

Valid as of version
V 2.03.XX (Device firmware, HART 5)
V 2.07.XX (Device firmware, HART 7)

Description of Device Functions

Proline Promag 53

Electromagnetic flowmeter

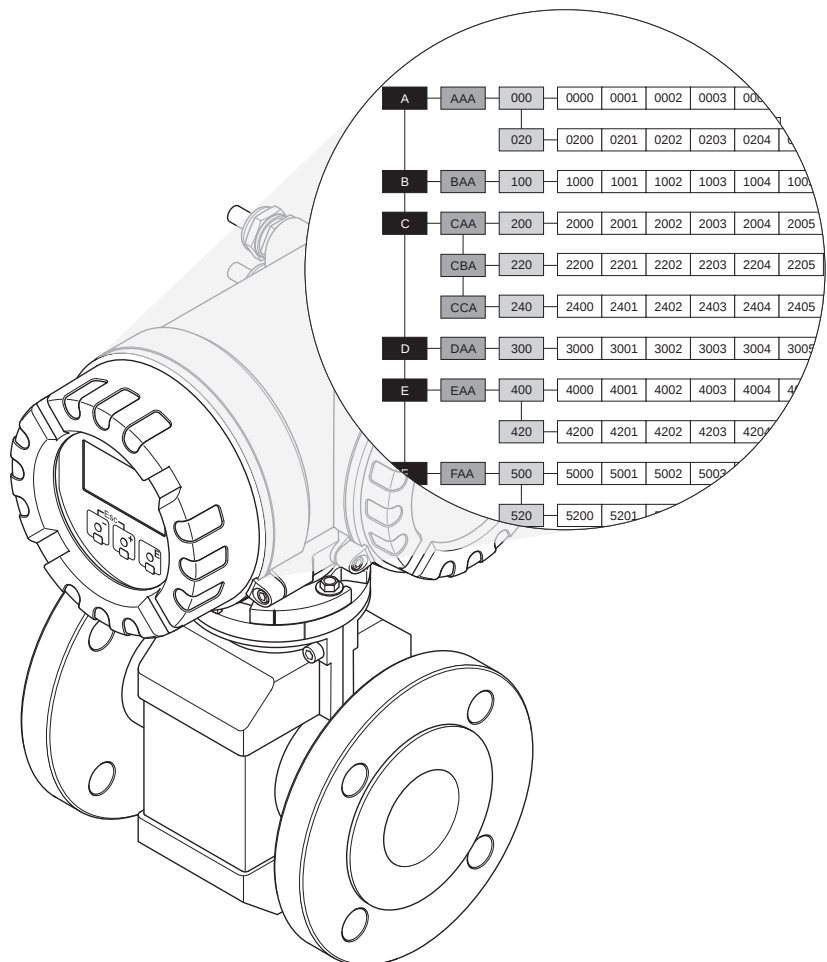


Table of contents

1	Notes on using this Manual	7
1.1	Using the table of contents to locate a function description	7
1.2	Using the graphic of the function matrix to locate a function description	7
1.3	Using the index of the function matrix to locate a function description	7
2	Function Matrix	8
2.1	General layout of the function matrix	8
2.1.1	Blocks (A, B, C, etc.)	8
2.1.2	Groups (AAA, AEA, CAA, etc.)	8
2.1.3	Function groups (000, 020, 060, etc.)	8
2.1.4	Functions (0000, 0001, 0002, etc.)	8
2.1.5	Codes identifying cells	9
2.1.6	Designation of device software	9
2.2	Function matrix Promag 53	10
3	Block MEASURED VARIABLES	11
3.1	Group MEASURING VALUES	12
3.2	Group SYSTEM UNITS	13
3.2.1	Function group CONFIGURATION	13
3.2.2	Function group ADDITIONAL CONFIGURATION	15
3.3	Group SPECIAL UNITS	17
3.3.1	Function group ARBITRARY UNIT	17
3.3.2	Function group DENSITY PARAMETER	18
4	Block QUICK SETUP	20
4.1	Setup Commissioning	22
4.2	Pulsating flow Setup menu	24
4.3	Batching Setup menu	26
5	Block USER INTERFACE	29
5.1	Group CONTROL	30
5.1.1	Function group BASIC CONFIGURATION	30
5.1.2	Function group UNLOCKING/LOCKING	33
5.1.3	Function group OPERATION	34
5.2	Group MAIN LINE	35
5.2.1	Function group CONFIGURATION	35
5.2.2	Function group MULTIPLEX	37
5.3	Group ADDITIONAL LINE	39
5.3.1	Function group CONFIGURATION	39
5.3.2	Function group MULTIPLEX	42
5.4	Group INFORMATION LINE	45
5.4.1	Function group CONFIGURATION	45
5.4.2	Function group MULTIPLEX	47
6	Block TOTALIZER	49
6.1	Group TOTALIZER (1 to 3)	50
6.1.1	Function group CONFIGURATION	50
6.1.2	Function group OPERATION	52
6.2	Group HANDLING TOTALIZER	53
7	Block OUTPUTS	54

7.1	Group CURRENT OUTPUT (1 to 2)	55
7.1.1	Function group CONFIGURATION	55
7.1.2	Function group OPERATION	65
7.1.3	Function group INFORMATION	66
7.2	Group PULSE/FREQUENCY OUTPUT (1 to 2)	67
7.2.1	Function group CONFIGURATION	67
7.2.2	Function group OPERATION	87
7.2.3	Function group INFORMATION	91
7.3	Group RELAY OUTPUT (1 to 2)	92
7.3.1	Function group CONFIGURATION	92
7.3.2	Function group OPERATION	96
7.3.3	Function group INFORMATION	98
7.3.4	Information on the response of the relay output	99
7.4	Switching response of the relay output	100
8	Block INPUTS	102
8.1	Group STATUS INPUT	103
8.1.1	Function group CONFIGURATION	103
8.1.2	Function group OPERATION	104
8.1.3	Function group INFORMATION	105
8.2	Group CURRENT INPUT	106
8.2.1	Function group CONFIGURATION	106
8.2.2	Function group OPERATION	108
8.2.3	Function group INFORMATION	109
9	Block BASIC FUNCTION	110
9.1	Group HART	111
9.1.1	Function group CONFIGURATION	111
9.1.2	Function group INFORMATION	113
9.2	Group PROCESS PARAMETER	113
9.2.1	Function group CONFIGURATION	113
9.2.2	Function group EPD PARAMETER	116
9.2.3	Function group ECC PARAMETER	119
9.2.4	Function group ADJUSTMENT	121
9.3	Group SYSTEM PARAMETER	122
9.3.1	Function group CONFIGURATION	122
9.4	Group SENSOR DATA	124
9.4.1	Function group CONFIGURATION	124
9.4.2	Function group OPERATION	125
10	Block SPECIAL FUNCTION	127
10.1	Group BATCHING FUNCTION	128
10.1.1	Function group CONFIGURATION	128
10.1.2	Function group VALVE PARAMETER	131
10.1.3	Examples of setting parameters for batching processes	133
10.1.4	Function group SUPERVISION	136
10.1.5	Function group OPERATION	141
10.1.6	Function group INFORMATION	143
11	Block SUPERVISION	145
11.1	Group SYSTEM	146
11.1.1	Function group CONFIGURATION	146
11.1.2	Function group OPERATION	149
11.2	Group VERSION INFO	151
11.2.1	Function group DEVICE	151
11.2.2	Function group SENSOR	151

11.2.3 Function group AMPLIFIER 152

11.2.4 Function group F-CHIP 152

11.2.5 Function group I/O MODULE 153

11.2.6 Function groups INPUT /OUTPUT 1 to 4 153

12 Factory settings 154

12.1 SI units (not for USA and Canada) 154

12.2 US units (only for USA and Canada) 156

13 Index function matrix 157

14 Index key words 161

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1 Notes on using this Manual

There are various ways of locating the description of a function of your choice in the manual:

1.1 Using the table of contents to locate a function description

The designations of all the cells in the function matrix are listed in the table of contents. You can use these unambiguous designations (such as USER INTERFACE, INPUTS, OUTPUTS, etc.) to choose whichever functions are applicable to a particular set of conditions. The page references show you exactly where to find the detailed descriptions of the functions in question. The table of contents is on → 3.

1.2 Using the graphic of the function matrix to locate a function description

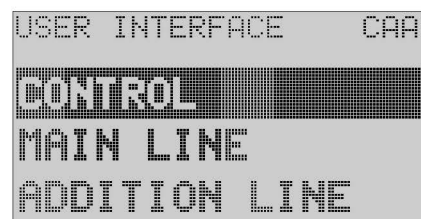
This step-by-step, top-down approach starts with the blocks, the highest level, and works down through the matrix to the description of the function you need:

1. All available blocks and their corresponding groups, are illustrated on → 10. Select the block (or the group within the block) which you need for your application and use the page reference to locate the information corresponding to the next level.
2. The page in question contains a graphic showing of the block with all its subordinate groups, function groups and functions. Select the function which you need for your application and use the page reference to locate the detailed function description.

1.3 Using the index of the function matrix to locate a function description

Each "cell" in the function matrix (blocks, groups, function groups, functions) has a unique identifier in the form of a code consisting of one or three letters or a three- or four-digit number. The code identifying a selected "cell" appears at the top right on the local display.

Example:



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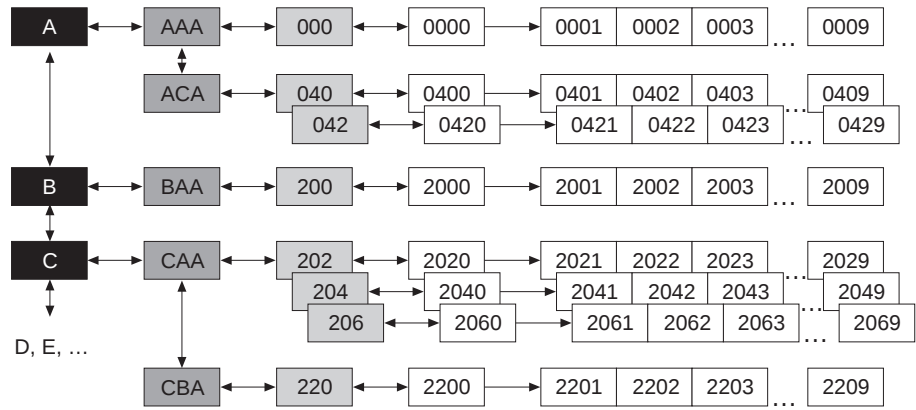
The function matrix index lists the codes for all the available "cells" in alphabetic and consecutive order, complete with the page references for the corresponding functions. The index to the function matrix is on → 157.

2 Function Matrix

2.1 General layout of the function matrix

The function matrix consists of four levels:

Blocks -> Groups -> Function groups -> Functions



A0000961

2.1.1 Blocks (A, B, C, etc.)

The blocks are the highest-level grouping of the operation options for the device. The blocks include, for example: MEASURED VARIABLES, QUICK SETUP, USER INTERFACE, TOTALIZER, etc.

2.1.2 Groups (AAA, AEA, CAA, etc.)

A block consists of one or more groups. Each group represents a more detailed selection of the operation options in the higher-order block. The groups in the "USER INTERFACE" block, for example, include: CONTROL, MAIN LINE, ADDITIONAL LINE, etc.

2.1.3 Function groups (000, 020, 060, etc.)

A group consists of one or more function groups. Each function group represents a more detailed selection of the operation options in the higher-order group. Function groups available of group "CONTROL" are for example: BASIC CONFIGURATION, UNLOCKING/LOCKING, OPERATION, etc.

2.1.4 Functions (0000, 0001, 0002, etc.)

Each function group consists of one or more functions. The functions are used to operate and parameterize the device. Numerical values can be entered or parameters selected and saved. The functions in the "BASIC CONFIGURATION" function group include LANGUAGE, DISPLAY DAMPING, CONTRAST LCD, etc. The procedure for changing the language of the user interface, for example, is as follows:

1. Select the block "USER INTERFACE".
2. Select the group "CONTROL".
3. Select the function group "BASIC CONFIGURATION".
4. Select the function "LANGUAGE" (here you can set the language required).

2.1.5 Codes identifying cells

Each cell (block, group, function group and function) in the function matrix has an individual, unique code.

Blocks:

The code is a letter (A, B, C, etc.)

Groups:

The code consists of three letters (AAA, ABA, BAA, etc.).

The first letter matches the block code (i.e. each group in block A has a code starting with an A _ _; the codes of the groups in block B start with a B _ _, etc.).

The other two letters are for identifying the group within the respective block.

Function groups:

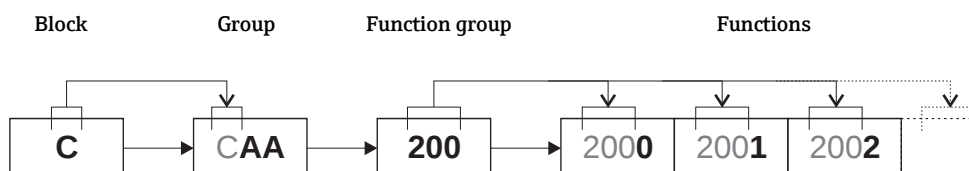
The code consists of three digits (000, 001, 100, etc.).

Functions:

The code consists of four digits (0000, 0001, 0201, etc.).

The first three digits are the same as the code for the function group.

The last digit in the code is a counter for the functions in the function group, incrementing from 0 to 9 (e.g. function 0005 is the sixth function in group 000).



A0001251

2.1.6 Designation of device software

HART 5

- Valid until software version: 2.03.XX
- Order code "Power Supply; Display", option A, B, C, D, E, F, G, H, X, 7, 8

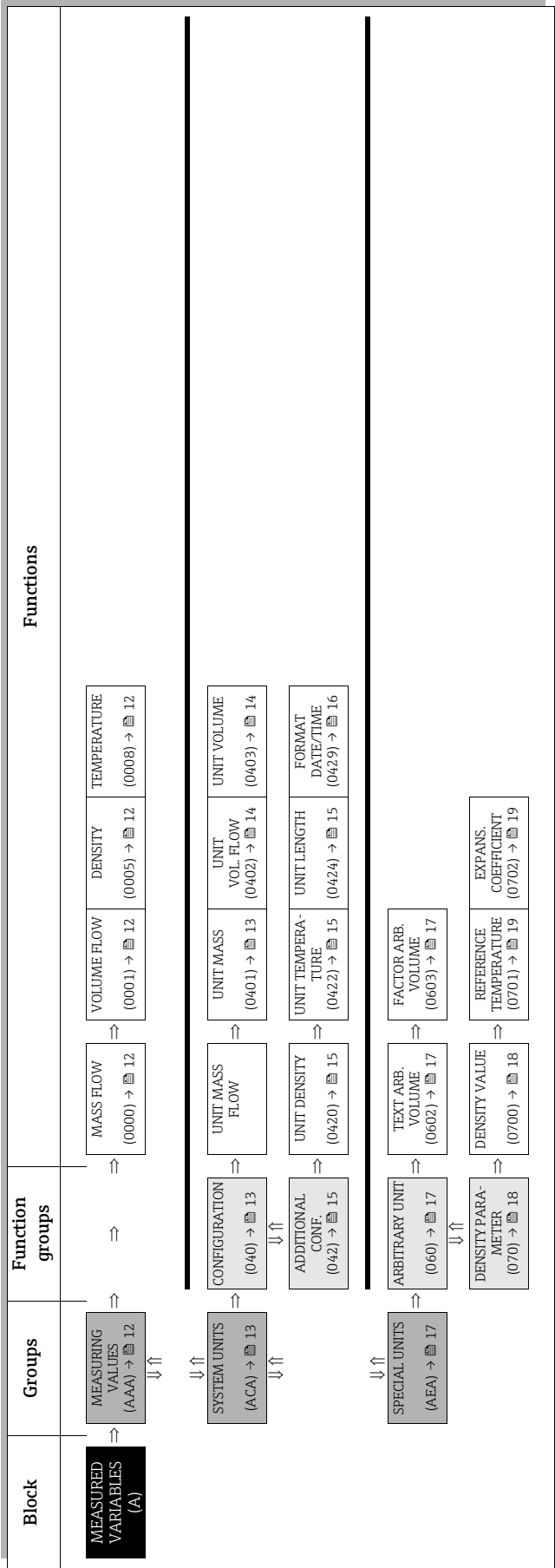
HART 7

- Valid as of software version: 2.07.XX
- Order code "Power Supply; Display", option P, Q, R, S, T, U, 4, 5

2.2 Function matrix Promag 53

BLOCKS		GROUPS		FUNCTION GROUPS
MEASURED VARIABLES A (→ 📖 11)	→	MEASURING VALUES AAA	→	→ 📖 12
		SYSTEM UNITS ACA	→	→ 📖 13
		SPECIAL UNITS AEA	→	→ 📖 17
↓				
QUICK SETUP B (→ 📖 20)	→	Commissioning and application setups	→	→ 📖 20
↓				
USER INTERFACE C (→ 📖 29)	→	CONTROL CAA	→	→ 📖 30
		MAIN LINE CCA	→	→ 📖 35
		ADDITIONAL LINE CEA	→	→ 📖 39
		INFORMATION LINE CGA	→	→ 📖 45
↓				
TOTALIZER D (→ 📖 49)	→	TOTALIZER 1 DAA	→	→ 📖 50
		TOTALIZER 2 DAB	→	→ 📖 50
		TOTALIZER 3 DAC	→	→ 📖 50
		HANDLING TOTALIZER DJA	→	→ 📖 53
↓				
OUTPUTS E (→ 📖 54)	→	CURRENT OUTPUT 1 EAA	→	→ 📖 55
		CURRENT OUTPUT 2 EAB	→	→ 📖 55
		PULSE/FREQ. OUTPUT 1 ECA	→	→ 📖 67
		PULSE/FREQ. OUTPUT 2 ECB	→	→ 📖 67
		RELAY OUTPUT 1 EGA	→	→ 📖 92
		RELAY OUTPUT 2 EGB	→	→ 📖 92
↓				
INPUTS F (→ 📖 102)	→	STATUS INPUT FAA	→	→ 📖 103
		CURRENT INPUT FCA	→	→ 📖 106
↓				
BASIC FUNCTION G (→ 📖 110)	→	HART GAA	→	→ 📖 111
		PROCESS PARAMETER GIA	→	→ 📖 113
		SYSTEM PARAMETER GLA	→	→ 📖 122
		SENSOR DATA GNA	→	→ 📖 124
↓				
SPECIAL FUNCTION H (→ 📖 127)	→	BATCHING FUNCTION HCA	→	→ 📖 128
↓				
SUPERVISION J (→ 📖 145)	→	SYSTEM JAA	→	→ 📖 146
		VERSION INFO JCA	→	→ 📖 151

3 Block MEASURED VARIABLES



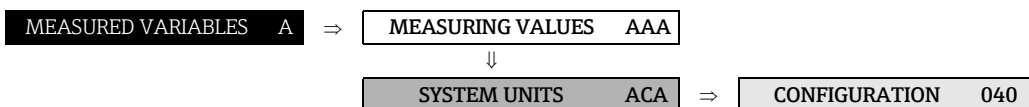
3.1 Group MEASURING VALUES

MEASURED VARIABLES A ⇒ MEASURING VALUES AAA ⇒ Measuring value functions

Function description	
MEASURED VARIABLES → MEASURING VALUES → Measuring value functions	
 Note! ■ The engineering units of all the measured variables 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.	
CALCULATED MASS FLOW (0000)	The calculated mass flow appears on the display. The mass flow is derived from the measured volume flow and the fixed (or temperature-compensated) density. User interface: 5-digit floating-point number, including unit and sign (e.g. 462.87 kg/h; -731.63 lb/min; etc.)
VOLUME FLOW (0001)	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.)
DENSITY (0005)	The fixed density, temperature-compensated density or density fed in via the current input appears on the display. User interface: 5-digit floating-point number, including unit (corresponding to 0.10000 to 6.0000 kg/dm³) e.g. 1.2345 kg/dm³; 993.5 kg/m³; 1.0015 SG_20 °C; etc.
TEMPERATURE (0008)	Display of the actual temperature, if the current input is set to "TEMPERATURE". User interface: max. 4-digit fixed-point number, including unit and sign (e.g. -23.4 °C; 160.0 °F; 295.4 K, etc.)

3.2 Group SYSTEM UNITS

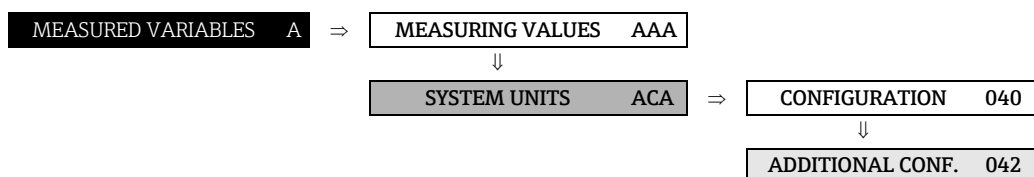
3.2.1 Function group CONFIGURATION



Function description	
MEASURED VARIABLES → SYSTEM UNITS → CONFIGURATION	
You can select the units for measured variables in this function group.	
UNIT MASS FLOW (0400)	Use this function to select the unit for displaying the calculated mass flow (mass/time). The mass flow is derived from the preset (compensated) specific fluid density and the measured volume flow. The unit you select here is also valid for: ■ Current outputs ■ Frequency outputs ■ Relay switch points (limit value for mass flow, flow direction) ■ Low flow 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: Depends on nominal diameter and country (→ 154).
UNIT MASS (0401)	Use this function to select the unit for displaying the calculated mass. The mass is derived from the preset (compensated) specific fluid density and the measured volume. The unit you select here is also valid for: ■ Pulse value (e.g. kg/p) Options: Metric → g; kg; t US → oz; lb; ton Factory setting: Depends on nominal diameter and country (→ 154).  Note! The unit for the totalizers is independent of your choice here. The unit for each totalizer is selected separately for the totalizer in question.

Function description	
MEASURED VARIABLES → SYSTEM UNITS → CONFIGURATION	
UNIT VOLUME FLOW (0402)	Use this function to select the unit for displaying the volume flow (volume/time). The unit you select here is also valid for: - Current outputs - Frequency outputs - Relay switch points (limit value for volume flow, flow direction) - Low flow 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 Kilo gallon → Kgal/s; Kgal/min; Kgal/h; Kgal/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 Arbitrary unit (see function group ARBITRARY UNIT on → 17) ____ → ____/s; ____/min; ____/h; ____/day Factory setting: Depends on nominal diameter and country (→ 154).  Note! If you defined a unit of volume in the ARBITRARY UNIT 060 function group (see → 17) the unit in question is shown here.
UNIT VOLUME (0403)	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 Mega US → cc; af; ft³; oz f; gal; Kgal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals); bbl (filling tanks) Imperial → gal; Mgal; bbl (beer); bbl (petrochemicals) Arbitrary unit → ____ (see function group ARBITRARY UNIT on → 17) Factory setting: Depends on nominal diameter and country (→ 154).  Note! - If you defined a unit of volume in the ARBITRARY UNIT 060 function group (see → 17) the unit in question is shown here. The unit of the totalizers is independent of your choice here. The unit for each totalizer is selected separately for the totalizer in question.

3.2.2 Function group ADDITIONAL CONFIGURATION

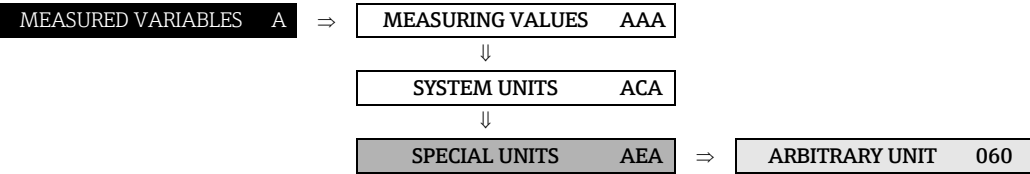


Function description	
MEASURED VARIABLES → SYSTEM UNITS → ADDITIONAL CONFIGURATION	
UNIT DENSITY (0420)	Use this function to select the unit for displaying the fluid density. The unit you select here is also valid for: Fluid density entry Options: Metric → g/cm³; g/l; g/cc; kg/dm³; kg/l kg/m³; SD 4 °C, SD 15 °C, SD 20 °C; SG 4 °C, SG 15 °C, SG 20 °C US → lb/ft³; lb/gal; lb/bbl (normal fluids); lb/bbl (beer); lb/bbl (petrochemicals); lb/bbl (filling tanks) Imperial → lb/gal; lb/bbl (beer); lb/bbl (petrochemicals) Factory setting: kg/l (SI units: not for USA and Canada) g/cc (US units: only for USA and Canada) SD = Specific Density, SG = Specific Gravity The specific density is the ratio of fluid density to water density (at water temperature = 4, 15, 20 °C).
UNIT TEMPERATURE (0422)	Use this function to select the unit for the temperature. The unit selected here is also valid for the current input. Options: °C (Celsius) K (Kelvin) °F (Fahrenheit) °R (Rankine) Factory setting: °C  Note! This function is only displayed if the current input is set to "TEMPERATURE" (→  106).
UNIT LENGTH (0424)	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 (function NOMINAL DIAMETER (6804) on →  124) Options: MILLIMETER INCH Factory setting: MILLIMETER (SI units: not for USA and Canada) INCH (US units: only for USA and Canada)

Function description	
MEASURED VARIABLES → SYSTEM UNITS → ADDITIONAL CONFIGURATION	
FORMAT DATE/TIME (0429)	Use this function to select the format for the date and the time. The unit you select here is also valid for: Displaying the current calibration date (function CALIBRATION DATE (6808) on →  124) Options: DD.MM.YY 24H MM/DD/YY 12H A/P DD.MM.YY 12H A/P MM/DD/YY 24H Factory setting: DD.MM.YY 24H (SI units) MM/DD/YY 12H A/P (US units)

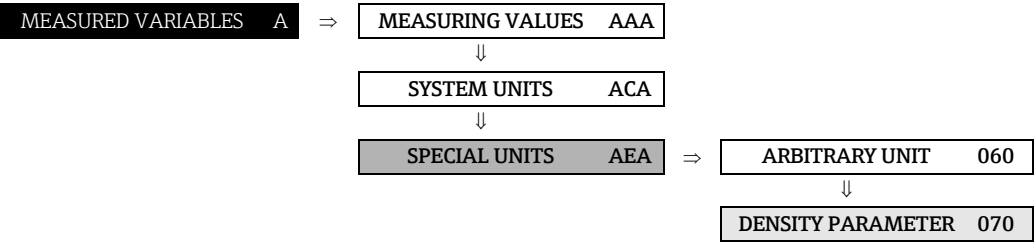
3.3 Group SPECIAL UNITS

3.3.1 Function group ARBITRARY UNIT



Function description	
MEASURED VARIABLES → SPECIAL UNITS → ARBITRARY UNIT	
Use this function group to define an arbitrary unit for the flow rate variable.	
TEXT ARBITRARY VOLUME (0602)	Use this function to enter a text for the selectable volume unit / volume flow unit. You define only the text, the unit of time is provided from a choice of options (s, min, h, day). User input: xxxxxxx (max. 4 characters) Valid characters are A–Z, 0–9, +, –, decimal point, white space or underscore Factory setting: " _ _ _ _ " (No text) Example: If your text entry is "GLAS", this text string appears on the display complete with the unit of time, e.g. "GLAS/min": GLAS = Volume (text input) GLAS / min = Volume flow as shown (on the display)
FACTOR ARBITRARY VOLUME (0603)	Use this function to define a quantity factor (without time) for the selectable unit. The volume unit on which this factor is based is one liter. User input: 7-digit floating-point number Factory setting: 1 Reference quantity: Liter Example: The volume of a glass is 0.5 l → 2 glasses = 1 liter User input: 2

3.3.2 Function group DENSITY PARAMETER



Function description	
MEASURED VARIABLES → SPECIAL UNITS → DENSITY PARAMETER	
Use this function group to calculate a mass flow from a volume flow. The thermal expansion of the fluid can be compensated if the measuring device is provided with the fluid process temperature by means of a current input.  Note! It is advisable to enter the density factor at process temperature for calculating the mass flow without compensating for thermal expansion. Example of calculated mass flow without compensation for thermal expansion of the fluid: $\dot{m} = \dot{V} \cdot \rho = 1 \text{ [dm}^3/\text{h]} \cdot 0.900 \text{ [kg/l]} = 0.900 \text{ [kg/h]} \text{ (mass flow at 20 °C)}$ $\dot{m} = \dot{V} \cdot \rho = 1 \text{ [dm}^3/\text{h]} \cdot 0.783 \text{ [kg/l]} = 0.783 \text{ [kg/h]} \text{ (mass flow at 150 °C)}$ Example of calculated mass flow with compensation for thermal expansion of the fluid: $\dot{m} = \text{Mass flow [kg/h]}$ $\dot{V} = \text{Volume flow} = 1 \text{ [dm}^3/\text{h]}$ $\rho = \text{Density value} = 0.9 \text{ [kg/ l]}, \text{ see function DENSITY (0700)}$ $T_{\text{Ref}} = \text{Reference temperature} = 20 \text{ [°C]}, \text{ see function REFERENCE TEMPERATURE (0701)}$ $T_{\text{Pro}} = \text{Process temperature of the fluid} = 150 \text{ [°C]} \text{ via current input}$ $\varepsilon = \text{Vol. expansion coefficient} = 1 \cdot 10^{-3} \text{ [1/K]}, \text{ see function EXPANSION COEFFICIENT (0702)}$ $\dot{m} = \dot{V} \cdot \frac{\rho}{1 + \varepsilon \cdot (T_{\text{Pro}} - T_{\text{Ref}})} \rightarrow \dot{m} = 0.783 \text{ [kg/h]}$	
DENSITY VALUE (0700)	Use this function to enter a density value preferably at process temperature (or at reference temperature). This density value is used to convert the volume flow to a mass flow. User input: 5-digit floating-point number Factory setting: 1 [unit]  Note! The appropriate unit is taken from the function UNIT DENSITY (0420), (→ ⓘ 15).

Function description MEASURED VARIABLES → SPECIAL UNITS → DENSITY PARAMETER	
REFERENCE TEMPERATURE (0701)	Use this function to enter the reference temperature for the programmed density value. User input: 5-digit floating-point number Factory setting: 20 °C  Note! The appropriate unit is taken from the UNIT TEMPERATURE function (0422) (→  15).
EXPANSION COEFFICIENT (0702)	Use this function to enter a volume expansion coefficient [1/K] for temperature-dependent density changes. User input: 5-digit floating-point number Factory setting: 0  Note! This function is only displayed if the current input is set to TEMPERATURE" (→  106).

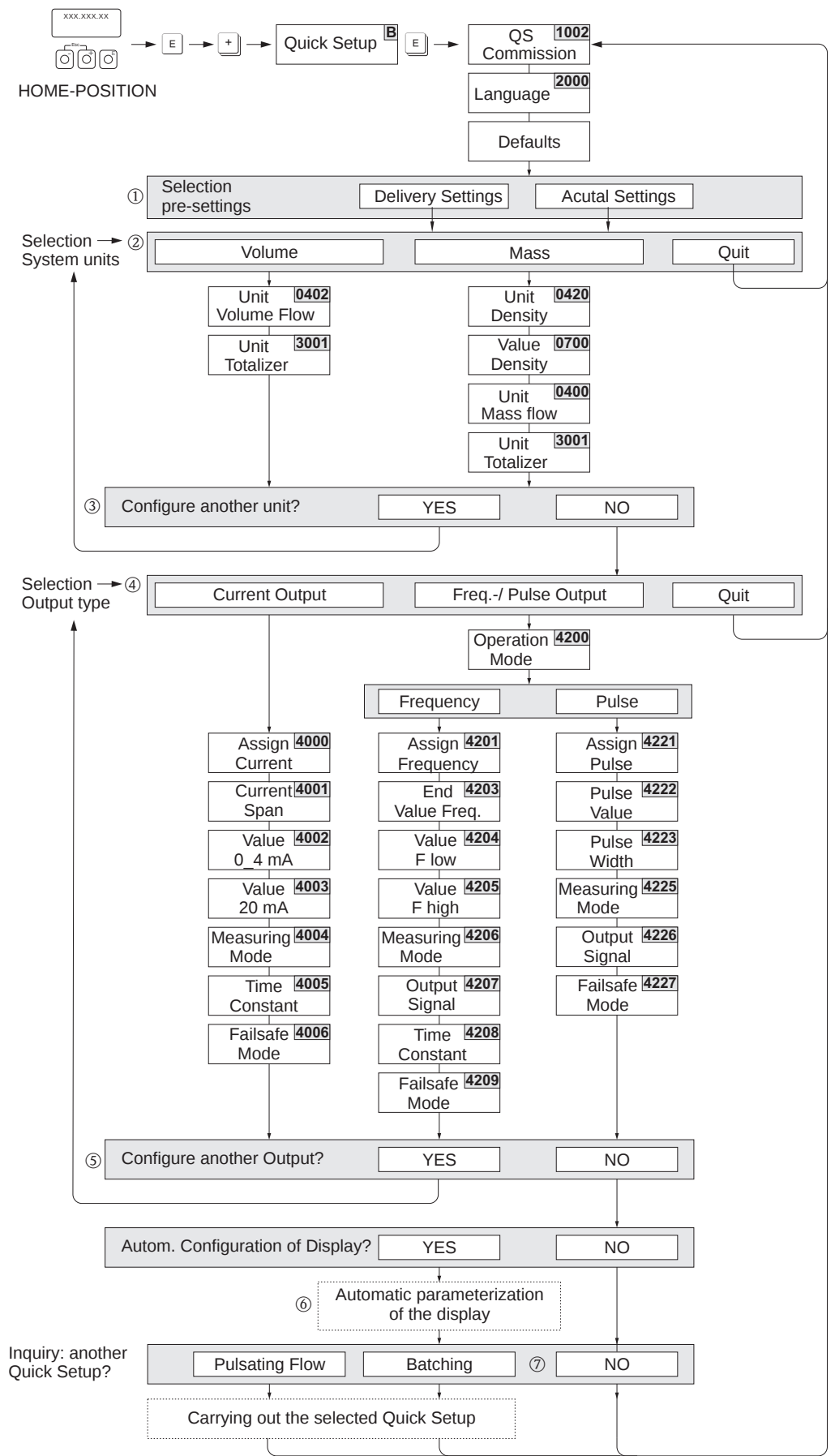
4 Block QUICK SETUP

Block	Group	Function groups	Functions
QUICK SETUP (B)	⇒	⇒	QUICK SETUP COMMISSION (1002) → 20 ⇒ QUICK SETUP PULS. FLOW (1003) → 20 QUICK SETUP BATCHING (1005) → 20 T-DAT SAVE/LOAD (1009) → 21

Function description QUICK SETUP	
QUICK SETUP COMMISSION (1002)	Use this function to start the Setup menu for commissioning. Options: YES NO Factory setting: NO Note! You will find a flowchart of the COMMISSIONING Setup menu on → 22. For more information on Setup menus, please refer to the Operating Instructions Promag 53, BA00047D.
QUICK SETUP PULSATING FLOW (1003)	Use this function to start the application-specific Setup menu for pulsating flow. Options: YES NO Factory setting: NO Note! You will find a flowchart of the PULSATING FLOW Setup menu on → 24. For more information on Setup menus, please refer to the Operating Instructions Promag 53, BA00047D.
QUICK SETUP BATCHING/DOSING (1005)	Note! This function is not available unless the optional software package BATCHING is installed and at least one relay output is available. Use this function to start the (optional) application-specific Setup menu for batching. Options: YES NO Factory setting: NO Note! You will find a flowchart of the BATCHING Setup menu on → 26. For more information on Setup menus, please refer to the Operating Instructions Promag 53, BA00047D.

Function description QUICK SETUP	
T-DAT SAVE/LOAD (1009)	Use this function to save the parameter settings / configuration of the transmitter in a transmitter DAT (T-DAT), or to load the parameter settings from the T-DAT into the EEPROM (manual security function). Application examples: ■ After commissioning, the current measuring point parameters can be saved to the T-DAT as a backup. ■ If the transmitter is replaced for some reason, the data from the T-DAT can be loaded into the new transmitter (EEPROM). Options: CANCEL SAVE (from EEPROM to T-DAT) LOAD (from the T-DAT into EEPROM) Factory setting: CANCEL  Note! ■ If the target device has an older software version, the message "TRANSM. SW-DAT" is displayed during start-up. Then only the "SAVE" function is available. ■ LOAD This function is only possible if the target device has the same software version as, or a more recent software version than, the source device. ■ SAVE This function is always available.

4.1 Setup Commissioning

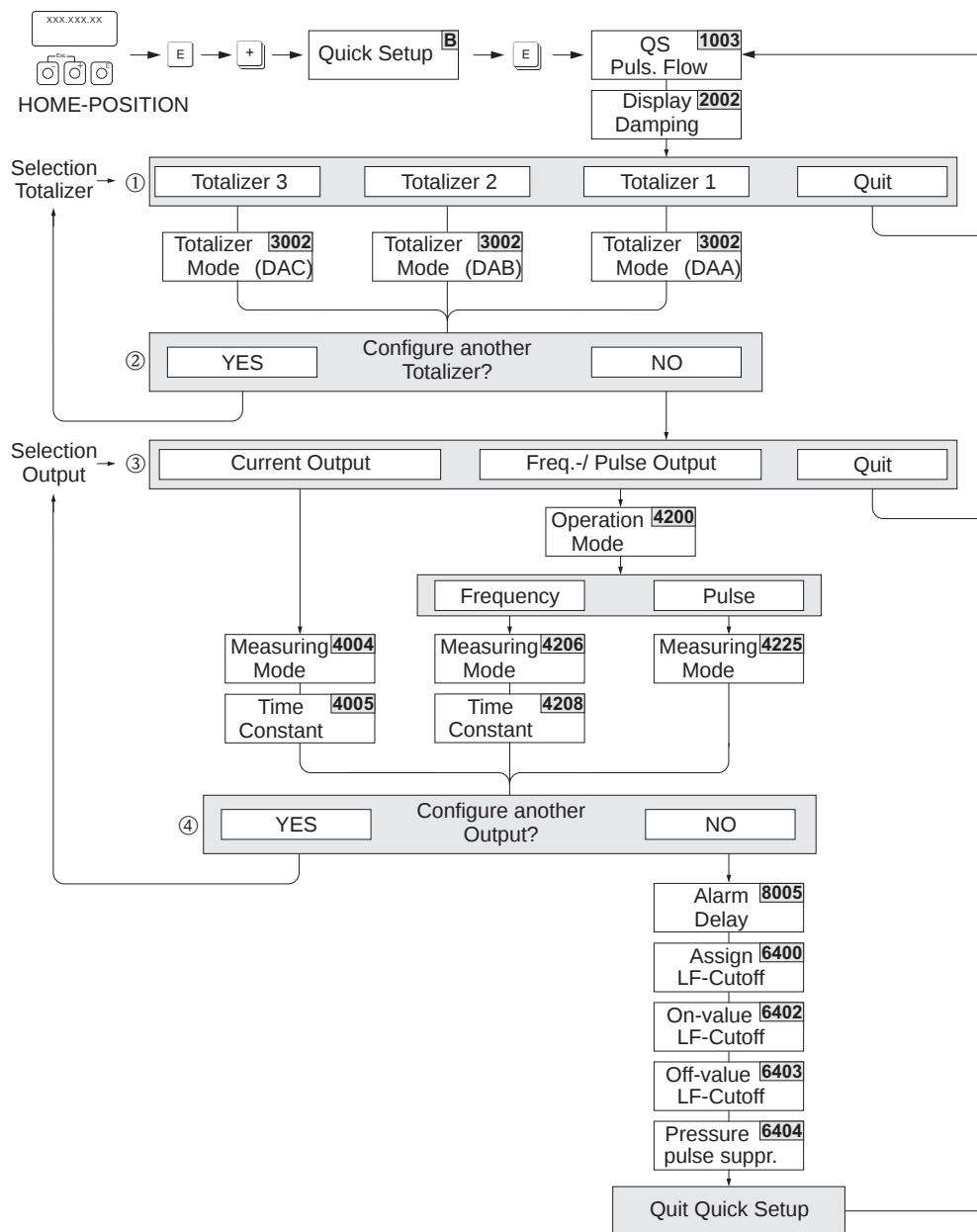


In the case of measuring devices without a local display, the individual parameters and functions must be configured by means of a configuration program, such as FieldCare from Endress+Hauser. During initial commissioning, the "Commissioning" Quick Setup must always be run through first, i.e. before other Quick Setups (→  24, 26).

 Note!

- The display returns to the cell SETUP COMMISSIONING (1002) if you press the ESC key combination during parameter interrogation. The stored parameters remain valid.
 - The "Commissioning" Quick Setup must be carried out before one of the Quick Setups explained below is run.
- ① The DELIVERY SETTINGS option sets every selected unit to the factory setting.
The ACTUAL SETTINGS option accepts the units you previously configured.
 - ② Only units not yet configured in the current Setup are offered for selection in each cycle.
The unit for mass, volume and corrected volume is derived from the corresponding flow unit.
 - ③ The "YES" option remains visible until all the units have been configured.
"NO" is the only option displayed when no further units are available.
 - ④ Only the outputs not yet configured in the current Setup are offered for selection in each cycle.
 - ⑤ The "YES" option remains visible until all the outputs have been parameterized.
"NO" is the only option displayed when no further outputs are available.
 - ⑥ The "automatic parameterization of the display" option contains the following basic settings/factory settings:
 - YES:** Main line = Mass flow; Additional line = Totalizer 1;
Information line = Operating/system conditions
 - NO:** The existing (selected) settings remain
 - ⑦ The QUICK SETUP BATCHING is only available when the optional software package BATCHING is installed.

4.2 Pulsating flow Setup menu



A0005524-en

Note!

- The display returns to the cell QUICK SETUP PULSATING FLOW (1003) if you press the ESC key combination during parameter interrogation.
 - You can call up this Setup menu either directly from the "COMMISSIONING" Setup menu or manually by means of the function QUICK SETUP PULSATING FLOW (1003).
- ① Only totalizers not yet configured in the current Setup are offered for selection in each cycle.
 - ② The "YES" option remains visible until all the totalizers have been configured. "NO" is the only option displayed when no further totalizers are available.
 - ③ Only the outputs not yet configured in the current Setup are offered for selection in each cycle.
 - ④ The "YES" option remains visible until all the outputs have been configured. "NO" is the only option displayed when no further outputs are available.

Settings for the pulsating flow Setup menu:

Fct. code	Function name	Suggested settings	Description
Call up through the function matrix:			
B	QUICK SETUP	QUICK SETUP PULSATING FLOW	→ 20
1003	QUICK SETUP PULSATING FLOW	YES	→ 20
Basic configuration:			
2002	DISPLAY DAMPING	3 s	→ 31
3002	TOTALIZER MODE (DAA)	BALANCE	→ 51
3002	TOTALIZER MODE (DAB)	BALANCE	→ 51
3002	TOTALIZER MODE (DAC)	BALANCE	→ 51
Select the signal type: CURRENT OUTPUT (1 to 2)			
4004	MEASURING MODE	PULSATING FLOW	→ 60
4005	TIME CONSTANT	3 s	→ 63
Select the signal type: FREQ./PULSE OUTPUT (1 to 2) / operating mode: FREQUENCY			
4206	MEASURING MODE	PULSATING FLOW	→ 71
4208	TIME CONSTANT	0 s	→ 76
Select the signal type: FREQ./PULSE OUTPUT (1 to 2) / operating mode: PULSE			
4225	MEASURING MODE	PULSATING FLOW	→ 79
Other settings:			
8005	ALARM DELAY	0 s	→ 147
6400	ASSIGN LOW FLOW CUT OFF	VOLUME FLOW	→ 113
6402	ON-VALUE LOW FLOW CUT OFF	see table below	→ 114
6403	OFF-VALUE LOW FLOW CUT OFF	50%	→ 114
6404	PRESSURE SHOCK SUPPRESSION	0 s	→ 115

Recommended settings for the function ASSIGN LOW FLOW CUT OFF (6400):

DN [mm]	dm ³ /min	US-gal/min
2	0.002 or	0.001
4	0.007 or	0.002
8	0.03 or	0.008
15	0.1 or	0.03
25	0.3 or	0.08
32	0.5 or	0.15
40	0.7 or	0.2
50	1.1 or	0.3
65	2.0 or	0.5
80	3.0 or	0.8
100	4.7 or	1.3

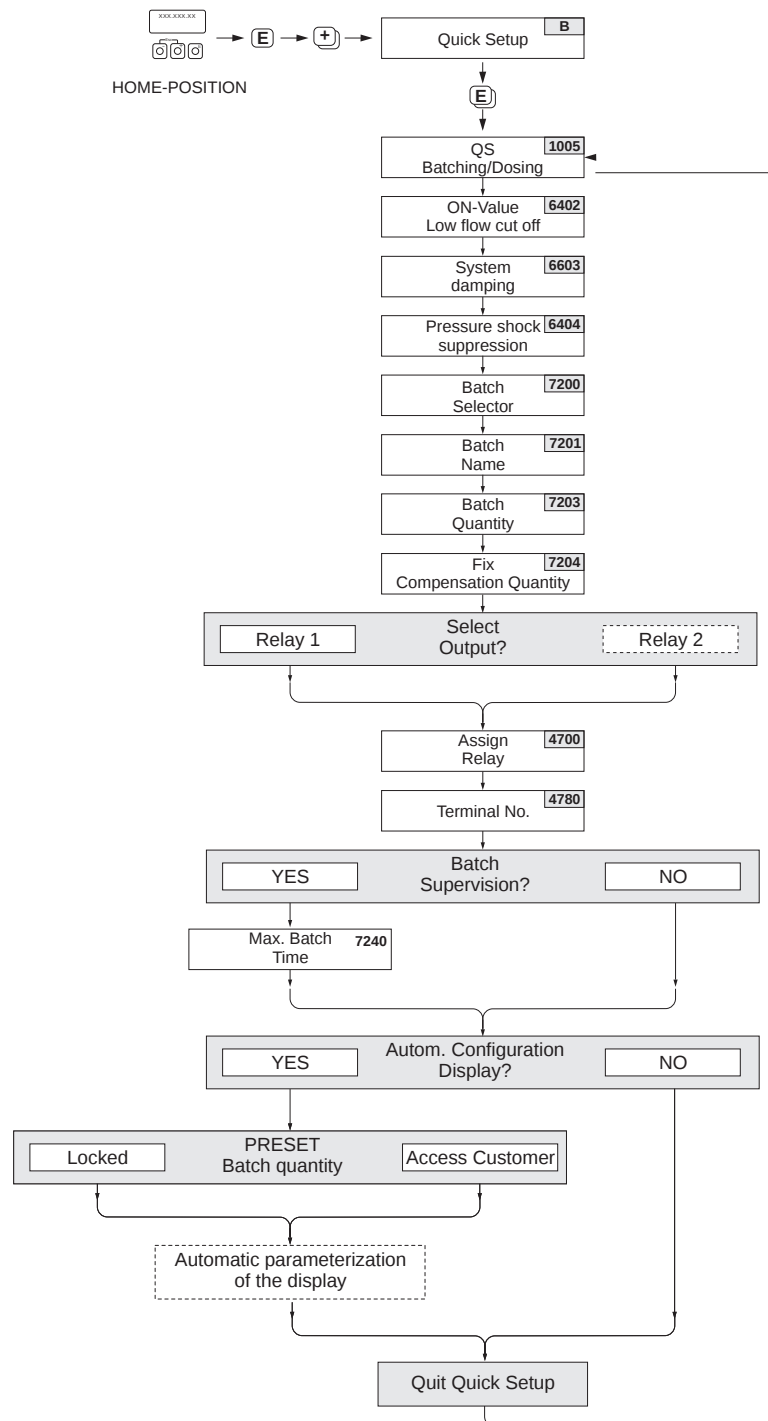
The recommended values correspond to the max. full scale value per DN divided by 1000 (see Operating Instructions Promag 53, BA00047D, Chapter "Installation" → nominal diameters and flow rates).

4.3 Batching Setup menu

This Setup menu guides the user systematically through all the device functions that have to be adjusted and configured for batching operation.

The Setup menu settings result in a (simple) one-stage batching process.

The parameters for any additional settings, e.g. for automatic compensation of after-runs or multi-stage batching, must be manually set in the function matrix.



A0004433-EN

**Note!**

- This Setup menu is only available if the optional software package BATCHING is installed in the measuring device. By means of the order option, the software package can already be installed in the measuring device when delivered from the factory or it can be ordered at a later date from Endress + Hauser and installed as an optional software package.
- The display returns to the function QUICK SETUP BATCHING/DOSING (1005), if you press the ESC key combination during parameter interrogation.
- At the start of the Setup, general device parameters are optimally configured for measuring signal processing and output response.
- Then you can enter the specific batching parameters, starting with the options list "Batching 1 to 6". In this way, by running through the Setup menu a number of times, up to six different batching parameter sets (incl. special naming) can be created and called up as necessary.
- In order to enjoy full functionality, it is advisable to let the display parameters be set automatically. This means that the lowest display line is parameterised as the batching menu. Softkeys are displayed which can be used to start or stop the batching process in the HOME position. In this way, the measuring device can be fully deployed as a "batch controller". The user can also use the "PRESET Batch quantity" interrogation to decide whether changing the batch quantity is possible via the local display with or without first entering a code:
 - ACCESS CUSTOMER: batch quantity can be changed without first entering a code.
 - LOCKED: batch quantity cannot be changed without first entering a code (read-only).

**Caution!**

By running the Setup, certain device parameters are optimally set for discontinuous operation. Should the measuring device be used for continuous flow measurement at a later time, we recommend you to rerun the "COMMISSIONING" or the "PULSATING FLOW" Setup.

Settings for the Batching Setup menu:

Fct. code	Function name	Suggested settings	Description
Call up through the function matrix:			
B	QUICK SETUP	QUICK SETUP BATCHING	→ 20
1005	QUICK SETUP BATCHING	YES	→ 20
Settings (functions with a grey background are set automatically):			
6400	ASSIGN LOW FLOW CUT OFF	Volume	→ 113
6402	ON-VALUE LOW FLOW CUT OFF	Table value	→ 114
6403	OFF-VALUE LOW FLOW CUT OFF	50%	→ 114
6603	SYSTEM DAMPING	9	→ 122
6404	PRESSURE SHOCK SUPPRESSION	0 seconds	→ 115
7200	BATCH SELECTOR	BATCH #1	→ 128
7202	BATCH NAME	BATCH #1	→ 128
7201	ASSIGN BATCH VARIABLE	Volume	→ 129
7203	BATCH QUANTITY	0	→ 129
7204	FIX COMPENSATION QUANTITY	0	→ 129
7208	BATCH STAGES	1	→ 130
7209	INPUT FORMAT	Value input	→ 130
4700	ASSIGN RELAY	BATCHING VALVE 1	→ 92
4780	TERMINAL NUMBER	Output (display only)	→ 98
7220	OPEN VALVE 1	0% or 0 [unit]	→ 131
7240	MAXIMUM BATCHING TIME	0 seconds (Off)	→ 136
7241	MINIMUM BATCHING QUANTITY	0% or 0 [unit]	→ 137
7242	MAXIMUM BATCHING QUANTITY	0% or 0 [unit]	→ 138

2200	ASSIGN (Main line)	BATCH NAME	→ ⓘ 35
2220	ASSIGN (Multiplex main line)	Off	→ ⓘ 37
2400	ASSIGN (Additional line)	BATCH DOWNWARDS	→ ⓘ 39
2420	ASSIGN (Multiplex additional line)	Off	→ ⓘ 42
2600	ASSIGN (Info line)	BATCHING KEYS	→ ⓘ 45
2620	ASSIGN (Multiplex info line)	Off	→ ⓘ 47

5 Block USER INTERFACE

Block	Groups	Function groups	Functions
USER INTERFACE (C)	CONTROL (CAA) → 30	⇒	
		⇕ ⇕	
		⇒	
	UN-/LOCKING (202) → 33	⇕ ⇕	
		⇒	
		⇕ ⇕	
	OPERATION (204) → 34	⇕ ⇕	
		⇒	
		⇕ ⇕	
	BASIC CONFIG. (200) → 30	⇕ ⇕	
		⇒	
		⇕ ⇕	
	LANGUAGE (2000) → 30	⇕ ⇕	
		⇒	
		⇕ ⇕	
	ACCESS CODE (2020) → 33	⇕ ⇕	
		⇒	
		⇕ ⇕	
	TEST DISPLAY (2040) → 34	⇕ ⇕	
		⇒	
		⇕ ⇕	
	DEF. PRIVATE CODE (2021) → 33	⇕ ⇕	
		⇒	
		⇕ ⇕	
	STATUS ACCESS (2022) → 33	⇕ ⇕	
		⇒	
		⇕ ⇕	
	ACCESS CODE COUNTER (2023) → 33	⇕ ⇕	
		⇒	
		⇕ ⇕	
	CONTRAST LCD (2003) → 31	⇕ ⇕	
		⇒	
		⇕ ⇕	
	DISPLAY DAMPING (2002) → 31	⇕ ⇕	
		⇒	
		⇕ ⇕	
	BACKLIGHT (2004) → 32	⇕ ⇕	
		⇒	
		⇕ ⇕	
	MAIN LINE (CCA) → 35	⇕ ⇕	
		⇒	
		⇕ ⇕	
	CONFIGURATION (220) → 35	⇕ ⇕	
		⇒	
		⇕ ⇕	
	MULTIPLY (222) → 37	⇕ ⇕	
		⇒	
		⇕ ⇕	
	100% VALUE (2201) → 35	⇕ ⇕	
		⇒	
		⇕ ⇕	
	100% VALUE (2221) → 37	⇕ ⇕	
		⇒	
		⇕ ⇕	
	FORMAT (2202) → 36	⇕ ⇕	
		⇒	
		⇕ ⇕	
	ADDITIONAL LINE (CEA) → 39	⇕ ⇕	
		⇒	
		⇕ ⇕	
	CONFIGURATION (240) → 39	⇕ ⇕	
		⇒	
		⇕ ⇕	
	MULTIPLY (242) → 42	⇕ ⇕	
		⇒	
		⇕ ⇕	
	100% VALUE (2401) → 40	⇕ ⇕	
		⇒	
		⇕ ⇕	
	100% VALUE (2421) → 43	⇕ ⇕	
		⇒	
		⇕ ⇕	
	FORMAT (2402) → 40	⇕ ⇕	
		⇒	
		⇕ ⇕	
	DISPLAY MODE (2403) → 41	⇕ ⇕	
		⇒	
		⇕ ⇕	
	INFORMATION LINE (CGA) → 45	⇕ ⇕	
		⇒	
		⇕ ⇕	
	CONFIGURATION (260) → 45	⇕ ⇕	
		⇒	
		⇕ ⇕	
	MULTIPLY (262) → 47	⇕ ⇕	
		⇒	
		⇕ ⇕	
	100% VALUE (2601) → 46	⇕ ⇕	
		⇒	
		⇕ ⇕	
	100% VALUE (2621) → 48	⇕ ⇕	
		⇒	
		⇕ ⇕	
	FORMAT (2602) → 46	⇕ ⇕	
		⇒	
		⇕ ⇕	
	DISPLAY MODE (2603) → 46	⇕ ⇕	
		⇒	
		⇕ ⇕	
	MULTIPLY (2620) → 47	⇕ ⇕	
		⇒	
		⇕ ⇕	
	100% VALUE (2621) → 48	⇕ ⇕	
		⇒	
		⇕ ⇕	
	FORMAT (2622) → 48	⇕ ⇕	
		⇒	
		⇕ ⇕	
	DISPLAY MODE (2623) → 48	⇕ ⇕	
		⇒	
		⇕ ⇕	

5.1 Group CONTROL

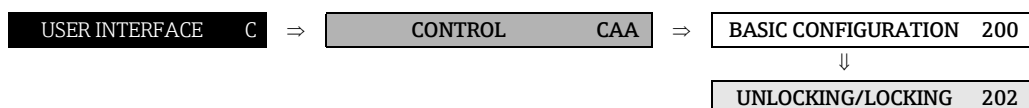
5.1.1 Function group BASIC CONFIGURATION

USER INTERFACE C ⇒ CONTROL CAA ⇒ BASIC CONFIGURATION 200	
Function description USER INTERFACE → CONTROL → BASIC CONFIGURATION	
LANGUAGE (2000) (HART 5)	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 (8226) function. Options: Language group WEST EU / USA: ENGLISH DEUTSCH FRANCAIS ESPANOL ITALIANO NEDERLANDS PORTUGUESE Language group EAST EU / SCAND: ENGLISH NORSK SVENSKA SUOMI POLISH RUSSIAN CZECH Language group ASIA: ENGLISH BAHASA INDONESIA JAPANESE (Silbenschrift) Language group CHINA: ENGLISH CHINESE Factory setting: Country-dependent (→  155)  Note! ▪ If you press the   keys at startup, the language defaults to "ENGLISH". ▪ You can change the language group via the configuration program FieldCare. Please do not hesitate to contact your Endress+Hauser sales office if you have any questions.

Function description USER INTERFACE → CONTROL → BASIC CONFIGURATION	
LANGUAGE (2000) (HART 7)	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 (8226) function. Options: Option P, Q: ENGLISH DEUTSCH FRANCAIS ESPANOL ITALIANO NEDERLANDS Option R, S: ENGLISH NEDERLANDS PORTUGUESE RUSSIAN CZECH Option T, U: ENGLISH BAHASA INDONESIA POLISH CHINA Option 4, 5: ENGLISH NORSK SVENSKA SUOMI JAPANESE Factory setting: Country-dependent (→  155)  Note! ■ If you press the  keys at startup, the language defaults to "ENGLISH". ■ You can change the language group via the configuration program FieldCare. Please do not hesitate to contact your Endress+Hauser sales office if you have any questions.
DISPLAY DAMPING (2002)	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 to 100 seconds Factory setting: 3 s  Note! Setting the time constant to zero seconds switches off damping.
CONTRAST LCD (2003)	Use this function to optimize display contrast to suit local operating conditions. User input: 10 to 100% Factory setting: 50%

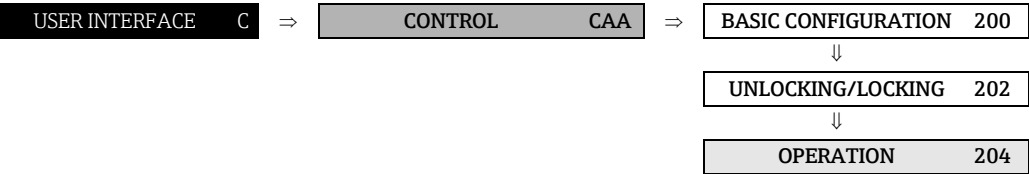
Function description USER INTERFACE → CONTROL → BASIC CONFIGURATION	
BACKLIGHT (2004)	Use this function to optimize the backlight to suit local operating conditions. User input: 0 to 100%  Note! Entering the value "0" means that the backlight is "switched off". The display then no longer emits any light, i.e. the display texts can no longer be read in the dark. Factory setting: 50%

5.1.2 Function group UNLOCKING/LOCKING



Function description	
USER INTERFACE → CONTROL → UNLOCKING/LOCKING	
ACCESS CODE (2020)	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 = 53, see function DEFINE PRIVATE CODE(2021)). User input: max. 4-digit number: 0 to 9999  Note! ■ Programming is 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 mislay your personal code.
DEFINE PRIVATE CODE (2021)	Use this function to specify a personal code for enabling programming in the function ACCESS CODE. User input: 0 to 9999 (max. 4-digit number) Factory setting: 53  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 (2022)	Use this function to check the access status for the function matrix. User Interface: ACCESS CUSTOMER (parameterization possible) LOCKED (parameterization disabled)
ACCESS CODE COUNTER (2023)	Displays how often the customer code, service code or the digit "0" (code-free) has been entered to gain access to the function matrix. Display: max. 7-digit number: 0 to 9999999 Factory setting: 0

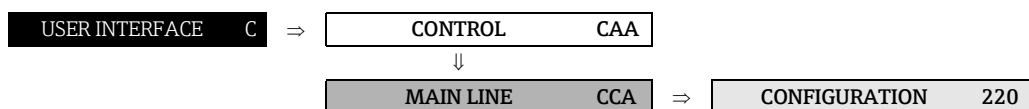
5.1.3 Function group OPERATION

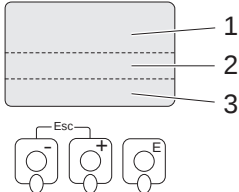


Function description	
USER INTERFACE → CONTROL → OPERATION	
TEST DISPLAY (2040)	Use this function to test the operability of the local display and its pixels. Options: OFF ON Factory setting: OFF Test sequence: 1. Start the test by selecting ON. 2. All pixels of the main line, additional line and information line are darkened for minimum 0.75 seconds. 3. Main line, additional line and information line show an "8" in each field for minimum 0.75 seconds. 4. Main line, additional line and information line show a "0" in each field for minimum 0.75 seconds. 5. Main line, additional line and information line show nothing (blank display) for minimum 0.75 seconds. When the test completes the local display returns to its initial state and the setting changes to OFF.

5.2 Group MAIN LINE

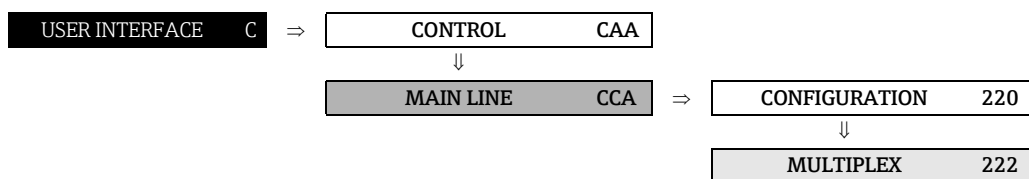
5.2.1 Function group CONFIGURATION



Function description USER INTERFACE → MAIN LINE → CONFIGURATION	
 A0001253 1 = main line, 2 = additional line, 3 = information line	
ASSIGN (2200)	In this function, a value to be displayed is assigned to the main line (top line in the local display). This value is displayed during normal operation. Options: OFF VOLUME FLOW MASS FLOW VOLUME FLOW IN % MASS FLOW IN % ACTUAL CURRENT (1 to 2) ACTUAL FREQUENCY (1 to 2) TOTALIZER (1 to 3) ACTUAL CURRENT IN Advanced options with optional software package BATCHING: BATCH NAME (BATCH # 1" or "BEER 330", etc.) BATCH QUANTITY (overall quantity to be batched) BATCH COUNTER (batching processes carried out) BATCH SUM (effective total batching quantity)  Note! The options given in the BATCHING software package always refer to the batching selected ("BATCH # 1", "BATCH # 2", etc.) in the function BATCH SELECTOR (→ 128). Example: If the option BATCH # 1 was selected in function BATCH SELECTOR (7200), then only the values of BATCH # 1 (batch name, batch quantity, etc.) can be displayed. Factory setting: VOLUME FLOW
100% VALUE (2201)	 Note! This function is only available if VOLUME FLOW IN % or MASS FLOW IN % was selected in the function ASSIGN (2200). 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 (→ 154).

Function description	
USER INTERFACE → MAIN LINE → CONFIGURATION	
FORMAT (2202)	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 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

5.2.2 Function group MULTIPLEX

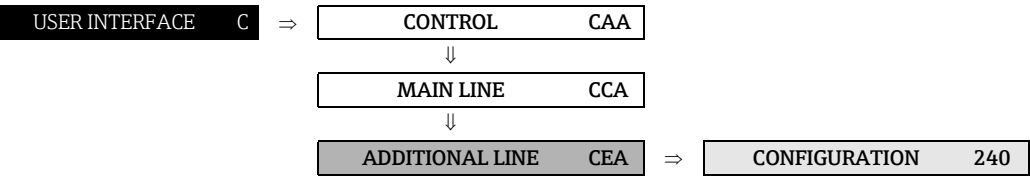


Function description	
USER INTERFACE → MAIN LINE → MULTIPLEX	
ASSIGN (2220)	Use this function to define the second reading to be displayed in the main line alternately (every 10 seconds) with the value defined in the ASSIGN function (2200). Options: OFF VOLUME FLOW MASS FLOW VOLUME FLOW IN % MASS FLOW IN % ACTUAL CURRENT (1 to 2) ACTUAL FREQUENCY (1 to 2) TOTALIZER (1 to 3) ACTUAL CURRENT IN Advanced options with optional software package BATCHING: BATCH NAME ("BATCH # 1" or "BEER 330", etc.) BATCH QUANTITY (overall quantity to be batched) BATCH COUNTER (batching processes carried out) BATCH SUM (effective total batching quantity) Note! The options given in the BATCHING software package always refer to the batching selected ("BATCH # 1", "BATCH # 2", etc.) in the function BATCH SELECTOR (→ 128). Example: If the option BATCH # 1 was selected in the function BATCH SELECTOR (7200), then only the values of BATCH # 1 (batch name, batch quantity, etc.) can be displayed. Factory setting: OFF
100% VALUE (2221)	Note! This function is only available if VOLUME FLOW IN % or MASS FLOW IN % was selected in the function ASSIGN (2220). 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 (→ 154).

Function description	
USER INTERFACE → MAIN LINE → MULTIPLEX	
FORMAT (2222)	Use this function to define the maximum number of places after the decimal point for the second value displayed 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 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

5.3 Group ADDITIONAL LINE

5.3.1 Function group CONFIGURATION

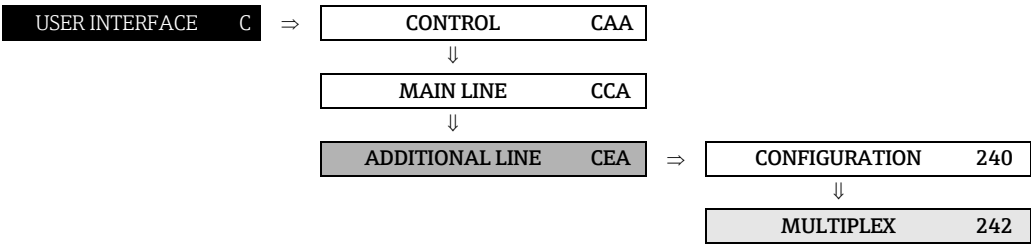


Function description	
USER INTERFACE → ADDITIONAL LINE → CONFIGURATION	
1 2 3 Esc A0001253 1 = main line, 2 = additional line, 3 = information line	
ASSIGN (2400)	In this function, a value to be displayed is assigned to the additional line (middle line in the local display). This value is displayed during normal operation. Options: OFF VOLUME FLOW MASS FLOW VOLUME FLOW IN % MASS FLOW IN % VOLUME FLOW BARGRAPH IN % MASS FLOW BARGRAPH IN % FLOW VELOCITY ACTUAL CURRENT (1 to 2) ACTUAL FREQUENCY (1 to 2) TOTALIZER (1 to 3) TAG NAME DENSITY * TEMPERATURE * ACTUAL CURRENT IN * LONG TAG 1...16 (only HART 7)** LONG TAG 17...32 (only HART 7)** * only available with present or correspondingly configured current input. ** Byte 29 to 32 only selectable in INFORMATION LINE. → 45 (continued on next page)

Function description USER INTERFACE → ADDITIONAL LINE → CONFIGURATION	
ASSIGN (continued)	Advanced options with optional software package BATCHING: BATCH NAME ("BATCH # 1" or "BEER 330", etc.) BATCH QUANTITY (overall quantity to be batched) BATCH COUNTER (batching processes carried out) BATCH SUM (effective total batching quantity) BATCH UPWARDS (batching progress upwards) BATCH DOWNWARDS (batching progress downwards)  Note! The options given in the BATCHING software package always refer to the batching selected ("BATCH # 1", "BATCH # 2", etc.) in the function BATCH SELECTOR (→  128). Example: If the option BATCH # 1 was selected in the function BATCH SELECTOR (7200), only the values of BATCH # 1 (batch name, batch quantity, etc.) can be displayed. Factory setting: TOTALIZER 1
100% VALUE (2401)	 Note! This function is not available unless one of the following was selected in the function ASSIGN (2400): ■ VOLUME FLOW IN % ■ MASS FLOW IN % ■ VOLUME FLOW BARGRAPH IN % ■ MASS FLOW BARGRAPH IN % 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 (→  154).
FORMAT (2402)	 Note! This function is not available unless a number was selected in the function ASSIGN (2400). Use this function to define the maximum number of places after the decimal point displayed for the reading in the additional line. Options: XXXXX. – XXX.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 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

Function description	
USER INTERFACE → ADDITIONAL LINE → CONFIGURATION	
DISPLAY MODE (2403)	Note! This function is only available if VOLUME FLOW BARGRAPH IN % or MASS FLOW BARGRAPH IN % was selected in the function ASSIGN (2400). Use this function to define the format of the bar graph. Options: STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign). +25 +50 +75 % A0001258 SYMMETRY (Symmetrical bar graph for positive and negative directions of flow, with -50 / 0 / +50% gradations and integrated sign). -50 - +50 % A0001259 Factory setting: STANDARD

5.3.2 Function group MULTIPLEX



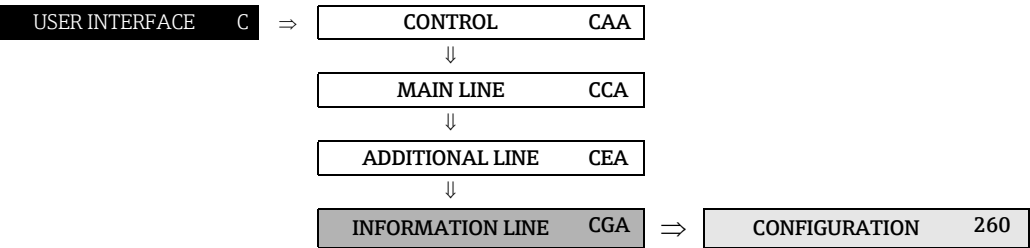
Function description	
USER INTERFACE → ADDITIONAL LINE → MULTIPLEX	
ASSIGN (2420)	Use this function to define the second reading to be displayed in the additional line alternately (every 10 seconds) with the value defined in the function ASSIGN (2400). Options: OFF VOLUME FLOW MASS FLOW VOLUME FLOW IN % MASS FLOW IN % VOLUME FLOW BARGRAPH IN % MASS FLOW BARGRAPH IN % FLOW VELOCITY ACTUAL CURRENT (1 to 2) ACTUAL FREQUENCY (1 to 2) TOTALIZER (1 to 3) TAG NAME DENSITY * TEMPERATURE * ACTUAL CURRENT IN * LONG TAG 1...16 (only HART 7)** LONG TAG 17...32 (only HART 7)** * only available with present or correspondingly configured current input. ** Byte 29 to 32 only selectable in INFORMATION LINE.→ 45 Advanced options with optional software package BATCHING: BATCH NAME ("BATCH # 1" or "BEER 330", etc.) BATCH QUANTITY (overall quantity to be batched) BATCH COUNTER (batching processes carried out) BATCH SUM (effective total batching quantity) BATCH UPWARDS (batching progress upwards) BATCH DOWNWARDS (batching progress downwards) Note! The options given in the BATCHING software package always refer to the batching selected ("BATCH # 1", "BATCH # 2", etc.) in the function BATCH SELECTOR (→ 128). Example: If option BATCH # 1 was selected in the function BATCH SELECTOR (7200), then only the values of BATCH # 1 (batch name, batch quantity, etc.) can be displayed. Factory setting: OFF (continued on next page)

Function description USER INTERFACE → ADDITIONAL LINE → MULTIPLEX	
ASSIGN (continued)	 Note! Multiplex mode is suspended as soon as a fault/notice message is generated. The message in question appears on the display. ■ Fault message (identified by a lightning icon): – If ON was selected in the function ACKNOWLEDGE FAULTS (8004), multiplex mode is continued as soon as the fault has been acknowledged and is no longer active. – If OFF was selected in the function ACKNOWLEDGE FAULTS (8004), multiplex mode is continued as soon as the fault is no longer active. ■ Notice message (identified by an exclamation mark): Multiplex mode is continued as soon as the notice message is no longer active.
100% VALUE (2421)	 Note! This function is not available unless one of the following was selected in the function ASSIGN (2420): ■ VOLUME FLOW IN % ■ MASS FLOW IN % ■ VOLUME FLOW BARGRAPH IN % ■ MASS FLOW BARGRAPH IN % 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 (→  154).
FORMAT (2422)	 Note! This function is not available unless a number was selected in the function ASSIGN (2420). Use this function to define the maximum number of places after the decimal point for the second value displayed in the additional 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 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

Function description	
USER INTERFACE → ADDITIONAL LINE → MULTIPLEX	
DISPLAY MODE (2423)	Note! This function is only available if VOLUME FLOW BARGRAPH IN % or MASS FLOW BARGRAPH IN % was selected in the function ASSIGN (2420). Use this function to define the format of the bar graph. Options: STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign). +25+50+75% A0001258 SYMMETRY (Symmetrical bar graph for positive and negative directions of flow, with -50 / 0 / +50% gradations and integrated sign). -500+50% A0001258 Factory setting: STANDARD

5.4 Group INFORMATION LINE

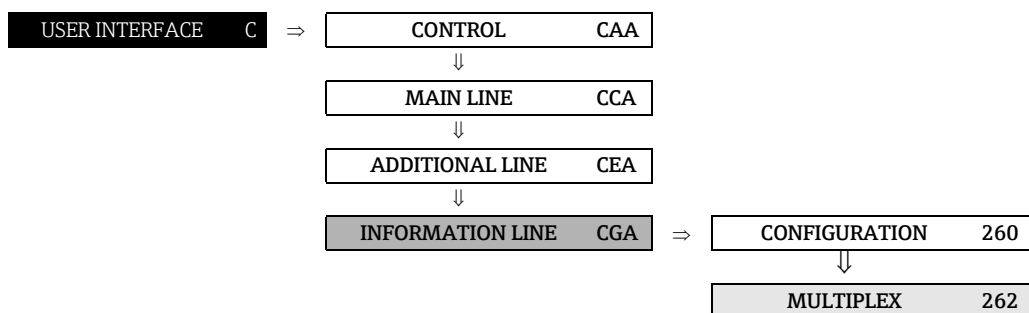
5.4.1 Function group CONFIGURATION



Function description	
USER INTERFACE → INFORMATION LINE → CONFIGURATION	
1 2 3 Esc A0001253 1 = main line, 2 = additional line, 3 = information line	
ASSIGN (2600)	In this function, a value to be displayed is assigned to the information line (bottom line in the local display). This value is displayed during normal operation. Options: OFF VOLUME FLOW IN % MASS FLOW IN % VOLUME FLOW BARGRAPH IN % MASS FLOW BARGRAPH IN % FLOW VELOCITY ACTUAL CURRENT (1 to 2) ACTUAL FREQUENCY (1 to 2) TOTALIZER (1 to 3) TAG NAME OPERATING/SYSTEM CONDITIONS DISPLAY FLOW DIRECTION DENSITY * TEMPERATURE * ACTUAL CURRENT IN * LONG TAG 1-14 (only HART 7) LONG TAG 15-28 (only HART 7) LONG TAG 29-32 (only HART 7) * only available with present or correspondingly configured current input. Advanced options with optional software package BATCHING: BATCHING KEYS (softkeys on the local display) Note! ■ If you select the BATCHING OPERATING KEYS, the multiplex display functionality (function ASSIGN (2620), etc.) is not available in the information line. ■ For information on the functional concept of the batching menu, see chapter "Operation" in the Operating Instructions Promag 53, BA00047D. Factory setting: OPERATING/SYSTEM CONDITIONS

Function description	
USER INTERFACE → INFORMATION LINE → CONFIGURATION	
100% VALUE (2601)	 Note! This function is not available unless one of the following was selected in the function ASSIGN (2600): - VOLUME FLOW IN % - MASS FLOW IN % - VOLUME FLOW BARGRAPH IN % - MASS FLOW BARGRAPH IN % 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 (→ ⓘ 154).
FORMAT (2602)	 Note! This function is not available unless a number was selected in the function ASSIGN (2600). Use this function to define the maximum number of places after the decimal point displayed for the reading in the information 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 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.
DISPLAY MODE (2603)	 Note! This function is only available if VOLUME FLOW BARGRAPH IN % or MASS FLOW BARGRAPH IN % was selected in the function ASSIGN (2600). Use this function to define the format of the bar graph. Options: STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign). +25 +50 +75 % A0001258 -50 - +50 % A0001259 Factory setting: STANDARD

5.4.2 Function group MULTIPLEX



Function description	
USER INTERFACE → INFORMATION LINE → MULTIPLEX	
Note! If you select the BATCHING KEYS in the function ASSIGN (2600), the multiplex display functionality is not available in the information line.	
ASSIGN (2620)	Use this function to define the second reading to be displayed in the information line alternately (every 10 seconds) with the value defined in the function ASSIGN (2600). Options: OFF VOLUME FLOW IN % MASS FLOW IN % VOLUME FLOW BARGRAPH IN % MASS FLOW BARGRAPH IN % FLOW VELOCITY ACTUAL CURRENT (1 to 2) ACTUAL FREQUENCY (1 to 2) TOTALIZER (1 to 3) TAG NAME OPERATING/SYSTEM CONDITIONS DISPLAY FLOW DIRECTION DENSITY * TEMPERATURE * ACTUAL CURRENT IN * LONG TAG 1-14 (only HART 7) LONG TAG 15-28 (only HART 7) LONG TAG 29-32 (only HART 7) * only available with present or correspondingly configured current input. Factory setting: OFF Note! Multiplex mode is suspended as soon as a fault / notice message is generated. The message in question appears on the display. ■ Fault message (identified by a lightning icon): – If ON was selected in the function ACKNOWLEDGE FAULTS (8004), multiplex mode is continued as soon as the fault has been acknowledged and is no longer active. – If OFF was selected in the function ACKNOWLEDGE FAULTS (8004), multiplex mode is continued as soon as the fault is no longer active. ■ Notice message (identified by an exclamation mark): – Multiplex mode is continued as soon as the notice message is no longer active.

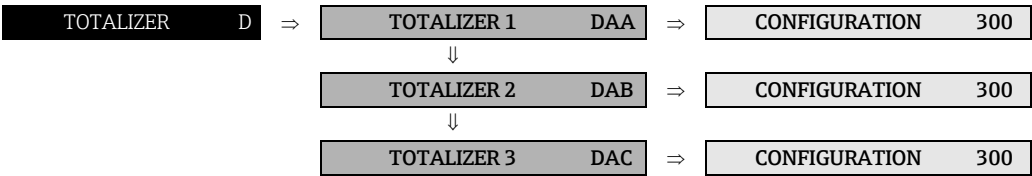
Function description	
USER INTERFACE → INFORMATION LINE → MULTIPLEX	
100% VALUE (2621)	 Note! This function is not available unless one of the following was selected in the function ASSIGN (2620): - VOLUME FLOW IN % - MASS FLOW IN % - VOLUME FLOW BARGRAPH IN % - MASS FLOW BARGRAPH IN % Use this function 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 (→ ⓘ 154).
FORMAT (2622)	 Note! This function is not available unless a number was selected in the ASSIGN function (2600). Use this function to define the maximum number of places after the decimal point for the second value displayed in the information 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 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.
DISPLAY MODE (2623)	 Note! This function is only available if VOLUME FLOW BARGRAPH IN % or MASS FLOW BARGRAPH IN % was selected in the function ASSIGN (2620). Use this function to define the format of the bar graph. Options: STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign). +25+50+75% A0001258 SYMMETRY (Symmetrical bar graph for positive and negative directions of flow, with -50 / 0 / +50% gradations and integrated sign). -500+50% A0001258 Factory setting: STANDARD

6 Block TOTALIZER

Block	Groups	Function groups	Functions
TOTALIZER (D)	TOTALIZER 1 (DAA) → 50	⇐	
		⇐	
		⇐	
		⇐	
	TOTALIZER 2 (DAB) → 50	⇐	
		⇐	
		⇐	
		⇐	
	TOTALIZER 3 (DAC) → 50	⇐	
		⇐	
⇐			
⇐			
HANDLING TOTALIZER (DJA) → 53	⇐		
	⇐		

6.1 Group TOTALIZER (1 to 3)

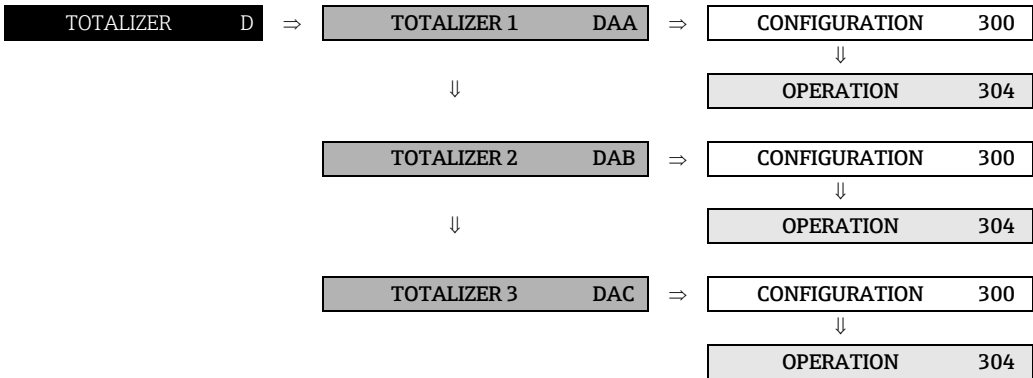
6.1.1 Function group CONFIGURATION



Function description	
TOTALIZER → TOTALIZER (1 to 3) → CONFIGURATION	
The function descriptions below apply to totalizers 1 to 3; the totalizers are independently configurable.	
ASSIGN (3000)	Use this function to assign a measured variable to the totalizer in question. Options: OFF MASS FLOW VOLUME FLOW Factory setting: VOLUME FLOW Note! ▪ The totalizer is reset to "0" as soon as the selection is changed. ▪ If you select OFF in the function group CONFIGURATION of the totalizer in question, only the ASSIGN (3000) function remains visible.
UNIT TOTALIZER (3001)	Use this function to define the unit for the totalizer's measured variable, as selected beforehand. Options: (for MASS FLOW assignment): Metric → g; kg; t US → oz; lb; ton Factory setting: Depends on nominal diameter and country (→ 154). Options (for VOLUME FLOW assignment): Metric → cm³; dm³; m³; ml; l; hl; Ml Mega US → cc; af; ft³; oz f; gal; Kgal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals); bbl (filling tanks) Imperial → gal; Mgal; bbl (beer); bbl (petrochemicals) Arbitrary unit → _ _ _ _ (see function group ARBITRARY UNIT on → 17) Factory setting: Depends on nominal diameter and country (→ 154).

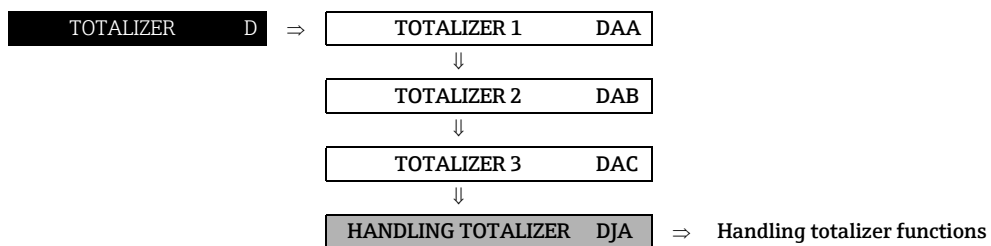
Function description TOTALIZER → TOTALIZER (1 to 3) → CONFIGURATION	
TOTALIZER MODE (3002)	Use this function to define how the flow components are to be totalised. Options: BALANCE Positive and negative flow components. The positive and negative flow components are balanced. In other words, net flow in the flow direction is registered. FORWARD Positive flow components only REVERSE Negative flow components only Factory setting: Totalizer 1 = BALANCE Totalizer 2 = FORWARD Totalizer 3 = REVERSE
RESET TOTALIZER (3003)	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 is equipped with a status input, with the appropriate configuration a reset for each individual totalizer can also be triggered by a pulse (siehe Funktion ASSIGN STATUS INPUT (5000) auf Seite 103).

6.1.2 Function group OPERATION



Function description	
TOTALIZER → TOTALIZER (1 to 3) → OPERATION	
The function descriptions below apply to totalizers 1 to 3; the totalizers are independently configurable.	
SUM (3040)	Use this function to view the total for the totalizer's measured variable aggregated since measuring commenced. The value can be positive or negative, depending on the setting selected in the "TOTALIZER MODE" function (3002), and the direction of flow. User interface: max. 7-digit floating-point number, including sign and unit (e.g. 15467.04 m³; -4925.631 kg) Note! ■ The effect of the setting in the "TOTALIZER MODE" function (see → 51) is as follows: - If the setting is "BALANCE", the totalizer balances flow in the positive and negative directions. - If the setting is "FORWARD", the totalizer registers only flow in the positive direction. - If the setting is "REVERSE", the totalizer registers only flow in the negative direction. ■ The totalizer's response to faults is defined in the "FAILSAFE ALL TOTALIZERS" function (3801), (see → 53).
OVERFLOW (3041)	Use this function to view the overflow for the totalizer aggregated since measuring commenced. 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 OVERFLOW plus the value returned by the SUM function. Example: Reading for 2 overflows: 2 · 10⁷ dm³ (= 20,000.000 dm³) The value displayed in the function SUM = 196,845.7 dm³ Effective total quantity = 20,196,845.7 dm³ User interface: integer with exponent, including sign and unit, e.g. 2 · 10⁷ dm³

6.2 Group HANDLING TOTALIZER



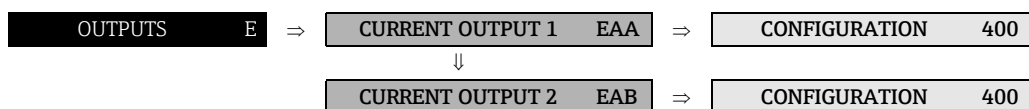
Function description	
TOTALIZER → HANDLING TOTALIZER → Handling totalizer functions	
RESET ALL TOTALIZERS (3800)	Use this function to reset the totals (including all overflows) of the totalizers (1 to 3) to zero (= RESET). Options: NO YES Factory setting: NO Note! If the device is equipped with a status input and if it is appropriately configured, a reset for the totalizer (1 to 3) can also be triggered by a pulse (siehe Funktion ASSIGN STATUS INPUT (5000) auf Seite 103).
FAILSAFE ALL TOTALIZERS (3801)	Use this function to define the common response of all totalizers (1 to 3) in case of error. Options: STOP The totalizer is paused until the fault is rectified. ACTUAL VALUE The totalizer continues to count is based on the current flow measuring value. The fault is ignored. HOLD VALUE The totalizer continues to count the flow that is based on the last valid flow measuring value (before the fault occurred). Factory setting: STOP

7 Block OUTPUTS

Block	Groups	Function groups	Functions												
OUTPUTS (E)	CURRENT (EAA, EAB) → 55	⇕	CONFIGURATION (400) → 55	⇕	ASSIGN CURRENT (4001) → 56	VALUE 0_4 mA (4002) → 57	VALUE 20 mA (4003) → 59	MEASURING MODE (4004) → 60	TIME CONSTANT (4005) → 63	FAILSAFE MODE (4006) → 64					
		⇕⇕	OPERATION (404) → 65	⇕	VALUE SIM. CURRENT (4041) → 65										
		⇕⇕	INFORMATION (408) → 66	⇕	TERMINAL NUM- BER (4080) → 66										
	PULSE/FREQ. (ECA, ECB) → 6	⇕⇕	CONFIGURATION (420) → 67	⇕	OPERATION MODE (4200) → 67	⇕	ASSIGN FREQUENCY (4201) → 67	START VALUE FREQ. (4202) → 68	END VALUE FREQ. (4203) → 68	VALUE-f LOW (4204) → 68	VALUE-f HIGH (4205) → 69	MEASURING MODE (4206) → 71	OUTPUT SIGNAL (4207) → 73	TIME CONSTANT (4208) → 76	FAILSAFE MODE (4209) → 76
		⇕⇕	FAILSAFE VALUE (4211) → 76												
		⇕⇕													
			⇕⇕	OPERATION (430) → 87	⇕	ACTUAL FREQ. (4301) → 87	SIMULATION FREQ. (4302) → 87	VALUE SIMUL. FREQ. (4303) → 88							
			⇕⇕	⇕⇕	⇕	SIMULATION PULSE (4322) → 89	VALUE SIM. PULSE (4323) → 89								
			⇕⇕	⇕⇕	⇕	ACTUAL STATUS (4341) → 90	SIM. SWITCH POINT (4342) → 90	VAL. SIM. SWITCH PNT. (4343) → 90							
		RELAY (EGA, EGB) → 8	⇕⇕	INFORMATION (438) → 91	⇕	TERMINAL NUM- BER (4380) → 91									
⇕⇕			CONFIGURATION (470) → 92	⇕	ASSIGN RELAY (4700) → 92	ON-VALUE (4701) → 93	SWITCH-ON DELAY (4702) → 93	OFF-VALUE (4703) → 93	SWITCH-OFF DELAY (4704) → 94	MEASURING MODE (4705) → 94	TIME CONSTANT (4706) → 95				
⇕⇕			OPERATION (474) → 96	⇕	ACTUAL STATUS RELAY (4740) → 96	SIM. SWITCH POINT (4741) → 96	VAL. SIM. SWITCH PNT. (4742) → 97								
		⇕⇕	INFORMATION (478) → 98	⇕	TERMINAL NUM- BER (4780) → 98										
		⇕⇕													
		⇕⇕													
		⇕⇕													

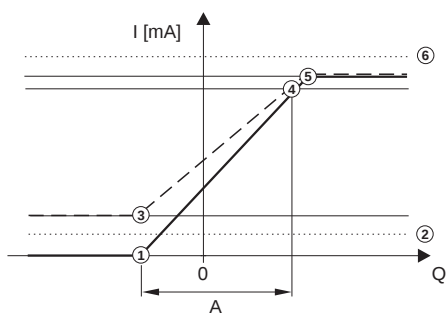
7.1 Group CURRENT OUTPUT (1 to 2)

7.1.1 Function group CONFIGURATION



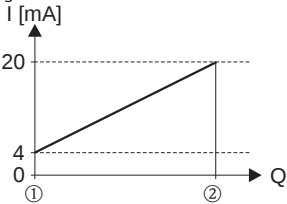
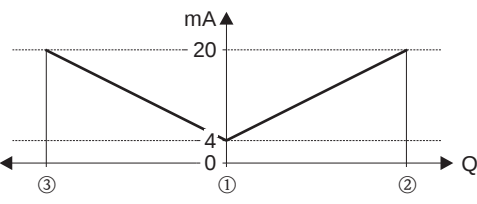
Function description	
OUTPUTS → CURRENT OUTPUT (1 to 2) → CONFIGURATION	
ASSIGN CURRENT OUTPUT (4000)	Use this function to assign a measured variable to the current output. Options: OFF MASS FLOW VOLUME FLOW Advanced options with optional software package BATCHING: BATCH UPWARDS (batching progress upwards) BATCH DOWNWARDS (batching progress downwards) Note! ■ The current range selected (function CURRENT SPAN (4001)) corresponds to a batching rate of 0 to 100%, based on the batching quantity. ■ The batching software automatically sets the values for 0/4 mA and 20 mA (function VALUE 0_4 mA (4002) and VALUE 20 mA (4003)). Example with upward batching: Value 0/4 mA = 0 [unit]; Value 20 mA = batch quantity [unit]. Factory setting: VOLUME FLOW Note! If you select OFF, the only function shown in the function group CONFIGURATION (400) is this function, in other words, ASSIGN CURRENT OUTPUT (4000).

Function description																													
OUTPUTS → CURRENT OUTPUT (1 to 2) → CONFIGURATION																													
CURRENT SPAN (4001)	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: 0–20 mA 4–20 mA 4–20 mA HART (only current output1) 4–20 mA NAMUR 4–20 mA HART NAMUR (only current output1) 4–20 mA US 4–20 mA HART US (only current output1) 0–20 mA (25 mA) 4–20 mA (25 mA) 4–20 mA (25 mA) HART (only current output1) Factory setting: 4–20 mA HART NAMUR (für current output 1) 4–20 mA NAMUR (für current output 2)  Note! ■ The option HART is only supported by the current output designated as current output 1 in the device software, (terminals 26 and 27, see function TERMINAL NUMBER (4080) on →  66). ■ When switching the hardware from an active (factory setting) to a passive output signal select a current span of 4–20 mA (see Operating Instructions Promag 53, BA047D/06/en) Current span, operational range and signal on alarm level <table><tr><th></th><th>1</th><th>2</th><th>3</th></tr><tr><td></td><td>0 - 20.5 mA</td><td>0</td><td>22</td></tr><tr><td></td><td>4 - 20.5 mA</td><td>2</td><td>22</td></tr><tr><td></td><td>3.8 - 20.5 mA</td><td>3.5</td><td>22.6</td></tr><tr><td></td><td>3.9 - 20.8 mA</td><td>3.75</td><td>22.6</td></tr><tr><td></td><td>0 - 24 mA</td><td>0</td><td>25</td></tr><tr><td></td><td>4 - 24 mA</td><td>2</td><td>25</td></tr></table> A0001222 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 functions VALUE 0_4 mA (4002) and VALUE 20 mA (4003)) a notice message is generated (#351 to 354, current span). ■ In case of a fault the behaviour of the current output is according to the selected option in the function FAILSAFE MODE (4006). Change the error category in the function ASSIGN SYSTEM ERROR (8000) to generate a fault message instead of a notice message.		1	2	3		0 - 20.5 mA	0	22		4 - 20.5 mA	2	22		3.8 - 20.5 mA	3.5	22.6		3.9 - 20.8 mA	3.75	22.6		0 - 24 mA	0	25		4 - 24 mA	2	25
	1	2	3																										
	0 - 20.5 mA	0	22																										
	4 - 20.5 mA	2	22																										
	3.8 - 20.5 mA	3.5	22.6																										
	3.9 - 20.8 mA	3.75	22.6																										
	0 - 24 mA	0	25																										
	4 - 24 mA	2	25																										

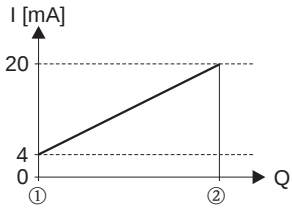
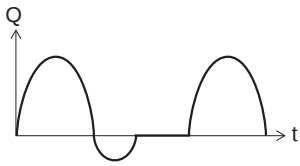
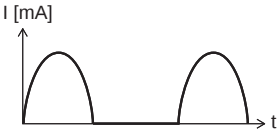
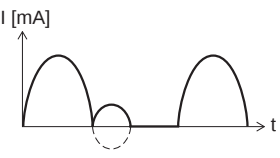
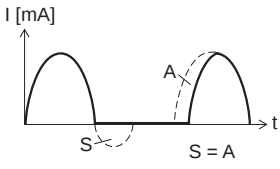
Function description OUTPUTS → CURRENT OUTPUT (1 to 2) → CONFIGURATION	
VALUE 0_4 mA (4002)	Use this function to assign the 0/4 mA current a value. The value can be higher or lower than the value assigned to 20 mA (function VALUE 20 mA (4003)). Positive and negative values are permissible, depending on the measured variable in question (e.g. volume flow). Example: 4 mA assigned value = -250 l/h 20 mA assigned value = +750 l/h Calculated current value = 8 mA (at zero flow) Note that values with different signs cannot be entered for 0/4 mA and 20 mA (function 4003) if SYMMETRY is the setting selected for the MEASURING MODE function (4004). In this case, the message "INPUT RANGE EXCEEDED" appears on the display. Example for STANDARD measuring mode:  A0001223 ① = Initial value (0 to 20 mA) ② = Lower signal on alarm level:: depends on the setting in the function CURRENT SPAN ③ = Initial value (4 to 20 mA): depends on the setting in the function CURRENT SPAN ④ = Full scale value (0/4 to 20 mA): depends on the setting in the function CURRENT SPAN ⑤ = Maximum current value: depends on the setting in the function CURRENT SPAN ⑥ = Failsafe mode (upper signal on alarm level): depends on the setting in the functions CURRENT SPAN (→ 56) and FAILSAFE MODE, (→ 64) A = Measuring range (the minimum measuring range has to exceed the value that correlates with a flow velocity of 0.3 m/s) User input: 5-digit floating-point number, with sign Factory setting: 0 [unit]  Note! ■ The appropriate unit is taken from the function UNIT VOLUME FLOW (0402) or UNIT MASS FLOW (0400), (see → 14 or → 13). ■ If the option BATCH UPWARDS or BATCH DOWNWARDS (only possible with the optional software package BATCHING) is selected in the function ASSIGN CURRENT OUTPUT (4000), the value 0/4 mA is automatically specified in this function and cannot be edited.  Caution! The current output responds differently, depending on the parameters set in the various functions. Some examples of parameter settings and their effect on the current output are given in the following section.

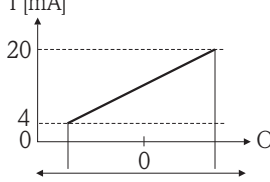
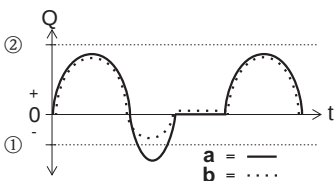
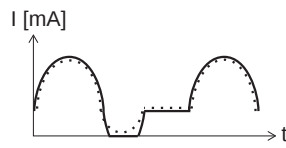
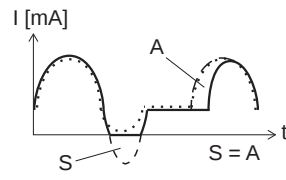
Function description	
OUTPUTS → CURRENT OUTPUT (1 to 2) → CONFIGURATION	
VALUE 0_4 mA (continued)	Parameter setting example A: - VALUE 0_4 mA (4002) = not equal to zero flow (e.g. -5 m³/h) VALUE 20 mA (4003) = not equal to zero flow (e.g. 10 m³/h) or - VALUE 0_4 mA (4002) = not equal to zero flow (e.g. 100 m³/h) VALUE 20 mA (4003) = not equal to zero flow (e.g. -40 m³/h) and MEASURING MODE (4004) = STANDARD When you enter the values for 0/4 mA and 20 mA, the working range of the measuring device is defined. If the effective flow drops below or exceeds this working range (see ①), a fault/notice message is generated (#351-354, current range) and the current output responds in accordance with the parameter settings in the function FAILSAFE MODE (4006). 1) 2) A0001262 Parameter setting example B: - VALUE 0_4 mA (4002) = equal to zero flow (e.g. 0 m³/h) VALUE 20 mA (4003) = not equal to zero flow (e.g. 10 m³/h) or - VALUE 0_4 mA (4002) = not equal to zero flow (e.g. 100 m³/h) VALUE 20 mA (4003) = equal to zero flow (e.g. 0 m³/h) and MEASURING MODE (4004) = STANDARD When you enter the values for 0/4 mA and 20 mA, the working range of the measuring device is defined. In doing so, one of the two values is parameterised as zero flow (e.g. 0 m³/h). If the effective flow drops below or exceeds the value parameterised as the zero flow, no fault/notice message is generated and the current output retains its value. If the effective flow drops below or exceeds the other value, a fault/notice message is generated (#351-354, current range) and the current output responds in accordance with the parameter settings in the function FAILSAFE MODE (4006). 1) 2) A0001264 Deliberately only one flow direction is output with this setting and flow values in the other flow direction are suppressed. Parameter setting example C: MEASURING MODE (4004) = SYMMETRY The current output signal is independent of the direction of flow (absolute amount of the measured variable). The 0_4 mA value ① and the 20 mA value ② must have the same sign (+ or -). The "20 mA VALUE" ③ (e.g. backflow) corresponds to the mirrored 20 mA VALUE ② (e.g. flow). A0001249 ASSIGN RELAY (4700) = FLOW DIRECTION With this setting e.g. the flow direction output via a switching contact can be made. Parameter setting example D: MEASURING MODE (4004) = PULSATING FLOW

Function description OUTPUTS → CURRENT OUTPUT (1 to 2) → CONFIGURATION	
VALUE 20 mA (4003)	Use this function to assign the 20 mA current a value. The value can be higher or lower than the value assigned to 0/4 mA (function VALUE 0_4 mA (4002), see → 57). Positive and negative values are permissible, depending on the measured variable in question (e.g. volume flow). Example: 4 mA assigned value = -250 l/h 20 mA assigned value = +750 l/h Calculated current value = 8 mA (at zero flow) Note that values with different signs cannot be entered for 0/4 mA (function 4002) and 20 mA, if SYMMETRY is the setting selected in the function MEASURING MODE (4004). In this case, the message "INPUT RANGE EXCEEDED" appears. Example for STANDARD measuring mode → 57 User input: 5-digit floating-point number, with sign Factory setting: Depends on nominal diameter and country (→ 154).  Note! ■ The appropriate unit is taken from the function UNIT VOLUME FLOW (0402) or UNIT MASS FLOW (0400). ■ If the option BATCH UPWARDS or BATCH DOWNWARDS, (only possible with the optional software package BATCHING), is selected in the function ASSIGN CURRENT OUTPUT (4000), the value 20 mA is automatically specified in this function and cannot be edited.  Caution! It is very important to read and comply with the information in the function VALUE 0_4 mA (under "Caution"; Examples of parameter settings) on → 57.

Function description	
OUTPUTS → CURRENT OUTPUT (1 to 2) → CONFIGURATION	
MEASURING MODE (4004)	Use this function to define the measuring mode for the current output. Options: STANDARD SYMMETRY PULSATING FLOW Factory setting: STANDARD Description of the individual options: - STANDARD - The current output signal is proportional to the measured variable. The flow components outside the scaled measuring range (defined by the 0_4 mA VALUE ① and the 20 mA VALUE ②) are taken into account as follows for signal output. - If one of the values is defined as equal to the zero flow (e.g. VALUE 0_4 mA = 0 m³/h), no message is given if this value is exceeded or not achieved and the current output retains its value (4 mA in the example). If the other value is exceeded or not achieved, the message "CURRENT OUTPUT AT FULL SCALE VALUE" appears and the current output responds in accordance with the parameter setting in the function FAILSAFE MODE (4006). - If both values defined are not equal to the zero flow (for example VALUE 0_4 mA = -5 m³/h; VALUE 20 mA = 10m³/h), the message "CURRENT OUTPUT AT FULL SCALE VALUE" appears if the measuring range is exceeded or not achieved and the current output responds in accordance with the parameter setting in the function FAILSAFE MODE (4006).  A0001248 - SYMMETRY - The current output signal is independent of the direction of flow (absolute amount of the measured variable). The 0_4 mA value ① and the 20 mA value ② must have the same sign (+ or -). The "20 mA value" ③ (e.g. backflow) corresponds to the mirrored 20 mA value ② (e.g. flow).  A0001249  Note! - The direction of flow can be output via the configurable relay or status outputs. - SYMMETRY cannot be selected unless the values in the VALUE 0_4 mA (4002) and VALUE 20 mA (4003) functions have the same sign or one of the values is zero. If the values have different signs, SYMMETRY cannot be selected and an "ASSIGNMENT NOT POSSIBLE" message is displayed. (continued on next page)

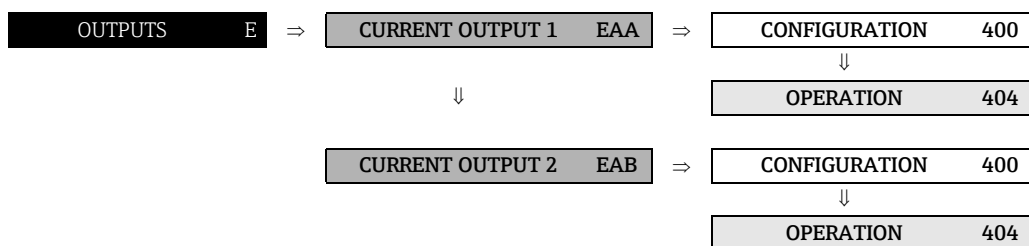
Function description OUTPUTS → CURRENT OUTPUT (1 to 2) → CONFIGURATION	
MEASURING MODE (continued)	■ PULSATING FLOW If flow is characterized by severe fluctuations as is the case, for example, with reciprocating pumps, flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 seconds. If the buffered data cannot be processed within approx. 60 seconds, a fault/notice message appears. Under certain plant conditions, flow values can aggregate in the buffer, for example in the case of prolonged and unwanted fluid backflow. However, this buffer is reset in all relevant programming adjustments which affect the current output.  Caution! If the option BATCHING QUANTITY UPWARDS or BATCH QUANTITY DOWNWARDS is selected in the function ASSIGN CURRENT OUTPUT (4000), the option is automatically specified and cannot be edited.

Function description	
OUTPUTS → CURRENT OUTPUT (1 to 2) → CONFIGURATION	
Detailed explanations and information	How the current output responds under the following postulated conditions: 1. Defined measuring range (①–②): ① and ② have the same sign  A0001248 and the following flow behaviour:  A0001265 ■ STANDARD The current output signal is proportional to the measured variable. The flow components outside the scaled measuring range are not taken into account for signal output.  A0001267 ■ SYMMETRY The current output signal is independent of the direction of flow.  A0001268 ■ PULSATING FLOW Flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 seconds.  A0001269 (Continued on next page)

Function description	
OUTPUTS → CURRENT OUTPUT (1 to 2) → CONFIGURATION	
Detailed explanations and information (continued)	2. Defined measuring range (①-②): ① and ② do not have the same sign.  A0001272 3. Flow a (—) outside, b (---) within the measuring range.  A0001273 ■ STANDARD a (—): The flow components outside the scaled measuring range cannot be taken into account for signal output. A fault message is generated (# 351 to 354, current range) and the current output responds in accordance with the parameter settings in the function FAIL-SAFE MODE (4006). b (---): The current output signal is proportional to the measured variable assigned.  A0001274 ■ SYMMETRY This option is not available under these circumstances, because the 0_4 mA value and the 20 mA value have different signs. ■ PULSATING FLOW Flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 seconds.  A0001275
TIME CONSTANT (4005)	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 to 100.00 s Factory setting: 3.00 s

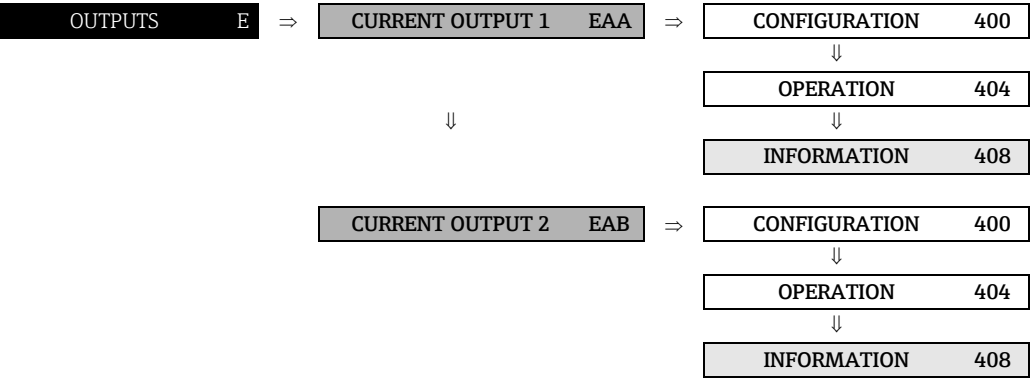
Function description	
OUTPUTS → CURRENT OUTPUT (1 to 2) → CONFIGURATION	
FAILSAFE MODE (4006)	For safety reasons it is advisable to ensure that the current output assumes a pre-defined state in the event of a fault. The setting you select here affects only the current output. It has no effect on other outputs and the display (e.g. totalizers). Options: MIN. CURRENT The current output adopts the value of the lower signal on alarm level (as defined in the function CURRENT SPAN (4001) MAX. CURRENT The current output adopts the value of the upper signal on alarm level (as defined in the function CURRENT SPAN (4001) HOLD VALUE (not recommended) Measuring value output is based on the last measuring value saved before the error occurred . ACTUAL VALUE Measured value output is based on the current flow measurement. The fault is ignored . Factory setting: MIN. CURRENT

7.1.2 Function group OPERATION



Function description	
OUTPUTS → CURRENT OUTPUT (1 to 2) → OPERATION	
ACTUAL CURRENT (4040)	Use this function to view the computed actual value of the output current. User interface: 0.00 to 25.00 mA
SIMULATION CURRENT (4041)	Use this function to activate simulation of the current output. Options: OFF ON 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 current measuring values are output correctly via the other outputs.  Caution! The setting is not saved if the power supply fails.
VALUE SIMULATION CURRENT (4042)	 Note! The function is not visible unless the SIMULATION CURRENT function (4041) is active (= ON). Use this function to define a freely 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: 0.00 to 25.00 mA Factory setting: 0.00 mA  Caution! The setting is not saved if the power supply fails.

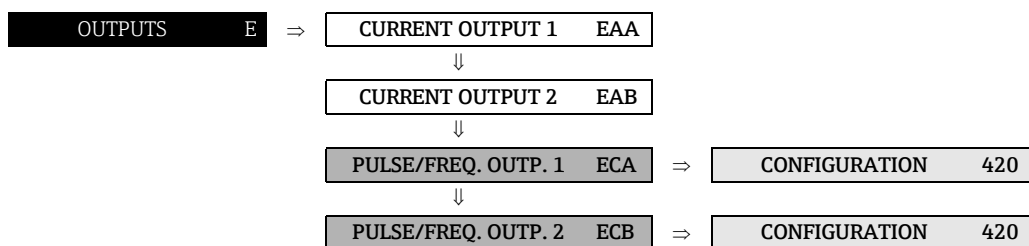
7.1.3 Function group INFORMATION



Function description	
OUTPUTS → CURRENT OUTPUT (1 to 2) → INFORMATION	
TERMINAL NUMBER (4080)	Use this function to display the numbers of the terminals (in the connection compartment) which are used by the current output.

7.2 Group PULSE/FREQUENCY OUTPUT (1 to 2)

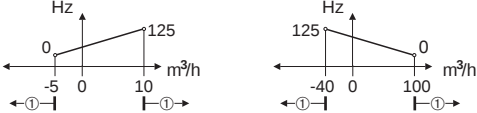
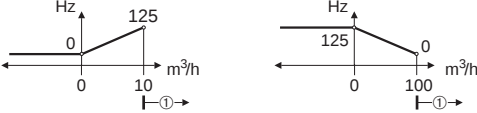
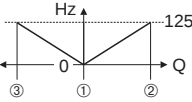
7.2.1 Function group CONFIGURATION

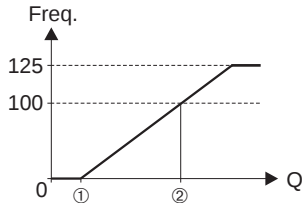
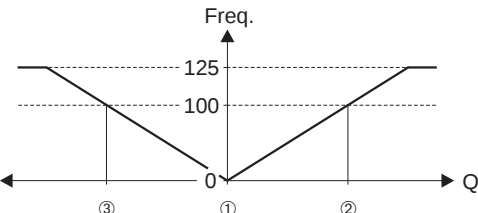


Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → CONFIGURATION (GENERAL / FREQUENCY)	
OPERATION MODE (4200)	Use this function to configure the output as a pulse output, frequency output or status output. The functions available in this function group vary, depending on which option you select here. Options: PULSE FREQUENCY STATUS Factory setting: PULSE
ASSIGN FREQUENCY (4201)	Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to assign a measured variable to the frequency output. Options: OFF MASS FLOW VOLUME FLOW Factory setting: VOLUME FLOW Note! If you select OFF, the only function shown in the CONFIGURATION function group is this function, in other words ASSIGN FREQUENCY (4201).

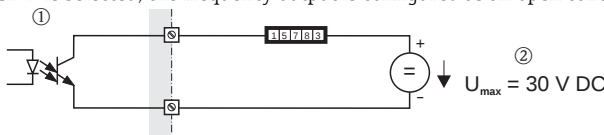
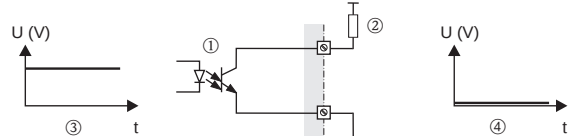
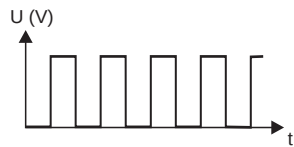
Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → CONFIGURATION (FREQUENCY)	
START VALUE FREQUENCY (4202)	 Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to define an initial frequency for the frequency output. You define the associated measuring value of the measuring range in the VALUE-f LOW function (4204) described on → 68. User input: 5-digit fixed-point number: 0 to 10000 Hz Factory setting: 0 Hz Example: ■ VALUE-f LOW. = 0 l/h, initial frequency = 0 Hz: i.e. a frequency of 0 Hz is output at a flow of 0 l/h. ■ VALUE-f LOW. = 1 l/h, initial frequency = 10 Hz: i.e. a frequency of 10 Hz is output at a flow of 1 l/h.
END VALUE FREQUENCY (4203)	 Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to define a full scale frequency for the frequency output. You define the associated measuring value of the measuring range in the VALUE-f HIGH function (4205) described on → 69. User input: 5-digit fixed-point number 2 to 10000 Hz Factory setting: 10000 Hz Example: ■ VALUE-f HIGH = 1000 l/h, full scale value frequency = 1000 Hz: i.e. a frequency of 1000 Hz is output at a flow of 1000 l/h. ■ VALUE-f HIGH = 3600 l/h, full scale value frequency = 1000 Hz: i.e. a frequency of 1000 Hz is output at a flow of 3600 l/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 2 seconds, i.e. the on/off ratio is no longer symmetrical.
VALUE-f LOW (4204)	 Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to assign a variable to the start value frequency (4202). The value can be higher or lower than the value assigned to the VALUE-f HIGH. Positive and negative values are permissible, depending on the measured variable in question (e.g. volume flow). You define a measuring range by defining the VALUE-f LOW and VALUE-f HIGH values. User input: 5-digit floating-point number Factory setting: 0 [unit]  Note! ■ For graphic illustration of VALUE-f LOW see function VALUE-f HIGH (4205). ■ The appropriate unit is taken from the function UNIT VOLUME FLOW (0402) or UNIT MASS FLOW (0400), (see → 14 or → 13).

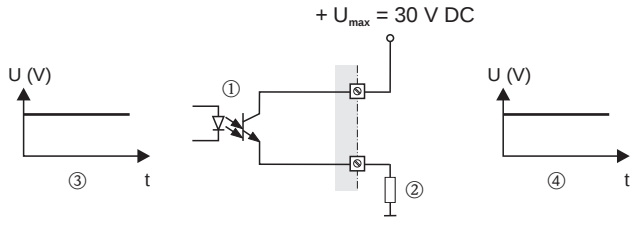
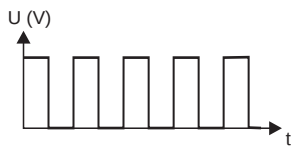
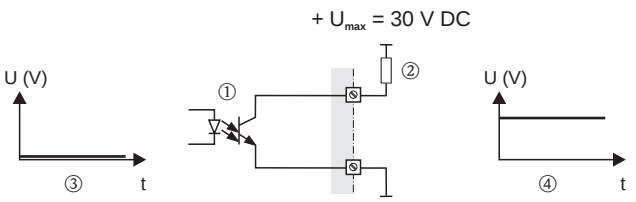
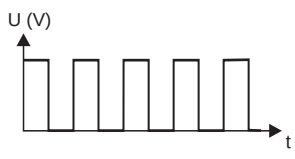
Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → CONFIGURATION (FREQUENCY)	
VALUE-f HIGH (4205)	 Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to assign a variable to the end value frequency (4203). The value can be higher or lower than the value assigned to the VALUE-f LOW. Positive and negative values are permissible, depending on the measured variable in question (e.g. volume flow). You define a measuring range by defining the VALUE-f LOW and VALUE-f HIGH values. User input: 5-digit floating-point number Factory setting: Depends on nominal diameter and country (→  154).  Note! Note that values with different signs cannot be entered for VALUE F LOW and VALUE F HIGH, if SYMMETRY is the setting selected for the MEASURING MODE function (4206). In this case the message "INPUT RANGE EXCEEDED" appears on the display. responds to the factory setting for the final value. A0001279 ① = Value-f min. ② = Value-f high (continued on next page)

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → CONFIGURATION (FREQUENCY)	
VALUE-f HIGH (continued)	Parameter setting example A: 1. VALUE-f LOW (4204) = not equal to zero flow (e.g. -5 m³/h) VALUE-f HIGH (4205) = not equal to zero flow (e.g. 10 m³/h) or 2. VALUE-f LOW (4204) = not equal to zero flow (e.g. 100 m³/h) VALUE-f HIGH (4205) = not equal to zero flow s (e.g. -40 m³/h) and MEASURING MODE (4206) = STANDARD When you enter the values for VALUE-f LOW and VALUE-f HIGH the working range of the measuring device is defined. If the effective flow drops below or exceeds this working range (see ①), a fault or notice message is generated (#355-358, frequency area) and the frequency output responds in accordance with the parameter settings in the function FAILSAFE MODE (4209).  a0001276 Parameter setting example B: 1. VALUE-f LOW (4204) = equal to zero flow (e.g. 0 m³/h) VALUE-f HIGH (4205) = not equal to zero flow (e.g. 10 m³/h) or 2. VALUE-f LOW (4204) = not equal to zero flow (e.g. 100 m³/h) VALUE-f HIGH (4205) = equal to zero flow s (e.g. 0 m³/h) and MEASURING MODE (4206) = STANDARD When you enter the values for VALUE-f LOW and VALUE-f HIGH the working range of the measuring device is defined. In doing so, one of the two values is parameterised as zero flow (e.g. 0 m³/h). If the effective flow drops below or exceeds the value parameterised as the zero flow, no fault/notice message is generated and the frequency output retains its value. If the effective flow drops below or exceeds the other value, a fault/notice message is generated (#355-358, frequency area) and the frequency output responds in accordance with the parameters set in the function FAILSAFE MODE (4209).  A0001277 Deliberately only one flow direction is output with this setting and flow values in the other flow direction are suppressed. Parameter setting example C: MEASURING MODE (4206) = SYMMETRY The frequency output signal is independent of the direction of flow (absolute amount of the measured variable). The VALUE-f LOW ① and VALUE-f HIGH ② must have the same sign (+ or -). The "VALUE-f HIGH" ③ (e.g. backflow) corresponds to the mirrored VALUE-f HIGH ② (e.g. flow).  A0001278 ASSIGN RELAY (4700) = FLOW DIRECTION Flow direction output via a switching contact. Parameter setting example D: MEASURING MODE (4206) = PULSATING FLOW

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → CONFIGURATION (FREQUENCY)	
MEASURING MODE (4206)	 Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to define the measuring mode for the frequency output. Options: STANDARD SYMMETRY PULSATING FLOW Factory setting: STANDARD Description of the individual options: ■ STANDARD The frequency output signal is proportional to the measured variable. The flow components outside the scaled measuring range (defined by the VALUE-f LOW. ① and VALUE-f HIGH. ②) are not taken into account for signal output. – If one of the values is defined as equal to the zero flow (e.g. VALUE-f LOW = 0 m³/h), no message is given if this value is exceeded or not achieved and the frequency output retains its value (0 Hz in the example). If the other value is exceeded or not achieved, the message "FREQUENCY OUTPUT AT FULL SCALE VALUE" appears and the frequency output responds in accordance with the parameter setting in the function FAILSAFE MODE (4209). – If both values defined are not equal to the zero flow (for example VALUE-f LOW = -5 m³/h; VALUE-f HIGH = 10m³/h) the message "FREQUENCY OUTPUT AT FULL SCALE VALUE" appears if the measuring range is exceeded or not achieved and the frequency output responds in accordance with the parameter settings in the function FAILSAFE MODE (4209).  A0001279 ■ SYMMETRY The frequency output signal is independent of the direction of flow (absolute amount of the measured variable). The VALUE-f LOW ① and VALUE-f HIGH ② must have the same sign (+ or -). The VALUE-f HIGH ③ (e.g. backflow) corresponds to the mirrored VALUE-f HIGH ② (e.g. forward flow).  A0001280  Note! ■ The direction of flow can be output via the configurable relay or status outputs. ■ SYMMETRY cannot be selected unless the values in the VALUE-f LOW (4204) and VALUE-f HIGH (4205) functions have the same sign or one of the values is zero. If the values have different signs, SYMMETRY cannot be selected and an "ASSIGNMENT NOT POSSIBLE" message is displayed. (continued on next page)

Function description OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → CONFIGURATION (FREQUENCY)	
MEASURING MODE (continued)	■ PULSATING FLOW If flow is characterized by severe fluctuations as is the case, for example, with reciprocating pumps, flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 seconds. If the buffered data cannot be processed within approx. 60 seconds, a fault/notice message appears. Under certain plant conditions, flow values can aggregate in the buffer, for example in the case of prolonged and unwanted fluid backflow. However, this buffer is reset in all relevant programming adjustments which affect the frequency output.

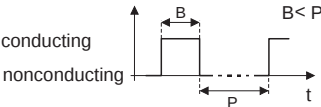
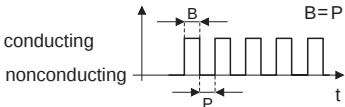
Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → CONFIGURATION (FREQUENCY)	
OUTPUT SIGNAL (4207)	 Note! Function is not available unless the FREQUENCY setting was selected in the OPERATING MODE (4200) function. For selecting the output configuration of the frequency output. Options: 0 = PASSIVE - POSITIVE 1 = PASSIVE - NEGATIVE 2 = ACTIVE - POSITIVE 3 = ACTIVE - NEGATIVE Factory setting: PASSIVE - POSITIVE Explanation ■ PASSIVE = power is supplied to the frequency output by means of an external power supply. ■ ACTIVE = power is supplied to the frequency output by means of the device-internal power supply. Configuring the output signal level (POSITIVE or NEGATIVE) determines the quiescent behaviour (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 ($I_{\max} = 250 \text{ mA} / 20 \text{ ms}$). 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. $+ U_{\max} = 30 \text{ V DC}$  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.  A000197

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → CONFIGURATION (FREQUENCY)	
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 (continued on next page)

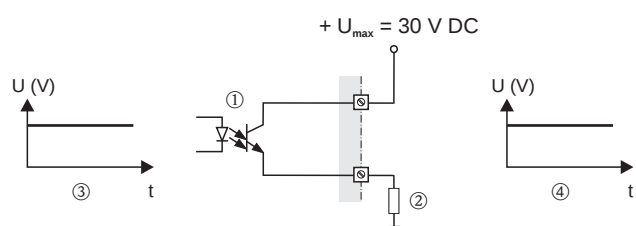
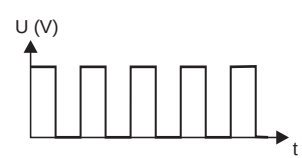
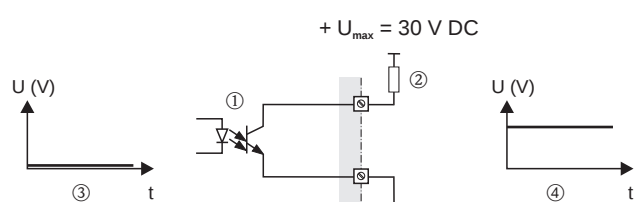
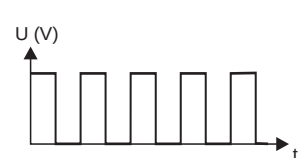
A0004691

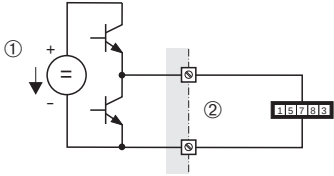
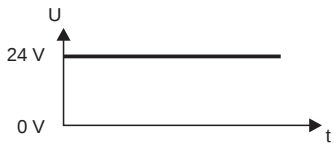
Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → CONFIGURATION (FREQUENCY)	
TIME CONSTANT (4208)	 Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to enter a time constant defining how the frequency 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: fixed-point number 0.00 to 100.00 s Factory setting: 0.00 s
FAILSAFE MODE (4209)	 Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). For safety reasons it is advisable to ensure that the frequency output assumes a predefined state in the event of a fault. 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 VALUE Output is the frequency specified in the FAILSAFE VALUE function (4211). 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 (4211)	 Note! This function is not available unless FREQUENCY was selected in the OPERATION MODE function (4200) and FAILSAFE VALUE was selected in the FAILSAFE MODE function (4209). Use this function to define the frequency that the measuring device outputs in the event of an error. User input: max. 5-digit number: 0 to 12500 Hz Factory setting: 12500 Hz

Function description OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → CONFIGURATION (PULSE)	
ASSIGN PULSE (4221)	 Note! This function is not available unless the PULSE setting was selected in the OPERATION MODE function (4200). Use this function to assign a measured variable to the pulse output. Options: OFF MASS FLOW VOLUME FLOW Factory setting: VOLUME FLOW  Note! If you select OFF, the only function shown in the CONFIGURATION function group is this function, in other words ASSIGN PULSE (4221).
PULSE VALUE (4222)	 Note! This function is not available unless the PULSE setting was selected in the OPERATION MODE function (4200). 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 [unit] Factory setting: Depends on nominal diameter and country (→  154).  Note! The appropriate unit is taken from the function UNIT VOLUME (0403) or UNIT MASS (0401), (see →  14 or →  13).

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → CONFIGURATION (PULSE)	
PULSE WIDTH (4223)	Note! This function is not available unless the PULSE setting was selected in the OPERATION MODE function (4200). Use this function to enter the pulse width of the output pulse. User input: 0.05 to 2000 ms Factory setting: 100 ms Pulse output is always with the pulse width (B) entered in this function. The pauses (P) between the individual pulses are automatically configured. However, they must at least correspond to the pulse width ($B = P$). transistor  transistor  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 (4222) on → 77) and from the current flow is too large to maintain the pulse width selected (the interval P is smaller than the pulse width B entered), a system error message (# 359 to 362, pulse memory) is generated after buffering/balancing has occurred.

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → CONFIGURATION (PULSE)	
MEASURING MODE (4225)	 Note! This function is not available unless the PULSE setting was selected in the OPERATION MODE function (4200). Use this function to define the measuring mode for the pulse output. Options: 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 relay output. PULSATING FLOW If flow is characterized by severe fluctuations as is the case, for example, with reciprocating pumps, the positive and negative flow components are totalled, with the signs taken into account (e.g. -10 l and +25 l = 15 l). Flow components outside the maximum pulse number per second (value/width) are buffered, balanced and output after a maximum delay of 60 seconds. If the buffered data cannot be processed within approx. 60 seconds, a fault/notice message appears. Under certain plant conditions, flow values can aggregate in the buffer, for example in the case of prolonged and unwanted fluid backflow. However, this buffer is reset in all relevant programming adjustments which affect the pulse output. STANDARD REVERSE Only negative flow components are totaled. Positive components are not taken into account. Factory setting: STANDARD

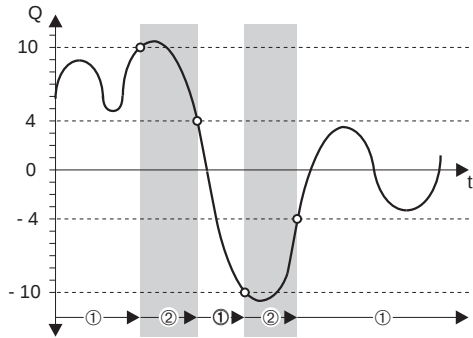
Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → CONFIGURATION (PULSE)	
OUTPUT SIGNAL (continued)	Example for output configuration PASSIVE-POSITIVE: Output configuration with an external pull-down resistance. In the quiescent state (at zero flow), a positive voltage level is measured via the pull-down resistance.  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.  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.  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 (continued on next page)

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → CONFIGURATION (PULSE)	
OUTPUT SIGNAL (continued)	Example for active output circuit (ACTIVE): With an active circuit, the internal power supply is 24 V. The pulse output is short-circuit proof.  A0004691 ① = 24 V DC internal power supply ② = Short-circuit proof output The signal levels are to be seen as analogous to the passive circuit. The following applies for the output configuration ACTIVE-POSITIVE: In the quiescent state (at zero flow), the output signal level at the terminals is 0 V.  A0004694 In the operating status (flow present), the output signal level changes from 0 V to a positive voltage level.  A0004692 The following applies for the output configuration ACTIVE-NEGATIVE: In the quiescent state (at zero flow), the output signal level at the terminals is at a positive voltage level.  A0004693 In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V.  A0004710

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → CONFIGURATION (PULSE)	
FAILSAFE MODE (4227)	 Note! This function is not available unless the PULSE setting was selected in the OPERATION MODE function (4200). For safety reasons it is advisable to ensure that the pulse output assumes a predefined state in the event of a fault. 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. ACTUAL VALUE Measuring value output is based on the current flow measurement. The fault is ignored. Factory setting: FALL BACK VALUE

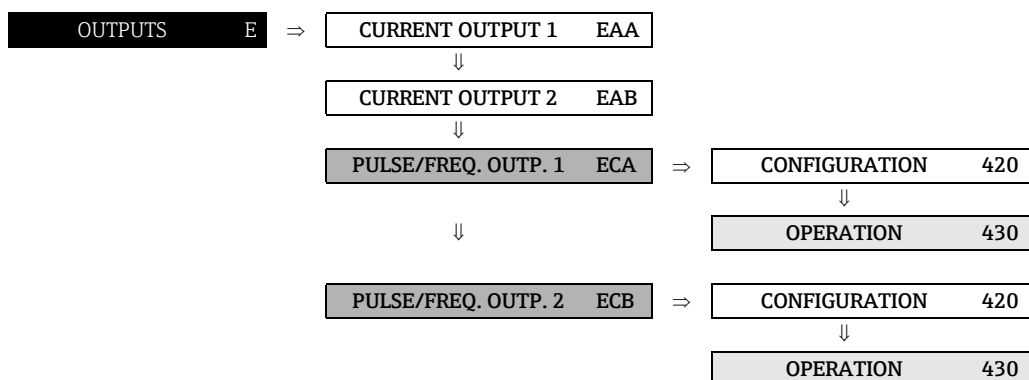
Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → CONFIGURATION (STATUS)	
ASSIGN STATUS (4241)	 Note! This function is not available unless the STATUS setting was selected in the OPERATION MODE function (4200). Use this function to assign a switching function to the status output. Options: OFF ON (operation) FAULT MESSAGE NOTICE MESSAGE FAULT MESSAGE or NOTICE MESSAGE EPD or OED (Empty Pipe Detection/ Open Electrode Detection, only if active) FLOW DIRECTION MASS FLOW LIMIT VALUE VOLUME FLOW LIMIT VALUE TOTALIZER (1 to 3) LIMIT VALUE Advanced options with optional software package BATCHING: BATCH RUNNING > BATCH TIME >< BATCH QUANTITIES (< min. / > max. batching quantity) PROGRESS NOTE (batching end approaching)  Note! The only options available are the monitoring functions (7240 to 7243) which have a value not equal to zero (max. 3). Factory setting: FAULT MESSAGE  Note! ■ The behaviour of the status output is a normally closed behaviour, in other words the output is closed (transistor conductive) when normal, error-free measuring is in progress. – The following apply as "normal, error-free" measurements: Flow direction = forward; limit values = not exceeded; no empty or partially filled measuring tube (EPD/OED); no fault or notice message present. – For switching behaviour such as relay output, →  99 ■ If you select OFF, the only function shown in the CONFIGURATION function group is this function, in other words ASSIGN STATUS (4241).

Function description OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → CONFIGURATION (STATUS)	
ON-VALUE (4242)	 Note! This function is not available unless STATUS was selected in the OPERATION MODE function (4200) and LIMIT VALUE or FLOW DIRECTION was selected in the ASSIGN STATUS function (4241). Use this function to assign a value to the switch-on point (activation of the status output). The value can be equal to, higher than or lower than the switch-off point. Positive or negative values are permissible, depending on the measured variable in question (e.g. volume flow, totalizer reading). User input: 5-digit floating-point number [unit] Factory setting: 0 [unit]  Note! ■ The appropriate unit is taken from the function UNIT VOLUME FLOW (0402) or UNIT MASS FLOW (0400). ■ 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 switchover hysteresis.
SWITCH-ON DELAY (4243)	 Note! This function is not available unless STATUS was selected in the OPERATION MODE function (4200) and LIMIT VALUE or FLOW DIRECTION was selected in the ASSIGN STATUS function (4241). Use this function to specify a delay (0 to 100 seconds) for switching on the status output (i.e. signal changes from 0 to 1). The delay starts when the limit value is reached. The status output does switch when the delay has timed out and the switch-on condition has been valid over the delay time. User input: fixed-point number: 0.0 to 100.0 s Factory setting: 0.0 s
OFF-VALUE (4244)	 Note! This function is not available unless STATUS was selected in the OPERATION MODE function (4200) and LIMIT VALUE was selected in the ASSIGN STATUS function (4241). Use this function to assign a value to the switch-off point (deactivation of the status output). The value can be equal to, higher than or lower than the switch-on point. Positive and negative values are permissible, depending on the measured variable in question (e.g. volume flow, totalizer reading). User input: 5-digit floating-point number [unit] Factory setting: 0 [unit]  Note! ■ The appropriate unit is taken from the function UNIT VOLUME FLOW (0402) or UNIT MASS FLOW (0400). ■ If SYMMETRY is selected in the function MEASURING MODE (4246) and values with different signs are entered for the switch-on and switch-off points, the notice message "INPUT RANGE EXCEEDED" appears.

Function description OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → CONFIGURATION (STATUS)	
SWITCH-OFF DELAY (4245)	 Note! This function is not available unless the STATUS setting was selected in the OPERATION MODE function (4200). Use this function to define a delay (0 to 100 seconds) for switching off the status output (i.e. signal changes from 1 to 0). The delay starts when the limit value is reached. The status output does switch when the delay has timed out and the switch condition has been valid over the delay time. User input: fixed-point number 0.0 to 100.0 s Factory setting: 0.0 s
MEASURING MODE (4246)	 Note! This function is not available unless STATUS was selected in the function OPERATION MODE (4200) and the status output was assigned a limit value. Use this function to define the measuring mode for the status output. Options: 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. 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. Factory setting: STANDARD 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  Note! - SYMMETRY cannot be selected unless the values in the ON-VALUE (4242) and OFF-VALUE (4244) functions have the same sign or one of the values is zero. - If the values have different signs, SYMMETRY cannot be selected and an "ASSIGNMENT NOT POSSIBLE" message is displayed.

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → CONFIGURATION (STATUS)	
TIME CONSTANT (4247)	 Note! This function is not available unless the STATUS setting was selected in the OPERATION MODE function (4200). 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). Damping acts on the measuring signal before the switch status changes, and consequently before switch-on or switch-off delay is activated. 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 to 100.00 s Factory setting: 0.00 s

7.2.2 Function group OPERATION



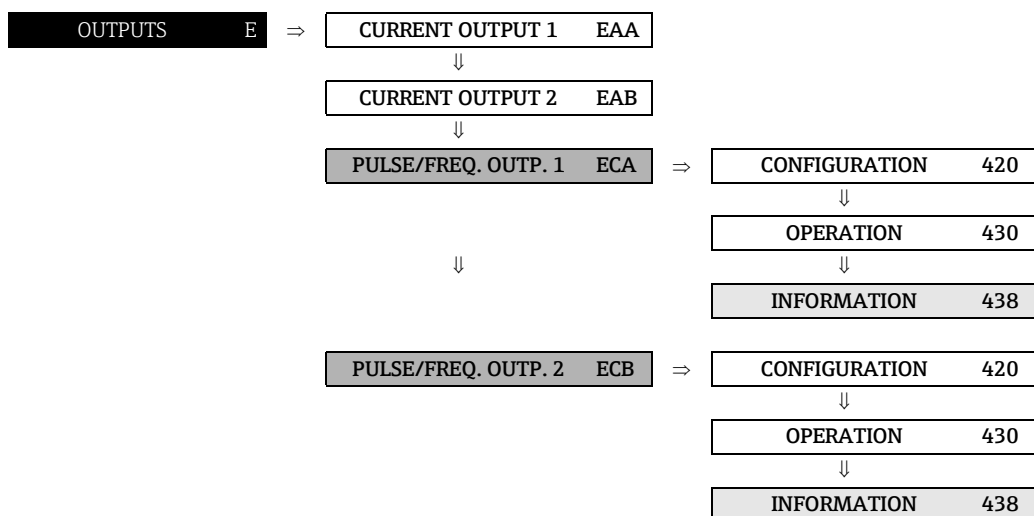
Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → OPERATION (FREQUENCY)	
ACTUAL FREQUENCY (4301)	Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to view the computed value of the output frequency. User Interface: 0 to 12500 Hz
SIMULATION FREQUENCY (4302)	Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). 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 current measuring values are output correctly via the other outputs. Caution! The setting is not saved if the power supply fails.

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → OPERATION (FREQUENCY)	
VALUE SIMULATION FREQUENCY (4303)	 Note! This function is not available unless FREQUENCY was selected in the OPERATION MODE function (4200) and the SIMULATION FREQUENCY function (4302) 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 to 12500 Hz Factory setting: 0 Hz  Caution! The setting is not saved if the power supply fails.

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → OPERATION (PULSE)	
SIMULATION PULSE (4322)	 Note! This function is not available unless the PULSE option was selected in the OPERATING 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. Simulation is started once the CONTINUOUSLY option is confirmed with the  key.  Note! Simulation is started by confirming the CONTINUOUSLY option with the  key. 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 current measured values are output correctly via the other outputs.  Caution! The setting is not saved if the power supply fails.
VALUE SIMULATION PULSE (4323)	 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 measuring device 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 with the  key. The display remains at 0 if the specified pulses have been output. User input: 0 to 10000 Factory setting: 0  Note! Simulation is started by confirming the simulation value with the  key. The simulation can be switched off again via the SIMULATION PULSE function.  Caution! The setting is not saved if the power supply fails.

Function description OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → OPERATION (STATUS)	
ACTUAL STATUS (4341)	 Note! This function is not available unless the STATUS setting was selected in the OPERATION MODE function (4200). Use this function to check the current status of the status output. User Interface: NOT CONDUCTIVE CONDUCTIVE
SIMULATION SWITCH POINT (4342)	 Note! This function is not available unless the STATUS setting was selected in the OPERATION MODE function (4200). 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.
VALUE SIMULATION SWITCH POINT (4343)	 Note! This function is not available unless STATUS was selected in the OPERATION MODE function (4200) and the SIMULATION SWITCH POINT function (4342) 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. Options: NOT CONDUCTIVE CONDUCTIVE Factory setting: NOT CONDUCTIVE  Caution! The setting is not saved if the power supply fails.

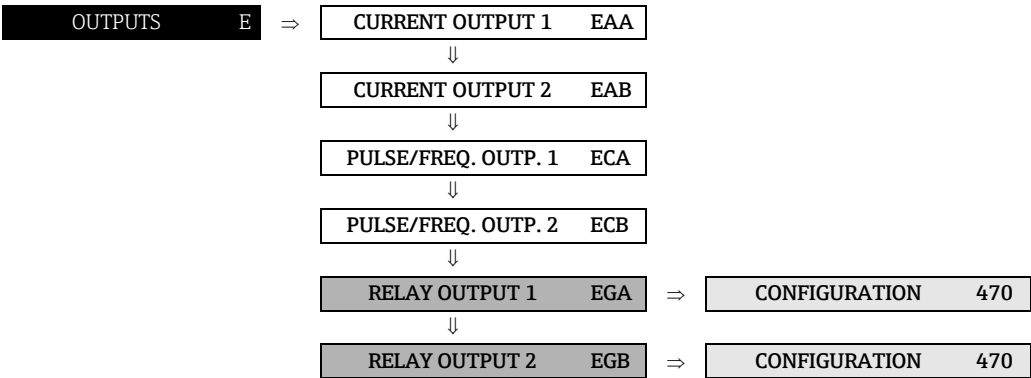
7.2.3 Function group INFORMATION



Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT (1 to 2) → INFORMATION	
TERMINAL NUMBER (4380)	Use this function to display the numbers of the terminals (in the connection compartment) which are used by the pulse/frequency output.

7.3 Group RELAY OUTPUT (1 to 2)

7.3.1 Function group CONFIGURATION



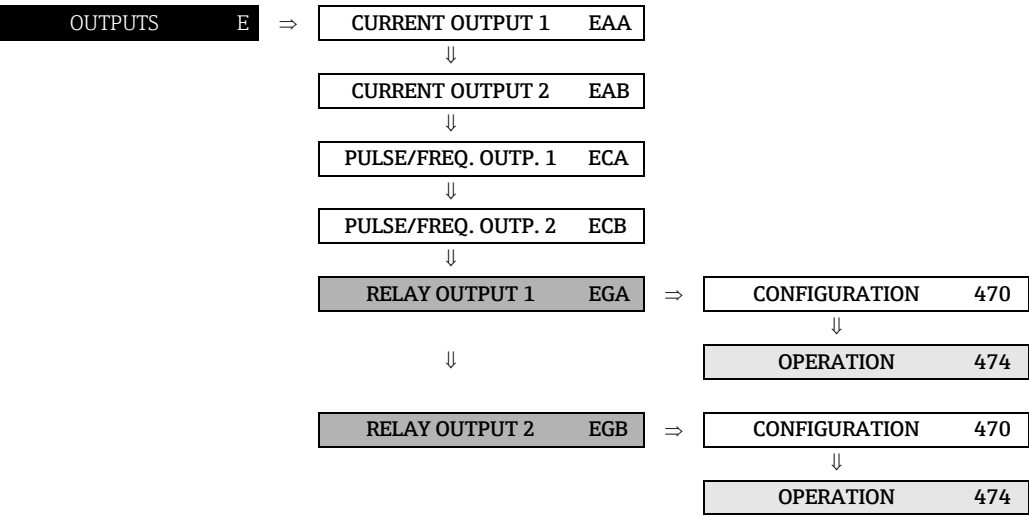
Function description	
OUTPUTS → RELAY OUTPUT (1 to 2) → CONFIGURATION	
ASSIGN RELAY (4700)	Use this function to assign a switching function to the relay output. Options: OFF ON (operation) FAULT MESSAGE NOTICE MESSAGE FAULT MESSAGE or NOTICE MESSAGE EPD or OED (Empty Pipe Detection / Open Electrode Detection, only if active) FLOW DIRECTION MASS FLOW LIMIT VALUE VOLUME FLOW LIMIT VALUE TOTALIZER (1 to 3) LIMIT VALUE Advanced options with optional software package BATCHING: BATCH VALVE 1 (e.g. to control valve 1) BATCH VALVE 2 (e.g. to control valve 2) BATCH RUNNING > BATCH TIME >< BATCH QUANTITIES (< min. / > max. batching quantity) PROGRESS NOTE (batching end approaching)  Note! ▪ The batching valves defined in the function BATCH STAGES (7208) are the only available selection (max. 3). ▪ Only the monitoring functions (7240 to 7243) which have a value not equal to zero (max. 3) are available as selection. Factory setting: FAULT MESSAGE  Note! ▪ It is very important to read and comply with the information on the switching characteristics of the relay output (see →  99). ▪ It is advisable to configure at least one relay output as a fault output and define the outputs' response to error. ▪ The relay output is configured as a normally open (NO or make) contact by default. It can be reconfigured as a normally closed (NC or break) contact by means of a jumper on the relay module (see Operating Instructions Promag 53, BA00047D). ▪ If you select OFF, the only function shown in the CONFIGURATION function group is this function ASSIGN RELAY (4700).

Function description OUTPUTS → RELAY OUTPUT (1 to 2) → CONFIGURATION	
ON-VALUE (4701)	 Note! This function is not available unless LIMIT VALUE or FLOW DIRECTION was selected in the function ASSIGN RELAY (4700). Use this function to assign a value to the switch-on point (relay output pulls up). The value can be equal to, higher than or lower than the switch-off point. Positive or negative values are permissible, depending on the measured variable in question (e.g. volume flow, totalizer reading). User input: 5-digit floating-point number [unit] Factory setting: 0 [unit]  Note! ■ The appropriate unit is taken from the function UNIT VOLUME FLOW (0402) or UNIT MASS FLOW (0400). ■ 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 switching hysteresis.
SWITCH-ON DELAY (4702)	 Note! This function is not available unless LIMIT VALUE or FLOW DIRECTION was selected in the function ASSIGN RELAY (4700). Use this function to define a delay (0 to 100 seconds) for pull-up (i.e. signal changes from 0 to 1) of the relay output. The delay starts when the limit value is reached. The relay output does switch when the delay has timed out and the switch condition has been valid throughout the delay time. User input: fixed-point number 0.0 to 100.0 s Factory setting: 0.0 s
OFF-VALUE (4703)	 Note! This function is not available unless LIMIT VALUE was selected in the ASSIGN RELAY function (4700). Use this function to assign a value to the switch-off point (relay drops out). The value can be equal to, higher than or lower than the switch-on point. Positive or negative values are permissible, depending on the measured variable in question (e.g. volume flow, totalizer reading). User input: 5-digit floating-point number [unit] Factory setting: 0 [unit]  Note! ■ The appropriate unit is taken from the function UNIT VOLUME FLOW (0402) or UNIT MASS FLOW (0400). ■ If SYMMETRY is selected in the function MEASURING MODE (4705) and values with different signs are entered for the switch-on and switch-off points, the notice message "INPUT RANGE EXCEEDED" appears.

Function description	
OUTPUTS → RELAY OUTPUT (1 to 2) → CONFIGURATION	
SWITCH-OFF DELAY (4704)	Note! This function is not available unless LIMIT was selected in the ASSIGN RELAY function (4700). Use this function to define a delay (0 to 100 seconds) for drop-out (i.e. signal changes from 1 to 0) of the relay output. The delay starts when the limit value is reached. The relay output does switch when the delay has timed out and the switch condition has been valid throughout the delay time. User input: fixed-point number 0.0 to 100.0 s Factory setting: 0.0 s
MEASURING MODE (4705)	Note! This function is not visible unless a limit value was assigned to the relay output. Use this function to define the measuring mode for the relay output. Options: STANDARD The relay output signal switches at the defined switch points. SYMMETRY The relay output signal switches at the defined switching points, irrespective of the sign. If you define a switch point with a positive sign, the relay output switches as soon as the value is reached in the negative direction (negative sign), (see illustration). Factory setting: STANDARD Example for the SYMMETRY measuring mode: Switch-on point Q = 4 Switch-off point Q = 10 ① = Relay energized ② = Relay de-energized A0001247 Note! ■ SYMMETRY cannot be selected unless the values in the ON-VALUE (4701) and OFF-VALUE (4703) functions have the same sign or one of the values is zero. ■ If the values have different signs, SYMMETRY cannot be selected and an "ASSIGNMENT NOT POSSIBLE" message is displayed.

Function description OUTPUTS → RELAY OUTPUT (1 to 2) → CONFIGURATION	
TIME CONSTANT (4706)	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). Damping acts on the measuring signal before the switch status changes, and consequently before switch-on or switch-off delay is activated. The purpose of damping, therefore, is to prevent the relay output changing state continuously in response to fluctuations in flow. User input: fixed-point number 0.00 to 100.00 s Factory setting: 0.00 s

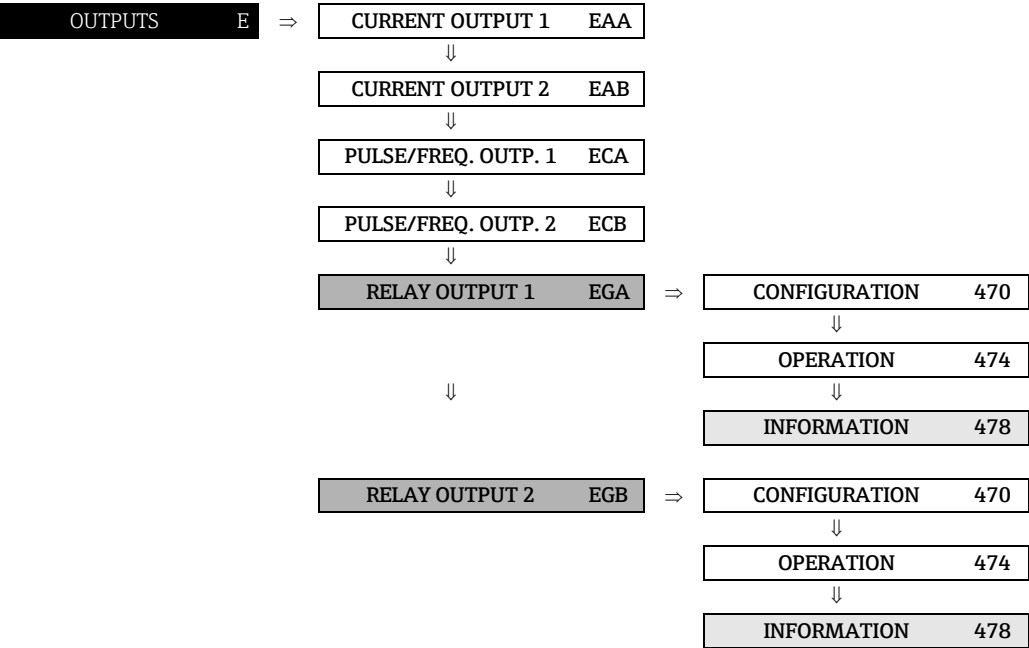
7.3.2 Function group OPERATION



Function description	
OUTPUTS → RELAY OUTPUT (1 to 2) → OPERATION	
ACTUAL STATUS RELAY (4740)	Use this function to check the current status of the relay output. A jumper on the contact side defines the relay output as a normally open (NO or make) or normally closed (NC or break) contact (see Operating Instructions Pro-mag 53, BA00047D). User interface: BREAK CONTACT OPEN BREAK CONTACT CLOSED MAKE CONTACT OPEN MAKE CONTACT CLOSED
SIMULATION SWITCH POINT (4741)	Use this function to activate simulation of the relay output. Options: OFF ON Factory setting: OFF  Note! ▪ The "SIMULATION RELAY" 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 OUTPUTS → RELAY OUTPUT (1 to 2) → OPERATION	
VALUE SIMULATION SWITCH POINT (4742)	 Note! The function is not visible unless the SIMULATION SWITCH POINT function (4741) is active (= ON). Use this function to define the status of the relay output during the simulation. This value is used to test downstream devices and the flowmeter itself. Depending on the relay configuration (as make or break contact) the following selections are available. Options: Relay output configured as normally open (make) contact: MAKE CONTACT OPEN MAKE CONTACT CLOSED Relay output configured as normally closed (break) contact: BREAK CONTACT OPEN BREAK CONTACT CLOSED  Caution! The setting is not saved if the power supply fails.

7.3.3 Function group INFORMATION



Function description	
OUTPUTS → RELAY OUTPUT (1 to 2) → INFORMATION	
TERMINAL NUMBER (4780)	Use this function to display the numbers of the terminals (in the connection compartment) which are used by the relay output.

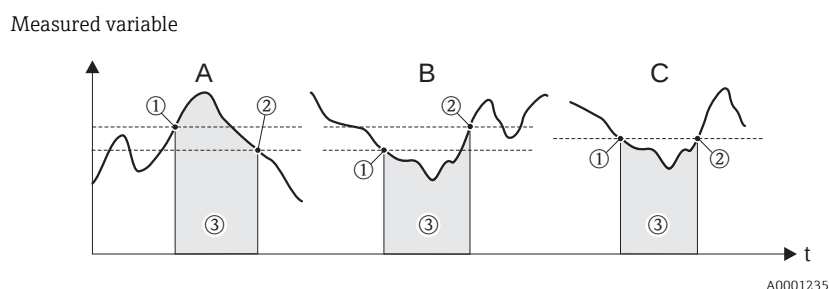
7.3.4 Information on the response of the relay output

General

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

Relay output configured for "limit value"

The relay output signal switches as soon as the measured variable undershoots or overshoots a defined switch point. Application: Monitoring flow or process-related boundary conditions.



A = Maximum safety → ① SWITCH-OFF POINT > ② SWITCH-ON POINT

B = Minimum safety → ① SWITCH-OFF POINT < ② SWITCH-ON POINT

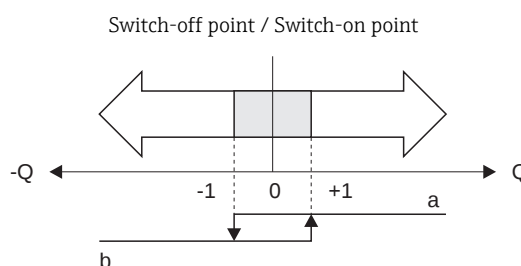
C = Minimum safety → ① SWITCH-OFF POINT = ② SWITCH-ON POINT (this configuration is to avoid)

③ = Relay de-energised

Relay output configured for "flow direction"

The value you entered in the function ON-VALUE defines the switch point for the positive and negative directions of flow.

If, for example, the switch point you define is $1 \text{ m}^3/\text{h}$, the relay drops out at $-1 \text{ m}^3/\text{h}$ and pulls up at $+1 \text{ m}^3/\text{h}$. 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 higher than or equal to the low flow rate.

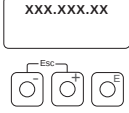
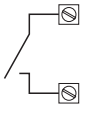
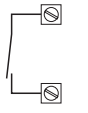
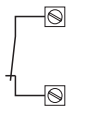
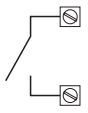
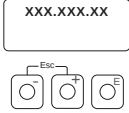
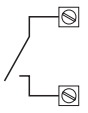
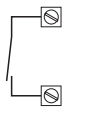
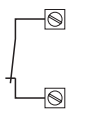
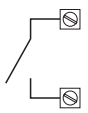
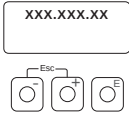
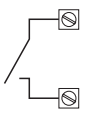
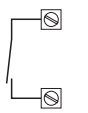
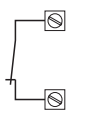
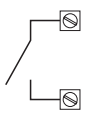
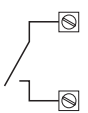
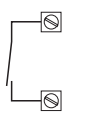
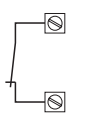
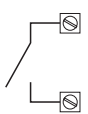


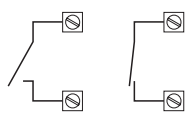
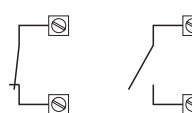
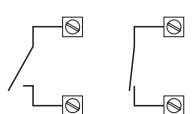
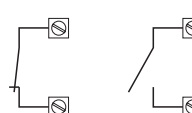
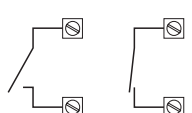
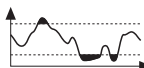
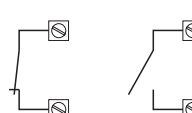
a = Relay energised

b = Relay de-energised

A0001236

7.4 Switching response of the relay output

Function	State		Relay coil	Contact*	
				NC	NO
ON (operation)	System in measuring mode	 A0001052	energized	 A0001239	 A0001237
	System not in measuring mode (power supply failed)	 A0001291	de-energized	 A0001240	 A0001238
Fault message	System OK	 A0001052	energized	 A0001239	 A0001237
	(System or process error) Fault → Response to error, outputs /inputs and totalizers	 A0001291	de-energized	 A0001240	 A0001238
Notice message	System OK	 A0001052	energized	 A0001239	 A0001237
	(System or process error) Fault → Continuation of measuring	 A0001291	de-energized	 A0001240	 A0001238
Fault message or Notice message	System OK	 A0001052	energized	 A0001239	 A0001237
	(System or process error) Fault → Response to error or Note → Continuation of measuring	 A0001291	de-energized	 A0001240	 A0001238

Function	State	Relay coil	Contact*	
			NC	NO
Empty pipe detection (EPD) / Open electrode detection (OED)	Measuring tube full	 A0001292	energized	 A0001239 A0001237
	Measuring tube partially filled / empty measuring tube	 A0001293	de-energized	 A0001240 A0001238
Flow direction	forward	 A0001241	energized	 A0001239 A0001237
	reverse	 A0001242	de-energized	 A0001240 A0001238
Limit value – Volume flow – Totalizer	Limit value not overshoot or undershot	 A0001243	energized	 A0001239 A0001237
	Limit value overshoot or undershot	 A0001244	de-energized	 A0001240 A0001238
* Terminal numbers in accordance with the TERMINAL NUMBER function (4780) on → 98.  Note! If the measuring device has two relays, the factory setting is: ■ Relay 1 → normally open contact (NO) ■ Relay 2 → normally closed contact (NC)  Caution! When using the optional software package BATCHING, it is advisable for the contacts (either normally open or normally closed contacts) to have the same switching response for all relay outputs used.				

8 Block INPUTS

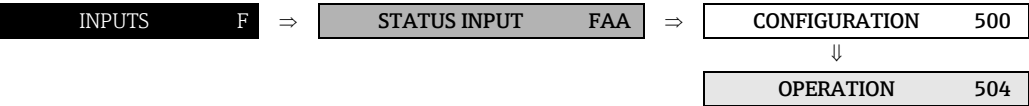
Block	Groups	Function groups	Functions
INPUTS (F)	STATUS INPUT (FAA) → 103	CONFIGURATION (500) → 103	ASSIGN STATUS INPUT (5000) → 103
		OPERATION (504) → 104	ACTIVE LEVEL (5001) → 103
		INFORMATION (508) → 105	MIN. PULSE WIDTH (5002) → 103
	↓ ↑		SIM. STATUS IN (5041) → 104
			VALUE SIM. STATUS IN (5042) → 104
	CURRENT INPUT (FCA) → 106	CONFIGURATION (520) → 106	ASSIGN CURRENT INPUT (5200) → 106
		OPERATION (524) → 108	CURRENT SPAN (5201) → 106
		INFORMATION (528) → 109	VALUE 0_4 mA (5202) → 106
			VALUE 20 mA (5203) → 107
			ERROR VALUE (5204) → 107
			SIM. CURRENT (5241) → 108
			VALUE SIM. CURRENT (5242) → 108
			TERMINAL NUMBER (5280) → 109

8.1 Group STATUS INPUT

8.1.1 Function group CONFIGURATION

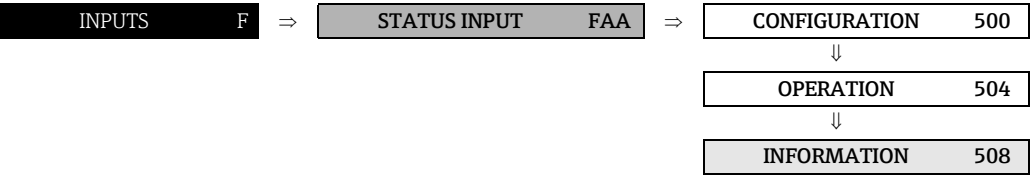
INPUTS	F	⇒	STATUS INPUT	FAA	⇒	CONFIGURATION	500
Function description							
INPUTS → STATUS INPUT → CONFIGURATION							
ASSIGN STATUS INPUT (5000)		Use this function to assign a switching function to the status input. Options: OFF RESET TOTALIZER (1 to 3) RESET ALL TOTALIZERS POSITIVE ZERO RETURN RESET FAULT MESSAGE Advanced options with optional software package BATCHING: RUN BATCHING (start/stop) HOLD BATCHING (stop/continue) RESET BATCH SUM (resetting total quantity / total quantity totalizers) RESET TOTALIZER 3 & START BATCHING (reset of totalizer 3, followed by start) Factory setting: OFF  Caution! Positive zero return is active as long as the 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 (5001)		Use this function to define whether the assigned switch function is released or sustained when the signal level is present (HIGH) or not present (LOW). Options: HIGH LOW Factory setting: HIGH					
MINIMUM PULSE WIDTH (5002)		Use this function to define a minimum pulse width which the input pulse must achieve in order to trigger the selected switching function (see function ASSIGN STATUS INPUT (5000)). User input: 20 to 100 ms Factory setting: 50 ms					

8.1.2 Function group OPERATION



Function description	
INPUTS → STATUS INPUT → OPERATION	
ACTUAL STATUS INPUT (5040)	Use this function to view the current level of the status input. User Interface: HIGH LOW
SIMULATION STATUS INPUT (5041)	Use this function to simulate the status input, i.e. to trigger the function (siehe Funktion ASSIGN STATUS INPUT (5000) auf Seite 103) assigned to the status input. Options: OFF ON Factory setting: OFF  Note! ▪ The "SIMULATION STATUS INPUT" 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 STATUS INPUT (5042)	 Note! The function is not visible unless the SIMULATION STATUS INPUT function (5041) is active (= ON). Use this function to define the level to be assumed at the status output during the simulation. This value is used to test downstream devices and the measuring device itself. Options: HIGH LOW Factory setting: LOW  Caution! The setting is not saved if the power supply fails.

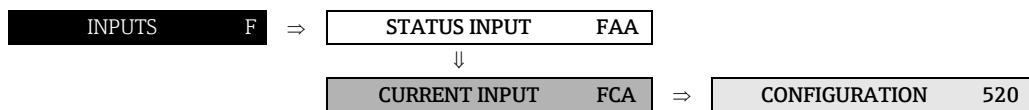
8.1.3 Function group INFORMATION



Function description	
INPUTS → STATUS INPUT → INFORMATION	
TERMINAL NUMBER (5080)	Use this function to display the numbers of the terminals (in the connection compartment) which are used by the status input.

8.2 Group CURRENT INPUT

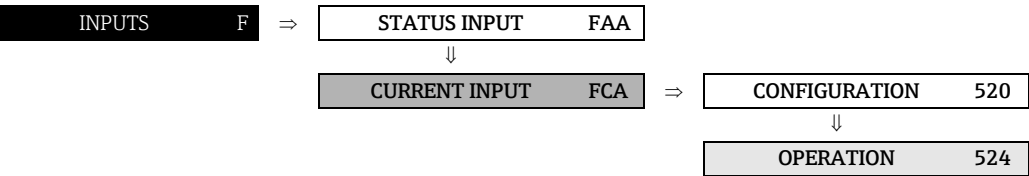
8.2.1 Function group CONFIGURATION



Function description INPUTS → CURRENT INPUT → CONFIGURATION	
ASSIGN CURRENT (5200)	Use this function to assign a process variable to the current input. Options: OFF TEMPERATURE DENSITY Factory setting: OFF
CURRENT SPAN (5201)	Use this function to select the current range. This selection defines the operational range and the upper and lower signal on alarm. Options: 0–20 mA 4–20 mA 4–20 mA NAMUR 4–20 mA US 0–20 mA (25 mA) 4–20 mA (25 mA) Factory setting: 4–20 mA NAMUR Note! When switching the hardware from an active (factory setting) to a passive output signal, select a current range of 4–20 mA (see Operating Instructions Promag 53, BA047D/06/en). Current span / operational range (measuring information): 0–20 mA / 0 to 20.5 mA 4–20 mA / 4 to 20.5 mA 4–20 mA NAMUR / 3.8 to 20.5 mA 4–20 mA US / 3.9 to 20.8 mA 0–20 mA (25 mA) / 0 to 24 mA 4–20 mA (25 mA) / 4 to 24 mA
VALUE 0_4 mA (5202)	Use this function to assign a value to the 0/4 mA current. User input: 5-digit floating-point number Factory setting: Dependent on the process variable assigned to the current input (see function ASSIGN CURRENT, 5200). – Density: 0.5 kg/l – Temperature: –50 °C Note! The appropriate unit is taken from the functions UNIT DENSITY (0420) or UNIT TEMPERATURE (0422).

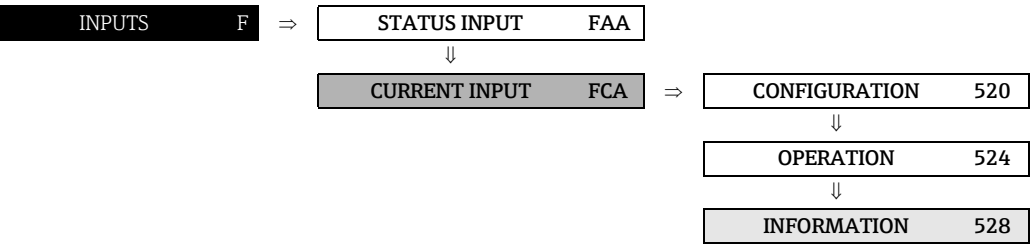
Function description INPUTS → CURRENT INPUT → CONFIGURATION	
VALUE 20 mA (5203)	Use this function to assign a value to the 20 mA current. User input: 5-digit floating-point number Factory setting: Dependent on the process variable assigned to the current input (see function ASSIGN CURRENT, 5200). – Density: 2.0 kg/l – Temperature: 200 °C  Note! The appropriate unit is taken from the functions UNIT DENSITY (0420) or UNIT TEMPERATURE (0422).
ERROR VALUE (5204)	Use this function to enter a defined error value for the process variable concerned. If the current value lies outside of the selected range (see function CURRENT SPAN, 5201), then the process variable is set to the "error value" defined here and a corresponding notice message CURRENT INPUT RANGE (# 363) is generated. User input: 5-digit floating-point number Factory setting: Dependent on the process variable assigned to the current input (see function ASSIGN CURRENT INPUT, 5200). – Density: 1.25 kg/l – Temperature: 75 °C  Note! ■ Triggered amplifier faults or the error behaviour of the outputs do not have any influence on the current input. ■ The appropriate unit is taken from the functions UNIT DENSITY (0420) or UNIT TEMPERATURE (0422).

8.2.2 Function group OPERATION



Function description	
INPUTS → CURRENT INPUT → OPERATION	
ACTUAL CURRENT (5240)	The actual value of the input current appears on the display. User interface: 0.0 to 25 mA
SIMULATION CURRENT (5241)	Use this function to activate the simulation of the current input. Options: OFF ON Factory setting: OFF  Note! ▪ An active simulation is displayed by the notice message "SIM. CURR. IN" (# 661). ▪ The value output for the simulation at the current input is defined in the function VALUE SIMULATION CURRENT (5242). ▪ The measuring device remains fully operational during the simulation and the current measured values are output correctly via the other outputs and the display.  Caution! The setting is not saved in the event of a power failure.
VALUE SIMULATION CURRENT (5242)	 Note! This function is only available if the function SIMULATION CURRENT (5241) is switched on. Use this function to specify a freely selectable value, e.g. 12 mA, which is to be simulated at the current input. This value is used to test downstream devices and the measuring device itself. User input: 0.00 to 25.00 mA Factory setting: 0.00 mA or 4 mA (depending on the setting in function 5201).  Caution! The setting is not saved in the event of a power failure.

8.2.3 Function group INFORMATION



Function description	
INPUTS → CURRENT INPUT → INFORMATION	
TERMINAL NUMBER (5280)	This function is used to display the polarity and numbers of the terminals (in the terminal compartment) occupied by the current input.

9 Block BASIC FUNCTION

Block	Groups	Function groups	Functions							
BASIC FUNCTION (G)	HART (GAA) → 111	CONFIGURATION (600) → 111	TAG NAME (6000) → 111 LONG TAG 1...14 LONG TAG 15...28 LONG TAG 29...32 (6006) → 111							
			TAG DESC. (6001) → 111 BUS ADDRESS (6002) → 111 HART PROTOCOL (6003) → 111 WRITE PROTECTION (6004) → 112 SELECTION ERROR MESSAGE (6007) → 112 ZUORD. COND STAT (6008) → 112 SIMULATION HART STATUS (6009) → 112							
	↓ ↑	INFORMATION (604) → 113	MANUFACTURER ID (6040) → 113 DEVICE ID (6041) → 113 DEVICE REVISION (6042) → 113 HART MESSAGE RECV (6043) → 113 HART MESSAGE SENT (6043) → 113							
	↓ ↑	CONFIGURATION (640) → 113	ASSIGN LF CUT OFF (6400) → 113 ON-VALUE LF CUT OFF (6402) → 114 OFF-VALUE LF CUT OFF (6403) → 114 PRESSURE SHOCK SUPPR. (6404) → 115							
	↓ ↑	EPD PARAMETER (6420) → 116	EMPTY PIPE DETECTION (6420) → 116 EPD/OED RESP. TIME (6425) → 118							
	ECC PARAMETER (644) → 119	ADJUSTMENT (648) → 121	ECC (6440) → 119 ECC DURATION (6441) → 119 ECC RECOV. TIME (6442) → 120 ECC CLEAN. CYCLE (6443) → 120							
	↓ ↑	CONFIGURATION (660) → 122	EPD/OED ADJUSTMENT (6481) → 121 INST. DIR. SENSOR (6600) → 122 SYSTEM DAMPING (6603) → 122 INTEGRATION TIME (6604) → 122 POS. ZERO RETURN (6605) → 123							
	↓ ↑	CONFIGURATION (680) → 124	CALIBRATION DATE (6808) → 124 K-FACTOR (6801) → 124 ZERO POINT (6803) → 124 NOMINAL DIAMETER (6804) → 124							
	↓ ↑	OPERATION (682) → 125	MEASURING PERIOD (6820) → 125 OVERVOLT. TIME (6821) → 125 EPD ELECTRODE (6822) → 125 POLARITY ECC (6823) → 126							

9.1 Group HART

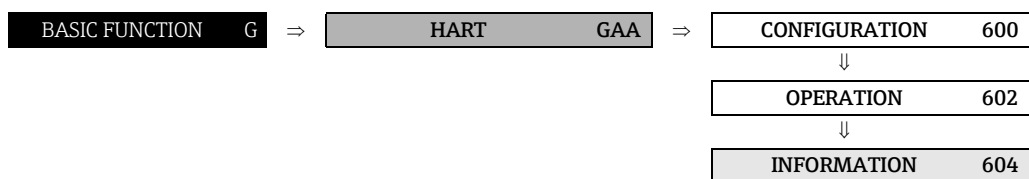
9.1.1 Function group CONFIGURATION

BASIC FUNCTION	G	⇒	HART	GAA	⇒	CONFIGURATION	600
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Function description	
BASIC FUNCTION → HART → CONFIGURATION	
LONG TAG 1...14 (6006) (HART 7)	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.
LONG TAG 15...28 (6006) (HART 7)	User input: max. 14-character text: LONG TAG 1...14, LONG TAG 15...28 max. 4-character text: LONG TAG 29...32 permissible: A-Z, 0-9, +, -, punctuation marks
LONG TAG 29...32 (6006) (HART 7)	Factory setting: LONG TAG 1...14: " _____ " (no text) LONG TAG 15...28: " _____ " (no text) LONG TAG 29...32: " ____ " (no text)
TAG NAME (6000) (HART 5)	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, permissible: A-Z, 0-9, +, -, punctuation marks
	Factory setting: " _____ " (no text)
TAG DESCRIPTION (6001)	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, permissible: A-Z, 0-9, +, -, punctuation marks
	Factory setting: " _____ " (No text)
BUS ADDRESS (6002)	Use this function to define the address for the exchange of data with the HART protocol.
	User input: 0 to 15 (HART 5) 0 to 63 (HART 7)
	Factory setting: 0
	 Note! HART 5: With the Addresses 1 to 15 a constant 4 mA current is applied. HART 7: With the Addresses 1 to 63 a constant 4 mA current is applied.
HART PROTOCOL (6003)	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 can be activated with the selection 4-20 mA HART or 4-20 mA (25 mA) HART in the CURRENT SPAN function (see → 56).

Function description BASIC FUNCTION → HART → CONFIGURATION	
WRITE PROTECTION (6004)	Use this function to check whether the measuring device can be write-accessed. User interface OFF (Data exchange is possible) ON (Data exchange is disabled) Factory setting: OFF  Note! Write protection is activated and deactivated by means of a jumper on the I/O module (see Operating Instructions Promag 53, BA00047D).
SELECTION ERROR MESSAGE (6007) (HART 7)	In this function, the error to be categorized is selected. Options: CANCEL #401 EMPTY PIPE #601 POS.ZERO-RET. ...  Note! List of error messages: Operating Instructions Promag 53, BA00047D, chapter "Trouble shooting" Factory setting: CANCEL
ASSIGN NE107 CONDENSED STATUS (6008) (HART 7)	In this function, an NE107 category is assigned to the function previously selected. Auswahl: CANCEL FUNCTION CHECK (C) OUT OF SPECIFICATIONS (S) MAINTENANCE REQ. (M) NO EFFECT (N) Factory setting: CANCEL
SIMULATION HART STATUS (6009) (HART 7)	In this function, the error to be simulated is selected. Options: CANCEL #401 EMPTY PIPE #601 POS.ZERO-RET. ...  Note! List of error messages: Operating Instructions Promag 53, BA00047D, chapter "Trouble shooting" Factory setting: CANCEL

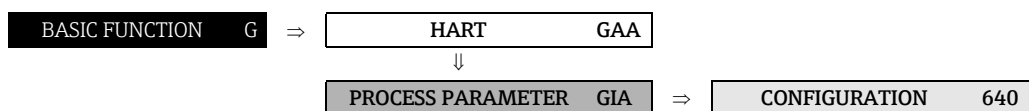
9.1.2 Function group INFORMATION



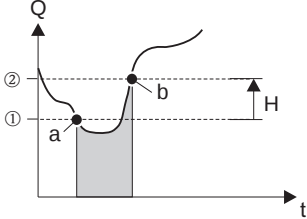
Function description BASIC FUNCTION → HART → OPERATION	
MANUFACTURER ID (6040)	Use this function to view the manufacturer ID. User Interface: – Endress+Hauser – 17 (≅ 11 hex) for Endress+Hauser
DEVICE ID (6041)	Use this function to view the device ID in hexadecimal numerical format. User Interface: 42 hex (≅ 66 dez) for ProdType
DEVICE REVISION (6042)	Use this function to view the device-specific revision of the HART command interface. User interface: E.g.: 5
HART MESSAGES RECV (6043) (HART 7)	Returns the number of HART messages that are received without error and destined for the device in question (including broadcast messages). This does not include messages that contain a communication error but still demand a response on the part of the device (e.g. checksum error type of errors). User interface: 0 to 65535
HART MESSAGES SENT (6043) (HART 7)	Returns the number of all the messages sent by the device. Also contains the messages that are sent as a response to an incorrect request, e.g. to a request with a checksum error type of error or to a command that is not supported. User interface: 0 to 65535

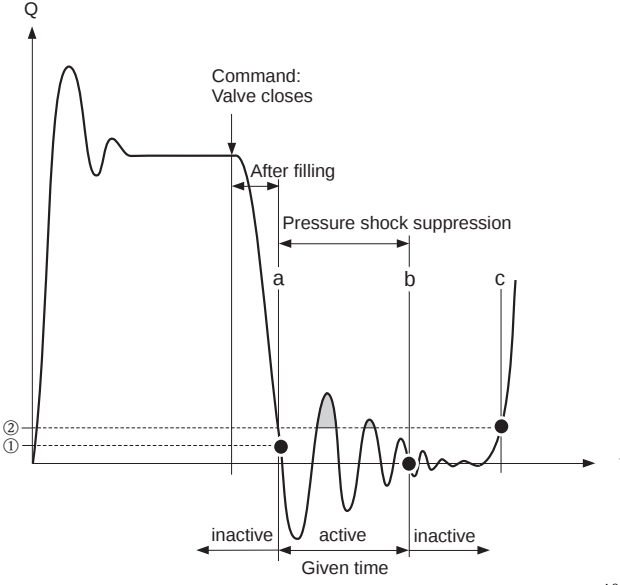
9.2 Group PROCESS PARAMETER

9.2.1 Function group CONFIGURATION

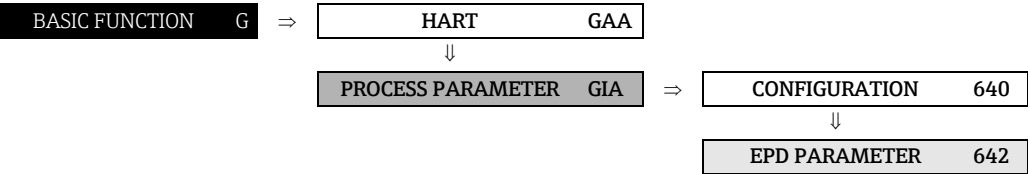


Function description BASIC FUNCTION → PROCESS PARAMETER → CONFIGURATION	
ASSIGN LOW FLOW CUT OFF (6400)	Use this function to assign the switch point for the low flow cut off. Options: OFF MASS FLOW VOLUME FLOW Factory setting: VOLUME FLOW

Function description	
BASIC FUNCTION → PROCESS PARAMETER → CONFIGURATION	
ON-VALUE LOW FLOW CUT OFF (6402)	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 (→ 154). Note! The appropriate unit is taken from the function UNIT VOLUME FLOW (0402) or UNIT MASS FLOW (0400) (see → 14 or → 13).
OFF-VALUE LOW FLOW CUT OFF (6403)	Use this function to enter the switch-off (b) point for 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% Example:  A0003882 ① = switch-on point, ② = switch-off point a Low flow cut off is switched on b b = Low flow cut off is switched off (a + a · H) H Hysteresis: 0 to 100% Low flow cut off is active Q Flow

Function description	
BASIC FUNCTION → PROCESS PARAMETER → CONFIGURATION	
PRESSURE SHOCK SUPPRESSION (6404)	The closure of a valve can cause brief but severe movements of the fluid in the piping system, movements which the measuring system registers. The pulses totalled in this way result in a totalizer reading error, particularly in the case of batching processes. For this reason, the measuring device is equipped with pressure shock suppression (= short-term signal suppression) which can eliminate system-related "disruptions".  Note! Note that pressure shock suppression cannot be used unless the low flow cut off is active (see ON-VALUE LOW FLOW CUT OFF function on →  114). Use this function to define the time span for active pressure shock suppression. Activation of the pressure shock suppression Pressure shock suppression is activated once the flow falls below the switch-on point of the low flow (see point a in graphic). While pressure shock suppression is active, the following conditions apply: ▪ Current output → outputs the current corresponding to zero flow. ▪ Pulse/frequency output → outputs the frequency corresponding to zero flow. ▪ Flow reading on display → 0 ▪ Totalizer reading → the totalizers are pegged at the last correct value. Deactivation of the pressure shock suppression The pressure shock suppression is deactivated after the time interval, set in this function, has passed (see point b in graphic).  Note! The current flow value is displayed and output, when the time interval for the pressure shock suppression has passed and the flow exceeds the switch-off point of the low flow (see point c in graphic).  A0001285-EN ① = switch-on point (for low flow), ② = switch-off point (for low flow) a Activated if on-value of low flow is not reached b Deactivated once the predefined time period has elapsed c Flow values are taken into account when calculating the pulses ■ Suppressed values Q Flow User input: max. 4-digit number, incl. unit: 0.00 to 100.0 s Factory setting: 0.00 s

9.2.2 Function group EPD PARAMETER

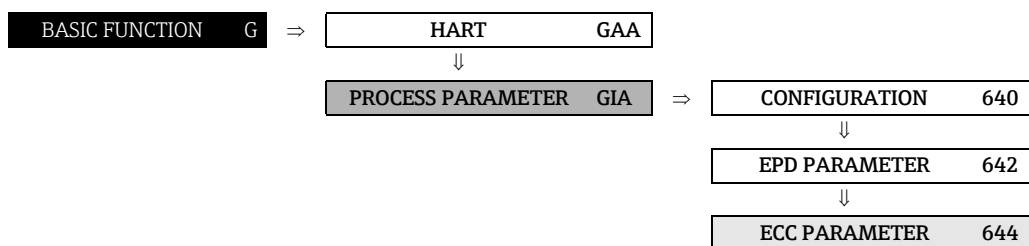


Function description	
BASIC FUNCTION → PROCESS PARAMETER → EPD PARAMETER	
EMPTY PIPE DETECTION (6420)	Flow cannot be measured correctly unless the measuring tube is full. This status can be monitored at all times with the Empty Pipe Detection function. Use this function to activate Empty Pipe Detection (EPD) or Open Electrode Detection (OED). ▪ EPD = Empty Pipe Detection (with the help of an EPD electrode) ▪ OED = Open Electrode Detection (empty pipe detection with the help of the measuring electrodes, if the sensor is not equipped with an EPD electrode or the orientation is not suitable for using EPD). Options: OFF – ON SPECIAL – OED – ON STANDARD OFF (neither EPD nor OED are active) ON SPECIAL (for DN < 400 only): Switching on the Empty Pipe Detection (EPD) for devices in remote version (transmitter and sensor are installed separately). OED: Switching on the Open Electrode Detection (OED). ON STANDARD: Switching on the Empty Pipe Detection (EPD) for: – Devices in compact version (transmitter and sensor form a single mechanical unit). – Applications where a facing and coating of the fluid on the measuring tube line and measuring electrode accrues. Factory setting: OFF Note! ▪ The options ON STANDARD and ON SPECIAL are 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 devices are calibrated at the factory with water (approx. 500 µS/cm). If the conductivity of certain fluids deviates from this reference, empty pipe/full pipe adjustment must be performed again on site (siehe Funktion EPD/OED ADJUSTMENT (6481) auf Seite 121). ▪ The adjustment coefficients must be valid before you can switch on the EPD or OED. If these coefficients are not available, the function EPD/OED ADJUSTMENT (6481) is displayed (→ 121). ▪ If there are problems with the adjustment, the following error messages appear on the screen: – ADJUSTMENT FULL = EMPTY: The adjustment values for empty pipe and full pipe are identical. In such instances, empty pipe adjustment/full pipe adjustment must be carried out again. – ADJUSTMENT NOT OK: Adjustment is not possible as the fluid conductivity values are outside the permitted range. (continued on next page)

Function description BASIC FUNCTION → PROCESS PARAMETER → EPD PARAMETER	
EMPTY PIPE DETECTION (continued)	Notes on empty pipe detection (EPD and OED) - 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/OED. - An empty or partially filled pipe is a process error. A default factory setting defines that a fault message is issued and that this process error has an effect on the outputs. - The EPD/OED process error can be output via the configurable relay or status outputs. - Use the function ASSIGN PROCESS ERROR (8002) to define whether a notice or fault message should be triggered (→ 146). - A plausibility check of the adjustment values will only be executed by activating the empty pipe detection. If an empty or full pipe adjustment is performed during the empty pipe detection is active, the empty pipe detection has to be de- and again activated, after finishing the adjustment, to start the plausibility check. Response to partially filled pipes If the EPD/OED is switched on and responds to a partially filled or empty pipe, the fault message "EMPTY PIPE" appears on the display. If the pipe is partially empty and the EPD/OED 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 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 by means of the two measuring electrodes which are present as standard (fluid no longer covers the measuring electrodes). 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) EPD electrode.  Note! Cable connection length: When mounting a remote version, please observe the maximum permissible cable length of 15 metres in order to keep the OED function. OED empty pipe adjustment: To achieve the best results for the open electrode detection, it is important to have the electrodes surface as dry as possible (no liquid film) while the empty-pipe adjustment is being made. Even during normal operation, the OED function is only secured if there is no longer any liquid film present on the electrodes when the measuring pipe is empty.

Function description	
BASIC FUNCTION → PROCESS PARAMETER → EPD PARAMETER	
EPD/OED RESPONSE TIME (6425)	 Note! This function is not available unless ON STANDARD, ON SPECIAL or OED was selected in the EMPTY PIPE DETECTION function (6420). 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 etection (EPD) or open electrode detection (OED). User input: fixed-point number: 1.0 to 100 s Factory setting: 1.0 s  Note! OED detection time: The recognition of open electrodes is, in contrast to the empty pipe detection (EPD), very slow reacting (delay at least 25 seconds) and is only activated after an additional delay from the programmed response time! We recommend in most applications to use the empty pipe detection (EPD) which is an optimal solution for detecting partly filled measuring tubes.

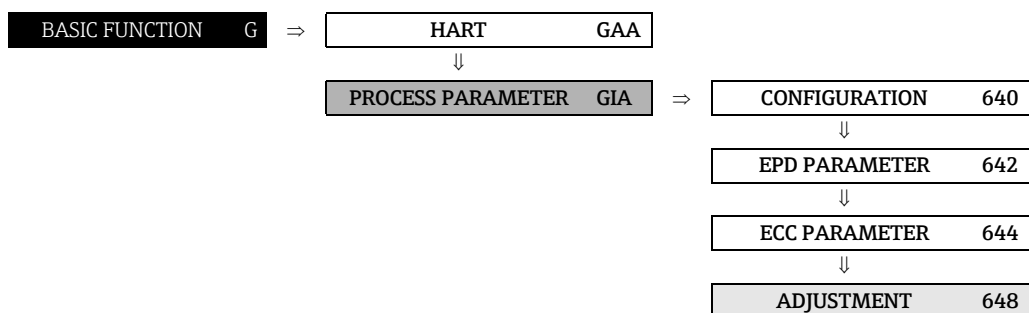
9.2.3 Function group ECC PARAMETER



Function description	
BASIC FUNCTION → PROCESS PARAMETER → ECC PARAMETER	
ECC (6440)	 Note! This function is not available unless the measuring device is equipped with an (optional) electrode cleaning function. Use this function to activate cyclical electrode cleaning (ECC). Options: ON (only with the optional electrode cleaning function ECC) OFF 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 accreting 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 accrete 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 (6441)	 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 to 30.0 s Factory setting: 2.0 s

Function description	
BASIC FUNCTION → PROCESS PARAMETER → ECC PARAMETER	
ECC RECOVERY TIME (6442)	 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 to 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.
ECC CLEANING CYCLE (6443)	 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 to 10080 min Factory setting: 40 min

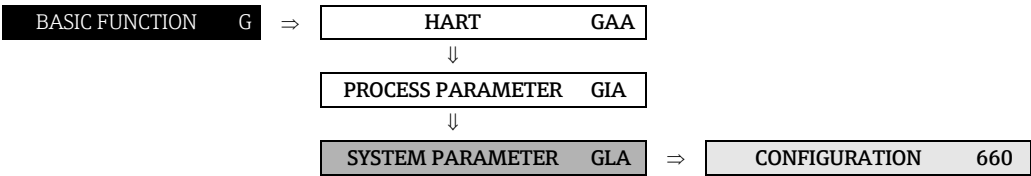
9.2.4 Function group ADJUSTMENT



Function description	
BASIC FUNCTION → PROCESS PARAMETER → ADJUSTMENT	
EPD/OED ADJUSTMENT (6481)	Use this function to activate the EPD/OED adjustment for an empty or full measuring tube. Note! A detailed description and other helpful hints for the empty-pipe/full-pipe adjustment procedure can be found on → 116. Options: OFF FULL PIPE ADJUST EMPTY PIPE ADJUST OED FULL ADJUST OED EMPTY ADJUST Factory setting: OFF Procedure for EPD or OED empty-pipe / full-pipe adjustment 1. Empty the piping. In case of an EPD adjustment, the wall of the measuring tube should be wetted with fluid for the adjustment procedure but this is not the case with an OED adjustment! 2. Start empty-pipe adjustment: Select "EMPTY PIPE ADJUST" or "OED EMPTY ADJUST" and press to confirm. 3. After empty-pipe adjustment, fill the piping with fluid. 4. Start full-pipe adjustment: Select "FULL PIPE ADJUST" or "OED FULL ADJUST" and press to confirm. 5. Having completed the adjustment, select the setting "OFF" and exit the function by pressing . 6. Now select the "EMPTY PIPE DETECTION" function (6420). Switch on Empty Pipe Detection by selecting the following settings: – EPD → Select ON STANDARD or ON SPECIAL and press to confirm. – OED → Select OED and confirm with . Caution! The adjustment coefficients must be valid before you can activate the EPD/OED function. If adjustment is incorrect the following messages might appear on the display: – FULL = EMPTY The adjustment values for empty pipe and full pipe are identical. In cases of this nature you must repeat empty-pipe or full-pipe adjustment again! – ADJUSTMENT NOT OK Adjustment is not possible because the fluid's conductivity is out of range.

9.3 Group SYSTEM PARAMETER

9.3.1 Function group CONFIGURATION

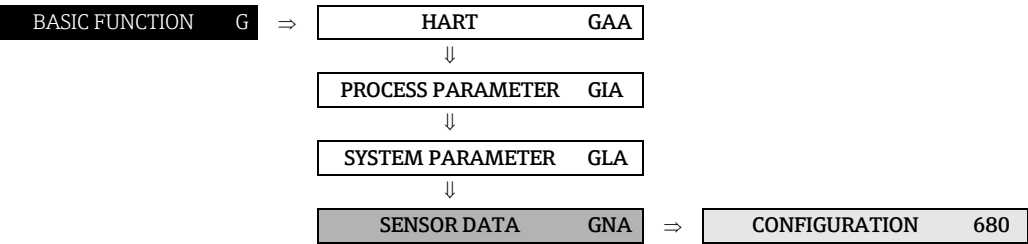


Function description	
BASIC FUNCTION → SYSTEM PARAMETER → CONFIGURATION	
INSTALLATION DIRECTION SENSOR (6600)	Use this function to reverse the sign of the flow quantity, if necessary. Options: NORMAL (flow as indicated by the arrow) INVERSE (flow opposite to direction indicated by the arrow) Factory setting: NORMAL  Note! Ascertain the actual direction of fluid flow with reference to the direction indicated by the arrow on the sensor (nameplate).
SYSTEM DAMPING (6603)	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 decreases with an increasing filter setting. User input: 0 to 15 Factory setting: 9  Note! The system damping acts on all functions and outputs of the measuring device.
INTEGRATION TIME (6604)	Use this function to set the integration time. Under normal circumstances it is not necessary to change the factory settings. User input: 3.3 to 65 ms Factory setting: 20 ms at 50 Hz → mains frequency (e.g. Europe) 16.7 ms at 60 Hz → mains frequency (e.g. USA)  Caution! The integration time must not be selected with a greater value than the measuring period (6820).  Note! The integration time defines the duration of internal totalling 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).

Function description	
BASIC FUNCTION → SYSTEM PARAMETER → CONFIGURATION	
POSITIVE ZERO RETURN (6605)	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  Note! Positive zero return may not be activated for batching processes with the optional software package BATCHING.

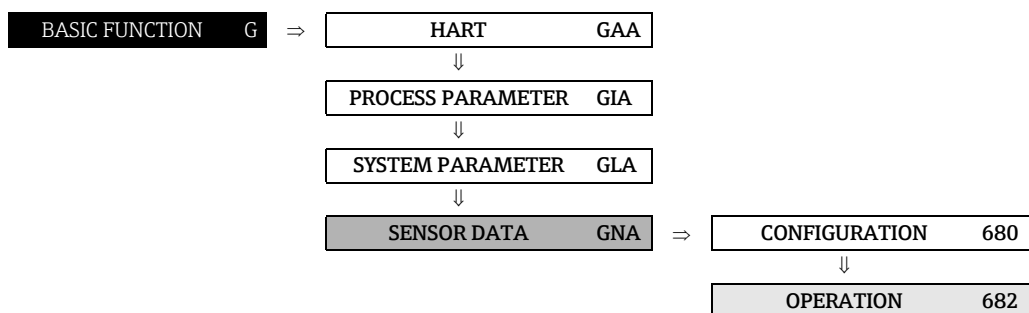
9.4 Group SENSOR DATA

9.4.1 Function group CONFIGURATION



Function description	
BASIC FUNCTION → SENSOR DATA → CONFIGURATION	
All sensor data (calibration factors, zero (point) and nominal diameter) 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 Endress+Hauser service organization if you have any questions about these functions.  Note! The individual values of the functions are also provided on the sensor nameplate.	
CALIBRATION DATE (6808)	Use this function to view the current calibration date and time for the sensor. User interface: Calibration date and time Factory setting: Calibration date and time of the current calibration.  Note! The calibration date and time format is defined in the FORMAT DATE/TIME (0429) function, →  16.
K-FACTOR (6801)	Use this function to display the actual 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 to 2.0000 Factory setting: Depends on nominal diameter and calibration  Note! This value is also provided on the sensor nameplate.
ZERO POINT (6803)	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
NOMINAL DIAMETER (6804)	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 to 2000 mm or 1/12 to 78" Factory setting: Depends on the size of the sensor

9.4.2 Function group OPERATION



Function description	
BASIC FUNCTION → SENSOR DATA → OPERATION	
All sensor data (measuring period, overvoltage time etc.) are set at the factory and saved on the S-DAT sensor memory chip.	
MEASURING PERIOD (6820)	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 to 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.
 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 Endress+Hauser service organization if you have any questions about these functions.	
OVERVOLTAGE TIME (6821)	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 to 100.0 ms Factory setting: Depends on nominal diameter
EPD ELECTRODE (6822)	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

Function description	
BASIC FUNCTION → SENSOR DATA → OPERATION	
POLARITY ECC (6823)	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, titanium NEGATIVE → for electrodes made of: tantalum  Caution! If the incorrect current is applied to the electrodes, the electrode material is destroyed.

10 Block SPECIAL FUNCTION

[illegible]

10.1 Group BATCHING FUNCTION

10.1.1 Function group CONFIGURATION

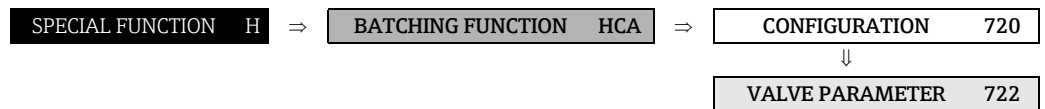
SPECIAL FUNCTION	H	⇒	BATCHING FUNCTION	HCA	⇒	CONFIGURATION	720
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Function description	
SPECIAL FUNCTION → BATCHING FUNCTION → CONFIGURATION	
BATCH SELECTOR (7200)	Use this function to select a batching specification. There are six different batching specifications available by means of which different batchings can be defined. Options: BATCH # 1 (or the name which was defined for batching specification 1 in the function BATCH NAME (7201). BATCH # 2 (or the name which was defined for batching specification 2 in the function BATCH NAME (7201). BATCH # 3 (or the name which was defined for batching specification 3 in the function BATCH NAME (7201). BATCH # 4 (or the name which was defined for batching specification 4 in the function BATCH NAME (7201). BATCH # 5 (or the name which was defined for batching specification 5 in the function BATCH NAME (7201). BATCH # 6 (or the name which was defined for batching specification 6 in the function BATCH NAME (7201). Factory setting: BATCH #1  Note! ■ By selecting a batching specification and its related settings (explained below), up to 6 different batchings can be preconfigured and selected as necessary. ■ All the following functions in this function group, as well as the functions in the function groups VALVE PARAMETER (722) and SUPERVISION (724) are assigned to the batching specification selected here. ■ All the settings in the following functions of this function group are valid only for the batching specification selected in the function BATCH SELECTOR (7200). In other words, the entry or option is assigned to the batching specification currently selected (e.g. in the factory setting BATCH # 1).
BATCH NAME (7201)	Use this function to assign a specific name to the batching specification . User input: max. 8-character text, permissible: A–Z, 0–9 Factory setting: Name of batching specification (depends on selection in the function BATCH SELECTOR (7200), e.g. "BATCH # 1").  Note! Once an entry has been made (e.g. "BEER 33"), the batch name (BEER 33) appears in the home position when selecting the quantity and the name of the batching specification ("e.g. BATCH # 1") no longer appears.

Function description SPECIAL FUNCTION → BATCHING FUNCTION → CONFIGURATION	
ASSIGN BATCH VARIABLE (7202)	Use this function to assign a batching variable to the batching specification. Options: OFF VOLUME FLOW MASS FLOW Factory setting: OFF  Note! ■ The possible assignments of the display functions are automatically extended. Once a batching variable has been selected (MASS or VOLUME), you can locally define the application-specific function of the minus key (start-stop-continue) and the plus key (stop-batching name/quantity) in the information line by means of the "batching menu" assignment. In this way, a direct batching control station is made available locally at the measuring device by means of the user interface and the controls. ■ Select OFF if the BATCHING functionality is no longer to be used. All settings related to the function (e.g. switching contact assigned to the relay output) must be assigned to another functionality.
BATCH QUANTITY (7203)	Use this function to define the quantity to be batched. User input: 5-digit floating-point number: 0 to max. value (depends on nominal diameter) [unit] Factory setting: 0 [unit]  Note! ■ The appropriate unit is taken from the function group SYSTEM UNITS (ACA), (see → 13). ■ When the batching quantity entered here is achieved, valve 1 closes (see function CLOSE VALVE 1 (7221) on → 131).
FIX COMPENSATION QUANTITY (7204)	Use this function to specify a positive or negative compensation quantity. The compensation quantity balances out a constant, system-related incorrect quantity. This can be caused, for example, by a pump over-running or by the closing time of a valve. The compensation quantity is determined by the system operator. A negative compensation quantity must be specified for overbatching and a positive compensation quantity for underbatching.  Note! The compensation quantity affects batching quantity only and does not affect the after run compensation. User input: Floating-point number with sign (depends on nominal diameter) Factory setting: 0 [unit]  Note! ■ If the entry range is not sufficient for the compensation quantity, the batching quantity may have to be adjusted. ■ The appropriate unit is taken from the function group SYSTEM UNITS (ACA), (see → 13).

Function description SPECIAL FUNCTION → BATCHING FUNCTION → CONFIGURATION	
BATCH STAGES (7208)	Use this function to define the number of batching stages. Batching can be carried out in several stages, e.g. 2-stage batching with fast and precise batching. Options: 1-stage (1 valve or 1-stage batching) 2-stage (2 valves or 2-stage batching) Factory setting: 1-stage (1 valve or 1-stage batching)  Note! ■ The batching stage selection (number of valves) is directly dependent on the configuration of the outputs. For 2-stage batching two relay outputs must be available in the measuring device. ■ The functions available in the function group VALVE PARAMETER (→  131) are dependent on the number of batching stages (number of valves) selected in this function.
INPUT FORMAT (7209)	Use this function to define the entry format of the quantities for the switch points of the valves. Options: VALUE-INPUT (e.g. 10 [unit]) %-INPUT (e.g. 80 [%]) Factory setting: VALUE-INPUT  Note! The entry format selected in this function is also used in the function groups VALVE PARAMETER (→  131) and SUPERVISION (→  136).

10.1.2 Function group VALVE PARAMETER



Function description	
SPECIAL FUNCTION → BATCHING FUNCTION → VALVE PARAMETER	
The parameters for the switching contacts of up to 2 valves can be set in the following functions. The number of switching contacts (valves) available, and thus their settings in this group, is defined in the function BATCH STAGES (7208).  Note! The following functions are only available if at least one batch stage has been selected in the function BATCH SELECTOR (7200).	
OPEN VALVE 1 (7220)	Use this function to specify the quantity value at which contact 1 opens. This is used as a switch point for valve 1 to output via an assigned output. The quantity value is entered as a % or as an absolute value, depending on the option selected in the function INPUT FORMAT (7209). User input: 0 to max. value or 0 to 100% (related to the batching quantity) Factory setting: 0 [unit] or 0 [%]  Note! ■ Dynamic tracking for %-data: If the value is entered as a %, this %-value always refers to the batching quantity (e.g. 70% of a batching quantity of 10 liters = 7 liters). If the BATCH QUANTITY (7203) is adjusted (reduced/increased), the effective quantity switch point is automatically and dynamically adjusted (e.g. taking 70% and changing the batching quantity from 10 to 20 liters, the quantity switch point is adjusted from 7 liters to 14 liters). ■ Dynamic tracking for value-data: If you enter value-input, this value is "absolute" for batching quantities that do not change (e.g. always 7 liters for a batching quantity of 10 liters). If the batching quantity (7203) is adjusted (reduced/increased), the quantity switch point is automatically and dynamically adjusted/tracked (e.g. with a new batching quantity changing from 10 to 20 liters, the quantity switch point is adjusted from 7 liters to 14 liters). In other words, the existing value data is tracked as a percentage of the altered batching quantity.
CLOSE VALVE 1 (7221)	Use this function to display the quantity value at which contact 1 (valve 1) closes. The quantity value is displayed either as a % or as an absolute value, depending on the option selected in the function INPUT FORMAT (7209). User Interface: Value or 100% (corresponds to the batching quantity) Factory setting: 0 [unit] or 0 [%]  Note! The switching contact for valve 1 is the "main contact", i.e. the closing function of valve 1 is firmly assigned to the batching quantity entered (see function BATCH QUANTITY (7203) on →  129). In this way, function CLOSE VALVE 1 is also the basis for calculating the after run quantity.

Function description SPECIAL FUNCTION → BATCHING FUNCTION → VALVE PARAMETER	
OPEN VALVE 2 (7222)	Use this function to specify the quantity value at which contact 2 opens. This is used as a switch point for valve 2 to output via an assigned output . The quantity value is entered as a % or as an absolute value, depending on the option selected in the function INPUT FORMAT (7209). User input: 0 to max. value or 0 to 100% (related to the batching quantity) Factory setting: 0 [unit] or 0 [%]  Note! - Dynamic tracking for %-data: If the value is entered as a %, this %-value always refers to the batching quantity (e.g. 70% of a batching quantity of 10 liters = 7 liters). If the BATCH QUANTITY (7203) is adjusted (reduced/increased), the effective quantity switch point is automatically and dynamically adjusted (e.g. taking 70% and changing the batching quantity from 10 to 20 liters, the quantity switch point is adjusted from 7 liters to 14 liters). - Dynamic tracking for value-data: If you enter value-input, this value is "absolute" for batching quantities that do not change (e.g. always 7 liters for a batching quantity of 10 liters). If the batching quantity (7203) is adjusted (reduced/increased), the quantity switch point is automatically and dynamically adjusted/tracked (e.g. with a new batching quantity changing from 10 to 20 liters, the quantity switch point is adjusted from 7 liters to 14 liters). In other words, the existing value data is tracked as a percentage of the altered batching quantity.
CLOSE VALVE 2 (7223)	Use this function to specify the quantity value at which contact 2 closes. This is used as a switch point for valve 2 to output via an assigned output . The quantity value is entered as a % or as an absolute value, depending on the option selected in the function INPUT FORMAT (7209). User input: 0 to max. value or 0 to 100% (related to the batching quantity) Factory setting: 0 [unit] or 0 [%]  Note! - Dynamic tracking for %-data: If the value is entered as a %, this %-value always refers to the batching quantity (e.g. 70% of a batching quantity of 10 liters = 7 liters). If the BATCH QUANTITY (7203) is adjusted (reduced/increased), the effective quantity switch point is automatically and dynamically adjusted (e.g. taking 70% and changing the batching quantity from 10 to 20 liters, the quantity switch point is adjusted from 7 liters to 14 liters). - Dynamic tracking for value-data: If you enter value-input, this value is "absolute" for batching quantities that do not change (e.g. always 7 liters for a batching quantity of 10 liters). If the batching quantity (7203) is adjusted (reduced/increased), the quantity switch point is automatically and dynamically adjusted/tracked (e.g. with a new batching quantity changing from 10 to 20 liters, the quantity switch point is adjusted from 7 liters to 14 liters). In other words, the existing value data is tracked as a percentage of the altered batching quantity.

10.1.3 Examples of setting parameters for batching processes

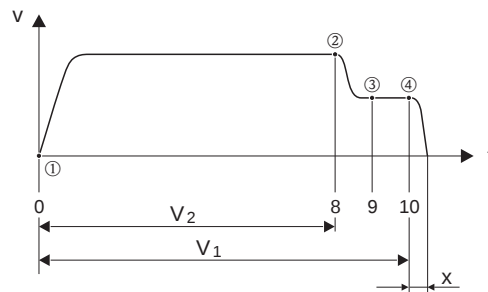
The two examples in the next section clearly show the effect of different entries and options in the function group BATCHING FUNCTION.

Example 1

The first example explains the parameter setting of various functions for carrying out batching and illustrates how functions are affected when the batching quantity is changed.

The following batching is to take place:

- 2-stage batching with a batching quantity of 10 liters in total.
- Coarse batching quantity of 8 liters. Valve 2 opens at the start of the batching and closes when 8 liters is achieved.
- Fine batching of 2 liters. Valve 1 opens at the start of the batching and closes (automatically) when the batching quantity (10 liters) is achieved.
- Once 9 liters have been batched a batching progress message should be generated.
- Value-input should be entered.



A0004670

v = Flow velocity [m/s]

t = Time

V_1 = Valve 1 open

V_2 = Valve 2 open

① = Start batching/coarse batching, valves 1 (7220) and 2 (7222) open

② = Valve 2 (7223) closes, coarse batching quantity achieved

③ = Batching progress message (7243)

④ = Valve 1 closes (7221), batching ends

x = After run quantity

The following parameter settings must be made:

– Select the unit for batching:

Function UNIT VOLUME (0403) → 14 = l (liter)

– Select the measured variable for batching:

Function ASSIGN BATCH VARIABLE (7202) → 129 = VOLUME FLOW

– Enter the batching quantity:

Function BATCH QUANTITY (7203) → 129 = 10 [liters]

– Select the entry format:

Function BATCH STAGES (7208) → 130 = 2-stage

– Select the entry format:

Function INPUT FORMAT (7209) → 130 = VALUE-INPUT

– Quantity data for when the first valve should open:

Function OPEN VALVE 1 (7220) → 131 = 0 [liters]

(valve 1 closes automatically when the batching quantity is achieved = 10 [liters], display in function CLOSE VALVE 1 (7221) → 131)

- Quantity data for when the second valve should open:
Function OPEN VALVE 2 (7224) → 132 = 0 [liters]
- Quantity data for when the second valve should close:
Function CLOSE VALVE 2 (7223) → 132 = 8 [liters]
- Quantity data for when the message should be generated:
Function PROGRESS NOTE (7243) → 139 = 9 [liters]

Example 1 a

Batching specifications identical to those in example 1, however the new batching quantity is 20 liters and the message should be generated once 18 liters are batched.

The following parameters must be set **manually** :

- Enter the new batching quantity:
Function BATCH QUANTITY (7203) → 129 = 20 [liters]
- New quantity data for when the message should be generated:
Function PROGRESS NOTE (7243) → 139 = 18 [liters]

The following functions are **automatically** adjusted to suit the new batching quantity:

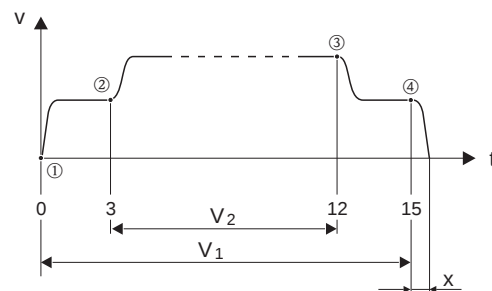
- Function OPEN VALVE 1 = 0 [liters]
- Function OPEN VALVE 2 = 0 [liters]
- Function CLOSE VALVE 2 = 16 [liters]

Example 2

The second example explains the parameter settings of the various functions for batching with the entry format in % for the switch points of the valves.

The following batching is to take place:

- 2-stage batching with a batching quantity of 15 liters in total.
- Coarse batching quantity from 3 to 12 liters. Valve 2 opens when 20% (3 liters) of the batching quantity is achieved and closes once 80% (12 liters) is achieved.
- Valve 1 opens at the start of the batching and closes (automatically) when the batching quantity (15 liters) is achieved.
- %-data should be entered.



A0004684

v = Flow velocity [m/s]

t = Time

V₁ = Valve 1 open

V₂ = Valve 2 open

① = Start batching, valve 1 (7220) opens

② = Valve 2 (7222) opens, coarse batching quantity starts

③ = Valve 2 (7223) closes, coarse batching quantity achieved

④ = Valve 1 (7221) closes, end of batching

x = After run quantity

The following parameter settings must be made:

- Select the unit for batching:
Function UNIT VOLUME (0403) → 14 = 1 (liter)
- Select the measured variable for batching:
Function ASSIGN BATCH VARIABLE (7202) → 129 = VOLUME FLOW
- Enter the batching quantity:
Function BATCH QUANTITY (7203) → 129 = 15 [liters]
- Select the entry format:
Function BATCH STAGES (7208) → 130 = 2-stage
- Select the entry format:
Function INPUT FORMAT (7209) → 130 = %-DATA
- Percentage data for when the first valve should open:
Function OPEN VALVE 1 (7220) → 131 = 0 [%]
(valve 1 closes automatically when the batching quantity is achieved = 15 [liters],
display in function CLOSE VALVE 1 (7221) → 131)
- Percentage data for when the second valve should open:
Function OPEN VALVE 2 (7224) → 132 = 20 [%], corresponds to 3 liters
- Percentage data for when the second valve should close:
Function CLOSE VALVE 2 (7223) → 132 = 80 [%], corresponds to 12 liters

Example 2 a

Batching specifications identical to those in example 1, however the new batching quantity is 45 liters.

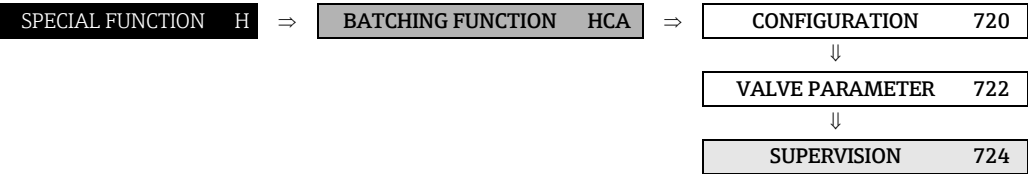
The following parameters must be set **manually**:

- Enter the new batching quantity:
Function BATCH QUANTITY (7203) → 129 = 45 [liters]

The following functions are **automatically** adjusted to suit the new batching quantity:

- Function OPEN VALVE 1 = 0 [%]
- Function OPEN VALVE 2 = 20 [%] corresponds to 9 liters
- Function CLOSE VALVE 2 = 80 [%] corresponds to 36 liters

10.1.4 Function group SUPERVISION



Function description	
SPECIAL FUNCTION → BATCHING FUNCTION → SUPERVISION	
MAXIMUM BATCHING TIME (7240)	Use this function to specify a maximum batching time. All valves close once the specified batching time elapses (see functions CLOSE VALVE 1 to 2, see → 131 ff.). This function can be used for safety reasons, for example, to ensure all batching valves close in the event of a system fault. User input: 0 to 30000 s Factory setting: 0 s (= deactivated)  Caution! - When the batching quantity is adjusted (reduced/increased), (see function BATCH QUANTITY (7203) on → 129), automatic adjustment does not take place i.e. this value must be determined again and re-entered (see also fault message # 471 in the Operating Instructions Promag 53, BA00047D, Troubleshooting Chapter). - Batching (START) is not possible when the fault message is active!  Note! - The function is not active if you enter 0 s (factory setting). This means that the batching valves are not closed by means of this function. - As a factory setting, this function is assigned to a fault message. These messages are no longer automatically removed after 60 s but are now continuously displayed. The fault message can be acknowledged by following actions: - General reset: A reset is possible, if any batch parameter is configured or by pressing the "+" key together with the  key. - Reset via the status input: The error message is reset with an initial input pulse, with the continuation of the batch procedure is resumed with an additional input pulse. - Reset via the batch control keys (soft keys): The error message is reset by pressing the START key, while the continuation of the batch procedure is resumed by pressing the START button. - Reset via the BATCH PROCEDURE (7260) parameter: The error message is reset via a STOP, START, HOLD or GO ON selection, while the continuation of the batch procedure is resumed by pressing the START button. - If this function is intended more for general monitoring purposes or if there is a short time lapse between two batching processes, it is advisable to assign this function to a notice message (see function ERROR CATEGORY on → 146). However, while the notice message is active (60 seconds) the next batching can be started and the notice message is thereby acknowledged. - This function can be output via the switch output.

Function description SPECIAL FUNCTION → BATCHING FUNCTION → SUPERVISION	
MINIMUM BATCHING QUANTITY (7241)	Use this function to specify a minimum batching quantity. A message is generated if the minimum batching quantity was not achieved by the time batching ends (e.g. if after run mode is active). The quantity value is entered as a % or as an absolute value, depending on the option selected in the function INPUT FORMAT (7209). Application: Message stating that underbatching is present (e.g. the contents of the containers does not correspond to the quantity declared). User input: 0 to max. value or 0 to 100% (related to the batching quantity) Factory setting: 0 [unit] (= deactivated)  Caution! - When the batching quantity is adjusted (reduced/increased), (see function BATCH QUANTITY (7203) on → 129) automatic adjustment does not take place, i.e. this value must be determined again and re-entered (see also fault message # 472 in the Operating Instructions Promag 53, BA00047D, Troubleshooting Chapter). - Batching (START) is not possible when the fault message is active!  Note! - The function is not active if you enter 0 s (factory setting). - As a factory setting, this function is assigned to a fault message. These messages are no longer automatically removed after 60 s but are now continuously displayed. The fault message can be acknowledged by following actions: - General reset: A reset is possible, if any batch parameter is configured or by pressing the "+" key together with the  key. - Reset via the status input: The error message is reset with an initial input pulse, with the continuation of the batch procedure is resumed with an additional input pulse. - Reset via the batch control keys (soft keys): The error message is reset by pressing the START key, while the continuation of the batch procedure is resumed by pressing the START button. - Reset via the BATCH PROCEDURE (7260) parameter: The error message is reset via a STOP, START, HOLD or GO ON selection, while the continuation of the batch procedure is resumed by pressing the START button. - If this function is intended more for general monitoring purposes or if there is a short time lapse between two batching processes, it is advisable to assign this function to a notice message (see function ERROR CATEGORY on → 146). However, while the notice message is active (60 seconds) the next batching can be started and the notice message is acknowledged. - This function can be output via the switch output.

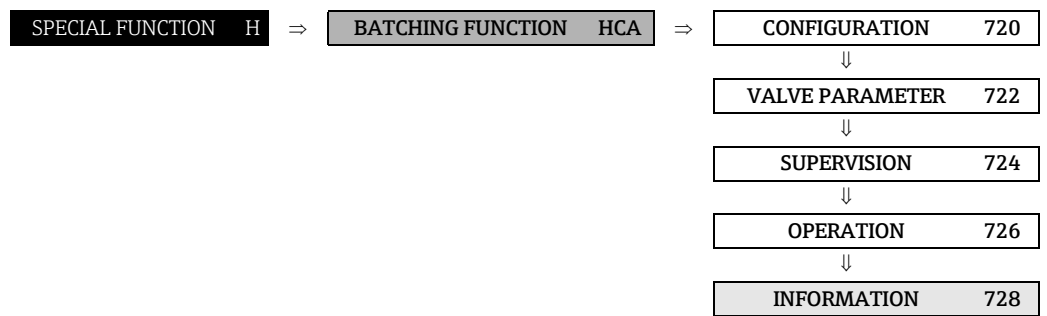
Function description SPECIAL FUNCTION → BATCHING FUNCTION → SUPERVISION	
MAXIMUM BATCHING QUANTITY (7242)	Use this function to specify a maximum batching quantity. If the maximum batching quantity is exceeded during batching, all valves are closed, batching is stopped and a message is generated. The quantity value is entered as a % or as an absolute value, depending on the option selected in the function INPUT FORMAT (7209). Application: To avoid overbatching and thus prevent critical situations caused by fluid overflow arising in the plant (e.g. plant standstill caused by safety level switches being triggered, contamination, product loss, etc.). User input: 0 to 2 · max. value or 0 to 200% (related to the batching quantity) Factory setting: 0 [unit] (= deactivated)  Caution! - When the batching quantity is adjusted (reduced/increased), (see function BATCH QUANTITY (7203) on →  129) automatic adjustment does not take place, i.e. this value must be determined again and re-entered (see also fault message # 472 in the Operating Instructions Promag 53, BA00047D, Troubleshooting Chapter). - Batching (START) is not possible when the fault message is active!  Note! - The function is not active if you enter 0 s (factory setting). - As a factory setting, this function is assigned to a fault message. These messages are no longer automatically removed after 60 s but are now continuously displayed. The fault message can be acknowledged by following actions: - General reset: A reset is possible, if any batch parameter is configured or by pressing the "+" key together with the  key. - Reset via the status input: The error message is reset with an initial input pulse, with the continuation of the batch procedure is resumed with an additional input pulse. - Reset via the batch control keys (soft keys): The error message is reset by pressing the START key, while the continuation of the batch procedure is resumed by pressing the START button. - Reset via the BATCH PROCEDURE (7260) parameter: The error message is reset via a STOP, START, HOLD or GO ON selection, while the continuation of the batch procedure is resumed by pressing the START button. - If this function is intended more for general monitoring purposes or if there is a short time lapse between two batching processes, it is advisable to assign this function to a notice message (see function ERROR CATEGORY on →  146). However, while the notice message is active (60 seconds) the next batching can be started and the notice message is acknowledged. - This function can be output via the switch output.

Function description SPECIAL FUNCTION → BATCHING FUNCTION → SUPERVISION	
PROGRESS NOTE (7243)	Use this function to define a batching quantity at which a message should be generated. When the specified batching quantity is achieved, the message is generated and signaled via an output. The quantity value is entered as a % or as an absolute value, depending on the selection in function INPUT FORMAT (7209). Application: For longer batching processes when preparing or taking measures related to production (e.g. preparing to replace container, etc.). User input: 0 to max. value or 0 to 100% (related to the batching quantity) Factory setting: 0 [unit] (= deactivated)  Caution! When the batching quantity is adjusted (reduced/increased), (see function BATCH QUANTITY (7203) on → 129) there is no automatic adjustment, i.e. this value must be determined again and re-entered, (see also notice message # 473 in the Operating Instructions Promag 53, BA00047D, Trouble-shooting Chapter).  Note! ■ The function is not active if you enter 0 (factory setting). ■ This function can be output via the switch output. ■ The batching progress message remains active until batching ends.

Function description SPECIAL FUNCTION → BATCHING FUNCTION → SUPERVISION	
MAX. FLOW VALUE (7244)	A maximum flow value can be specified in this function. The batching process is aborted and all the valves are closed if the specified flow value is overshoot. Application: This function can be used for safety reasons, for example, to ensure all batching valves close in the event of a system fault. User input: 5-digit floating-point number Factory setting: 0 [Unit] (= deactivated)  Note! ▪ The appropriate unit is taken depending on the process variable selected in the ASSIGN BATCH VARIABLE parameter and the unit configured in the SYSTEM UNITS function group. ▪ The function is not active if you enter 0 s (factory setting). ▪ If the batching process is aborted because the specified flow value is overshoot, the parameter BATCH COUNTER is not incremented. ▪ New error message > MAX. FLOW with the error number #474. ▪ As a factory setting, this function is assigned to a fault message. These messages are no longer automatically removed after 60 s but are now continuously displayed. The fault message can be acknowledged by following actions: - General reset: A reset is possible, if any batch parameter is configured or by pressing the "+" key together with the  key. - Reset via the status input: The error message is reset with an initial input pulse, with the continuation of the batch procedure is resumed with an additional input pulse. - Reset via the batch control keys (soft keys): The error message is reset by pressing the START key, while the continuation of the batch procedure is resumed by pressing the START button. - Reset via the BATCH PROCEDURE (7260) parameter: The error message is reset via a STOP, START, HOLD or GO ON selection, while the continuation of the batch procedure is resumed by pressing the START button. In the function ASSIGN PROCESS ERROR (8002), you can use the ERROR CATEGORY (8003) to define whether this should be treated as a fault or notice message. Factory setting = FAULT MESSAGE

Function description SPECIAL FUNCTION → BATCHING FUNCTION → OPERATION	
BATCH COUNTER (7263)	Use this function to display the number of batchings carried out. User interface: max. 7-digit floating-point number Factory setting: 0  Note! ■ The batching quantity totalizer can be reset to 0 via the function RESET SUM/COUNTER (7265). ■ This function is reset to 0 (zero) if a different batching specification is selected in the function BATCH SELECTOR (7200).
BATCH SUM (7264)	Use this function to display the effective overall total of all the batchings carried out. User Interface: max. 7-digit floating-point number [unit] Factory setting: 0 [unit]  Note! ■ E.g. in 2-stage batching the effective overall total is calculated from the coarse batching quantity, fine batching quantity and after run quantity. ■ The total batching quantity can be reset to 0 via the function RESET SUM/COUNTER (7265). ■ This function is reset to 0 (zero) if a different batching specification is selected in the function BATCH SELECTOR (7200).
RESET SUM/COUNTER (7265)	Use this function to reset the batch counter and the batch sum to zero. User input: NO YES Factory setting: NO  Note! The batch counter and the batch sum can also be reset via the batching menu (information line on the local display) .

10.1.6 Function group INFORMATION



Function description	
SPECIAL FUNCTION → BATCHING FUNCTION → INFORMATION	
INTERNAL SWITCH POINT VALVE 1 (7280)	Use this function to display the internal switch point of valve 1 (siehe Funktion CLOSE VALVE 1 (7221) auf Seite 131). The value displayed takes the fixed correction quantity and / or the calculated after run quantity into account. User Interface: max. 7-digit floating-point number [unit]  Note! The appropriate unit is taken from the function group SYSTEM UNITS (ACA), (see → 13).
VALVE 1 CLOSING TIME (7282)	Use this function to display the valve closing time calculated internally. User Interface: max. 7-digit floating-point number [ms]  Note! ■ The valve closing time is the period between the switch point of valve 1 and the first undershooting of the low flow. ■ The data can only be taken as a general trend as the accuracy of the time value is directly dependent on the measuring period.

Function description	
SPECIAL FUNCTION → BATCHING FUNCTION → INFORMATION	
BATCHING TIME (7283)	In this function, you can read the batching time for the current or completed batching process, i.e. starting at 0 seconds, the time displayed increases until the batching process is complete. Application: This BATCHING TIME refers to the batch quantity determined in the BATCH SUM function for the current or last batching process. A0001170-EN User Interface: max. 7-digit floating-point number Note! ■ Behaviour when controlling batching process via function BATCH PROCEDURE: - STOP ⇒ BATCHING TIME is not reset and stays at the current value. - START ⇒ BATCHING TIME is reset and starts with the value 0 - HOLD ⇒ BATCHING TIME is not reset and stays at the current value. - GO ON ⇒ BATCHING TIME is not reset and continues updating on the basis of the last time value ■ The BATCHING TIME is also updated during the batching process

11 Block SUPERVISION

Block	Groups	Function groups	Functions											
SUPERVISION (U)	SYSTEM (JAA) → 146	⇕⇕	⇐	CONFIGURATION (800) → 146	⇒	ASSIGN SYS. ERROR (8000) → 146	⇒	ERROR CATEGORY (8001) → 146	ASSIGN PROC. ERROR (8002) → 146	ERROR CATEGORY (8003) → 147	ACKNOWL. FAULTS (8004) → 147	ALARM DELAY (8005) → 147	REMOVE SW-OPTION (8006) → 148	
			⇐	OPERATION (804) → 149	⇐	ACT. SYST. CON-DITION (8040) → 149	⇐	PREV. SYST. CON-DITION (8041) → 149	SIM. FAILSAFE MODE (8042) → 149	SIM. MEASURED (8043) → 149	VAL. SIM. MEASURAND (8044) → 149	SYSTEM RESET (8046) → 150	OPERATION HOURS (8048) → 150	PERMANENT STORAGE (8007) → 150
	VERSION INFO (JCA) → 151	⇕⇕	⇐	DEVICE (810) → 151	⇐	DEVICE SOFT-WARE (8100) → 151	⇐	SERIAL NUMBER (820) → 151	⇐	SENSOR TYPE (8201) → 151	⇐	SW REV. NO. S-DAT (8205) → 151		
			⇐	AMPLIFIER (822) → 152	⇐	SW REV. NO. AMPLIFIER (8222) → 152	⇐	SW REV. NO. T-DAT (8225) → 152	⇐	LANGUAGE GROUP (8226) → 152				
		⇕⇕	⇐	F-CHIP (824) → 152	⇐	STATUS F-CHIP (8240) → 152	⇐	SYSTEM OPTION (8241) → 152	⇐	SW REV. NO. F-CHIP (8244) → 152				
			⇐	I/O MODULE (830) → 153	⇐	I/O MODULE TYPE (8300) → 153	⇐	SW REV. NO. I/O MODULE (8303) → 153						
		⇕⇕	⇐	I/O SUB MODULE 1 (832) → 153	⇐	SUB-I/O TYPE (8320) → 153	⇐	SW REV. SUB-I/O (8323) → 153						
			⇐	I/O SUB MODULE 2 (834) → 153	⇐	SUB-I/O TYPE (8340) → 153	⇐	SW REV. SUB-I/O (8343) → 153						
		⇕⇕	⇐	I/O SUB MODULE 3 (836) → 153	⇐	SUB-I/O TYPE (8360) → 153	⇐	SW REV. SUB-I/O (8363) → 153						
			⇐	I/O SUB MODULE 4 (838) → 153	⇐	SUB-I/O TYPE (8380) → 153	⇐	SW REV. SUB-I/O (8383) → 153						

11.1 Group SYSTEM

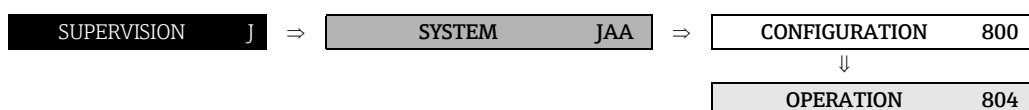
11.1.1 Function group CONFIGURATION

SUPERVISION	J	⇒	SYSTEM	JAA	⇒	CONFIGURATION	800
Function description							
SUPERVISION → SYSTEM → CONFIGURATION							
ASSIGN SYSTEM ERROR (8000)		Use this function to view all system errors. By selecting a certain system error, its error category can be changed in the subsequent function ERROR CATEGORY (8001). Options: CANCEL List of system errors  Note! ■ You can exit this function as follows: select "CANCEL" and confirm with . ■ A list of possible system errors is provided in the Operating Instructions Promag 53, BA00047D					
ERROR CATEGORY (8001)		 Note! This function is only available if a system error has been selected in the function ASSIGN SYSTEM ERROR (8000). 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 function ASSIGN SYSTEM ERROR (8000).					
ASSIGN PROCESS ERROR (8002)		Use this function to view all process errors. By selecting an individual process error, its error category can be changed in the subsequent function ERROR CATEGORY (8003). Options: CANCEL List of process errors  Note! ■ You can exit this function as follows: select "CANCEL" and confirm with . ■ A list of possible process errors is provided in the Operating Instructions Promag 53, BA00047D					

Function description SUPERVISION → SYSTEM → CONFIGURATION	
ERROR CATEGORY (8003)	 Note! This function is only available if a process error has been selected in the function ASSIGN PROCESS ERROR (8002). 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 function ASSIGN PROCESS ERROR (8002).
ACKNOWLEDGE FAULTS (8004)	Use this function to define the measuring device's response to fault messages. Options: OFF The measuring device resumes normal operation when the fault is rectified. The fault message disappears automatically. ON The measuring device resumes normal operation when the fault is rectified. The fault message is shown on the local display until the message is acknowledged by pressing the  key. Factory setting: OFF
ALARM DELAY (8005)	Use this function to define a time span in which the criteria for a fault have to be satisfied without interruption before a fault or notice message is generated. Depending on the setting and the type of fault, this suppression acts on: ■ Display ■ Relay output ■ Current output ■ Frequency output User input: 0 to 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 transmitted 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 may not be suppressed, a value of 0 seconds must be entered here.

Function description	
SUPERVISION → SYSTEM → CONFIGURATION	
REMOVE SW-OPTION (8006)	 Note! This function is only available if: ■ The F-CHIP software options were saved beforehand ■ The F-CHIP is not located on the I/O board of the measuring device Deletes all F-CHIP software options, such as batching, etc. The measuring device is restarted after the software options have been deleted. Options: 0 = NO 1 = YES Factory setting: NO  Caution! If process variables which are only available via the F-CHIP software options are assigned to the local display or the outputs, these have to be reconfigured.

11.1.2 Function group OPERATION

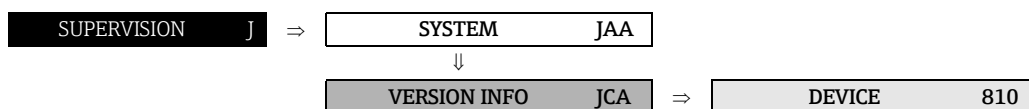


Function description SUPERVISION → SYSTEM → OPERATION	
ACTUAL SYSTEM CONDITION (8040)	Use this function to check the present system condition. User Interface: "SYSTEM OK" or the fault / notice message with the highest priority.
PREVIOUS SYSTEM CONDITIONS (8041)	Use this function to view the fifteen most recent fault and notice messages since measuring last started. User Interface: The 15 most recent fault or notice messages.
SIMULATION FAILSAFE MODE (8042)	Use this function to set all inputs, outputs and totalizers 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 MEASURAND (8043)	Use this function to set all inputs, outputs and totalizers 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 FLOW 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 MEASURAND (8044)	 Note! The function is not visible unless the SIMULATION MEASURAND function (8043) is active. Use this function to specify a selectable value (e.g. 12 m³/s). This is used to test the associated functions in the device itself and downstream signal loops. User input: 5-digit floating-point number [unit] Factory setting: 0 [unit]  Caution! ■ The setting is not saved if the power supply fails. ■ The appropriate unit is taken from the function group SYSTEM UNITS (ACA), (see → 13).

Function description SUPERVISION → SYSTEM → OPERATION	
SYSTEM RESET (8046)	Use this function to perform a reset of the measuring system. Options: NO RESTART SYSTEM (restart without interrupting power supply) Factory setting: NO
OPERATION HOURS (8048)	The hours of operation of the device appear on the display. Display: 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 to 10,000 hours → display format = 0000:00 (hr:min) Hours of operation > 10,000 hours → display format = 000000 (hr)
PERMANENT STRORAGE (8007)	This function indicates whether permanent storage of all parameters in the EEPROM has been switched on or off. Display: 0 = OFF 1 = ON Factory setting: ON

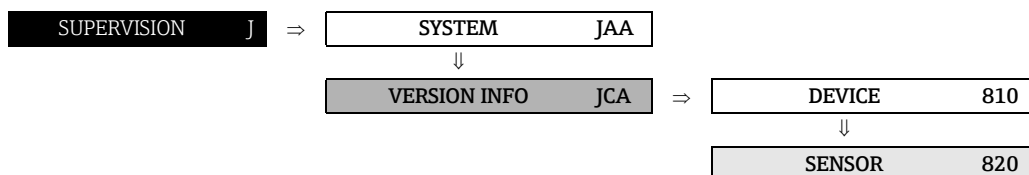
11.2 Group VERSION INFO

11.2.1 Function group DEVICE



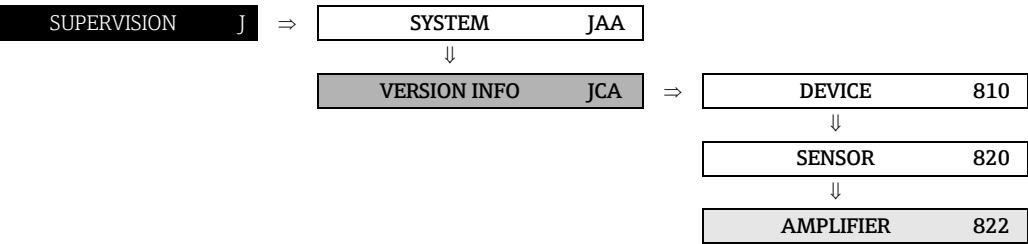
Function description SUPERVISION → VERSION INFO → DEVICE	
DEVICE SOFTWARE (8100)	Displays the current device software version.

11.2.2 Function group SENSOR



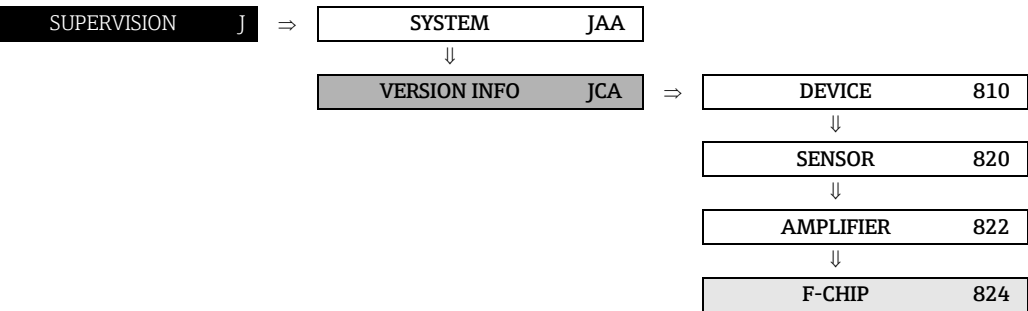
Function description SUPERVISION → VERSION INFO → SENSOR	
SERIAL NUMBER (8200)	Use this function to view the serial number of the sensor.
SENSOR TYPE (8201)	Use this function to view the sensor type.
SOFTWARE REVISION NUMBER S-DAT (8205)	Use this function to view the software revision number of the software used to create the content of the S-DAT.

11.2.3 Function group AMPLIFIER



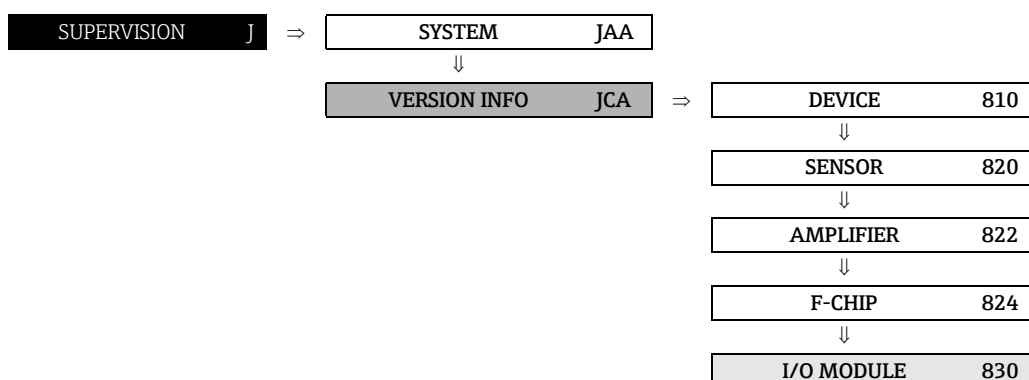
Function description	
SUPERVISION → VERSION INFO → AMPLIFIER	
SOFTWARE REVISION NUMBER AMPLIFIER (8222)	Use this function to view the software revision number of the amplifier.
SOFTWARE REVISION NUMBER T-DAT (8225)	Use this function to view the software revision number of the software used to create the content of the T-DAT.
LANGUAGE GROUP (8226)	Use this function to view the language group. The following language groups can be ordered: WEST EU / USA, EAST EU / SCAND., ASIA, CHINA. Display: available language group Note! ▪ The language options of the available language group are displayed in the LANGUAGE (2000) function. ▪ You can change the language group via the configuration software FieldCare. Please do not hesitate to contact your Endress+Hauser sales office if you have any questions.

11.2.4 Function group F-CHIP



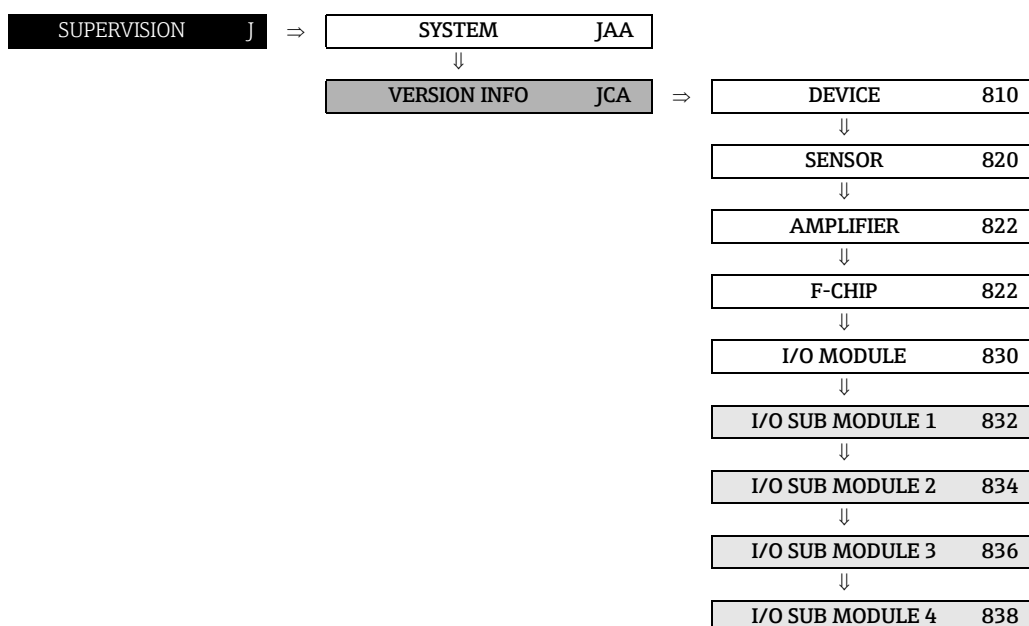
Function description	
SUPERVISION → VERSION INFO → F-CHIP	
STATUS F-CHIP (8240)	Use this function to check whether an F-CHIP is installed and which software options are available.
SYSTEM OPTION (8241)	Note! This function is not available unless the measuring device is equipped an F-CHIP. The software options available in the measuring device appear on the display.
SOFTWARE REVISION NUMBER F-CHIP (8244)	Note! This function is not available unless the measuring device is equipped an F-CHIP. Use this function to view the software revision number of the F-CHIP.

11.2.5 Function group I/O MODULE



Function description	
SUPERVISION → VERSION INFO → I/O MODULE	
I/O MODULE TYPE (8300)	Use this function to view the configuration of the I/O module complete with terminal numbers.
SOFTWARE REVISION NUMBER I/O MODULE (8303)	Use this function to view the software revision number of the I/O module.

11.2.6 Function groups INPUT /OUTPUT 1 to 4



Function description	
SUPERVISION → VERSION INFO → I/O SUB MODULE 1 to 4	
SUB I/O TYPE 1 = (8320) 2 = (8340) 3 = (8360) 4 = (8380)	Use this function to view the configuration complete with terminal numbers.
SOFTWARE REV.-NO. SUBMODULE I/O 1 = (8322) 2 = (8343) 3 = (8363) 4 = (8383)	Use this function to view the software revision number of the corresponding submodule.

12 Factory settings

12.1 SI units (not for USA and Canada)

Low flow, full scale value, pulse value, totalizer

Nominal diameter		Low flow (approx. v = 0.04 m/s)			Full scale value (approx. v = 2.5 m/s)			Pulse value (approx. 2 pulse/s at 2.5 m/s)			Totalizer	
[mm]	[inch]		Volume	Mass		Volume	Mass		Vol.	Mass	Vol.	Mass
2	1/12"	0.01	dm ³ /min	kg/min	0.5	dm ³ /min	kg/min	0.005	dm ³	kg	dm ³	kg
4	1/8"	0.05	dm ³ /min	kg/min	2	dm ³ /min	kg/min	0.025	dm ³	kg	dm ³	kg
8	3/8"	0.1	dm ³ /min	kg/min	8	dm ³ /min	kg/min	0.10	dm ³	kg	dm ³	kg
15	1/2"	0.5	dm ³ /min	kg/min	25	dm ³ /min	kg/min	0.20	dm ³	kg	dm ³	kg
25	1"	1	dm ³ /min	kg/min	75	dm ³ /min	kg/min	0.50	dm ³	kg	dm ³	kg
32	1 1/4"	2	dm ³ /min	kg/min	125	dm ³ /min	kg/min	1.00	dm ³	kg	dm ³	kg
40	1 1/2"	3	dm ³ /min	kg/min	200	dm ³ /min	kg/min	1.50	dm ³	kg	dm ³	kg
50	2"	5	dm ³ /min	kg/min	300	dm ³ /min	kg/min	2.50	dm ³	kg	dm ³	kg
65	2 1/2"	8	dm ³ /min	kg/min	500	dm ³ /min	kg/min	5.00	dm ³	kg	dm ³	kg
80	3"	12	dm ³ /min	kg/min	750	dm ³ /min	kg/min	5.00	dm ³	kg	dm ³	kg
100	4"	20	dm ³ /min	kg/min	1200	dm ³ /min	kg/min	10.00	dm ³	kg	dm ³	kg
125	5"	30	dm ³ /min	kg/min	1850	dm ³ /min	kg/min	15.00	dm ³	kg	dm ³	kg
150	6"	2.5	m ³ /h	t/h	150	m ³ /h	t/h	0.025	m ³	t	m ³	t
200	8"	5.0	m ³ /h	t/h	300	m ³ /h	t/h	0.05	m ³	t	m ³	t
250	10"	7.5	m ³ /h	t/h	500	m ³ /h	t/h	0.05	m ³	t	m ³	t
300	12"	10	m ³ /h	t/h	750	m ³ /h	t/h	0.10	m ³	t	m ³	t
350	14"	15	m ³ /h	t/h	1000	m ³ /h	t/h	0.10	m ³	t	m ³	t
375	15"	20	m ³ /h	t/h	1200	m ³ /h	t/h	0.15	m ³	t	m ³	t
400	16"	20	m ³ /h	t/h	1200	m ³ /h	t/h	0.15	m ³	t	m ³	t
450	18"	25	m ³ /h	t/h	1500	m ³ /h	t/h	0.25	m ³	t	m ³	t
500	20"	30	m ³ /h	t/h	2000	m ³ /h	t/h	0.25	m ³	t	m ³	t
600	24"	40	m ³ /h	t/h	2500	m ³ /h	t/h	0.30	m ³	t	m ³	t
700	28"	50	m ³ /h	t/h	3500	m ³ /h	t/h	0.50	m ³	t	m ³	t
–	30"	60	m ³ /h	t/h	4000	m ³ /h	t/h	0.50	m ³	t	m ³	t
800	32"	75	m ³ /h	t/h	4500	m ³ /h	t/h	0.75	m ³	t	m ³	t
900	36"	100	m ³ /h	t/h	6000	m ³ /h	t/h	0.75	m ³	t	m ³	t
1000	40"	125	m ³ /h	t/h	7000	m ³ /h	t/h	1.00	m ³	t	m ³	t
–	42"	125	m ³ /h	t/h	8000	m ³ /h	t/h	1.00	m ³	t	m ³	t
1200	48"	150	m ³ /h	t/h	10000	m ³ /h	t/h	1.50	m ³	t	m ³	t
–	54"	200	m ³ /h	t/h	13000	m ³ /h	t/h	1.50	m ³	t	m ³	t
1400	–	225	m ³ /h	t/h	14000	m ³ /h	t/h	2.00	m ³	t	m ³	t
–	60"	250	m ³ /h	t/h	16000	m ³ /h	t/h	2.00	m ³	t	m ³	t
1600	–	300	m ³ /h	t/h	18000	m ³ /h	t/h	2.50	m ³	t	m ³	t
–	66"	325	m ³ /h	t/h	20500	m ³ /h	t/h	2.50	m ³	t	m ³	t
1800	72"	350	m ³ /h	t/h	23000	m ³ /h	t/h	3.00	m ³	t	m ³	t
–	78"	450	m ³ /h	t/h	28500	m ³ /h	t/h	3.50	m ³	t	m ³	t
2000	–	450	m ³ /h	t/h	28500	m ³ /h	t/h	3.50	m ³	t	m ³	t

Language

Country	Language
Australia	English
Austria	Deutsch
Belgium	English
China	Chinese
Czech Republic	Czech
Denmark	English
England	English
Finland	Suomi
France	Francais
Germany	Deutsch
Hong Kong	English
Hungary	English
India	English
Indonesia	Bahasa Indonesia
Instruments International	English
Italy	Italiano
Japan	Japanese
Malaysia	English
Netherlands	Nederlands
Norway	Norsk
Poland	Polish
Portugal	Portuguese
Russia	Russian
Singapore	English
South Africa	English
Spain	Espanol
Sweden	Svenska
Switzerland	Deutsch
Thailand	English

Density, length, temperature

	Unit
Density	kg/l
Length	mm
Temperature	°C

12.2 US units (only for USA and Canada)

Low flow, full scale value, pulse value, totalizer

Nominal diameter		Low flow			Full scale value			Pulse value			Totalizer	
		(approx. v = 0.04 m/s)			(approx. v = 2.5 m/s)			(approx. 2 pulse/s at 2.5 m/s)				
[inch]	[mm]		Volume	Mass		Volume	Mass		Vol.	Mass	Vol.	Mass
1/12"	2	0.002	gal/min	lb/min	0.1	gal/min	lb/min	0.001	gal	lb	gal	lb
1/8"	4	0.008	gal/min	lb/min	0.5	gal/min	lb/min	0.005	gal	lb	gal	lb
3/8"	8	0.025	gal/min	lb/min	2	gal/min	lb/min	0.02	gal	lb	gal	lb
1/2"	15	0.10	gal/min	lb/min	6	gal/min	lb/min	0.05	gal	lb	gal	lb
1"	25	0.25	gal/min	lb/min	18	gal/min	lb/min	0.20	gal	lb	gal	lb
1 1/4"	32	0.50	gal/min	lb/min	30	gal/min	lb/min	0.20	gal	lb	gal	lb
1 1/2"	40	0.75	gal/min	lb/min	50	gal/min	lb/min	0.50	gal	lb	gal	lb
2"	50	1.25	gal/min	lb/min	75	gal/min	lb/min	0.50	gal	lb	gal	lb
2 1/2"	65	2.0	gal/min	lb/min	130	gal/min	lb/min	1	gal	lb	gal	lb
3"	80	2.5	gal/min	lb/min	200	gal/min	lb/min	2	gal	lb	gal	lb
4"	100	4.0	gal/min	lb/min	300	gal/min	lb/min	2	gal	lb	gal	lb
5"	125	7.0	gal/min	lb/min	450	gal/min	lb/min	5	gal	lb	gal	lb
6"	150	12	gal/min	lb/min	600	gal/min	lb/min	5	gal	lb	gal	lb
8"	200	15	gal/min	lb/min	1200	gal/min	lb/min	10	gal	lb	gal	lb
10"	250	30	gal/min	lb/min	1500	gal/min	lb/min	15	gal	lb	gal	lb
12"	300	45	gal/min	lb/min	2400	gal/min	lb/min	25	gal	lb	gal	lb
14"	350	60	gal/min	lb/min	3600	gal/min	lb/min	30	gal	lb	gal	lb
15"	375	60	gal/min	lb/min	4800	gal/min	lb/min	50	gal	lb	gal	lb
16"	400	60	gal/min	lb/min	4800	gal/min	lb/min	50	gal	lb	gal	lb
18"	450	90	gal/min	lb/min	6000	gal/min	lb/min	50	gal	lb	gal	lb
20"	500	120	gal/min	lb/min	7500	gal/min	lb/min	75	gal	lb	gal	lb
24"	600	180	gal/min	lb/min	10500	gal/min	lb/min	100	gal	lb	gal	lb
28"	700	210	gal/min	lb/min	13500	gal/min	lb/min	125	gal	lb	gal	lb
30"	–	270	gal/min	lb/min	16500	gal/min	lb/min	150	gal	lb	gal	lb
32"	800	300	gal/min	lb/min	19500	gal/min	lb/min	200	gal	lb	gal	lb
36"	900	360	gal/min	lb/min	24000	gal/min	lb/min	225	gal	lb	gal	lb
40"	1000	480	gal/min	lb/min	30000	gal/min	lb/min	250	gal	lb	gal	lb
42"	–	600	gal/min	lb/min	33000	gal/min	lb/min	250	gal	lb	gal	lb
48"	1200	600	gal/min	lb/min	42000	gal/min	lb/min	400	gal	lb	gal	lb
54"	–	1.3	Mgal/d	ton/h	75	Mgal/d	ton/h	0.0005	Mgal	ton	Mgal	ton
–	1400	1.3	Mgal/d	ton/h	85	Mgal/d	ton/h	0.0005	Mgal	ton	Mgal	ton
60"	–	1.3	Mgal/d	ton/h	95	Mgal/d	ton/h	0.0005	Mgal	ton	Mgal	ton
–	1600	1.7	Mgal/d	ton/h	110	Mgal/d	ton/h	0.0008	Mgal	ton	Mgal	ton
66"	–	2.2	Mgal/d	ton/h	120	Mgal/d	ton/h	0.0008	Mgal	ton	Mgal	ton
72"	1800	2.6	Mgal/d	ton/h	140	Mgal/d	ton/h	0.0008	Mgal	ton	Mgal	ton
78"	–	3.0	Mgal/d	ton/h	175	Mgal/d	ton/h	0.001	Mgal	ton	Mgal	ton
–	2000	3.0	Mgal/d	ton/h	175	Mgal/d	ton/h	0.001	Mgal	ton	Mgal	ton

Language, density, length, temperature

	Unit
Language	English
Density	g/cc
Length	inch
Temperature	°F

13 Index function matrix

Blöcke

A = MEASURED VARIABLES	11
B = QUICK SETUP	20
C = USER INTERFACE	29
D = TOTALIZER	49
E = OUTPUT	54
F = INPUT	102
G = BASIC FUNCTION	110
H = SPECIAL FUNCTION	127
J = SUPERVISION	145

Gruppen

AAA = MEASURING VALUES	12
ACA = SYSTEM UNITS	13
AEA = SPECIAL UNITS	17
CAA = CONTROL	30
CCA = MAIN LINE	35
CEA = ADDITIONAL LINE	39
CGA = INFORMATION LINE	45
DAA = TOTALIZER 1	50
DAB = TOTALIZER 2	50
DAC = TOTALIZER 3	50
DJA = HANDLING TOTALIZER	53
EAA = CURRENT OUTPUT 1	55
EAB = CURRENT OUTPUT 2	55
ECA = PULSE/FREQUENCY OUTPUT 1	67
ECB = PULSE/FREQUENCY OUTPUT 2	67
EGA = RELAY OUTPUT 1	92
EGB = RELAY OUTPUT 2	92
FAA = STATUS INPUT	103
FCA = CURRENT INPUT	106
GAA = HART	111
GIA = PROCESS PARAMETER	113
GLA = SYSTEM PARAMETER	122
GNA = SENSOR DATA	124
HCA = BATCHING FUNCTION	128
JAA = SYSTEM	146
JCA = VERSION INFO	151

Funktionsgruppen

040 = CONFIGURATION	13
042 = ADDITIONAL CONFIGURATION	15
060 = ARBITRARY UNIT	17
070 = DENSITY PARAMETER	18
200 = BASIC CONFIGURATION	30
202 = UNLOCKING/LOCKING	33
204 = OPERATION	34
220 = CONFIGURATION	35
222 = MULTIPLEX	37
240 = CONFIGURATION	39
242 = MULTIPLEX	42
260 = CONFIGURATION	45
262 = MULTIPLEX	47
300 = CONFIGURATION	50
304 = OPERATION	52

400 = CONFIGURATION	55
404 = OPERATION	65
408 = INFORMATION	66
420 = CONFIGURATION	67
430 = OPERATION	87
438 = INFORMATION	91
470 = CONFIGURATION	92
474 = OPERATION	96
478 = INFORMATION	98
500 = CONFIGURATION	103
504 = OPERATION	104
508 = INFORMATION	105
520 = CONFIGURATION	106
524 = OPERATION	108
528 = INFORMATION	109
600 = CONFIGURATION	111
604 = INFORMATION	113
640 = CONFIGURATION	113
642 = EPD PARAMETER	116
644 = ECC PARAMETER	119
648 = ADJUSTMENT	121
660 = CONFIGURATION	122
680 = CONFIGURATION	124
682 = OPERATION	125
720 = CONFIGURATION	128
722 = VALVE PARAMETER	131
724 = SUPERVISION	136
726 = OPERATION	141
728 = INFORMATION	143
800 = CONFIGURATION	146
804 = OPERATION	149
820 = SENSOR	151
822 = AMPLIFIER	152
824 = F-CHIP	152
830 = I/O MODULE	153
832 = INPUT/OUTPUT 1	153
834 = INPUT/OUTPUT 2	153
836 = INPUT/OUTPUT 3	153
838 = INPUT/OUTPUT 4	153

Funktionen 0...

0000 = CALCULATED MASS FLOW	12
0001 = VOLUME FLOW	12
0005 = DENSITY	12
0008 = TEMPERATURE	12
0400 = UNIT MASS FLOW	13
0401 = UNIT MASS	13
0402 = UNIT VOLUME FLOW	14
0403 = UNIT VOLUME	14
0420 = UNIT DENSITY	15
0422 = UNIT TEMPERATURE	15
0424 = UNIT LENGTH	15
0429 = FORMAT DATE/TIME	16
0602 = TEXT ARBITRARY VOLUME	17
0603 = FACTOR ARBITRARY VOLUME	17
0700 = DENSITY VALUE	18
0701 = REFERENCE TEMPERATURE	19
0702 = EXPANSION COEFFICIENT	19

1...

1002 = QUICK SETUP COMMISSION	20
1003 = QUICK SETUP PULSATING FLOW	20
1005 = QUICK SETUP BATCHING/DOSING	20
1009 = T DAT SAVE/LOAD	21

2...

2000 = LANGUAGE	30,31
2002 = DISPLAY DAMPING	31
2003 = CONTRAST LCD	31
2004 = BACKLIGHT	32
2020 = ACCESS CODE	33
2021 = DEFINE PRIVATE CODE	33
2022 = STATUS ACCESS	33
2023 = ACCESS CODE COUNTER	33
2040 = TEST DISPLAY	34
2200 = ASSIGN	35
2201 = 100% VALUE	35
2202 = FORMAT	36
2220 = ASSIGN	37
2221 = 100% VALUE	37
2222 = FORMAT	38
2400 = ASSIGN	39,40
2401 = 100% VALUE	40
2402 = FORMAT	40
2403 = DISPLAY MODE	41
2420 = ASSIGN	42,43
2421 = 100% VALUE	43
2422 = FORMAT	43
2423 = DISPLAY MODE	44
2600 = ASSIGN	45
2601 = 100% VALUE	46
2602 = FORMAT	46
2603 = DISPLAY MODE	46
2620 = ASSIGN	47
2621 = 100% VALUE	48
2622 = FORMAT	48
2623 = DISPLAY MODE	48

3...

3000 = ASSIGN	50
3001 = UNIT TOTALIZER	50
3002 = TOTALIZER MODE	51
3003 = RESET TOTALIZER	51
3040 = SUM	52
3041 = OVERFLOW	52
3800 = RESET ALL TOTALIZERS	53
3801 = FAILSAFE ALL TOTALIZERS	53

4...

4000 = ASSIGN CURRENT OUTPUT	55
4001 = CURRENT SPAN	56
4002 = VALUE 0_4 mA	57,58
4003 = VALUE 20 mA	59
4004 = MEASURING MODE	60,61
4005 = TIME CONSTANT	63
4006 = FAILSAFE MODE	64
4040 = ACTUAL CURRENT	65
4041 = SIMULATION CURRENT	65

4042 = VALUE SIMULATION CURRENT	65
4080 = TERMINAL NUMBER	66
4200 = OPERATION MODE	67
4201 = ASSIGN FREQUENCY	67
4202 = START VALUE FREQUENCY	68
4203 = END VALUE FREQUENCY	68
4204 = VALUE F LOW	68
4205 = VALUE-F HIGH	69
4206 = MEASURING MODE	71
4207 = OUTPUT SIGNAL	73,74,75
4208 = TIME CONSTANT	76
4209 = FAILSAFE MODE	76
4211 = FAILSAFE VALUE	76
4221 = ASSIGN PULSE	77
4222 = PULSE VALUE	77
4223 = PULSE WIDTH	78
4225 = MEASURING MODE	79
4226 = OUTPUT SIGNAL	80,81,82
4227 = FAILSAFE MODE	83
4241 = ASSIGN STATUS	83
4242 = ON VALUE	84
4243 = SWITCH-ON DELAY	84
4244 = OFF-VALUE	84
4245 = SWITCH-OFF DELAY	85
4246 = MEASURING MODE	85
4247 = TIME CONSTANT	86
4301 = ACTUAL FREQUENCY	87
4302 = SIMULATION FREQUENCY	87
4303 = VALUE SIMULATION FREQUENCY	88
4322 = SIMULATION PULSE	89
4323 = VALUE SIMULATION PULSE	89
4341 = ACTUAL STATUS	90
4342 = SIMULATION SWITCH POINT	90
4343 = VALUE SIMULATION SWITCH POINT	90
4380 = TERMINAL NUMBER	91
4700 = ASSIGN RELAY	92
4701 = ON-VALUE	93
4702 = SWITCH-ON DELAY	93
4703 = OFF-VALUE	93
4704 = SWITCH-OFF DELAY	94
4705 = MEASURING MODE	94
4706 = TIME CONSTANT	95
4740 = ACTUAL STATUS RELAY	96
4741 = SIMULATION SWITCH POINT	96
4742 = VALUE SIMULATION SWITCH POINT	97
4780 = TERMINAL NUMBER	98

5...

5000 = ASSIGN STATUS INPUT	103
5001 = ACTIVE LEVEL	103
5002 = MINIMUM PULSE WIDTH	103
5040 = ACTUAL STATUS INPUT	104
5041 = SIMULATION STATUS INPUT	104
5042 = VALUE SIMULATION STATUS INPUT	104
5080 = TERMINAL NUMBER	105
5200 = ASSIGN CURRENT INPUT	106
5201 = CURRENT SPAN	106
5202 = VALUE 0_4 mA	106
5203 = VALUE 20 mA	107

5204 = FAILSAFE MODE	107
5240 = ACTUAL CURRENT INPUT.....	108
5241 = SIMULATION CURRENT INPUT	108
5242 = VALUE SIMULATION CURRENT INPUT.....	108
5245 = TERMINAL NUMBER	109

6...

6000 = TAG NAME	111
6001 = TAG DESCRIPTION	111
6002 = BUS ADDRESS	111
6003 = HART PROTOCOL	111
6004 = WRITE PROTECTION	112
6006 = LONG TAG 1...14	111
6006 = LONG TAG 15...28	111
6006 = LONG TAG 29...32	111
6007 = SELECTION ERROR MESSAGE.....	112
6008 = ASSIGN NE107 COND. STAT.....	112
6009 = SIMULATION HART STATUS	112
6040 = MANUFACTURER ID	113
6041 = DEVICE ID	113
6042 = DEVICE REVISION.....	113
6043 = HART MESSAGES RECV.....	113
6043 = HART MESSAGES SENT.....	113
6400 = ASSIGN LOW FLOW CUT OFF.....	113
6402 = ON-VALUE LOW FLOW CUT OFF	114
6403 = OFF-VALUE LOW FLOW CUT OFF.....	114
6404 = PRESSURE SHOCK SUPPRESSION.....	115
6420 = EMPTY PIPE DETECTION (EPD)	116
6425 = EPD/OED RESPONSE TIME	118
6440 = ECC.....	119
6441 = ECC DURATION.....	119
6442 = ECC RECOVERY TIME.....	120
6443 = ECC CLEANING CYCLE	120
6481 = EPD/OED ADJUSTMENT	121
6600 = INSTALLATION DIRECTION SENSOR.....	122
6603 = SYSTEM DAMPING.....	122
6604 = INTEGRATION TIME.....	122
6605 = POSITIVE ZERO RETURN	123
6801 = K-FACTOR.....	124
6803 = ZERO POINT	124
6804 = NOMINAL DIAMETER	124
6808 = CALIBRATION DATE	124
6820 = MEASURING PERIOD	125
6821 = OVERVOLTAGE TIME	125
6822 = EPD ELECTRODE.....	125
6823 = POLARITY ECC	126

7...

7200 = BATCH SELECTOR	128
7201 = BATCH NAME.....	128
7202 = ASSIGN BATCH VARIABLE	129
7203 = BATCH QUANTITY	129
7204 = FIX COMPENSATION QUANTITY	129
7208 = BATCH STAGES.....	130
7209 = INPUT FORMAT	130

7220 = OPEN VALVE 1	131
7221 = CLOSE VALVE 1.....	131
7222 = OPEN VALVE 2	132
7223 = CLOSE VALVE 2.....	132
7240 = MAXIMUM BATCHING TIME.....	136
7241 = MINIMUM BATCHING QUANTITY	137
7242 = MAXIMUM BATCHING QUANTITY.....	138
7243 = PROGRESS NOTE	139
7244 = MAX. FLOW VALUE	140
7260 = BATCH PROCEDURE	141
7261 = BATCH UPWARDS.....	141
7262 = BATCH DOWNWARDS	141
7263 = BATCH COUNTER	142
7264 = BATCH SUM.....	142
7265 = RESET TOTAL SUM/COUNTER.....	142
7280 = INTERNAL SWITCH POINT VALVE 1	143
7282 = CLOSING TIME VALVE 1.....	143
7283 = BATCHING TIME	144

8...

8000 = ASSIGN SYSTEM ERROR.....	146
8001 = ERROR CATEGORY.....	146
8002 = ASSIGN PROCESS ERROR	146
8003 = ERROR CATEGORY.....	147
8004 = ACKNOWLEDGE FAULTS	147
8005 = ALARM DELAY	147
8006 = REMOVE SW-OPTION.....	148
8007 = PERMANENT STORAGE.....	150
8040 = ACTUAL SYSTEM CONDITION	149
8041 = PREVIOUS SYSTEM CONDITIONS	149
8042 = SIMULATION FAILSAFE MODE.....	149
8043 = SIMULATION MEASURAND.....	149
8044 = VALUE SIMULATION MEASURAND.....	149
8046 = OPERATION HOURS	150
8046 = SYSTEM RESET.....	150
8200 = SERIAL NUMBER.....	151
8201 = SENSOR TYPE.....	151
8205 = SOFTWARE REV. NO. S-DAT	151
8222 = SOFTWARE REV. NO. AMPLIFIER.....	152
8225 = SOFTWARE REV. NO. T-DAT	152
8226 = LANGUAGE GROUP.....	152
8240 = STATUS F-CHIP	152
8241 = SYSTEM OPTION	152
8244 = SOFTWARE REV. NO. F-CHIP.....	152
8300 = I/O MODULE TYPE.....	153
8303 = SOFTWARE REV. NO. I/O MODULE	153
8320 = SUBMODULE I/O TYPE 1	153
8323 = SOFTWARE REV. NO. SUBMODULE I/O 1 ...	153
8340 = SUBMODULE I/O TYPE 2	153
8343 = SOFTWARE REV. NO. SUBMODULE I/O 2 ...	153
8360 = SUBMODULE I/O TYPE 3	153
8363 = SOFTWARE REV. NO. SUBMODULE I/O 3 ...	153
8380 = SUBMODULE I/O TYPE 4	153
8383 = SOFTWARE REV. NO. SUBMODULE I/O 4 ...	153

14 Index key words

A

Access Code	33
Acknowledge faults	147
Active level	103
Actual	
Current (current input)	108
Current (current output)	65
Frequency	87
Actual status	
Relay output	96
Status input	104
Status (pulse/frequency output)	90
Actual system condition	149
Additional configuration (system units)	15
Additional line	
Configuration	39
Multiplex	42
Adjustment	
EPD/EED	121
Alarm delay	147
Amplifier (version info)	152
Arbitrary unit	17
Assign	
Additional line	39, 40
Additional line (Multiplex)	42, 43
Batch variable	129
Current input	106
Current output	55
Frequency (Pulse/freq. output)	67
Information line	45
Information line (Multiplex)	47
Low flow cut off	113
Main line	35
Main line (Multiplex)	37
Process error	146
Pulse output	77
Relay (relay output)	92
Status input	103
Status (pulse/frequency output)	83
System error	146
Totalizer	50

B

Backlight	32
Basic configuration (user interface)	30
Basic function	110
Batch	
Counter	142
Downwards	141
Name	128
Procedure	141
Quantity	129
Selector	128
Stages	130
Sum	142
Upwards	141

Batching function	128
Batching time	144
Block	
Basic function	110
Inputs	102
Measured variables	11
Outputs	54
Quick Setup	20
Special function	127
Supervision	145
Totalizer	49
User interface	29
Bus address	111

C

Calculated mass flow	12
Calibration date	124
Close	
Valve 1	131
Valve 2	132
Closing time Valve 1	143
Commission	20
Compensation	
Quantity (fixed)	129
Configuration	
Additional line	39
Batching function	128
Current input	106
Current output	55
HART	111
Information line	45
Main line	35
Process parameter	113
Pulse/Frequency output	67
Relay output	92
Sensor data	124
Status input	103
System	146
System parameter	122
System units	13
Totalizer	50
Contrast LCD	31
Control	
Basic configuration	30
Operation	34
Unlocking/locking	33
Current input	
Configuration	106
Information	109
Operation	108
Current output	
Configuration	55
Information	66
Operation	65
Current span	56

D

Define private code	33
Density	12

Density parameter (introduction)	18	Additional line	40
Density value (display)	12	Additional line (Multiplex)	43
Density value (input)	18	Date and Time	16
Expansion coefficient (volume)	19	Information line	46
Reference temperature	19	Information line (Multiplex)	48
Device ID	113	Main line	36
Device Revision	113	Main line (Multiplex)	38
Diagram		Function group	
Batching Setup menu	26	Additional configuration (system units)	15
Pulsating flow Setup menu	24	Adjustment	121
Setup Commissioning	22	Amplifier	152
Display		Arbitrary unit (special units)	17
Backlight	32	Basic configuration (user interface)	30
Damping	31	Configuration	
Test	34	Additional line	39
Display mode		Batching function	128
Additional line	41	Current input	106
Additional line (Multiplex)	44	Current output	55
Information line	46	HART	111
Information line (Multiplex)	48	Information line	45
E		Main line	35
ECC		Process parameter	113
Cleaning cycle	120	Pulse/Frequency output	67
Duration	119	Relay output	92
Parameter	119	Sensor data	124
Polarity	126	Status input	103
Recovery time	120	System	146
Electrode cleaning (ECC)	119	System parameter	122
Empty pipe detection (EPD/OED)		System units	13
Empty/Full pipe adjustment	121	Totalizer	50
EPD electrode	125	Density parameter	18
General information	116	ECC parameter	119
Response time	118	EPD parameter	116
Switching on/off EPD/OED	116	F-CHIP	152
End value frequency	68	Information	
EPD (Empty Pipe Detection)	116	Batching function	143
Error category		Current input	109
Process error	147	Current output	66
System error	146	HART	113
Error message	112	Pulse/frequency output	91
Expansion coefficient for volume (density)	19	Relay output	98
F		Status input	105
Factor arbitrary volume	17	Input/output (1...4)	153
Factory settings	154	I/O Module	153
Failsafe mode		Multiplex	
All totalizers	53	Additional line	42
Current input	107	Information line	47
Current output	64	Main line	37
Frequency output	76	Operation	
Pulse output	83	Batching function	141
Failsafe value	76	Current input	108
F-CHIP (version info)	152	Current output	65
Fix compensation quantity	129	Pulse/Frequency output	87
Flow damping	122	Relay output	96
Flow value		Sensor data	125
Maximum	140	Status input	104
Format		System	149
		Totalizer	52
		User interface	34

Sensor	151
Supervision	136
Unlocking/locking (user interface)	33
Valve parameter	131
Function matrix	
General layout	8
Identification code	9
Overview	10

G

Group

Additional line	39
Batching function	128
Control (User interface)	30
Current input	106
Current output	55
Handling Totalizer	53
HART	111
Information line	45
Main line	35
Measuring values	12
Process parameter	113
Pulse/Frequency output	67
Relay output	92
Sensor data	124
Special units	17
Status input	103
System	146
System parameter	122
System units	13
Totalizer	50
Version info	151

H

Handling Totalizer	53
Hardware ID number	
Input/output 1...4	153
HART	
Configuration	111
Information	113
HART messages	113

I

Information

Batching function	143
Current input	109
Current output	66
Pulse/frequency output	91
Relay output	98
Status input	105
Information line	
Configuration	45
Multiplex	47
Input format	130
Inputs	102
Input/output 1...4 (version info)	153
Installation direction sensor	122
Integration time	122
Internal switch point Valve 1	143
I/O Module	153

K

K-Factor	124
----------------	-----

L

Language

Factory settings	155
Language group (display)	152
Selection	30, 31
Low flow cut off	113

M

Main line

Configuration	35
Multiplex	37
Manufacturer number	113
Mass flow (calculated)	12
Maximum	
Batching quantity	138
Batching time	136
Max. flow value	140
Measured variables (block A)	11
Measuring mode	
Current output	60, 61
Frequency (pulse/frequency output)	71, 72
Pulse output	79
Relay output	94
Status (pulse/frequency output)	85
Measuring period	125
Measuring values	12
Minimum	
Batching quantity	137
Pulse width	103
Multiplex	
Additional line	42
Information line	47
Main line	37

N

NE107 category	112
Nominal diameter	124

O

OED (Open Electrode Detection)

see Empty Pipe Detection (EPD/OED)	116
Off value	
Low flow cut off	114
Relay output	93
Status (pulse/frequency output)	84
On value	
Low flow cut off	114
Relay output	93
Status (pulse/frequency output)	84
Open	
Valve 1	131
Valve 2	132
Open electrode detection (OED)	116
Operation	
Batching function	141
Current input	108
Current output	65

Pulse/frequency output	87
Relay output	96
Sensor data	125
Status input	104
System	149
Totalizer	52
User interface	34
Operation hours	150
Operation mode (Pulse/frequency output)	67
Output signal	
Frequency output	73
Pulse output	80
Outputs	54
Overflow	52
Overvoltage time	125
P	
Permanent storage	150
Polarity ECC	126
Positive zero return	123
Pressure shock suppression	115
Previous system conditions	149
Process parameter	
Adjustment	121
Configuration	113
ECC parameter	119
EPD parameter	116
Progress note	139
Pulsating flow	20
Pulse	
Value	77
Width	78
Pulse/frequency output	
Configuration	67
Information	91
Operation	87
Q	
Quick Setup	
Batching/Dosing	20
Commission	20
Pulsating flow	20
R	
Reference temperature	19
Relay output	
Configuration	92
Flow direction	99
General	99
Information	98
Limit value	99
Operation	96
Switching response	100
Remove SW-option	148
Reset	
All totalizers	53
Total sum/counter	142
Totalizer	51

S

Sensor data	
Configuration	124
Operation	125
Sensor type	151
Sensor (version info)	151
Serial number sensor	151
Simulation	
Current input	108
Current (current output)	65
Failsafe mode	149
Frequency	87
HART status	112
Measurand	149
Pulse	89
Relay output switch point	96
Status input	104
Status (pulse/frequency output)	90
Software revision number	
Amplifier	152
F-CHIP	152
I/O Module	153
S-DAT	151
T-DAT	152
Special units	
Arbitrary unit	17
Density parameter	18
Start value frequency	68
Status	
Access	33
F-CHIP	152
Status input	
Configuration	103
Information	105
Operation	104
Sum (Totalizer)	52
Supervision	
Batching function	136
Block Supervision	145
Switching response of the relay output	100
Switch-off delay	
Relay output	94
Status (pulse/frequency output)	85
Switch-on delay	
Relay output	93
Status (pulse/frequency output)	84
System	
Configuration	146
Operation	149
Operation hours	150
Parameter	122
Permanent storage	150
Reset	150
System condition	
Actual	149
Previous	149
System option (additional software)	152
System units	
Additional configuration	15

Configuration	13	User interface	29
T		V	
Tag		Value	
Description	111	F High	69
Name	111	F Low	68
Tag name	111	Simulation Pulse	89
T-DAT Save/Load	21	0_4 mA	57
Temperature		0_4 mA (current input)	106
Display (current input)	12	20 mA	59
Reference temperature	19	20 mA (current input)	107
Units	15	Value Simulation	
Terminal number		Frequency	88
Current input	109	Relay output switch point	97
Current output	66	Switch point status (pulse/frequency output)	90
Pulse/frequency output	91	Value simulation	
Relay output	98	Current (current input)	108
Status input	105	Current (current output)	65
Text arbitrary volume	17	Measurand	149
Time constant		Status input	104
Current output	63	Valve parameter	
Frequency output	76	Batching function	131
Relay output	95	Version info	
Status (pulse/frequency output)	86	Amplifier	152
Totalizer	49	F-CHIP	152
Configuration	50	Input/output 1...4	153
Mode	51	I/O Module	153
Operation	52	Sensor	151
Reset	51	Volume flow	12
Type		W	
Input/output 1...4	153	Write protection	111, 112
I/O Module	153	Z	
U		Zero point	124
Unit		Zahlen	
Density	15	100% value flow	
Length	15	Additional line	40
Mass	13	Additional line (Multiplex)	43
Mass flow	13	Information line	46
Temperature	15	Information line (Multiplex)	48
Totalizer	50	Main line	35
Volume	14	Main line (Multiplex)	37
Volume flow	14		
Unlocking/locking (user interface)	33		

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