



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Description of Device Functions

Proline Promag 53 MODBUS RS485

Electromagnetic Flow Measuring System

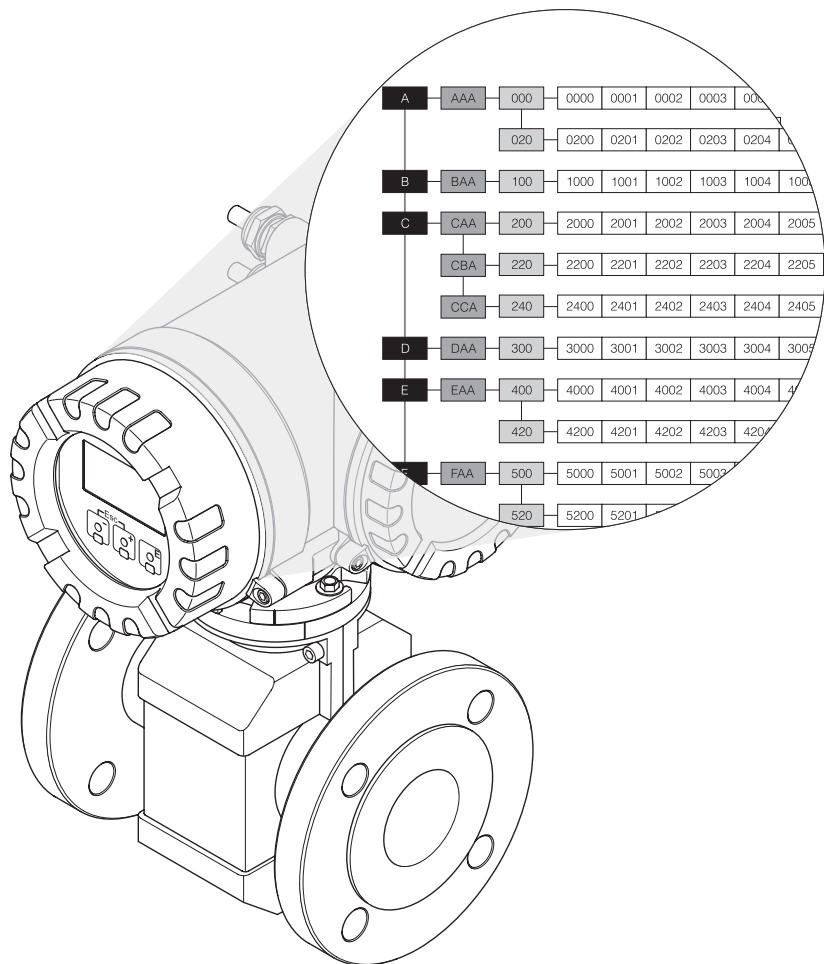


Table of contents

1	Notes on using this Manual	7		
1.1	Using the table of contents to locate a function description	7	6.1.2	Function group OPERATION
1.2	Using the graphic of the function matrix to locate a function description	7	6.2	Group HANDLING TOTALIZER
1.3	Using the index of the function matrix to locate a function description	7		
2	Function Matrix	8	7	Block OUTPUTS
2.1	General layout of the function matrix	8	7.1	Group CURRENT OUTPUT 1
2.1.1	Blocks (A, B, C, etc.)	8	7.1.1	Function group CONFIGURATION
2.1.2	Groups (AAA, AEA, CAA, etc.)	8	7.1.2	Function group OPERATION
2.1.3	Function groups (000, 020, 060, etc.)	8	7.1.3	Function group INFORMATION
2.1.4	Functions (0000, 0001, 0002, etc.)	8	7.2	Group PULSE/FREQUENCY OUTPUT 1
2.1.5	Codes identifying cells	9	7.2.1	Function group CONFIGURATION
2.2	Illustration of the function descriptions	10	7.2.2	Function group OPERATION
2.3	Display lines on the local display	10	7.2.3	Function group INFORMATION
2.4	Function matrix Promag 53	11	7.3	Group RELAY OUTPUT (1...2)
			7.3.1	Function group CONFIGURATION
3	Block MEASURED VARIABLES	12	7.3.2	Function group OPERATION
3.1	Group MEASURED VALUES	13	7.3.3	Function group INFORMATION
3.2	Group SYSTEM UNITS	14	7.3.4	Information on the response of the relay output
3.2.1	Function group CONFIGURATION	14	7.3.5	Switching response of the relay output
3.2.2	Function group ADDITIONAL CONFIGURATION	17		
3.3	SPECIAL UNITS group	18	8	Block INPUTS
3.3.1	Function group DENSITY PARAMETER	18	8.1	Group STATUS INPUT
			8.1.1	Function group CONFIGURATION
4	Block QUICK-SETUP	19	8.1.2	Function group OPERATION
4.1	Quick Setup "Commissioning"	21	8.1.3	Function group INFORMATION
4.2	Quick Setup "Pulsating flow"	23		
4.3	Quick Setup "Batching"	25	9	Block BASIC FUNCTION
4.4	Quick Setup "Communication"	27	9.1	Group MODBUS RS485
			9.1.1	Function group CONFIGURATION
5	Block USER INTERFACE	28	9.2	Group PROCESSPARAMETER
5.1	Group CONTROL	29	9.2.1	Function group CONFIGURATION
5.1.1	Function group BASIC CONFIGURATION	29	9.2.2	Function group EPD PARAMETER
5.1.2	Function group UNLOCKING/ LOCKING	31	9.2.3	Function group ECC PARAMETER
5.1.3	Function group OPERATION	32	9.2.4	Function group ADJUSTMENT
5.2	Group MAIN LINE	33	9.3	Group SYSTEM PARAMETER
5.2.1	Function group CONFIGURATION	33	9.3.1	Function group CONFIGURATION
5.2.2	Function group MULTIPLEX	35	9.4	Group SENSOR DATA
5.3	Group ADDITIONAL LINE	37	9.4.1	Function group CONFIGURATION
5.3.1	Function group CONFIGURATION	37	9.4.2	Function group OPERATION
5.3.2	Function group MULTIPLEX	40		
5.4	Group INFORMATION LINE	43	10	Block SPECIAL FUNCTION
5.4.1	Function group CONFIGURATION	43	10.1	Group BATCHING FUNCTION
5.4.2	Function group MULTIPLEX	46	10.1.1	Function group CONFIGURATION
			10.1.2	Function group VALVE PARAMETER
6	Block TOTALIZER	48	10.1.3	Examples of setting parameters for batching processes
6.1	Group TOTALIZER (1...3)	49	10.1.4	Function group SUPERVISION
6.1.1	Function group CONFIGURATION	49	10.1.5	Function group OPERATION
			10.1.6	Function group INFORMATION
			11	Block SUPERVISION
			11.1	Group SYSTEM

11.1.1	Function group CONFIGURATION	141
11.1.2	Function group OPERATION	142
11.2	Group VERSION INFO	144
11.2.1	Function group DEVICE	144
11.2.2	Function group SENSOR	144
11.2.3	Function group AMPLIFIER	145
11.2.4	Function group F-CHIP	146
11.2.5	Function group I/O MODULE	147
11.2.6	Function groups INPUT/OUTPUT 2...4 .	148
12	Factory settings	150
12.1	SI units (not for USA and Canada)	150
12.2	US units (only for USA and Canada)	152
13	Index function matrix	153
14	Index of key words	157

Registered trademarks

KALREZ[®] and VITON[®]

Registered trademarks of E.I. Du Pont de Nemours & Co., Wilmington, USA

TRI-CLAMP[®]

Registered trademark of Ladish & Co., Inc., Kenosha, USA

HistoROM[™], S-DAT[®], T-DAT[™], F-CHIP[®], ToF Tool - Fieldtool[®] Package, Fieldcheck[®], Applicator[®]

Pending or registered trademarks of Endress+Hauser Flowtec AG, Reinach, CH

MODBUS[®]

Registered trademark of MODBUS Organization

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 page 3.

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

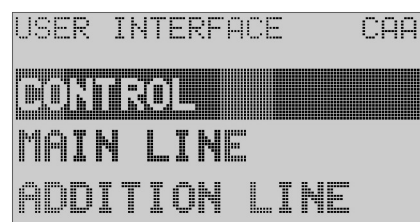
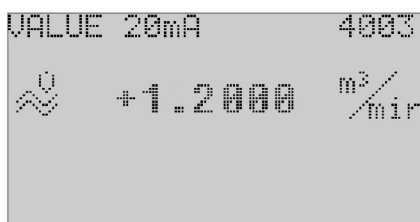
This step-by-step, top-down approach starts with the blocks, the highest level, and factory down through the matrix to the description of the function you need:

1. All blocks available, and their related groups, are illustrated on page 11. 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:



A0001653-EN

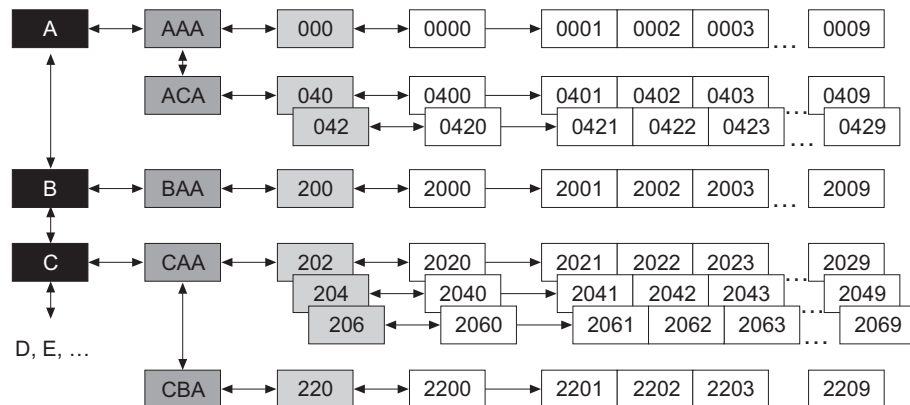
The function matrix index lists the codes for all the available “cells” in alphabetic and consecutive order, complete with the page references for the corresponding functions. The index to the function matrix is on page 153.

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 “CONTROL” group 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:

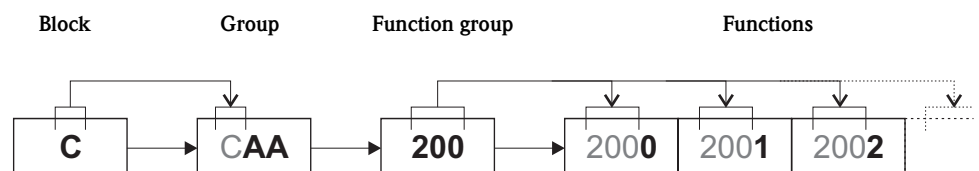
The code consists of three digits (000, 001, 100, etc.).

Functions:

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

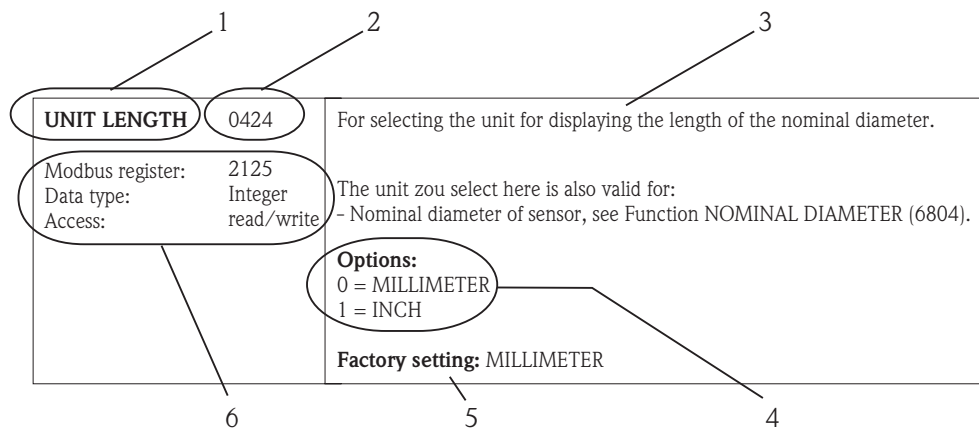
The first three digits are the same as the code for the function group.

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

2.2 Illustration of the function descriptions



F06-x3MBxxxx-19-xx-xx-en-000

Fig. 1: Example for the description of a function

- 1 Name of the function
- 2 Number of the function (appears on the local display; is **not** identical to the MODBUS register address)
- 3 Description of the function
- 4 Selection or entry options or display
- 5 Factory setting (the measuring device is delivered with this setting/selected option)
- 6 Information on communication via MODBUS RS485
 - MODBUS register (information in decimal numerical format)
 - Data type: float (length = 4 bytes), integer (length = 2 bytes), string (length = depends on function)
 - Possible ways of accessing the function:
read = read access via function code 03, 04 or 23
write = write access via 06, 16 or 23

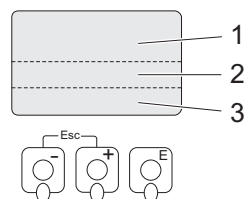


Note!

If a nonvolatile device parameter is modified via the MODBUS function codes 06, 16 or 23, this change is saved in the EEPROM of the measuring device. The number of writes to the EEPROM is technically restricted to a maximum of 1 million. Attention must be paid to this limit since, if exceeded, it results in data loss and measuring device failure. For this reason, avoid constantly writing nonvolatile device parameters via the MODBUS!

2.3 Display lines on the local display

The local display is split into various display lines.



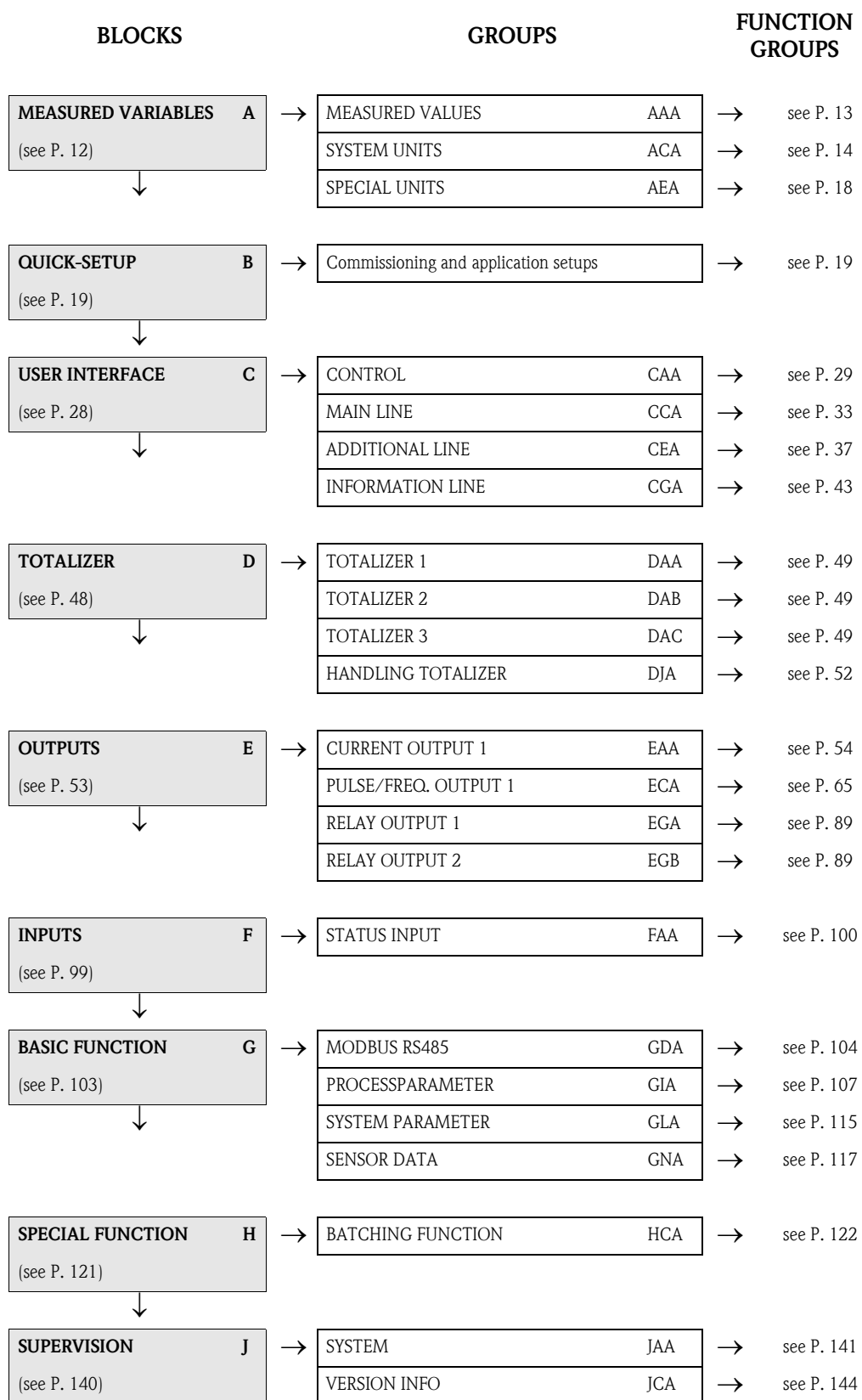
A0001253

Fig. 2: Local display

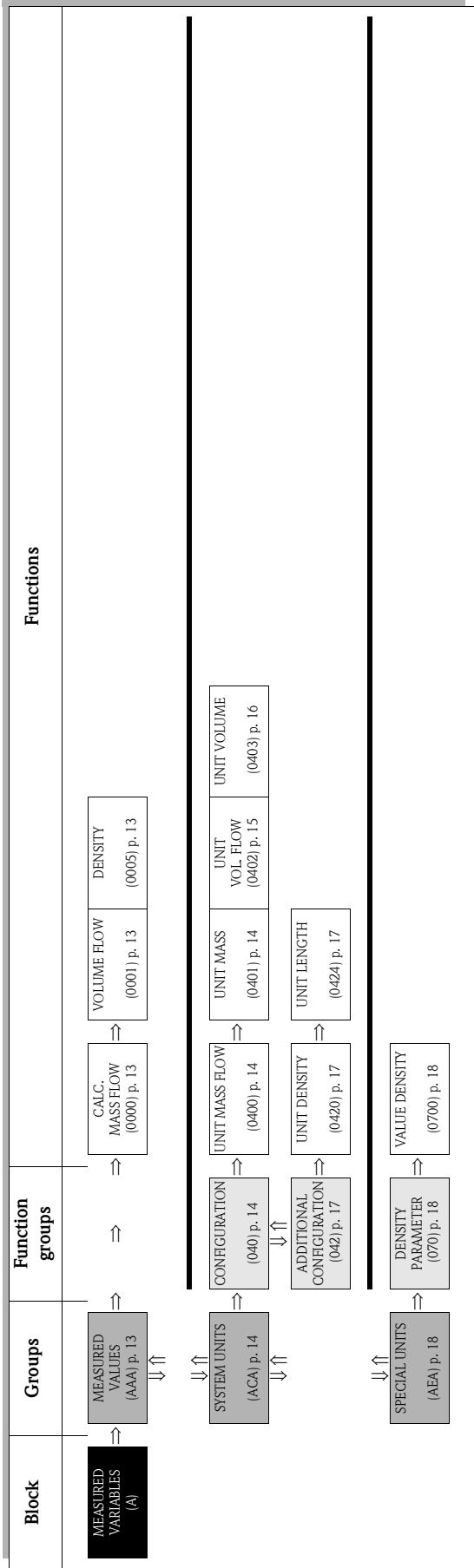
- 1 Main line
- 2 Additional line
- 3 Information line

The values are assigned to the individual lines in the USER INTERFACE block, see page 28.

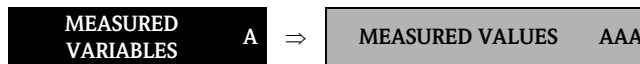
2.4 Function matrix Promag 53



3 Block MEASURED VARIABLES



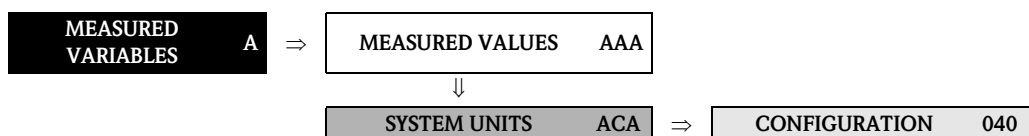
3.1 Group MEASURED VALUES



Function description MEASURED VARIABLES → MEASURED VALUES		
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 MODBUS register: Data type: Access:	0000 2007 Float Read	The calculated mass flow appears on the display. The mass flow is derived from the measured volume flow and the fixed density of the fluid. User interface: 5-digit floating-point number, including unit and sign (e.g. 462.87 kg/h; -731.63 lb/min; etc.)
VOLUME FLOW MODBUS register: Data type: Access:	0001 2009 Float Read	The volume flow currently measured appears on the display. User interface: 5-digit floating-point number, including unit and sign (e.g. 5.5445 dm ³ /min; 1.4359 m ³ /h; -731.63 gal/d; etc.)
DENSITY MODBUS register: Data type: Access:	0005 2013 Float Read	Display of the fixed density. User interface: 5-digit floating-point number, including unit (corresponding to 0.10000...6.0000 kg/dm ³) e.g. 1.2345 kg/dm ³ ; 993.5 kg/m ³ ; 1.0015 SG_20 °C; etc.

3.2 Group SYSTEM UNITS

3.2.1 Function group CONFIGURATION

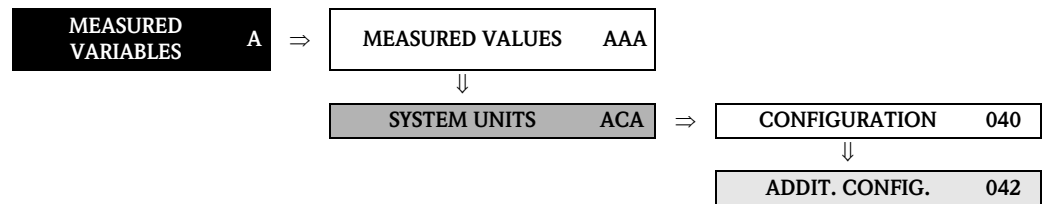


Function description		
MEASURED VARIABLES → SYSTEM UNITS → CONFIGURATION		
You can select the units for measured variables in this function group.		
UNIT MASS FLOW 0400 MODBUS register: 2101 Data type: Integer Access: read/write		Use this function to select the unit for displaying the calculated mass 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 output ■ Pulse/Frequency output ■ Relay switch points (limit value for mass flow, flow direction) ■ Low flow cut off Options: Metric: 0...3 = gram → g/s; g/min; g/h; g/day 4...7 = kilogram → kg/s; kg/min; kg/h; kg/day 8...11 = ton → t/s; t/min; t/h; t/day US: 12...15 = ounce → oz/s; oz/min; oz/h; oz/day 16...19 = pound → lb/s; lb/min; lb/h; lb/day 20...23 = ton → ton/s; ton/min; ton/h; ton/day Factory setting: Depends on nominal diameter and country (s. page 150 ff.).
UNIT MASS 0401 MODBUS register: 2102 Data type: Integer Access: read/write		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: 0 = g 1 = kg 2 = t US: 3 = oz 4 = lb 5 = ton Factory setting: Depends on nominal diameter and country (s. page 150 ff.).  Note! The unit of the totalizers is independent of your choice here. The unit for each totalizer is selected separately for the totalizer in question.

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).
MODBUS register:	2103	The unit you select here is also valid for:
Data type:	Integer	■ Current output ■ Pulse/Frequency output ■ Relay switch points (limit value for volume flow, flow direction) ■ Low flow cut off
Access:	read/write	Options: Metric: 0...3 = cubic centimeter → cm³/s; cm³/min; cm³/h; cm³/day 4...7 = cubic decimeter → dm³/s; dm³/min; dm³/h; dm³/day 8...11 = cubic meter → m³/s; m³/min; m³/h; m³/day 12...15 = milliliter → ml/s; ml/min; ml/h; ml/day 16...19 = liter → l/s; l/min; l/h; l/day 20...23 = hectoliter → hl/s; hl/min; hl/h; hl/day 24...27 = megaliter → Ml/s; Ml/min; Ml/h; Ml/day US: 28...31 = cubic centimeter → cc/s; cc/min; cc/h; cc/day 32...35 = acre foot → af/s; af/min; af/h; af/day 36...39 = cubic foot → ft³/s; ft³/min; ft³/h; ft³/day 40...43 = fluid ounce → oz f/s; oz f/min; oz f/h; oz f/day 44...47 = gallon → gal/s; gal/min; gal/h; gal/day 48...51 = kilo gallon → Kgal/s; Kgal/min; Kgal/h; Kgal/day 52...55 = million gallon → Mgal/s; Mgal/min; Mgal/h; Mgal/day 56...59 = barrel (normal fluids: 31.5 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day 60...63 = barrel (beer: 31.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day 64...67 = barrel (petrochemicals: 42.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Imperial: 68...71 = gallon → gal/s; gal/min; gal/h; gal/day 72...75 = mega gallon → Mgal/s; Mgal/min; Mgal/h; Mgal/day 76...79 = barrel (beer: 36.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day 80...83 = barrel (petrochemicals: 34.97 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Factory setting: Depends on nominal diameter and country (s. page 150 ff.).

Function description		
MEASURED VARIABLES → SYSTEM UNITS → CONFIGURATION		
UNIT VOLUME	0403	Use this function to select the unit for displaying the volume.
MODBUS register:	2104	The unit you select here is also valid for:
Data type:	Integer	■ Pulse weighting (e.g. m ³ /p)
Access:	read/write	Options: 0...6 = metric → cm ³ ; dm ³ ; m ³ ; ml; l; hl; Ml Mega 7...16 = US → cc; af; ft ³ ; oz f; gal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals) → bbl (filling tanks) 22 = Kgal 17...20 = Imperial → gal; Mgal; bbl (beer); bbl (petrochemicals) Factory setting: Depends on nominal diameter and country (s. page 150 ff.).  Note! ■ The unit of the totalizers is independent of your choice here. The unit for each totalizer is selected separately for the totalizer in question.

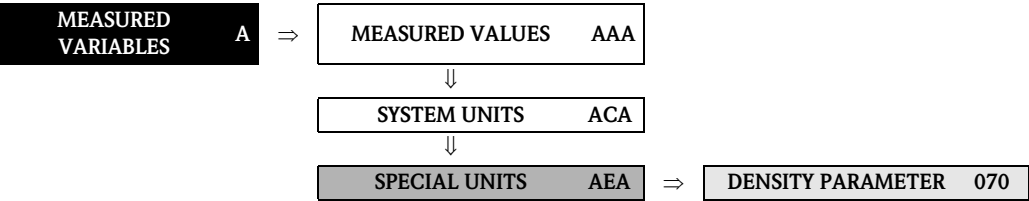
3.2.2 Function group ADDITIONAL CONFIGURATION



Function description		
MEASURED VARIABLES → SYSTEM UNITS → ADDITIONAL CONFIGURATION		
UNIT DENSITY	0420	Use this function to select the unit for displaying the fluid density.
MODBUS register:	2107	The unit you select here is also valid for:
Data type:	Integer	■ Fluid density entry
Access:	read/write	
		Options: 0...10 = metric → g/cm ³ ; g/cc; kg/dm ³ ; kg/l; kg/m ³ ; SD 4 °C; SD 15 °C; SD 20 °C; SG 4 °C; SG 15 °C; SG 20 °C 11...16 = US → lb/ft ³ ; lb/gal; lb/bbl (normal fluids); lb/bbl (beer); lb/bbl (petrochemicals); lb/bbl (filling tanks) 17...19 = 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 LENGTH	0424	Use this function to select the unit for displaying the length of the nominal diameter.
MODBUS register:	2125	The unit you select here is also valid for:
Data type:	Integer	Nominal diameter of sensor (function NOMINAL DIAMETER (6804) on page 118)
Access:	read/write	
		Options: 0 = MILLIMETER 1 = INCH Factory setting: MILLIMETER (SI units: not for USA and Canada) INCH (US units: only for USA and Canada)

3.3 SPECIAL UNITS group

3.3.1 Function group DENSITY PARAMETER



Function description		
MEASURED VARIABLES → SPECIAL UNITS → DENSITY PARAMETER		
VALUE DENSITY	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) (see page 17).
MODBUS register:	2201	
Data type:	Float	
Access:	read/write	

4 Block QUICK-SETUP

Block	Group / Function groups	Functions					
QUICK-SETUP (B)	⇒	OS-COMMISSION. (1002) p. 19	⇒	QUICK SETUP PULSATING (1003) p. 19	QUICK SETUP BATCHING (1005) p. 19	QUICK SETUP COMMUNICATION (1006) p. 19	T-DAT SAVE/LOAD (1009) p. 20

Function description QUICK-SETUP



Note!

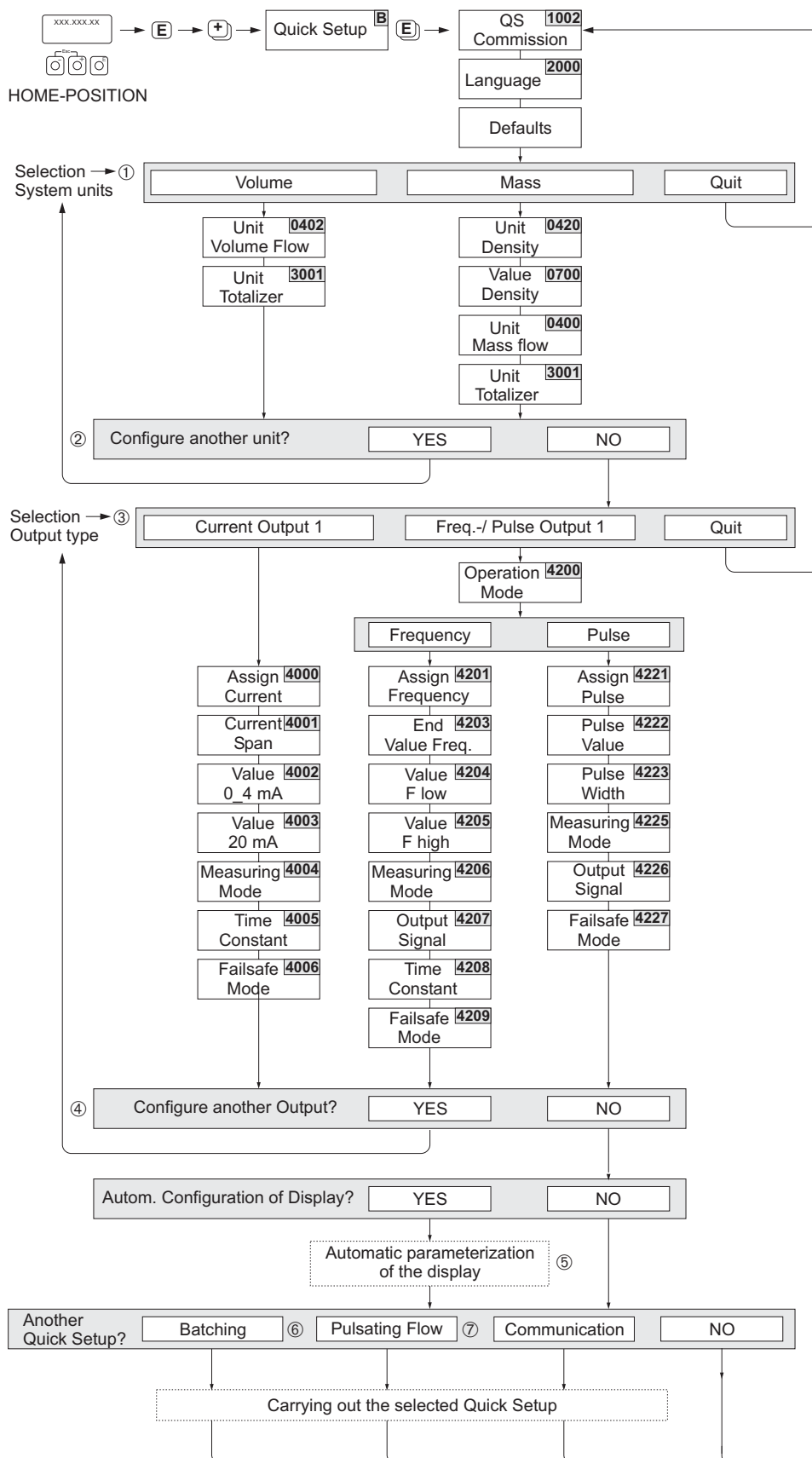
- The Quick Setups are only available by means of the local display.
- The flowcharts of the various Quick Setups are provided on the pages to follow.
- For more information on the Setup menus, please refer to the Operating Instructions BA117D.

QUICK SETUP COMMISSIONING	1002	For starting the Setup menu. Options: NO YES Factory setting: NO
QUICK SETUP PULSATING FLOW	1003	Note! Function only available for measuring devices with a current or pulse/frequency output. For starting the Setup menu. Options: NO YES Factory setting: NO
QUICK SETUP BATCHING	1005	Note! Function is only available with the optional software package BATCHING. For starting the Setup menu. Options: NO YES Factory setting: NO
QUICK SETUP COMMUNICATION	1006	For starting the Setup menu. Options: NO YES Factory setting: NO

Function description	
QUICK-SETUP	
T-DAT SAVE/LOAD 1009 MODBUS register: 2401 Data type: Integer Access: read/write	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: 0 = CANCEL 1 = SAVE (from EEPROM to T-DAT) 2 = 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 startup. 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 Quick Setup “Commissioning”

In the case of measuring devices without a local display, the individual parameters and functions must be configured via the configuration program, e.g. ToF Tool - Fieldtool Package.



A0004280-EN

- 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 Only units not yet configured in the current Setup are offered for selection in each cycle.
The unit for mass and volume is derived from the corresponding flow unit.
 - ② The “YES” option remains visible until all the units have been configured.
“NO” is the only option displayed when no further units are available.
 - ③ The prompt only appears if a current output and/or a pulse/frequency output is available.
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 parameterized.
“NO” is the only option displayed when no further outputs are available.
 - ⑤ The “automatic parameterization of the display” option contains the following basic settings/factory settings:
 - YES: Main line = Volume flow
 Additional line = Totalizer 1
 Information line = Operating/System conditions
 - NO: The existing (selected) settings remain.
 - ⑥ The BATCHING QUICK SETUP is only available when the optional software package BATCHING is installed.
 - ⑦ The QUICK SETUP PULSATING FLOW is only available if the device has a current output or a pulse/frequency output.

4.2 Quick Setup “Pulsating flow”



Note!

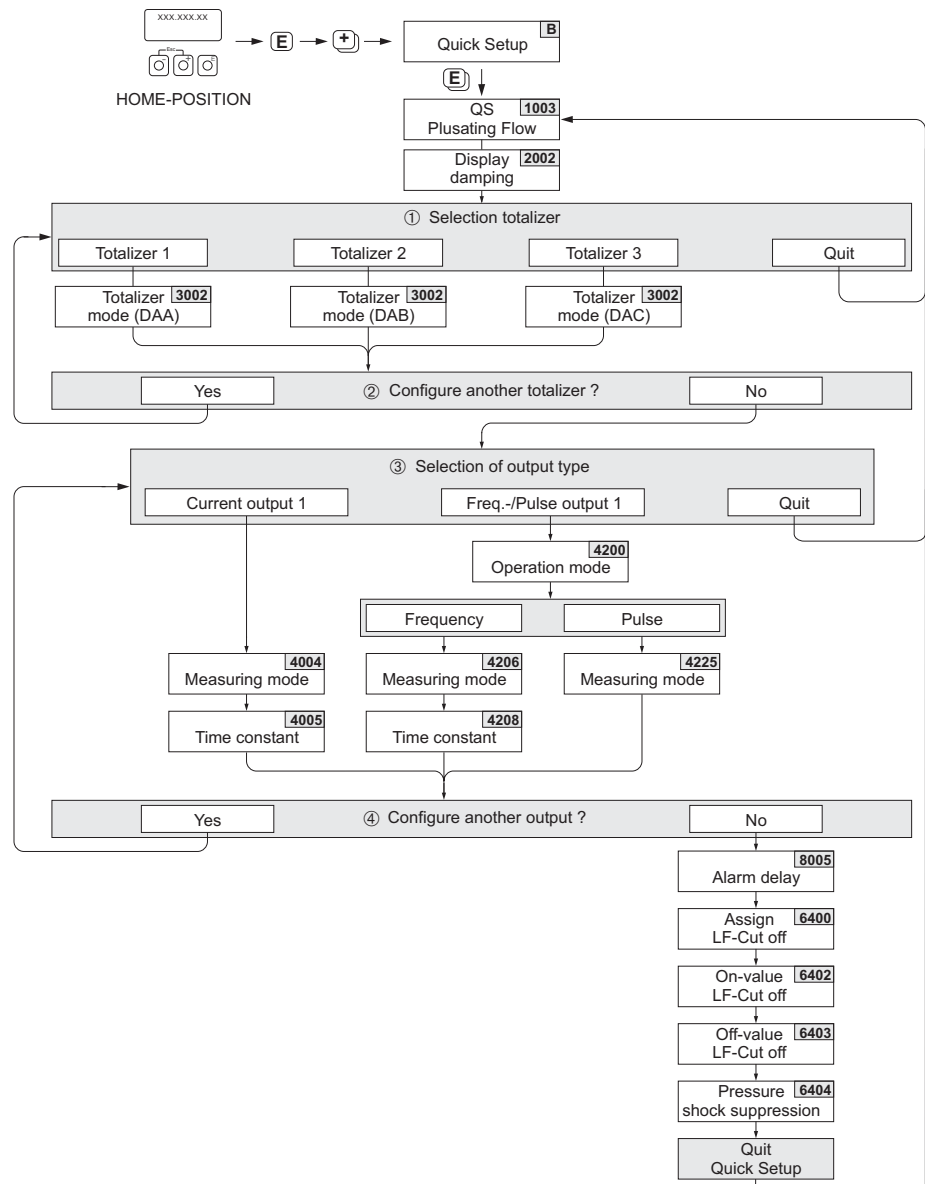
The “Pulsating flow” Quick Setup is only available if the device has a current output or a pulse/frequency output.

Certain types of pump such as reciprocating, peristaltic and cam-type pumps, for example, create a flow characterized by severe periodic fluctuations. Negative flows can occur with pumps of these types on account of the closing volume of the valves or valve leaks.



Note!

Before carrying out the Quick Setup “Pulsating Flow” the Quick Setup “Commissioning” (s. page 24) has to be executed.



A0004431-EN

- 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 parameterized. “NO” is the only option displayed when no further totalizers are available.
- ③ Only the output not yet configured in the current Setup is offered for selection in the second cycle.
- ④ The “YES” option remains visible until both outputs have been parameterized. “NO” is the only option displayed when no further outputs are available.

**Note!**

- If you press the key combination during parameter interrogation, the display returns to the cell QUICK SETUP PULSATING FLOW (1003).
- You can call up the Setup menu either directly from the “COMMISSIONING” Quick Setup menu or manually by means of the function QUICK SETUP PULSATING FLOW (1003).

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	see P. 19
1003	QUICK SETUP PULSATING FLOW	YES	see P. 19
Basic configuration:			
2002	DISPLAY DAMPING	3 s	see P. 30
3002	TOTALIZER MODE (DAA)	BALANCE (Totalizer 1)	see P. 50
3002	TOTALIZER MODE (DAB)	BALANCE (Totalizer 2)	see P. 50
3002	TOTALIZER MODE (DAC)	BALANCE (Totalizer 3)	see P. 50
Select the signal type: CURRENT OUTPUT 1			
4004	MEASURING MODE	PULSATING FLOW	see P. 59
4005	TIME CONSTANT	3 s	see P. 61
Select the signal type: FREQ./PULSE OUTPUT 1 / operating mode: FREQUENCY			
4206	MEASURING MODE	PULSATING FLOW	see P. 69
4208	TIME CONSTANT	0 s	see P. 74
Select the signal type: FREQ./PULSE OUTPUT 1 / operating mode: PULSE			
4225	MEASURING MODE	PULSATING FLOW	see P. 77
Other settings:			
8005	ALARM DELAY	0 s	see P. 141
6400	ASSIGN LOW FLOW CUT OFF	VOLUME FLOW	see P. 107
6402	ON-VALUE LOW FLOW CUT OFF	see table below	see P. 107
6403	OFF-VALUE LOW FLOW CUT OFF	50%	see P. 107
6404	PRESSURE SHOCK SUPPRESSION	0 s	see P. 108

Recommended settings for the function ON-VALUE LOW FLOW CUT OFF (6402):

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 see Promag 53 MODBUS RS485 Operating Instructions, BA117D/06/en, Chapter “Installation” → nominal diameters and flow rates).

4.3 Quick Setup “Batching”

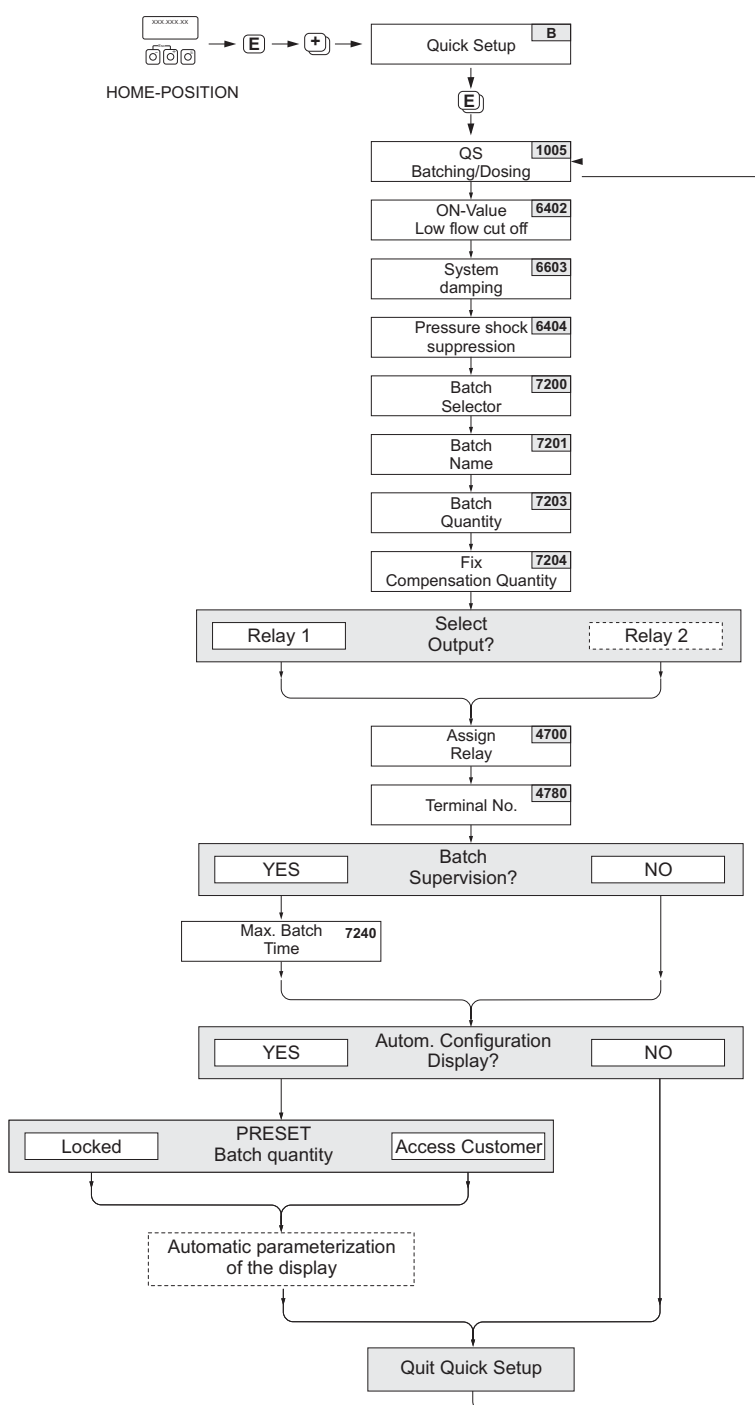


Note!

This function is only available when the additional “batching” software is installed in the measuring device (order option). You can order this software from Endress+Hauser as an accessory at a later date (see Operating Instructions).

This Quick Setup menu guides you systematically through the setup procedure for all the device functions that have to be parameterized and configured for batching operation. These basic settings allow simple (one step) batching processes.

Additional settings, e.g. for multi-stage batching processes, have to be made via the function matrix itself.



A0004433-EN

**Caution!**

The “Batching” Quick Setup sets certain device parameters for discontinuous measurement operation.

If the measuring device is used for continuous flow measurement at a later time, we recommend at you rerun the “Commissioning” and/or “Pulsating Flow” Quick Setup.

**Note!**

- Before carrying out the Quick Setup “Batching” the Quick Setup “Commissioning” (s. page 21) has to be executed.

- Detailed information about the batching functions can be found on Page 121 ff.

- You can also directly control filling process using the local display. During Quick Setup, an appropriate dialog appears concerning the automatic display configuration. Acknowledge this by clicking “YES”.

This assigns special batching functions (START, PRESET, MATRIX) to the bottom line of the display. These can be directly executed onsite using the three operating keys ($\rightarrow$ / $\leftarrow$ / E).

Therefore, the measuring device can be fully deployed in the field as a “batch controller”.

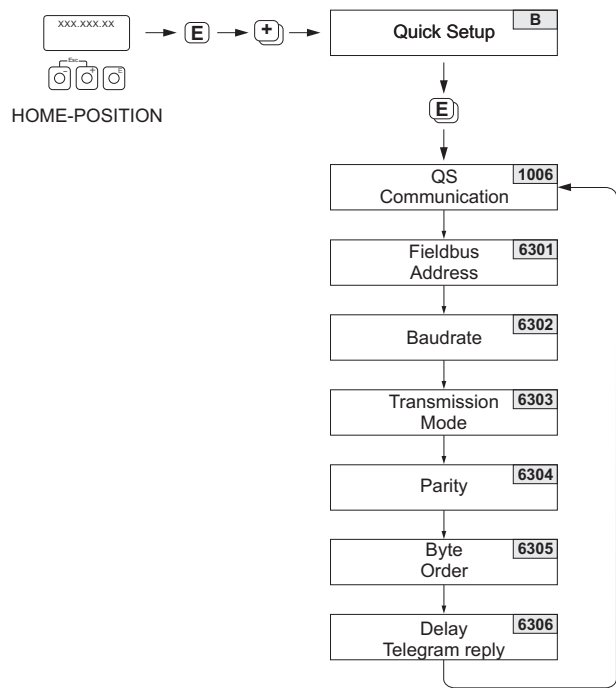
- You can also directly control the filling process using the fieldbus.

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	see P. 19
1005	QUICK SETUP BATCHING	YES	see P. 19
Settings (functions with a gray background are set automatically):			
6400	ASSIGN LOW FLOW CUT OFF	Volume	see P. 107
6402	ON-VALUE LOW FLOW CUT OFF	Table value	see P. 107
6403	OFF-VALUE LOW FLOW CUT OFF	50%	see P. 107
6603	SYSTEM DAMPING	9 Note! The SYSTEM DAMPING has to be optimized for highly accurate and short filling processes: to do this, put the setting to “0”.	see P. 115
6404	PRESSURE SHOCK SUPPRESSION	0 seconds	see P. 108
7200	BATCH SELECTOR	BATCH #1	see P. 122
7202	BATCH NAME	BATCH #1	see P. 123
7201	ASSIGN BATCH VARIABLE	Volume	see P. 123
7203	BATCH QUANTITY	0	see P. 124
7204	FIX COMPENSATION QUANTITY	0	see P. 124
7208	BATCH STAGES	1	see P. 125
7209	INPUT FORMAT	Value input	see P. 125
4700	ASSIGN RELAY	BATCH VALVE 1	see P. 89
4780	TERMINAL NUMBER	Output (display only)	see P. 95
7220	OPEN VALVE 1	0% or 0 [unit]	see P. 126
7240	MAXIMUM BATCH TIME	0 seconds	see P. 132
7241	MINIMUM BATCH QUANTITY	0 seconds	see P. 133
7242	MAXIMUM BATCH QUANTITY	0 seconds	see P. 134
2200	ASSIGN (Main line)	BATCH NAME	see P. 33
2220	ASSIGN (Multiplex main line)	Off	see P. 35
2400	ASSIGN (Additional line)	BATCH DOWNWARDS	see P. 37
2420	ASSIGN (Multiplex additional line)	Off	see P. 40
2600	ASSIGN (Information line)	BATCHING KEYS	see P. 43
2620	ASSIGN (Multiplex information line)	Off	see P. 46

4.4 Quick Setup “Communication”

To establish serial data transfer, various arrangements between the MODBUS master and MODBUS slave are required which have to be taken into consideration when configuring various functions. These functions can be configured quickly and easily by means of the “Communication” Quick Setup. The following table explains the parameter configuration options in more detail.



A0004430-EN

Settings for the Communication Setup menu:			
Fct. code	Function name	Suggested settings	Description
Call up through the function matrix:			
B	QUICK SETUP	QUICK SETUP COMMUNICATION	see P. 19
1006	QUICK SETUP COMMUNICATION	YES	see P. 19
Basic configuration:		Factory setting:	
6301	FIELDBUS ADDRESS	247	see P. 104
6302	BAUDRATE	19200 BAUD	see P. 104
6303	TRANSMISSION MODE	RTU	see P. 104
6304	PARITY	EVEN	see P. 105
6305	BYTE ORDER	1 - 0 - 3- 2	see P. 105
6306	DELAY TELEGRAM REPLY	10 ms	see P. 105

5 Block USER INTERFACE

Block	Groups	Function groups	Functions
USER INTERFACE (C)	CONTROL (CAA) p. 29	⇕⇕ 	

5.1 Group CONTROL

5.1.1 Function group BASIC CONFIGURATION

USER INTERFACE C



CONTROL

CAA

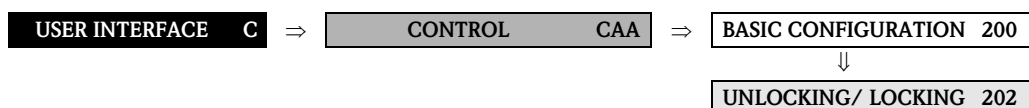


BASIC CONFIGURATION 200

Function description		
USER INTERFACE → CONTROL → BASIC CONFIGURATION		
LANGUAGE	2000	Use this function to select the language for all texts, parameters and messages shown on the local display.
MODBUS register:	2502	
Data type:	Integer	 Note!
Access:	read/write	The displayed options depend on the available language group shown in the LANGUAGE GROUP (8226) function.
		OPTIONS: Language group WEST EU / USA: 0 = ENGLISH 1 = DEUTSCH 2 = FRANCAIS 3 = ESPANOL 4 = ITALIANO 5 = NEDERLANDS 12 = PORTUGUESE Language group EAST EU / SCAND: 0 = ENGLISH 7 = NORSK 8 = SVENSKA 9 = SUOMI 13 = POLISH 14 = RUSSIAN 15 = CZECH Language group ASIA: 0 = ENGLISH 10 = BAHASA INDONESIA 11 = JAPANESE (syllabary) Language group CHINA: 0 = ENGLISH 16 = CHINESE Factory setting: Country-dependent (s. page 151)  Note! ■ If you press the  /  keys at startup, the language defaults to "ENGLISH". ■ You can change the language group via the configuration software ToF Tool - Fieldtool Package. Please do not hesitate to contact your Endress+Hauser sales office if you have any questions.

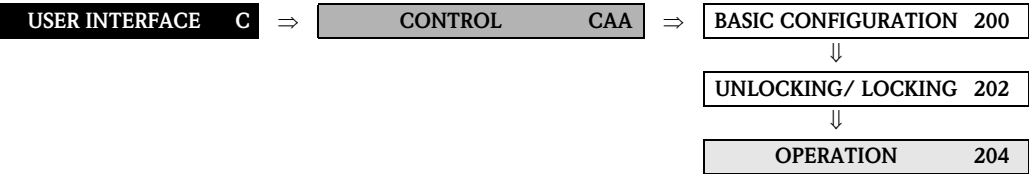
Function description USER INTERFACE → CONTROL → BASIC CONFIGURATION		
DISPLAY DAMPING 2002 MODBUS register: 2503 Data type: Float Access: read/write		Use this function to enter a time constant defining how the display reacts to severely fluctuating flow variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). User input: 0...100 seconds Factory setting: 3 s  Note! Setting the time constant to zero seconds switches off damping.
CONTRAST LCD 2003 MODBUS register: 2505 Data type: Float Access: read/write		Use this function to optimize display contrast to suit local operating conditions. User input: 10...100% Factory setting: 50%
BACKLIGHT 2004 MODBUS register: 2566 Data type: Float Access: read/write		Use this function to optimize the backlight to suit local operating conditions. User input: 0...100%  Note! Entering the value "0" means that the backlight is "switched off". The display then no longer emits any light, i.e. the display texts can no longer be read in the dark. Factory setting: 50%

5.1.2 Function group UNLOCKING/ LOCKING



Function description	
USER INTERFACE → CONTROL → UNLOCKING/ LOCKING	
ACCESS CODE 2020 MODBUS register: 2508 Data type: Float Access: read/write	Note! This function is only relevant for local operation and has no effect on access via MODBUS RS485 communication. 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). User input: max. 4-digit number: 0...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 MODBUS register: 2510 Data type: Float Access: read/write	Use this function to specify a personal code for enabling programming in the function ACCESS CODE. User input: 0...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 MODBUS register: 2512 Data type: Integer Access: Read	Use this function to check the access status for the function matrix. User interface: 0 = LOCKED (parameterization disabled) 1 = ACCESS CUSTOMER (parameterization possible)
ACCESS CODE COUNTER 2023 MODBUS register: 2568 Data type: Integer Access: Read	Displays how often the customer code, service code or the digit "0" (code-free) has been entered to gain access to the function matrix. User interface: max. 7-digit number: 0...9999999 Factory setting: 0

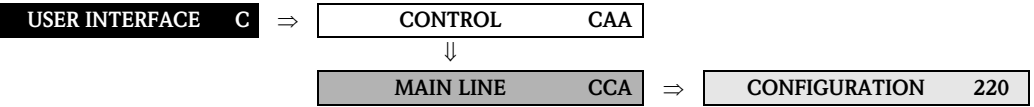
5.1.3 Function group OPERATION



Function description		
USER INTERFACE → CONTROL → OPERATION		
TEST DISPLAY	2040	Use this function to test the operability of the local display and its pixels.
MODBUS register:	2513	Options: 0 = OFF 1 = 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.
Data type:	Integer	
Access:	read/write	

5.2 Group MAIN LINE

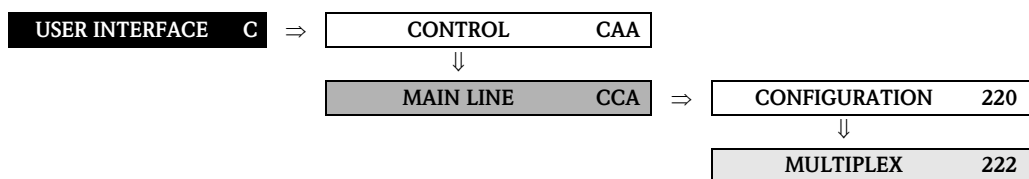
5.2.1 Function group CONFIGURATION



Function description		
USER INTERFACE → MAIN LINE → CONFIGURATION		
1 2 3 Esc 1 = main line, 2 = additional line, 3 = information line A0001253		
ASSIGN MODBUS register: Data type: Access:	2200 2514 Integer read/write	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: 0 = OFF 1 = VOLUME FLOW 2 = MASS FLOW 3 = VOLUME FLOW IN % 4 = MASS FLOW IN % 8 = ACTUAL CURRENT 1 10 = ACTUAL FREQUENCY 1 12 = TOTALIZER 1 13 = TOTALIZER 2 14 = TOTALIZER 3 Advanced options with optional software package BATCHING: 42 = BATCH NAME (“BATCH # 1” or “BEER 330”, etc.) 43 = BATCH QUANTITY (overall quantity to be batched) 44 = BATCH COUNTER (batching processes carried out) 45 = 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 (page 122). Example: If BATCH # 1 was selected in the BATCH SELECTOR function (7200), then only the values from BATCH # 1 (batch name, batch quantity, etc.) can be displayed. Factory setting: VOLUME FLOW

Function description USER INTERFACE → MAIN LINE → CONFIGURATION		
100% VALUE MODBUS register: Data type: Access:	2201 2519 Float read/write	 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 (s. page 150 ff.).
FORMAT MODBUS register: Data type: Access:	2202 2516 Integer read/write	Use this function to define the maximum number of places after the decimal point displayed for the reading in the main line. Options: 0 = XXXXX. 1 = XXXX.X 2 = XXX.XX 3 = XX.XXX 4 = 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 measured value and the engineering unit (e.g. 1.2 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

5.2.2 Function group MULTIPLEX

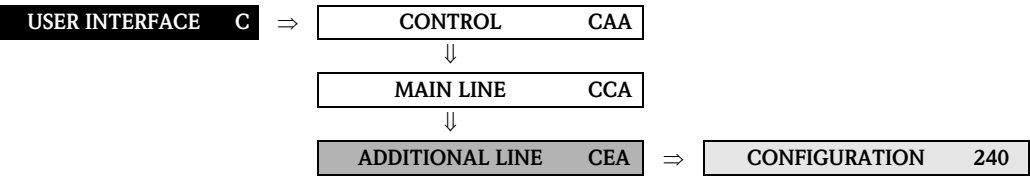


Function description		
USER INTERFACE → MAIN LINE → MULTIPLEX		
ASSIGN	2220	Use this function to define the second reading to be displayed in the main line alternately (every 10 seconds) with the value defined in the ASSIGN function (2200). Options: 0 = OFF 1 = VOLUME FLOW 2 = MASS FLOW 3 = VOLUME FLOW IN % 4 = MASS FLOW IN % 8 = ACTUAL CURRENT 1 10 = ACTUAL FREQUENCY 1 12 = TOTALIZER 1 13 = TOTALIZER 2 14 = TOTALIZER 3 Advanced options with optional software package BATCHING: 42 = BATCH NAME ("BATCH # 1" or "BEER 330", etc.) 43 = BATCH QUANTITY (overall quantity to be batched) 44 = BATCH COUNTER (batching processes carried out) 45 = 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 (page 122). Example: If BATCH # 1 was selected in the BATCH SELECTOR function (7200), then only the values from 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 (s. page 150 ff.).

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: 0 = XXXXX. 1 = XXXX.X 2 = XXX.XX 3 = XX.XXX 4 = 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 measured value and the engineering unit (e.g. 1.2 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.
MODBUS register:	2523	
Data type:	Integer	
Access:	read/write	

5.3 Group ADDITIONAL LINE

5.3.1 Function group CONFIGURATION

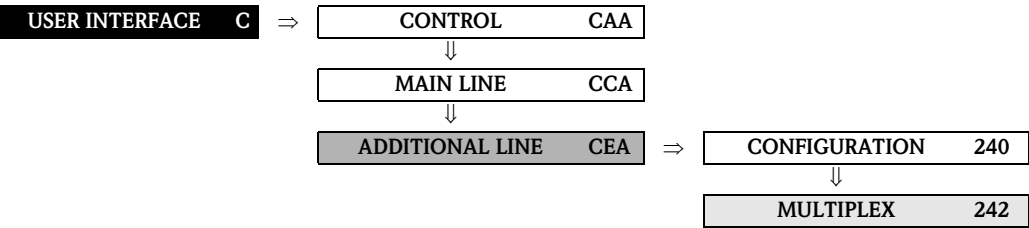


Function description		
USER INTERFACE → ADDITIONAL LINE → CONFIGURATION		
1 2 3 Esc + −		
1 = main line, 2 = additional line, 3 = information line		A0001253
ASSIGN	2400	In this function, a value to be displayed is assigned to the additional line (middle line in the local display). This value is displayed during normal operation. Options: 0 = OFF 1 = VOLUME FLOW 2 = MASS FLOW 3 = VOLUME FLOW IN % 4 = MASS FLOW IN % 5 = VOLUME FLOW BARGRAPH IN % 6 = MASS FLOW BARGRAPH IN % 7 = FLOW VELOCITY 8 = ACTUAL CURRENT 1 10 = ACTUAL FREQUENCY 1 12 = TOTALIZER 1 13 = TOTALIZER 2 14 = TOTALIZER 3 15 = TAG NAME Advanced options with optional software package BATCHING: 42 = BATCH NAME (“BATCH # 1” or “BEER 330”, etc.) 43 = BATCH QUANTITY (overall quantity to be batched) 44 = BATCH COUNTER (batching processes carried out) 45 = BATCH SUM (effective total batching quantity) 46 = BATCH UPWARDS (batching progress upwards) 47 = 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 (page 122). Example: If BATCH # 1 was selected in the BATCH SELECTOR function (7200), then only the values from BATCH # 1 (batch name, batch quantity, etc.) can be displayed. Factory setting: TOTALIZER 1

Function description		
USER INTERFACE → ADDITIONAL LINE → CONFIGURATION		
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 (s. page 150 ff.).
MODBUS register: Data type: Access:	2529 Float read/write	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: 0 = XXXXX. 1 = XXXX.X 2 = XXX.XX 3 = XX.XXX 4 = 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 measured value and the engineering unit (e.g. 1.2 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

Function description	
USER INTERFACE → ADDITIONAL LINE → CONFIGURATION	
DISPLAY MODE 2403 MODBUS register: 2531 Data type: Integer Access: read/write	 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: 0 = STANDARD 1 = SYMMETRY Factory setting: STANDARD Illustration of bar graph Bar graph for STANDARD option Simple bar graph with 25 / 50 / 75% gradations and integrated sign.  A0001258 Bar graph for SYMMETRY option Symmetrical bar graph for positive and negative directions of flow, with -50 / 0 / +50% gradations and integrated sign.  A0001259

5.3.2 Function group MULTIPLEX



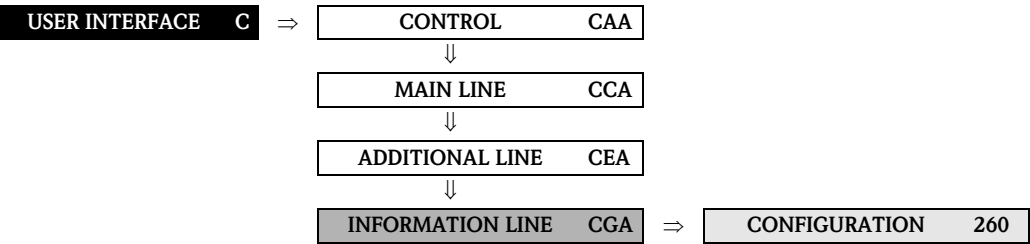
Function description		
USER INTERFACE → ADDITIONAL LINE → MULTIPLEX		
ASSIGN	2420	Use this function to define the second reading to be displayed in the additional line alternately (every 10 seconds) with the value defined in the function ASSIGN (2400). Options: 0 = OFF 1 = VOLUME FLOW 2 = MASS FLOW 3 = VOLUME FLOW IN % 4 = MASS FLOW IN % 5 = VOLUME FLOW BARGRAPH IN % 6 = MASS FLOW BARGRAPH IN % 7 = FLOW VELOCITY 8 = ACTUAL CURRENT 1 10 = ACTUAL FREQUENCY 1 12 = TOTALIZER 1 13 = TOTALIZER 2 14 = TOTALIZER 3 15 = TAG NAME Advanced options with optional software package BATCHING: 42 = BATCH NAME ("BATCH # 1" or "BEER 330", etc.) 43 = BATCH QUANTITY (overall quantity to be batched) 44 = BATCH COUNTER (batching processes carried out) 45 = BATCH SUM (effective total batching quantity) 46 = BATCH UPWARDS (batching progress upwards) 47 = 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 (page 122). Example: If BATCH # 1 was selected in the BATCH SELECTOR function (7200), then only the values from BATCH # 1 (batch name, batch quantity, etc.) can be displayed. 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. Once the fault is eliminated, the measuring device resumes operation in Multiplex mode and the error message is no longer displayed on the local display.
MODBUS register:	2532	
Data type:	Integer	
Access:	read/write	

Function description		
USER INTERFACE → ADDITIONAL LINE → MULTIPLEX		
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 (s. page 150 ff.).
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: 0 = XXXXX. 1 = XXXX.X 2 = XXX.XX 3 = XX.XXX 4 = 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 measured value and the engineering unit (e.g. 1.2 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

Function description	
USER INTERFACE → ADDITIONAL LINE → MULTIPLEX	
DISPLAY MODE2423 MODBUS register:2536 Data type:Integer Access:read/write	 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: 0 = STANDARD 1 = SYMMETRY Factory setting: STANDARD Illustration of bar graph Bar graph for STANDARD option Simple bar graph with 25 / 50 / 75% gradations and integrated sign. +25+50+75% A0001258 Bar graph for SYMMETRY option Symmetrical bar graph for positive and negative directions of flow, with -50 / 0 / +50% gradations and integrated sign. -500+50% A0001259

5.4 Group INFORMATION LINE

5.4.1 Function group CONFIGURATION

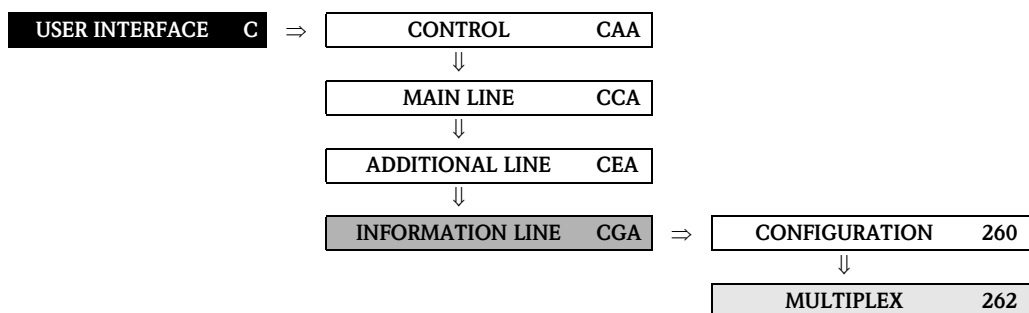


Function description		
USER INTERFACE → INFORMATION LINE → CONFIGURATION		
1 2 3 Esc 1 = main line, 2 = additional line, 3 = information line A0001253		
ASSIGN	2600	In this function, a value to be displayed is assigned to the information line (bottom line in the local display). This value is displayed during normal operation. Options: 0 = OFF 3 = VOLUME FLOW IN % 4 = MASS FLOW IN % 5 = VOLUME FLOW BARGRAPH IN % 6 = MASS FLOW BARGRAPH IN % 7 = FLOW VELOCITY 8 = ACTUAL CURRENT 1 10 = ACTUAL FREQUENCY 1 12 = TOTALIZER 1 13 = TOTALIZER 2 14 = TOTALIZER 3 15 = TAG NAME 16 = OPERATING/SYSTEM CONDITIONS 17 = DISPLAY FLOW DIRECTION Advanced options with optional software package BATCHING: 50 = 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 see Promag 53 MODBUS RS485 Operating Instructions, BA117D/06/en. 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 (s. page 150 ff.).
MODBUS register: Data type: Access:	2539 Float read/write	
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: 0 = XXXXX. 1 = XXXX.X 2 = XXX.XX 3 = XX.XXX 4 = 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 measured value and the engineering unit (e.g. 1.2 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.
MODBUS register: Data type: Access:	2538 Integer read/write	

Function description		
USER INTERFACE → INFORMATION LINE → CONFIGURATION		
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: 0 = STANDARD 1 = SYMMETRY Factory setting: STANDARD Illustration of bar graph Bar graph for STANDARD option Simple bar graph with 25 / 50 / 75% gradations and integrated sign. +25 +50 +75 % A0001258 Bar graph for SYMMETRY option Symmetrical bar graph for positive and negative directions of flow, with -50 / 0 / +50% gradations and integrated sign. -50 - - +50 % A0001259
MODBUS register:	2541	
Data type:	Integer	
Access:	read/write	

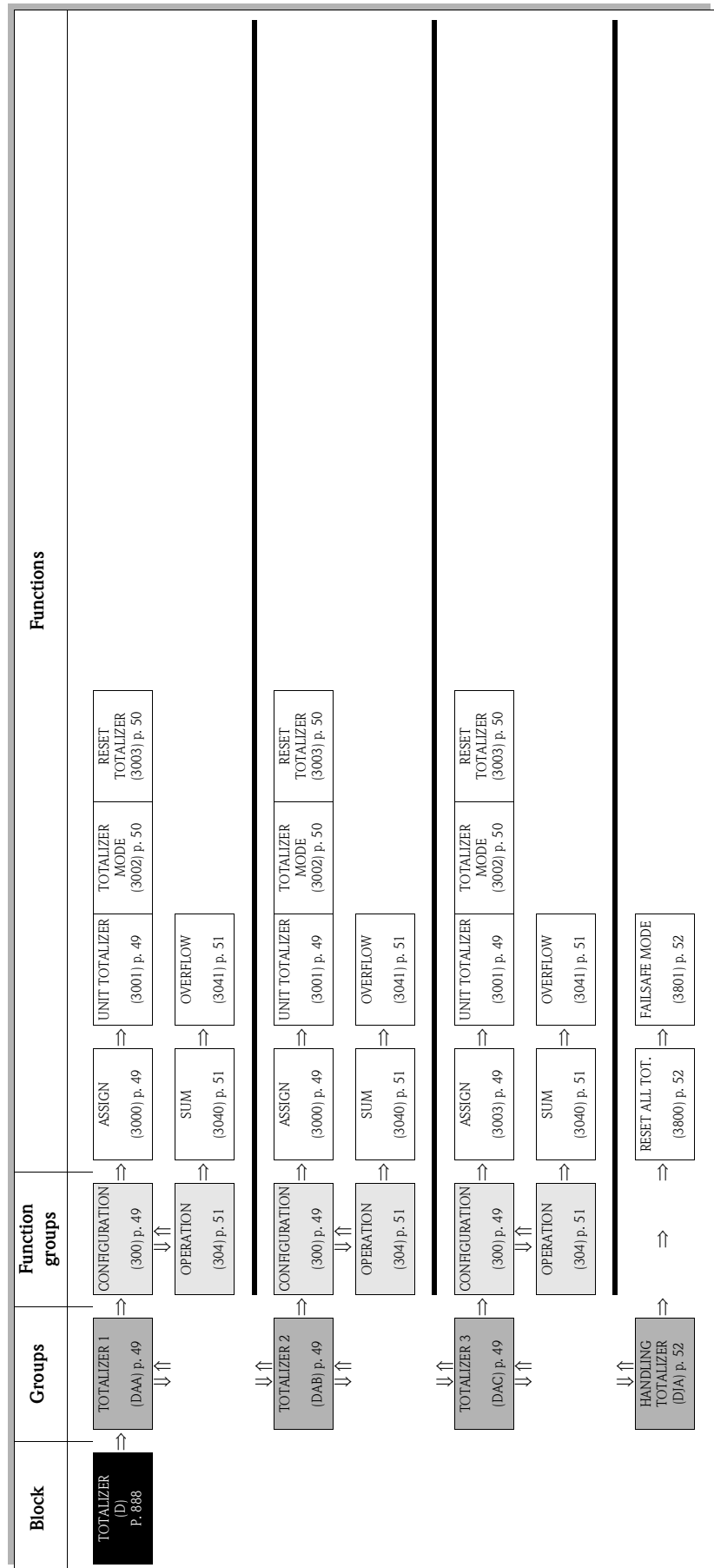
5.4.2 Function group MULTIPLEX



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 MODBUS register: Data type: Access:	2620 2542 Integer read/write	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: 0 = OFF 3 = VOLUME FLOW IN % 4 = MASS FLOW IN % 5 = VOLUME FLOW BARGRAPH IN % 6 = MASS FLOW BARGRAPH IN % 7 = FLOW VELOCITY 8 = ACTUAL CURRENT 1 10 = ACTUAL FREQUENCY 1 12 = TOTALIZER 1 13 = TOTALIZER 2 14 = TOTALIZER 3 15 = TAG NAME 16 = OPERATING/SYSTEM CONDITIONS 18 = DISPLAY FLOW DIRECTION 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. Once the fault is eliminated, the measuring device resumes operation in Multiplex mode and the error message is no longer displayed on the local display.
100% VALUE MODBUS register: Data type: Access:	2621 2544 Float read/write	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 (s. page 150 ff.).

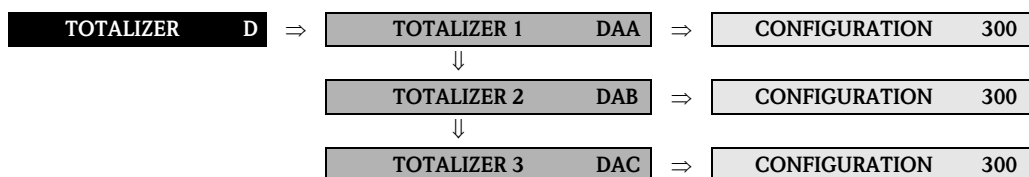
Function description		
USER INTERFACE → INFORMATION LINE → MULTIPLEX		
FORMAT	2622	Note! This function is not available unless a number was selected in the function ASSIGN (2600). Use this function to define the maximum number of places after the decimal point for the second value displayed in the information line. Options: 0 = XXXXX. 1 = XXXX.X 2 = XXX.XX 3 = XX.XXX 4 = 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 measured value and the engineering unit (e.g. 1.2 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.
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: 0 = STANDARD 1 = SYMMETRY Factory setting: STANDARD Illustration of bar graph Bar graph for STANDARD option Simple bar graph with 25 / 50 / 75% gradations and integrated sign. +25 +50 +75 % A0001258 Bar graph for SYMMETRY option Symmetrical bar graph for positive and negative directions of flow, with -50 / 0 / +50% gradations and integrated sign. -50 -- +50 % A0001259

6 Block TOTALIZER



6.1 Group TOTALIZER (1...3)

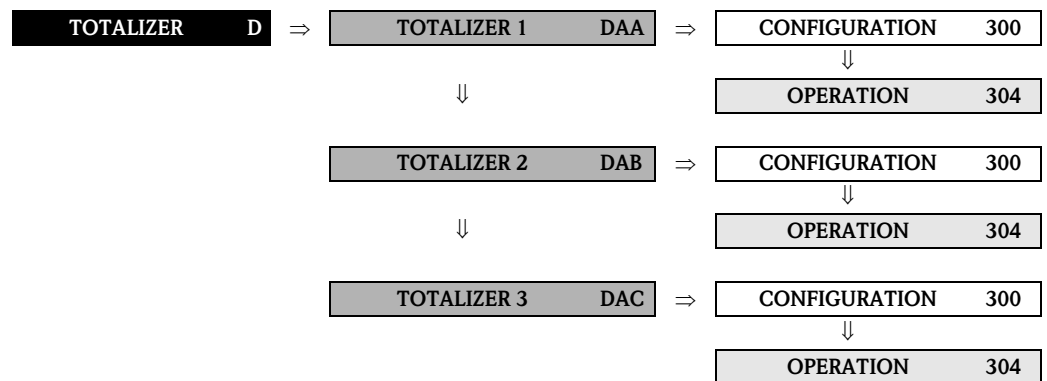
6.1.1 Function group CONFIGURATION



Function description		
TOTALIZER → TOTALIZER (1...3) → CONFIGURATION		
The function descriptions below apply to totalizers 1...3; the totalizers are independently configurable.		
ASSIGN	3000	Use this function to assign a measured variable to the totalizer in question.
MODBUS register:		Options:
Totalizer 1	2601	0 = OFF
Totalizer 2	2801	1 = MASS FLOW
Totalizer 3	3001	2 = VOLUME FLOW
Data type:	Integer	Factory setting:
Access:	read/write	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.
MODBUS register:		Options: (for MASS FLOW assignment):
- Totalizer 1 - Mass flow - Volume flow - Totalizer 2 - Mass flow - Volume flow - Totalizer 3 - Mass flow - Volume flow	2602 2603 2802 2803 3002 3003	0...2 = metric → g; kg; t 3...5 = US → oz; lb; ton
		Factory setting:
		Depends on nominal diameter and country (s. page 150 ff.).
		Options (for VOLUME FLOW assignment):
		0...6 = metric → cm ³ ; dm ³ ; m ³ ; ml; l; hl; Ml Mega
		7...16 = US → cc; af; ft ³ ; oz f; gal; Kgal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals); bbl (filling tanks)
		17...20 = Imperial → gal; Mgal; bbl (beer); bbl (petrochemicals)
		Factory setting:
		Depends on nominal diameter and country (s. page 150 ff.).
Data type:	Integer	
Access:	read/write	

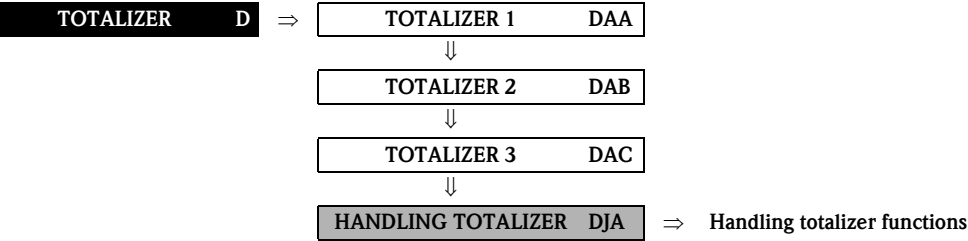
Function description		
TOTALIZER → TOTALIZER (1...3) → CONFIGURATION		
TOTALIZER MODE	3002	Use this function to define how the flow components are to be totaled.
MODBUS register:		Options:
Totalizer 1	2605	0 = BALANCE
Totalizer 2	2805	Positive and negative flow components. The positive and negative flow components are balanced. In other words, net flow in the flow direction is registered.
Totalizer 3	3005	
Data type:	Integer	1 = FORWARD
Access:	read/write	Positive flow components only
		2 = 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.
MODBUS register:		Options:
Totalizer 1	2608	0 = NO
Totalizer 2	2808	1 = YES
Totalizer 3	3008	
Data type:	Integer	Factory setting:
Access:	read/write	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 (see function ASSIGN STATUS INPUT on page 100).

6.1.2 Function group OPERATION



Function description		
TOTALIZER → TOTALIZER (1...3) → OPERATION		
The function descriptions below apply to totalizers 1...3; the totalizers are independently configurable.		
SUM 3040 MODBUS register: Totalizer 1 2610 Totalizer 2 2810 Totalizer 3 3010 Data type: Float Access: Read		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 function "TOTALIZER MODE" (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 page 50) 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 MODE" function (3801), (see page 52).
OVERFLOW 3041 MODBUS register: Totalizer 1 2612 Totalizer 2 2812 Totalizer 3 3012 Data type: Float Access: Read		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 E7 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 E7 dm³

6.2 Group HANDLING TOTALIZER



Function description		
TOTALIZER → HANDLING TOTALIZER → Handling totalizer functions		
RESET ALL TOTALIZERS MODBUS register: 2609 Data type: Integer Access: read/write	3800	Use this function to reset the totals (including all overflows) of the totalizers (1...3) to zero (= RESET). Options: 0 = NO 1 = 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...3) can also be triggered by a pulse (see function ASSIGN STATUS INPUT on page 100).
FAILSAFE MODE MODBUS register: 2607 Data type: Integer Access: read/write	3801	Use this function to define the common response of all totalizers (1...3) in case of error. Options: 0 = STOP The totalizer is paused until the fault is rectified. 1 = ACTUAL VALUE The totalizer continues to count is based on the current flow measured value. The fault is ignored. 2 = HOLD VALUE The totalizer continues to count the flow that is based on the last valid flow value (before the fault occurred). Factory setting: STOP

7 Block OUTPUTS

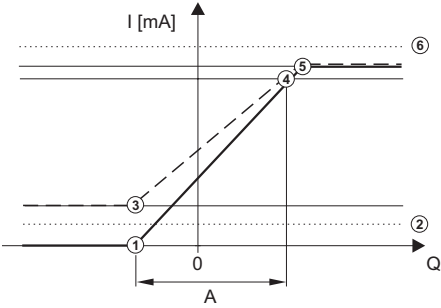
Block	Groups	Function groups	Functions										
OUTPUTS (E)	CURRENT OUTPUT 1 (EAA) p. 54	⇕⇕ CONFIGURATION (400) p. 54 ⇕⇕ OPERATION (404) p. 54 ⇕⇕ INFORMATION (408) p. 64	⇕⇕ ASSIGN CURRENT (4000) p. 54	⇕⇕ CURRENT RANGE (4001) p. 55	⇕⇕ VALUE 0.4 mA (4002) p. 56	⇕⇕ VALUE 20 mA (4003) p. 58	⇕⇕ MEASURING MODE (4004) p. 59	⇕⇕ TIME CONSTANT (4005) p. 61	⇕⇕ FAILSAFE MODE (4006) p. 62				
			⇕⇕ ACTUAL CURRENT (4040) p. 63	⇕⇕ SIMULATION CURRENT (4041) p. 63	⇕⇕ VALUE SIM. CURRENT (4042) p. 63								
			⇕⇕ TERMINAL NUMBER (4080) p. 64										
	PULSE/FREQ. OUTPUT 1 (ECA) p. 65	⇕⇕ CONFIGURATION (420) p. 65 ⇕⇕	⇕⇕ OPERATING MODE (4200) p. 65	⇕⇕ ASSIGN FREQ. (4201) p. 65	⇕⇕ START VALUE FREQUENCY (4202) p. 65	⇕⇕ END VALUE FREQUENCY (4203) p. 66	⇕⇕ VALUE F LOW (4204) p. 66	⇕⇕ VALUE F HIGH (4205) p. 67	⇕⇕ MEASURING MODE (4206) p. 69	⇕⇕ OUTPUT SIGNAL (4207) p. 71	⇕⇕ TIME CONSTANT (4208) p. 74	⇕⇕ FAILSAFE MODE (4209) p. 74	
			⇕⇕ FAILSAFE VALUE (4211) p. 74										
			⇕⇕ ASSIGN PULSE (4221) p. 75										
			⇕⇕ ASSIGN STATUS (4241) p. 82										
		OPERATION (430) p. 85	⇕⇕ ⇕⇕ ⇕⇕	⇕⇕ ACTUAL FREQ. (4301) p. 85	⇕⇕ SIMULATION FREQ. (4302) p. 85	⇕⇕ VALUE SIM. FREQ. (4303) p. 85							
				⇕⇕ SIMULATION PULSE (4322) p. 86	⇕⇕ VALUE SIM. PULSE (4323) p. 86								
⇕⇕ ACT. STATUS (4341) p. 87				⇕⇕ SIM. SWITCH POINT (4343) p. 87	⇕⇕ VALUE SIM. SWITCH PNT. (4343) p. 87								
INFORMATION (438) p. 88		⇕⇕ ⇕⇕ ⇕⇕	⇕⇕ TERMINAL NUMBER (4380) p. 88										
RELAY 1...2 (EGB, EGB) p. 89		⇕⇕ CONFIGURATION (470) p. 89 ⇕⇕ OPERATION (474) p. 93 ⇕⇕ INFORMATION (478) p. 95	⇕⇕ ASSIGN RELAY (4700) p. 89	⇕⇕ ON-VALUE (4701) p. 90	⇕⇕ SWITCH-ON DELAY (4702) p. 90	⇕⇕ OFF-VALUE (4703) p. 90	⇕⇕ SWITCH-OFF DELAY (4704) p. 91	⇕⇕ MEASURING MODE (4705) p. 91	⇕⇕ TIME CONSTANT (4706) p. 92				
			⇕⇕ ACTUAL STATUS RELAY (4740) p. 93	⇕⇕ SIM. SWITCH POINT (4741) p. 93	⇕⇕ VALUE SIM. SWITCH PNT. (4742) p. 94								
	⇕⇕ TERMINAL NUMBER (4780) p. 95												

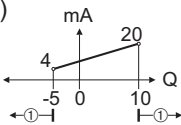
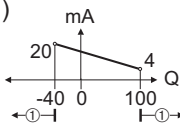
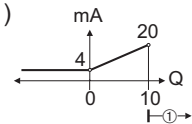
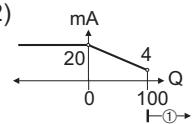
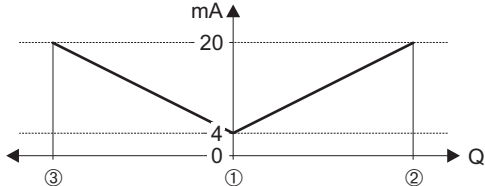
7.1 Group CURRENT OUTPUT 1

7.1.1 Function group CONFIGURATION

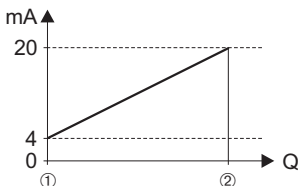
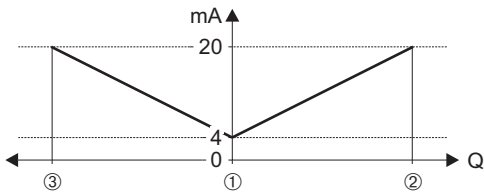
OUTPUTS		E	⇒	CURRENT OUTPUT 1	EAA	⇒	CONFIGURATION	400
Function description OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION								
ASSIGN CURRENT OUTPUT		4000	Use this function to assign a measured variable to the current output.					
MODBUS register:		5801	Options:					
Data type:		Integer	0 = OFF					
Access:		read/write	1 = VOLUME FLOW					
			2 = MASS FLOW					
			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).					

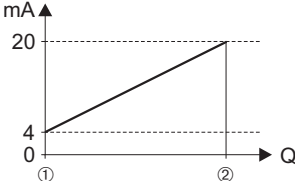
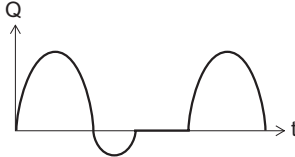
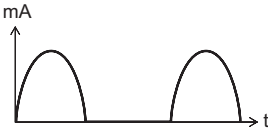
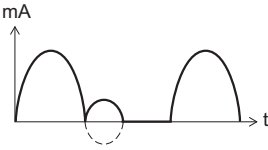
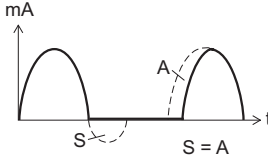
Function description																														
OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION																														
CURRENT RANGE	4001	Use this function to define the current range. The selection specifies the operational range and the lower and upper signal on alarm. For the current output 1 the option HART can be defined additionally. Options 0 = 0–20 mA (25 mA) 1 = 4–20 mA (25 mA) 3 = 0–20 mA 4 = 4–20 mA 6 = 4–20 mA NAMUR 8 = 4–20 mA US 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 (please refer to the Operating Instructions BA117D/06/en). Current range, operational range and signal on alarm level <table><tr><th>a</th><th>1</th><th>2</th><th>3</th></tr><tr><td>0-20 mA (25 mA)</td><td>0 - 24 mA</td><td>0</td><td>25</td></tr><tr><td>4-20 mA (25 mA)</td><td>4 - 24 mA</td><td>2</td><td>25</td></tr><tr><td>0-20 mA</td><td>0 - 20.5 mA</td><td>0</td><td>22</td></tr><tr><td>4-20 mA</td><td>4 - 20.5 mA</td><td>2</td><td>22</td></tr><tr><td>4-20 mA NAMUR</td><td>3.8 - 20.5 mA</td><td>3.5</td><td>22.6</td></tr><tr><td>4-20 mA US</td><td>3.9 - 20.8 mA</td><td>3.75</td><td>22.6</td></tr></table> A0002959 <i>a</i> Current range <i>1</i> Operational range (measuring information) <i>2</i> Lower signal on alarm level <i>3</i> 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 (#351–354, current range). ■ In case of a fault the behavior of the current output is according to the selected option in the function FAILSAFE MODE (4006).	a	1	2	3	0-20 mA (25 mA)	0 - 24 mA	0	25	4-20 mA (25 mA)	4 - 24 mA	2	25	0-20 mA	0 - 20.5 mA	0	22	4-20 mA	4 - 20.5 mA	2	22	4-20 mA NAMUR	3.8 - 20.5 mA	3.5	22.6	4-20 mA US	3.9 - 20.8 mA	3.75	22.6
a	1	2	3																											
0-20 mA (25 mA)	0 - 24 mA	0	25																											
4-20 mA (25 mA)	4 - 24 mA	2	25																											
0-20 mA	0 - 20.5 mA	0	22																											
4-20 mA	4 - 20.5 mA	2	22																											
4-20 mA NAMUR	3.8 - 20.5 mA	3.5	22.6																											
4-20 mA US	3.9 - 20.8 mA	3.75	22.6																											
MODBUS register:	5802																													
Data type:	Integer																													
Access:	read/write																													

Function description		
OUTPUTS → CURRENT OUTPUT 1 → 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:  ① = Initial value (0...20 mA) ② = Lower signal on alarm level: depends on the setting in the function CURRENT RANGE ③ = Initial value (4...20 mA): depends on the setting in the function CURRENT RANGE ④ = Full scale value (0/4...20 mA): depends on the setting in the function CURRENT RANGE ⑤ = Maximum current value: depends on the setting in the function CURRENT RANGE ⑥ = Failsafe mode (upper signal on alarm level): depends on the setting in the functions CURRENT RANGE (s. page 55) and FAILSAFE MODE, (s. page 62) 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 page 15 or page 14).  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. (continued on next page)

Function description		
OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION		
VALUE 0_4 mA (continued)	4002	Parameter setting example A: 1. 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 2. 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)  Parameter setting example B: 1. 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 2. 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 parameterized as zero flow (e.g. 0 m³/h). If the effective flow drops below or exceeds the value parameterized 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)  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).  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 → page 59 ff.

Function description		
OUTPUTS → CURRENT OUTPUT 1 → 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 page 56). 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 → page 56 User input: 5-digit floating-point number, with sign Factory setting: Depends on nominal diameter and country (s. page 150 ff.).  Note! ■ The appropriate unit is taken from the function UNIT VOLUME FLOW (0402) or UNIT MASS FLOW (0400).  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 page 56.
MODBUS register:	5805	
Data type:	Float	
Access:	read/write	

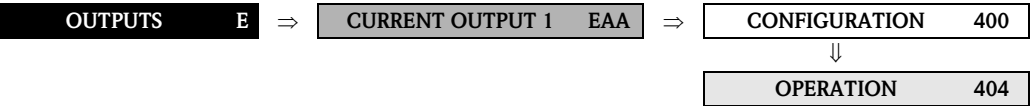
Function description		
OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION		
MEASURING MODE	4004	Use this function to define the measuring mode for the current output.
MODBUS register:	5807	Options: 0 = STANDARD 1 = SYMMETRY 2 = PULSATING FLOW Factory setting: STANDARD Description of the individual options: ■ 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 m ³ /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 m ³ /h; VALUE 20 mA = 10m ³ /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.
MODBUS register:	5807	
Data type:	Integer	
Access:	read/write	
(continued on next page)		

Function description	
OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION	
MEASURING MODE (continued)	4004
■ 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.	
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 behavior:  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 → CONFIGURATION	
Detailed explanations and information (continued)	2. Defined measuring range (①–②): ① and ② do not have the same sign. A0001272 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...354, current range) and the current output responds in accordance with the parameter settings in the function FAILSAFE 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 MODBUS register: 5808 Data type: Float Access: read/write	Use this function to enter a time constant defining how the current output signal reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). User input: fixed-point number 0.01...100.00 s Factory setting: 3.00 s

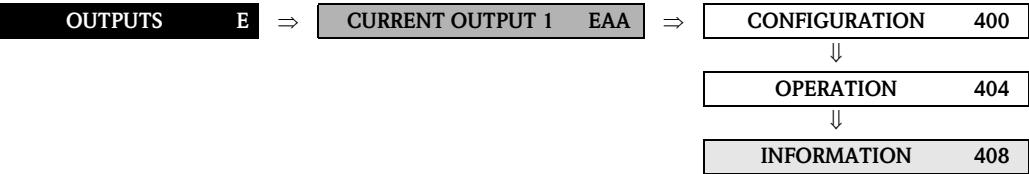
Function description		
OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION		
FAILSAFE MODE	4006	For safety reasons it is advisable to ensure that the current output assumes a predefined state in the event of a fault. The setting you select here affects only the current output. It has no effect on other outputs and the display (e.g. totalizers). Options: 0 = MIN. CURRENT The current output adopts the value of the lower signal on alarm level (as defined in the function CURRENT RANGE (4001, page 55). 1 = MAX. CURRENT The current output adopts the value of the upper signal on alarm level (as defined in the function CURRENT RANGE (4001, page 55). 2 = HOLD VALUE (not recommended) Measured value output is based on the last measured value saved before the error occurred . 3 = ACTUAL VALUE Measured value output is based on the current flow measurement. The fault is ignored. Factory setting: MIN. CURRENT
MODBUS register:	5810	
Data type:	Integer	
Access:	read/write	

7.1.2 Function group OPERATION



Function description		
OUTPUTS → CURRENT OUTPUT 1 → OPERATION		
ACTUAL CURRENT	4040	Use this function to view the computed actual value of the output current. User interface: 0.00...25.00 mA
MODBUS register:	5811	
Data type:	Float	
Access:	Read	
SIMULATION CURRENT	4041	Use this function to activate simulation of the current output. Options: 0 = OFF 1 = 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 measured values are output correctly via the other outputs.  Caution! The setting is not saved if the power supply fails.
MODBUS register:	5813	
Data type:	Integer	
Access:	read/write	
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...25.00 mA Factory setting: 0.00 mA  Caution! The setting is not saved if the power supply fails.
MODBUS register:	5814	
Data type:	Float	
Access:	read/write	

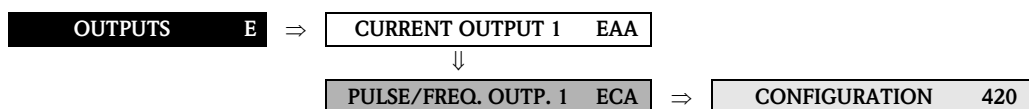
7.1.3 Function group INFORMATION



Function description		
OUTPUTS → CURRENT OUTPUT 1 → 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.
MODBUS register:	5816	User interface: 3 = 20(+) / 21 (-)
Data type:	Integer	
Access:	Read	

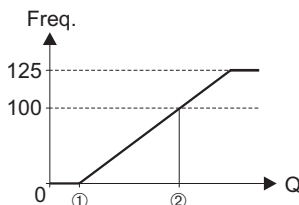
7.2 Group PULSE/FREQUENCY OUTPUT 1

7.2.1 Function group CONFIGURATION



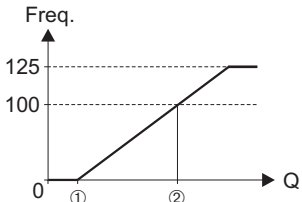
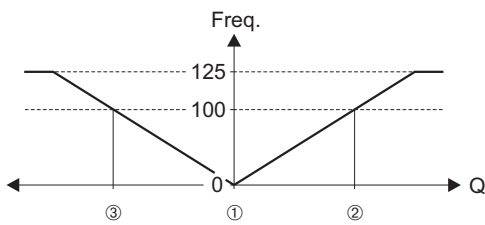
Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (GENERAL / FREQUENCY)	
OPERATING MODE 4200 MODBUS register: 3201 Data type: Integer Access: read/write	Use this function to configure the output as a pulse output, frequency output or status output. The functions available in this function group vary, depending on which option you select here. Options: 0 = PULSE 1 = FREQUENCY 2 = STATUS Factory setting: PULSE
ASSIGN FREQUENCY 4201 MODBUS register: 3202 Data type: Integer Access: read/write	 Note! This function is not available unless the FREQUENCY setting was selected in the OPERATING MODE function (4200). Use this function to assign a measured variable to the frequency output. Options: 0 = OFF 1 = VOLUME FLOW 2 = MASS 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).
START VALUE FREQUENCY 4202 MODBUS register: 3203 Data type: Float Access: read/write	 Note! This function is not available unless the FREQUENCY setting was selected in the OPERATING MODE function (4200). Use this function to define an initial frequency for the frequency output. You define the associated measured value of the measuring range in the VALUE F LOW function (4204) described on page 66. User input: 5-digit fixed-point number: 0...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.

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (GENERAL / FREQUENCY)	
END VALUE FREQUENCY 4203 MODBUS register: 3205 Data type: Float Access: read/write	 Note! This function is not available unless the FREQUENCY setting was selected in the OPERATING MODE function (4200). Use this function to define a full scale frequency for the frequency output. You define the associated measured value of the measuring range in the VALUE F HIGH function (4205) described on page 67. User input: 5-digit fixed-point number 2...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 MODBUS register: 3207 Data type: Float Access: read/write	 Note! This function is not available unless the FREQUENCY setting was selected in the OPERATING 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. ■ The appropriate unit is taken from the function UNIT VOLUME FLOW (0402) or UNIT MASS FLOW (0400), (see page 15 or page 14).

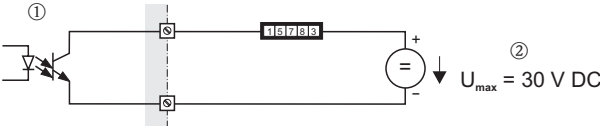
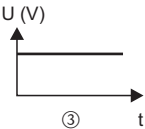
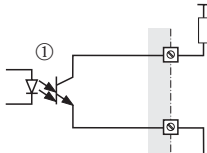
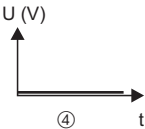
Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (GENERAL / FREQUENCY)		
VALUE F HIGH	4205	Note! This function is not available unless the FREQUENCY setting was selected in the OPERATING MODE function (4200). Use this function to assign a variable to the end value frequency (4203). 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 (s. page 150 ff.). 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.  ① = Value F Low ② = Value F High A0001279
MODBUS register:	3209	
Data type:	Float	
Access:	read/write	

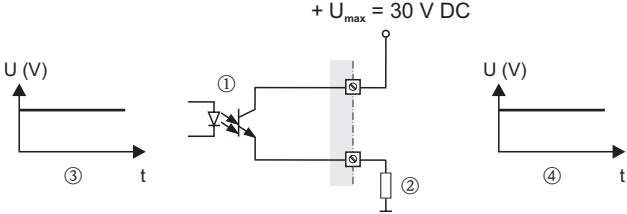
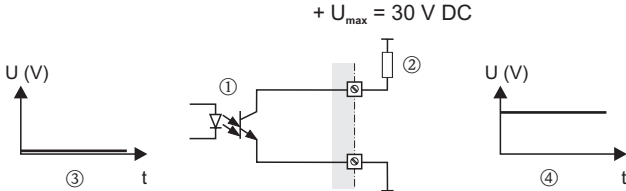
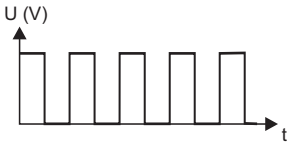
(continued on next page)

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (GENERAL / FREQUENCY)	
VALUE F HIGH 4205 (continued)	Parameter setting example 1: 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 (e.g. -40 m³/h) and MEASURING MODE (4004) = 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). 1) 2) Parameter setting example 2: 1. VALUE F LOW (4204) = not equal to zero flow s (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) = not equal to zero flow s (e.g. 0 m³/h) and MEASURING MODE (4004) = 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 parameterized as zero flow (e.g. 0 m³/h). If the effective flow drops below or exceeds the value parameterized 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). 1) 2) Deliberately only one flow direction is output with this setting and flow values in the other flow direction are suppressed. Parameter setting example 3: 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). ASSIGN RELAY (4700) = FLOW DIRECTION With this setting e.g. the flow direction output via a switching contact can be made. Parameter setting example 4: MEASURING MODE (4004) = PULSATING FLOW → page 59 ff.

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (GENERAL / FREQUENCY)	
MEASURING MODE MODBUS register: Data type: Access:	4206 Integer read/write
 Note! This function is not available unless the FREQUENCY setting was selected in the OPERATING MODE function (4200). Use this function to define the measuring mode for the frequency output. Options: 0 = STANDARD 1 = SYMMETRY 2 = 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 = 10 m³/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 → CONFIGURATION (GENERAL / FREQUENCY)		
MEASURING MODE (continued)	4206	■ 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.

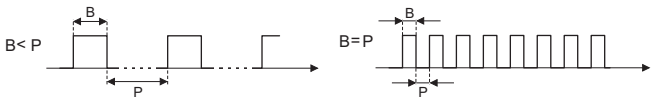
Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (GENERAL / FREQUENCY)	
OUTPUT SIGNAL 4207 MODBUS register: 3212 Data type: Integer Access: read/write	 Note! Function is not available unless the FREQUENCY setting was selected in the OPERATING MODE function (4200). For selecting 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 behavior (at zero flow) of the frequency output. The internal transistor is activated as follows: - If POSITIVE is selected, the internal transistor is activated with a positive signal level. - If NEGATIVE is selected, the internal transistor is activated with a negative signal level (0 V).  Note! With the passive output configuration, the output signal levels of the frequency output depend on the external circuit (see examples). Example for passive output circuit (PASSIVE) If PASSIVE is selected, the frequency output is configured as an open collector.  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. $+ U_{max} = 30 \text{ V DC}$    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. 

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (GENERAL / FREQUENCY)	
OUTPUT SIGNAL 4207 (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)

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (GENERAL / FREQUENCY)	
OUTPUT SIGNAL 4207 (continued)	Example for active output circuit (ACTIVE): With an active circuit, the internal power supply is 24 V. The frequency output is short-circuit proof. 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. In the operating status (flow present), the output signal level changes from 0 V to a positive voltage level. 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. In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V.

		Function description
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (GENERAL / FREQUENCY)		
TIME CONSTANT	4208	 Note! This function is not available unless the FREQUENCY setting was selected in the OPERATING 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...100.00 s Factory setting: 1.00 s
MODBUS register:	3213	
Data type:	Float	
Access:	read/write	
FAILSAFE MODE	4209	 Note! This function is not available unless the FREQUENCY setting was selected in the OPERATING 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: 0 = FALLBACK VALUE Output is 0 Hz. 1 = FAILSAFE VALUE Output is the frequency specified in the FAILSAFE VALUE function (4211). 2 = HOLD VALUE Measured value output is based on the last measured value saved before the error occurred . 3 = ACTUAL VALUE Measured value output is based on the current flow measurement. The fault is ignored. Factory setting: FALLBACK VALUE
MODBUS register:	3215	
Data type:	Integer	
Access:	read/write	
FAILSAFE VALUE	4211	 Note! This function is not available unless FREQUENCY was selected in the OPERATING 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...12500 Hz Factory setting: 12500 Hz
MODBUS register:	3216	
Data type:	Float	
Access:	read/write	

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (PULSE)	
ASSIGN PULSE 4221 MODBUS register: 3223 Data type: Integer Access: read/write	 Note! This function is not available unless the PULSE setting was selected in the OPERATING MODE function (4200). Use this function to assign a measured variable to the pulse output. Options: 0 = OFF 1 = VOLUME FLOW 2 = MASS 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 MODBUS register: 3224 Data type: Float Access: read/write	 Note! This function is not available unless the PULSE setting was selected in the OPERATING 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 (s. page 150 ff.).  Note! The appropriate unit is taken from the function UNIT VOLUME (0403) or UNIT MASS (0401) (see page 16 or page 14).

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (PULSE)	
PULSE WIDTH 4223 MODBUS register: 3226 Data type: Float Access: read/write	 Note! This function is not available unless the PULSE setting was selected in the OPERATING MODE function (4200). Use this function to enter the pulse width of the output pulse. User input: 0.05...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).  A0001233 B = Pulse width entered (the illustration applies to positive pulses) P= Intervals between the individual pulses  Note! When selecting the pulse width, choose a value that can still be processed by a connected counter (e.g. mechanical counter, PLC, etc.).  Caution! If the pulse number or frequency resulting from the pulse value entered, (see function PULSE VALUE (4222) on page 75) 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...362, pulse memory) is generated after buffering/balancing has occurred.

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (PULSE)	
MEASURING MODE MODBUS register: Data type: Access:	4225 3228 Integer read/write
	 Note! This function is not available unless the PULSE setting was selected in the OPERATING MODE function (4200). Use this function to define the measuring mode for the pulse output. Options: 0 = STANDARD Only positive flow components are totaled. Negative components are not taken into account. 1 = SYMMETRY Positive and negative flow components are taken into account.  Note! The direction of flow can be output via the relay output. 2 = 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 totaled, 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. 3 = STANDARD REVERSE Only negative flow components are totaled. Positive components are not taken into account. Factory setting: STANDARD

Function description

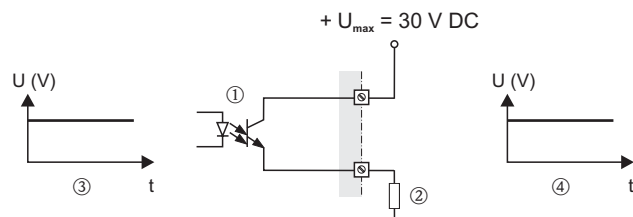
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (PULSE)

OUTPUT SIGNAL 4226
(continued)

Example for output configuration PASSIVE-POSITIVE:

Output configuration with an external pull-down resistance.

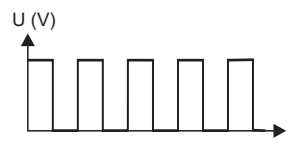
Output configuration with an external pull-down resistance:
In the quiescent state (at zero flow), a positive voltage level is measured via the pull-down resistance.



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.

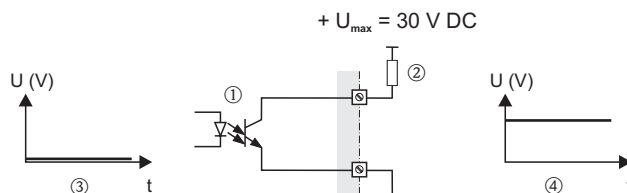


A0001981

Example for output configuration PASSIVE-NEGATIVE:

Output configuration with an external pull-up resistance.

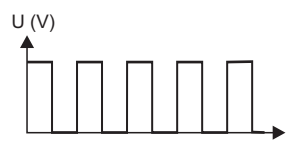
In the quiescent state (at zero flow), the output signal level at the terminals is at a positive voltage level.



A0004690

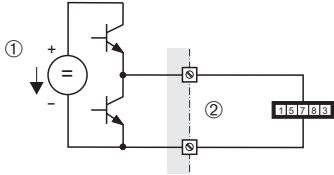
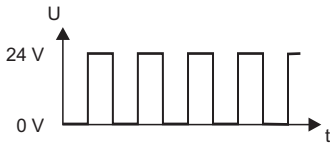
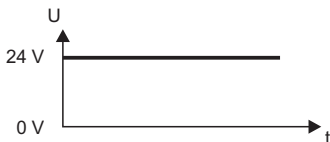
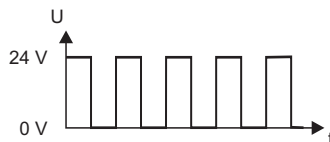
- ① = Open Collector
② = Pull-Up-Resistance
③ = Transistor activation in "NEGATIVE" quiescent state (at zero flow)
④ = Output signal level in quiescent state (at zero flow)

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



A0001981

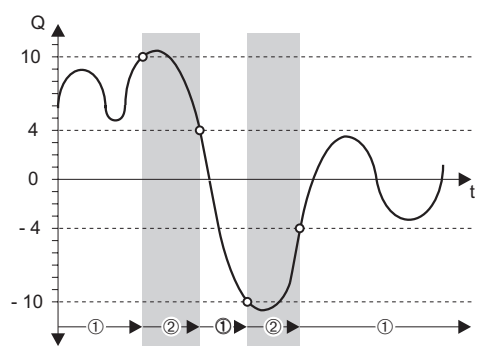
(continued on next page)

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (PULSE)	
OUTPUT SIGNAL4226 (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

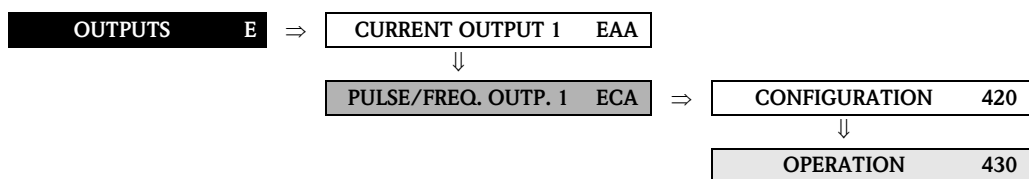
Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (PULSE)	
FAILSAFE MODE MODBUS register: Data type: Access: 4227 3230 Integer read/write	 Note! This function is not available unless the PULSE setting was selected in the OPERATING MODE function (4200). For safety reasons it is 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: 0 = FALLBACK VALUE Output is 0 pulse. 3 = ACTUAL VALUE Measured 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 → CONFIGURATION (STATUS)	
ASSIGN STATUS	4241	 Note! This function is not available unless the STATUS setting was selected in the OPERATING MODE function (4200). Use this function to assign a switching function to the status output. Options: 0 = OFF 1 = ON (operation) 2 = FAULT MESSAGE 3 = NOTICE MESSAGE 4 = FAULT MESSAGE or NOTICE MESSAGE 5 = EPD or OED (Empty Pipe Detection/ Open Electrode Detection, only if active) 6 = FLOW DIRECTION 7 = MASS FLOW LIMIT VALUE 8 = VOLUME FLOW LIMIT VALUE 9 = TOTALIZER 1 LIMIT VALUE 10 = TOTALIZER 2 LIMIT VALUE 11 = TOTALIZER 3 LIMIT VALUE Factory setting: FAULT MESSAGE  Note! ■ The behavior of the status output is a normally closed behavior, in other words the output is closed (transistor conductive) when normal, error-free measuring is in progress. – 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 behavior such as relay output, s. page 96 ■ If you select OFF, the only function shown in the CONFIGURATION function group is this function, in other words ASSIGN STATUS (4241).	MODBUS register: 3236 Data type: Integer Access: read/write
ON-VALUE	4242	 Note! This function is not available unless STATUS was selected in the OPERATING 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.	MODBUS register: 3237 Data type: Float Access: read/write

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (STATUS)	
SWITCH-ON DELAY 4243 MODBUS register: 3239 Data type: Float Access: read/write	 Note! This function is not available unless STATUS was selected in the OPERATING 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...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...100.0 s Factory setting: 0.0 s
OFF-VALUE 4244 MODBUS register: 3241 Data type: Float Access: read/write	 Note! This function is not available unless STATUS was selected in the OPERATING 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.
SWITCH-OFF DELAY 4245 MODBUS register: 3243 Data type: Float Access: read/write Volatile	 Note! This function is not available unless the STATUS setting was selected in the OPERATING MODE function (4200). Use this function to define a delay (0...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...100.0 s Factory setting: 0.0 s

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (STATUS)	
MEASURING MODE 4246 MODBUS register: 3245 Data type: Integer Access: read/write	 Note! This function is not available unless STATUS was selected in the function OPERATING MODE (4200) and the status output was assigned a limit value. Use this function to define the measuring mode for the status output. Options: 0 = STANDARD The status output signal switches at the defined switch points. 1 = 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 (nonconductive)  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.
TIME CONSTANT 4247 MODBUS register: 3246 Data type: Float Access: read/write	 Note! This function is not available unless the STATUS setting was selected in the OPERATING 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...100.00 s Factory setting: 0.00 s

7.2.2 Function group OPERATION

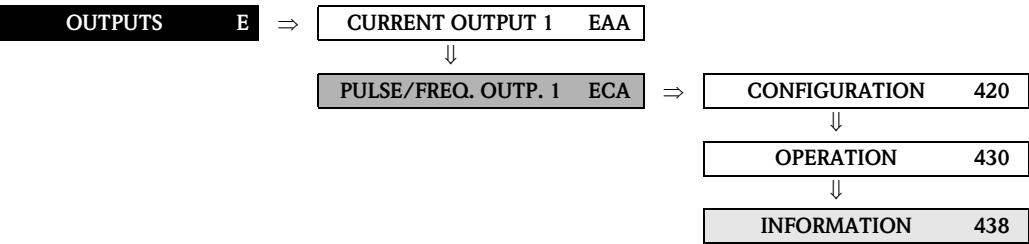


Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → OPERATION (FREQUENCY)		
ACTUAL FREQUENCY 4301 MODBUS register: 3218 Data type: Float Access: Read		 Note! This function is not available unless the FREQUENCY setting was selected in the OPERATING MODE function (4200). Use this function to view the computed actual value of the output frequency. User interface: 0...12500 Hz
SIMULATION FREQUENCY 4302 MODBUS register: 3220 Data type: Integer Access: read/write		 Note! This function is not available unless the FREQUENCY setting was selected in the OPERATING MODE function (4200). Use this function to activate simulation of the frequency output. Options: 0 = OFF 1 = 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 measured values are output correctly via the other outputs.  Caution! The setting is not saved if the power supply fails.
VALUE SIMULATION FREQUENCY 4303 MODBUS register: 3221 Data type: Float Access: read/write		 Note! This function is not available unless FREQUENCY was selected in the OPERATING 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 measuring device itself. User input: 0...12500 Hz Factory setting: 0 Hz  Caution! The setting is not saved if the power supply fails.

		Function description OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → OPERATION (PULSE)	
SIMULATION PULSE MODBUS register: Data type: Access:	4322 Integer read/write	 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: 0 = OFF 1 = COUNTDOWN The pulses specified in the VALUE SIMULATION PULSE function are output. 2 = 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 MODBUS register: Data type: Access:	4323 Float read/write	 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...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 → OPERATION (STATUS)	
ACTUAL STATUS	4341	 Note! This function is not available unless the STATUS setting was selected in the OPERATING MODE function (4200). Use this function to check the current status of the status output. User interface: 0 = NOT CONDUCTIVE 1 = CONDUCTIVE	
MODBUS register: 3248 Data type: Integer Access: Read			
SIMULATION SWITCH POINT	4343	 Note! This function is not available unless the STATUS setting was selected in the OPERATING MODE function (4200). Use this function to activate simulation of the status output. Options: 0 = OFF 1 = 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 measured values are output correctly via the other outputs.  Caution! The setting is not saved if the power supply fails.	
MODBUS register: 3249 Data type: Integer Access: read/write			
VALUE SIMULATION SWITCH POINT	4343	 Note! This function is not available unless STATUS was selected in the OPERATING MODE function (4200) and the SIMULATION SWITCH POINT function (4343) is active (= ON). Use this function to define the switching response of the status output during the simulation. This value is used to test downstream devices and the measuring device itself. Options: 0 = NOT CONDUCTIVE 1 = CONDUCTIVE Factory setting: NOT CONDUCTIVE  Caution! The setting is not saved if the power supply fails.	
MODBUS register: 3250 Data type: Float Access: read/write			

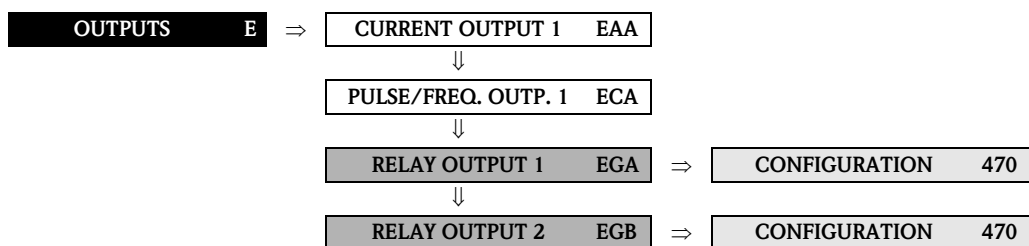
7.2.3 Function group INFORMATION



Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → 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.
MODBUS register:	3251	User interface: 2 = 22(+) / 23 (-)
Data type:	Integer	
Access:	Read	

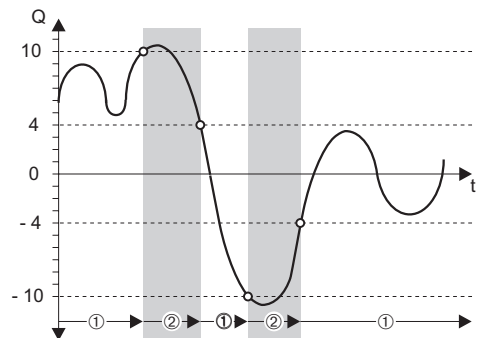
7.3 Group RELAY OUTPUT (1...2)

7.3.1 Function group CONFIGURATION



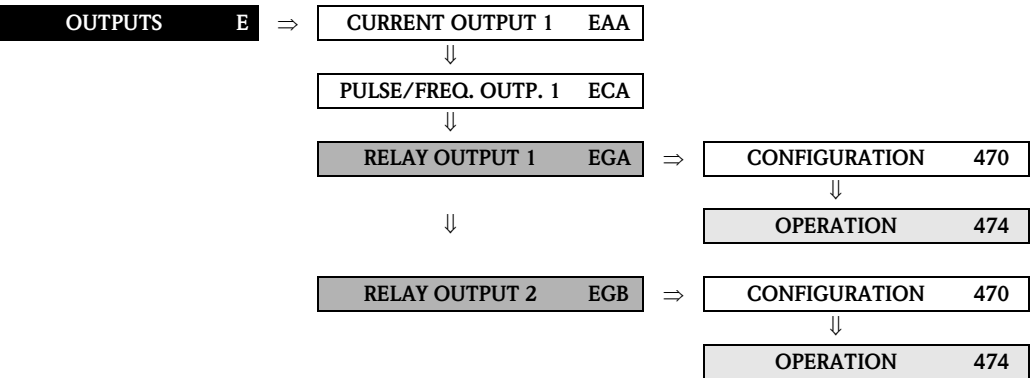
Function description		
OUTPUTS → RELAY OUTPUT (1...2) → CONFIGURATION		
ASSIGN RELAY	4700	Use this function to assign a switching function to the relay output.
MODBUS register:		Options:
Relay output 1	3801	0 = OFF
Relay output 2	4001	1 = ON (operation)
Data type:	Integer	2 = FAULT MESSAGE
Access:	read/write	3 = NOTICE MESSAGE
		4 = FAULT MESSAGE or NOTICE MESSAGE
		5 = EPD or OED (Empty Pipe Detection/ Open Electrode Detection, only if active)
		6 = FLOW DIRECTION
		7 = MASS FLOW LIMIT VALUE
		8 = VOLUME FLOW LIMIT VALUE
		9 = TOTALIZER 1 LIMIT VALUE
		10 = TOTALIZER 2 LIMIT VALUE
		11 = TOTALIZER 3 LIMIT VALUE
		Advanced options with optional software package BATCHING:
		22 = BATCH VALVE 1 (e.g. to control valve 1)
		23 = BATCH VALVE 2 (e.g. to control valve 2)
		25 = BATCH RUNNING
		26 = > BATCH TIME
		27 = >< BATCH QUANTITIES (< min. / > max. batching quantity)
		28 = PROGRESS NOTE (batching end approaching)
		 Note!
		- The batching valves defined in the function BATCH STAGES (7208) are the only available selection (max. 2). - The only options available are the monitoring functions (7240...7243) which have a value not equal to zero.
		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 page 96). - It is advisable to configure at least one relay output as a fault output and define the outputs' response to error. - Relay output 1 is configured as a normally open (NO or make) contact and relay output 2 as a normally closed (NC or break) contact by default. It can be reconfigured by means of a jumper on the relay module (see Promag 53 MODBUS RS485 Operating Instructions, BA117D/06/en). - If you select OFF, the only function shown in the CONFIGURATION function group is this function (4700).

Function description		OUTPUTS → RELAY OUTPUT (1...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 switchover hysteresis.	MODBUS register: Relay output 1 3802 Relay output 2 4002 Data type: Float Access: read/write
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 ... 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...100.0 s Factory setting: 0.0 s	MODBUS register: Relay output 1 3804 Relay output 2 4004 Data type: Float Access: read/write
OFF-VALUE	4703	 Note! This function is not available unless LIMIT 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.	MODBUS register: Relay output 1 3806 Relay output 2 4006 Data type: Float Access: read/write

Function description	
OUTPUTS → RELAY OUTPUT (1...2) → CONFIGURATION	
SWITCH-OFF DELAY 4704 MODBUS register: Relay output 1 3808 Relay output 2 4008 Data type: Float Access: read/write	 Note! This function is not available unless LIMIT was selected in the ASSIGN RELAY function (4700). Use this function to define a delay (0 ... 100 seconds) for dropout (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...100.0 s Factory setting: 0.0 s
MEASURING MODE 4705 MODBUS register: Relay output 1 3810 Relay output 2 4010 Data type: Integer Access: read/write	 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: 0 = STANDARD The relay output signal switches at the defined switch points. 1 = 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...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...100.00 s Factory setting: 0.00 s
MODBUS register:		
Relay output 1	3811	
Relay output 2	4011	
Data type:	Float	
Access:	read/write	

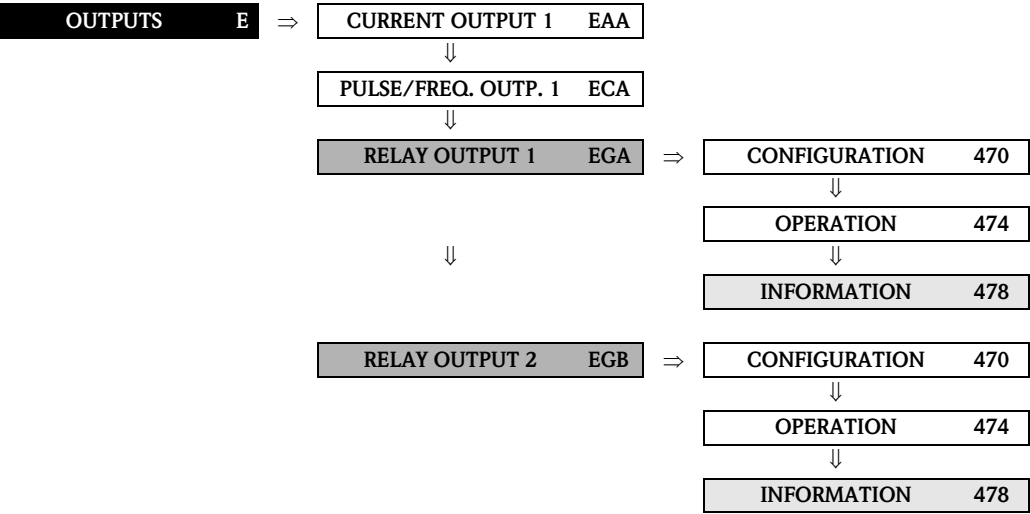
7.3.2 Function group OPERATION



Function description		
OUTPUTS → RELAY OUTPUT (1...2) → OPERATION		
ACTUAL STATUS RELAY MODBUS register: Relay output 1 Relay output 2 Data type: Access:	4740 3813 4013 Integer Read	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 see Promag 53 MODBUS RS485 Operating Instructions, BA117D/06/en). User interface: 0 = BREAK CONTACT OPEN 1 = BREAK CONTACT CLOSED 2 = MAKE CONTACT OPEN 3 = MAKE CONTACT CLOSED
SIMULATION SWITCH POINT MODBUS register: Relay output 1 Relay output 2 Data type: Access:	4741 3814 4014 Integer read/write	Use this function to activate simulation of the relay output. Options: 0 = OFF 1 = 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 measured 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...2) → OPERATION		
VALUE SIMULATION SWITCH POINT MODBUS register: Relay output 1 Relay output 2 Data type: Access:	4742 3815 4015 Integer read/write	 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 measuring device 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: 0 = BREAK CONTACT OPEN 1 = BREAK CONTACT CLOSED Relay output configured as normally closed (break) contact: 2 = MAKE CONTACT OPEN 3 = MAKE 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...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.
MODBUS register:		User interface:
Relay output 1	3816	2 = 22 (+) / 23 (-) → RELAY OUTPUT 1
Relay output 2	4016	3 = 20 (+) / 21 (-) → RELAY OUTPUT 2
Data type:	Integer	
Access:	Read	

7.3.4 Information on the response of the relay output

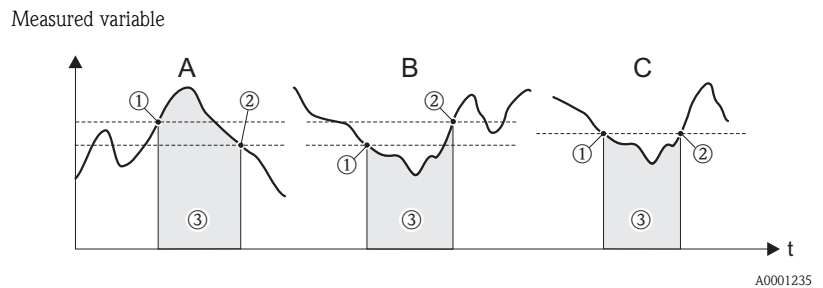
General

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.

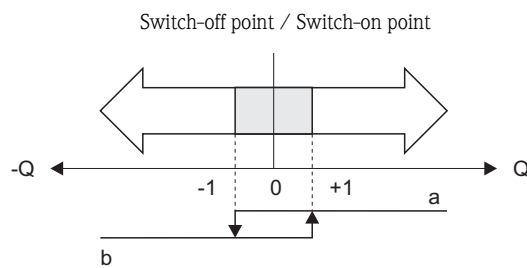
Application: Monitoring flow or process-related boundary conditions.



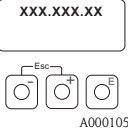
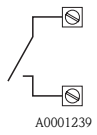
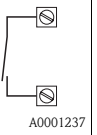
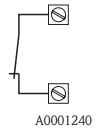
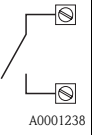
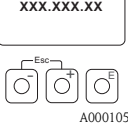
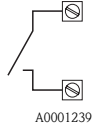
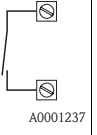
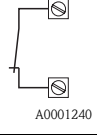
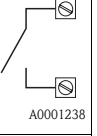
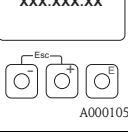
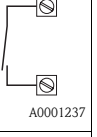
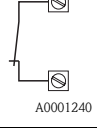
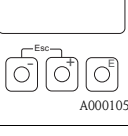
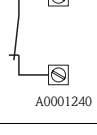
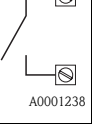
Relay output configured for “flow direction”

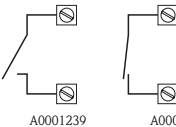
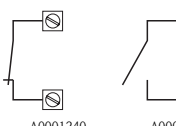
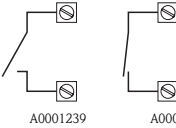
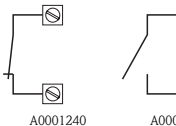
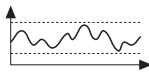
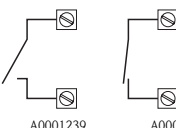
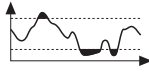
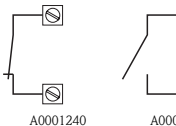
The value you entered in the function ON-VALUE defines the switch point for the positive and negative directions of flow.

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 cut off rate.

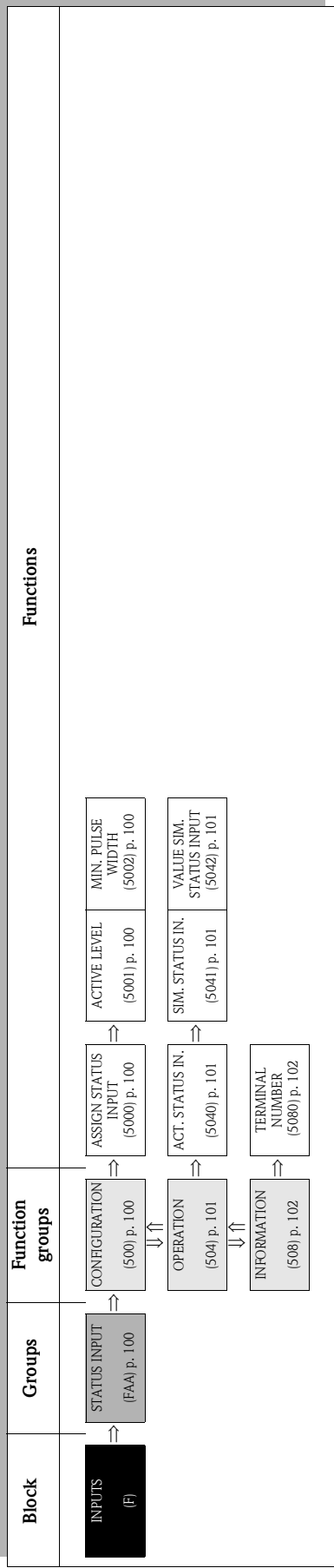


7.3.5 Switching response of the relay output

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	
	Measuring tube partially filled / empty measuring tube	 A0001293	de-energized	
Flow direction	forward	 A0001241	energized	
	reverse	 A0001242	de-energized	
Limit value – Volume flow – Totalizer	Limit value not overshoot or undershot	 A0001243	energized	
	Limit value overshoot or undershot	 A0001244	de-energized	
* Terminal numbers in accordance with the TERMINAL NUMBER function (4780) on page 95.  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



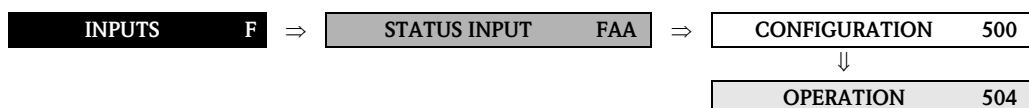
8.1 Group STATUS INPUT

8.1.1 Function group CONFIGURATION

INPUTS	F	⇒	STATUS INPUT	FAA	⇒	CONFIGURATION	500
--------	---	---	--------------	-----	---	---------------	-----

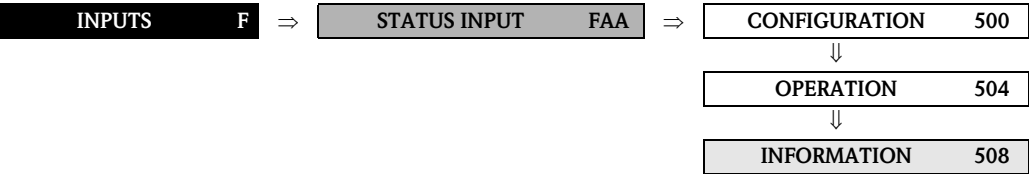
Function description		
INPUTS → STATUS INPUT → CONFIGURATION		
ASSIGN STATUS INPUT MODBUS register: Data type: Access:	5000 4301 Integer read/write	Use this function to assign a switching function to the status input. Options: 0 = OFF 1 = RESET TOTALIZER 1 2 = RESET TOTALIZER 2 3 = RESET TOTALIZER 3 4 = RESET ALL TOTALIZERS 5 = POSITIVE ZERO RETURN Advanced options with optional software package BATCHING: 9 = RUN BATCHING (start/stop) 10 = HOLD BATCHING (stop/continue) 11 = RESET BATCH SUM (resetting total quantity / total quantity totalizers) 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 MODBUS register: Data type: Access:	5001 4302 Integer read/write	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: 0 = LOW 1 = HIGH Factory setting: HIGH
MINIMUM PULSE WIDTH MODBUS register: Data type: Access:	5002 4303 Float read/write	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...100 ms Factory setting: 50 ms

8.1.2 Function group OPERATION



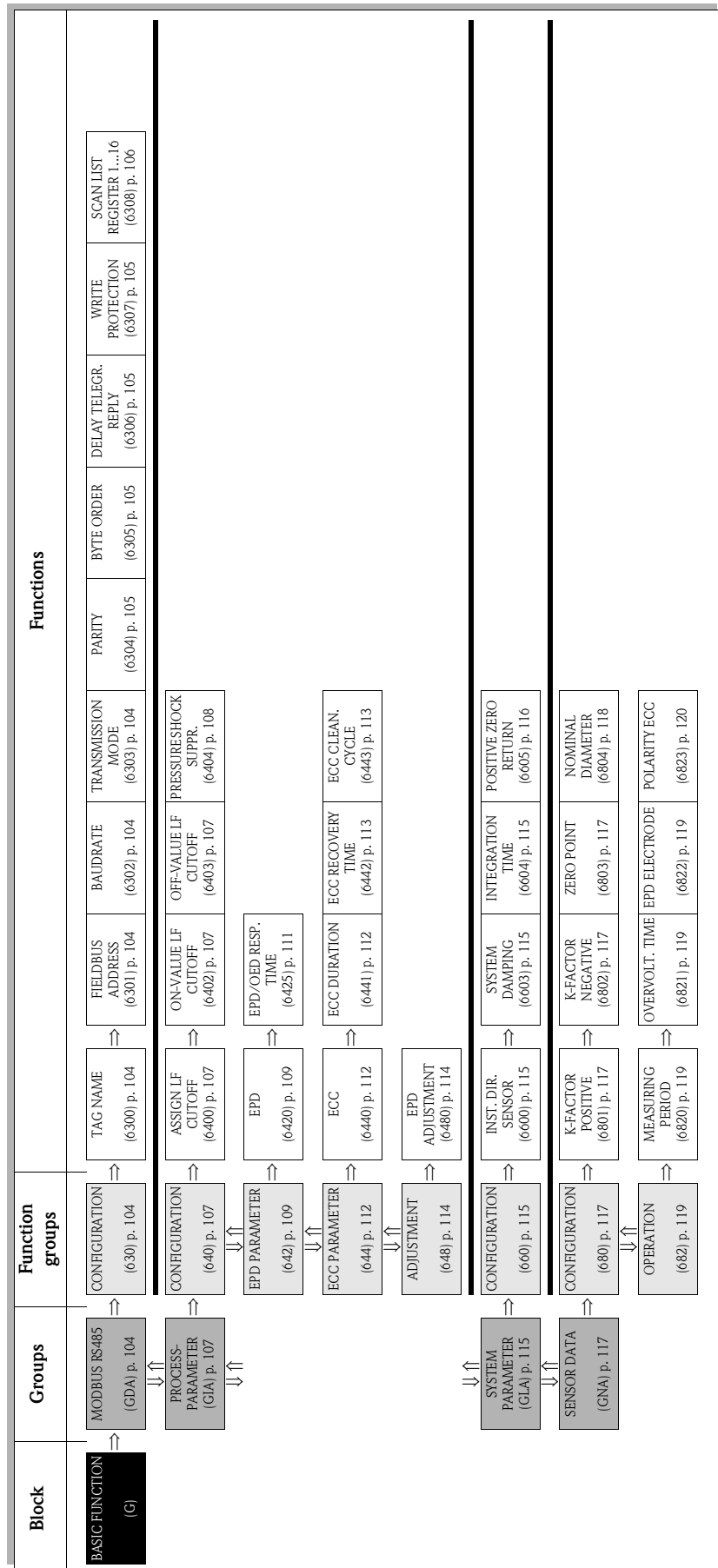
Function description		
INPUTS → STATUS INPUT → OPERATION		
ACTUAL STATUS INPUT MODBUS register: Data type: Access:	5040 4305 Integer Read	Use this function to view the current level of the status input. User interface: 0 = LOW 1 = HIGH
SIMULATION STATUS INPUT MODBUS register: Data type: Access:	5041 4306 Integer read/write	Use this function to simulate the status input, i.e. to trigger the function (see function ASSIGN STATUS INPUT on page 100) assigned to the status input. Options: 0 = OFF 1 = 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 measured values are output correctly via the other outputs.  Caution! The setting is not saved if the power supply fails.
VALUE SIMULATION STATUS INPUT MODBUS register: Data type: Access:	5042 4307 Integer read/write	 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: 0 = LOW 1 = HIGH 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.
MODBUS register:	4308	User interface: 1 = 24 (+) / 25 (-)
Data type:	Integer	
Access	Read	

9 Block BASIC FUNCTION



9.1 Group MODBUS RS485

9.1.1 Function group CONFIGURATION

BASIC FUNCTION	G	⇒	MODBUS RS485	GDA	⇒	CONFIGURATION	630
----------------	---	---	--------------	-----	---	---------------	-----

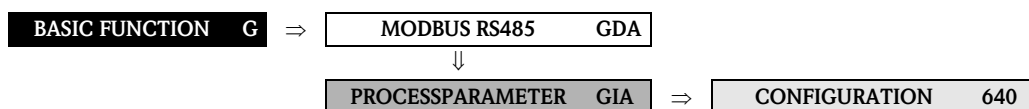
Function description		
BASIC FUNCTION → MODBUS RS485 → CONFIGURATION		
TAG NAME	6300	For entering a tag name for the measuring device. You can edit and read this tag name via the local display or the MODBUS protocol.
MODBUS register:	4901	
Data type:	String (16)	
Access:	read/write	
		User input: max. 16-character text, permissible: A-Z, 0-9, +, -, punctuation marks Factory setting: “-----” (No text)
FIELDBUS ADDRESS	6301	For entering the device address.
MODBUS register:	4910	
Data type:	Integer	
Access:	read/write	
		User input: 1...247 Factory setting: 247
BAUDRATE	6302	For selecting the baudrate.
MODBUS register:	4912	
Data type:	Integer	
Access:	read/write	
		Options: 0 = 1200 BAUD 1 = 2400 BAUD 2 = 4800 BAUD 3 = 9600 BAUD 4 = 19200 BAUD 5 = 38400 BAUD 6 = 57600 BAUD 7 = 115200 BAUD Factory setting: 19200 BAUD
TRANSMISSION MODE	6303	For selecting the data transfer mode.
MODBUS register:	4913	
Data type:	Integer	
Access:	read/write	
		Options: 0 = RTU 1 = ASCII Factory setting: RTU  Note! ■ RTU = transmission of data in binary form. Error protection via CRC16. ■ RTU = transmission of data in the form of readable ASCII characters. Error protection via LRC.

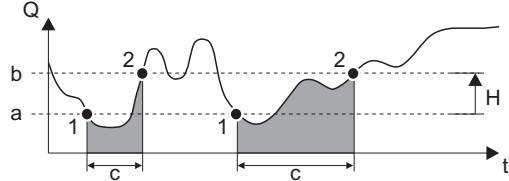
Function description		
BASIC FUNCTION → MODBUS RS485 → CONFIGURATION		
PARITY MODBUS register: Data type: Access:	6304 4914 Integer read/write	For selecting whether no parity bit or an even or uneven parity bit should be transmitted.  Note! The options available depend on the TRANSMISSION MODE function: Options: (for DATA TRANSFER MODE = RTU) 0 = EVEN 1 = ODD 2 = NONE Options: (for DATA TRANSFER MODE = ASCII) 0 = EVEN 1 = ODD Factory setting: EVEN
BYTE ORDER MODBUS register: Data type: Access:	6305 4915 Integer read/write	Select the byte transmission sequence for the Integer, Float and String data types. Options: 0 = 0-1-2-3 1 = 3-2-1-0 2 = 2-3-0-1 3 = 1-0-3-2 Factory setting: 1-0-3-2  Note! ■ The transmission sequence must suit the MODBUS master. ■ More information can be found in Operating Instructions BA117D under the keyword "Byte transmission sequence".
DELAY TELEGR. REPLY MODBUS register: Data type: Access:	6306 4916 Float read/write	For entering a delay time after which the measuring device replies to the request telegram of the MODBUS master. This allows communication to be adapted to slow MODBUS masters. User input: 0...100 ms Factory setting: 10 ms
WRITE PROTECTION MODBUS register: Data type: Access:	6307 4918 Integer Read	Indicates whether write access to the measuring device is possible via local operation or MODBUS. User interface: 0 = OFF (write access via MODBUS possible) 1 = ON (write access via MODBUS blocked) Factory setting: OFF  Note! Hardware write protection is activated and deactivated by means of a jumper on the I/O module (see Operating Instructions BA117D).

Function description		
BASIC FUNCTION → MODBUS RS485 → CONFIGURATION		
SCAN LIST REGISTER 1...16	6308	By entering the register address, up to 16 device parameters can be grouped in the auto-scan buffer where they are assigned to the scan list registers 1 to 16. The data of the device parameters assigned here are read out via the register addresses 5051...5081. User input: 0...9999 Factory setting: 0  Note! More detailed information and examples of using the auto-scan buffer are provided in Operating Instructions BA117D.
MODBUS register:		
SCAN LIST REG. 1	5001	
SCAN LIST REG. 2	5002	
SCAN LIST REG. 3	5003	
SCAN LIST REG. 4	5004	
SCAN LIST REG. 5	5005	
SCAN LIST REG. 6	5006	
SCAN LIST REG. 7	5007	
SCAN LIST REG. 8	5008	
SCAN LIST REG. 9	5009	
SCAN LIST REG. 10	5010	
SCAN LIST REG. 11	5011	
SCAN LIST REG. 12	5012	
SCAN LIST REG. 13	5013	
SCAN LIST REG. 14	5014	
SCAN LIST REG. 15	5015	
SCAN LIST REG. 16	5016	
Data type:	Integer	
Access:	read/write	

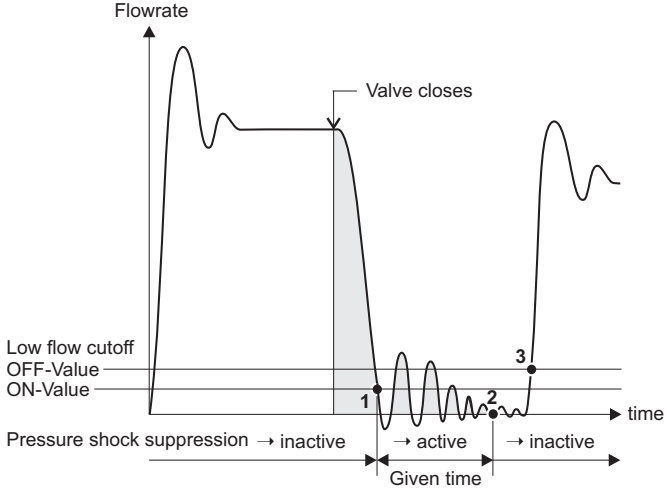
9.2 Group PROCESSPARAMETER

9.2.1 Function group CONFIGURATION

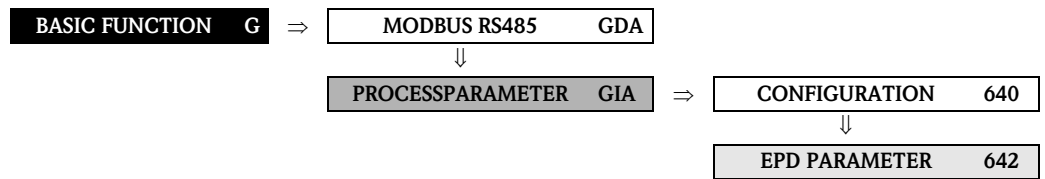


Function description		
BASIC FUNCTION → PROCESSPARAMETER → CONFIGURATION		
ASSIGN LOW FLOW CUT OFF MODBUS register: Data type: Access:	6400 Integer read/write	Use this function to assign the switch point for the low flow cut off. Options: 0 = OFF 1 = VOLUME FLOW 2 = MASS FLOW Factory setting: VOLUME FLOW
ON-VALUE LOW FLOW CUT OFF MODBUS register: Data type: Access:	6402 Float read/write	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 (s. page 150 ff.).  Note! The appropriate unit is taken from the function UNIT VOLUME FLOW (0402) or UNIT MASS FLOW (0400), (see page 15 or page 14).
OFF-VALUE LOW FLOW CUT OFF MODBUS register: Data type: Access:	6403 Float read/write	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...100% Factory setting: 50% Example:  Q = Flow [volume/time] t = Time a = ON-VALUE LOW FLOW CUT OFF (6402) = 200 dm³/h b = OFF-VALUE LOW FLOW CUT OFF (6403) = 10% c = Low flow cut off active 1 = Low flow cut off is switched on at 200 dm³/h 2 = Low flow cut off is switched off at 220 dm³/h

A0001245

Function description		
BASIC FUNCTION → PROCESSPARAMETER → 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 totaled 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 page 107). Use this function to define the time span for active pressure shock suppression. Activation of the pressure shock suppression Pressure shock suppression is activated after the flow falls below the switch-on point of the low flow cut off (see point 1 in graphic). While pressure shock suppression is active, the following conditions apply: ■ Current outputs → outputs the current corresponding to zero flow. ■ Pulse-/Freq.-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 2 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 cut off (see point 3 in graphic).  User input: max. 4-digit number, incl. unit: 0.00...100.0 s Factory setting: 0.00 s

9.2.2 Function group EPD PARAMETER

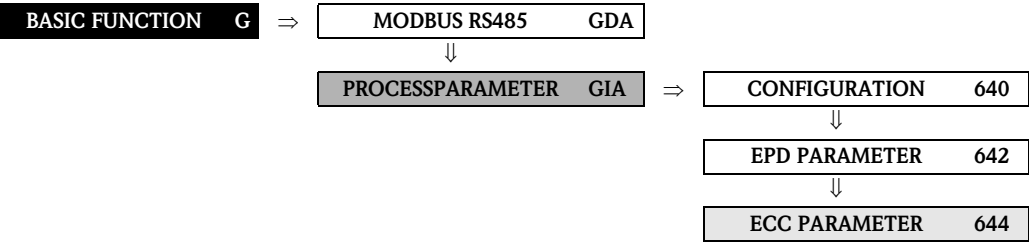


Function description		
BASIC FUNCTION → PROCESSPARAMETER → EPD PARAMETER		
EPD	6420	Flow cannot be measured correctly unless the measuring tube is full. This status can be monitored at all times with the Empty Pipe Detection function. Use this function to activate Empty Pipe Detection (EPD) or Open Electrode 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: 0 = OFF 1 = ON SPECIAL 2 = OED 3 = ON STANDARD OFF (neither EPD nor OED are active) ON SPECIAL: 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 (see function EPD ADJUSTMENT on page 114). ■ The adjustment coefficients must be valid before you can switch on the EPD or OED. If these coefficients are not available, the function EPD ADJUSTMENT is displayed (s. page 114). ■ 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 → PROCESSPARAMETER → EPD PARAMETER		
EPD (continued)	6420	Notes on empty pipe detection (EPD and OED) ■ Flow cannot be measured correctly unless the measuring tube is 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 notice message is issued and that this process error has no effect on the outputs. ■ The EPD/OED process error can be output via the configurable relay or status outputs. ■ 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 notice 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 meters 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 → PROCESSPARAMETER → EPD PARAMETER		
EPD RESPONSE TIME	6425	 Note! This function is not available unless ON STANDARD, ON SPECIAL or OED was selected in the EPD 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 detection (EPD) or open electrode detection (OED). User input: fixed-point number: 1.0...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.

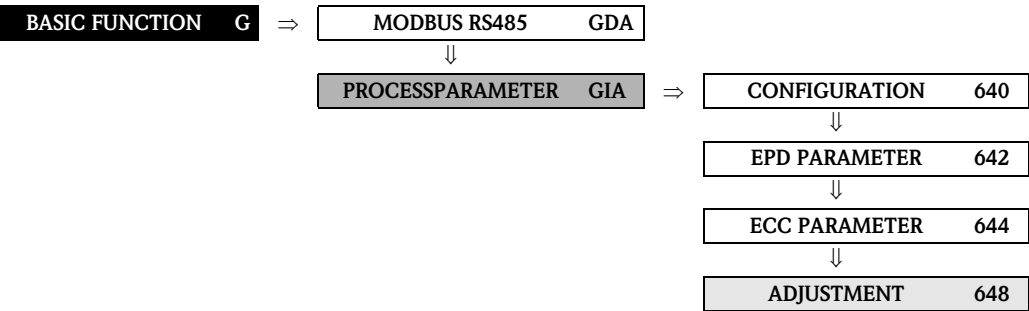
9.2.3 Function group ECC PARAMETER



Function description		
BASIC FUNCTION → PROCESSPARAMETER → ECC PARAMETER		
ECC MODBUS register: 5114 Data type: Integer Access: read/write	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: 0 = OFF 1 = ON (only with the optional electrode cleaning function ECC) 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 MODBUS register: 5115 Data type: Float Access: read/write	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...30.0 s Factory setting: 2.0 s

Function description		
BASIC FUNCTION → PROCESSPARAMETER → ECC PARAMETER		
ECC RECOVERY TIME MODBUS register: Data type: Access:	6442 5117 Float read/write	 Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to specify the recovery time for which the last flow value measured prior to cleaning is retained. A recovery time is necessary as the signal outputs can fluctuate after electrode cleaning on account of electrochemical interference voltages. User input: max. 3-digit number: 1...600 s Factory setting: 5 s  Caution! The last value measured prior to cleaning is output for the duration of the recovery time (max. 600 s). This in turn means that the measuring system does not register changes in flow, e.g. stoppage, during this time span.
ECC CLEANING CYCLE MODBUS register: Data type: Access:	6443 5119 Float read/write	 Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to specify the cleaning cycle for electrode cleaning. User input: Integer: 30...10080 min Factory setting: 40 min

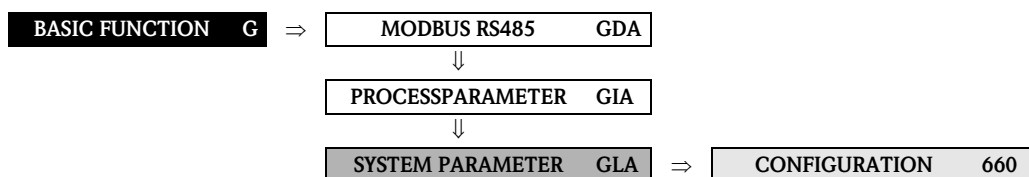
9.2.4 Function group ADJUSTMENT



Function description		
BASIC FUNCTION → PROCESSPARAMETER → ADJUSTMENT		
EPD ADJUSTMENT 6480 MODBUS register: 5107 Data type: Integer Access: read/write		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 Seite 109. Options: 0 = OFF 1 = FULL-PIPE ADJUSTMENT 2 = EMPTY-PIPE ADJUSTMENT 3 = OED FULL ADJUSTMENT 4 = OED EMPTY ADJUSTMENT 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 EPD function (s. page 109). 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

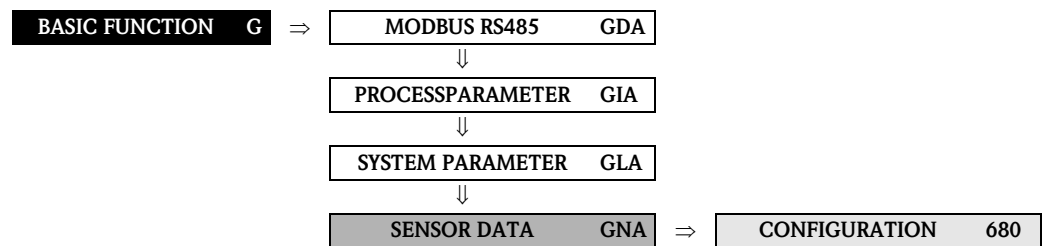


Function description		
BASIC FUNCTION → SYSTEM PARAMETER → CONFIGURATION		
INSTALLATION DIRECTION SENSOR MODBUS register: 5501 Data type: Integer Access: read/write	6600	Use this function to reverse the sign of the flow direction, if necessary. Options: 0 = NORMAL (flow as indicated by the arrow) 1 = 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 MODBUS register: 5504 Data type: Float Access: read/write	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...15 Factory setting: 9  Note! ■ The system damping acts on all functions and outputs of the measuring device. ■ The SYSTEM DAMPING has to be optimized for highly accurate and short filling processes. To do this, put the setting to "0".
INTEGRATION TIME MODBUS register: 5506 Data type: Float Access: read/write	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...65 ms Factory setting: 20 ms at 50 Hz → power supply frequency (e.g. Europe) 16.7 ms at 60 Hz → power supply 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 totaling of the induced voltage in the fluid (measured by the measuring electrode), i.e. the time in which the measuring device records the true flow (afterwards the magnetic field for the next integration is created from the opposite pole).

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: 0 = OFF 1 = 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.
MODBUS register:	5503	
Data type:	Integer	
Access:	read/write	

9.4 Group SENSOR DATA

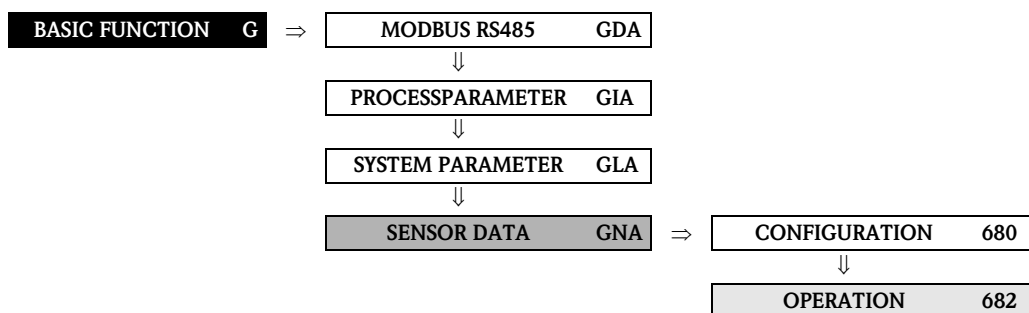
9.4.1 Function group CONFIGURATION



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.		
K-FACTOR POSITIVE MODBUS register: Data type: Access:	6801 3101 Float Read	Use this function to display the current calibration factor (positive flow direction) for the sensor. The calibration factor is determined and set at the factory. User interface: 5-digit fixed-point number: 0.5000...2.0000 Factory setting: Depends on nominal diameter and calibration
K-FACTOR NEGATIVE MODBUS register: Data type: Access:	6802 3103 Float Read	Use this function to display the current calibration factor (negative flow direction) for the sensor. The calibration factor is determined and set at the factory. User interface: 5-digit fixed-point number: 0.5000...2.0000 Factory setting: Depends on nominal diameter and calibration
ZERO POINT MODBUS register: Data type: Access:	6803 3105 Float Read	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...+1000 Factory setting: Depends on nominal diameter and calibration

Function description		
BASIC FUNCTION → SENSOR DATA → CONFIGURATION		
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: 1 = DN 2 or 1/12" 2 = DN 3 or 1/8" 3 = DN 3.5 or 9/64" 4 = DN 4 or 5/32" 5 = DN 6 or 1/4" 6 = DN 8 or 5/16" 7 = DN 10 or 3/8" 8 = DN 15 or 1/2" 9 = DN 20 or 3/4" 10 = DN 25 or 1" 11 = DN 32 or 1 1/4" 12 = DN 40 or 1 1/2" 13 = DN 50 or 2" 14 = DN 65 or 2 1/2" 15 = DN 80 or 3" 16 = DN 100 or 4" 17 = DN 125 or 5" 18 = DN 150 or 6" 19 = DN 200 or 8" 20 = DN 250 or 10" 21 = DN 300 or 12" 22 = DN 350 or 14" 23 = DN 400 or 16" 24 = DN 450 or 18" 25 = DN 500 or 20" 26 = DN 600 or 24" 27 = DN 700 or 28" 29 = DN 800 or 32" 30 = DN 900 or 36" 31 = DN 1000 or 40" 32 = DN 1050 or 42" 34 = DN 1200 or 48" 37 = DN 1500 or 60" 41 = DN 1800 or 72" 42 = DN 2000 or 78" Factory setting: Depends on the size of the sensor
MODBUS register:	3107	
mm	3108	
inch	Integer	
Data type:	Read	
Access:		

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 MODBUS register: 3111 Data type: Float Access: read/write		Use this function to set the time for a full measuring period. The duration of the measuring period is calculated from the rise time of the magnetic field, the brief recovery time, the integration time (which can be set) and the empty pipe detection time. User input: 0.0...1000 ms Factory setting: Depends on nominal diameter  Note! The system checks the time entered and sets the measuring period which is actually used internally to a plausible value. If you enter 0 ms, the system automatically computes the shortest time.
 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 MODBUS register: 3115 Data type: Float Access: Read		Use this function to specify the time in which overvoltage is applied to the coil circuit in order to build up the magnetic field as fast as possible. The overvoltage time is adjusted automatically while measuring is in progress. The overvoltage time depends on the sensor type and the nominal diameter and is set at the factory. User interface: 4-digit floating-point number 0.0...100.0 ms Factory setting: Depends on nominal diameter
EPD ELECTRODE 6822 MODBUS register: 3113 Data type: Integer Access: Read		Use this function to check whether the sensor is equipped with an EPD electrode. User interface: 0 = NO 1 = YES Factory setting: YES → Electrode fitted as standard

Function description		
BASIC FUNCTION → SENSOR DATA → OPERATION		
POLARITY ECC	6823	 Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to display the actual current polarity for optional electrode cleaning (ECC). Electrode cleaning uses either a positive or negative current, depending on the electrode material. The measuring device automatically selects the correct polarity on the basis of the electrode-material data stored in the S-DAT. User interface: 0 = POSITIVE → for electrodes made of: 1.4435, Hastelloy C, platinum 1 = NEGATIVE → for electrodes made of: tantalum  Caution! If the incorrect current is applied to the electrodes, the electrode material is destroyed.
MODBUS register:	3114	
Data type:	Integer	
Access:	Read	

10 Block SPECIAL FUNCTION

Block	Groups	Function groups	Functions									
SPECIAL FUNCTION (H)	BATCHING FUNCTION (HCA) p. 122	CONFIGURATION (720) p. 122	BATCH SELECTOR (7200) p. 122	BATCH NAME (7201) p. 123	ASSIGN BATCH VARIABLE (7202) p. 123	BATCH QUANTITY (7203) p. 124	FIX COMPENS. QUANTITY (7204) p. 124	BATCH STAGES (7208) p. 125	INPUT FORMAT (7209) p. 125			
		VALVE PARAMETER (722) p. 126	OPEN VALVE 1 (7220) p. 126	CLOSE VALVE 1 (7221) p. 127	OPEN VALVE 2 (7222) p. 127	CLOSE VALVE 2 (7223) p. 128						
		SUPERVISION (724) p. 132	MAXIMUM BATCH TIME (7240) p. 132	MINIMUM BATCH QUANT. (7241) p. 133	MAXIMUM BATCH QUANT. (7242) p. 134	PROGRESS NOTE (7243) p. 135	MAX. FLOW VALUE (7244) p. 136					
		OPERATION (726) p. 137	BATCH PROCEDURE (7260) p. 137	BATCH UPWARDS (7261) p. 137	BATCH DOWNWARDS (7262) p. 137	BATCH COUNTER (7263) p. 138	BATCH SUM (7264) p. 138	RESET SUM/COUNTER (7265) p. 138				
		INFORMATION (728) p. 139	INT. SWITCH PNT. VALVE 1 (7280) p. 139	VALVE 1 CLOSING TIME (7282) p. 139	BATCHING TIME (7283) p. 139							

10.1 Group BATCHING FUNCTION

10.1.1 Function group CONFIGURATION

SPECIAL FUNCTION	H	⇒	BATCHING FUNCTION	HCA	⇒	CONFIGURATION	720
------------------	---	---	-------------------	-----	---	---------------	-----

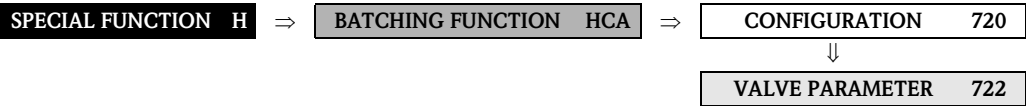
Function description		
SPECIAL FUNCTION → BATCHING FUNCTION → CONFIGURATION		
BATCH SELECTOR	7200	Use this function to select a batching specification. There are six different batching specifications available by means of which different batchings can be defined.
MODBUS register:	6301	Options: 0 = BATCH # 1 (or the name which was defined for batching specification 1 in the function BATCH NAME (7201). 1 = BATCH # 2 (or the name which was defined for batching specification 2 in the function BATCH NAME (7201). 2 = BATCH # 3 (or the name which was defined for batching specification 3 in the function BATCH NAME (7201). 3 = BATCH # 4 (or the name which was defined for batching specification 4 in the function BATCH NAME (7201). 4 = BATCH # 5 (or the name which was defined for batching specification 5 in the function BATCH NAME (7201). 5 = 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).
Data type:	Integer	
Access:	read/write	

Function description		
SPECIAL FUNCTION → BATCHING FUNCTION → CONFIGURATION		
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.  Note for MODBUS! The MODBUS register depends on the option selected in the function BATCH SELECTOR (7200): ■ BATCH # 1 = MODBUS register 6302 ■ BATCH # 2 = MODBUS register 6306 ■ BATCH # 3 = MODBUS register 6310 ■ BATCH # 4 = MODBUS register 6314 ■ BATCH # 5 = MODBUS register 6318 ■ BATCH # 6 = MODBUS register 6322
ASSIGN BATCH VARIABLE	7202	Use this function to assign a batching variable to the batching specification. Options: 0 = OFF 1 = VOLUME FLOW 2 = 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.  Note for MODBUS! The MODBUS register depends on the option selected in the function BATCH SELECTOR (7200): ■ BATCH # 1 = MODBUS register 6326 ■ BATCH # 2 = MODBUS register 6327 ■ BATCH # 3 = MODBUS register 6328 ■ BATCH # 4 = MODBUS register 6329 ■ BATCH # 5 = MODBUS register 6330 ■ BATCH # 6 = MODBUS register 6331

Function description		
SPECIAL FUNCTION → BATCHING FUNCTION → CONFIGURATION		
BATCH QUANTITY	7203	Use this function to define the quantity to be batched BATCH SELECTOR.
MODBUS register:	See Note	User input:
Data type:	Float	5-digit floating-point number: 0...max. value (depends on nominal diameter) [unit]
Access:	read/write	Factory setting:
		0 [unit]
		 Note!
		■ The appropriate unit is taken from the function group SYSTEM UNITS (ACA), (see page 14). ■ When the batching quantity entered here is achieved, valve 1 closes (see function CLOSE VALVE 1 (7221) on page 127).
		 Note for MODBUS!
		The MODBUS register depends on the option selected in the function BATCH SELECTOR (7200):
		■ BATCH # 1 = MODBUS register 6332 ■ BATCH # 2 = MODBUS register 6334 ■ BATCH # 3 = MODBUS register 6336 ■ BATCH # 4 = MODBUS register 6338 ■ BATCH # 5 = MODBUS register 6340 ■ BATCH # 6 = MODBUS register 6342
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.
MODBUS register:	See Note	User input:
Data type:	Float	Floating-point number with sign (depends on nominal diameter)
Access:	read/write	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 page 14).
		 Note for MODBUS!
		The MODBUS register depends on the option selected in the function BATCH SELECTOR (7200):
		■ BATCH # 1 = MODBUS register 6344 ■ BATCH # 2 = MODBUS register 6346 ■ BATCH # 3 = MODBUS register 6348 ■ BATCH # 4 = MODBUS register 6350 ■ BATCH # 5 = MODBUS register 6352 ■ BATCH # 6 = MODBUS register 6354

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: 0 = 1-stage (1 valve or 1-stage batching) 1 = 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 (page 126) are dependent on the number of batching stages (number of valves) selected in this function.  Note for MODBUS! The MODBUS register depends on the option selected in the function BATCH SELECTOR (7200): ■ BATCH # 1 = MODBUS register 6380 ■ BATCH # 2 = MODBUS register 6381 ■ BATCH # 3 = MODBUS register 6382 ■ BATCH # 4 = MODBUS register 6383 ■ BATCH # 5 = MODBUS register 6384 ■ BATCH # 6 = MODBUS register 6385
INPUT FORMAT	7209	Use this function to define the entry format of the quantities for the switch points of the valves. Options: 0 = VALUE-INPUT (e.g. 10 [unit]) 1 = %-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 (page 126) and SUPERVISION (page 132).  Note for MODBUS! The MODBUS register depends on the option selected in the function BATCH SELECTOR (7200): ■ BATCH # 1 = MODBUS register 6386 ■ BATCH # 2 = MODBUS register 6387 ■ BATCH # 3 = MODBUS register 6388 ■ BATCH # 4 = MODBUS register 6389 ■ BATCH # 5 = MODBUS register 6390 ■ BATCH # 6 = MODBUS register 6391

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 in the function INPUT FORMAT (7209). User input: 0...max. value or 0...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.  Note for MODBUS! The MODBUS register depends on the option selected in the function BATCH SELECTOR (7200): ■ BATCH # 1 = MODBUS register 8001 ■ BATCH # 2 = MODBUS register 8003 ■ BATCH # 3 = MODBUS register 8005 ■ BATCH # 4 = MODBUS register 8007 ■ BATCH # 5 = MODBUS register 8009 ■ BATCH # 6 = MODBUS register 8011
MODBUS register:	See Note	
Data type:	Float	
Access:	read/write	

Function description		
SPECIAL FUNCTION → BATCHING FUNCTION → VALVE PARAMETER		
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 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 page 124). In this way, function CLOSE VALVE 1 is also the basis for calculating the after run quantity.
MODBUS register: Data type: Access:	8013 Float Read	
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 in the function INPUT FORMAT (7209). User input: 0...max. value or 0...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.  Note for MODBUS! The MODBUS register depends on the option selected in the function BATCH SELECTOR (7200): - BATCH # 1 = MODBUS register 8015 - BATCH # 2 = MODBUS register 8017 - BATCH # 3 = MODBUS register 8019 - BATCH # 4 = MODBUS register 8021 - BATCH # 5 = MODBUS register 8023 - BATCH # 6 = MODBUS register 8025
MODBUS register: Data type: Access:	See Note Float read/write	

Function description		
SPECIAL FUNCTION → BATCHING FUNCTION → VALVE PARAMETER		
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 in the function INPUT FORMAT (7209). User input: 0...max. value or 0...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.  Note for MODBUS! The MODBUS register depends on the option selected in the function BATCH SELECTOR (7200): ■ BATCH # 1 = MODBUS register 8027 ■ BATCH # 2 = MODBUS register 8029 ■ BATCH # 3 = MODBUS register 8031 ■ BATCH # 4 = MODBUS register 8033 ■ BATCH # 5 = MODBUS register 8035 ■ BATCH # 6 = MODBUS register 8037
MODBUS register:	See Note	
Data type:	Float	
Access:	read/write	

10.1.3 Examples of setting parameters for batching processes

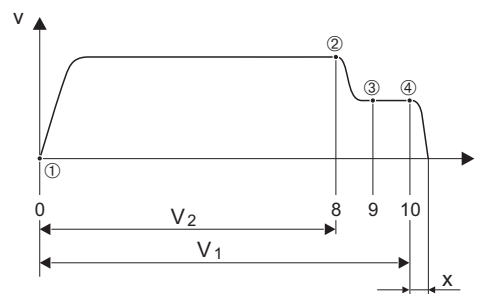
The two examples in the next section clearly show the effect of different entries and options in the function groups.

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.



v = Flow velocity [m/s]

t = Time

V₁ = Valve 1 open

V₂ = 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), end of batching

x = After run quantity

A0004670

The following parameter settings must be made:

- Select the unit for batching:
Function UNIT VOLUME (0403) page 16 = 1 (liter)
- Select the measured variable for batching:
Function ASSIGN BATCH VARIABLE (7202) page 123 = VOLUME FLOW
- Enter the batching quantity:
Function BATCH QUANTITY (7203) page 124 = 10 [liters]
- Select the entry format:
Function BATCH STAGES (7208) page 125 = 2-stage
- Select the entry format:
Function INPUT FORMAT (7209) page 125 = VALUE-INPUT
- Quantity data for when the first valve should open:
Function OPEN VALVE 1 (7220) page 126 = 0 [liters]
(valve 1 closes automatically when the batching quantity is achieved = 10 [liters], display in function CLOSE VALVE 1 (7221) page 127)
- Quantity data for when the second valve should open:
Function OPEN VALVE 2 (7224) page 127 = 0 [liters]

- Quantity data for when the second valve should close:
Function CLOSE VALVE 2 (7223) page 128 = 8 [liters]
- Quantity data for when the message should be generated:
Function PROGRESS NOTE (7243) page 135 = 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) page 124 = 20 [liters]
- New quantity data for when the message should be generated:
Function PROGRESS NOTE (7243) page 135 = 18 [liters]

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

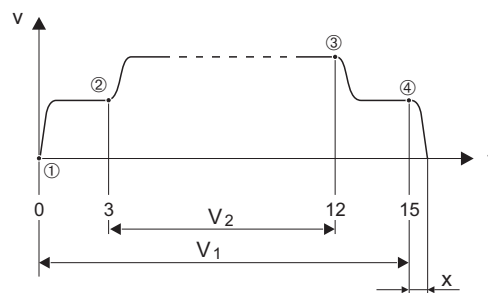
- Function OPEN VALVE 1 = 0 [liters]
- Function OPEN VALVE 2 = 0 [liters]
- Function CLOSE VALVE 2 = 16 [liters]

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.



v = Flow velocity [m/s]

t = Time

V_1 = Valve 1 open

V_2 = 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

A0004684

The following parameter settings must be made:

- Select the unit for batching:
Function UNIT VOLUME (0403) page 16 = 1 (liter)
- Select the measured variable for batching:
Function ASSIGN BATCH VARIABLE (7202) page 123 = VOLUME FLOW
- Enter the batching quantity:
Function BATCH QUANTITY (7203) page 124 = 15 [liters]
- Select the entry format:
Function BATCH STAGES (7208) page 125 = 2-stage
- Select the entry format:
Function INPUT FORMAT (7209) page 125 = %-INPUT
- Percentage data for when the first valve should open:
Function OPEN VALVE 1 (7220) page 126 = 0 [%]
(valve 1 closes automatically when the batching quantity is achieved = 15 [liters],
display in function CLOSE VALVE 1 (7221) page 127)
- Percentage data for when the second valve should open:
Function OPEN VALVE 2 (7224) page 127 = 20 [%], corresponds to 3 liters
- Percentage data for when the second valve should close:
Function CLOSE VALVE 2 (7223) page 128 = 80 [%], corresponds to 12 liters

Example 2 a

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

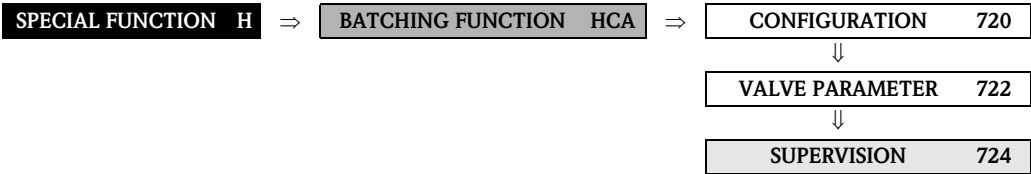
The following parameters must be set **manually**:

- Enter the new batching quantity:
Function BATCH QUANTITY (7203) page 124 = 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 BATCH TIME MODBUS register: See Note Data type: Float Access: read/write	7240	Use this function to specify a maximum batching time. All valves close once the specified batching time elapses (see functions CLOSE VALVE 1...2, see page 127 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...30000 s Factory setting: 0 s (= deactivated) ⚠ Caution! ■ When the batching quantity is adjusted (reduced/increased), (see function BATCH QUANTITY (7203) on page 124), there is no automatic adjustment, i.e. this value must be determined again and reentered, (see also fault message # 471 in the Troubleshooting section of the Promag 53 MODBUS RS485 Operating Instructions BA117D/06/en). ■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. ■ A fault message is assigned to the function. This fault message can be acknowledged prematurely: – By modifying a batching function. – By selecting RESET in the “BATCH PROCEDURE” parameter ■This function can be output via the switch output. 🔧 Note for MODBUS! Depends on the option selected in the function BATCH SELECTOR (7200): ■ BATCH # 1 = MODBUS register 8063 ■ BATCH # 2 = MODBUS register 8065 ■ BATCH # 3 = MODBUS register 8067 ■ BATCH # 4 = MODBUS register 8069 ■ BATCH # 5 = MODBUS register 8071 ■ BATCH # 6 = MODBUS register 8073

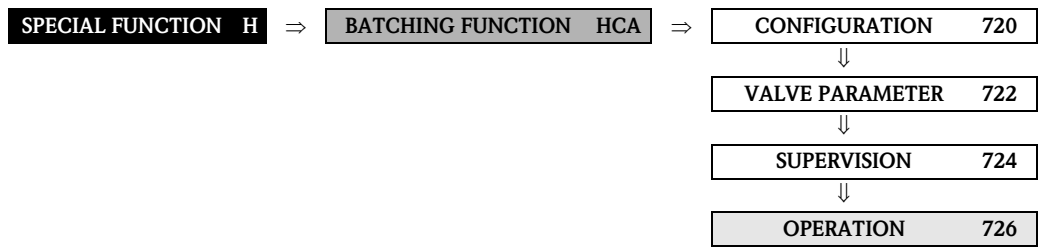
Function description		
SPECIAL FUNCTION → BATCHING FUNCTION → SUPERVISION		
MINIMUM BATCH QUANTITY	7241	Use this function to specify a minimum batching quantity. A message is generated if the minimum batching quantity was not achieved by the time batching ends (e.g. if after run mode is active). The quantity value is entered as a % or as an absolute value, depending on the option in the function INPUT FORMAT (7209). MODBUS register: See Note Data type: Float Access: read/write Application: Message stating that underbatching is present (e.g. the contents of the containers does not correspond to the quantity declared). User input: 0...max. value or 0...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 page 124), there is no automatic adjustment, i.e. this value must be determined again and reentered, (see also fault message # 472 in the Troubleshooting section of the Promag 53 MODBUS RS485 Operating Instructions BA117D/06/en). ■ Batching (START) is not possible when the fault message is active! ■ The function is not active if you enter 0 (factory setting). ■ A fault message is assigned to the function. This fault message can be acknowledged prematurely: – By modifying a batching function. – By selecting RESET in the “BATCH PROCEDURE” parameter ■ This function can be output via the switch output.  Note for MODBUS! Depends on the option selected in the function BATCH SELECTOR (7200): ■ BATCH # 1 = MODBUS register 8075 ■ BATCH # 2 = MODBUS register 8077 ■ BATCH # 3 = MODBUS register 8079 ■ BATCH # 4 = MODBUS register 8081 ■ BATCH # 5 = MODBUS register 8083 ■ BATCH # 6 = MODBUS register 8085

Function description	
SPECIAL FUNCTION → BATCHING FUNCTION → SUPERVISION	
MAXIMUM BATCH QUANTITY 7242 MODBUS register: Data type: Access:	See Note Float read/write 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 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...2 x max. value or 0...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 page 124), there is no automatic adjustment, i.e. this value must be determined again and reentered, (see also fault message # 472 in the Troubleshooting section of the Promag 53 MODBUS RS485 Operating Instructions BA117D/06/en). ■ Batching (START) is not possible when the fault message is active!  Note! ■ The function is not active if you enter 0 (factory setting). ■ A fault message is assigned to the function. This fault message can be acknowledged prematurely: – By modifying a batching function. – By selecting RESET in the “BATCH PROCEDURE” parameter ■ This function can be output via the switch output.  Note for MODBUS! Depends on the option selected in the function BATCH SELECTOR (7200): ■ BATCH # 1 = MODBUS register 8087 ■ BATCH # 2 = MODBUS register 8089 ■ BATCH # 3 = MODBUS register 8091 ■ BATCH # 4 = MODBUS register 8093 ■ BATCH # 5 = MODBUS register 8095 ■ BATCH # 6 = MODBUS register 8097

Function description	
SPECIAL FUNCTION → BATCHING FUNCTION → SUPERVISION	
PROGRESS NOTE 7243 MODBUS register: See Note Data type: Float Access: read/write	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 the output. The quantity value is entered as a % or as an absolute value, depending on the option in the 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...max. value or 0...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 page 124), there is no automatic adjustment, i.e. this value must be determined again and reentered, (see also notice message # 473 in the Troubleshooting section of the Promag 53 MODBUS RS485 Operating Instructions BA117D/06/en).  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.  Note for MODBUS! Depends on the option selected in the function BATCH SELECTOR (7200): ■ BATCH # 1 = MODBUS register 8099 ■ BATCH # 2 = MODBUS register 8101 ■ BATCH # 3 = MODBUS register 8103 ■ BATCH # 4 = MODBUS register 8105 ■ BATCH # 5 = MODBUS register 8107 ■ BATCH # 6 = MODBUS register 8109

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. MODBUS register: See Note Data type: Float Access: read/write 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 7202 parameter and the unit configured in the SYSTEM UNITS group. ■ The function is not active if you enter 0 (factory setting). ■ If the batching process is aborted because the specified flow value was overshoot, the BATCH COUNTER (7263) parameter is not incremented. ■ The error message #474 > MAX. FLOW is output if the maximum flow is overshoot. This fault message can be acknowledged prematurely: – By modifying a batching function. – By selecting RESET in the “BATCH PROCEDURE” parameter  Note for MODBUS! Depends on the option selected in the function BATCH SELECTOR (7200): ■ BATCH # 1 = MODBUS register 8121 ■ BATCH # 2 = MODBUS register 8119 ■ BATCH # 3 = MODBUS register 8117 ■ BATCH # 4 = MODBUS register 8115 ■ BATCH # 5 = MODBUS register 8113 ■ BATCH # 6 = MODBUS register 8111

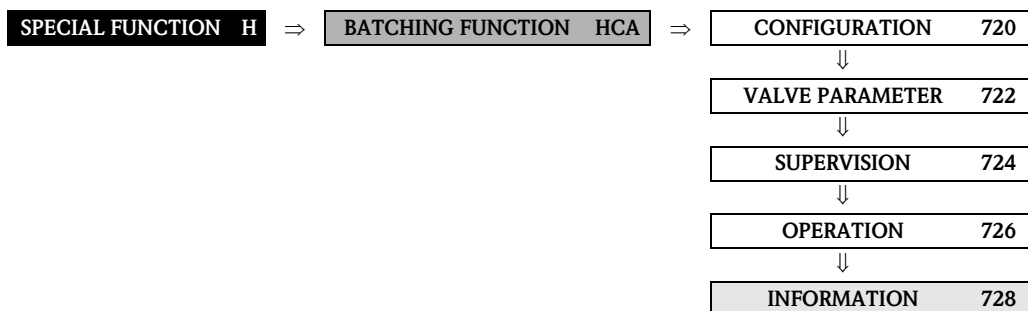
10.1.5 Function group OPERATION



Function description		
SPECIAL FUNCTION → BATCHING FUNCTION → OPERATION		
BATCH PROCEDURE	7260	Use this function to control a batching process. The batching can be started manually or a batching already running can be interrupted or stopped at any time. MODBUS register: 6392 Data type: Integer Access: read/write Options: 0 = STOP (Stop batching) 1 = START (Start batching) 2 = HOLD (Interrupt batching) 3 = GO ON (Continue batching) 4 = RESET (Reset error message # 471, # 472, # 473, # 474) Factory setting: STOP  Note! ■ This function can also be controlled via the status input, (see function ASSIGN STATUS INPUT (5000) on page 100). ■ If the information line has been assigned to BATCHING MENU (see page 43), the application-specific functions of the minus key (START-STOP) and the plus key (HOLD / GO ON / PRESET) are defined locally. In this way, a direct batching control station is available locally at the measuring device by means of the user interface (not access-protected). ■ In the event of a fault: – during the batching process, the batching is canceled (STOP) and the local display alternates between displaying the batching menu and the fault message. ■ If the positive zero return is activated (see page 116): – during the batching process, the batching is canceled (STOP). – during a pause in the batching (option HOLD), the batching cannot be restarted, (see also notice messages # 571 and # 572 in the Troubleshooting section of the Promag 53 MODBUS RS485 Operating Instructions BA117D/06/en).
BATCH UPWARDS	7261	In this function the batching progress can be read upwards, i.e. starting from 0 the quantity displayed increases until the batching process is complete or the amount specified in the BATCH QUANTITY (7203) function is reached. MODBUS register: 6393 Data type: Float Access: Read User interface: Floating-point number incl. unit
BATCH DOWNWARDS	7262	In this function the batching progress can be read downwards, i.e. starting from the batching quantity (BATCH QUANTITY (7203)) the quantity displayed decreases until the batching process is complete. MODBUS register: 6395 Data type: Float Access: Read User interface: Floating-point number incl. unit

Function description		
SPECIAL FUNCTION → BATCHING FUNCTION → OPERATION		
BATCH COUNTER MODBUS register: 6397 Data type: Float Access: Read	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 MODBUS register: 6399 Data type: Float Access: Read	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 and fine batching 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 MODBUS register: 6401 Data type: Integer Access: read/write	7265	Use this function to reset the batch counter and the batch sum to zero. User input: 0 = NO 1 = 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 MODBUS register: 6402 Data type: Float Access: Read	Use this function to display the internal switch point of valve 1 (see function CLOSE VALVE 1 on page 127). The value displayed takes the fixed correction 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 page 14).
VALVE 1 CLOSING TIME 7282 MODBUS register: 6406 Data type: Float Access: Read	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 cut off. ■ The data can only be taken as a general trend as the accuracy of the time value is directly dependent on the measuring period.
BATCHING TIME 7283 MODBUS register: 6408 Data type: Float Access: Read	Displays the batching time for the current or completed batch process. Starting at 0 seconds, the time displayed increases until the batch process is completed. Application: The batching time refers to the batch quantity determined in the function BATCH SUM for the current or last batch process. User interface: max. 7-digit floating-point number [s]  Note! ■ Behavior when controlling the batching process by means of the BATCH PROCEDURE function: – STOP → BATCHING TIME is not reset and remains at the current value. – START → BATCHING TIME is reset and starts at 0. – HOLD → BATCHING TIME is not reset and remains at the current value. – GO ON → BATCHING TIME is not reset and continues updating based on the last time value. ■ The BATCHING TIME is also updated during the batching process

11 Block SUPERVISION

Block	Groups	Function groups	Functions					
SUPERVISION (1)	SYSTEM (JAA) p. 141	CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
	VERSION INFO (JCA) p. 144	↑						
		↑						
		↑						
		↑						
		↑						
		↑						
		↑						
		↑						
		↑						
		↑						
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					
			↑					
		↓		↓		↓		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		↑		↑		↑		
		CONFIGURATION (800) p. 141	↑					
			ALARM DELAY (8005) p. 141					
		OPERATION (804) p. 142	↑					

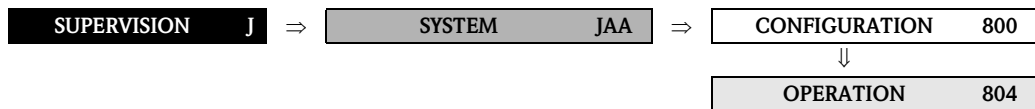
11.1 Group SYSTEM

11.1.1 Function group CONFIGURATION

SUPERVISION	J	⇒	SYSTEM	JAA	⇒	CONFIGURATION	800
-------------	---	---	--------	-----	---	---------------	-----

Function description		SUPERVISION → SYSTEM → CONFIGURATION
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: ■ User interface ■ Current output ■ Pulse/Frequency output ■ Relay output ■ MODBUS RS485 User input: 0...100 s (in steps of one second) Factory setting: 0 s  Caution! If this function is activated, fault and notice messages are delayed by the time corresponding to the setting before being 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.
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 MODBUS register: 6859 Data type: Integer Access: Read MODBUS register: 6821 Data type: String (18) Access: Read		Use this function to check the present system condition. User interface: 1 = "SYSTEM OK" or the fault / notice message with the highest priority.  Note! More information can be found in Operating Instructions BA117D under the keyword "System or process error messages."
PREVIOUS SYSTEM CONDITIONS 8041 MODBUS register: See Note Data type: Integer Access: Read		Use this function to view the sixteen most recent fault and notice messages since measuring last started. User interface: The 16 most recent fault or notice messages.  Note for MODBUS! The various less recent system conditions are available via the following MODBUS registers: ■ Fault/notice message 1 = MODBUS register 6860 ■ Fault/notice message 2 = MODBUS register 6861 ■ Fault/notice message 3 = MODBUS register 6862 ■ Fault/notice message 4 = MODBUS register 6863 ■ Fault/notice message 5 = MODBUS register 6864 ■ Fault/notice message 6 = MODBUS register 6865 ■ Fault/notice message 7 = MODBUS register 6866 ■ Fault/notice message 8 = MODBUS register 6867 ■ Fault/notice message 9 = MODBUS register 6868 ■ Fault/notice message 10 = MODBUS register 6869 ■ Fault/notice message 11 = MODBUS register 6870 ■ Fault/notice message 12 = MODBUS register 6871 ■ Fault/notice message 13 = MODBUS register 6872 ■ Fault/notice message 14 = MODBUS register 6873 ■ Fault/notice message 15 = MODBUS register 6874 ■ Fault/notice message 16 = MODBUS register 6875  Note! More information can be found in Operating Instructions BA117D under the keyword "System or process error messages."
SIMULATION FAILSAFE MODE 8042 MODBUS register: 6812 Data type: Integer Access: read/write		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 message "SIMULATION FAILSAFE MODE" appears on the display. Options: 0 = ON 1 = OFF Factory setting: OFF

Function description		
SUPERVISION → SYSTEM → OPERATION		
SIMULATION MEASURAND MODBUS register: Data type: Access:	8043 Integer read/write	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 message “SIMULATION MEASURAND” appears on the display. Options: 0 = OFF 1 = VOLUME FLOW 2 = MASS 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 MODBUS register: Data type: Access:	8044 Float read/write	 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 page 14).
SYSTEM RESET MODBUS register: Data type: Access:	8046 Integer read/write	Use this function to perform a reset of the measuring system. Options: 0 = NO 1 = RESTART SYSTEM (restart without interrupting power supply) Factory setting: NO
OPERATION HOURS MODBUS register: Data type: Access:	8048 Float Read	The hours of operation of the device appear on the display. User interface: depends on the number of hours of operation elapsed ■ Hours of operation < 10 hours → display format = 0:00:00 (hr:min:sec) ■ Hours of operation 10...10,000 hours → display format = 0000:00 (hr:min) ■ Hours of operation > 10,000 hours → display format = 000000 (hr)

11.2 Group VERSION INFO

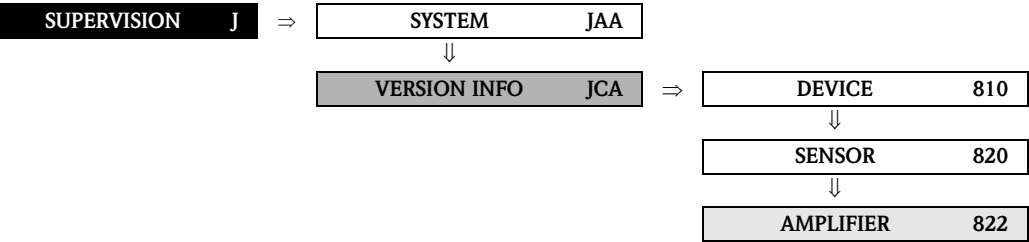
11.2.1 Function group DEVICE

SUPERVISION J		⇒	SYSTEM JAA		
			↓		
			VERSION INFO JCA	⇒	DEVICE 810
Function description SUPERVISION → VERSION INFO → DEVICE					
DEVICE SOFTWARE	8100	Displays the current device software version.			
MODBUS register:	7277				
Data type:	String (16)				
Access:	Read				

11.2.2 Function group SENSOR

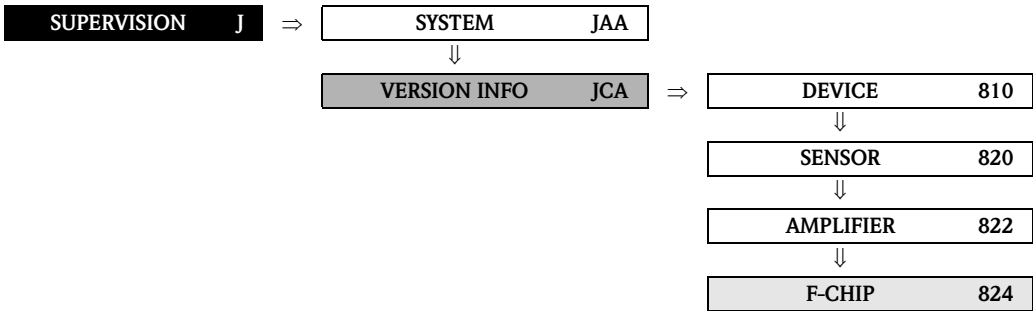
SUPERVISION J		⇒	SYSTEM JAA		
			↓		
			VERSION INFO JCA	⇒	DEVICE 810
				↓	
				↓	SENSOR 820
Function description SUPERVISION → VERSION INFO → SENSOR					
SERIAL NUMBER	8200	Use this function to view the serial number of the sensor.			
MODBUS register:	7003				
Data type:	String (16)				
Access:	Read				
SENSOR TYPE	8201	Use this function to view the sensor type.			
MODBUS register:	7012				
Data type:	String (16)				
Access:	Read				
SW REV. NO. S-DAT	8205	Use this function to view the software revision number of the software used to create the content of the S-DAT.			
MODBUS register:	7021				
Data type:	String (16)				
Access:	Read				

11.2.3 Function group AMPLIFIER



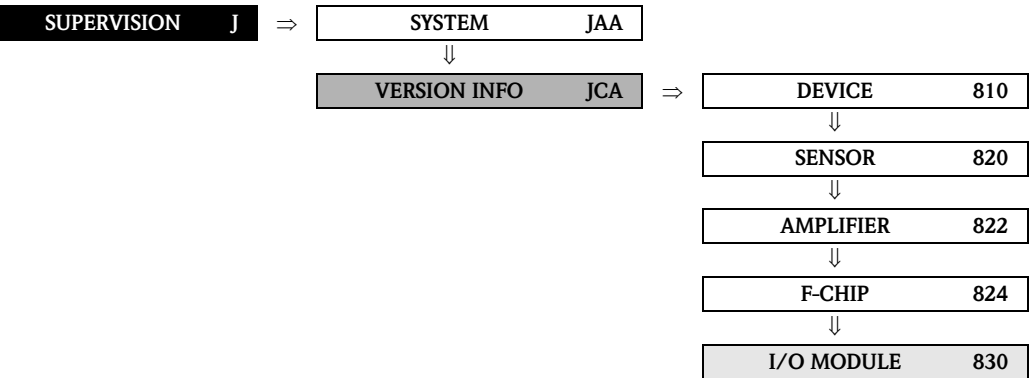
Function description		
SUPERVISION → VERSION INFO → AMPLIFIER		
SW REV. NO. AMPLIFIER	8222	Use this function to view the software revision number of the amplifier.
MODBUS register:	7039	
Data type:	String (16)	
Access:	Read	
SW REV. NO. T-DAT	8225	Use this function to view the software revision number of the software used to create the content of the T-DAT.
MODBUS register:	7048	
Data type:	String (16)	
Access:	Read	
LANGUAGE GROUP	8226	Displays the installed language group.
MODBUS register:	7262	
Data type:	Integer	
Access:	Read	
User interface: 0 = TYPE UNKNOWN 1 = WEST EU / USA 2 = EAST EU / SCAND. 3 = ASIA 4 = CHINA		
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 ToF Tool - Fieldtool Package. Please do not hesitate to contact your Endress+Hauser sales office if you have any questions.		

11.2.4 Function group F-CHIP



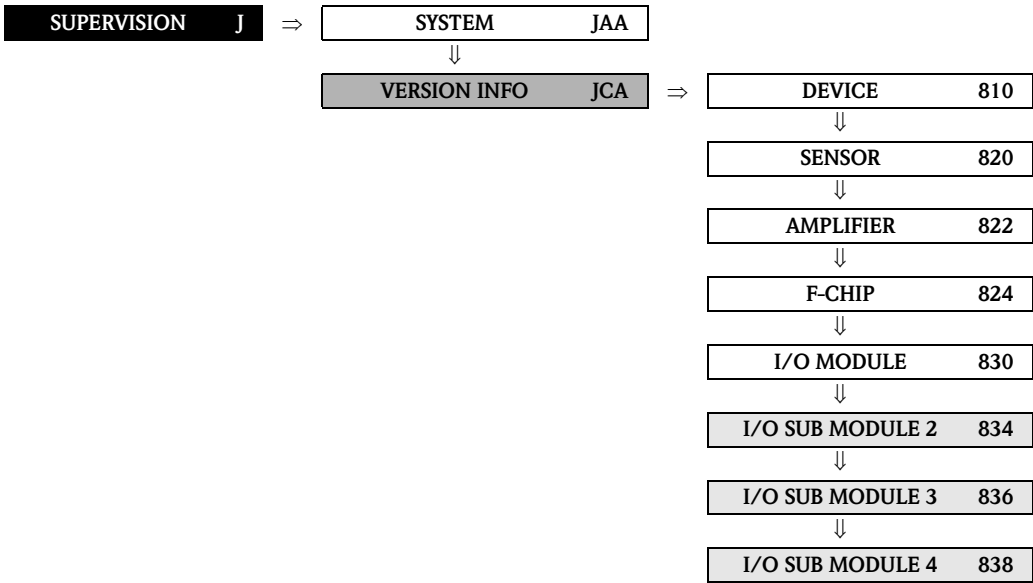
Function description		
SUPERVISION → VERSION INFO → F-CHIP		
STATUS F-CHIP 8240 MODBUS register: 7057 Data type: Integer Access: Read		Use this function to check whether an F-CHIP is installed and which software options are available. User interface: 0 = NO F-CHIP HW 1 = F-CHIP OK 2 = DEMONSTRATION 3 = SERVICE&ANALYSIS 4 = P-TYPE F-CHIP 5 = TYPE UNKNOWN 6 = SER. NUM. WRONG 7 = FAILURE 8 = CRITICAL FAIL. 9 = DEVICE ID
SYSTEM OPTIONS 8241 MODBUS register: 7058 Data type: Integer Access: Read		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. User interface: 0 = NO ENTRY 1 = ECC 3 = BATCH FUNCTION
SW REV. NO F-CHIP 8244 MODBUS register: 7059 Data type: String (16) Access: Read		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 MODBUS register: 7285 Data type: Integer Access: Read	Use this function to view the configuration of the I/O module complete with terminal numbers. User interface: 12 = MODBUS RS485	
SW REV. NO. I/O MODULE 8303 MODBUS register: 7078 Data type: String (16) Access: Read	Use this function to view the software revision number of the I/O module.	

11.2.6 Function groups INPUT/OUTPUT 2...4



Function description		
SUPERVISION → VERSION INFO → IN-/OUTPUT 2...4		
SUB I/O TYPE 2	8340	Displays the configuration of the I/O submodule.
MODBUS register:	7106	User interface: 7 = STATUS INPUT
Data type:	Integer	
Access:	Read	
SW REV. NO. SUB IN-/OUTPUT TYPE 2	8343	Use this function to view the software revision number of the corresponding submodule.
MODBUS register:	7190	
Data type:	String (16)	
Access:	Read	
SUB I/O TYPE 3	8360	Displays the configuration of the I/O submodule.
MODBUS register:	7107	User interface: 0 = TYPE UNKNOWN 5 = PULS/FREQ. OUT. 6 = STATUS/REL. OUT.
Data type:	Integer	
Access:	Read	
SW REV. NO. SUB IN-/OUTPUT TYPE 3	8363	Use this function to view the software revision number of the corresponding submodule.
MODBUS register:	7199	
Data type:	String (16)	
Access:	Read	

Function description		
SUPERVISION → VERSION INFO → IN-/OUTPUT 2...4		
SUB I/O TYPE 4	8380	Displays the configuration of the I/O submodule.
MODBUS register:	7108	User interface: 0 = TYPE UNKNOWN 4 = CURRENT OUTPUT 6 = STATUS/REL. OUT.
Data type:	Integer	
Access:	Read	
SW REV. NO. SUB IN-/OUTPUT TYPE 4	8383	Use this function to view the software revision number of the corresponding submodule.
MODBUS register:	7199	
Data type:	String (16)	
Access:	Read	

12 Factory settings

12.1 SI units (not for USA and Canada)

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

Nominal diameter		Low flow cut off			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)				
[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	5/32"	0.05	dm ³ /min	kg/min	2	dm ³ /min	kg/min	0.025	dm ³	kg	dm ³	kg
8	5/16"	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
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
Belgium	English
China	Chinese
Denmark	English
Germany	Deutsch
England	English
Finland	Suomi
France	Francais
Netherlands	Nederlands
Hong Kong	English
India	English
Indonesia	Bahasa Indonesia
Instruments International	English
Italy	Italiano
Japan	Japanese
Malaysia	English
Norway	Norsk
Poland	Polish
Portugal	Portuguese
Austria	Deutsch
Russia	Russian
Sweden	Svenska
Switzerland	Deutsch
Singapore	English
Spain	Espanol
South Africa	English
Thailand	English
Czech Republic	Czech
Hungary	English

Density, length, temperature

	Unit
Density	kg/l
Length	mm
Temperature	° C

12.2 US units (only for USA and Canada)

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

Nominal diameter		Low flow cut off			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
5/32"	4	0.008	gal/min	lb/min	0.5	gal/min	lb/min	0.005	gal	lb	gal	lb
5/16"	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
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

Blocks

A = MEASURED VARIABLES	12
B = QUICK SETUP	19
C = USER INTERFACE	28
D = TOTALIZER	48
E = OUTPUT	53
F = INPUT	99
G = BASIC FUNCTION	103
H = SPECIAL FUNCTION	121
J = SUPERVISION	140

Groups

AAA = MEASURED VALUES	13
ACA = SYSTEM UNITS	14
CAA = CONTROL	29
CCA = MAIN LINE	33
CEA = ADDITIONAL LINE	37
CGA = INFORMATION LINE	43
DAA = TOTALIZER 1	49
DAB = TOTALIZER 2	49
DAC = TOTALIZER 3	49
DJA = HANDLING TOTALIZER	52
EAA = CURRENT OUTPUT 1	54
EAB = CURRENT OUTPUT 2	54
ECA = PULSE/FREQUENCY OUTPUT 1	65
ECB = PULSE/FREQUENCY OUTPUT 2	65
EGA = RELAY OUTPUT 1	89
EGB = RELAY OUTPUT 2	89
FAA = STATUS INPUT	100
GDA = MODBUS RS485	104
GIA = PROCESS PARAMETER	107
GLA = SYSTEM PARAMETER	115
GNA = SENSOR DATA	117
HCA = BATCHING FUNCTION	122
JAA = SYSTEM	141
JCA = VERSION INFO	144

Function groups

040 = CONFIGURATION	14
042 = ADDITIONAL CONFIGURATION	17
070 = DENSITY PARAMETER	18
200 = BASIC CONFIGURATION	29
202 = UNLOCKING/LOCKING	31
204 = OPERATION	32
220 = CONFIGURATION	33
222 = MULTIPLEX	35
240 = CONFIGURATION	37
242 = MULTIPLEX	40
260 = CONFIGURATION	43
262 = MULTIPLEX	46
300 = CONFIGURATION	49
304 = OPERATION	51
400 = CONFIGURATION	54
404 = OPERATION	63
408 = INFORMATION	64
420 = CONFIGURATION	65

430 = OPERATION	85
438 = INFORMATION	88
470 = CONFIGURATION	89
474 = OPERATION	93
478 = INFORMATION	95
500 = CONFIGURATION	100
504 = OPERATION	101
508 = INFORMATION	102
630 = CONFIGURATION	104
640 = CONFIGURATION	107
642 = EPD PARAMETER	109
644 = ECC PARAMETER	112
648 = ADJUSTMENT	114
660 = CONFIGURATION	115
680 = CONFIGURATION	117
682 = OPERATION	119
720 = CONFIGURATION	122
722 = VALVE PARAMETER	126
724 = SUPERVISION	132
726 = OPERATION	137
728 = INFORMATION	139
800 = CONFIGURATION	141
804 = OPERATION	142
810 = DEVICE	144
820 = SENSOR	144
822 = AMPLIFIER	145
824 = F-CHIP	146
830 = I/O MODULE	147
834 = INPUT/OUTPUT 2	148
836 = INPUT/OUTPUT 3	148
838 = INPUT/OUTPUT 4	148

Functions 0...

0000 = CALCULATED MASS FLOW	13
0001 = VOLUME FLOW	13
0005 = DENSITY	13
0400 = UNIT MASS FLOW	14
0401 = UNIT MASS	14
0402 = UNIT VOLUME FLOW	15
0403 = UNIT VOLUME	16
0420 = UNIT DENSITY	17
0424 = UNIT LENGTH	17
0700 = DENSITY VALUE	18

Functions 1...

1002 = QUICK SETUP COMMISSION	19
1003 = QUICK SETUP PULSATING FLOW	19
1005 = QUICK SETUP BATCHING/DOSING	19
1006 = QS COMMUNICATION	19
1009 = T DAT SAVE/LOAD	20

Functions 2...

2000 = LANGUAGE	29
2002 = DISPLAY DAMPING	30
2003 = CONTRAST LCD	30
2004 = BACKLIGHT	30
2020 = ACCESS CODE	31

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

Functions 3...

3000 = ASSIGN	49
3001 = UNIT TOTALIZER	49
3002 = TOTALIZER MODE	50
3003 = RESET TOTALIZER	50
3040 = SUM	51
3041 = OVERFLOW	51
3800 = RESET ALL TOTALIZERS	52
3801 = FAILSAFE MODE	52

Functions 4...

4000 = ASSIGN CURRENT OUTPUT	54
4001 = CURRENT RANGE	55
4002 = VALUE 0_4 mA	56, 57
4003 = VALUE 20 mA	58
4004 = MEASURING MODE	59, 60
4005 = TIME CONSTANT	61
4006 = FAILSAFE MODE	62
4040 = ACTUAL CURRENT	63
4041 = SIMULATION CURRENT	63
4042 = VALUE SIMULATION CURRENT	63
4080 = TERMINAL NUMBER	64
4200 = OPERATING MODE	65
4201 = ASSIGN FREQUENCY	65
4202 = START VALUE FREQUENCY	65
4203 = END VALUE FREQUENCY	66
4204 = VALUE F LOW	66
4205 = VALUE F HIGH	67
4206 = MEASURING MODE	69
4207 = OUTPUT SIGNAL	71
4208 = TIME CONSTANT	74
4209 = FAILSAFE MODE	74

4211 = FAILSAFE VALUE	74
4221 = ASSIGN PULSE	75
4222 = PULSE VALUE	75
4223 = PULSE WIDTH	76
4225 = MEASURING MODE	77
4226 = OUTPUT SIGNAL	78
4227 = FAILSAFE MODE	81
4241 = ASSIGN STATUS	82
4242 = ON VALUE	82
4243 = SWITCH-ON DELAY	83
4244 = OFF-VALUE	83
4245 = SWITCH-OFF DELAY	83
4246 = MEASURING MODE	84
4247 = TIME CONSTANT	84
4301 = ACTUAL FREQUENCY	85
4302 = SIMULATION FREQUENCY	85
4303 = VALUE SIMULATION FREQUENCY	85
4322 = SIMULATION PULSE	86
4323 = VALUE SIMULATION PULSE	86
4341 = ACTUAL STATUS	87
4342 = SIMULATION SWITCH POINT	87
4343 = VALUE SIMULATION SWITCH POINT	87
4380 = TERMINAL NUMBER	88
4700 = ASSIGN RELAY	89
4701 = ON-VALUE	90
4702 = SWITCH-ON DELAY	90
4703 = OFF-VALUE	90
4704 = SWITCH-OFF DELAY	91
4705 = MEASURING MODE	91
4706 = TIME CONSTANT	92
4740 = ACTUAL STATUS RELAY	93
4741 = SIMULATION SWITCH POINT	93
4742 = VALUE SIMULATION SWITCH POINT	94
4780 = TERMINAL NUMBER	95

Functions 5...

5000 = ASSIGN STATUS INPUT	100
5001 = ACTIVE LEVEL	100
5002 = MINIMUM PULSE WIDTH	100
5040 = ACTUAL STATUS INPUT	101
5041 = SIMULATION STATUS INPUT	101
5042 = VALUE SIMULATION STATUS INPUT	101
5080 = TERMINAL NUMBER	102

Functions 6...

6300 = TAG NAME	104
6301 = BUS ADDRESS	104
6302 = BAUDRATE	104
6303 = DATA TRANSFER MODE	104
6304 = PARITY	105
6305 = BYTE SEQUENCE	105
6306 = DELAY RESPONSE TELEGRAM	105
6307 = WRITE PROTECTION	105
6308 = SCAN LIST REGISTER 1...16	106
6400 = ASSIGN LOW FLOW CUT OFF	107
6402 = ON-VALUE LOW FLOW CUT OFF	107
6403 = OFF-VALUE LOW FLOW CUT OFF	107
6404 = PRESSURE SHOCK SUPPRESSION	108
6420 = EMPTY PIPE DETECTION (EPD)	109

6425 = EPD/OED RESPONSE TIME	111
6440 = ECC	112
6441 = ECC DURATION	112
6442 = ECC RECOVERY TIME	113
6443 = ECC CLEANING CYCLE	113
6480 = EPD ADJUSTMENT	114
6600 = INSTALLATION DIRECTION SENSOR	115
6603 = SYSTEM DAMPING	115
6604 = INTEGRATION TIME	115
6605 = POSITIVE ZERO RETURN	116
6801 = K-FACTOR POSITIVE	117
6802 = K-FACTOR NEGATIVE	117
6803 = ZERO POINT	117
6804 = NOMINAL DIAMETER	118
6820 = MEASURING PERIOD	119
6821 = OVERVOLTAGE TIME	119
6822 = EPD ELECTRODE	119
6823 = POLARITY ECC	120

Functions 7...

7200 = BATCH SELECTOR	122
7201 = BATCH NAME	123
7202 = ASSIGN BATCH VARIABLE	123
7203 = BATCH QUANTITY	124
7204 = FIXED COMPENSATION QUANTITY	124
7208 = BATCH STAGES	125
7209 = INPUT FORMAT	125
7220 = OPEN VALVE 1	126
7221 = CLOSE VALVE 1	127
7222 = OPEN VALVE 2	127
7223 = CLOSE VALVE 2	128
7240 = MAXIMUM BATCHING TIME	132
7241 = MINIMUM BATCHING QUANTITY	133
7242 = MAXIMUM BATCHING QUANTITY	134
7243 = PROGRESS NOTE	135
7244 = MAX. FLOW	136
7260 = BATCH PROCEDURE	137
7261 = BATCH UPWARDS	137
7262 = BATCH DOWNWARDS	137
7263 = BATCH COUNTER	138
7264 = BATCH SUM	138
7265 = RESET TOTAL SUM/COUNTER	138
7280 = VALVE 1 INTERNAL SWITCH POINT	139
7282 = BATCHING TIME	139
7282 = VALVE 1 CLOSING TIME	139

Functions 8...

8005 = ALARM DELAY	141
8006 = REMOVE SW-OPTION	141
8040 = ACTUAL SYSTEM CONDITION	142
8041 = PREVIOUS SYSTEM CONDITIONS	142
8042 = SIMULATION FAILSAFE MODE	142
8043 = SIMULATION MEASURAND	143
8044 = VALUE SIMULATION MEASURAND	143
8046 = SYSTEM RESET	143
8048 = OPERATION HOURS	143
8100 = DEVICE SOFTWARE	144
8200 = SERIAL NUMBER	144
8201 = SENSOR TYPE	144

8205 = SOFTWARE REV. NO. S-DAT	144
8222 = SOFTWARE REV. NO. AMPLIFIER	145
8225 = SOFTWARE REV. NO. T-DAT	145
8226 = LANGUAGE GROUP	145
8240 = STATUS F-CHIP	146
8241 = SYSTEM OPTION	146
8244 = SOFTWARE REV. NO. F-CHIP	146
8300 = I/O MODULE TYPE	147
8303 = SOFTWARE REV. NO. I/O MODULE	147
8340 = SUB I/O MODULE TYPE 2	148
8343 = SW-REV NO. SUB I/O TYPE 2	148
8360 = SUB I/O MODULE TYPE 3	148
8363 = SW-REV NO. SUB I/O TYPE 3	148
8380 = SUB I/O MODULE TYPE 4	149
8383 = SW-REV NO. SUB I/O TYPE 4	149

14 Index of key words

A

Access type	10
Active level (status input)	100
Actual	
Current (current output)	63
Frequency	85
Actual status	
Relay output	93
Status input	101
Status (pulse/frequency output)	87
Actual system condition	142
Additional configuration (system units)	17
Additional line	
Configuration	37
Multiplex	40
Adjustment EPD/EED	114
Alarm delay	141
Amplifier (version info)	145
Assign	
Additional line	37
Additional line (Multiplex)	40
Current output	54
Frequency (Pulse/freq. output)	65
Information line	43
Information line (Multiplex)	46
Low flow cut off	107
Main line	33
Main line (Multiplex)	35
Pulse output	75
Relay (relay output)	89
Status input	100
Status (pulse/frequency output)	82
Totalizer	49
Assign Batch variable	123

B

Basic configuration (user interface)	29
Basic function	103
Batch Counter	138
Batch Name	123
Batch Procedure	137
Batch Quantity	124
Downwards	137
Upwards	137
Batch Selector	122
Batch Stages	125
Batch Sum	138
Batching function, configuration	122
Batching time	139
Block	
Basic function	103
Inputs	99
Measured variables	12
Outputs	53
Quick Setup	19
Special function	121

Supervision	140
Totalizer	48
User interface	28
Block Supervision	140
Bus address	104

C

Close	
Valve 1	127
Valve 2	128
Code	
Access	31
Private code	31
Commissioning	19
Compensation Quantity (fixed)	124
Configuration	
Additional line	37
Batching function	122
Current output	54
Information line	43
Main line	33
MODBUS	
RS485	104
Process parameter	107
Pulse/frequency output	65
Relay output	89
Sensor data	117
Status input	100
System	141
System parameter	115
System units	14
Totalizer	49
Contrast LCD	30
Current output	
Configuration	54
Current range	55
Information	64

D

Damping	
Relay, time constant	92
Status output, time constant	84
System, reaction time	115
User interface	30
Data type	10
Define private code	31
Delay resp. tele.	105
Density	
Density parameter (introduction)	18
Density value (display)	13
Density value (input)	18
Device Software	144
Display	
Display test	32
Display lines of local operation	10
Display mode	

Additional line	39	Relay output	89
Additional line (Multiplex)	42	Sensor data	117
Information line	45	Status input	100
Information line (Multiplex)	47	System	141
E		System parameter	115
ECC (Electrode Cleaning Circuitry)	112	System units	14
Cleaning cycle	113	Totalizer	49
Duration	112	Density parameter	18
Parameter	112	Device	144
Polarity	120	ECC parameter	112
Recovery time	113	EPD parameter	109
EEPROM	10	F-CHIP	146
Electrode cleaning circuitry		Information	
see ECC		Batching function	139
Empty Pipe Detection (EPD/OED)		Current output	64
Empty-pipe/Full-pipe adjustment	114	Pulse/Frequency output	88
EPD electrode	119	Relay output	95
General information	109, 110	Status input	102
Response time	111	Input/output 2...4)	148
Switching on/off	109, 110	I/O Module	147
End value frequency	66	Multiplex	
EPD		Additional line	40
see Empty Pipe Detection (EPD/OED)		Information line	46
F		Main line	35
Factory settings	150	Operation	
Failsafe mode		Batching function	137
All totalizers	52	Current output	54, 63
Current output	62	Pulse/frequency output	85
Frequency output	74	Relay output	93
Pulse output	81	Status input	101
Failsafe value	74	System	142
F-CHIP (Version Info)	146	Totalizer	51
Fix compensation quantity	124	User interface	32
Float	10	Sensor	144
Flow	136	Supervision	
Format		Batching function	132
Additional line	38	Unlocking/locking (user interface)	31
Additional line (Multiplex)	41	Valve parameter	
Information line	44	Batching function	126
Information line (Multiplex)	47	Function matrix	
Main line	34	General layout	8
Main line (Multiplex)	36	Identification code	9
Function group		Overview	11
Additional configuration (system units)	17	G	
Adjustment	114	Group	
Amplifier	145	Additional line	37
Basic configuration (user interface)	29	Batching function	122
Configuration		Control (User interface)	29
Additional line	37	Current output	54
Batching function	122	Handling Totalizer	52
Current output	54	Information line	43
Information line	43	Main line	33
Main line	33	Measured values	13
MODBUS RS485	104	MODBUS RS485	104
Operation	119	Process parameter	107
Process parameter	107	Pulse/frequency output	65
Pulse/freq. output	65	Relay output	89
		Sensor data	117

Status input	100	Status (pulse/frequency output)	84
System	141	Measuring period, sensor	119
System parameter	115	Minimum Batching quantity	133
System units	14	Minimum Pulse width	100
Version Info	144	MODBUS register	10
H		MODBUS RS485	104
Handling Totalizer	52	Multiplex	
I		Additional line	40
Illustration of function description	10	Information line	46
Information		Main line	35
Batching function	139	N	
Current output	64	Nominal diameter	118
Pulse/frequency output	88	O	
Relay output	95	OED (Open Electrode Detection)	
Status input	102	see Empty Pipe Detection (EPD/OED)	109, 110
Information line		Off value	
Configuration	43	Low flow cut off	107
Multiplex	46	Relay output	90
Input format	125	Status (pulse/frequency output)	83
Inputs	99	On-value	
Input/output 2...4 (version info)	148	Low flow cut off	107
Installation direction sensor	115	Relay output	90
Integer	10	Status (pulse/frequency output)	82
Integration time	115	Open	
K		Valve 1	126
K-Factor		Valve 2	127
Negative	117	Operating mode	
Positive	117	Pulse/frequency output	65
L		Operation	
Language		Basic configuration	29
Factory settings (country)	151	Batching function	137
Language group (display)	145	Current output	54
Options	29	Operation	32
LCD contrast	30	Pulse/frequency output	85
Local display		Relay output	93
see Display		Sensor data	119
Local operation (display lines)	10	Status input	101
Low flow cut off	107	System	142
M		Totalizer	51
Main line		Unlocking/locking	31
Configuration	33	User interface	32
Multiplex	35	Operation hours	143
Mapping reg. 1...16	106	Output signal	
Mass flow (calculated)	13	Frequency output	71, 72, 73
Maximum	136	Pulse output	78, 79, 80
Maximum Batching quantity	134	Outputs	53
Maximum Batching time	132	Overflow, totalizer	51
Max. writes	10	Overvoltage time, field coils	119
Measured values	13	P	
Measured variables (block A)	12	Polarity ECC	120
Measuring mode		Positive zero return	116
Current output	59, 60	Pressure shock suppression	108
Frequency (Pulse/freq. output)	69, 70	Previous system conditions	142
Pulse output	77	Process parameter	
Relay output	91	Adjustment	114
		Configuration	107
		ECC parameter	112

EPD parameter	109
Progress note	135
Pulsating flow	19
Pulse value	75
Pulse Width	76
Pulse/frequency output	
Configuration	65
Information	88
Operation	85

Q

Quick Setup	
Batching/Dosing	19
Commissioning	19
Communication	19
Pulsating flow	19
Quick Setup (Block B)	19

R

Read	10
Relay output	
Configuration	89
General	96
Information	95
Operation	93
Switching response	97
Remove SW-option	141
Reset	
All totalizers	52
System	143
Total sum/counter	138
Totalizer	50

S

Sensor	
Configuration	117
Installation direction	115
K-Factor	117
Measuring period	119
Operating data	119
Overvoltage time	119
see Sensor	
Version Info	144
Zero point	117
Sensor (version info)	144
Serial number sensor	144
Simulation	
Current (current output)	63
Failsafe mode	142
Frequency	85
Measurand	143
Pulse	86
Relay output switch point	93
Status input	101
Switch point status (pulse/frequency output)	87
Software revision number	
Amplifier	145
F-Chip	146
I/O Module	147
S-DAT	144

T-DAT	145
Special units	
Density parameter	18
Start value frequency	65
Status access	31
Status F-CHIP	146
Status input	
Configuration	100
Information	102
Operation	101
String	10
Supervision, batching function	132
Switching response of the relay output	97
Switch-off delay	
Relay output	91
Status (pulse/frequency output)	83
Switch-on delay	
Relay output	90
Status (pulse/frequency output)	83
System	
Configuration	141
Damping	115
Operation	142
Operation hours	143
Reset	143
System condition	
Actual	142
Previous	142
System option (additional software)	146
System parameters, settings	115
System units	
Additional configuration	17
Configuration	14

T

Tag Name	104
T-DAT Save/Load	20
Terminal number	
Current output	64
Pulse/frequency output	88
Relay output	95
Status input	102
Test display	32
Time constant	
Current output	61
Frequency output	74
Relay output	92
Status (pulse/frequency output)	84
Totalizer	48
Configuration	49
Handling totalizer (reset, etc.)	52
Operation	51
Reset	50
Sum (Totalizer)	51
Totalizer Mode	50
Type	
Input/output 2...4	149
Type I/O Module	147

U

Unit

Density	17
Length	17
Mass	14
Mass flow	14
Totalizer	49
Volume	16
Volume flow	15
Unlocking/locking (user interface)	31
User interface	28
Contrast LCD	30
Language selection	29
Lighting (back lighting)	30

V

Value F High	67, 68
Value F Low	66
Value simulation	
Current (current output)	63
Frequency	85
Measurand	143
Pulse	86
Relay output switch point	94
Status input	101
Switch point status (pulse/frequency output)	87
Value 0_4 mA	
Current output	56, 57
Value 20 mA	
Current output	58
Valve parameter, batching function	126
Valve 1 closing time	139
Valve 1 Internal switch point	139
Version Info	
Amplifier	145
F-CHIP	146
Input/output 2...4	148
I/O Module	147
Sensor	144

W

Write	10
Write protection	105
Writes (max.)	10

Z

Zero point	117
------------------	-----

Numbers

100% value flow	
Additional line	38
Additional line (Multiplex)	41
Information line	44
Information line (Multiplex)	46
Main line	34
Main line (Multiplex)	35

www.endress.com/worldwide

For more Endress+Hauser product please visit: www.ainstru.com
Mail: Sales@ainstru.com

Endress+Hauser 
People for Process Automation
