation > 10,000 hours → display format = 000000 (hr)

18 Group SIMULATION SYSTEM

Function description SIMULATION SYSTEM	
SIMULATION FAIL-SAFE MODE	Use this function to set all inputs, outputs and totalizer to their defined fault response modes, in order to check whether they respond correctly. During this time, the words "SIMULATION FAILSAFE MODE" appear on the display. **Options:** OFF ON **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.
SIMULATION MEASURAND	Use this function to set all inputs, outputs and 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 MASS (if the instrument works as mass flowmeter) VOLUME (if the instrument works as volume flowmeter) CORRECTED VOLUME (if the instrument works as corrected volume flowmeter) **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 MEASURAND	Note! This function is not available unless the SIMULATION MEASURAND function is active. Use this function to define a selectable value (e.g. 12 kg/s). This value is used to test downstream devices and the flowmeter itself. **User input:** 5-digit floating-point number **Factory setting:** 0 Caution! The setting is not saved if the power supply fails.

19 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.
SOFTWARE REVISION NUMBER S-DAT	Use this function to view the software revision number of the S-DAT.

20 Group AMPLIFIER VERSION

Function description AMPLIFIER VERSION	
DEVICE SOFTWARE	Displays the current device software version.
SOFTWARE REVISION NUMBER AMPLIFIER	Use this function to view the software revision number of the amplifier.
LANGUAGE GROUP	Use this function to view the language group. The following language group can be ordered: WEST EU/USA **Display shows:** available language group
I/O MODULE TYPE	Use this function to view the I/O type (input/output type).
SOFTWARE REVISION NUMBER I/O	Use this function to view the software revision number of the I/O module.

21 Factory settings

21.1 SI units (not for USA and Canada)

Low flow cut off, full scale value, pulse value – Liquid

Nominal diameter [mm]	Low flow cut off (approx. v = 0.04 m/s)		Full scale value (approx. v = 2 m/s)		Pulse value (approx. 2 pulse/s at 2 m/s)	
8	8.00	kg/h	400	kg/h	0.100	kg/p
15	26.00	kg/h	1300	kg/h	0.100	kg/p
25	72.00	kg/h	3600	kg/h	1.000	kg/p
40	180.00	kg/h	9000	kg/h	1.000	kg/p
50	300.00	kg/h	15000	kg/h	10.000	kg/p

Low flow cut off, full scale value, pulse value – Gas

Nominal diameter [mm]	Low flow cut off (approx. v = 0.01 m/s)		Full scale value (approx. v = 2 m/s)		Pulse value (approx. 2 pulse/s at 2 m/s)	
8	2.00	kg/h	400	kg/h	0.100	kg/p
15	6.50	kg/h	1300	kg/h	0.100	kg/p
25	18.00	kg/h	3600	kg/h	1.000	kg/p
40	45.00	kg/h	9000	kg/h	1.000	kg/p
50	75.00	kg/h	15000	kg/h	10.000	kg/p

Language

Country	Language
Australia	English
Belgium	English
China	English
Denmark	English
Germany	Deutsch
England	English
Finland	English
France	Francais
Netherlands	Nederlands
Hong Kong	English
India	English
Indonesia	English
Instruments International	English
Italy	Italiano
Japan	English
Malaysia	English
Norway	English
Poland	English
Portugal	Portuguese
Austria	Deutsch
Russia	English

Continued on next page

Language (continued)

Country	Language
Sweden	English
Switzerland	Deutsch
Singapore	English
Spain	Espanol
South Africa	English
Thailand	English
Czech Republic	English
Hungary	English

Length, reference density

	Unit
Length	mm
Reference density	kg/Nl

21.2 US units (only for USA and Canada)

Low flow cut off, full scale value, pulse value – Liquid

Nominal diameter [mm]	Low flow cut off (approx. v = 0.04 m/s)		Full scale value (approx. v = 2 m/s)		Pulse value (approx. 2 pulse/s at 2 m/s)	
8	0.300	lb/min	15.00	lb/min	0.200	lb/p
15	1.000	lb/min	50.00	lb/min	0.200	lb/p
25	2.600	lb/min	130.00	lb/min	2.000	lb/p
40	6.600	lb/min	330.00	lb/min	2.000	lb/p
50	11.000	lb/min	550.00	lb/min	20.000	lb/p

Low flow cut off, full scale value, pulse value – Gas

Nominal diameter [mm]	Low flow cut off (approx. v = 0.01 m/s)		Full scale value (approx. v = 2 m/s)		Pulse value (approx. 2 pulse/s at 2 m/s)	
8	0.075	lb/min	15.00	lb/min	0.200	lb/p
15	0.250	lb/min	50.00	lb/min	0.200	lb/p
25	0.650	lb/min	130.00	lb/min	2.000	lb/p
40	1.650	lb/min	330.00	lb/min	2.000	lb/p
50	2.750	lb/min	550.00	lb/min	20.000	lb/p

Language, length, reference density

	Unit
Language	English
Length	Inch
Reference density	g/Scc

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