



Füllstand



Druck



Durchfluss



Temperatur



Flüssigkeits-
analyse



Registrierung



Systeme
Komponenten



Services



Solutions

Operating Instructions

Proline Promass 83 MODBUS RS485

Coriolis Mass Flow Measuring System

Description of Device Functions

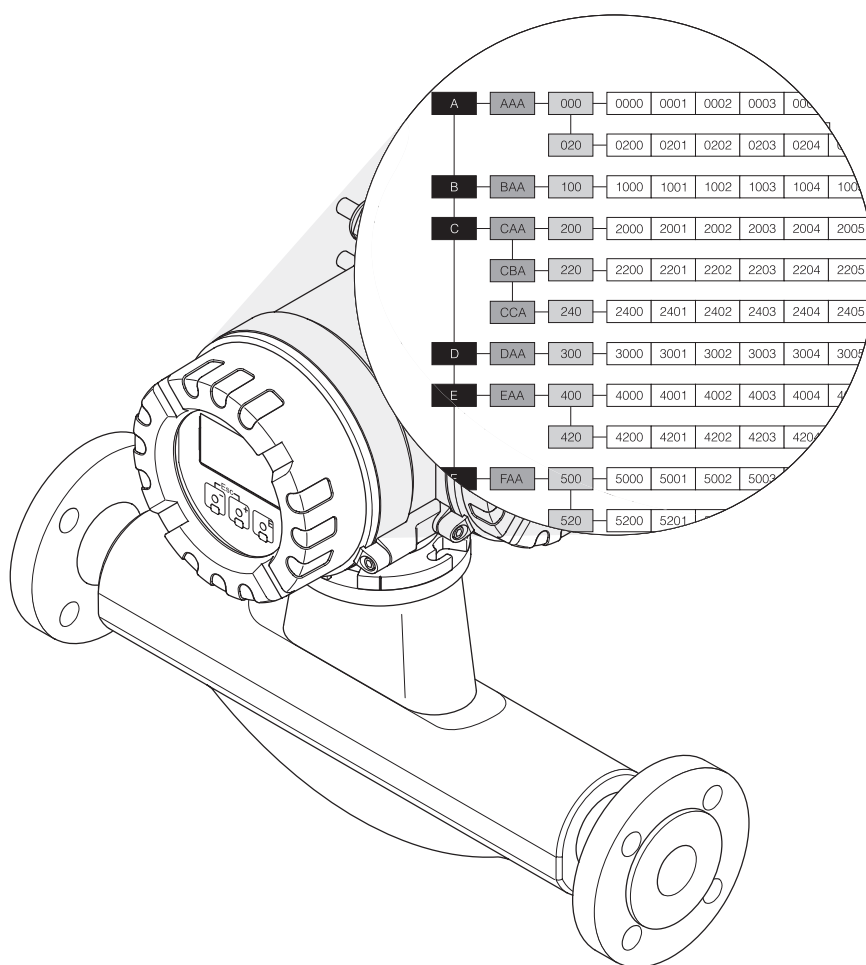


Table of Contents

1	Using this Manual	5	6	Block TOTALIZER	52
1.1	Finding a function description	5	6.1	Group TOTALIZER (1...3)	53
1.1.1	Using the table of contents	5	6.1.1	Function group CONFIGURATION	53
1.1.2	Using the graphic of the function matrix	5	6.1.2	Function group OPERATION	55
1.1.3	Using the index of the function matrix	5	6.2	Group HANDLING TOTALIZER	56
2	Function Matrix	6	7	Block OUTPUT	57
2.1	General layout of the function matrix	6	7.1	Group CURRENT OUTPUT	58
2.1.1	Blocks (A, B, C, etc.)	6	7.1.1	Function group CONFIGURATION	58
2.1.2	Groups (AAA, AEA, CAA, etc.)	6	7.1.2	Function group OPERATION	66
2.1.3	Function groups (000, 020, 060, etc.)	6	7.1.3	Function group INFORMATION	66
2.1.4	Functions (0000, 0001, 0002, etc.)	6	7.2	Group PULSE/FREQUENCY OUTPUT	67
2.1.5	Codes identifying cells	7	7.2.1	Function group CONFIGURATION	67
2.2	Illustration of the function descriptions	8	7.2.2	Function group OPERATION	88
2.3	Display lines on the local display	8	7.2.3	Function group INFORMATION	91
2.4	Function matrix Proline Promass 83 MODBUS RS485	9	7.3	Group RELAY OUTPUT (1...2)	92
3	Block MEASURED VARIABLES	10	7.3.1	Function group CONFIGURATION	92
3.1	Group MEASURING VALUES	11	7.3.2	Function group OPERATION	96
3.1.1	Function group MAIN VALUES	11	7.3.3	Function group INFORMATION	97
3.1.2	Function group ADDITIONAL VALUES	12	7.3.4	Information on the response of the relay output	98
3.2	Group SYSTEM UNITS	15	7.3.5	Switching response of the relay output	99
3.2.1	Function group CONFIGURATION	15	8	Block INPUT	101
3.2.2	Function group ADDITIONAL CONFIGURATION	18	8.1	Group STATUS INPUT	102
4	Block QUICK SETUP	20	8.1.1	Function group CONFIGURATION	102
4.0.1	Setup Commissioning	22	8.1.2	Function group OPERATION	103
4.0.2	Batching Setup menu	24	8.1.3	Function group INFORMATION	104
4.0.3	Pulsating flow Setup menu	27	9	Block BASIC FUNCTION	105
4.0.4	Gas measurement Setup menu	29	9.1	Group MODBUS RS485	106
4.0.5	Communication Setup menu	30	9.1.1	Function group CONFIGURATION	106
5	Block USER INTERFACE	31	9.2	Group PROCESS PARAMETER	108
5.1	Group CONTROL	32	9.2.1	Function group CONFIGURATION	108
5.1.1	Function group BASIC CONFIGURATION	32	9.2.2	Function group EPD PARAMETER	110
5.1.2	Function group UN-/LOCKING	34	9.2.3	Function group REFERENCE PARAMETER	112
5.1.3	Function group OPERATION	35	9.2.4	Function group ADJUSTMENT	114
5.2	Group MAIN LINE	36	9.2.5	Function group PRESSURE CORRECTION	116
5.2.1	Function group CONFIGURATION	36	9.3	Group SYSTEM PARAMETER	117
5.2.2	Function group MULTIPLEX	38	9.3.1	Function group CONFIGURATION	117
5.3	Group ADDITIONAL LINE	40	9.4	Group SENSOR DATA	118
5.3.1	Function group CONFIGURATION	40	9.4.1	Function group CONFIGURATION	118
5.3.2	Function group MULTIPLEX	43	9.4.2	Function group FLOW COEFFICIENT	119
5.4	Group INFORMATION LINE	46	9.4.3	Function group DENSITY COEFFICIENT	120
5.4.1	Function group CONFIGURATION	46	9.4.4	Function group ADDITIONAL COEFFICIENT	121
5.4.2	Function group MULTIPLEX	49			

10	Block SPECIAL FUNCTION	122
10.1	Group DENSITY FUNCTIONS	123
10.1.1	Function group CONFIGURATION	123
10.2	Group BATCHING FUNCTION	129
10.2.1	Function group CONFIGURATION	129
10.2.2	Function group VALVE PARAMETER	136
10.2.3	Examples of setting parameters for batching processes	138
10.2.4	Function group SUPERVISION	141
10.2.5	Function group OPERATION	144
10.2.6	Function group INFORMATION	146
10.3	Group ADVANCED DIAGNOSTICS	147
10.3.1	Function group CONFIGURATION	147
10.3.2	Function group ACQUISITION	148
10.3.3	Function group MASS FLOW	149
10.3.4	Function group DENSITY	151
10.3.5	Function group REFERENCE DENSITY	153
10.3.6	Function group TEMPERATURE	155
10.3.7	Function group TUBE DAMPING	157
10.3.8	Function group ELECTRODYNAMIC SENSORS	159
11	Block SUPERVISION	161
11.1	Group SYSTEM	162
11.1.1	Function group CONFIGURATION	162
11.1.2	Function group OPERATION	163
11.2	Group VERSION INFO	165
11.2.1	Function group DEVICE	165
11.2.2	Function group SENSOR	166
11.2.3	Function group AMPLIFIER	167
11.2.4	Function group F-CHIP	168
11.2.5	Function group I/O MODULE	169
11.2.6	Function groups I/O SUBMODULE 2...4	170
12	Factory settings	172
12.1	SI units (not for USA and Canada)	172
12.1.1	Low flow cut off, full scale value, pulse value	172
12.1.2	Language	172
12.1.3	Density, length, temperature	172
12.2	US units (only for USA and Canada)	173
12.2.1	Low flow cut off, full scale value, pulse value	173
12.2.2	Language, density, length, temperature	173
	Index function matrix	175
	Index key words	179

1 Using this Manual

This manual must be used in conjunction with the Operating Instructions of the measuring device. A description of all the functions of the measuring device is provided here.

1.1 Finding a function description

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

1.1.1 Using the table of contents

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.

1.1.2 Using the graphic of the function matrix

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

1. All blocks available, and their related groups, are illustrated on Page 9. 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.

1.1.3 Using the index of the function matrix

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.

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.

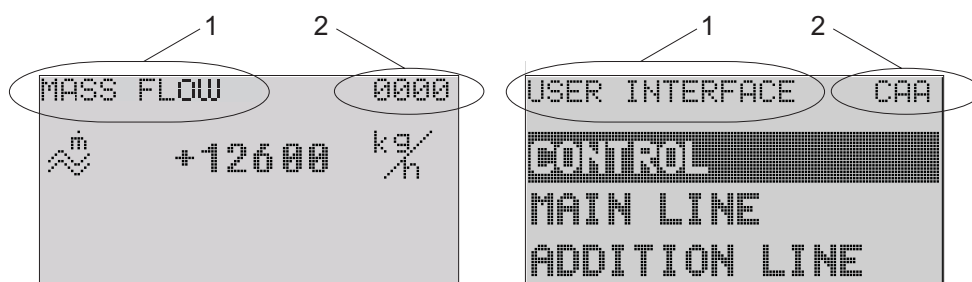


Fig. 1 : Local display

- 1 Name of the function, e.g. mass flow, user interface
2 Function code, e.g. 0000, CAA

The index to the function matrix is on Page 175.

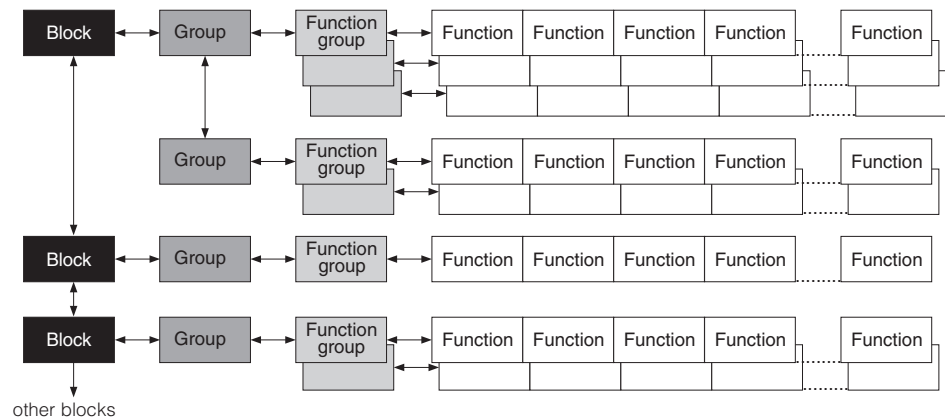
F06-x3PBxxxx-20-xx-xx-en-000

2 Function Matrix

2.1 General layout of the function matrix

The function matrix consists of four levels:

Blocks → Groups → Function groups → Functions



F06-x3xxxxxx-13-xx-xx-en-000

Fig. 2 : Layout of the function matrix

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. The function groups in the “CONTROL” group, for example, include: BASIC CONFIGURATION, UN-/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 resp. 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:

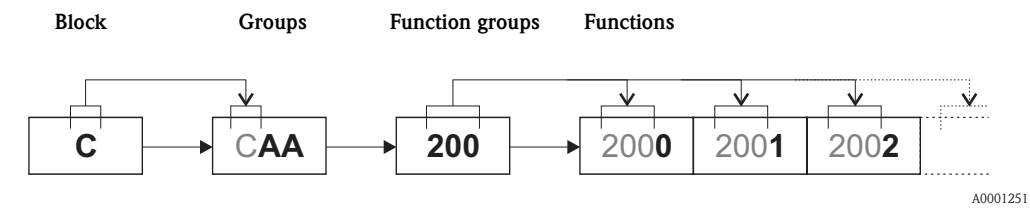
The code consists of three letters (AAA, ABA, BAA, etc.).
The first letter matches the block code (i.e. each group in block A has a code starting with an A __; the codes of the groups in block B start with a B __ etc.). The other two letters are for identifying the group within the respective block.

Function groups:

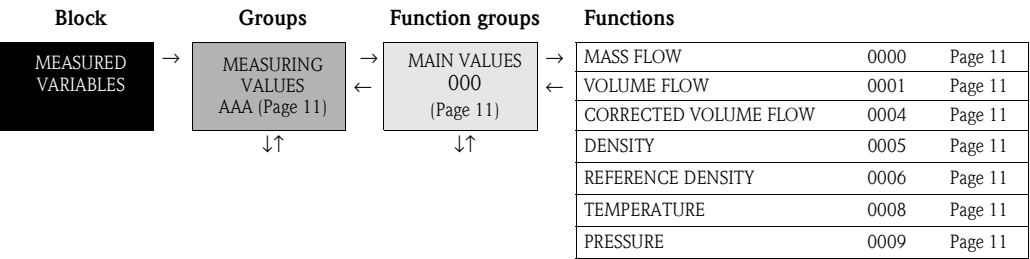
The code consists of three digits (000, 001, 100, etc.).

Functions:

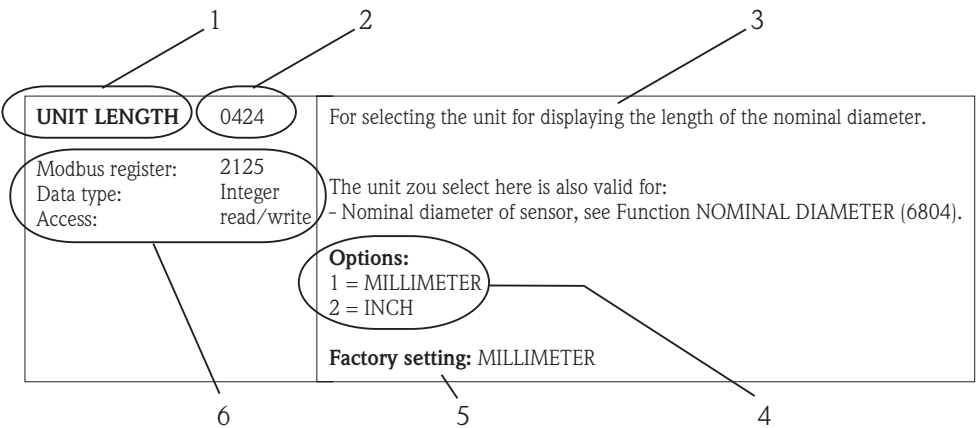
The code consists of four digits (0000, 0001, 0201, etc.).
The first three digits are the same as the code for the function group.
The last digit in the code is a counter for the functions in the function group, incrementing from 0 to 9 (e.g. function 0005 is the sixth function in group 000).



Example:



2.2 Illustration of the function descriptions



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

Fig. 3: 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 = read access via function code 03, 04, or 23; write access via 06, 16 or 23

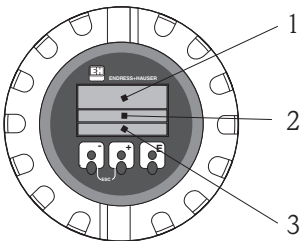


Note!

If a non-volatile 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 non-volatile device parameters via the MODBUS!

2.3 Display lines on the local display

The local display is split into various display lines.



F-x3xxxxxx-07-05-xx-xx-000

Fig. 4: 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 32.

2.4 Function matrix Proline Promass 83 MODBUS RS485

Blocks		Groups		Function groups
MEASURED VARIABLES A (see Page 10)	→	MEASURING VALUES AAA	→	see Page 11
		SYSTEM UNITS ACA	→	see Page 15
↓↑				
QUICK SETUP B (see Page 20)	→	Commissioning and application setups	→	see Page 20
↓↑				
USER INTERFACE C (see Page 31)	→	CONTROL CAA	→	see Page 32
		MAIN LINE CCA	→	see Page 36
		ADDITIONAL LINE CEA	→	see Page 40
		INFORMATION LINE CGA	→	see Page 46
↓↑				
TOTALIZER D (see Page 52)	→	TOTALIZER 1 DAA	→	see Page 53
		TOTALIZER 2 DAB	→	see Page 53
		TOTALIZER 3 DAC	→	see Page 53
		HANDLING TOTALIZER DJA	→	see Page 56
↓↑				
OUTPUT E (see Page 57)	→	CURRENT OUTPUT EAA	→	see Page 58
		PULSE/FREQ. OUTPUT ECA	→	see Page 67
		RELAY OUTPUT 1 EGA	→	see Page 92
		RELAY OUTPUT 2 EGB	→	see Page 92
↓↑				
INPUT F (see Page 101)	→	STATUS INPUT FAA	→	see Page 102
↓↑				
BASIC FUNCTION G (see Page 105)	→	MODBUS RS485 GDA	→	see Page 106
		PROCESS PARAMETER GIA	→	see Page 108
		SYSTEM PARAMETER GLA	→	see Page 117
		SENSOR DATA GNA	→	see Page 118
↓↑				
SPECIAL FUNCTION H (see Page 122)	→	DENSITY FUNCTIONS HAA	→	see Page 123
		BATCHING FUNCTION HCA	→	see Page 129
		ADVANCED DIAGNOSTICS HEA	→	see Page 147
↓↑				
SUPERVISION J (see Page 161)	→	SYSTEM JAA	→	see Page 162
		VERSION INFO JCA	→	see Page 165

3 Block MEASURED VARIABLES

Block	Groups	Function groups	Functions									
MEASURED VARIABLES (A)	MEASURING VALUES (AAA) P. 11	MAIN VALUES (000) P. 11	MASS FLOW (0000) P. 11	VOLUME FLOW (0001) P. 11	CORRECTED VOLUME FLOW (0004) P. 11	DENSITY (0005) P. 11	REFERENCE DENSITY (0006) P. 11	TEMPERATURE (0008) P. 11	PRESSURE (0009) P. 11			
		ADDITIONAL VALUES	TARGET MASS FLOW (0020) P. 12	% TARGET MASS FLOW (0021) P. 12	TARGET VOLUME FLOW (0022) P. 12	% TARGET VOLUME FLOW (0023) P. 12	CORR. TARGET VOL. FLOW (0024) P. 12	CARRIER MASS FLOW (0025) P. 13	% CARRIER MASS FLOW (0026) P. 13	CARRIER VOLUME FLOW (0027) P. 13	% CARRIER VOLUME FLOW (0028) P. 13	CORR. CARR. VOLUME FLOW (0029) P. 13
			% BLACK-LIQUOR (0030) P. 14	% BAUME (0031) P. 14	% API (0033) P. 14	% PLATO (0034) P. 14	% BALLING (0035) P. 14	% BRUX (0036) P. 14				
	SYSTEM UNITS (ACA) P. 15	CONFIGURATION (040) P. 15	UNIT MASS FLOW (0400) P. 15	UNIT MASS (0401) P. 15	UNIT VOLUME FLOW (0402) P. 16	UNIT VOLUME (0403) P. 16	UNIT CORR. VOL. FLOW (0404) P. 17	UNIT CORR. VOLUME (0405) P. 17				
		ADDITIONAL CONFIGURATION (042) P. 18	UNIT DENSITY (0420) P. 18	UNIT REF. DENSITY (0421) P. 18	UNIT TEMPERATURE (0422) P. 18	UNIT LENGTH (0424) P. 19	UNIT PRESSURE (0426) P. 19					

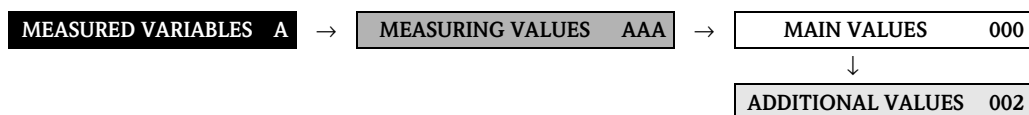
3.1 Group MEASURING VALUES

3.1.1 Function group MAIN VALUES

MEASURED VARIABLES A → MEASURING VALUES AAA → MAIN VALUES 000

Function description MEASURED VARIABLES → MEASURING VALUES → MAIN 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.		
MASS FLOW 0000 MODBUS register: 2007 247 Data type: Float Access: read		The currently measured mass flow appears on the display. Display: 5-digit floating-point number, including unit and sign (e.g. 462.87 kg/h; -731.63 lb/min; etc.)
VOLUME FLOW 0001 MODBUS register: 2009 253 Data type: Float Access: read		The calculated volume flow appears on the display. The volume flow is derived from the measured mass flow and the measured density of the fluid. Display: 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.)
CORRECTED VOLUME FLOW 0004 MODBUS register: 2011 Data type: Float Access: read		The calculated corrected volume flow appears on the display. The calculated corrected volume flow is derived from the measured mass flow and the reference density of the fluid (density at reference temperature, measured or fixed entry). Display: 5-digit floating-point number, including unit and sign (e.g. 1.3549 Nm ³ /h; 7.9846 scm/day; etc.)
DENSITY 0005 MODBUS register: 2013 249 Data type: Float Access: read		The currently measured density or its specific gravity appears on the display. Display: 5-digit floating point number, incl. unit, corresponding to 0.1000...6.0000 kg/dm ³ (e.g. 1.2345 kg/dm ³ ; 993.5 kg/m ³ ; 1.0015 SG_20 °C; etc.)
REFERENCE DENSITY 0006 MODBUS register: 2015 Data type: Float Access: read		The density of the fluid, at reference temperature, appears on the display. The reference density can be measured or also specified via the function FIXED REFERENCE DENSITY (6461), (see Page 112). Display: 5-digit floating point number, incl. unit, corresponding to 0.1000...6.0000 kg/dm ³ (e.g. 1.2345 kg/dm ³ ; 993.5 kg/m ³ ; 1.0015 SG_20 °C; etc.)
TEMPERATURE 0008 MODBUS register: 2017 251 Data type: Float Access: read		The currently measured temperature appears on the display. Display: max. 4-digit fixed-point number, including unit and sign (e.g. -23.4 °C; 160.0 °F; 295.4 K; etc.)
PRESSURE 0009 MODBUS register: 2089 257 Data type: Float Access: read		The specified pressure appears on the display. Display: max. 4-digit fixed-point number, including unit and sign (e.g. 50 barg, etc.)

3.1.2 Function group ADDITIONAL VALUES



Function description	
MEASURED VARIABLES → MEASURING VALUES → ADDITIONAL VALUES	
TARGET MASS FLOW 0020 MODBUS register: 2023 Data type: Float Access: read	 Note! Function is not available unless one of the following was selected: ■ in the function DENSITY FUNCTION (7000), see Page 123: – % MASS / % VOLUME – FLEXIBLE and in the function MODE (7021), see Page 125, the selection % MASS 2D or % MASS 3D The currently measured mass flow of the target fluid appears on the display. Target fluid = carried material (e.g. lime powder). Display: 5-digit floating-point number, including unit and sign
% TARGET MASS FLOW 0021 MODBUS register: 2025 Data type: Float Access: read	 Note! Function is not available unless one of the following was selected: ■ in the function DENSITY FUNCTION (7000), see Page 123: – % MASS / % VOLUME – FLEXIBLE and in the function MODE (7021), see Page 125, the selection % MASS 2D or % MASS 3D The currently measured mass flow of the target fluid is displayed as a % (of the overall mass flow). Target fluid = carried material (e.g. lime powder). Display: 5-digit floating-point number, including unit and sign
TARGET VOLUME FLOW 0022 MODBUS register: 2029 Data type: Float Access: read	 Note! Function is not available unless one of the following was selected: ■ in the function DENSITY FUNCTION (7000), see Page 123: – % MASS / % VOLUME – FLEXIBLE and in the function MODE (7021), see Page 125, the selection % VOLUME 2D or % VOLUME 3D The currently measured volume flow of the target fluid appears on the display. Target fluid = carried material (e.g. lime powder). Display: 5-digit floating-point number, including unit and sign
% TARGET VOLUME FLOW 0023 MODBUS register: 2031 Data type: Float Access: read	 Note! Function is not available unless one of the following was selected: ■ in the function DENSITY FUNCTION (7000), see Page 123: – % MASS / % VOLUME – FLEXIBLE and in the function MODE (7021), see Page 125, the selection % VOLUME 2D or % VOLUME 3D The currently measured volume flow of the target fluid is displayed as a % (of the overall volume flow). Target fluid = carried material (e.g. lime powder). Display: 5-digit floating-point number, including unit and sign
CORRECTED TARGET VOLUME FLOW 0024 MODBUS register: 2033 Data type: Float Access: read	 Note! Function is not available unless % MASS / % VOLUME was selected in the DENSITY FUNCTION function (7000), (see Page 123). The currently measured corrected volume flow of the target fluid appears on the display. Target fluid = carried material (e.g. lime powder). Display: 5-digit floating-point number, including unit and sign

		Function description
		MEASURED VARIABLES → MEASURING VALUES → ADDITIONAL VALUES
CARRIER MASS FLOW	0025	 Note! Function is not available unless one of the following was selected: ■ in the function DENSITY FUNCTION (7000), see Page 123: – % MASS / % VOLUME – FLEXIBLE and in the function MODE (7021), see Page 125, the selection % MASS 2D or % MASS 3D The currently measured mass flow of the carrier fluid appears on the display. Carrier fluid = transporting liquid (e.g. water). Display: 5-digit floating-point number, including unit and sign
% CARRIER MASS FLOW	0026	 Note! Function is not available unless one of the following was selected: ■ in the function DENSITY FUNCTION (7000), see Page 123: – % MASS / % VOLUME – FLEXIBLE and in the function MODE (7021), see Page 125, the selection % MASS 2D or % MASS 3D The currently measured mass flow of the carrier fluid is displayed as a % (of the overall mass flow). Carrier fluid = transporting liquid (e.g. water). Display: 5-digit floating-point number, including unit and sign
CARRIER VOLUME FLOW	0027	 Note! Function is not available unless one of the following was selected: ■ in the function DENSITY FUNCTION (7000), see Page 123: – % MASS / % VOLUME – FLEXIBLE and in the function MODE (7021), see Page 125, the selection % VOLUME 2D or % VOLUME 3D The currently measured volume flow of the carrier fluid appears on the display. Carrier fluid = transporting liquid (e.g. water). Display: 5-digit floating-point number, including unit and sign
% CARRIER VOLUME FLOW	0028	 Note! Function is not available unless % MASS / % VOLUME was selected in the DENSITY FUNCTION function (7000), (see Page 123). Use this function to display the currently measured corrected volume flow of the carrier fluid. Carrier fluid = transporting liquid (e.g. water). Display: 5-digit floating-point number, including unit and sign
CORRECTED CARRIER VOLUME FLOW	0029	 Note! Function is not available unless % MASS / % VOLUME was selected in the DENSITY FUNCTION function (7000), (see Page 123). The currently measured corrected volume flow of the carrier fluid appears on the display. Carrier fluid = transporting liquid (e.g. water). Display: 5-digit floating-point number, including unit and sign

Function description		
MEASURED VARIABLES → MEASURING VALUES → ADDITIONAL VALUES		
% BLACK-LIQUOR	0030	 Note! Function is not available unless %-BLACK LIQUOR was selected in the DENSITY FUNCTION function (7000), (see Page 123). The concentration in %-BLACK LIQUOR is displayed. Display: 5-digit floating-point number, including units
MODBUS register:	2027	
Data type:	Float	
Access:	read	
°BAUME	0031	 Note! Function is not available unless °BAUME was selected in the DENSITY FUNCTION function (7000), (see Page 123). The concentration in °BAUME is displayed. Display: 5-digit floating-point number, including units
MODBUS register:	2045	
Data type:	Float	
Access:	read	
°API	0033	 Note! Function is not available unless °API was selected in the DENSITY FUNCTION function (7000), (see Page 123). The concentration in °API is displayed. Display: 5-digit floating-point number, including units
MODBUS register:	2049	
Data type:	Float	
Access:	read	
°PLATO	0034	 Note! Function is not available unless °PLATO was selected in the DENSITY FUNCTION function (7000), (see Page 123). The concentration in °PLATO is displayed. Display: 5-digit floating-point number, including units
MODBUS register:	2051	
Data type:	Float	
Access:	read	
°BALLING	0035	 Note! Function is not available unless °BALLING was selected in the DENSITY FUNCTION function (7000), (see Page 123). The concentration in °BALLING is displayed. Display: 5-digit floating-point number, including units
MODBUS register:	2053	
Data type:	Float	
Access:	read	
°BRIX	0036	 Note! Function is not available unless °BRIX was selected in the DENSITY FUNCTION function (7000), (see Page 123). The concentration in °BRIX is displayed. Display: 5-digit floating-point number, including units
MODBUS register:	2055	
Data type:	Float	
Access:	read	

3.2 Group SYSTEM UNITS

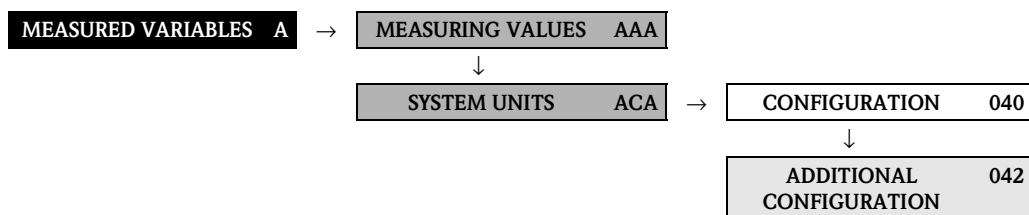
3.2.1 Function group CONFIGURATION

MEASURED VARIABLES A		→	MEASURING VALUES AAA	
			↓	
			SYSTEM UNITS ACA	→ CONFIGURATION 040
Function description MEASURED VARIABLES → MEASURING VALUES → CONFIGURATION				
You can select the units for measured variables in this function group.				
UNIT MASS FLOW 0400		For selecting the unit for displaying the mass flow (mass/time).		
MODBUS register:	2101	The unit you select here is also valid for:		
Data type:	Integer	■ Current output		
Access:	read/write	■ 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: Country-dependent (kg/h or US-lb/min)		
UNIT MASS 0401		For selecting the unit for displaying the mass.		
MODBUS register:	2102	The unit you select here is also valid for:		
Data type:	Integer	■ Pulse value (e.g. kg/p)		
Access:	read/write	Options:		
		Metric:		
		0 = g		
		1 = kg		
		2 = t		
		US:		
		3 = oz		
		4 = lb		
		5 = ton		
		Factory setting: Country-dependent (kg or US-lb)		
		 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 → MEASURING VALUES → CONFIGURATION		
UNIT VOLUME FLOW	0402	For selecting the unit for displaying the volume flow (volume/time). The unit you select here is also valid for: ■ Current output ■ Frequency output ■ Relay switch points (limit value for volume flow, flow direction) ■ Low flow cut off Options: Metric: 0...3 = cubic centimetre → cm³/s; cm³/min; cm³/h; cm³/day 4...7 = cubic decimetre → 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 = million gallon → Mgal/s; Mgal/min; Mgal/h; Mgal/day 52...55 = barrel (normal fluids: 31.5 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day 56...59 = barrel (beer: 31.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day 60...63 = barrel (petrochemicals: 42.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day 64...67 = barrel (filling tanks: 55.0 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: Country-dependent (m³/h or US-Mgal/day)
UNIT VOLUME	0403	For selecting the unit for displaying the volume. The unit you select here is also valid for: Pulse weighting (e.g. m³/p) Options: 0...6 = metric → cm³; dm³; m³; ml; l; hl; Ml Mega 7...16 = US → cc; af; ft³; oz f; gal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals); bbl (filling tanks) 17...20 = Imperial → gal; Mgal; bbl (beer); bbl (petrochemicals) Factory setting: m³  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 → MEASURING VALUES → CONFIGURATION		
UNIT CORRECTED VOLUME FLOW	0404	For selecting the unit for displaying the corrected volume flow (corrected volume/time). MODBUS register: 2105 Data type: Integer Access: read/write The unit you select here is also valid for: ■ Current output ■ Frequency output ■ Relay switch points (limit value for corrected volume flow, flow direction) ■ Low flow cut off Options: Metric: 0 = m^3/s 1 = m^3/min 2 = m^3/h 3 = m^3/day 4 = Nm^3/s 5 = Nm^3/min 6 = Nm^3/h 7 = Nm^3/day US: 8 = Sm^3/s 9 = Sm^3/min 10 = Sm^3/h 11 = Sm^3/day 12 = Scf/s 13 = Scf/min 14 = Scf/h 15 = Scf/day Factory setting: Nm^3/h
UNIT CORRECTED VOLUME	0405	For selecting the unit for displaying the corrected volume. MODBUS register: 2106 Data type: Integer Access: read/write The unit you select here is also valid for: ■ Pulse value (e.g. Nm^3/p) Options: Metric: 0 = Nm^3 1 = m^3 US: 2 = Sm^3 3 = Scf Factory setting: Nm^3  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 → MEASURING VALUES → ADDITIONAL CONFIGURATION		
UNIT DENSITY	0420	For selecting the unit for displaying the fluid density.
MODBUS register:	2107	The unit you select here is also valid for:
Data type:	Integer	■ Current output ■ Frequency output ■ Relay switch points (limit value for density) ■ Density response value for EPD ■ Density adjustment value
Access:	read/write	Options: 0...10 = metric → g/cm³; g/cc; kg/dm³; kg/l; kg/m³; SD 4 °C, SD 15 °C, SD 20 °C; SG 4 °C, SG 15 °C, SG 20 °C 11...16 = US → lb/ft³; 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 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 REFERENCE DENSITY	0421	For selecting the unit for displaying the reference density.
MODBUS register:	2108	The unit you select here is also valid for:
Data type:	Integer	■ Current output ■ Frequency output ■ Relay switch points (limit value for density) ■ Fixed reference density (for calculation of corrected volume flow)
Access:	read/write	Options: Metric: 1 = kg/Nl 2 = kg/Nm³ US: 0 = g/Sc 3 = kg/Sm³ 4 = lb/Scf Factory setting: kg/Nl
UNIT TEMPERATURE	0422	For selecting the unit for displaying the temperature.
MODBUS register:	2109	The unit you select here is also valid for:
Data type:	Integer	■ Current output ■ Frequency output ■ Relay switch points (limit value for temperature) ■ Reference temperature (for corrected vol. measurement with measured reference density)
Access:	read/write	Options: 0 = °C (Celsius) 1 = K (Kelvin) 2 = °F (Fahrenheit) 3 = °R (Rankine) Factory setting: °C

Function description		
MEASURED VARIABLES → MEASURING VALUES → ADDITIONAL CONFIGURATION		
UNIT LENGTH MODBUS register: Data type: Access:	0424 2125 Integer read/write	For selecting the unit for displaying the length of the nominal diameter. The unit you select here is also valid for: ■ Nominal diameter of sensor (function NOMINAL DIAMETER (6804) on Page 118) Options: 0 = MILLIMETER 1 = INCH Factory setting: MILLIMETER
UNIT PRESSURE MODBUS register: Data type: Access:	0426 2130 Integer read/write	For selecting the unit for displaying the pressure. The unit you select here is also valid for: ■ Specified pressure (function PRESSURE (6501) on Page 116) Options: 0 = bara 1 = barg 2 = psia 3 = psig Factory setting: barg

4 Block QUICK SETUP

Block	Group / Function groups	Functions				
QUICK SETUP (B)	→	OS COMMISSION (1002) P. 20	→	OS - PULS. FLOW (1003) P. 20	OS - BATCHING (1005) P. 20	SETUP GAS MEAS. (1004) P. 20
		T-DAT SAVE/LOAD (1009) P. 21			QS - COM- MUNICATION (1006) P. 20	

Function description QUICK SETUP

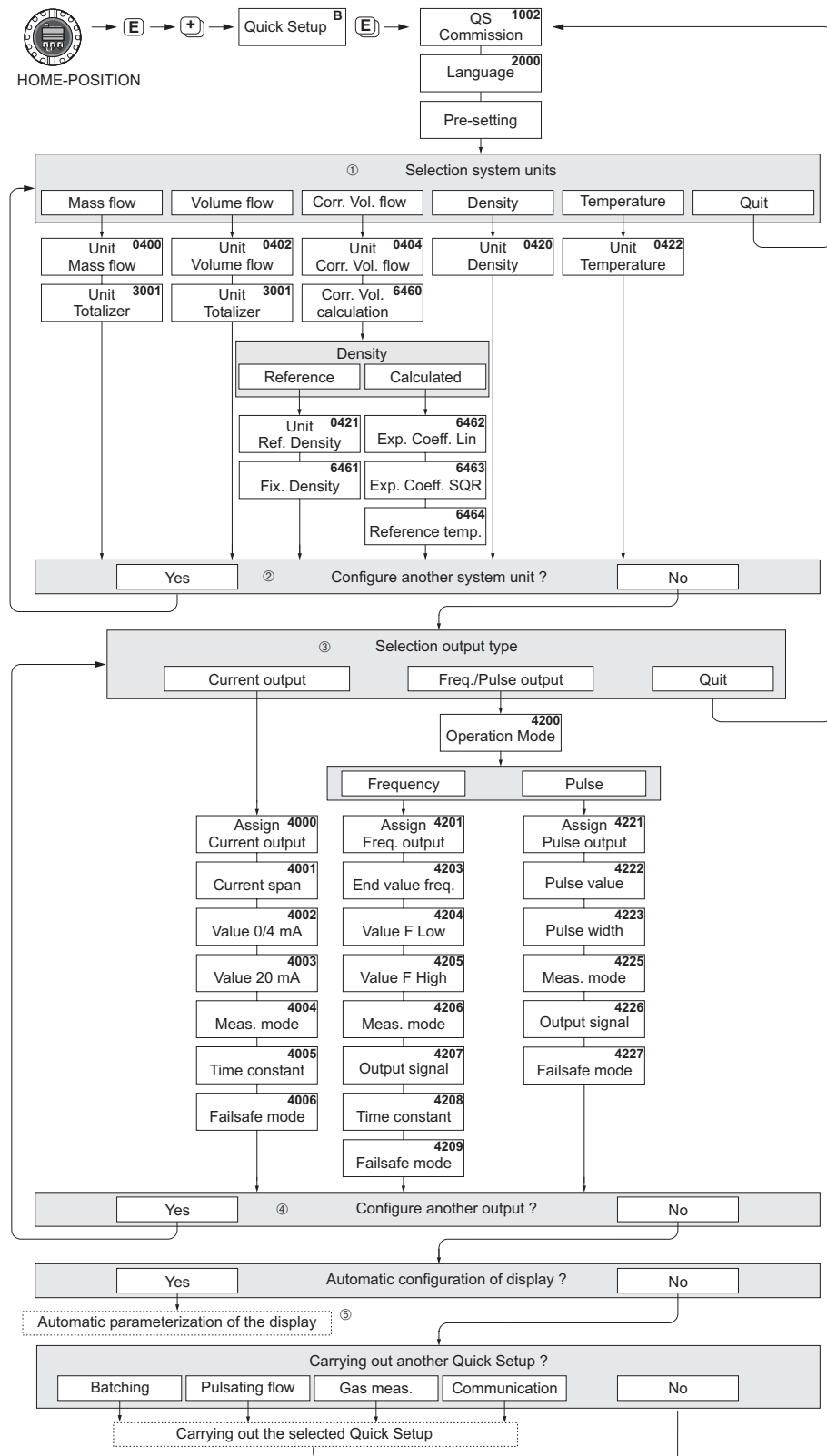
 Note!

- 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 BA107D.

QUICK SETUP COMMISSION	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 frequency output. For starting the Setup menu. Options: NO YES Factory setting: NO
QUICK SETUP BATCHING/ DOSING	1005	 Note! Function is only available with the optional software package BATCHING. For starting the Setup menu. Options: NO YES Factory setting: NO
SETUP GAS MEASUREMENT	1004	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 safety 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! ■ The device is restarted if "LOAD" (2) is selected. ■ If the power supply fails, the reading of the totalizers are automatically saved in the EEPROM. ■ You cannot "LOAD" from the T-DAT to the EEPROM if the T-DAT is empty or defect. ■ The "LOAD" or "SAVE" setting cannot be carried out if no T-DAT is available.

4.0.1 Setup Commissioning



F06-83MBxxxx-19-xx-xx-en-000

**Note!**

- The display returns to the cell QUICK SETUP COMMISSION (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, volume and corrected 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 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 = Mass flow;
Additional line = Totalizer 1;
Information line = Operating/system conditions
 - NO : The existing (selected) settings remain.

4.0.2 Batching Setup menu

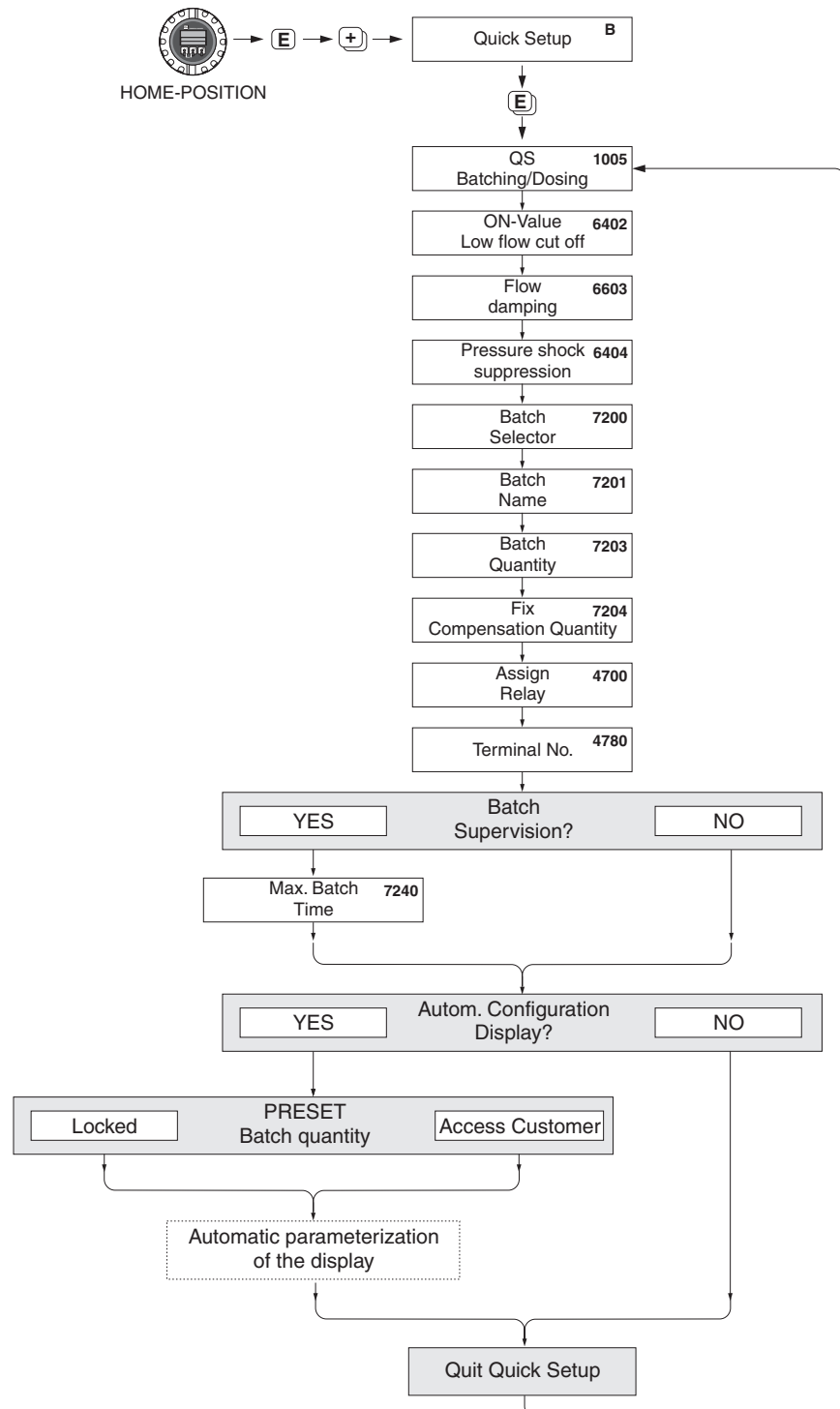
This Setup menu guides the user systematically through all the device functions that have to be adjusted and configured for batching operation. The Setup menu settings result in a (simple) one-stage batching process. The parameters for additional settings, e.g. for automatic compensation of after-runs or multi-stage batching must be manually set in the function matrix.



Note!

Each time the setup is launched, the same values are displayed or specified for the individual device functions (see Table on Page 26, “Recommended settings” column).

This means that every time the setup is run, the device functions have to be checked and modified if necessary.



F06-53xxxxxx-19-xx-xx-en-002

**Note!**

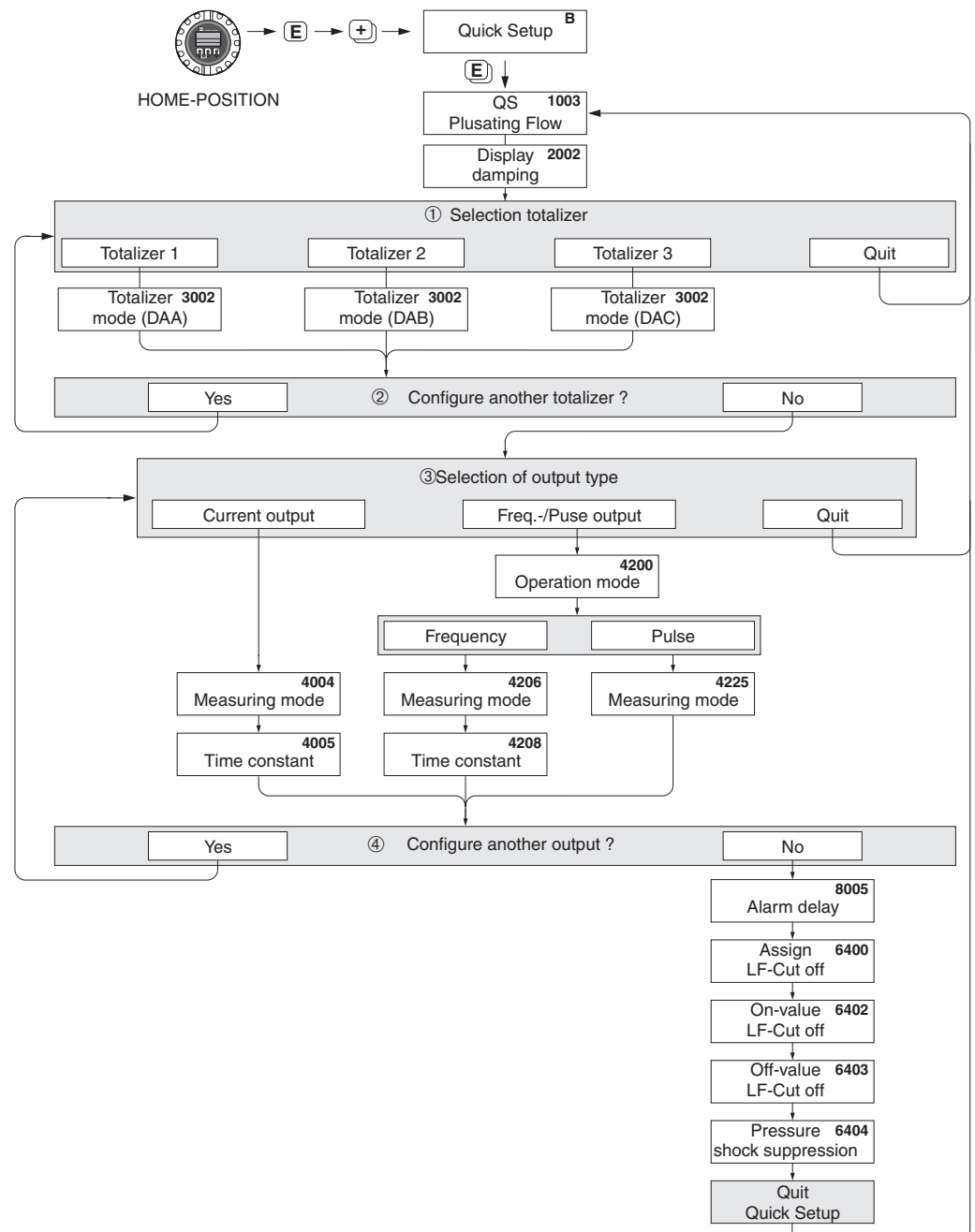
- This Setup menu is only available when the optional software package BATCHING is installed in the measuring device. By means of the order option, the software package can already be installed in the measuring device when delivered from the factory or it can be ordered at a later date from Endress +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

**Caution!**

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

Settings for the Batching Setup menu:			
Fct. code	Function name	Suggested settings	Description
Call up through the function matrix:			
B	QUICK SETUP	QUICK SETUP BATCHING/DOSING	see Page 20
1005	QUICK SETUP BATCHING/DOSING	YES	see Page 20
Settings (functions with a grey background are set automatically):			
6400	ASSIGN LOW FLOW CUT OFF	Mass	see Page 108
6402	ON-VALUE LOW FLOW CUT OFF	Depends on diameter (DN [mm]): – DN 1 = 0.02 [kg/h] resp. [l/h] – DN 2 = 0.10 [kg/h] resp. [l/h] – DN 4 = 0.45 [kg/h] resp. [l/h] – DN 8 = 2.0 [kg/h] resp. [l/h] – DN 15 = 6.5 [kg/h] resp. [l/h] – DN 15* = 18 [kg/h] resp. [l/h] – DN 25 = 18 [kg/h] resp. [l/h] – DN 25* = 45 [kg/h] resp. [l/h] – DN 40 = 45 [kg/h] resp. [l/h] – DN 40* = 70 [kg/h] resp. [l/h] – DN 50 = 70 [kg/h] resp. [l/h] – DN 80 = 180 [kg/h] resp. [l/h] – DN 100 = 350 [kg/h] resp. [l/h] – DN 150 = 650 [kg/h] resp. [l/h] – DN 250 = 1800 [kg/h] resp. [l/h] *DN 15, 25, 40 “FB” = Full bore versions Promass I	see Page 108
6403	OFF-VALUE LOW FLOW CUT OFF	50%	see Page 108
6603	FLOW DAMPING	0 seconds	see Page 117
6404	PRESSURE SHOCK SUPPRESSION	0 seconds	see Page 109
7200	BATCH SELECTOR	BATCH #1	see Page 129
7201	BATCH NAME	BATCH #1	see Page 130
7202	ASSIGN BATCH VARIABLE	Massflow	see Page 129
7203	BATCH QUANTITY	0	see Page 130
7204	FIX COMPENSATION QUANTITY	0	see Page 131
7205	COMPENSATION MODE	OFF	see Page 131
7208	BATCH STAGES	1	see Page 134
7209	INPUT FORMAT	Value input	see Page 135
4700	ASSIGN RELAY	BATCHING VALVE 1	see Page 92
4780	TERMINAL NUMBER	Output (display only)	see Page 97
7220	OPEN VALVE 1	0% or 0 [unit]	see Page 136
7240	MAXIMUM BATCHING TIME	0 seconds (Off)	see Page 141
7241	MINIMUM BATCHING QUANTITY	0 seconds	see Page 141
7242	MAXIMUM BATCHING QUANTITY	0 seconds	see Page 142
2200	ASSIGN (Main line)	BATCH NAME	see Page 36
2220	ASSIGN (Multiplex main line)	Off	see Page 38
2400	ASSIGN (Additional line)	BATCH DOWNWARDS	see Page 40
2420	ASSIGN (Multiplex additional line)	Off	see Page 43
2600	ASSIGN (Info line)	BATCHING KEYS	see Page 46
2620	ASSIGN (Multiplex info line)	Off	see Page 49

4.0.3 Pulsating flow Setup menu



F06-83xxxxxx-19-xx-xx-en-001

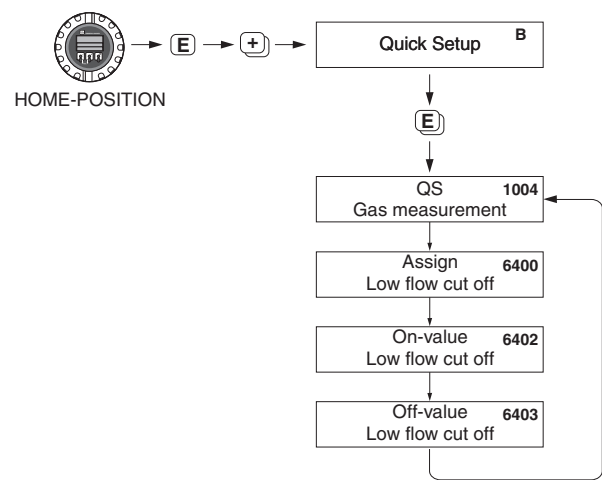


Note!

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

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 Page 20
1003	QUICK SETUP PULSATING	YES	see Page 20
Basic configuration:			
2002	DISPLAY DAMPING	1 second	see Page 33
3002	TOTALIZER MODE (DAA)	BALANCE	see Page 54
3002	TOTALIZER MODE (DAB)	BALANCE	see Page 54
3002	TOTALIZER MODE (DAC)	BALANCE	see Page 54
Select the signal type: CURRENT OUTPUT (1...n)			
4004	MEASURING MODE	PULSATING FLOW	see Page 61
4005	TIME CONSTANT	1 second	see Page 64
Select the signal type: FREQ./PULSE OUTPUT (1...n) / operating mode: FREQUENCY			
4206	MEASURING MODE	PULSATING FLOW	see Page 65
4208	TIME CONSTANT	0 seconds	see Page 77
Select the signal type: FREQ./PULSE OUTPUT (1...n) / operating mode: PULSE			
4225	MEASURING MODE	PULSATING FLOW	see Page 79
Other settings:			
8005	ALARM DELAY	0 seconds	see Page 162
6400	ASSIGN LF CUT OFF	MASS FLOW	see Page 108
6402	ON-VALUE LOW FLOW CUT OFF	Depends on diameter (DN [mm]): – DN 1 = 0.02 [kg/h] resp. [l/h] – DN 2 = 0.10 [kg/h] resp. [l/h] – DN 4 = 0.45 [kg/h] resp. [l/h] – DN 8 = 2.0 [kg/h] resp. [l/h] – DN 15 = 6.5 [kg/h] resp. [l/h] – DN 15* = 18 [kg/h] resp. [l/h] – DN 25 = 18 [kg/h] resp. [l/h] – DN 25* = 45 [kg/h] resp. [l/h] – DN 40 = 45 [kg/h] resp. [l/h] – DN 40* = 70 [kg/h] resp. [l/h] – DN 50 = 70 [kg/h] resp. [l/h] – DN 80 = 180 [kg/h] resp. [l/h] – DN 100 = 350 [kg/h] resp. [l/h] – DN 150 = 650 [kg/h] resp. [l/h] – DN 250 = 1800 [kg/h] resp. [l/h] *DN 15, 25, 40 "FB" = Full bore versions Promass I	see Page 108
6403	OFF-VALUE LOW FLOW CUT OFF	50%	see Page 108
6404	PRESSURE SHOCK SUPPRESSION	0 s	see Page 109

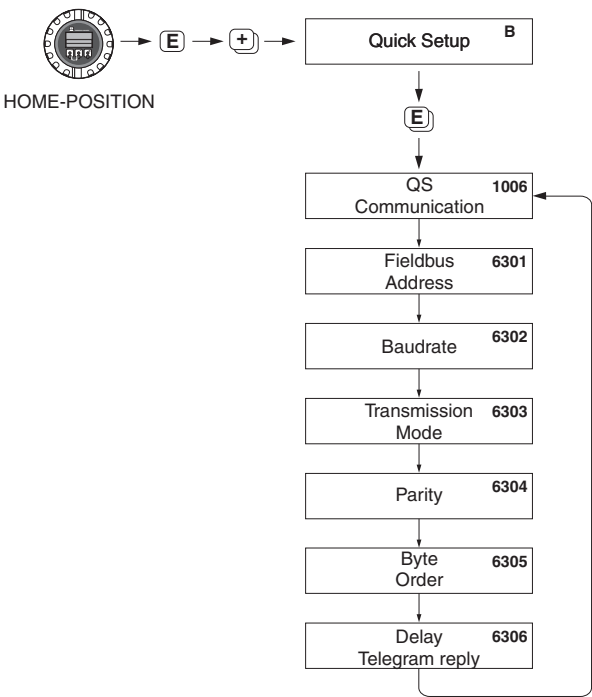
4.0.4 Gas measurement Setup menu



F06-83xxxxxx-19-xx-xx-en-002

Settings for the Gas Measurement Setup menu:			
Fct. code	Function name	Suggested settings	Description
Call up through the function matrix:			
B	QUICK SETUP	QUICK SETUP GAS MEASUR.	see Page 20
1004	QUICK SETUP GAS MEASUR.	YES	see Page 20
Basic configuration:			
6420	EMPTY PIPE DETECTION	No entry possible, the selection changes automatically to OFF.	see Page 110
6400	ASSIGN LOW FLOW CUT OFF	For gas measurement we recommend to switch off the low flow cut off. OFF	see Page 108
6402	ON-VALUE LOW FLOW CUT OFF	If you don't switch off the low flow cut off: 0.0000	see Page 108
6403	OFF-VALUE LOW FLOW CUT OFF	If you don't switch off the low flow cut off: 50%	see Page 108

4.0.5 Communication Setup menu



F06-83MBxxx-19-xx-xx-en-004

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 Page 20
1006	QUICK SETUP COMMUNICATION	YES	see Page 20
Basic configuration:		Factory setting:	
6301	FIELDBUS ADDRESS	247	see Page 106
6302	BAUDRATE	19200 BAUD	see Page 106
6303	TRANSMISSION MODE	RTU	see Page 106
6304	PARITY	EVEN	see Page 106
6305	BYTE ORDER	1 - 0 - 3 - 2	see Page 107
6306	DELAY TELEGRAM REPLY	10 ms	see Page 107

5 Block USER INTERFACE

Block	Groups	Function groups	Functions
USER INTERFACE (C)	CONTROL (CAA) P. 32	BASIC CONFIG. (200) P. 32	LANGUAGE (2000) P. 32
			DISPLAY DAMPING (2002) P. 33
		UN-/LOCKING (202) P. 34	CONTRAST LCD (2003) P. 33
			BACKLIGHT (2004) P. 33
	MAIN LINE (CCA) P. 36	ACCESS CODE (2020) P. 34	DEFINE PRIVATE CODE (2021) P. 34
			STATUS ACCESS (2022) P. 34
		OPERATION (204) P. 35	ACCESS CODE COUNTER (2023) P. 34
			TEST DISPLAY (2040) P. 35
	ADDITIONAL LINE	CONFIGURATION (220) P. 36	100% VALUE (2201) P. 37
			FORMAT (2202) P. 37
		MULTIPLEX (222) P. 38	100% VALUE (2221) P. 39
			FORMAT (2222) P. 39
	INFORMATION LINE	CONFIGURATION (240) P. 40	100% VALUE (2401) P. 41
			DISPLAY MODE (2403) P. 42
		MULTIPLEX (242) P. 43	100% VALUE (2421) P. 44
			DISPLAY MODE (2422) P. 45
		CONFIGURATION (260) P. 46	100% VALUE (2601) P. 47
			DISPLAY MODE (2603) P. 48
		MULTIPLEX (262) P. 49	100% VALUE (2621) P. 50
			DISPLAY MODE (2623) P. 51

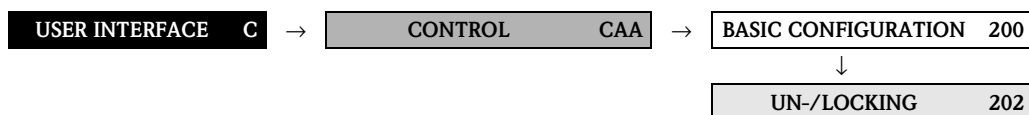
5.1 Group CONTROL

5.1.1 Function group BASIC CONFIGURATION

USER INTERFACE		C	→	CONTROL	CAA	→	BASIC CONFIGURATION	200
Function description								
USER INTERFACE → CONTROL → BASIC CONFIGURATION								
LANGUAGE	2000	For selecting the language for all texts, parameters and messages shown on the local display.						
MODBUS register:	2502	 Note! The displayed options depend on the language group available. The language group that is supplied with the measuring device is displayed in the LANGUAGE GROUP (8226) function (see Page 167). Options: (for language group WEST EU / USA) 0 = ENGLISH 1 = DEUTSCH 2 = FRANCAIS 3 = ESPANOL 4 = ITALIANO 5 = NEDERLANDS 12 = PORTUGUESE Options: (for language group EAST EU / SCAND) 0 = ENGLISH 7 = NORSK 8 = SVENSKA 9 = SUOMI 13 = POLISH 14 = RUSSIAN 15 = CZECH Options: (for language group ASIA) 0 = ENGLISH 10 = BAHASA INDONESIA 11 = JAPANESE (syllabary) Options: (for language group CHINA) 0 = ENGLISH 16 = CHINESE Factory setting: Country-dependent (Page 172)  Note! ■ If you press the  and  keys at startup, the language defaults to “ENGLISH”. ■ You can change the language group via the service and operating program ToF Tool - FieldTool Package. Please do not hesitate to contact your Endress+Hauser sales office if you have any questions.						
Data type:	Integer							
Access:	read/write							

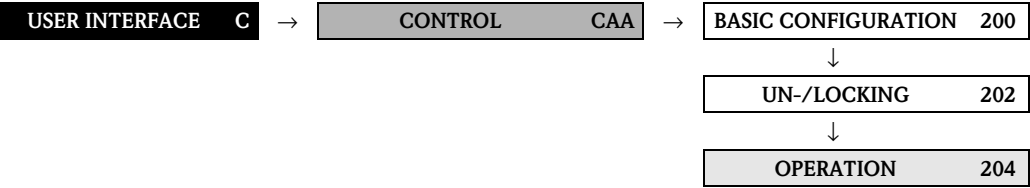
Function description USER INTERFACE → CONTROL → BASIC CONFIGURATION		
DISPLAY DAMPING 2002 MODBUS register: 2503 Data type: Float Access: read/write		For entering a time constant which defines how the display reacts to severely fluctuating flow variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). User input: 0...100 seconds Factory setting: 1 s  Note! Entering the value “0” (seconds) means that the damping is switched off.
CONTRAST LCD 2003 MODBUS register: 2505 Data type: Float Access: read/write		For adjusting the 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		For adjusting 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 UN-/LOCKING



Function description	
USER INTERFACE → CONTROL → UN-/LOCKING	
ACCESS CODE 2020	 Note! This function is only relevant for local operation and has no effect on access via MODBUS 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 = 83, see function DEFINE PRIVATE CODE (2021)). 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	 Note! This function is only relevant for local operation and has no effect on access via MODBUS communication. For specifying a personal code for enabling programming in the function ACCESS CODE. User input: 0...9999 (max. 4-digit number) Factory setting: 83  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	Indicates whether access to the function matrix is currently possible (ACCESS CUSTOMER) or whether configuration is locked (LOCKED). Display: 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. Display: max. 7-digit number: 0...9999999 Factory setting: 0

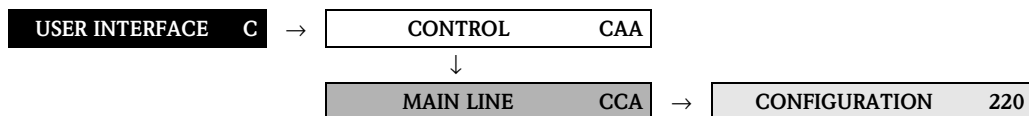
5.1.3 Function group OPERATION



Function description		
USER INTERFACE → CONTROL → OPERATION		
TEST DISPLAY	2040	For testing the operability of the local display and its pixels. MODBUS register: 2513 Data type: Integer Access: read/write 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 second. 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 second. When the test is completed, the local display returns to its initial state and the setting changes to “OFF”.

5.2 Group MAIN LINE

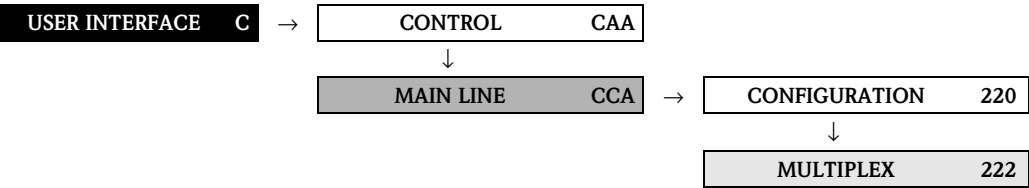
5.2.1 Function group CONFIGURATION



Function description USER INTERFACE → CONTROL → CONFIGURATION		
ASSIGN	2200	For assigning a value to be displayed to the main line (top line in the local display). This value is displayed during normal operation. Options: (standard) 0 = OFF 1 = MASS FLOW 2 = MASS FLOW IN % 3 = VOLUME FLOW 4 = VOLUME FLOW IN % 5 = CORRECTED VOLUME FLOW 6 = CORRECTED VOLUME FLOW IN % 7 = DENSITY 8 = REFERENCE DENSITY 9 = TEMPERATURE 15 = ACTUAL CURRENT 18 = ACTUAL FREQUENCY 20 = TOTALIZER 1 21 = TOTALIZER 2 22 = TOTALIZER 3 Factory setting: MASS FLOW Advanced selection: (with the optional SW package BATCHING) 52 = BATCH NAME ("BATCH # 1" or "BEER 330", etc.) 53 = BATCH QUANTITY (overall quantity to be batched) 54 = BATCH COUNTER (batching processes carried out) 55 = BATCH SUM (effective total batching quantity) Note! The options given in the BATCHING software package always refer to the batching selected in the function BATCH SELECTOR ("BATCH # 1", "BATCH # 2", etc.). 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. Advanced selection: (with the optional SW package CONCENTRATION) 61 = TARGET MASS FLOW 62 = % TARGET MASS FLOW 63 = TARGET VOLUME FLOW 64 = % TARGET VOLUME FLOW 65 = CORRECTED TARGET VOLUME FLOW 66 = CARRIER MASS FLOW 67 = % CARRIER MASS FLOW 68 = CARRIER VOLUME FLOW 69 = % CARRIER VOLUME FLOW 70 = CORRECTED CARRIER VOLUME FLOW 71 = % BLACK LIQUOR 72 = ° BAUME 74 = ° API 75 = ° PLATO 76 = ° BALLING 77 = ° BRIX 78 = OTHER (_ _ _ flexible concentration) (continued on next page)

Function description USER INTERFACE → CONTROL → CONFIGURATION		
ASSIGN (continued)	2200	Advanced selection: (with the optional SW package ADVANCED DIAGNOSIS) 79 = MASS FLOW DEVIATION 80 = DENSITY DEVIATION 81 = REFERENCE DENSITY DEVIATION 82 = TEMPERATURE DEVIATION 83 = TUBE DAMPING DEVIATION 84 = ELECTRODYNAMIC SENSOR DEVIATION
100% VALUE MODBUS register: Data type: Access:	2201 2519 Float read/write	 Note! Function is not available unless one of the following was selected in the ASSIGN function (2200): ■ MASS FLOW IN % ■ VOLUME FLOW IN % ■ CORRECTED VOLUME FLOW IN % For specifying the flow value to be shown on the display as the 100% value. User input: 5-digit floating-point number Factory setting: 10 kg/s, 10 l/s or 10 NI/s
FORMAT MODBUS register: Data type: Access:	2202 2516 Integer read/write	For selecting the maximum number of places after the decimal point to be displayed for the display value. 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 measuring value and the engineering unit (e.g. 1.2 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

5.2.2 Function group MULTIPLEX

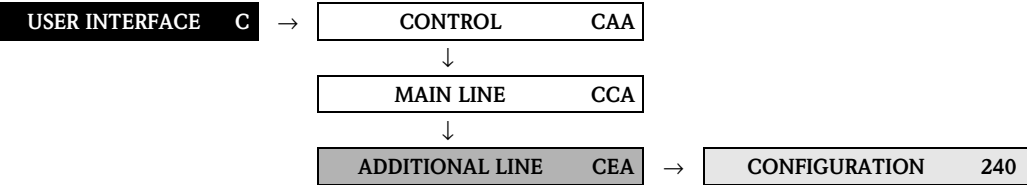


Function description		
USER INTERFACE → CONTROL → MULTIPLEX		
ASSIGN	2220	For assigning a second reading to be displayed in the main line alternately (every 10 seconds) with the value defined in the ASSIGN function (2200). Options: (standard) 0 = OFF 1 = MASS FLOW 2 = MASS FLOW IN % 3 = VOLUME FLOW 4 = VOLUME FLOW IN % 5 = CORRECTED VOLUME FLOW 6 = CORRECTED VOLUME FLOW IN % 7 = DENSITY 8 = REFERENCE DENSITY 9 = TEMPERATURE 15 = ACTUAL CURRENT 18 = ACTUAL FREQUENCY 20 = TOTALIZER 1 21 = TOTALIZER 2 22 = TOTALIZER 3 Factory setting: OFF Advanced selection: (with the optional SW package BATCHING) 52 = BATCH NAME ("BATCH # 1" or "BEER 330", etc.) 53 = BATCH QUANTITY (overall quantity to be batched) 54 = BATCH COUNTER (batching processes carried out) 55 = BATCH SUM (effective total batching quantity) Note! The options given in the BATCHING software package always refer to the batching selected in the function BATCH SELECTOR ("BATCH # 1", "BATCH # 2", etc.). 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. Advanced selection: (with the optional SW package CONCENTRATION) 61 = TARGET MASS FLOW 62 = % TARGET MASS FLOW 63 = TARGET VOLUME FLOW 64 = % TARGET VOLUME FLOW 65 = CORRECTED TARGET VOLUME FLOW 66 = CARRIER MASS FLOW 67 = % CARRIER MASS FLOW 68 = CARRIER VOLUME FLOW 69 = % CARRIER VOLUME FLOW 70 = CORRECTED CARRIER VOLUME FLOW 71 = % BLACK LIQUOR 72 = ° BAUME 74 = ° API 75 = ° PLATO 76 = ° BALLING 77 = ° BRIX 78 = OTHER (_ _ _ flexible concentration) (continued on next page)
MODBUS register:	2522	
Data type:	Integer	
Access:	read/write	

Function description USER INTERFACE → CONTROL → MULTIPLEX		
ASSIGN (continued)	2220	Advanced selection: (with the optional SW package ADVANCED DIAGNOSIS) 79 = MASS FLOW DEVIATION 80 = DENSITY DEVIATION 81 = REFERENCE DENSITY DEVIATION 82 = TEMPERATURE DEVIATION 83 = TUBE DAMPING DEVIATION 84 = ELECTRODYNAMIC SENSOR DEVIATION
100% VALUE MODBUS register: Data type: Access:	2221 2524 Float read/write	 Note! Function is not available unless one of the following was selected in the ASSIGN function (2220): ■ MASS FLOW IN % ■ VOLUME FLOW IN % ■ CORRECTED VOLUME FLOW IN % For specifying the flow value to be shown on the display as the 100% value. User input: 5-digit floating-point number Factory setting: 10 kg/s, 10 l/s or 10 NI/s
FORMAT MODBUS register: Data type: Access:	2222 2523 Integer read/write	For selecting the maximum number of places after the decimal point to be displayed for the display value. 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 measuring value and the engineering unit (e.g. 1.2 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

5.3 Group ADDITIONAL LINE

5.3.1 Function group CONFIGURATION

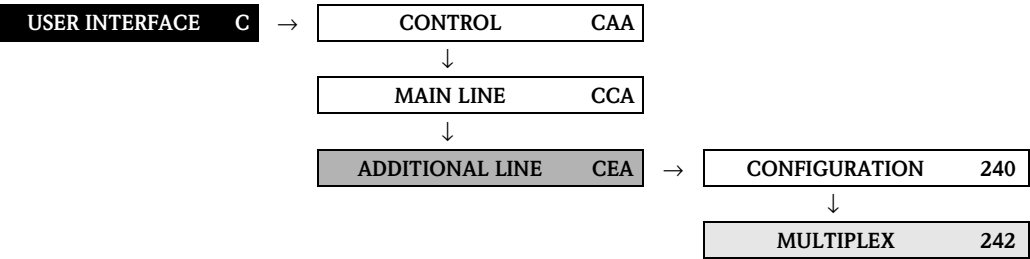


Function description		
USER INTERFACE → ADDITIONAL LINE → CONFIGURATION		
ASSIGN	2400	For assigning a value to be displayed to the additional line (middle line in the local display). This value is displayed during normal operation.
MODBUS register:	2527	Options: standard 0 = OFF 1 = MASS FLOW 2 = MASS FLOW IN % 3 = VOLUME FLOW 4 = VOLUME FLOW IN % 5 = CORRECTED VOLUME FLOW 6 = CORRECTED VOLUME FLOW IN % 7 = DENSITY 8 = REFERENCE DENSITY 9 = TEMPERATURE 10 = MASS FLOW BARGRAPH IN % 11 = VOLUME FLOW BARGRAPH IN % 12 = CORRECTED VOLUME FLOW BARGRAPH IN % 15 = ACTUAL CURRENT 18 = ACTUAL FREQUENCY 20 = TOTALIZER 1 20 = TOTALIZER 2 20 = TOTALIZER 3 23 = TAG NAME Factory setting: TOTALIZER 1 Advanced selection: with the optional SW package BATCHING 52 = BATCH NAME (“BATCH # 1” or “BEER 330”, etc.) 53 = BATCH QUANTITY (overall quantity to be batched) 54 = BATCH COUNTER (batching processes carried out) 55 = BATCH SUM (effective total batching quantity) 56 = BATCH UPWARDS (batching progress upwards) 57 = BATCH DOWNWARDS (batching progress downwards)  Note! The options given in the BATCHING software package always refer to the batching selected in the function BATCH SELECTOR (“BATCH # 1”, “BATCH # 2”, etc.). 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.
Data type:	Integer	
Access:	read/write	
(continued on next page)		

Function description USER INTERFACE → ADDITIONAL LINE → CONFIGURATION		
ASSIGN (continued)	2400	Advanced selection: with the optional SW package CONCENTRATION 61 = TARGET MASS FLOW 62 = % TARGET MASS FLOW 63 = TARGET VOLUME FLOW 64 = % TARGET VOLUME FLOW 65 = CORRECTED TARGET VOLUME FLOW 66 = CARRIER MASS FLOW 67 = % CARRIER MASS FLOW 68 = CARRIER VOLUME FLOW 69 = % CARRIER VOLUME FLOW 70 = CORRECTED CARRIER VOLUME FLOW 71 = % BLACK LIQUOR 72 = ° BAUME 74 = ° API 75 = ° PLATO 76 = ° BALLING 77 = ° BRIX 78 = OTHER (_ _ _ flexible concentration) Advanced selection: with the optional SW package ADVANCED DIAGNOSIS 79 = MASS FLOW DEVIATION 80 = DENSITY DEVIATION 81 = REFERENCE DENSITY DEVIATION 82 = TEMPERATURE DEVIATION 83 = TUBE DAMPING DEVIATION 84 = ELECTRODYNAMIC SENSOR DEVIATION
100% VALUE MODBUS register: Data type: Access:	2401 2529 Float read/write	 Note! Function is not available unless one of the following was selected in the ASSIGN function (2400): ■ MASS FLOW IN % ■ VOLUME FLOW IN % ■ CORRECTED VOLUME FLOW IN % ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH IN % ■ CORRECTED VOLUME FLOW BARGRAPH IN % For specifying the flow value to be shown on the display as the 100% value. User input: 5-digit floating-point number Factory setting: 10 kg/s, 10 l/s or 10 NI/s
FORMAT MODBUS register: Data type: Access:	2402 2528 Integer read/write	For selecting the maximum number of places after the decimal point to be displayed for the display value. 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 measuring value and the engineering unit (e.g. 1.2 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

Function description	
USER INTERFACE → ADDITIONAL LINE → CONFIGURATION	
DISPLAY MODE2403 MODBUS register: 2531 Data type: Integer Access: read/write	Note! Function is not available unless one of the following was selected in the ASSIGN function (2400): ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH IN % ■ CORRECTED VOLUME FLOW BARGRAPH IN % Use this function to define the format of the bar graph. Options: 0 = STANDARD 1 = SYMMETRY Factory setting: STANDARD Illustration of bar graph +25+50+75% A0001258 Fig. 5 : Bar graph for STANDARD option Simple bar graph with 25 / 50 / 75% gradations and integrated sign. -50--+50% A0001259 Fig. 6: Bar graph for SYMMETRY option Symmetrical bar graph for positive and negative directions of flow, with -50 / 0 / +50% gradations and integrated sign.

5.3.2 Function group MULTIPLEX



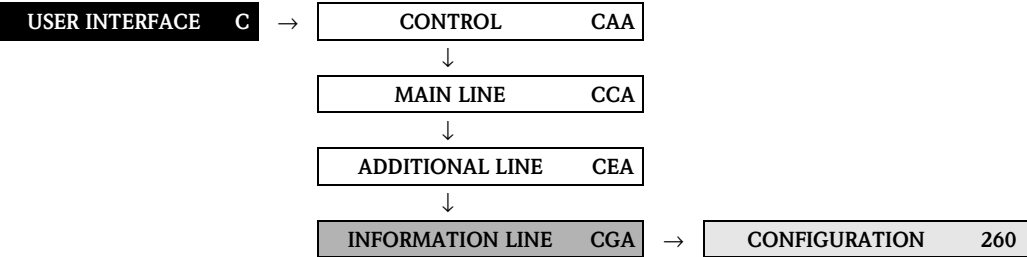
Function description		
USER INTERFACE → ADDITIONAL LINE → MULTIPLEX		
ASSIGN	2420	For assigning a second reading to be displayed in the main line alternately (every 10 seconds) with the value defined in the ASSIGN function (2400).
MODBUS register:	2532	Options: standard 0 = OFF 1 = MASS FLOW 2 = MASS FLOW IN % 3 = VOLUME FLOW 4 = VOLUME FLOW IN % 5 = CORRECTED VOLUME FLOW 6 = CORRECTED VOLUME FLOW IN % 7 = DENSITY 8 = REFERENCE DENSITY 9 = TEMPERATURE 10 = MASS FLOW BARGRAPH IN % 11 = VOLUME FLOW BARGRAPH IN % 12 = CORRECTED VOLUME FLOW BARGRAPH IN % 15 = ACTUAL CURRENT 18 = ACTUAL FREQUENCY 20 = TOTALIZER 1 21 = TOTALIZER 2 22 = TOTALIZER 3 23 = TAG NAME
Data type:	Integer	
Access:	read/write	
		Factory setting: OFF
		Advanced selection: with the optional SW package BATCHING 52 = BATCH NAME ("BATCH # 1" or "BEER 330", etc.) 53 = BATCH QUANTITY (overall quantity to be batched) 54 = BATCH COUNTER (batching processes carried out) 55 = BATCH SUM (effective total batching quantity) 56 = BATCH UPWARDS (batching progress upwards) 57 = BATCH DOWNWARDS (batching progress downwards)
		Note! The options given in the BATCHING software package always refer to the batching selected in the function BATCH SELECTOR ("BATCH # 1", "BATCH # 2", etc.). 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.
		(continued on next page)

Function description USER INTERFACE → ADDITIONAL LINE → MULTIPLEX		
ASSIGN (continued)	2420	Advanced selection: with the optional SW package CONCENTRATION 61 = TARGET MASS FLOW 62 = % TARGET MASS FLOW 63 = TARGET VOLUME FLOW 64 = % TARGET VOLUME FLOW 65 = CORRECTED TARGET VOLUME FLOW 66 = CARRIER MASS FLOW 67 = % CARRIER MASS FLOW 68 = CARRIER VOLUME FLOW 69 = % CARRIER VOLUME FLOW 70 = CORRECTED CARRIER VOLUME FLOW 71 = % BLACK LIQUOR 72 = ° BAUME 74 = ° API 75 = ° PLATO 76 = ° BALLING 77 = ° BRIX 78 = OTHER (_ _ _ _ flexible concentration) Advanced selection: with the optional SW package ADVANCED DIAGNOSIS 79 = MASS FLOW DEVIATION 80 = DENSITY DEVIATION 81 = REFERENCE DENSITY DEVIATION 82 = TEMPERATURE DEVIATION 83 = TUBE DAMPING DEVIATION 84 = ELECTRODYNAMIC SENSOR DEVIATION  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:	2421 2534 Float read/write	 Note! Function is not available unless one of the following was selected in the ASSIGN function (2420): ■ MASS FLOW IN % ■ VOLUME FLOW IN % ■ CORRECTED VOLUME FLOW IN % ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH IN % ■ CORRECTED VOLUME FLOW BARGRAPH IN % For specifying the flow value to be shown on the display as the 100% value. User input: 5-digit floating-point number Factory setting: 10 kg/s, 10 l/s or 10 NI/s

Function description		
USER INTERFACE → ADDITIONAL LINE → MULTIPLEX		
FORMAT MODBUS register: Data type: Access:	2422 2533 Integer read/write	For selecting the maximum number of places after the decimal point to be displayed for the display value. 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 measuring value and the engineering unit (e.g. 1.2 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.
DISPLAY MODE MODBUS register: Data type: Access:	2423 2536 Integer read/write	 Note! Function is not available unless one of the following was selected in the ASSIGN function (2420): ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH IN % ■ CORRECTED VOLUME FLOW BARGRAPH IN % Use this function to define the format of the bar graph. Options: 0 = STANDARD 1 = SYMMETRY Factory setting: STANDARD Illustration of bar graph  A0001258 <i>Fig. 7 : Bar graph for STANDARD option Simple bar graph with 25 / 50 / 75% gradations and integrated sign.</i>  A0001259 <i>Fig. 8: Bar graph for SYMMETRY option Symmetrical bar graph for positive and negative directions of flow, with -50 / 0 / +50% gradations and integrated sign.</i>

5.4 Group INFORMATION LINE

5.4.1 Function group CONFIGURATION

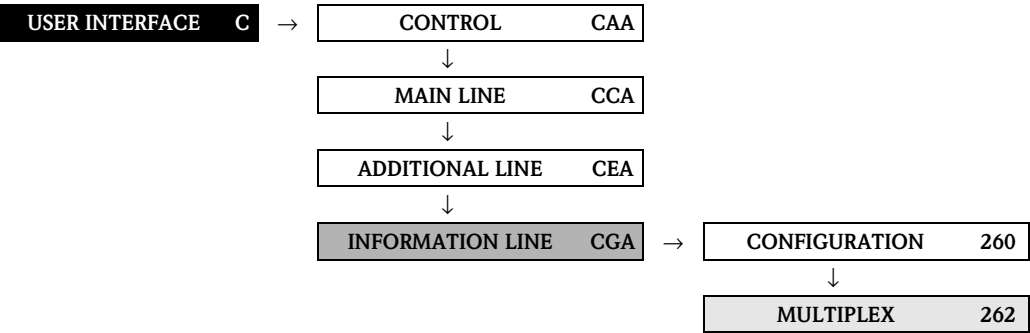


Function description		
USER INTERFACE → INFORMATION LINE → CONFIGURATION		
ASSIGN	2600	For assigning a value to be displayed to the information line (bottom line in the local display). This value is displayed during normal operation.
MODBUS register:	2537	Options: standard 0 = OFF 1 = MASS FLOW 2 = MASS FLOW IN % 3 = VOLUME FLOW 4 = VOLUME FLOW IN % 5 = CORRECTED VOLUME FLOW 6 = CORRECTED VOLUME FLOW IN % 7 = DENSITY 8 = REFERENCE DENSITY 9 = TEMPERATURE 10 = MASS FLOW BARGRAPH IN % 11 = VOLUME FLOW BARGRAPH IN % 12 = CORRECTED VOLUME FLOW BARGRAPH IN % 15 = ACTUAL CURRENT 18 = ACTUAL FREQUENCY 20 = TOTALIZER 1 21 = TOTALIZER 2 22 = TOTALIZER 3 23 = TAG NAME 24 = OPERATING/SYSTEM CONDITIONS 26 = FLOW DIRECTION READING
Data type:	Integer	
Access:	read/write	
		Factory setting: OPERATING/SYSTEM CONDITIONS
		Advanced selection: with the optional SW package BATCHING 60 = BATCHING KEYS (softkeys on the local display)
		Note!
		■ If you select the BATCHING OPERATING KEYS, the multiplex display functionality is not available in the information line.
		■ For the functionality and display examples of the Batching menu, see Operating Instructions BA0107D, “Operation” section.
		(continued on next page)

Function description USER INTERFACE → INFORMATION LINE → CONFIGURATION		
ASSIGN (continued)	2600	Advanced selection: with the optional SW package CONCENTRATION 61 = TARGET MASS FLOW 62 = % TARGET MASS FLOW 63 = TARGET VOLUME FLOW 64 = % TARGET VOLUME FLOW 65 = CORRECTED TARGET VOLUME FLOW 66 = CARRIER MASS FLOW 67 = % CARRIER MASS FLOW 68 = CARRIER VOLUME FLOW 69 = % CARRIER VOLUME FLOW 70 = CORRECTED CARRIER VOLUME FLOW 71 = % BLACK LIQUOR 72 = ° BAUME 74 = ° API 75 = ° PLATO 76 = ° BALLING 77 = ° BRIX 78 = OTHER (_ _ _ flexible concentration) Advanced selection: with the optional SW package ADVANCED DIAGNOSIS 79 = MASS FLOW DEVIATION 80 = DENSITY DEVIATION 81 = REFERENCE DENSITY DEVIATION 82 = TEMPERATURE DEVIATION 83 = TUBE DAMPING DEVIATION 84 = ELECTRODYNAMIC SENSOR DEVIATION
100% VALUE MODBUS register: Data type: Access:	2601 2539 Float read/write	 Note! Function is not available unless one of the following was selected in the ASSIGN function (2600): ■ MASS FLOW IN % ■ VOLUME FLOW IN % ■ CORRECTED VOLUME FLOW IN % ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH IN % ■ CORRECTED VOLUME FLOW BARGRAPH IN % For specifying the flow value to be shown on the display as the 100% value. User input: 5-digit floating-point number Factory setting: 10 kg/s, 10 l/s or 10 NI/s
FORMAT MODBUS register: Data type: Access:	2602 2538 Integer read/write	For selecting the maximum number of places after the decimal point to be displayed for the display value. 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 measuring value and the engineering unit (e.g. 1.2 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

Function description	
USER INTERFACE → INFORMATION LINE → CONFIGURATION	
DISPLAY MODE MODBUS register: Data type: Access:	2603 2541 Integer read/write Note! Function is not available unless one of the following was selected in the ASSIGN function (2600): ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH IN % ■ CORRECTED VOLUME FLOW BARGRAPH IN % Use this function to define the format of the bar graph. Options: 0 = STANDARD 1 = SYMMETRY Factory setting: STANDARD Illustration of bar graph +25 +50 +75 % A0001258 Fig. 9 : Bar graph for STANDARD option Simple bar graph with 25 / 50 / 75% gradations and integrated sign. -50 -- +50 % A0001259 Fig. 10: Bar graph for SYMMETRY option Symmetrical bar graph for positive and negative directions of flow, with -50 / 0 / +50% gradations and integrated sign.

5.4.2 Function group MULTIPLEX

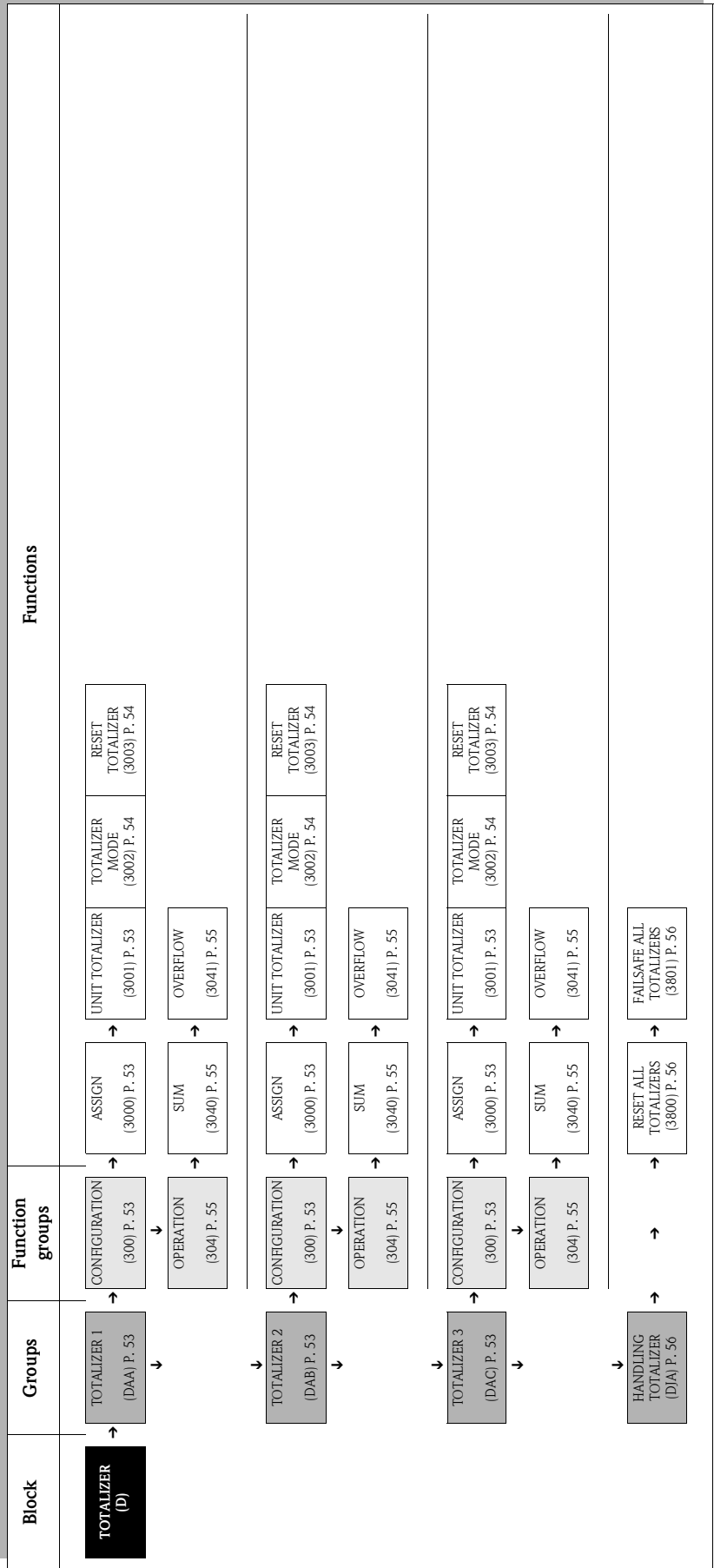


Function description		
USER INTERFACE → INFORMATION LINE → MULTIPLEX		
Note! If you select the BATCHING OPERATING KEYS in the function ASSIGN (2600), the multiplex display functionality is not available in the information line.		
ASSIGN	2620	For assigning a second reading to be displayed in the main line alternately (every 10 seconds) with the value defined in the ASSIGN function (2600).
MODBUS register:	2542	Options: standard 0 = OFF 1 = MASS FLOW 2 = MASS FLOW IN % 3 = VOLUME FLOW 4 = VOLUME FLOW IN % 5 = CORRECTED VOLUME FLOW 6 = CORRECTED VOLUME FLOW IN % 7 = DENSITY 8 = REFERENCE DENSITY 9 = TEMPERATURE 10 = MASS FLOW BARGRAPH IN % 11 = VOLUME FLOW BARGRAPH IN % 12 = CORRECTED VOLUME FLOW BARGRAPH IN % 15 = ACTUAL CURRENT 18 = ACTUAL FREQUENCY 20 = TOTALIZER 1 21 = TOTALIZER 2 22 = TOTALIZER 3 23 = TAG NAME 24 = OPERATING/SYSTEM CONDITIONS 26 = DISPLAY FLOW DIRECTION Factory setting: OFF Advanced selection: with the optional SW package CONCENTRATION 61 = TARGET MASS FLOW 62 = % TARGET MASS FLOW 63 = TARGET VOLUME FLOW 64 = % TARGET VOLUME FLOW 65 = CORRECTED TARGET VOLUME FLOW 66 = CARRIER MASS FLOW 67 = % CARRIER MASS FLOW 68 = CARRIER VOLUME FLOW 69 = % CARRIER VOLUME FLOW 70 = CORRECTED CARRIER VOLUME FLOW 71 = % BLACK LIQUOR 72 = ° BAUME 74 = ° API 75 = ° PLATO 76 = ° BALLING 77 = ° BRIX 78 = OTHER (_ _ _ flexible concentration) (continued on next page)
Data type:	Integer	
Access:	read/write	

Function description USER INTERFACE → INFORMATION LINE → MULTIPLEX		
ASSIGN (continued)	2620	Advanced selection: with the optional SW package ADVANCED DIAGNOSIS 79 = MASS FLOW DEVIATION 80 = DENSITY DEVIATION 81 = REFERENCE DENSITY DEVIATION 82 = TEMPERATURE DEVIATION 83 = TUBE DAMPING DEVIATION 84 = ELECTRODYNAMIC SENSOR DEVIATION  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! Function is not available unless one of the following was selected in the ASSIGN function (2620): ■ MASS FLOW IN % ■ VOLUME FLOW IN % ■ CORRECTED VOLUME FLOW IN % ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH IN % ■ CORRECTED VOLUME FLOW BARGRAPH IN % For specifying the flow value to be shown on the display as the 100% value. User input: 5-digit floating-point number Factory setting: 10 kg/s, 10 l/s or 10 NI/s
FORMAT MODBUS register: Data type: Access:	2622 2543 Integer read/write	For selecting the maximum number of places after the decimal point to be displayed for the display value. 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 measuring value and the engineering unit (e.g. 1.2 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

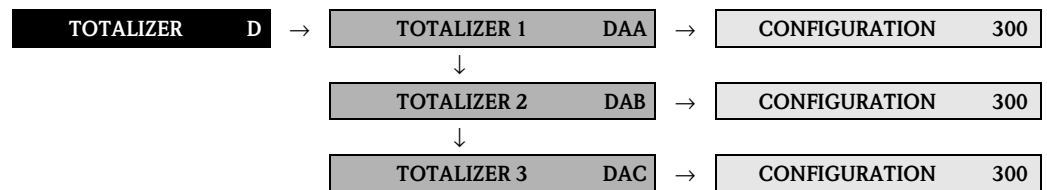
Function description		
USER INTERFACE → INFORMATION LINE → MULTIPLEX		
DISPLAY MODE	2623	Note! Function is not available unless one of the following was selected in the ASSIGN function (2620): ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH IN % ■ CORRECTED VOLUME FLOW BARGRAPH IN % Use this function to define the format of the bar graph. Options: 0 = STANDARD 1 = SYMMETRY Factory setting: STANDARD Illustration of bar graph +25+50+75% A0001258 Fig. 11 : Bar graph for STANDARD option Simple bar graph with 25 / 50 / 75% gradations and integrated sign. -50--+50% A0001259 Fig. 12: Bar graph for SYMMETRY option Symmetrical bar graph for positive and negative directions of flow, with -50 / 0 / +50% gradations and integrated sign.

6 Block TOTALIZER



6.1 Group TOTALIZER (1...3)

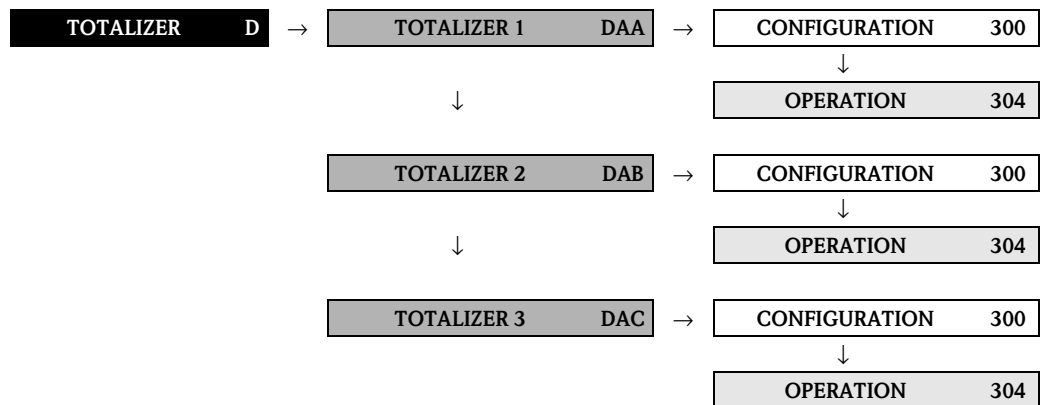
6.1.1 Function group CONFIGURATION



Function description TOTALIZER → TOTALIZER (1...3) → CONFIGURATION		
Note! The function descriptions below apply to totalizers 1...3; the totalizers are independently configurable.		
ASSIGN 3000 MODBUS register: Totalizer 1 2601 Totalizer 2 2801 Totalizer 3 3001 Data type: Integer Access: read/write		For assigning a measured variable to the totalizer in question. Options: standard 0 = OFF 2 = MASS FLOW 5 = VOLUME FLOW 6 = CORRECTED VOLUME FLOW Factory setting: MASS FLOW Advanced selection: with the optional SW package CONCENTRATION 7 = TARGET MASS FLOW 8 = TARGET VOLUME FLOW 9 = CORRECTED TARGET VOLUME FLOW 10 = CARRIER MASS FLOW 11 = CARRIER MASS FLOW 12 = CORRECTED CARRIER 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 MODBUS register: ■ Totalizer 1 – Mass flow 2602 – Volume flow 2603 – Corr. vol. flow 2604 ■ Totalizer 2 – Mass flow 2802 – Volume flow 2803 – Corr. vol. flow 2804 ■ Totalizer 3 – Mass flow 3002 – Volume flow 3003 – Corr. vol. flow 3004 Data type: Integer Access: read/write		For selecting the unit for the measured variable assigned in the function ASSIGN (3000). Options: for the MASS FLOW assignment 0...2 = metric → g; kg; t 3...4 = US → oz; lb; ton Factory setting: kg Options: for the 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; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals); bbl (filling tanks) 17...20 = Imperial → gal; Mgal; bbl (beer); bbl (petrochemicals) Factory setting: m ³ Options: for the CORRECTED VOLUME FLOW assignment 0...1 = metric → NI; Nm ³ 2...3 = US → Sm ³ ; Scf Factory setting: Nm ³

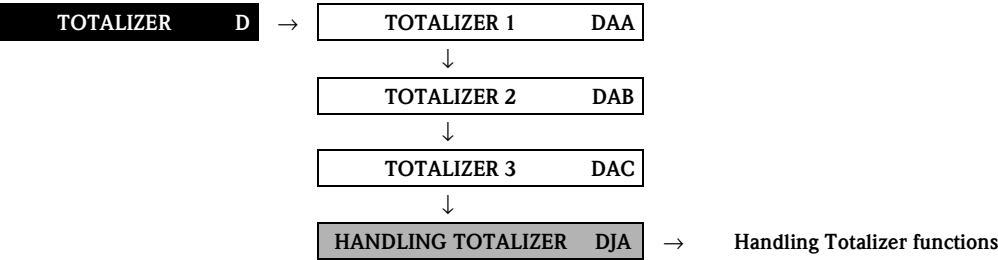
		Function description
		TOTALIZER → TOTALIZER (1...3) → CONFIGURATION
TOTALIZER MODE	3002	For selecting how the totalizer should operate.
MODBUS register:		Options:
Totalizer 1	2605	0 = BALANCE
Totalizer 2	2805	Positive and negative flow components. The positive and negative flow components are balanced. In other words, net flow in the flow direction is registered.
Totalizer 3	3005	
Data type:	Integer	1 = FORWARD
Access:	read/write	Only positive flow components
		2 = REVERSE
		Only negative flow components
		Factory setting:
		Totalizer 1 = BALANCE
		Totalizer 2 = FORWARD
		Totalizer 3 = REVERSE
RESET TOTALIZER	3003	Resets the total 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 the function ASSIGN STATUS INPUT (5000) on Page 102).

6.1.2 Function group OPERATION



Function description		
TOTALIZER → TOTALIZER (1...3) → OPERATION		
 Note! The function descriptions below apply to totalizers 1...3; the totalizers are independently configurable.		
SUM MODBUS register: Totalizer 1 2610 259 261 Totalizer 2 2810 Totalizer 3 3010 Data type: Float Access: read	3040	Displays the total for the totalizer's measured variable aggregated since measuring began. The value can be positive or negative, depending on the setting selected in the function “TOTALIZER MODE” (3002), and the direction of flow. Display: 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 54) is as follows: – If the setting is “BALANCE”, the totalizer balances flow in the positive and negative directions. – If the setting is “FORWARD”, the totalizer registers only flow in the positive direction. – If the setting is “REVERSE”, the totalizer registers only flow in the negative direction. ■ The totalizer's response to faults is defined in the “FAILSAFE ALL TOTALIZERS” function (3801), (see Page 56).
OVERFLOW MODBUS register: Totalizer 1 2612 Totalizer 2 2812 Totalizer 3 3012 Data type: Float Access: read	3041	Displays the total for the totalizer's overflow aggregated since measuring began. Total flow quantity is represented by a floating-point number consisting of max. 7 digits. You can use this function to view higher numerical values (>9,999,999) as overflows. The effective quantity is thus the total of OVERFLOW plus the value returned by the SUM function. Example: Reading for 2 overflows: 2 10⁷ kg (= 20,000,000 kg) The value displayed in the function SUM = 196,845.7 kg Effective total quantity = 20,196,845.7 kg Display: integer with exponent, including sign and unit, e.g. 2 10⁷ kg

6.2 Group HANDLING TOTALIZER



Function description		
TOTALIZER → HANDLING TOTALIZER → Handling Totalizer functions		
RESET ALL TOTALIZERS MODBUS register: Data type: Access:	3800 2609 Integer read/write	Resets the totals and the overflows of all totalizers to zero. Options: 0 = NO 1 = YES Factory setting: NO Note! If the device has a status input and if it is appropriately configured, a reset for the totalizer (1...3) can also be triggered by a pulse (see the ASSIGN STATUS INPUT function (5000) on Page 102).
FAILSAFE ALL TOTALIZERS MODBUS register: Data type: Access:	3801 2607 Integer read/write	Use this function to define the common response of all totalizers (1...3) to error. Options: 0 = STOP The totalizer is paused until the fault is rectified. 1 = ACTUAL VALUE The totalizer continues to count based on the current flow measuring 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

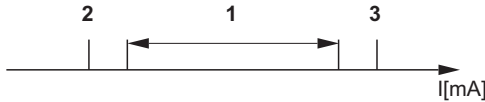
7 Block OUTPUT

Block	Groups	Function groups	Functions												
OUTPUT (E)	CURRENT OUTPUT (EAA) P. 58	→	CONFIGURATION (400) P. 58	→	ASSIGN CURRENT OUTPUT (4000) P. 58	→	CURRENT SPAN (4001) P. 59	VALUE 0.4 mA (4002) P. 60	VALUE 20 mA (4003) P. 61	MEASURING MODE (4004) P. 61	TIME CONSTANT (4005) P. 64	FAILSAFE MODE (4006) P. 65			
		→	OPERATION (404) P. 66	→	ACTUAL CURRENT (4040) P. 66	→	SIMULATION CURRENT (4041) P. 66	VALUE SIM. CURRENT (4042) P. 66							
		→	INFORMATION (408) P. 66	→	TERMINAL NUMBER (4080) P. 66										
	PULSE/FREQ. OUTPUT (ECA) P. 67	→	CONFIGURATION (420) P. 67	→	OPERATION MODE (4200) P. 67	→	ASSIGN FREQUENCY (4201) P. 68	START VALUE FREQUENCY (4202) P. 68	END VALUE FREQUENCY (4203) P. 69	VALUE F LOW (4204) P. 69	VALUE F HIGH (4205) P. 70	MEASURING MODE (4206) P. 72	OUTPUT SIGNAL (4207) P. 74	TIME CONSTANT (4208) P. 77	FAILSAFE MODE (4209) P. 77
		→		→		→	FAILSAFE VALUE (4211) P. 77								
		→		→		→	ASSIGN PULSE (4221) P. 78	PULSE VALUE (4222) P. 78	PULSE WIDTH (4223) P. 78	MEASURING MODE (4225) P. 79	OUTPUT SIGNAL (4226) P. 80	FAILSAFE MODE (4227) P. 83			
		→		→		→	ASSIGN STATUS (4241) P. 84	ON-VALUE (4242) P. 85	SWITCH-ON DELAY (4243) P. 85	OFF-VALUE (4244) P. 86	SWITCH-OFF DELAY (4245) P. 86	MEASURING MODE (4246) P. 87	TIME CONSTANT (4247) P. 87		
		→	OPERATION (430) P. 88	→		→	ACTUAL FREQUENCY (4301) P. 88	SIMULATION FREQUENCY (4302) P. 88	VALUE SIMUL. FREQ. (4303) P. 88						
		→		→		→	SIMULATION PULSE (4322) P. 89	VALUE SIM. IMPULS (4323) P. 89							
		→		→		→	ACTUAL STATUS (4341) P. 90	SIMULATION SWITCH POINT (4342) P. 90	VALUE SIM. SWITCH PNT. (4342) P. 90						
		→	INFORMATION (438) P. 91	→	TERMINAL NUMBER (4380) P. 91										
		→		→		→	ASSIGN RELAY (4700) P. 92	SWITCH-ON DELAY (4702) P. 93	OFF-VALUE (4703) P. 94	SWITCH-OFF DELAY (4704) P. 94	MEASURING MODE (4705) P. 95	TIME CONSTANT (4706) P. 95			
	RELAY 1...2 (EGB) P. 92	→	CONFIGURATION (470) P. 92	→	ACTUAL STATUS RELAY (4740) P. 96	→	SIMULATION SWITCH POINT (4741) P. 96	VALUE SIM. SWITCH PNT. (4742) P. 96							
		→	OPERATION (474) P. 96	→	TERMINAL NUMBER (4780) P. 97										
		→	INFORMATION (478) P. 97	→											

7.1 Group CURRENT OUTPUT

7.1.1 Function group CONFIGURATION

OUTPUT E		CURRENT OUTPUT EAA	CONFIGURATION 400
Function description OUTPUT → CURRENT OUTPUT → CONFIGURATION			
ASSIGN CURRENT OUTPUT	4000	For assigning a measured variable to the current output. Options: 0 = OFF 2 = MASS FLOW 5 = VOLUME FLOW 6 = CORRECTED VOLUME FLOW 7 = DENSITY 8 = REFERENCE DENSITY 9 = TEMPERATURE Advanced selection: with the optional SW package BATCHING 52 = BATCH UPWARDS (batching progress upwards) 53 = BATCH DOWNWARDS (batching progress downwards) Note! ■ The current range selected (function CURRENT SPAN (4001) corresponds to a batching rate of 0 – 100%, based on the batching quantity. ■ The batching software automatically sets the values for 0/4 mA and 20 mA (function VALUE 0_4 mA (4002) and VALUE 20 mA (4003)). Example with upward batching: Value 0/4 mA = 0 [unit]; value 20 mA = batching quantity [unit]. Advanced selection: with the optional SW package CONCENTRATION 12 = TARGET MASS FLOW 13 = % TARGET MASS FLOW 14 = TARGET VOLUME FLOW 15 = % TARGET VOLUME FLOW 16 = CORRECTED TARGET VOLUME FLOW 17 = CARRIER MASS FLOW 18 = % CARRIER MASS FLOW 19 = CARRIER VOLUME FLOW 20 = % CARRIER VOLUME FLOW 21 = CORRECTED CARRIER VOLUME FLOW 22 = % BLACK LIQUOR 23 = ° BAUME 25 = ° API 26 = ° PLATO 27 = ° BALLING 28 = ° BRIX 29 = OTHER (_ _ _ flexible concentration) Advanced selection: with the optional SW package ADVANCED DIAGNOSIS: 58 = MASS FLOW DEVIATION 59 = DENSITY DEVIATION 60 = REFERENCE DENSITY DEVIATION 61 = TEMPERATURE DEVIATION 62 = TUBE DAMPING DEVIATION 63 = ELECTRODYNAMIC SENSOR DEVIATION Factory setting: MASS FLOW Note! If you select OFF, the only function shown in the CONFIGURATION function group is this function, in other words ASSIGN CURRENT OUTPUT (4000).	
MODBUS register:	5801		
Data type:	Integer		
Access:	read/write		

Function description		
OUTPUT → CURRENT OUTPUT → CONFIGURATION		
CURRENT SPAN	4001	For selecting the current span. The selection specifies the operational range and the lower and upper signal on alarm. 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 span of 4–20 mA (please refer to the Operating Instructions BA107D). 
MODBUS register:	5802	
Data type:	Integer	
Access:	read/write	

a	1	2	3
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
0-20 mA (25 mA)	0 - 24 mA	0	25
4-20 mA (25 mA)	4 - 24 mA	2	25

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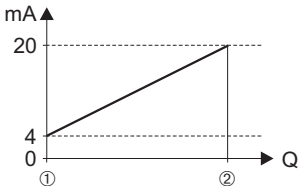
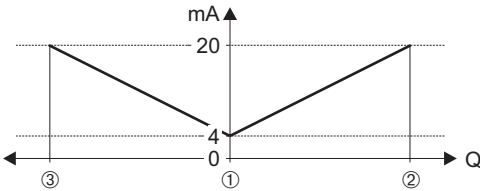
Fig. 13 : Overview of current span, operational range and signal on alarm level

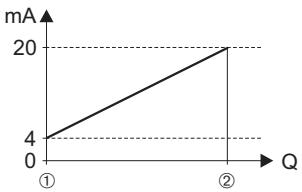
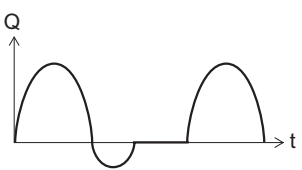
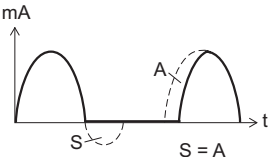
a Current span
1 Operational range (measuring information)
2 Lower signal on alarm level
3 Upper signal on alarm level

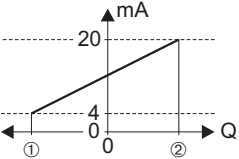
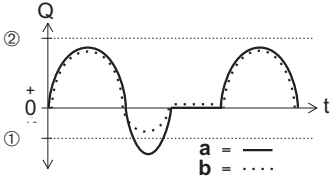
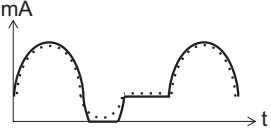
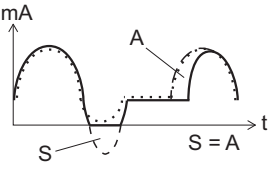
 **Note!**

- If the measured value exceeds the measuring range (as defined in the functions VALUE 0_4 mA (4002) and VALUE 20 mA (4003)) a notice message is generated (#351...354, current span).
- In case of a fault the behaviour of the current output is according to the selected option in the function FAILSAFE MODE (4006).

Function description		
OUTPUT → CURRENT OUTPUT → CONFIGURATION		
VALUE 20 mA MODBUS register: Data type: Access:	4003 5805 Float read/write	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 (function VALUE 0_4 mA (4002), see Page 60). Positive and negative values are permissible, depending on the measured variable in question (e.g. mass flow). Example: 4 mA assigned value = - 250 kg/h 20 mA assigned value = +750 kg/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, if SYMMETRY is the setting selected in the function MEASURING MODE (4004). In this case, the message "INPUT RANGE EXCEEDED" appears. User input: 5-digit floating-point number, with sign Factory setting: Depends on nominal diameter [kg/h] or 2 [kg/l] or 200 [°C]  Note! - The appropriate unit is taken from the following functions: - UNIT MASS FLOW(0400) - UNIT VOLUME FLOW(0402) - UNIT CORRECTED VOLUME FLOW(0404) - UNIT DENSITY(0420) - UNIT REFERENCE DENSITY(0421) - UNIT TEMPERATURE(0422) (see Page 15 till Page 18). - If the option BATCH UPWARDS or BATCH DOWNWARDS, (only possible with the optional software package BATCHING) is selected in the function ASSIGN CURRENT OUTPUT (4000), the value 20 mA is automatically specified in this function and cannot be edited. - The appropriate unit is taken from the function UNIT MASS FLOW (0400), (see Page 15). - An example for selecting the STANDARD option in the function MEASURING MODE (4004) can be found on Page 62.  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 60.
MEASURING MODE MODBUS register: Data type: Access:	4004 5807 Integer read/write	For selecting the measuring mode for the current output. Options: 0 = STANDARD 1 = SYMMETRY 2 = PULSATING FLOW Factory setting: STANDARD (continued on next page)

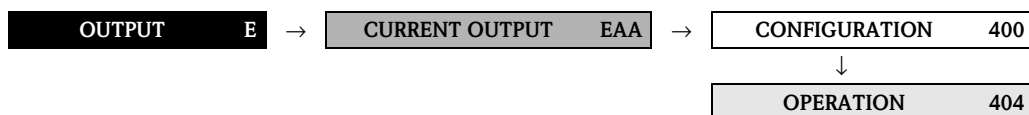
Function description		
OUTPUT → CURRENT OUTPUT → CONFIGURATION		
MEASURING MODE (continued)	4004	Description of the individual options: STANDARD The current output signal is proportional to the measured variable. The flow components outside the scaled measuring range (defined by the 0_4 mA VALUE ① and the 20 mA VALUE ②) are taken into account as follows for signal output. ■ If one of the values is defined as equal to the zero flow (e.g. VALUE 0_4 mA = 0 m³/h), no message is given if this value is exceeded or not achieved and the current output retains its value (in example 4 mA). If the other value is exceeded or not achieved, the message “CURRENT OUTPUT AT FULL SCALE VALUE” appears and the current output responds in accordance with the parameter setting in the function FAILSAFE MODE (4006). ■ If both values defined are not equal to the zero flow (for example VALUE 0_4 mA = -5 m³/h, VALUE 20 mA = 10m³/h), the message “CURRENT OUTPUT AT FULL SCALE VALUE” appears if the measuring range is exceeded or not achieved and the current output responds in accordance with the parameter settings in the function FAILSAFE MODE (4006).  Fig. 15 : Example for STANDARD measuring mode 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).  Fig. 16 : Example for SYMMETRY measuring mode 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. PULSATING FLOW If flow is characterized by severe fluctuations as is the case, for example, with reciprocating pumps, flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 seconds. If the buffered data cannot be processed within approx. 60 seconds, a fault/notice message appears. Under certain plant conditions, flow values can aggregate in the buffer, for example in the case of prolonged and unwanted fluid backflow. However, this buffer is reset in all relevant programming adjustments which affect the current output.  Caution! If the option BATCH UPWARDS or BATCH DOWNWARDS is selected in the function ASSIGN CURRENT OUTPUT (4000), the option is automatically specified and cannot be edited.

Function description	
OUTPUT → CURRENT OUTPUT → CONFIGURATION	
Detailed explanations and information	How the current output responds at a defined measuring range ①~② (s. Fig. 17) and flow behaviour (s. Fig. 18):  Fig. 17 : Defined measuring range: ① and ② with the same sign  Fig. 18 : Flow behaviour For STANDARD measuring mode 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.  Fig. 19 : Behaviour of current output for STANDARD measuring mode For SYMMETRY measuring mode The current output signal is independent of the direction of flow.  Fig. 20 : Behaviour of current output for SYMMETRY measuring mode For PULSATING FLOW measuring mode Flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 seconds.  Fig. 21 : Behaviour of current output for PULSATING FLOW measuring mode (continued on next page)

Function description	
OUTPUT → CURRENT OUTPUT → CONFIGURATION	
Detailed explanations and information (continued)	How the current output responds at a defined measuring range ①-② (s. Fig. 22) and flow behaviour (s. Fig. 23):  <i>Fig. 22 : Defined measuring range: ① and ② do not have the same sign</i>  <i>Fig. 23 : Flow a (—) outside, b (---) within the measuring range</i> For STANDARD measuring mode 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.  <i>Fig. 24 : Behaviour of current output for STANDARD measuring mode</i> For SYMMETRY measuring mode This option is not available under these circumstance, because the 0_4 mA value and the 20 mA value have different signs. For PULSATING FLOW measuring mode Flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 seconds.  <i>Fig. 25 : Behaviour of current output for PULSATING FLOW measuring mode</i>
TIME CONSTANT 4005 MODBUS register: 5808 Data type: Float Access: read/write	Entering a time constant defines how the current output signal reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). User input: fixed-point number 0.01...100.00 s Factory setting: 1.00 s

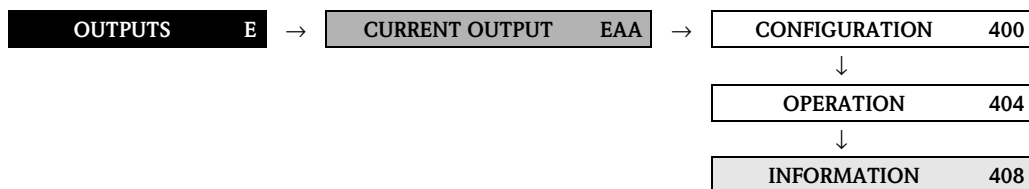
Function description		
OUTPUT → CURRENT OUTPUT → CONFIGURATION		
FAILSAFE MODE	4006	For safety reasons it is advisable to ensure that the current output assumes a predefined state in the event of a fault. The setting you select here affects only the current output. The failsafe mode of other outputs and the totalizers is defined in the related function group. Options: 0 = MIN. CURRENT The current output adopts the value of the lower signal on alarm level (as defined in the function CURRENT SPAN (4001), see Page 59). 1 = MAX. CURRENT The current output adopts the value of the upper signal on alarm level (as defined in the function CURRENT SPAN (4001), see Page 59). 2 = HOLD VALUE (not recommended) Measuring value output is based on the last measuring 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 OUTPUT → CURRENT OUTPUT → OPERATION		
ACTUAL CURRENT 4040		Use this function to view the computed actual value of the output current. Display: 0.00...25.00 mA
MODBUS register: 5811 Data type: Float Access: read		
SIMULATION CURRENT 4041		Activates simulation of the current output. Options: 0 = OFF 1 = ON Factory setting: OFF
MODBUS register: 5813 Data type: Integer Access: read/write		
		 Note! ■ If simulation is active, the “SIMULATION CURRENT OUTPUT” message is displayed. ■ 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 in the event of a power failure.
VALUE SIMULATION CURRENT 4042		 Note! The function is not visible unless the function SIMULATION CURRENT (4041) is active. For defining 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
MODBUS register: 5814 Data type: Float Access: read/write		
		 Caution! The setting is not saved in the event of a power failure.

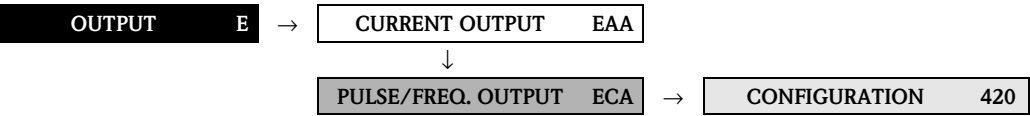
7.1.3 Function group INFORMATION



Function description OUTPUT → CURRENT OUTPUT → INFORMATION		
TERMINAL NUMBER 4080		Displays the: ■ Numbers of the terminals used by the current output (in the connection compartment) ■ Polarity Display: 0 = 26 (+) / 27 (-) 1 = 24 (+) / 25 (-) 2 = 22 (+) / 23 (-) 3 = 20 (+) / 21 (-)
MODBUS register: 5816 Data type: Integer Access: read		

7.2 Group PULSE/FREQUENCY OUTPUT

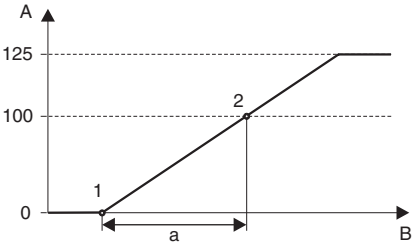
7.2.1 Function group CONFIGURATION

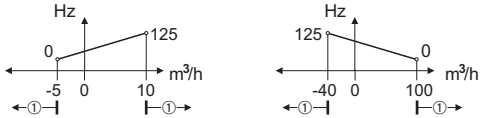
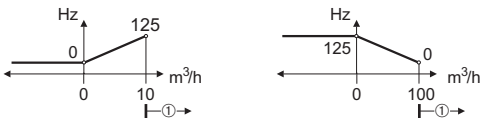
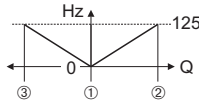


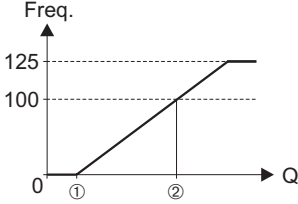
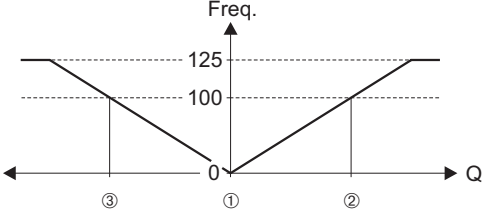
Function description	
OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION	
OPERATION MODE4200 MODBUS register:3201 Data type:Integer Access:read/write	Configuration of the output as a pulse, frequency or status output. The functions available in this function group vary, depending on which option you select here. Options: 0 = PULSE 1 = FREQUENCY 2 = STATUS Factory setting: PULSE

		Function description
		OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION (FREQUENCY)
ASSIGN FREQUENCY MODBUS register: Data type: Access:	4201 3202 Integer read/write	 Note! Function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). For assigning a measured variable to the frequency output. Options: 0 = OFF 2 = MASS FLOW 5 = VOLUME FLOW 6 = CORRECTED VOLUME FLOW 7 = DENSITY 8 = REFERENCE DENSITY 9 = TEMPERATURE Advanced selection: with the optional SW package CONCENTRATION 11 = TARGET MASS FLOW 12 = % TARGET MASS FLOW 13 = TARGET VOLUME FLOW 14 = % TARGET VOLUME FLOW 15 = CORRECTED TARGET VOLUME FLOW 16 = CARRIER MASS FLOW 17 = % CARRIER MASS FLOW 18 = CARRIER VOLUME FLOW 19 = % CARRIER VOLUME FLOW 20 = CORRECTED CARRIER VOLUME FLOW 21 = % BLACK LIQUOR 22 = ° BAUME 24 = ° API 25 = ° PLATO 26 = ° BALLING 27 = ° BRIX 28 = OTHER (_ _ _ _ flexible concentration) Advanced selection: with the optional SW package ADVANCED DIAGNOSIS 51 = MASS FLOW DEVIATION 52 = DENSITY DEVIATION 53 = REFERENCE DENSITY DEVIATION 54 = TEMPERATURE DEVIATION 55 = TUBE DAMPING DEVIATION 56 = ELECTRODYNAMIC SENSOR DEVIATION Factory setting: MASS 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 MODBUS register: Data type: Access:	4202 3203 Float read/write	 Note! Function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). For defining 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 69. User input: 5-digit fixed-point number: 0...10000 Hz Factory setting: 0 Hz Example: ■ VALUE F LOW = 0 kg/h, initial frequency = 0 Hz: i.e. a frequency of 0 Hz is output at a flow of 0 kg/h. ■ VALUE F LOW = 1 kg/h, initial frequency = 10 Hz: i.e. a frequency of 10 Hz is output at a flow of 1 kg/h.

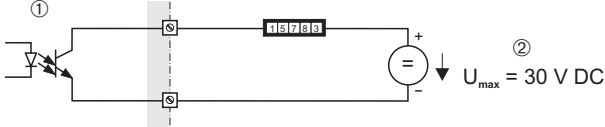
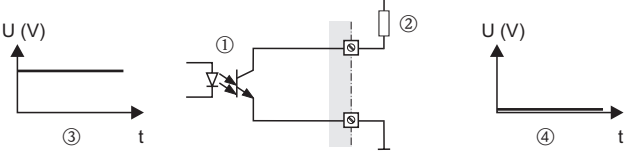
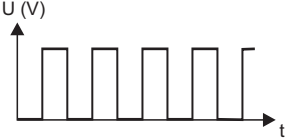
Function description		
OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION (FREQUENCY)		
END VALUE FREQUENCY	4203	 Note! Function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). For defining a full scale frequency for the frequency output. You define the associated measured value of the measuring range in the VALUE F HIGH function (4205) described on Page 70. User input: 5-digit fixed-point number: 2...10000 Hz Factory setting: 10000 Hz Example: ■ VALUE F HIGH = 10000 kg/h, full scale frequency = 10000 Hz: i.e. a frequency of 10000 Hz is output at a flow of 10000 kg/h. ■ VALUE F HIGH = 3600 kg/h, full scale frequency = 10000 Hz: i.e. a frequency of 10000 Hz is output at a flow of 3600 kg/h.  Note! In the FREQUENCY operating mode the output signal is symmetrical (on/off ratio = 1:1). At low frequencies the pulse duration is limited to a maximum of 2 seconds, i.e. the on/off ratio is no longer symmetrical.
MODBUS register:	3205	
Data type:	Float	
Access:	read/write	
VALUE F LOW	4204	 Note! Function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to assign a variable to the START VALUE FREQUENCY (4202). The value can be higher or lower than the value assigned to the VALUE F HIGH. Positive and negative values are permissible, depending on the measured variable in question (e.g. mass 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 [kg/h] or 0 [kg/l] or -50 [°C]  Note! ■ For a graphic illustration of the VALUE F LOW, see the VALUE F HIGH (4205) function. ■ 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. ■ The appropriate unit is taken from the following functions: – UNIT MASS FLOW (0400) – UNIT VOLUME FLOW (0402) – UNIT CORRECTED VOLUME FLOW (0404) – UNIT DENSITY (0420) – UNIT REFERENCE DENSITY (0421) – UNIT TEMPERATURE (0422) (see Page 15 till Page 18).
MODBUS register:	3207	
Data type:	Float	
Access:	read/write	

Function description		
OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION (FREQUENCY)		
VALUE F HIGH	4205	Note! Function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to assign a variable to the END VALUE FREQUENCY (4203). The value can be higher or lower than the value assigned to the VALUE F LOW. Positive and negative values are permissible, depending on the measured variable in question (e.g. mass 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 [kg/h] or 2 [kg/l] or 200 [°C] 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.  F06-x3MBxxxx-05-xx-xx-xx-000 Fig. 26 : Behaviour of frequency output a = Measuring range A = Frequency [%] B = Measured variable (amount) 1 = Value F low 2 = Value F high Note! Parameter setting examples for the frequency output → see overleaf.

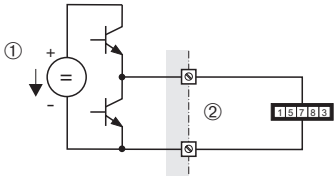
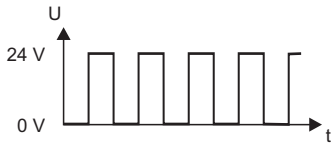
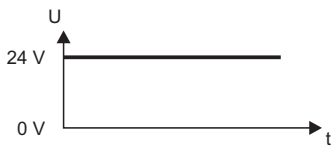
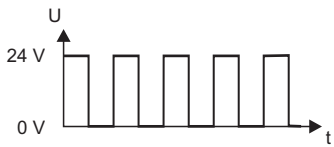
Function description	
OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION (FREQUENCY)	
Parameter setting examples for the frequency output	Parameter setting example 1: VALUE F LOW (4204) = not equal to zero flow (e.g. -5 m³/h, 10m³/h) VALUE F HIGH (4205) = not equal to zero flow (e.g. 100 m³/h, -40 m³/h) MEASURING MODE (4206) = STANDARD When you enter the values for VALUE F LOW and VALUE F HIGH the working range of the measuring device is defined. If the effective flow drops below or exceeds this working range (see Fig. ①), a fault/notice message is generated (#351-354, frequency area) and the frequency output responds in accordance with the parameters set in the function FAILSAFE MODE (4209).  Parameter setting example 2: VALUE F LOW (4204) = equal to zero flow (e.g. 0 m³/h) VALUE F HIGH (4205) = not equal to zero flow (e.g. 10 m³/h) or VALUE F LOW (4204) = not equal to zero flow (e.g. 100 m³/h) VALUE F HIGH (4205) = equal to zero flow (e.g. 0 m³/h) and MEASURING MODE (4206) = STANDARD When you enter the values for VALUE F LOW and VALUE F HIGH the working range of the measuring device is defined. In doing so, one of the two values is parameterised as zero flow (e.g. 0 m³/h). If the effective flow drops below or exceeds the value parameterised as the zero flow, no fault/notice message is generated and the frequency output retains its value. If the effective flow drops below or exceeds the other value, a fault/notice message is generated (#351-354, frequency area) and the frequency output responds in accordance with the parameters set in the function FAILSAFE MODE (4209).  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).  Parameter setting example 4: MEASURING MODE (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 delay. If the effective flow drops below or exceeds the defined working range, normally no fault message or notice message is generated.

Function description	
OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION (FREQUENCY)	
MEASURING MODE MODBUS register: 3211 Data type: Integer Access: read/write	Note! Function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to define the measuring mode for the frequency output. Options: 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 the VALUE F HIGH ②) are not taken into account for signal output. If one of the values is defined as equal to the zero flow (e.g. VALUE F LOW = 0 m³/h), no message is given if this value is exceeded or not achieved and the frequency output retains its value (0 Hz in the example). If the other value is exceeded or not achieved, the message "FREQUENCY OUTPUT AT FULL SCALE VALUE" appears and the frequency output responds in accordance with the parameter setting in the function FAILSAFE MODE (4209). If both values defined are not equal to the zero flow (for example VALUE F LOW = -5 m³/h; VALUE F HIGH = 10m³/h), the message "FREQUENCY OUTPUT AT FULL SCALE VALUE" appears if the measuring range is exceeded or not achieved and the frequency output responds in accordance with the parameter settings in the function FAILSAFE MODE (4209).  Fig. 27 : STANDARD measuring mode 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).  Fig. 28 : SYMMETRY measuring mode 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)

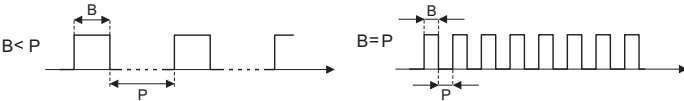
Function description		
OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION (FREQUENCY)		
MEASURING MODE (continued)	4206	PULSATING FLOW ■ If flow is characterized by severe fluctuations as is the case, for example, with reciprocating pumps, flow components outside the measuring range are buffered, balanced 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	
OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION (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 OPERATION MODE (4200) function. For selecting the output configuration of the frequency output. Options: 0 = PASSIVE - POSITIVE 1 = PASSIVE - NEGATIVE 2 = ACTIVE - POSITIVE 3 = ACTIVE - NEGATIVE Factory setting: PASSIVE - POSITIVE Explanation PASSIVE = power is supplied to the frequency output by means of an external power supply. ACTIVE = power is supplied to the frequency output by means of the device-internal power supply. Configuring the output signal level (POSITIVE or NEGATIVE) determines the quiescent behaviour (at zero flow) of the frequency output. The internal transistor is activated as follows: If POSITIVE is selected, the internal transistor is activated with a positive signal level. If NEGATIVE is selected, the internal transistor is activated with a negative signal level (0 V). Note! With the passive output configuration, the output signal levels of the frequency output depend on the external circuit (see examples). Example for passive output circuit (PASSIVE) If PASSIVE is selected, the frequency output is configured as an open collector.  A0001225 ① = Open Collector, ② = External power supply Note! For continuous currents up to 25 mA (I_{max} = 250 mA / 20 ms). Example for output configuration PASSIVE-POSITIVE: Output configuration with an external pull-up resistance. In the quiescent state (at zero flow), the output signal level at the terminals is 0 V. + U_{max} = 30 V DC  F06-xxxxxxxx-04-xx-xx-xx-000 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.  F06-xxxxxxxx-04-xx-xx-xx-004 (continued on next page)

Function description		
OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION (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. + U_{max} = 30 V DC U (V) t ③ ① ② ④ t ④ F06-xxxxxxxx-04-xx-xx-xx-001 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. U (V) t F06-xxxxxxxx-04-xx-xx-xx-006 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. + U_{max} = 30 V DC U (V) t ③ ① ② ④ t ④ F06-xxxxxxxx-04-xx-xx-xx-002 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. U (V) t F06-xxxxxxxx-04-xx-xx-xx-006	
(continued on next page)		

Function description	
OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION (FREQUENCY)	
OUTPUT SIGNAL4207 (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.  F06-xxxxxxxx-04-xx-xx-xx-003 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.  F06-xxxxxxxx-04-xx-xx-xx-015 In the operating status (flow present), the output signal level changes from 0 V to a positive voltage level.  F06-xxxxxxxx-04-xx-xx-xx-009 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.  F06-xxxxxxxx-04-xx-xx-xx-014 In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V.  F06-xxxxxxxx-04-xx-xx-xx-010

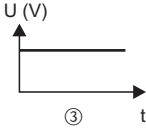
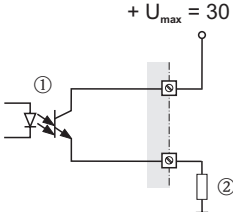
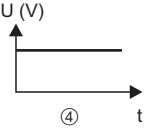
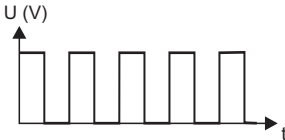
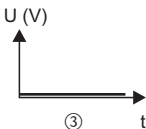
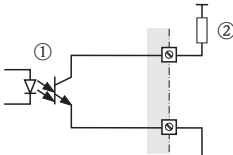
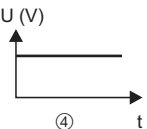
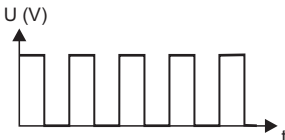
		Function description
		OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION (FREQUENCY)
TIME CONSTANT	4208	 Note! Function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Entering a time constant defines how the frequency output signal reacts to severely fluctuating 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: 0.00 s
MODBUS register: Data type: Access:	3213 Float read/write	
FAILSAFE MODE	4209	 Note! Function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). For safety reasons it is advisable to ensure that the frequency output assumes a predefined state in the event of a fault. The setting you select here affects only the frequency output. It has no effect on other outputs and the display (e.g. totalizers). Options: 0 = FALLBACK VALUE Output is 0 Hz. 1 = FAILSAFE VALUE Output is the frequency specified in the FAILSAFE VALUE function (4211). 2 = HOLD VALUE Measuring value output is based on the last measuring 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: Data type: Access:	3215 Integer read/write	
FAILSAFE VALUE	4211	 Note! Function is not available unless FREQUENCY was selected in the OPERATION MODE function (4200) and FAILSAFE VALUE was selected in the FAILSAFE MODE function (4209). For specifying 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: Data type: Access:	3216 Float read/write	

		Function description
		OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION (PULSE)
ASSIGN PULSE MODBUS register: Data type: Access:	4221 Integer read/write	 Note! Function is not available unless the PULSE setting was selected in the OPERATION MODE function (4200). Use this function to assign a measured variable to the pulse output. Options: 0 = OFF 2 = MASS FLOW 5 = VOLUME FLOW 6 = CORRECTED VOLUME FLOW Advanced selection: with the optional SW package CONCENTRATION 11 = TARGET MASS FLOW 13 = TARGET VOLUME FLOW 15 = CORRECTED TARGET VOLUME FLOW 16 = CARRIER MASS FLOW 18 = CARRIER VOLUME FLOW 20 = CORRECTED CARRIER VOLUME FLOW Factory setting: MASS 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 MODBUS register: Data type: Access:	4222 Float read/write	 Note! Function is not available unless the PULSE setting was selected in the OPERATION MODE function (4200). Use this function to define the flow at which a pulse is triggered. These pulses can be totalled 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  Note! The appropriate unit is taken from the UNIT MASS FLOW (0400), UNIT VOLUME FLOW (0402) or UNIT CORRECTED VOLUME FLOW (0404) function (see Page 15 to Page 18).
PULSE WIDTH MODBUS register: Data type: Access:	4223 Float read/write	 Note! Function is not available unless the PULSE setting was selected in the OPERATION MODE function (4200). Use this function to enter the pulse width of the output pulse. User input: 0.05...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 <i>Fig. 29 : Pulse Width</i> <i>B = Pulse width entered (the illustration applies to positive pulses)</i> <i>P = Pauses between the individual pulses</i> (continued on next page)

Function description	
OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION (PULSE)	
PULSE WIDTH 4223 (continued)	 Note! When entering the pulse width, select a value that can still be processed by an external totalizer (e.g. mechanical totalizer, PLC, etc.).  Caution! If the pulse number or frequency resulting from the pulse value entered (see function PULSE VALUE (4222) on Page 78) and from the current flow is too large to maintain the pulse width selected (the time interval is smaller than the pulse width B entered), a system error message is generated (# 359...362, pulse buffer) after approx. 5 seconds buffer/balance time.
MEASURING MODE 4225 MODBUS register: 3228 Data type: Integer Access: read/write	 Note! Function is not available unless the PULSE setting was selected in the OPERATION MODE function (4200). Use this function to define the measuring mode for the pulse output. Options: 0 = STANDARD Only positive flow components are totalled. 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 totalled, with the signs taken into account (e.g. -10 l and +25 l = 15 l). Flow components outside the maximum pulse number per second (value/width) are buffered, balanced and output after a maximum delay of 60 seconds. If the buffered data cannot be processed within approx. 60 seconds, a fault/notice message appears. Under certain plant conditions, flow values can aggregate in the buffer, for example in the case of prolonged and unwanted fluid backflow. However, this buffer is reset in all relevant programming adjustments which affect the pulse output. 3 = STANDARD REVERSE Only negative flow components are totalled. Positive components are not taken into account. Factory setting: STANDARD

Function description	
OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION (PULSE)	
OUTPUT SIGNAL 4226 MODBUS register: 3229 Data type: Integer Access: read/write	Note! Function is not available unless the PULSE setting was selected in the OPERATION MODE (4200) function. For selecting the output configuration of the pulse 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 pulse output by means of an external power supply. ACTIVE = power is supplied to the pulse output by means of the device-internal power supply. Configuring the output signal level (POSITIVE or NEGATIVE) determines the quiescent behaviour (at zero flow) of the pulse output. The internal transistor is activated as follows: If POSITIVE is selected, the internal transistor is activated with a positive signal level. If NEGATIVE is selected, the internal transistor is activated with a negative signal level (0 V). Note! With the passive output configuration, the output signal levels of the pulse output depend on the external circuit (see examples). Example for passive output circuit (PASSIVE) If PASSIVE is selected, the pulse output is configured as an open collector. A0001225 ① = Open Collector, ② = External power supply Note! For continuous currents up to 25 mA ($I_{\text{max}} = 250 \text{ mA} / 20 \text{ ms}$). 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. + $U_{\text{max}} = 30 \text{ V DC}$ F06-xxxxxxx-04-xx-xx-xx-000 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. F06-xxxxxxx-04-xx-xx-xx-004

(continued on next page)

Function description	
OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION (PULSE)	
OUTPUT SIGNAL 4226 (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.    F06-xxxxxxx-04-xx-xx-xx-001 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.  F06-xxxxxxx-04-xx-xx-xx-006 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.    F06-xxxxxxx-04-xx-xx-xx-002 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.  F06-xxxxxxx-04-xx-xx-xx-006

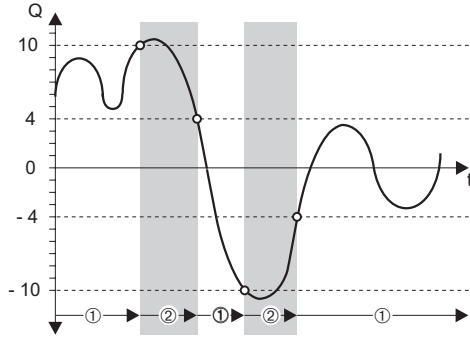
Function description	
OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION (PULSE)	
OUTPUT SIGNAL 4226 (continued)	Example for active output circuit (ACTIVE): With an active circuit, the internal power supply is 24 V. The pulse output is short-circuit proof. F06-xxxxxxxx-04-xx-xx-xx-003 ① = 24 V DC internal 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. F06-xxxxxxxx-04-xx-xx-xx-015 In the operating status (flow present), the output signal level changes from 0 V to a positive voltage level. F06-xxxxxxxx-04-xx-xx-xx-009 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. F06-xxxxxxxx-04-xx-xx-xx-014 In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V. F06-xxxxxxxx-04-xx-xx-xx-010

Function description		
OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION (PULSE)		
FAILSAFE MODE	4227	 Note! Function is not available unless the PULSE setting was selected in the OPERATION MODE function (4200). For safety reasons it is advisable to ensure that the pulse output assumes a predefined state in the event of a fault. The setting you select here affects only the pulse output. It has no effect on other outputs and the display (e.g. totalizers). Options: 0 = FALLBACK VALUE Output is 0 pulse. 2 = HOLD VALUE Measuring value output is based on the last measuring 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:	3230	
Data type:	Integer	
Access:	read/write	

		Function description
		OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION (STATUS)
ASSIGN STATUS	4241	 Note! Function is not available unless the STATUS setting was selected in the OPERATION MODE function (4200). Use this function to assign a switching function to the status output. Options: 0 = OFF 1 = ON (operation) 2 = FAULT MESSAGE 3 = NOTICE MESSAGE 4 = FAULT MESSAGE or NOTICE MESSAGE 5 = EMPTY PIPE DETECTION (only with active function) 6 = FLOW DIRECTION 7 = MASS FLOW LIMIT VALUE 8 = VOLUME FLOW LIMIT VALUE 14 = CORRECTED VOLUME FLOW LIMIT VALUE 15 = DENSITY LIMIT VALUE 16 = REFERENCE DENSITY LIMIT VALUE 17 = TEMPERATURE LIMIT VALUE 19 = TOTALIZER 1 LIMIT VALUE 20 = TOTALIZER 2 LIMIT VALUE 21 = TOTALIZER 3 LIMIT VALUE Advanced selection: with the optional SW package CONCENTRATION 30 = LIMIT TARGET MASS FLOW 31 = LIMIT TARGET % MASS PROPORTION FLOW 32 = LIMIT TARGET VOLUME FLOW 33 = LIMIT TARGET % VOLUME PROPORTION FLOW 34 = LIMIT TARGET CORRECTED VOLUME FLOW 35 = LIMIT CARRIER MASS FLOW 36 = LIMIT CARRIER % MASS PROPORTION FLOW 37 = LIMIT CARRIER VOLUME FLOW 38 = LIMIT CARRIER % VOLUME PROPORTION FLOW 39 = LIMIT CARRIER CORRECTED VOLUME FLOW 40 = LIMIT % BLACK LIQUOR 41 = LIMIT °BAUME > 1 42 = LIMIT °BAUME < 1 43 = LIMIT °API 44 = LIMIT °PLATO 45 = LIMIT °BALLING 46 = LIMIT °BRIX 47 = LIMIT OTHER (_ _ _ flexible concentration) Advanced selection: with the optional SW package ADVANCED DIAGNOSIS 84 = LIMIT MASS FLOW DEVIATION 85 = LIMIT DENSITY DEVIATION 86 = LIMIT REFERENCE DENSITY DEVIATION 87 = LIMIT TEMPERATURE DEVIATION 88 = LIMIT TUBE DAMPING DEVIATION 89 = LIMIT ELECTRODYNAMIC SENSOR DEVIATION Factory setting: FAULT MESSAGE  Note! ■ The behaviour of the status output is a normally closed behaviour, in other words the output is closed (transistor conductive) when normal, error-free measuring is in progress. – “normal, error-free” operation: Flow direction = forwards; limit values = not exceeded; no empty or partially filled measuring tube (EPD/OED); no fault or notice message present. – Switching response like relay output, see Page 99 ■ If you select OFF, the only function shown in the CONFIGURATION function group is this function, in other words ASSIGN STATUS (4241). ■ Switching response like relay output, see Page 99.

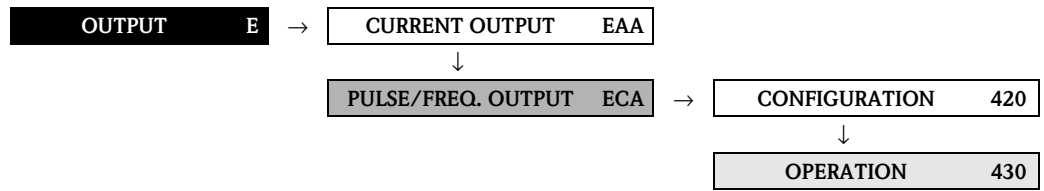
		Function description
		OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION (STATUS)
ASSIGN STATUS	4241	 Note! ■ The behaviour of the status output is a normally closed behaviour, in other words the output is closed (transistor conductive) when normal, error-free measuring is in progress. – “normal, error-free” operation: Flow direction = forwards; limit values = not exceeded; no empty or partially filled measuring tube (EPD/OED); no fault or notice message present. – Switching response like relay output, see Page 99 ■ If you select OFF, the only function shown in the CONFIGURATION function group is this function, in other words ASSIGN STATUS (4241). ■ Switching response like relay output, see Page 92.
(continued)		
ON-VALUE	4242	 Note! Function is not available unless STATUS was selected in the OPERATION MODE function (4200) and LIMIT VALUE or FLOW DIRECTION was selected in the ASSIGN STATUS function (4241). Use this function to assign a value to the switch-on point (activation of the status output). The value can be higher or lower than the switch-off point. Positive or negative values are permissible, depending on the measured variable in question (e.g. mass flow, totalizer reading). User input: 5-digit floating-point number, [unit] Factory setting: 0 [kg/h] or 2 [kg/l] or 200 [°C]  Note! ■ 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. ■ 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	
SWITCH-ON DELAY	4243	 Note! Function is not available unless STATUS was selected in the OPERATION MODE function (4200) and LIMIT VALUE or FLOW DIRECTION was selected in the ASSIGN STATUS function (4241). Use this function to define a delay (0...100 seconds) for the switch-on (i.e. signal changes from “not conductive” to “conductive”) of the status output. 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
MODBUS register:	3239	
Data type:	Float	
Access:	read/write	

Function description		
OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION (STATUS)		
OFF-VALUE MODBUS register: Data type: Access:	4244 3241 Float read/write	 Note! Function is not available unless STATUS was selected in the OPERATION MODE function (4200) and a 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 higher or lower than the switch-on point. Positive and negative values are permissible, depending on the measured variable in question (e.g. mass flow, totalizer reading). User input: 5-digit floating-point number, [unit] Factory setting: 0 [kg/h] or 2 [kg/l] or 200 [°C]  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 MODBUS register: Data type: Access:	4245 3243 Float read/write Volatile	 Note! Function is not available unless the STATUS setting was selected in the OPERATION MODE function (4200). Use this function to define a delay (0...100 seconds) for the switch-off (i.e. signal changes from "conductive" to "not conductive") of the status output. The delay starts when the limit value is reached. The status output does switch when the delay has timed out and the switch off 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 OUTPUT → PULSE/FREQUENCY OUTPUT → CONFIGURATION (STATUS)		
MEASURING MODE 4246 MODBUS register: 3245 Data type: Integer Access: read/write		 Note! Function is not available unless STATUS was selected in the OPERATION MODE function (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  <i>Fig. 30: Example for the SYMMETRY measuring mode</i> Switch-on point $Q = 4$ Switch-off point $Q = 10$ ① = Status output switched on (conductive) ② = Status output switched off (non-conductive)  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! Function is not available unless the STATUS setting was selected in the OPERATION MODE function (4200). Entering a time constant defines 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

A0001247

7.2.2 Function group OPERATION

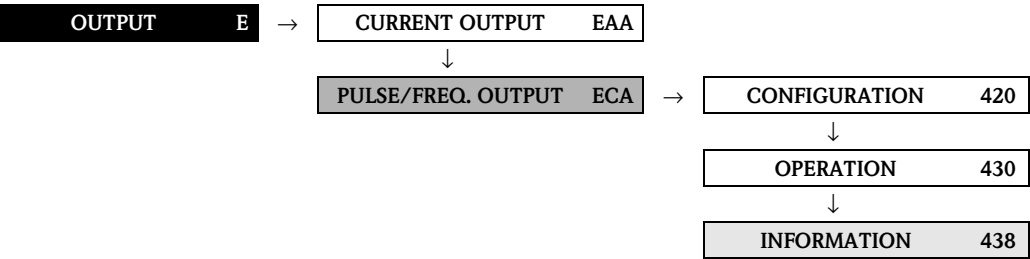


Function description OUTPUT → PULSE/FREQUENCY OUTPUT → OPERATION (FREQUENCY)		
ACTUAL FREQUENCY MODBUS register: 3218 Data type: Float Access: read	4301	 Note! Function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to view the computed actual value of the output frequency. Display: 0...12500 Hz
SIMULATION FREQUENCY MODBUS register: 3220 Data type: Integer Access: read/write	4302	 Note! Function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to activate simulation of the frequency output. Options: 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 in the event of a power failure.
VALUE SIMULATION FREQUENCY MODBUS register: 3221 Data type: Float Access: read/write	4303	 Note! Function is not available unless FREQUENCY was selected in the OPERATION MODE function (4200) and the SIMULATION FREQUENCY function (4302) is active (= ON). Use this function to define a free selectable frequency value (e.g. 500 Hz) which should be output at the frequency output (with maximum pulse frequency or shortened minimum pulse width). 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 in the event of a power failure.

Function description		
OUTPUT → PULSE/FREQUENCY OUTPUT → OPERATION (PULSE)		
SIMULATION PULSE MODBUS register: 4322 Data type: Integer Access: read/write		 Note! Function is not available unless the PULSE setting was selected in the OPERATION MODE function (4200). 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 in the event of a power failure.
VALUE SIMULATION PULSE MODBUS register: 4323 Data type: Float Access: read/write		 Note! Function is not available unless the COUNTDOWN setting 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...10 000 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 in the event of a power failure.

Function description OUTPUT → PULSE/FREQUENCY OUTPUT → OPERATION (STATUS)		
ACTUAL STATUS MODBUS register: Data type: Access:	4341 3248 Integer read	 Note! Function is not available unless the STATUS setting was selected in the OPERATION MODE function (4200). Use this function to check the current status of the status output. Display: 0 = NOT CONDUCTIVE 1 = CONDUCTIVE
SIMULATION SWITCH POINT MODBUS register: Data type: Access:	4342 3249 Integer read/write	 Note! Function is not available unless the STATUS setting was selected in the OPERATION MODE function (4200). Use this function to activate simulation of the status output. Options: 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 in the event of a power failure.
VALUE SIMULATION SWITCH POINT MODBUS register: Data type: Access:	4343 3250 Float read/write	 Note! Function is not available unless STATUS was selected in the OPERATION MODE function (4200) and the SIMULATION SWITCH POINT function (4342) is active (= ON). Use this function to define the switching response of the status output during the simulation. This value is used to test downstream devices and the measuring device itself. Options: 0 = NOT CONDUCTIVE 1 = CONDUCTIVE Factory setting: NOT CONDUCTIVE  Caution! The setting is not saved in the event of a power failure.

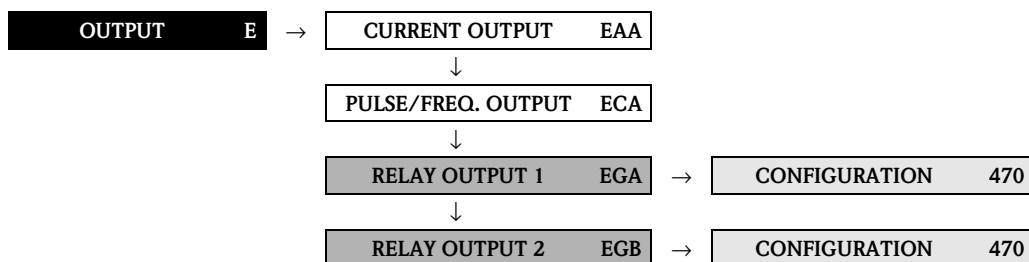
7.2.3 Function group INFORMATION



Function description		
OUTPUT → PULSE/FREQUENCY OUTPUT → INFORMATION		
TERMINAL NUMBER	4380	Use this function to view the numbers of the terminals (in the connection compartment) and the polarity used by the pulse/frequency output.
MODBUS register:	3251	Display: 0 = 26 (+) / 27 (-) 1 = 24 (+) / 25 (-) 2 = 22 (+) / 23 (-) 3 = 20 (+) / 21 (-)
Data type:	Integer	
Access:	read	

7.3 Group RELAY OUTPUT (1...2)

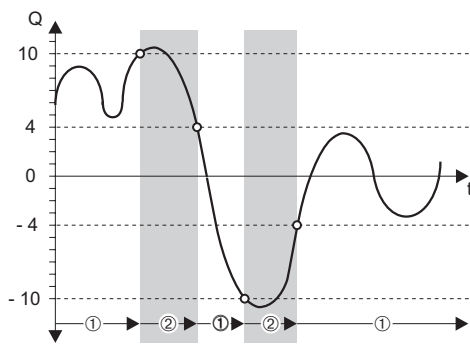
7.3.1 Function group CONFIGURATION



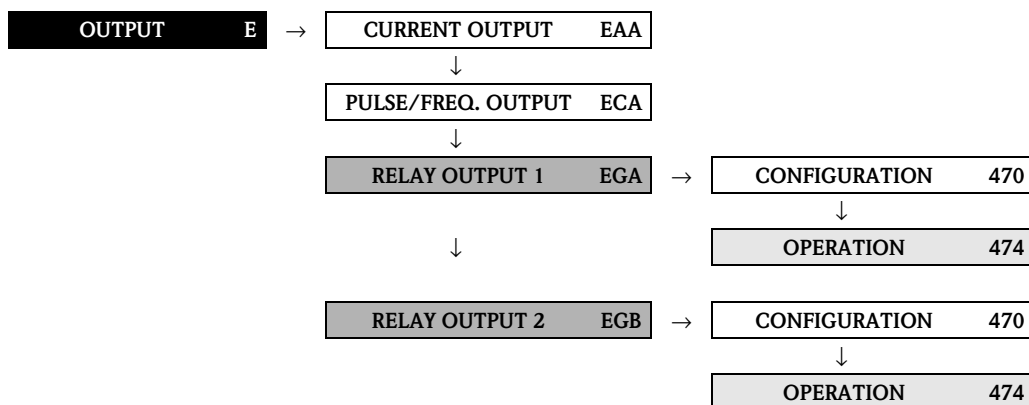
Function description		
OUTPUT → RELAY OUTPUT (1...2) → CONFIGURATION		
ASSIGN RELAY	4700	Use this function to assign a switching function to the relay output.
MODBUS register:		Options: (standard)
Relay output 1	3801	0 = OFF
Relay output 2	4001	1 = ON (operation)
Data type:	Integer	2 = FAULT MESSAGE
Access:	read/write	3 = NOTICE MESSAGE
		4 = FAULT MESSAGE or NOTICE MESSAGE
		5 = EPD (empty pipe detection, only if active)
		6 = FLOW DIRECTION
		7 = MASS FLOW LIMIT VALUE
		8 = VOLUME FLOW LIMIT VALUE
		14 = CORRECTED VOLUME FLOW LIMIT VALUE
		15 = DENSITY LIMIT VALUE
		16 = REFERENCE DENSITY LIMIT VALUE
		17 = TEMPERATURE LIMIT VALUE
		19 = TOTALIZER 1 LIMIT VALUE
		20 = TOTALIZER 2 LIMIT VALUE
		21 = TOTALIZER 3 LIMIT VALUE
		Advanced selection: with the optional SW 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 (max. 2).
		Advanced selection: with the optional SW package CONCENTRATION
		30 = LIMIT TARGET MASS FLOW
		31 = LIMIT TARGET % MASS PROPORTION FLOW
		32 = LIMIT TARGET VOLUME FLOW
		33 = LIMIT TARGET % VOLUME PROPORTION FLOW
		34 = LIMIT TARGET CORRECTED VOLUME FLOW
		35 = LIMIT CARRIER MASS FLOW
		36 = LIMIT CARRIER % MASS PROPORTION FLOW
		37 = LIMIT CARRIER VOLUME FLOW
		38 = LIMIT CARRIER % VOLUME PROPORTION FLOW
		39 = LIMIT CARRIER CORRECTED VOLUME FLOW
		40 = LIMIT % BLACK LIQUOR
		41 = LIMIT °BAUME > 1
		42 = LIMIT °BAUME < 1
		43 = LIMIT °API
		44 = LIMIT °PLATO
		45 = LIMIT °BALLING
		46 = LIMIT °BRIX
		47 = LIMIT OTHER (_ _ _ flexible concentration)
		(continued on next page)

Function description		
OUTPUT → RELAY OUTPUT (1...2) → CONFIGURATION		
ASSIGN RELAY (continued)	4700	Advanced selection: with the optional SW package ADVANCED DIAGNOSIS 84 = LIMIT MASS FLOW DEVIATION 85 = LIMIT DENSITY DEVIATION 86 = LIMIT REFERENCE DENSITY DEVIATION 87 = LIMIT TEMPERATURE DEVIATION 88 = LIMIT TUBE DAMPING DEVIATION 89 = LIMIT ELECTRODYNAMIC SENSOR DEVIATION 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 99). - It is advisable to configure at least one relay output as a fault output and define the outputs' response to error. - The relay output is configured as a normally open (NO or make) contact by default. It can be reconfigured as a normally closed (NC or break) contact by means of a jumper on the relay module (see Operating Instructions BA107D). - If you select OFF or ON, the only function shown in the CONFIGURATION function group is the function ASSIGN RELAY (4700).
ON-VALUE MODBUS register: Relay output 1 Relay output 2 Data type: Access:	4701 3802 4002 Float read/write	 Note! Function is not available unless LIMIT VALUE or FLOW DIRECTION was selected in the ASSIGN RELAY function (4700). Use this function to assign a value to the switch-on point (relay output pulls up). The value can be higher or lower than the switch-off point. Positive or negative values are permissible, depending on the measured variable in question (e.g. mass flow, totalizer reading). User input: 5-digit floating-point number, [unit] Factory setting: 0 [kg/h] or 2 [kg/l] or 200 [°C]  Note! - The appropriate unit is taken from the function UNIT VOLUME FLOW (0402) or UNIT MASS FLOW (0400). - Only the switch-on point is available for flow direction output (no switch-off point). If you enter a value not equal to the zero flow (e.g. 5), the difference between the zero flow and the value entered corresponds to half the switchover hysteresis.
SWITCH-ON DELAY MODBUS register: Relay output 1 Relay output 2 Data type: Access:	4702 3804 4004 Float read/write	 Note! Function is not available unless LIMIT VALUE or FLOW DIRECTION was selected in the ASSIGN RELAY function (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 on 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	
OUTPUT → RELAY OUTPUT (1...2) → CONFIGURATION	
OFF-VALUE 4703 MODBUS register: Relay output 1 3806 Relay output 2 4006 Data type: Float Access: read/write	 Note! Function is not available unless LIMIT VALUE was selected in the ASSIGN RELAY function (4700). Use this function to assign a value to the switch-off point (relay drops out). The value can be higher or lower than the switch-on point. Positive or negative values are permissible, depending on the measured variable in question (e.g. mass flow, totalizer reading). User input: 5-digit floating-point number, [unit] Factory setting: 0 [kg/h] or 2 [kg/l] or 200 [°C]  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.
SWITCH-OFF DELAY 4704 MODBUS register: Relay output 1 3808 Relay output 2 4008 Data type: Float Access: read/write	 Note! Function is not available unless LIMIT VALUE was selected in the ASSIGN RELAY function (4700). Use this function to define a delay (0 ... 100 seconds) for drop-out (i.e. signal changes from 1 to 0) of the relay output. The delay starts when the limit value is reached. The relay output does switch when the delay has timed out and the switch off condition has been valid over the delay time. User input: fixed-point number 0.0...100.0 s Factory setting: 0.0 s

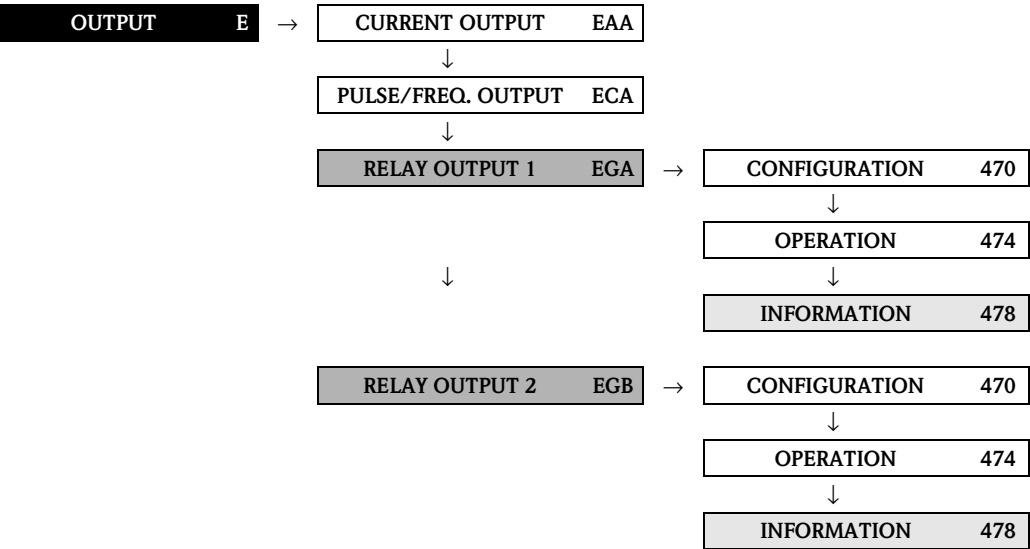
Function description		
OUTPUT → RELAY OUTPUT (1...2) → CONFIGURATION		
MEASURING MODE 4705 MODBUS register: Relay output 1 3810 Relay output 2 4010 Data type: Integer Access: read/write		 Note! This function is not visible unless a limit value was assigned to the relay output. Use this function to define 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 switch 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  A0001247 <i>Fig. 31 : Example for the SYMMETRY measuring mode</i> <i>Switch-on point Q = 4</i> <i>Switch-off point Q = 10</i> ① = Relay energised ② = Relay de-energised  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.
TIME CONSTANT 4706 MODBUS register: Relay output 1 3811 Relay output 2 4011 Data type: Float Access: read/write		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

7.3.2 Function group OPERATION



Function description OUTPUT → RELAY OUTPUT (1...2) → OPERATION		
ACTUAL STATUS RELAY 4740 MODBUS register: Relay output 1 3813 Relay output 2 4013 Data type: Integer Access: 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 Operating Instructions BA107D). Display: 0 = BREAK CONTACT OPEN 1 = BREAK CONTACT CLOSED 2 = MAKE CONTACT OPEN 3 = MAKE CONTACT CLOSED
SIMULATION SWITCH POINT 4741 MODBUS register: Relay output 1 3814 Relay output 2 4014 Data type: Integer Access: 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. - If the “BATCH VALVE 1” option was selected in the ASSIGN RELAY function (4700), the functional test takes place by means of the BATCH PROCEDURE function (7260), see Page 144. Caution! The setting is not saved in the event of a power failure.
VALUE SIMULATION SWITCH POINT 4742 MODBUS register: Relay output 1 3815 Relay output 2 4015 Data type: Integer Access: read/write		Note! The function is not visible unless the function SIMULATION SWITCH POINT (4741) is active. 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 Options: Relay output configured as normally closed (break) contact: 2 = MAKE CONTACT OPEN 3 = MAKE CONTACT CLOSED Caution! The setting is not saved in the event of a power failure.

7.3.3 Function group INFORMATION



Function description		
OUTPUT → RELAY OUTPUT (1...2) → INFORMATION		
TERMINAL NUMBER	4780	Use this function to view the numbers of the terminals (in the connection compartment) and the polarity used by the relay output.
MODBUS register:		Display:
Relay output 1	3816	0 = 26 (+) / 27 (–)
Relay output 2	4016	1 = 24 (+) / 25 (–)
Data type:	Integer	2 = 22 (+) / 23 (–)
Access:	read	3 = 20 (+) / 21 (–)

7.3.4 Information on the response of the relay output

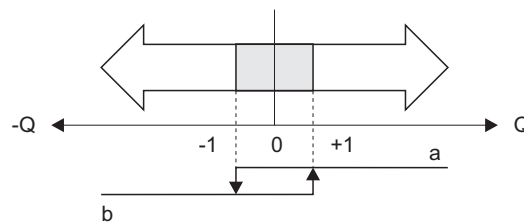
General

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 “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.



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Fig. 32 : Relay output configured for “flow direction”

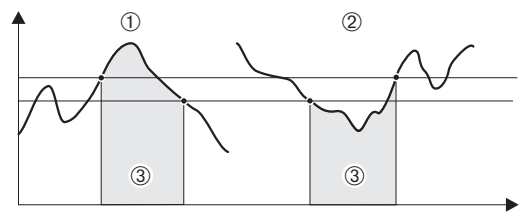
- a Relay energised
b Relay de-energised

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.

Measured variable

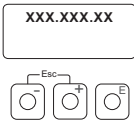
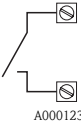
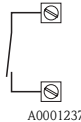
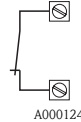
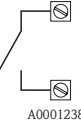
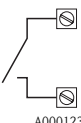
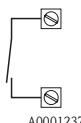
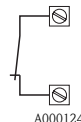
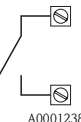
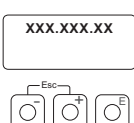
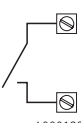
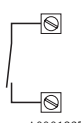
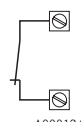
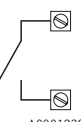
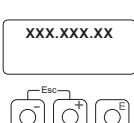
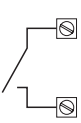
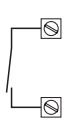
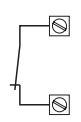
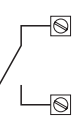
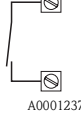
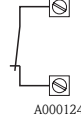


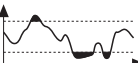
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Fig. 33 : Relay output configured for “limit value”

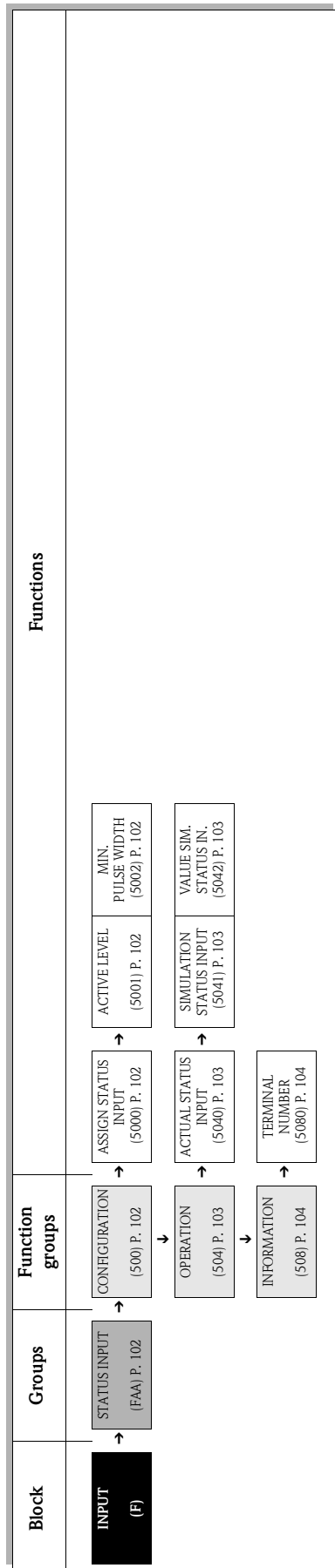
- ① = ON ≤ SWITCH-OFF POINT (maximum safety)
② = ON > SWITCH-OFF POINT (minimum safety)
③ = Relay de-energised

7.3.5 Switching response of the relay output

Function	State		Relay coil	Contact*	
				NC	NO
ON (operation)	System in measuring mode		energized		
	System not in measuring mode (power supply failed)		de-energized		
Fault message	System OK		energized		
	(System or process error) Fault → Response to error outputs/inputs and totalizers		de-energized		
Notice message	System OK		energized		
	(System or process error) Fault → Continuation of measuring		de-energized		
Fault message or Notice message	System OK		energized		
	(System or process error) Fault → Response to error or Note → Continuation of measuring		de-energized		
Empty pipe detection (EPD)	Measuring tube full		energized		
	Measuring tube partially filled / empty measuring tube		de-energized		

Function	State	Relay coil	Contact*	
			NC	NO
Flow direction	forward	 A0001241	 A0001239	 A0001237
	backward		 A0001240	 A0001238
Limit value – Mass flow – Volume flow – Corrected volume flow – Density – Reference density – Temperature – Totalizer	Limit value not overshoot or undershot	 A0001243	 A0001239	 A0001237
	Limit value overshoot or undershot	 A0001244	 A0001240	 A0001238
* Terminal numbers in accordance with the function TERMINAL NUMBER (4780) on Page 97.  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 INPUT

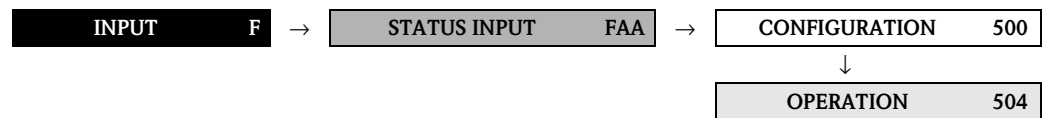


8.1 Group STATUS INPUT

8.1.1 Function group CONFIGURATION

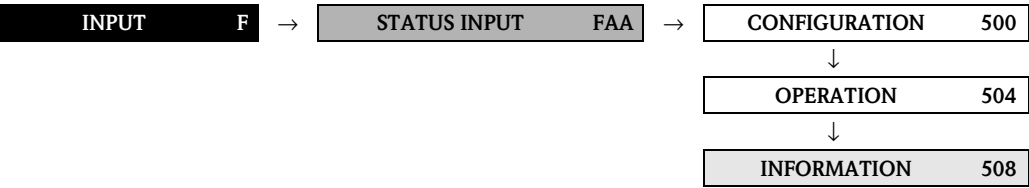
INPUT F		→	STATUS INPUT FAA	→	CONFIGURATION 500
Function description INPUT → STATUS INPUT → CONFIGURATION					
ASSIGN STATUS INPUT	5000				Use this function to assign a switching function to the status input. Options: 0 = OFF 1 = RESET TOTALIZER 1 2 = RESET TOTALIZER 2 3 = RESET TOTALIZER 3 4 = RESET ALL TOTALIZERS 5 = POSITIVE ZERO RETURN 6 = RESET FAULT MESSAGE 8 = ZEROPOINT ADJUST Advanced selection: with the optional SW package BATCHING: 9 = RUN BATCHING (start/stop) 10 = HOLD BATCHING (stop/continue) 11 = RESET BATCH SUM (resetting total quantity / total quantity totalizers) Advanced selection: with the optional SW package ADVANCED DIAGNOSIS 22 = ACQUISITION  Note! ACQUISITION is not available unless the MANUELL setting is selected in the ACQUISITION MODE function (7410). Factory setting: OFF  Caution! POSITIVE ZERO RETURN is active as long as the level is available at the status input (continuous signal). All other assignments react to a change in level (pulse) at the status input.
ACTIVE LEVEL	5001				Use this function to define whether the assigned function (see function ASSIGN STATUS INPUT (5000)) is released when the signal level is present (HIGH) or not present (LOW). Options: 1 = HIGH 0 = LOW Factory setting: HIGH
MINIMUM PULSE WIDTH	5002				Use this function to define a minimum pulse width which the input pulse must achieve in order to trigger the selected switching function, (see function ASSIGN STATUS INPUT (5000)). User input: 20...100 ms Factory setting: 50 ms

8.1.2 Function group OPERATION



Function description INPUT → STATUS INPUT → OPERATION		
ACTUAL STATUS INPUT 5040 MODBUS register: 4305 Data type: Integer Access: read		Use this function to view the current level of the status input. Display: 0 = LOW 1 = HIGH
SIMULATION STATUS INPUT 5041 MODBUS register: 4306 Data type: Integer Access: read/write		Use this function to simulate the status input, in other words to trigger the function assigned to the status input (see the function ASSIGN STATUS INPUT (5000) on Page 102). Display: 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 in the event of a power failure.
VALUE SIMULATION STATUS INPUT 5042 MODBUS register: 4307 Data type: Integer Access: read/write		 Note! The function is not visible unless the function SIMULATION STATUS INPUT (5041) is active. 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 in the event of a power failure.

8.1.3 Function group INFORMATION



Function description		
INPUT → STATUS INPUT → INFORMATION		
TERMINAL NUMBER	5080	Use this function to view the numbers of the terminals (in the connection compartment) and the polarity used by the status input.
MODBUS register:	4308	Display: 0 = 26 (+) / 27 (-) 1 = 24 (+) / 25 (-) 2 = 22 (+) / 23 (-) 3 = 20 (+) / 21 (-)
Data type:	Integer	
Access	read	

9 Block BASIC FUNCTION

Block	Groups	Function groups	Functions											
BASIC FUNCTION (G)	MODBUS RS485 (GDA) P. 106	↑	CONFIGURATION (630) P. 106	↑	TAG NAME (6300) P. 106	↑	FIELD BUS ADDRESS (6301) P. 106	BAUDRATE (6302) P. 106	TRANSMISSION MODE (6303) P. 106	PARITY (6304) P. 106	BYTE ORDER (6305) P. 107	DELAY TELEGR. REPLY (6306) P. 107	WRITE PROTECTION (6307) P. 107	SCAN LIST REGISTER 1...16 (6308) S. 107
		↓												
	PROCESS PARAMETER (GIA) P. 108	↑	CONFIGURATION (640) P. 108	↑	ASSIGN LF CUT OFF (6400) P. 108	↑	ON-VALUE LF CUT OFF (6402) P. 108	OFF-VALUE LF CUT OFF (6403) P. 108	OFF-VALUE LF CUT OFF (6403) P. 108	PRESS. SHOCK SUPP. (6404) P. 109				
		↓												
		↑	EPD PARAMETER (642) P. 110	↑	EPD (6420) P. 110	↑	EPD VALUE LOW (6423) P. 110	EPD VALUE HIGH (6424) P. 110	EPD RESPONSE TIME (6425) P. 110	EPD EXCITING CURRENT MAX (6426) P. 111				
		↓												
		↑	REFERENCE PARAMETER (646) P. 112	↑	COR. VOL. CALC. (6460) P. 112	↑	FIXED REFERENCE DENSITY (6462) P. 112	EXPANSION COEFF (6462) P. 112	EXPANSION COEF. SQR. (6463) P. 112	REFERENCE TEMPERATURE (6464) P. 113				
		↓												
		↑	ADJUSTMENT (648) P. 114	↑	ZERO POINT ADJUSTMENT (6480) P. 114	↑	DENSITY ADJUST MODE (6482) P. 114	DENSITY SETPOINT 1 (6483) P. 114	MEASURE FLUID 1 (6484) P. 114	DENSITY SETPOINT 2 (6485) P. 115	MEASURE FLUID 2 (6486) P. 115	DENSITY ADJUSTMENT (6487) P. 115	RESTORE ORIGINAL (6488) P. 115	
		↓												
		↑	PRESSURE CORRECTION (650) P. 116	↑	PRESSURE MODE (6500) P. 116	↑	PRESSURE (6501) P. 116							
		↓												
	SYSTEM PARAMETER (GLA) P. 117	↑	CONFIGURATION (660) P. 117	↑	INST. DIR. SENSOR (6600) P. 117	↑	DENSITY DAMPING (6602) P. 117	FLOW DAMPING (6603) P. 117	POSITIVE ZERO RETURN (6605) P. 117					
		↓												
	SENSOR DATA (GNA) P. 118	↑	CONFIGURATION (680) P. 118	↑	K-FACTOR (6800) P. 118	↑	ZERO POINT (6803) P. 118	NOMINAL DIAMETER (6804) P. 118						
		↓												
		↑	FLOW COEFFICIENT (684) P. 119	↑	COEFF. KM (6840) P. 119	↑	COEFF. KM 2 (6841) P. 119	COEFF. KT (6842) P. 119	COEFF. KD1 (6843) P. 119	COEFF. KD2 (6844) P. 119				
		↓												
		↑	DENSITY COEFFICIENT (685) P. 120	↑	COEFF. C 0 (6850) P. 120	↑	COEFF. C 1 (6851) P. 120	COEFF. C 2 (6852) P. 120	COEFF. C 3 (6853) P. 120	COEFF. C 4 (6854) P. 120	COEFF. C 5 (6855) P. 120			
		↓												
		↑	ADDITIONAL COEFFICIENT (686) P. 121	↑	MIN. TEMP. MEAS. (6860) P. 121	↑	MAX. TEMP. CARRIER (6861) P. 121	MIN. TEMP. MEAS. (6862) P. 121	MAX. TEMP. MEAS. (6863) P. 121					
		↓												

9.1 Group MODBUS RS485

9.1.1 Function group CONFIGURATION

BASIC FUNCTION	G	→	MODBUS RS485	GDA	→	CONFIGURATION	630
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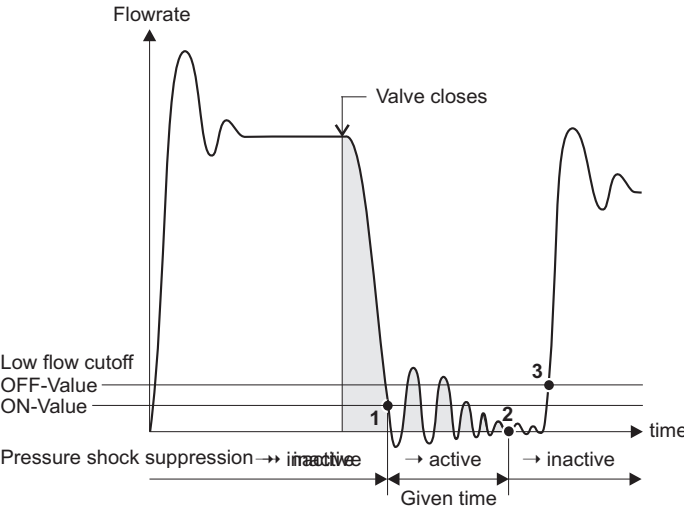
Function description		
BASIC FUNCTION → MODBUS RS485 → CONFIGURATION		
TAG NAME	6300	For entering a tag name for the measuring device. You can edit and read this tag name via the local display or the MODBUS protocol.
MODBUS register:	4901	
Data type:	String (16)	User input: max. 8-character text, permissible: A-Z, 0-9, +, -, punctuation marks
Access:	read/write	Factory setting: “ _____ ” (no text)
FIELDBUS ADDRESS	6301	For entering the device address.
MODBUS register:	4910	User input: 1...247
Data type:	Integer	Factory setting: 247
Access:	read/write	
BAUDRATE	6302	For selecting the baudrate.
MODBUS register:	4912	Options:
Data type:	Integer	0 = 1200 BAUD
Access:	read/write	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	Options:
Data type:	Integer	0 = RTU
Access:	read/write	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.
PARITY	6304	For selecting whether no parity bit or an even or uneven parity bit should be transmitted.
MODBUS register:	4914	 Note!
Data type:	Integer	The options available depend on the TRANSMISSION MODE function:
Access:	read/write	Options: (for TRANSMISSION MODE = RTU)
		0 = EVEN
		1 = ODD
		2 = NONE
		Options: (for TRANSMISSION MODE = ASCII)
		0 = EVEN
		1 = ODD
		Factory setting: EVEN

Function description		
BASIC FUNCTION → MODBUS RS485 → CONFIGURATION		
BYTE ORDER MODBUS register: Data type: Access:	6305 4915 Integer read/write	For selecting 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! More information can be found in Operating Instructions BA107D under the keyword "Byte transmission sequence".
DELAY TELEGRAM 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. Display: 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 BA107D).
SCAN LIST REGISTER 1...16 MODBUS register: SCAN LIST REG. 1 SCAN LIST REG. 2 SCAN LIST REG. 3 SCAN LIST REG. 4 SCAN LIST REG. 5 SCAN LIST REG. 6 SCAN LIST REG. 7 SCAN LIST REG. 8 SCAN LIST REG. 9 SCAN LIST REG. 10 SCAN LIST REG. 11 SCAN LIST REG. 12 SCAN LIST REG. 13 SCAN LIST REG. 14 SCAN LIST REG. 15 SCAN LIST REG. 16 Data type: Access:	6308 5001 5002 5003 5004 5005 5006 5007 5008 5009 5010 5011 5012 5013 5014 5015 5016 Integer read/write	By entering the register address, up to 16 device parameters can be grouped in the Autoscan 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 Autoscan Buffer are provided in Operating Instructions BA107D.

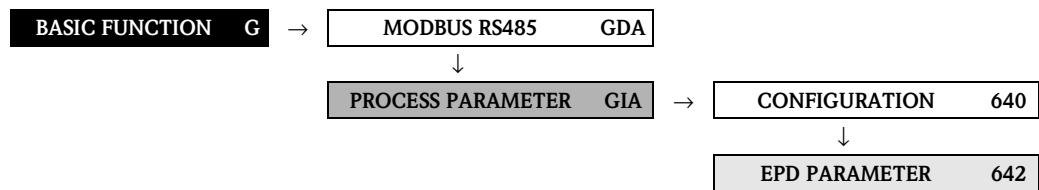
9.2
Group PROCESS PARAMETER

9.2.1
Function group CONFIGURATION

BASIC FUNCTION G		→	MODBUS RS485 GDA		
			↓		
				PROCESS PARAMETER GIA	→
				CONFIGURATION 640	
Function description BASIC FUNCTION → PROCESS PARAMETER → CONFIGURATION					
ASSIGN LOW FLOW CUT OFF MODBUS register: Data type: Access: 6400 5101 Integer read/write			Use this function to assign the switch point for low flow cut off rate suppression. Options: 0 = OFF 1 = MASS FLOW 2 = VOLUME FLOW 3 = CORRECTED VOLUME FLOW Factory setting: MASS FLOW		
ON-VALUE LOW FLOW CUT OFF MODBUS register: Data type: Access: 6402 5138 Float read/write			Use this function to assign a value to 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 Note! The appropriate unit is taken from the function group SYSTEM UNITS (see Page 15).		
OFF-VALUE LOW FLOW CUT OFF MODBUS register: Data type: Access: 6403 5104 Float read/write			Use this function to enter the switch-off point for low flow cut off. Enter the switch-off point as a positive hysteresis from the switch-on point. User input: 0...100% Factory setting: 50%		
Fig. 34 : Example for low flow cut off on-value and off-value Q = Flow [volume/time] t = Time a = ON-VALUE LOW FLOW CUT OFF (6402) = 200 kg/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 kg/h 2 = Low flow cut off is switched off at 220 kg/h					

Function description		
BASIC FUNCTION → PROCESS PARAMETER → CONFIGURATION		
PRESSURE SHOCK SUPPRESSION MODBUS register: Data type: Access:	6404 5104 Float read/write	The closure of a valve can cause brief but severe movements of the fluid in the piping system, movements which the measuring system registers. The pulses totalled in this way result in a totalizer reading error, particularly in the case of batching processes. For this reason, the measuring device is equipped with pressure shock suppression (= short-term signal suppression) which can eliminate system-related “disruptions”.  Note! Note that pressure shock suppression cannot be used unless the low flow cut off is active, (see function ON-VALUE LOW FLOW CUT OFF (6402) on Page 108). 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 actual 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).  <i>A0001285-EN</i> <i>Fig. 35 : Pressure shock suppression</i> User input: max. 4-digit number, incl. unit: 0.00...100.0 s Factory setting: 0.00 s

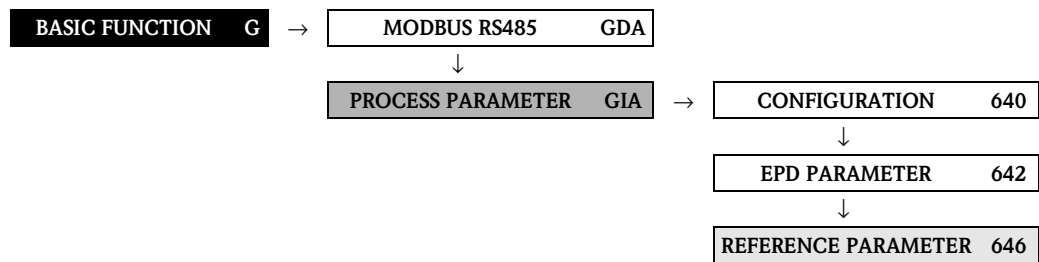
9.2.2 Function group EPD PARAMETER



Function description		
BASIC FUNCTION → PROCESS PARAMETER → EPD PARAMETER		
EMPTY PIPE DETECTION 6420 MODBUS register: 5106 Data type: Integer Access: read/write		Use this function to activate the empty pipe detection (EPD). With empty measuring tubes the density of the fluid falls below the value specified in the function EPD VALUE LOW. Options: 0 = OFF 1 = ON Factory setting: ON  Caution! ■ Select a correspondingly low EPD response value in the function EPD VALUE LOW, so that the difference to the effective density of the fluid is sufficiently large enough. This ensures that totally empty measuring tubes and not partially filled ones are detected. ■ For gas measurement we strongly recommend to switch off empty pipe detection.
EPD VALUE LOW 6423 MODBUS register: 5110 Data type: Float Access: read/write		 Note! Function is not available unless the ON selection was selected in the EMPTY PIPE DETECTION function. Use this function to set a lower threshold for the measured density value, in order to detect possible problems in the process indicated by too low density. User input: 5-digit floating-point number Factory setting: 0.2000 g/cc
EPD VALUE HIGH 6424 MODBUS register: 5112 Data type: Float Access: read/write		 Note! Function is not available unless the ON selection was selected in the EMPTY PIPE DETECTION function. Use this function to set an upper threshold for the measured density value. User input: 5-digit floating-point number Factory setting: 6.0000 g/cc
EPD RESPONSE TIME 6425 MODBUS register: 5108 Data type: Float Access: read/write		Use this function to enter the time span for which the criteria for an empty pipe have to be satisfied without interruption before a notice message or fault message is generated. User input: fixed-point number: 1.0...60 s Factory setting: 1.0 s

Function description		
BASIC FUNCTION → PROCESS PARAMETER → EPD PARAMETER		
EPD EXCITING CURRENT MAX	6426	Empty pipe detection (EPD) can be switched on in this function. In the event of inhomogeneous fluids or air bubbles, the exciting current of the measuring pipes increases. If the exciting current specified in this function is overshoot, error message #700 “EPD ACTIVE” is output similar to the EPD VALUE LOW (6423) function. User input: 5-digit floating-point number Factory setting: 100 mA (deactivated)  Note! The function is not activated until a value under 100 mA is input. Entering the value 100 mA deactivates the function.
MODBUS register:	5233	
Data type:	Float	
Access:	read/write	

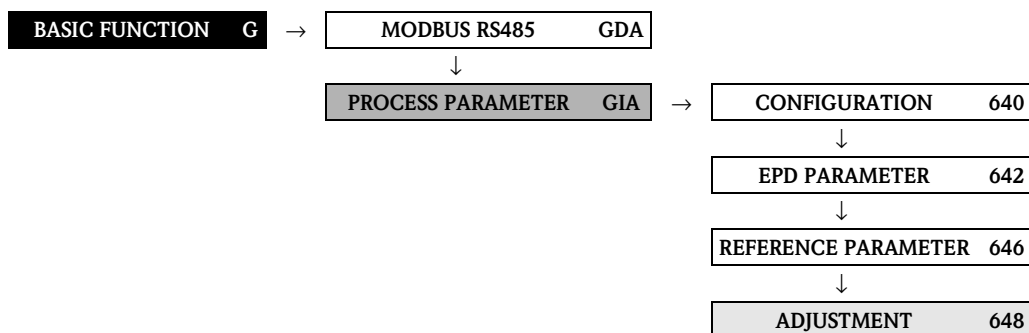
9.2.3 Function group REFERENCE PARAMETER



Function description BASIC FUNCTION → PROCESS PARAMETER → REFERENCE PARAMETER		
CORRECTED VOLUME CALCULATION MODBUS register: 5129 Data type: Integer Access: read/write	6460	This function is used to set the reference density for calculating the corrected volume flow. Options: 0 = FIXED REFERENCE DENSITY 1 = CALCULATED REFERENCE DENSITY Factory setting: CALCULATED REFERENCE DENSITY
FIXED REFERENCE DENSITY MODBUS register: 5130 Data type: Float Access: read/write	6461	 Note! Function is not available unless the FIXED REFERENCE DENSITY setting was selected in the CORRECTED VOLUME CALCULATION function (6460). In this function, a fixed value for the reference density can be entered, with which the corrected volume flow or corrected volume is calculated. User input: 5-digit floating-point number Factory setting: 1 kg/Nl
EXPANSION COEFFICIENT MODBUS register: 5132 Data type: Float Access: read/write	6462	 Note! Function is not available unless the CALCULATED REFERENCE DENSITY setting was selected in the CORRECTED VOLUME CALCULATION function (6460). For temperature-compensated calculations of the reference density an expansion coefficient specific to the fluid is required and can be entered in this function (see REFERENCE TEMPERATURE (6464) function on Page 113). User input: 5-digit floating-point number Factory setting: 0.5000 e-3 [1/K]
EXPANSION COEFFICIENT SQUARE MODBUS register: 5134 Data type: Float Access: read/write	6463	Use this function to enter a square expansion coefficient, if the temperature compensation follows a non-linear behaviour (see REFERENCE TEMPERATURE (6464) function on Page 113). User input: 5-digit floating-point number Factory setting: 0 e-6 [1/K ²]

Function description		
BASIC FUNCTION → PROCESS PARAMETER → REFERENCE PARAMETER		
REFERENCE TEMPERATURE	6464	 Note! Function is not available unless the CALCULATED REFERENCE DENSITY setting was selected in the CORRECTED VOLUME CALCULATION function (6460). For entering the reference temperature for calculating the corrected volume flow, the corrected volume and the reference density. User input: 5-digit floating-point number Factory setting: 20.000 °C The reference density is calculated as follows: $\rho_N = \rho \cdot (1 + \alpha \Delta t + \beta \Delta t^2)$; Δ where $t = t - t_N$ ρ_N = Reference density ρ = Currently measured fluid density (measuring value Promass) t = Actual measured temperature of fluid (measuring value Promass) t_N = Reference temperature for calculating the reference density (e.g. 20 °C) α = Vol. expansion coefficient of the fluid, unit [1/K] (K = Kelvin) β = Square vol. expansion coefficient of the fluid, unit [1/K²]

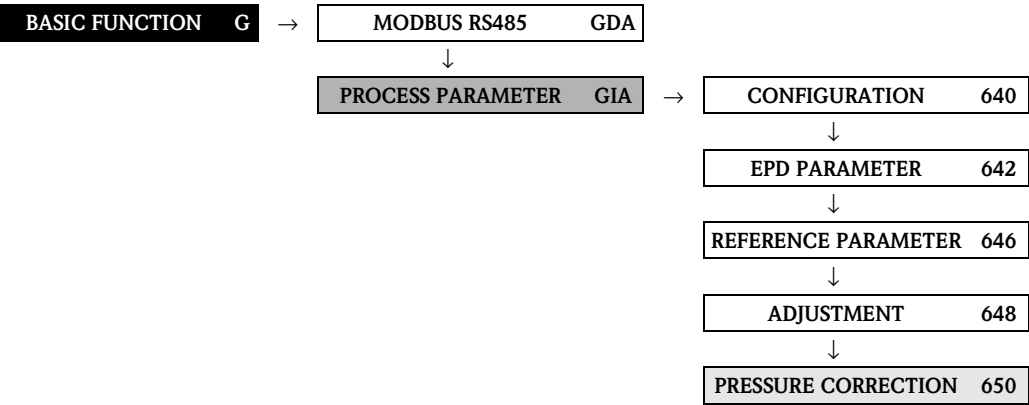
9.2.4 Function group ADJUSTMENT



Function description BASIC FUNCTION → PROCESS PARAMETER → ADJUSTMENT		
ZERO POINT ADJUSTMENT MODBUS register: 5121 Data type: Integer Access: read/write	6480	This function enables a zero point adjustment to be automatically carried out. The new zero point determined by the measuring system is adopted by the function ZERO POINT. Options: 0 = CANCEL 1 = START Factory setting: CANCEL  Caution! Before carrying this out, please refer to the Operating Instructions BA107D for a detailed description of the procedure for zero point adjustment.  Note! ■ Programming is locked during zero point adjustment. The message “ZERO ADJUST RUNNING” appears on the display. ■ If the zero point adjustment is not possible (e.g. if $v > 0.1$ m/s) or has been cancelled, the alarm message “ZERO ADJUST NOT POSSIBLE” appears on the display. ■ If the Promass 83 measuring electronics are fitted with a status input, then the zero point can also be activated by using this input.
DENSITY ADJUST MODE MODBUS register: 5180 Data type: Integer Access: read/write	6482	Use this function to select whether a 1-point or a 2-point density adjustment should be carried out. Options: 0 = CANCEL 1 = 1-POINT 2 = 2-POINT
DENSITY SETPOINT 1 MODBUS register: 5124 Data type: Float Access: read/write	6483	Use this function to enter the density setpoint value for the first fluid for which you want to carry out field density adjustment. User input: 5-digit floating-point number, including units  Note! ■ The preset density entered here should not vary from the actual fluid density by a more than $\pm 10\%$. ■ The appropriate unit is taken from the function group SYSTEM UNITS (see Page 15).
MEASURE FLUID 1 MODBUS register: 5126 Data type: Integer Access: read/write	6484	In this function the actual density of the first fluid is measured for density adjustment. Options: 0 = CANCEL 1 = START

Function description BASIC FUNCTION → PROCESS PARAMETER → ADJUSTMENT		
DENSITY SETPOINT 2	6485	Use this function to enter the density setpoint value for the second fluid for which you want to carry out field density adjustment. User input: 5-digit floating-point number, including units  Note! ■ The preset density entered here should not vary from the actual fluid density by a more than $\pm 10\%$. ■ The difference between the density setpoint values must be at least 0.2 kg/l. ■ The appropriate unit is taken from the function group SYSTEM UNITS (see Page 15).
MEASURE FLUID 2	6486	In this function the current density of the second fluid is measured for density adjustment. Options: 1 = CANCEL 2 = START
DENSITY ADJUSTMENT	6487	With this function a density adjustment can be carried out on site. The density adjustment values will thus be recalculated and stored. This ensures that the values dependent on density calculations (e.g. volume flow) are as accurate as possible.  Note! Before carrying this out, please refer to the Operating Instructions BA107D for a detailed description of the procedure for density adjustment. Two types of adjustment are possible: 1-point density adjustment (with one fluid) This type of density adjustment is necessary under the following conditions: ■ The sensor does not accurately measure the density which the operator expects based on laboratory trials. ■ The characteristics of the fluid are outside the measuring points set at the factory or reference conditions under which the flowmeter has been calibrated. ■ The plant is used solely for measuring a fluid whose density is to be determined very accurately under constant conditions. 2-point density adjustment (with two fluids) This type of adjustment must always be carried out when the measuring tubes are changed mechanically, e.g. due to deposits, abrasion or corrosion: In such instances, the measuring tube resonance frequency is influenced in such a way that it is no longer compatible with the calibration data determined at the factory. The 2-point density adjustment takes these mechanically-based changes into account and calculates new, adjusted calibration data. Options: 0 = CANCEL 1 = MEASURE FLUID 1 2 = MEASURE FLUID 2 3 = DENSITY ADJUST Factory setting: CANCEL
RESTORE ORIGINAL	6488	With this function the original density coefficient determined at the factory are restored. Options: 0 = NO 1 = YES Factory setting: NO

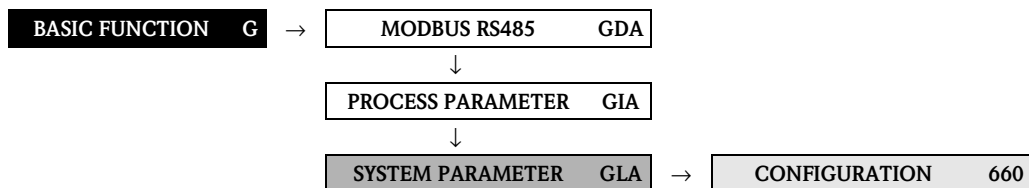
9.2.5 Function group PRESSURE CORRECTION



Function description		
BASIC FUNCTION → PROCESS PARAMETER → PRESSURE CORRECTION		
PRESSURE MODE6500 MODBUS register: 5184 Data type: Integer Access: read/write		Use this function to configure an automatic pressure correction. In this way, the effect of a pressure deviation between the calibration and process pressures on the measured error for mass flow is compensated for, (see also Operating Instructions BA107D, “Measuring accuracy” Chapter). Options: 0 = OFF 2 = FIX (a fixed process pressure for pressure correction is specified). Factory setting: OFF
PRESSURE6501 MODBUS register: 5185 Data type: Float Access: read/write		Note! Function is not available unless the FIX setting was selected in the PRESSURE MODE function (6500). Use this function to enter the value for the process pressure which should be used during pressure correction. User input: 7-digit floating-point number Factory setting: 0 bar g Note! The appropriate unit is taken from the function group SYSTEM UNITS (see Page 15).

9.3 Group SYSTEM PARAMETER

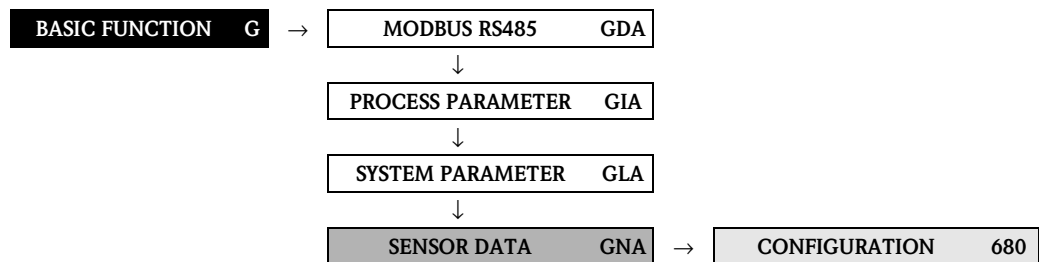
9.3.1 Function group CONFIGURATION



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).
DENSITY DAMPING MODBUS register: 5508 Data type: Float Access: read/write	6602	The density filter allows the sensitivity of the density measuring signal to be lowered with respect to variations in the density of the fluid, e.g. with inhomogeneous liquids. The damping acts on all functions and outputs of the measuring device. User input: max. 5-digit number, including unit: 0.00...100.00 s Factory setting: 0.00 s
FLOW DAMPING MODBUS register: 5510 Data type: Float Access: read/write	6603	Setting the filter depth of the digital filter. The sensitivity of the flow measurement signal can be reduced with respect to interference peaks (e.g. in the event of a high solid content, gas bubbles in the fluid etc.). The reaction time of the measuring device increases with every increase in the filter setting. The damping acts on all functions and outputs of the measuring device. User input: 0...100 s Factory setting: 0 s
POSITIVE ZERO RETURN MODBUS register: 5503 Data type: Integer Access: read/write	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, temperature and density are still output) Factory setting: OFF

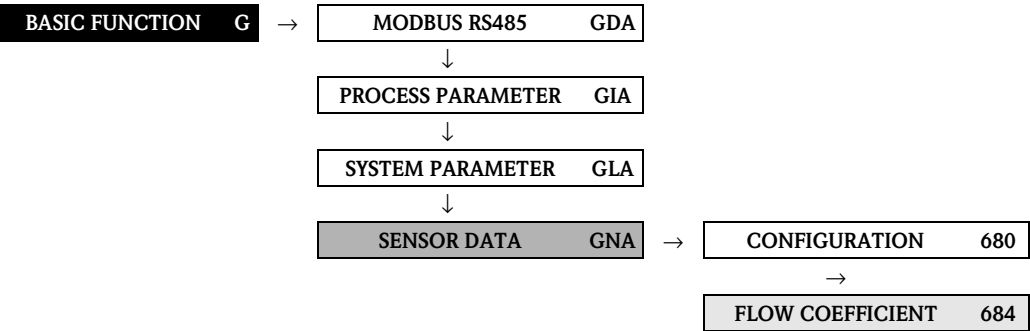
9.4 Group SENSOR DATA

9.4.1 Function group CONFIGURATION



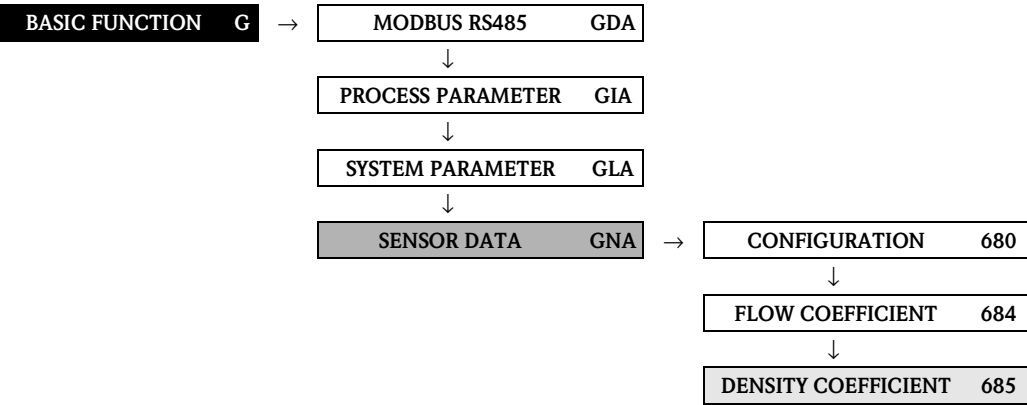
Function description BASIC FUNCTION → SENSOR DATA → CONFIGURATION		
All sensor data (calibration factor, zero point and nominal diameter) are set at the factory and saved on the S-DAT sensor memory chip.  Caution! Under normal circumstances you should not change the following parameter settings, because 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 6800 MODBUS register: 7513 Data type: Float Access: read		This function shows the current calibration factor for the sensor. Factory setting: Depends on nominal diameter and calibration
ZERO POINT 6803 MODBUS register: 7527 Data type: Float Access: read/write		This function shows the current zero point correction value for the sensor. Display: max. 5-digit number: -99999...+99999 Factory setting: Depends on calibration
NOMINAL DIAMETER 6804 MODBUS register: 7525 mm 7526 Inch 7526 Data type: Integer Access: read		Display: Nominal diameter for the sensor 0 = DN 1 or 1/24" 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 15 FB or 1/2" FB (FB = full bore) 10 = DN 20 or 3/4" 11 = DN 25 or 1" 12 = DN 25 FB or 1" FB 13 = DN 32 or 1 1/4" 14 = DN 40 or 1 1/2" 15 = DN 40 FB or 1 1/2" FB 16 = DN 50 or 2" 17 = DN 50 FB or 2" FB 18 = DN 65 or 2 1/2" 19 = DN 80 or 3" 20 = DN 100 or 4" 21 = DN 125 or 5" 22 = DN 150 or 6" 23 = DN 200 or 8" 24 = DN 250 or 10"

9.4.2 Function group FLOW COEFFICIENT



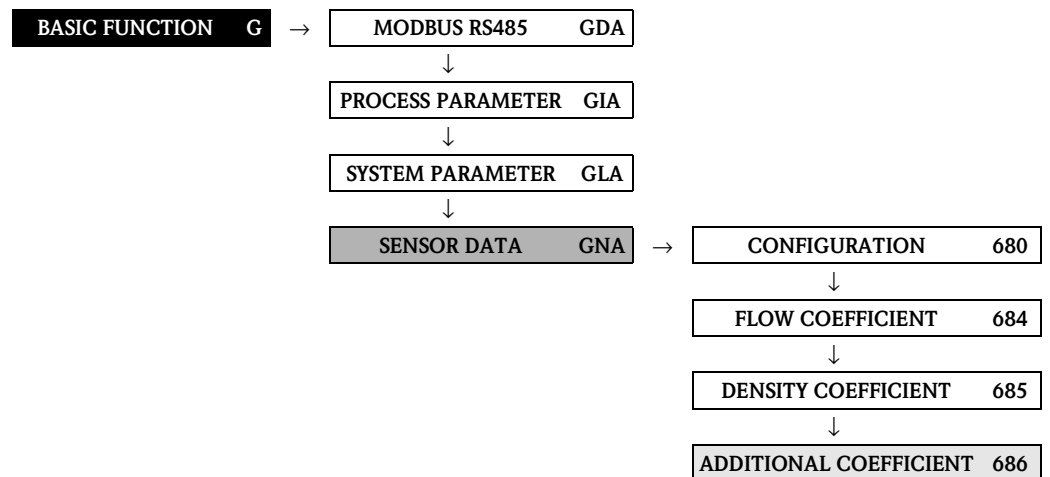
Function description		
BASIC FUNCTION → SENSOR DATA → FLOW COEFFICIENT		
All flow coefficients are set at the factory. All the sensor's parameter settings are saved on the S-DAT memory chip. Contact the Endress+Hauser service organization if you have any questions about these functions.		
TEMPERATURE COEFFICIENT KM MODBUS register: 7519 Data type: Float Access: read	6840	This function shows the temperature coefficient KM.
TEMPERATURE COEFFICIENT KM2 MODBUS register: 7521 Data type: Float Access: read	6841	This function shows the temperature coefficient KM2.
TEMPERATURE COEFFICIENT KT MODBUS register: 7523 Data type: Float Access: read	6842	This function shows the temperature coefficient KT.
CALIBRATION COEFFICIENT KD 1 MODBUS register: 7515 Data type: Float Access: read	6843	This function shows the calibration coefficient KD 1.
CALIBRATION COEFFICIENT KD 2 MODBUS register: 7515 Data type: Float Access: read	6844	This function shows the calibration coefficient KD 2.

9.4.3 Function group DENSITY COEFFICIENT



Function description		
BASIC FUNCTION → SENSOR DATA → DENSITY COEFFICIENT		
All density coefficients are set at the factory. All the sensor's parameter settings are saved on the S-DAT memory chip. Contact the Endress+Hauser service organization if you have any questions about these functions.		
DENSITY COEFF. C 0 MODBUS register: Data type: Access:	6850 7501 Float read	This function shows the actual density coefficient C 0.  Caution! A density adjustment can alter the calibration value of this coefficient.
DENSITY COEFF. C 1 MODBUS register: Data type: Access:	6851 7503 Float read	This function shows the actual density coefficient C 1.  Caution! A density adjustment can alter the calibration value of this coefficient.
DENSITY COEFF. C 2 MODBUS register: Data type: Access:	6852 7505 Float read	This function shows the actual density coefficient C 2.  Caution! A density adjustment can alter the calibration value of this coefficient.
DENSITY COEFF. C 3 MODBUS register: Data type: Access:	6853 7507 Float read	This function shows the actual density coefficient C 3.  Caution! A density adjustment can alter the calibration value of this coefficient.
DENSITY COEFF. C 4 MODBUS register: Data type: Access:	6854 7509 Float read	This function shows the actual density coefficient C 4.  Caution! A density adjustment can alter the calibration value of this coefficient.
DENSITY COEFF. C 5 MODBUS register: Data type: Access:	6855 7511 Float read	This function shows the actual density coefficient C 5.  Caution! A density adjustment can alter the calibration value of this coefficient.

9.4.4 Function group ADDITIONAL COEFFICIENT



Function description		
BASIC FUNCTION → SENSOR DATA → ADDITIONAL COEFFICIENT		
All sensor data are set at the factory. All the sensor's parameter settings are saved on the S-DAT memory chip.  Caution! These functions are used for displaying device parameters only and consequently cannot be accessed. Contact the Endress+Hauser service organization if you have any questions about these functions.		
MINIMAL TEMPERATURE MEASURED MODBUS register: 7529 Data type: Float Access: read	6860	The lowest fluid temperature measured appears on the display.
MAXIMAL TEMPERATURE MEASURED MODBUS register: 7531 Data type: Float Access: read	6861	The highest fluid temperature measured appears on the display.
MINIMAL TEMPERATURE CARRIER TUBE MODBUS register: 7533 Data type: Float Access: read	6862	 Hinweis! This function is not available for the Promass 83 E measuring device. The lowest carrier tube temperature measured appears on the display.
MAXIMAL TEMPERATURE CARRIER TUBE MODBUS register: 7535 Data type: Float Access: read	6863	 Hinweis! This function is not available for the Promass 83 E measuring device. The highest carrier tube temperature measured appears on the display.

10 Block SPECIAL FUNCTION

Block	Groups	Function groups	Functions												
SPECIAL FUNCTION (H)	DENSITY FUNCTIONS (HAA) P. 123	CONFIGURATION (700) P. 123	→	DENSITY FUNCTION (7000) P. 123	→	REF. DENSITY CARRIER FL. (7001) P. 123	EXP. COEF. LIN. CARR. FL. (7002) P. 123	EXP. COEF. SQR. CARR. FL. (7003) P. 124	REFERENCE DENSITY TARGET FLUID	EXP. COEF. LIN. TARGET FL. (7005) P. 124	EXP. COEF. SQR. TARG. FL. (7006) P. 124	LINEAR EXP. COEF. (7007) P. 124	SQUARE EXP. COEF. (7008) P. 125	REFERENCE TEMPERATURE (7009) P. 125	
			MODE (7021) P. 125	→	CONCENTRATIO N SELECTOR (7022) P. 126	CONCENTRATIO N NAME (7031) P. 126	COEFFICIENT A0 (7032) P. 126	COEFFICIENT A1 (7033) P. 126	COEFFICIENT A2 (7034) P. 127	COEFFICIENT A3 (7035) P. 127	COEFFICIENT A4 (7036) P. 127	COEFFICIENT B1 (7037) P. 127	COEFFICIENT B2 (7038) P. 128		
			COEFFICIENT B3 (7039) P. 128												
	BATCHING FUNCTION (HCA) P. 129	→	CONFIGURATION (720) P. 129	→	BATCH SELECTOR (7200) P. 129	→	BATCH NAME (7201) P. 129	ASSIGN BATCH VARIABLE (7202) P. 130	BATCH QUANTITY (7203) P. 130	FIX COMPENSATION QUANTITY	COMPENSATION MODE (7205) P. 131	CALCULATION MODE (7206) P. 133	AVERAGING DRIP (7207) P. 134	BATCH STAGES (7208) P. 134	INPUT FORMAT (7209) P. 135
		↓	VALVE PARAMETER (722) P. 136	→	OPEN VALVE 1 (7220) P. 136	→	CLOSE VALVE 1 (7221) P. 136	OPEN VALVE 2 (7222) P. 137	CLOSE VALVE 2 (7223) P. 138						
		↓	SUPERVISION (724) P. 141	→	MAXIMUM BATCHING TIME (7240) P. 141	→	MINIMUM BATCHING QUANTITY	MAXIMUM BATCHING QUANTITY	PROGRESS NOTE (7243) P. 143	MAX. FLOW VALUE (7244) P. 143					
		↓	OPERATION (726) P. 144	→	BATCH PROCEDURE (7260) P. 144	→	BATCH UPWARDS (7261) P. 144	BATCH DOWNWARDS (7262) P. 144	BATCH COUNTER (7263) P. 145	BATCH SUM (7264) P. 145	RESET SUM/COUNTER (7265) P. 145				
	↓	INFORMATION (728) P. 146	→	VALVE 1 INT. SETPOINT (7280) P. 146	→	DRIP QUANTITY (7281) P. 146	VALVE 1 CLOSING TIME (7282) P. 146	BATCHING TIME (7283) P. 146							
		↓	ADVANCED DIAGNOSTICS (HEA) P. 147	→	CONFIGURATION (740) P. 147	→	REF. COND. USER (7401) P. 147	WARNING MODE (7402) P. 147	(7403) P. 147						
		ACQUISITION (741) P. 148	→	ACQUISITION MODE (7410) P. 148	→	ACQUISITION PERIOD (7411) P. 148	ACQUISITION DO (7412) P. 148	RESET HISTORY (7413) P. 148							
↓			MASS FLOW (742) P. 149	→	REFERENCE VALUE (7420) P. 149	→	ACTUAL VALUE (7421) P. 149	MINIMUM VALUE (7422) P. 149	MAXIMUM VALUE (7423) P. 149	HISTORY MASS FLOW	ACTUAL DEVIATION (7425) P. 149	WARNING LEVEL (7426) P. 150			
↓			DENSITY (743) P. 151	→	REFERENCE VALUE (7430) P. 151	→	ACTUAL VALUE (7431) P. 151	MINIMUM VALUE (7432) P. 151	MAXIMUM VALUE (7433) P. 151	HISTORY DENSITY	ACTUAL DEVIATION (7435) P. 152	WARNING LEVEL (7436) P. 152			
↓		REFERENCE DENSITY (744) P. 153	→	REFERENCE VALUE (7440) P. 153	→	ACTUAL VALUE (7441) P. 153	MINIMUM VALUE (7442) P. 153	MAXIMUM VALUE (7443) P. 153	HISTORY REFERENCE DENSITY	ACTUAL DEVIATION (7445) P. 154	WARNING LEVEL (7446) P. 154				
↓		TEMPERATURE (745) P. 155	→	REFERENCE VALUE (7450) P. 155	→	ACTUAL VALUE (7451) P. 155	MINIMUM VALUE (7452) P. 155	MAXIMUM VALUE (7453) P. 155	HISTORY TEMPERATURE	ACTUAL DEVIATION (7455) P. 156	WARNING LEVEL (7456) P. 156				
↓		TUBE DAMPING (746) P. 157	→	REFERENCE VALUE (7460) P. 157	→	ACTUAL VALUE (7461) P. 157	MINIMUM VALUE (7462) P. 157	MAXIMUM VALUE (7463) P. 157	HISTORY 1 (7464) P. 158	ACTUAL DEVIATION (7465) P. 158	WARNING LEVEL (7466) P. 158				
↓		ELECTRODYNAM IC SENSORS (747) P. 159	→	REFERENCE VALUE (7470) P. 159	→	ACTUAL VALUE (7471) P. 159	MINIMUM VALUE (7472) P. 159	MAXIMUM VALUE (7473) P. 159	HISTORY 1 (7474) P. 160	ACTUAL DEVIATION (7475) P. 160	WARNING LEVEL (7476) P. 160				

10.1 Group DENSITY FUNCTIONS

10.1.1 Function group CONFIGURATION

SPECIAL FUNCTION H		→	DENSITY FUNCTIONS HAA	→	CONFIGURATION 700
Function description SPECIAL FUNCTION → DENSITY FUNCTIONS → CONFIGURATION					
DENSITY FUNCTION	7000	For selecting the density function which is used to calculate special density values or the percentage proportion of components in two-phase fluids. MODBUS register: 2207 Data type: Integer Access: read/write User input: 0 = OFF 1 = % MASS / % VOLUME 2 = % BLACK-LIQUOR 3 = °BAUME > 1 SG 4 = °BAUME < 1 SG 5 = ° API 6 = ° PLATO 7 = ° BALLING 8 = ° BRIX 9 = FLEXIBLE Factory setting: OFF			
REFERENCE DENSITY CARRIER FLUID	7001	 Note! Function is not available unless % MASS / % VOLUME or % BLACK-LIQUOR was selected in the DENSITY FUNCTION function (7000). Use this function to enter the reference density (density at reference temp.) of the carrier fluid. This value is required for temperature-compensated calculation of the target fluid content in a two-phase fluid. User input: 5-digit floating-point number, including units Factory setting: 1.0000 kg/l  Note! - Carrier fluid = transporting liquid, (e.g. water) - Target fluid = material transported (e.g. lime powder) - The appropriate unit is taken from the function UNIT REFERENCE DENSITY (0421) (see Page 18).			
EXPANSION COEFFICIENT LINEAR CARRIER FLUID	7002	 Note! Function is not available unless % MASS / % VOLUME or % BLACK-LIQUOR was selected in the DENSITY FUNCTION function (7000). For entering the fluid-specific expansion coefficient for the carrier fluid for linear temperature curves. This value is required for temperature-compensated calculation of the target fluid content in a two-phase fluid. User input: 5-digit floating-point number, including unit and sign Factory setting: 0.5000 e-3 [1/K]			

Function description SPECIAL FUNCTION → DENSITY FUNCTIONS → CONFIGURATION		
EXPANSION COEFFICIENT SQUARE CARRIER FLUID MODBUS register: 2212 Data type: Float Access: read/write	7003	 Note! Function is not available unless % MASS / % VOLUME or % BLACK-LIQUOR was selected in the DENSITY FUNCTION function (7000). For entering the fluid-specific expansion coefficient for the carrier fluid for non-linear temperature curves. This value is required for temperature-compensated calculation of the target fluid content in a two-phase fluid. User input: 5-digit floating-point number, including unit and sign Factory setting: 0.0000 e-6 [1/K²]
REFERENCE DENSITY TARGET FLUID MODBUS register: 2214 Data type: Float Access: read/write	7004	 Note! Function is not available unless % MASS / % VOLUME or % BLACK-LIQUOR was selected in the DENSITY FUNCTION function (7000). Use this function to enter the reference density (density at reference temp.) of the target fluid. This value is required for temperature-compensated calculation of the target fluid content in a two-phase fluid. User input: 5-digit floating-point number, including units Factory setting: 1.0000 kg/l  Note! ■ Carrier fluid = transporting liquid, (e.g. water) - Target fluid = material transported (e.g. lime powder) ■ The appropriate unit is taken from the function UNIT REFERENCE DENSITY (0421) (see Page 18). ■
EXPANSION COEFFICIENT LINEAR TARGET FLUID MODBUS register: 2216 Data type: Float Access: read/write	7005	 Note! Function is not available unless % MASS / % VOLUME or % BLACK-LIQUOR was selected in the DENSITY FUNCTION function (7000). For entering the fluid-specific expansion coefficient for the target fluid for linear temperature curves. This value is required for temperature-compensated calculation of the target fluid content in a two-phase fluid. User input: 5-digit floating-point number, including unit and sign Factory setting: 0.5000 e-3 [1/K]
EXPANSION COEFFICIENT SQUARE TARGET FLUID MODBUS register: 2218 Data type: Float Access: read/write	7006	 Note! Function is not available unless % MASS / % VOLUME or % BLACK-LIQUOR was selected in the DENSITY FUNCTION function (7000). For entering the fluid-specific expansion coefficient for the target fluid for non-linear temperature curves. This value is required for temperature-compensated calculation of the target fluid content in a two-phase fluid. User input: 5-digit floating-point number, including unit and sign Factory setting: 0.0000 e-6 [1/K²]
LINEAR EXPANSION COEFFICIENT MODBUS register: 2222 Data type: Float Access: read/write	7007	 Note! Function is not available unless °BAUME < 1SG, °BAUME > 1SG, °API, °PLATO, °BALLING or °BRIX was selected in the DENSITY FUNCTION function (7000). For entering the fluid-specific expansion coefficient (for linear temperature curves), to calculate the temperature-compensated density functions. User input: 5-digit floating-point number, including unit and sign Factory setting: 0.5000 e-3 [1/K]

Function description SPECIAL FUNCTION → DENSITY FUNCTIONS → CONFIGURATION		
SQUARE EXPANSION COEFFICIENT MODBUS register: 2224 Data type: Float Access: read/write	7008	 Note! Function is not available unless °BAUME < 1SG, °BAUME > 1SG, °API, °PLATO, °BALLING or °BRIX was selected in the DENSITY FUNCTION function (7000). For entering the fluid-specific expansion coefficient (for non-linear temperature curves), to calculate the temperature-compensated density functions. User input: 5-digit floating-point number, including unit and sign Factory setting: 0.0000 e-6 [1/K²]
REFERENCE TEMPERATURE MODBUS register: 2220 Data type: Float Access: read/write	7009	 Note! Function only available if OFF, °BRIX or FLEXIBLE was not selected in the function DENSITY FUNCTION (7000). For entering the reference temperature for the density functions. User input: 4-digit fixed-point number, including unit and sign Factory setting: 20 °C
MODE MODBUS register: 2226 Data type: Integer Access: read/write	7021	 Note! Function is not available unless the FLEXIBLE setting was selected in the DENSITY FUNCTION function (7000). Use this function to select a user-specific method of calculating the concentration of the density and temperature measured. In order to use this function, the following values are required: ■ Concentration (see formula) ■ Currently measured density ■ Currently measured temperature The concentration is calculated from the density and temperature as follows: $K = A0 + A1 \cdot \rho + A2 \cdot \rho^2 + A3 \cdot \rho^3 + A4 \cdot \rho^4 + B1 \cdot T + B2 \cdot T^2 + B3 \cdot T^3$ K = Concentration ρ = Currently measured density A0 = Value from function COEFFICIENT A0 (7032) A1 = Value from function COEFFICIENT A1 (7033) A2 = Value from function COEFFICIENT A2 (7034) A3 = Value from function COEFFICIENT A3 (7035) A4 = Value from function COEFFICIENT A4 (7036) B1 = Value from function COEFFICIENT B1 (7037) B2 = Value from function COEFFICIENT B2 (7038) B3 = Value from function COEFFICIENT B3 (7039) T = Currently measured temperature in °C User input: 0 = % MASS 3D 1 = % VOLUME 3D 2 = % MASS 2D 3 = % VOLUME 2D Factory setting: % MASS 3D  Note! If the relation between concentration density and temperature is given as table, the equation coefficients can be determined e.g. via the FieldTool operation program and transmitted to the measuring device.

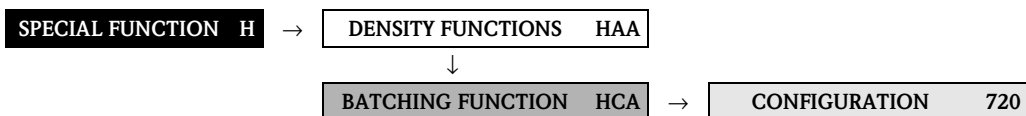
		Function description
		SPECIAL FUNCTION → DENSITY FUNCTIONS → CONFIGURATION
CONCENTRATION SELECTOR	7022	For selecting the concentration specification. There are four different specifications available, via which various concentrations can be defined. Options: 0 = CONC. # 1 1 = CONC. # 2 2 = CONC. # 3 3 = CONC. # 4 Factory setting: CONC. # 1  Note! ■ A specific name can be given to the concentration specification (CONC. # 1...4) in the CONCENTRATION NAME function (7031). ■ By selecting a concentration specification and the (subsequent) relevant settings, up to 4 different concentrations can be preconfigured and selected when needed. ■ All settings in the subsequent functions of this function group are each only valid for the concentration specification selected in the function CONCENTRATION SELECTOR (7022). In other words, the entry or option is assigned to the concentration specification currently selected (e.g. in the factory setting CONC. # 1).
CONCENTRATION NAME	7031	For entering a specific name for the concentration specification selected. User input: max. 8-character text, permissible: A-Z, 0-9 Factory setting: Name of concentration specification (depends on selection in the function CONCENTRATION SELECTOR (7022), e.g. "CONC. # 1").  Note for MODBUS! The MODBUS register depends on the option selected in the function CONCENTRATION SELECTOR (7022): ■ CONC. # 1 = MODBUS register 2292 ■ CONC. # 2 = MODBUS register 2296 ■ CONC. # 3 = MODBUS register 2300 ■ CONC. # 4 = MODBUS register 2304
COEFFICIENT A0	7032	Coefficient A0 entry. User input: 5-digit floating-point number Factory setting: 0  Note for MODBUS! The MODBUS register depends on the option selected in the function CONCENTRATION SELECTOR (7022): ■ CONC. # 1 = MODBUS register 2227 ■ CONC. # 2 = MODBUS register 2229 ■ CONC. # 3 = MODBUS register 2231 ■ CONC. # 4 = MODBUS register 2233
COEFFICIENT A1	7033	Coefficient A1 entry. User input: 5-digit floating-point number Factory setting: 0  Note for MODBUS! The MODBUS register depends on the option selected in the function CONCENTRATION SELECTOR (7022): ■ CONC. # 1 = MODBUS register 2235 ■ CONC. # 2 = MODBUS register 2237 ■ CONC. # 3 = MODBUS register 2239 ■ CONC. # 4 = MODBUS register 2241

Function description SPECIAL FUNCTION → DENSITY FUNCTIONS → CONFIGURATION		
COEFFICIENT A2	7034	Coefficient A2 entry. User input: 5-digit floating-point number Factory setting: 0  Note for MODBUS! The MODBUS register depends on the option selected in the function CONCENTRATION SELECTOR (7022): ■ CONC. # 1 = MODBUS register 2243 ■ CONC. # 2 = MODBUS register 2245 ■ CONC. # 3 = MODBUS register 2247 ■ CONC. # 4 = MODBUS register 2249
MODBUS register: Data type: Access:	See Note Float read	
COEFFICIENT A3	7035	Coefficient A3 entry. User input: 5-digit floating-point number Factory setting: 0  Note for MODBUS! The MODBUS register depends on the option selected in the function CONCENTRATION SELECTOR (7022): ■ CONC. # 1 = MODBUS register 2251 ■ CONC. # 2 = MODBUS register 2253 ■ CONC. # 3 = MODBUS register 2255 ■ CONC. # 4 = MODBUS register 2257
MODBUS register: Data type: Access:	See Note Float read	
COEFFICIENT A4	7036	Coefficient A4 entry. User input: 5-digit floating-point number Factory setting: 0  Note for MODBUS! The MODBUS register depends on the option selected in the function CONCENTRATION SELECTOR (7022): ■ CONC. # 1 = MODBUS register 2259 ■ CONC. # 2 = MODBUS register 2261 ■ CONC. # 3 = MODBUS register 2263 ■ CONC. # 4 = MODBUS register 2265
MODBUS register: Data type: Access:	See Note Float read	
COEFFICIENT B1	7037	 Note! This function does only appear if the option % MASS 3D, % VOLUME 3D or OTHER 3D was selected in the function MODE (7021). Coefficient B1 entry. User input: 5-digit floating-point number Factory setting: 0  Note for MODBUS! The MODBUS register depends on the option selected in the function CONCENTRATION SELECTOR (7022): ■ CONC. # 1 = MODBUS register 2267 ■ CONC. # 2 = MODBUS register 2269 ■ CONC. # 3 = MODBUS register 2271 ■ CONC. # 4 = MODBUS register 2273
MODBUS register: Data type: Access:	See Note Float read	

Function description		
SPECIAL FUNCTION → DENSITY FUNCTIONS → CONFIGURATION		
COEFFICIENT B2	7038	Note! This function does only appear if the option % MASS 3D, % VOLUME 3D or OTHER 3D was selected in the function MODE (7021). Coefficient B2 entry. User input: 5-digit floating-point number Factory setting: 0 Note for MODBUS! The MODBUS register depends on the option selected in the function CONCENTRATION SELECTOR (7022): ■ CONC. # 1 = MODBUS register 2275 ■ CONC. # 2 = MODBUS register 2277 ■ CONC. # 3 = MODBUS register 2279 ■ CONC. # 4 = MODBUS register 2281 Note! This function does only appear if the option % MASS 3D, % VOLUME 3D or OTHER 3D was selected in the function MODE (7021). Coefficient B3 entry. User input: 5-digit floating-point number Factory setting: 0 Note for MODBUS! The MODBUS register depends on the option selected in the function CONCENTRATION SELECTOR (7022): ■ CONC. # 1 = MODBUS register 2283 ■ CONC. # 2 = MODBUS register 2285 ■ CONC. # 3 = MODBUS register 2287 ■ CONC. # 4 = MODBUS register 2289 Note! This function does only appear if the option % MASS 3D, % VOLUME 3D or OTHER 3D was selected in the function MODE (7021). Coefficient B2 entry. User input: 5-digit floating-point number Factory setting: 0 Note for MODBUS! The MODBUS register depends on the option selected in the function CONCENTRATION SELECTOR (7022): ■ CONC. # 1 = MODBUS register 2275 ■ CONC. # 2 = MODBUS register 2277 ■ CONC. # 3 = MODBUS register 2279 ■ CONC. # 4 = MODBUS register 2281

10.2 Group BATCHING FUNCTION

10.2.1 Function group CONFIGURATION



Function description SPECIAL FUNCTION → BATCHING FUNCTION → CONFIGURATION		
BATCH SELECTOR	7200	For selecting the batching specification. There are six different batching specifications available by means of which different batchings can be defined. Options: 0 = BATCH # 1 1 = BATCH # 2 2 = BATCH # 3 3 = BATCH # 4 4 = BATCH # 5 5 = BATCH # 6 Factory setting: BATCH #1  Note! - A specific name can be given to the batching process (BATCH # 1...6) in the function BATCH NAME (7201). - 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 settings in the subsequent functions of this function group are each only valid for the batching specification selected in the function BATCH SELECTOR (7200). In other words, the entry or option is assigned to the batching specification currently selected (e.g. in the factory setting BATCH # 1).
BATCH NAME	7201	Use this function to assign a specific name to the batching specification. User input: max. 8-character text, permissible: A-Z, 0-9 Factory setting: Name of batching specification (depends on selection in the function BATCH SELECTOR (7200), e.g. "BATCH # 1").  Note! Once an entry has been made (e.g. "BEER 33"), the batch name (BEER 33) appears in the home position when selecting the quantity and the name of the batching specification (e.g. "BATCH # 1") no longer appears.  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

Function description SPECIAL FUNCTION → BATCHING FUNCTION → CONFIGURATION		
ASSIGN BATCH VARIABLE MODBUS register: Data type: Access:	7202 See Note Integer read/write	Use this function to assign a batching variable to the batching specification. Options: 0 = OFF 1 = MASS FLOW 2 = VOLUME FLOW 3 = CORRECTED VOLUME FLOW Advanced selection: with the optional SW package CONCENTRATION: 4 = TARGET MASS FLOW 5 = TARGET VOLUME FLOW 6 = TARGET CORRECTED VOLUME FLOW 7 = CARRIER MASS FLOW 8 = CARRIER VOLUME FLOW 9 = CARRIER CORRECTED VOLUME 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
BATCH QUANTITY MODBUS register: Data type: Access:	7203 See Note Float read/write	Use this function to define the quantity to be batched. User input: 5-digit floating-point number Factory setting: 0 [unit]  Note! ■ The appropriate unit is taken from the function group SYSTEM UNITS (see Page 15). ■ When the batching quantity entered here is achieved, valve 1 closes (see function CLOSE VALVE 1 (7221) on Page 136).  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

Function description SPECIAL FUNCTION → BATCHING FUNCTION → CONFIGURATION		
FIX COMPENSATION QUANTITY MODBUS register: Data type: Access:	7204 See Note Float read/write	Use this function to specify a positive or negative compensation quantity. The compensation quantity balances out a constant, system-related incorrect quantity. This can be caused, for example, by a pump over-running or by the closing time of a valve. The compensation quantity is determined by the system operator. A negative compensation quantity must be specified for overbatching and a positive compensation quantity for underbatching.  Note! The compensation quantity affects batching quantity only and does not affect the after run compensation. User input: +/-10% of the batch quantity 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 (see Page 15).  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
COMPENSATION MODE MODBUS register: Data type: Access:	7205 See Note Integer read/write	Use this function to determine whether the after run quantity or a fixed compensation quantity should be taken into account at the next batching. Options: 0 = OFF 1 = MODE 1 2 = MODE 2 Factory setting: OFF  Note! The pressure shock suppression must be switched off if MODE 1 or MODE 2 is selected in this function (siehe Funktion PRESSURE SHOCK SUPPRESSION auf Seite 109).  Note for MODBUS! The MODBUS register depends on the option selected in the function BATCH SELECTOR (7200): ■ BATCH # 1 = MODBUS register 6356 ■ BATCH # 2 = MODBUS register 6357 ■ BATCH # 3 = MODBUS register 6358 ■ BATCH # 4 = MODBUS register 6359 ■ BATCH # 5 = MODBUS register 6360 ■ BATCH # 6 = MODBUS register 6361 Detailed explanations and information When batching using the optional software package BATCHING, process-related variable after run quantities or incorrect quantities can be determined and balanced out (by computer) by means of various functions. This ensures a high level of accuracy throughout the entire batching range. ■ Response when OFF is selected: The batching ends as soon as the quantity specified in the function BATCH QUANTITY (7203) has been achieved. If after running occurs, this is not recorded and is not taken into consideration during the next batching. In this way, in the event of process-related after running, the effective batched quantity is generally larger than the batching quantity specified. (continued on next page)

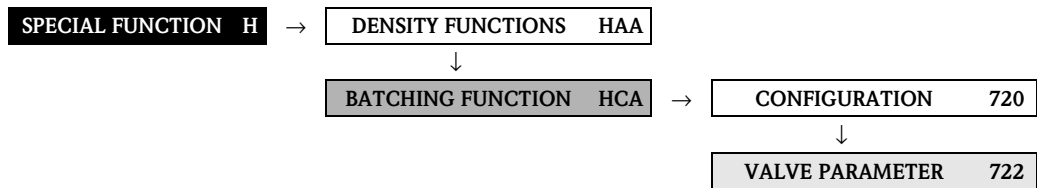
Function description	
SPECIAL FUNCTION → BATCHING FUNCTION → CONFIGURATION	
COMPENSATION MODE 7205 (continued)	■ Response when MODE 1 is selected: For short batchings and for batching cycles that follow on quickly from one other. Batching ends before the quantity specified in the function BATCH QUANTITY (7203) is achieved and the after run quantity is recorded. The exact batching switch-off time is calculated based on the previous after run quantities. The number of after run quantities which are to influence the calculation can be specified in the functions AVERAGING DRIP (7207) and CALCULATION MODE (7206). The after run quantity in MODE 1 is determined between the switch-off point and the first undershooting of the low flow cut off. Any subsequent fluid movements are not taken into account. ■ Response when MODE 2 is selected: For batchings where batching accuracy is vital and where process-related fluctuations in flow occur during after running. Batching ends before the quantity specified in the function BATCH QUANTITY (7203) is achieved and the after run quantity is recorded. The exact batching switch-off time is calculated based on the previous after run quantities. The number of after run quantities which are to influence the calculation can be specified in the functions AVERAGING DRIP (7207) and CALCULATION MODE (7206). The after run quantity in MODE 2 is determined between the switch-off point and the constant undershooting of the low-flow cut off. This means that the lower the setting is for the low-flow cut off, the longer the after run quantity is recorded. The batching is very accurate. Fig. 36 : Example diagram of a batching sequence and the respective response in MODE 1 and MODE 2 Q = Flow t = Time t_1 = Time period shorter than or equal to the maximum batching time A = Coarse batching quantity B = Fine batching quantity C = After run quantity (Effective batching quantity = $A + B + C$) 1 = Coarse batching starts and valve 2 opens (two-stage batching) 2 = Coarse batching ends / fine batching starts, valve 2 closes, valve 1 opens 3 = Fine batching ends, valve 1 closes (automatically when the specified batching quantity is achieved) 4 = After run quantity recording in MODE 1 ends 5 = After run quantity recording in MODE 2 ends a = After run quantity recorded in MODE 1 b = After run quantity recorded in MODE 2 s = Low flow cut off

Function description		
SPECIAL FUNCTION → BATCHING FUNCTION → CONFIGURATION		
CALCULATION MODE	7206	 Note! Function is only available if MODE 1 or MODE 2 is selected in the function COMPENSATION MODE (7205). For selecting the method for calculating the recorded after run quantities. Options: 0 = ALL All after run quantities are used in the calculation. 1 = SELECTION The after run quantities recorded are filtered. The smallest and largest after run quantity are not taken into account in the calculation (extreme value filter). Factory setting: ALL  Note! Machine-related (larger) “extreme values”, occurring especially at start-up, delay correction and distort real reproducibility. By selecting “SELECT”, these “extreme values” are not taken into account.  Note for MODBUS! The MODBUS register depends on the option selected in the function BATCH SELECTOR (7200): ■ BATCH # 1 = MODBUS register 6362 ■ BATCH # 2 = MODBUS register 6363 ■ BATCH # 3 = MODBUS register 6364 ■ BATCH # 4 = MODBUS register 6365 ■ BATCH # 5 = MODBUS register 6366 ■ BATCH # 6 = MODBUS register 6367 Example: Function CALCULATION MODE (7206) = SELECTION Function AVERAGING DRIP (7207) = 5 From five after run quantities recorded, the largest and smallest are not used. From the remaining three after run quantities, an average after run quantity is calculated which is taken into account at the next batching.
MODBUS register:	See Note	
Data type:	Integer	
Access:	read/write	

Function description	
SPECIAL FUNCTION → BATCHING FUNCTION → CONFIGURATION	
AVERAGING DRIP 7207 MODBUS register: See Note Data type: Float Access: read/write	 Note! Function is only available if MODE 1 or MODE 2 is selected in the function COMPENSATION MODE (7205). For specifying the number of after run quantities (cycles) which are included in calculating the batching compensation mode, MODE 1 or MODE 2.  Note! The value entered in this function influences the measuring system reaction time.  Note for MODBUS! The MODBUS register depends on the option selected in the function BATCH SELECTOR (7200): ■ BATCH # 1 = MODBUS register 6368 ■ BATCH # 2 = MODBUS register 6370 ■ BATCH # 3 = MODBUS register 6372 ■ BATCH # 4 = MODBUS register 6374 ■ BATCH # 5 = MODBUS register 6376 ■ BATCH # 6 = MODBUS register 6378 If you specify: ■ a small calculation depth (low value entered) = measuring system reacts quickly to differing amount of after run quantities. ■ a large calculation depth (high value entered) = measuring system reacts slowly to changing after run quantities. User input: 0...100 Factory setting: 0 [cycles]
BATCH STAGES 7208 MODBUS register: See Note Data type: Integer Access: read/write	For selecting the number of batching stages. Batching can be carried out in several stages, e.g. 2-stage batching with fast and precise batching. Options: 1-stage (1 valve or 1-stage batching) 2-stage (2 valves or 2-stage batching) Factory setting: 1-stage (1 valve or 1-stage batching)  Note! ■ The batching stage selection (number of valves) is directly dependent on the configuration of the outputs. For 2-stage batching two relay outputs must be available in the measuring device. ■ The functions available in the function group VALVE PARAMETER (Page 136) 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

Function description		
SPECIAL FUNCTION → BATCHING FUNCTION → CONFIGURATION		
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 136) and SUPERVISION (Page 141).  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
MODBUS register:	See Note	
Offset address:	See Note	
Data type:	Integer	
Access:	read/write	
Storage class:	Volatile	

10.2.2 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 MODBUS register: See Note Data type: Float Access: read/write		For specifying 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 kg for a batching quantity of 10 kg). 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
CLOSE VALVE 1 7221 MODBUS register: 8013 Data type: Float Access: read		Displays 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). Display: 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 130). In this way, function CLOSE VALVE 1 (7221) is also the basis for calculating the after run quantity.

Function description		
SPECIAL FUNCTION → BATCHING FUNCTION → VALVE PARAMETER		
OPEN VALVE 2	7222	For specifying 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 the batching quantity of 10 kg = 7 kg). If the BATCH QUANTITY (7203) is adjusted (reduced/increased), the effective quantity switch point is automatically and dynamically adjusted (e.g. at 70% and a new batching quantity changing from 10 to 20 kg, the quantity switch point is adjusted from 7 kg to 14 kg). - 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 kg for a batching quantity of 10 kg). If the BATCH 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:	See Note	
Data type:	Float	
Access:	read/write	

Function description		
SPECIAL FUNCTION → BATCHING FUNCTION → VALVE PARAMETER		
CLOSE VALVE 2	7223	For specifying 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). Display: Value or 100% (corresponds 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 kg for a batching quantity of 10 kg). If the BATCH 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

10.2.3 Examples of setting parameters for batching processes

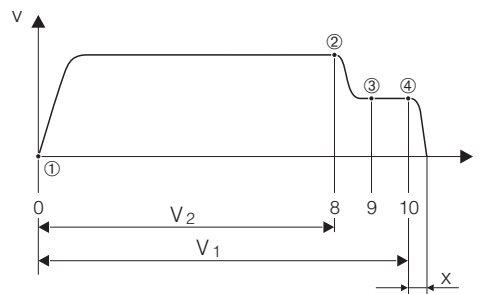
The two examples in the next section clearly show the effect of different entries and options in the function group.

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



F06-x3xxxxxx-05-xx-xx-xx-000

Fig. 37: Example 1

 v = Flow velocity [m/s] t = Time V_1 = Valve 1 open V_2 = Valve 2 open

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

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

③ = Batching progress message (7243)

④ = Valve 1 closes (7221), batching ends

 x = After run quantity

The following parameter settings must be made:

- Select the unit for batching:
Function UNIT MASS (0401) Page 15 = kg (kilogram)
- Select the measured variable for batching:
Function ASSIGN BATCH VARIABLE (7202) Page 130 = MASS FLOW
- Enter the batching quantity:
Function BATCH QUANTITY (7203) Page 130 = 10 [kg]
- Select the entry format:
Function BATCH STAGES (7208) Page 134 = 2-stage
- Select the entry format:
Function INPUT FORMAT (7209) Page 135 = VALUE-INPUT
- Quantity data for when the first valve should open:
Function OPEN VALVE 1 (7220) Page 136 = 0 [kg]
(valve 1 closes automatically when the batching quantity is achieved = 10 [kg], display in function CLOSE VALVE 1 (7221) Page 136)
- Quantity data for when the second valve should open:
Function OPEN VALVE 2 (7222) Page 137 = 0 [kg]
- Quantity data for when the second valve should close:
Function CLOSE VALVE 2 (7223) Page 138 = 8 [kg]
- Quantity data for when the message should be generated:
Function PROGRESS NOTE (7243) Page 143 = 9 [kg]

Example 1 a

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

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

- Enter the new batching quantity:
Function BATCH QUANTITY (7203) Page 130 = 20 [kg]
- New quantity data for when the message should be generated:
Function PROGRESS NOTE (7243) Page 143 = 18 [kg]

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

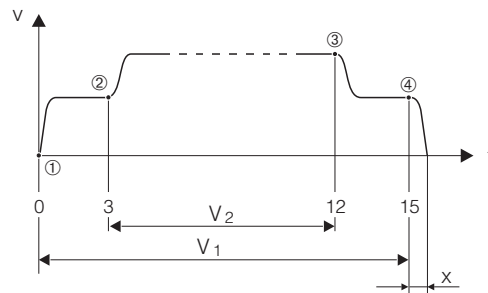
- Function OPEN VALVE 1 (7220) Page 136 = 0 [kg]
- Function OPEN VALVE 2 (7222) Page 137 = 0 [kg]
- Function CLOSE VALVE 2 (7223) Page 138 = 16 [kg]

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



F06-x3xxxxxx-05-xx-xx-xx-001

Fig. 38: Example 2

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

The following parameter settings must be made:

- Select the unit for batching:
Function UNIT MASS (0401) Page 15 = kg (kilogram)
- Select the measured variable for batching:
Function ASSIGN BATCH VARIABLE (7202) Page 130 = MASS FLOW
- Enter the batching quantity:
Function BATCH QUANTITY (7203) Page 130 = 15 [kg]
- Select the entry format:
Function BATCH STAGES (7208) Page 134 = 2-stage
- Select the entry format:
Function INPUT FORMAT (7209) Page 135 = %-INPUT
- Percentage data for when the first valve should open:
Function OPEN VALVE 1 (7220) Page 136 = 0 [%]
(Valve 1 closes automatically when the batching quantity is achieved = 15 [kg], display in function CLOSE VALVE 1 (7221) Page 136)
- Percentage data for when the second valve should open:
Function OPEN VALVE 2 (7222) Page 137 = 20 [%] corresponds to 3 kg
- Percentage data for when the second valve should close:
Function CLOSE VALVE 2 (7223) Page 138 = 80 [%] corresponds to 12 kg

Example 2 a

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

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

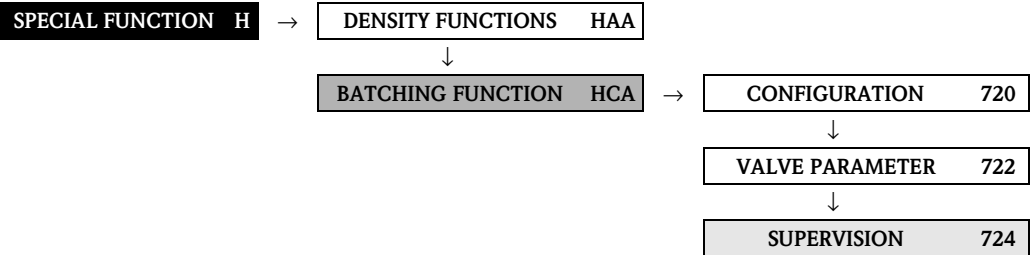
Enter the new batching quantity:

Function BATCH QUANTITY (7203) Page 130 = 45 [kg]

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

- Function OPEN VALVE 1 (7220) Page 136 = 0 [%]
- Function OPEN VALVE 2 (7222) Page 137 = 20 [%] corresponds to 9 kg.
- Function CLOSE VALVE 2 (7223) Page 138 = 80 [%] corresponds to 36 kg.

10.2.4 Function group SUPERVISION



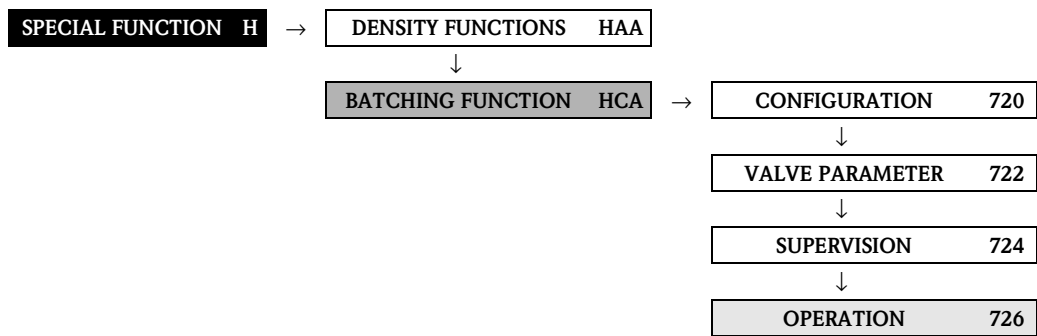
Function description		
SPECIAL FUNCTION → BATCHING FUNCTION → SUPERVISION		
MAXIMUM BATCHING TIME MODBUS register: Data type: Access:	7240 See Note Float read/write	For specifying a maximum batching time. All valves close once the specified batching time elapses, (see function CLOSE VALVE 1 (7221), Page 136 and CLOSE VALVE 2 (7223), Page 138). 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 130) there is no automatic adjustment, i.e. this value must be determined again and re-entered, (see also fault message # 471 in the Operating Instructions BA107D). - 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
MINIMUM BATCHING QUANTITY MODBUS register: Data type: Access:	7241 See Note Float read/write	For specifying 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). 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)

Continued on next page

Function description SPECIAL FUNCTION → BATCHING FUNCTION → SUPERVISION		
MINIMUM BATCHING QUANTITY (continued)	7241	 Caution! ■ When the batching quantity is adjusted (reduced/increased), (see function BATCH QUANTITY (7203) on Page 130) there is no automatic adjustment, i.e. this value must be determined again and re-entered, (see also fault message # 472 in the Operating Instructions BA107D). ■ 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
MAXIMUM BATCHING QUANTITY MODBUS register: Data type: Access:	7242 See Note Float read/write	For specifying 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 130) there is no automatic adjustment, i.e. this value must be determined again and re-entered, (see also fault message # 472 in the Operating Instructions BA107D). ■ 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	For specifying the batching quantity at which a message should be generated. When the specified batching quantity is achieved, the message is generated and signalled 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 130), there is no automatic adjustment, i.e. this value must be determined again and re-entered, (see also notice message # 473 in the Operating Instructions BA107D).  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
MAX. FLOW VALUE	7244	For specifying a maximum flow value. The batching process is aborted and all the valves are closed if the specified flow value is overshoot. Application: This function can be used for safety reasons, for example, to ensure all batching valves close in the event of a system fault. User input: 5-digit floating-point number Factory setting: 0 [unit] (= deactivated)  Note! ■ The appropriate unit is taken depending on the process variable selected in the parameter ASSIGN BATCH VARIABLE (7202) and the unit configured in the group SYSTEM UNITS. ■ 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 parameter BATCH COUNTER (7263) 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

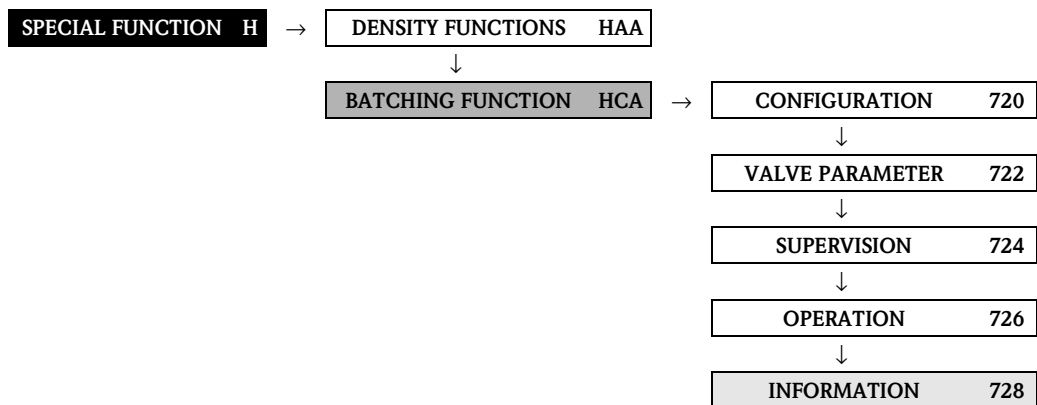
10.2.5 Function group OPERATION



Function description		
SPECIAL FUNCTION → BATCHING FUNCTION → OPERATION		
BATCH PROCEDURE MODBUS register: Data type: Access:	7260 6392 Integer read/write	For controlling the batching process. The batching can be started manually or a batching already running can be interrupted or stopped at any time. Options: 0 = STOP (Stop batching) 1 = START (Start batching) 2 = HOLD (Interrupt batching) 3 = GO ON (Continue batching) 4 = RESET (Reset fault message) Factory setting: STOP Note! ■ This function can also be controlled via the status input, (see function ASSIGN STATUS INPUT (5000) on Page 102). ■ If the information line has been assigned to BATCHING MENU (see Page 46), the application-specific functions of the minus key (START-STOP) and the plus key (HOLD-GO ON / batching specification) 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 cancelled (STOP) and the local display alternates between displaying the batching menu and the fault message. ■ If the positive zero return is activated: – during the batching process, the batching is cancelled (STOP). – during a pause in the batching (option HOLD), the batching cannot be restarted, (see also notice messages # 571 and # 572 in the Operating Instructions BA107D, “Trouble-shooting” section).
BATCH UPWARDS MODBUS register: Data type: Access:	7261 6393 Float read	In this function the batching progress can be read upwards, i.e. starting at 0 the quantity displayed increases until the batching process is complete. Display: Floating-point number incl. unit Note! The value of this function can be output via the current output.
BATCH DOWNWARDS MODBUS register: Data type: Access:	7262 6395 Float read	In this function the batching progress can be read downwards, i.e. starting from the batching quantity, the quantity displayed decreases until the batching process is complete. Display: Floating-point number incl. unit Note! The value of this function can be output via the current output.

Function description SPECIAL FUNCTION → BATCHING FUNCTION → OPERATION		
BATCH COUNTER	7263	Displays the number of batchings carried out. Display: 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).
MODBUS register: Data type: Access:	6397 Float read	
BATCH SUM	7264	Displays the effective overall total of all the batchings carried out. Display: max. 7-digit floating-point number [unit] Factory setting: 0 [unit]  Note! ■ E.g. in 2-stage batching the effective overall total is calculated from the coarse batching quantity, fine batching quantity and after run quantity. ■ The total batching quantity can be reset to 0 via the function RESET SUM/COUNTER (7265). ■ This function is reset to 0 (zero) if a different batching specification is selected in the function BATCH SELECTOR (7200).
MODBUS register: Data type: Access:	6399 Float read	
RESET SUM/COUNTER	7265	Resets the batching quantity counter and the total batching quantity to 0. Options: 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).
MODBUS register: Data type: Access:	6401 Integer read/write	

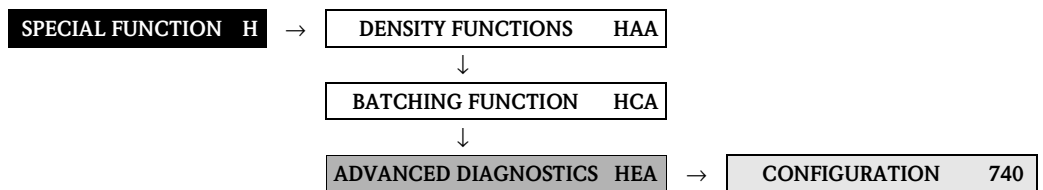
10.2.6 Function group INFORMATION



Function description SPECIAL FUNCTION → BATCHING FUNCTION → INFORMATION		
VALVE 1 INTERNAL SWITCH POINT 7280 MODBUS register: 6402 Data type: Float Access: read		Displays the internal switch point of valve 1 (siehe Funktion CLOSE VALVE 1 auf Seite 136). The value displayed takes the fixed correction quantity and / or the calculated after run quantity into account. Display: max. 7-digit floating-point number [unit]  Note! The appropriate unit is taken from the function group SYSTEM UNITS (see Page 15).
DRIP QUANTITY 7281 MODBUS register: 6404 Data type: Float Access: read/write		Displays the after run calculated (averaged) internally . The value displayed can be overwritten in this function and the after run can thus be adjusted. The after run quantity is used to optimise the internal switch point of valve 1. User input: max. 7-digit floating-point number [unit]  Note! ■ The after run, entered in this function, is only used for the first batching process. For the second and following batching processes, the internally calculated after run will be used again. ■ The appropriate unit is taken from the function group SYSTEM UNITS (ACA), (see Page 15).
VALVE 1 CLOSING TIME 7282 MODBUS register: 6406 Data type: Float Access: read		Displays the valve closing time calculated internally . Display: max. 7-digit floating-point number [unit]  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.
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. Display: max. 7-digit floating-point number [s]  Note! ■ Behaviour 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

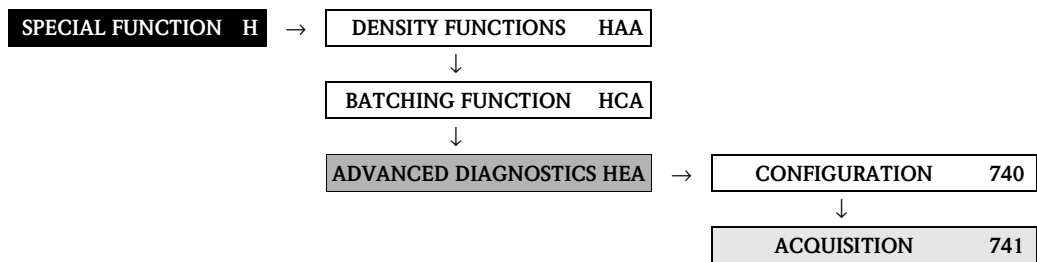
10.3 Group ADVANCED DIAGNOSTICS

10.3.1 Function group CONFIGURATION



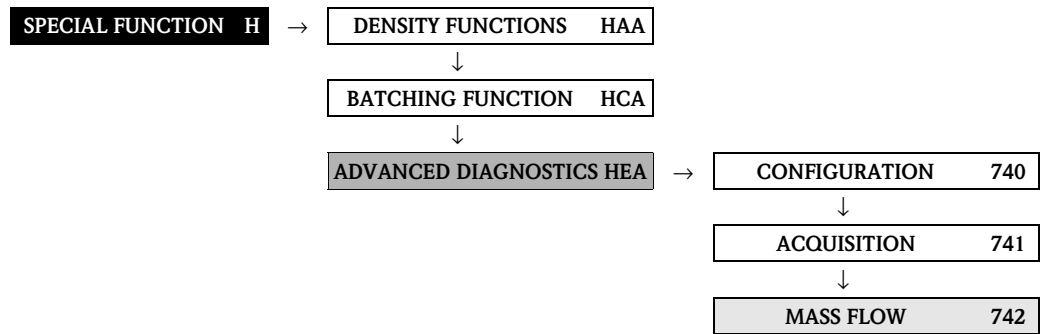
Function description		
SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → CONFIGURATION		
REFERENCE CONDITION USER MODBUS register: 6707 Data type: Integer Access: read/write	7401	Use this function to start determining the user reference status. The following values are determined: ■ MASS FLOW ■ DENSITY ■ REFERENCE DENSITY ■ TEMPERATURE ■ TUBE DAMPING ■ ELECTRODYNAMIC SENSORS Options: 0 = CANCEL 1 = START Factory setting: CANCEL
SELECT REFERENCE CONDITION MODBUS register: 6708 Data type: Integer Access: read/write	7402	Use this function to select the reference status which should be used to compare the advanced diagnosis parameters (see function ACQUISITION MODE (7410) on Page 148). Options: 0 = FACTORY 1 = USER Factory setting: FACTORY
WARNING MODE MODBUS register: 6709 Data type: Integer Access: read/write	7403	Use this function to determine whether a warning should be generated when there is a deviation between the reference status (FACTORY or USER, see function SELECT REFERENCE CONDITION, 7402) and the current measuring values. The values of the following functions are compared to the reference status : ■ ACTUAL VALUE (7421) ■ ACTUAL VALUE (7431) ■ ACTUAL VALUE (7441) ■ ACTUAL VALUE (7451) ■ ACTUAL VALUE (7461) ■ ACTUAL VALUE (7471) Options: 0 = OFF 1 = ON Factory setting: OFF

10.3.2 Function group ACQUISITION



Function description SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → ACQUISITION		
ACQUISITION MODE MODBUS register: 6710 Data type: Integer Access: read/write	7410	Use this function to specify whether the advanced diagnosis parameters should be determined on a periodical or single-shot basis. Options: 0 = OFF 1 = PERIODICAL 2 = SINGLE SHOT Factory setting: OFF  Note! See the Chapter on “Commissioning” in the Operating Instructions BA107D for more information on advanced diagnosis.
ACQUISITION PERIOD MODBUS register: 6501 Data type: Float Access: read/write	7411	 Note! Function is not available unless PERIODICAL was selected in the ACQUISITION MODE function (7410). Use this function to specify the time interval after which the advanced diagnosis parameters should be taken. The time interval starts with the confirmation of the input. User input: 0...99999 s Factory setting: 3600 s  Note! A reference status must be defined prior to determining the diagnosis parameters, see function SELECT REFERENCE CONDITION (7402).
ACQUISITION DO MODBUS register: 6711 Data type: Integer Access: read/write	7412	 Note! Function is not available unless SINGLE SHOT was selected in the ACQUISITION MODE function (7410). Use this function to start determining the advanced diagnosis parameters on a single-shot basis. User input: 0 = CANCEL 1 = START Factory setting: CANCEL  Note! A reference status must be defined prior to determining the diagnosis parameters, see function SELECT REFERENCE CONDITION (7402).
RESET HISTORY MODBUS register: 6712 Data type: Integer Access: read/write	7413	Use this function to delete all history values. User input: 0 = NO 1 = YES Factory setting: NO

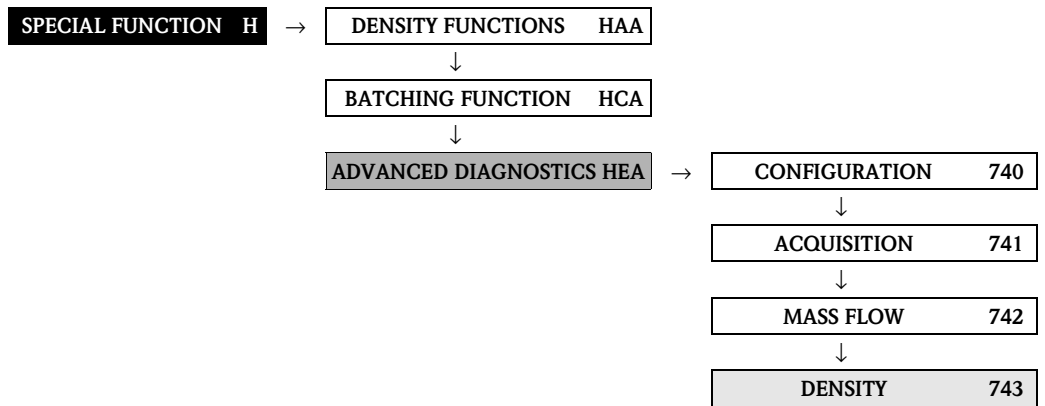
10.3.3 Function group MASS FLOW



Function description		
SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → MASS FLOW		
 Note! The appropriate unit is taken from the function UNIT MASS FLOW (0400), (see Page 15).		
REFERENCE VALUE 7420 MODBUS register: See Note Data type: Float Access: read	The reference value for the mass flow appears on the display. Display: 5-digit floating-point number, including unit and sign  Note for MODBUS! Depends on the setting in the function SELECT REFERENCE CONDITION: ■ Option = FACTORY → MODBUS register = 6503 ■ Option = USER → MODBUS register = 6507	
ACTUAL VALUE 7421 MODBUS register: 6507 Data type: Float Access: read	The measured mass flow appears on the display. Display: 5-digit floating-point number, including unit and sign	
MINIMUM VALUE 7422 MODBUS register: 6509 Data type: Float Access: read	The lowest mass flow value since the saved values were last reset appears on the display. Display: 5-digit floating-point number, including unit and sign	
MAXIMUM VALUE 7423 MODBUS register: 6511 Data type: Float Access: read	The highest mass flow value since the saved values were last reset appears on the display. Display: 5-digit floating-point number, including unit and sign	
HISTORY MASS FLOW 7424 MODBUS register: See Note Data type: Float Access: read/write	The last ten mass flow values since the saved values were last reset appear on the display. Display: 5-digit floating-point number, including unit and sign  Note for MODBUS! The various histories are available via the following MODBUS registers: ■ History 1 = MODBUS register 6513 ■ History 2 = MODBUS register 6515 ■ History 3 = MODBUS register 6517 ■ History 4 = MODBUS register 6519 ■ History 5 = MODBUS register 6521 ■ History 6 = MODBUS register 6523 ■ History 7 = MODBUS register 6525 ■ History 8 = MODBUS register 6527 ■ History 9 = MODBUS register 6529 ■ History 10 = MODBUS register 6531	
ACTUAL DEVIATION 7425 MODBUS register: 6535 Data type: Float Access: read	This function displays deviation between the measured mass flow and the reference values (FACTORY or USER), see Page 147, selected in the function SELECT REFERENCE CONDITION (7402). Display: 5-digit floating-point number, including unit and sign	

Function description		
SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → MASS FLOW		
WARNING LEVEL	7426	 Note! Function is not available unless ON was selected in the WARNING MODE function (7403). Use this function to specify a limit value for the mass flow. A notice message is generated if the limit value is exceeded. User input: 0...99999 [Mass flow unit] Factory setting: 90000 kg/h
MODBUS register:	6533	
Data type:	Float	
Access:	read/write	

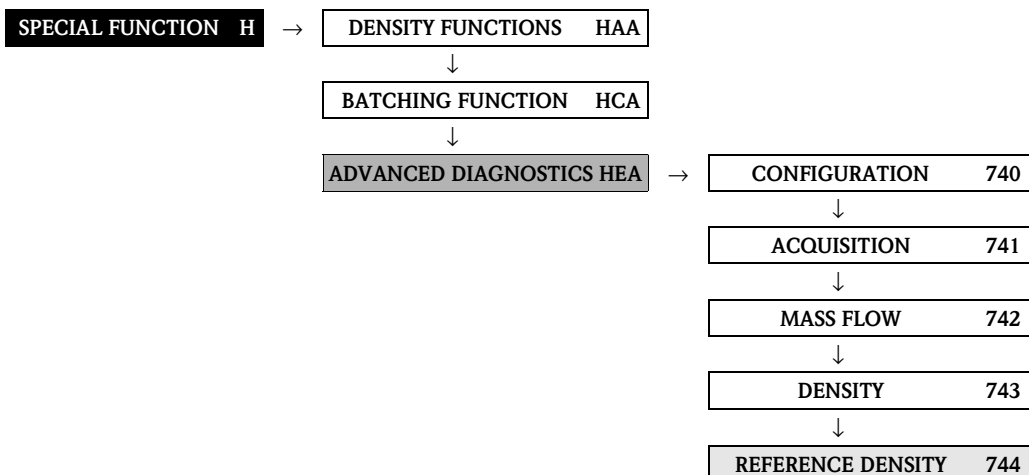
10.3.4 Function group DENSITY



Function description SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → DENSITY		
Note! The appropriate unit is taken from the function UNIT DENSITY (0420), (see Page 18).		
REFERENCE VALUE 7430 MODBUS register: See Note Data type: Float Access: read	The reference value for the density appears on the display. Display: 5-digit floating-point number, including units Note for MODBUS! Depends on the setting in the function SELECT REFERENCE CONDITION: ■ Option = FACTORY → MODBUS register = 6537 ■ Option = USER → MODBUS register = 6539	
ACTUAL VALUE 7431 MODBUS register: 6541 Data type: Float Access: read	The measured density appears on the display. Display: 5-digit floating-point number, including units	
MINIMUM VALUE 7432 MODBUS register: 6543 Data type: Float Access: read	The lowest density value since the saved values were last reset appears on the display. Display: 5-digit floating-point number, including units	
MAXIMUM VALUE 7433 MODBUS register: 6545 Data type: Float Access: read	The highest density value since the saved values were last reset appears on the display. Display: 5-digit floating-point number, including units	
HISTORY DENSITY 7434 MODBUS register: See Note Data type: Float Access: read/write	The last ten density values since the saved values were last reset appear on the display. Display: 5-digit floating-point number, including units Note for MODBUS! The various histories are available via the following MODBUS registers: ■ History 1 = MODBUS register 6547 ■ History 2 = MODBUS register 6549 ■ History 3 = MODBUS register 6551 ■ History 4 = MODBUS register 6553 ■ History 5 = MODBUS register 6555 ■ History 6 = MODBUS register 6557 ■ History 7 = MODBUS register 6559 ■ History 8 = MODBUS register 6561 ■ History 9 = MODBUS register 6563 ■ History 10 = MODBUS register 6565	

Function description		
SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → DENSITY		
ACTUAL DEVIATION	7435	This function displays the deviation between the measured density and the reference values (FACTORY or USER), see Page 147, selected in the function SELECT REFERENCE CONDITION (7402). Display: 5-digit floating-point number, including units
MODBUS register: Data type: Access:	6569 Float read	
WARNING LEVEL	7436	 Note! Function is not available unless ON was selected in the WARNING MODE function (7403). Use this function to specify a limit value for the density. A notice message is generated if the limit value is exceeded. User input: 0...99999 [%] Factory setting: 100%
MODBUS register: Data type: Access:	6567 Float read/write	

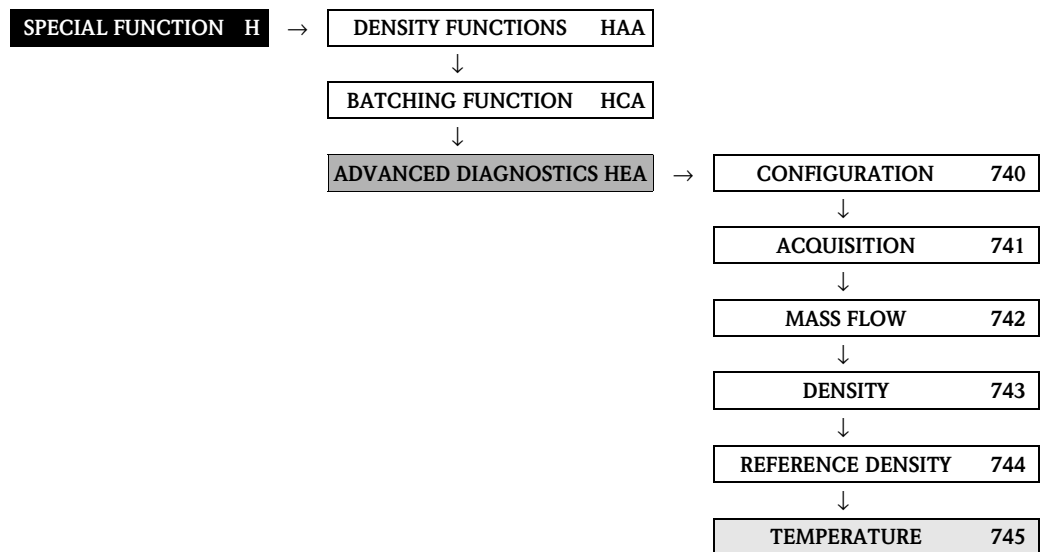
10.3.5 Function group REFERENCE DENSITY



Function description	
SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → REFERENCE DENSITY	
 Note! The appropriate unit is taken from the function UNIT REFERENCE DENSITY (0421) (Page 18).	
REFERENCE VALUE 7440 MODBUS register: See Note Data type: Float Access: read	The reference value for the reference density appears on the display. Display: 5-digit floating-point number, including units  Note for MODBUS! Depends on the setting in the function SELECT REFERENCE CONDITION: ■ Option = FACTORY → MODBUS register = 6571 ■ Option = USER → MODBUS register = 6573
ACTUAL VALUE 7441 MODBUS register: 6575 Data type: Float Access: read	The measured reference density appears on the display. Display: 5-digit floating-point number, including units
MINIMUM VALUE 7442 MODBUS register: 6577 Data type: Float Access: read	The lowest reference density value since the saved values were last reset appears on the display. Display: 5-digit floating-point number, including units
MAXIMUM VALUE 7443 MODBUS register: 6579 Data type: Float Access: read	The highest reference density value since the saved values were last reset appears on the display. Display: 5-digit floating-point number, including units
HISTORY REFERENCE DENSITY 7444 MODBUS register: See Note Data type: Float Access: read/write	The last ten reference density values since the saved values were last reset appear on the display. Display: 5-digit floating-point number, including units  Note for MODBUS! The various histories are available via the following MODBUS registers: ■ History 1 = MODBUS register 6581 ■ History 2 = MODBUS register 6583 ■ History 3 = MODBUS register 6585 ■ History 4 = MODBUS register 6587 ■ History 5 = MODBUS register 6589 ■ History 6 = MODBUS register 6591 ■ History 7 = MODBUS register 6593 ■ History 8 = MODBUS register 6595 ■ History 9 = MODBUS register 6597 ■ History 10 = MODBUS register 6599

Function description		
SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → REFERENCE DENSITY		
ACTUAL DEVIATION	7445	This function displays the deviation between the measured reference density and the reference values (FACTORY or USER), seePage 147, selected in the function SELECT REFERENCE CONDITION (7402). Display: 5-digit floating-point number, including units
MODBUS register: Data type: Access:	6603 Float read	
WARNING LEVEL	7446	 Note! Function is not available unless ON was selected in the WARNING MODE function (7403). Use this function to specify a limit value for the reference density. A notice message is generated if the limit value is exceeded. User input: 0...99999 [%] Factory setting: 100%
MODBUS register: Data type: Access:	6601 Float read/write	

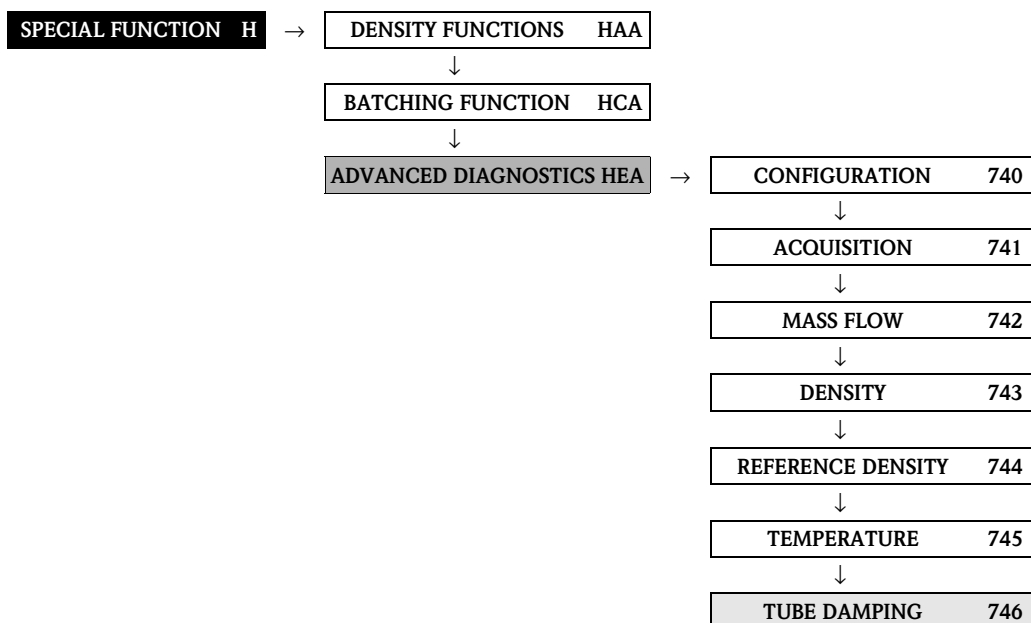
10.3.6 Function group TEMPERATURE



Function description	
SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → TEMPERATURE	
 Note! The appropriate unit is taken from the function UNIT TEMPERATURE (0422), (see Page 18).	
REFERENCE VALUE 7450 MODBUS register: See Note Data type: Float Access: read	The reference value for the temperature appears on the display. Display: 5-digit floating-point number, including units  Note for MODBUS! Depends on the setting in the function SELECT REFERENCE CONDITION: ■ Option = FACTORY → MODBUS register = 6605 ■ Option = USER → MODBUS register = 6607
ACTUAL VALUE 7451 MODBUS register: 6609 Data type: Float Access: read	The currently measured temperature appears on the display. Display: 5-digit floating-point number, including units
MINIMUM VALUE 7452 MODBUS register: 6611 Data type: Float Access: read	The lowest temperature value since the saved values were last reset appears on the display. Display: 5-digit floating-point number, including units
MAXIMUM VALUE 7453 MODBUS register: 6613 Data type: Float Access: read	The highest temperature value since the saved values were last reset appears on the display. Display: 5-digit floating-point number, including units

Function description		
SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → TEMPERATURE		
HISTORY TEMPERATURE MODBUS register: Data type: Access:	7454 See Note Float read/write	The last ten temperature values since the saved values were last reset appear on the display. Display: 5-digit floating-point number, including units  Note for MODBUS! The various histories are available via the following MODBUS registers: ■ History 1 = MODBUS register 6615 ■ History 2 = MODBUS register 6617 ■ History 3 = MODBUS register 6619 ■ History 4 = MODBUS register 6621 ■ History 5 = MODBUS register 6623 ■ History 6 = MODBUS register 6625 ■ History 7 = MODBUS register 6627 ■ History 8 = MODBUS register 6629 ■ History 9 = MODBUS register 6631 ■ History 10 = MODBUS register 6633
ACTUAL DEVIATION MODBUS register: Data type: Access:	7455 6637 Float read	This function displays the deviation between the currently measured temperature and the reference values (FACTORY or USER), see Page 147, selected in the function SELECT REFERENCE CONDITION (7402). Display: 5-digit floating-point number, including units
WARNING LEVEL MODBUS register: Data type: Access:	7456 6635 Float read/write	 Note! Function is not available unless ON was selected in the WARNING MODE function (7403). Use this function to specify a limit value for the temperature. A notice message is generated if the limit value is exceeded. User input: 0...99999 [°C] Factory setting: 100 °C

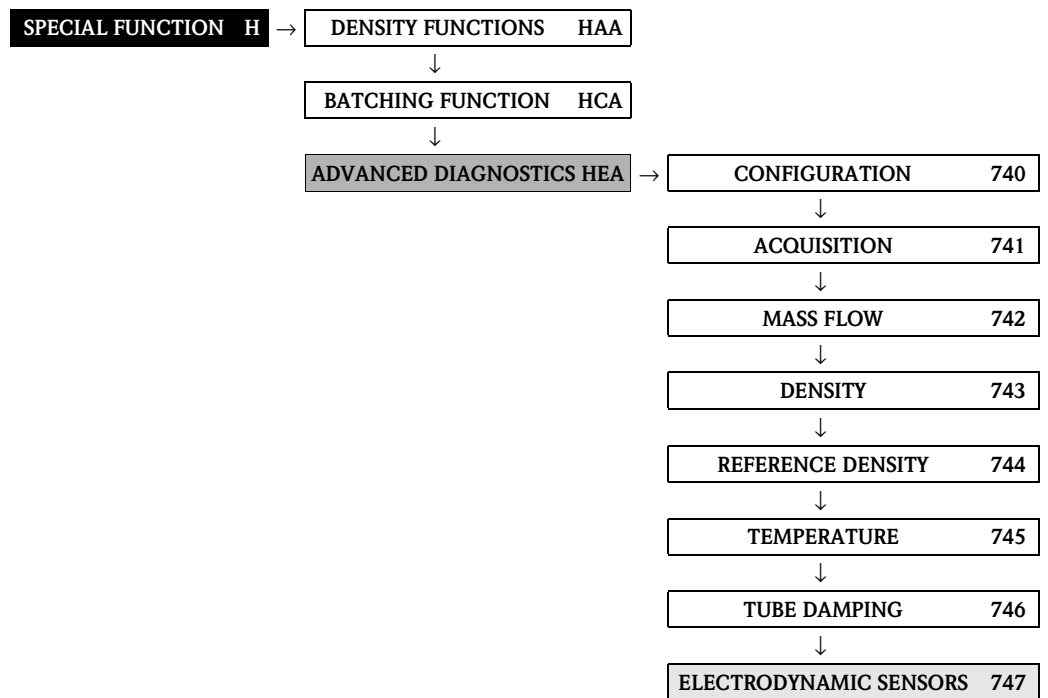
10.3.7 Function group TUBE DAMPING



Function description SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → TUBE DAMPING		
REFERENCE VALUE 7460	The reference value for tube damping appears on the display. Display: 5-digit floating-point number MODBUS register: See Note Data type: Float Access: read  Note for MODBUS! Depends on the setting in the function SELECT REFERENCE CONDITION: ■ Option = FACTORY → MODBUS register = 6639 ■ Option = USER → MODBUS register = 6641	
ACTUAL VALUE 7461	The measured tube damping appears on the display. Display: 5-digit floating-point number MODBUS register: 6643 Data type: Float Access: read	
MINIMUM VALUE 7462	The lowest tube damping value since the saved values were last reset appears on the display. Display: 5-digit floating-point number MODBUS register: 6645 Data type: Float Access: read	
MAXIMUM VALUE 7463	The highest tube damping value since the saved values were last reset appears on the display. Display: 5-digit floating-point number MODBUS register: 6647 Data type: Float Access: read	

Function description		
SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → TUBE DAMPING		
HISTORY TUBE DAMPING MODBUS register: Data type: Access:	7464 See Note Float read/write	The last ten tube damping values since the saved values were last reset appears on the display. Display: 5-digit floating-point number  Note for MODBUS! The various histories are available via the following MODBUS registers: ■ History 1 = MODBUS register 6649 ■ History 2 = MODBUS register 6651 ■ History 3 = MODBUS register 6653 ■ History 4 = MODBUS register 6655 ■ History 5 = MODBUS register 6657 ■ History 6 = MODBUS register 6659 ■ History 7 = MODBUS register 6661 ■ History 8 = MODBUS register 6663 ■ History 9 = MODBUS register 6665 ■ History 10 = MODBUS register 6667
ACTUAL DEVIATION MODBUS register: Data type: Access:	7465 6671 Float read	This function displays the deviation between the measured tube damping and the reference values (FACTORY or USER), see Page 147, selected in the function SELECT REFERENCE CONDITION (7402). Display: 5-digit floating-point number
WARNING LEVEL MODBUS register: Data type: Access:	7466 6669 Float read/write	 Note! Function is not available unless ON was selected in the WARNING MODE function (7403). Use this function to specify a limit value for tube damping. A notice message is generated if the limit value is exceeded. User input: 0...99999 [%] Factory setting: 1000%

10.3.8 Function group ELECTRODYNAMIC SENSORS



Function description	
SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → ELECTRODYNAMIC SENSORS	
REFERENCE VALUE 7470 MODBUS register: See Note Data type: Float Access: read	The reference value for the electrodynamic sensors appears on the display. Display: 5-digit floating-point number  Note for MODBUS! Depends on the setting in the function SELECT REFERENCE CONDITION: ■ Option = FACTORY → MODBUS register = 6673 ■ Option = USER → MODBUS register = 6675
ACTUAL VALUE 7471 MODBUS register: 6677 Data type: Float Access: read	The measuring values for the electrodynamic sensors appear on the display. Display: 5-digit floating-point number
MINIMUM VALUE 7472 MODBUS register: 6679 Data type: Float Access: read	The lowest value of the electrodynamic sensors since the saved values were last reset appears on the display. Display: 5-digit floating-point number
MAXIMUM VALUE 7473 MODBUS register: 6681 Data type: Float Access: read	The highest value of the electrodynamic sensors since the saved values were last reset appears on the display. Display: 5-digit floating-point number

		Function description
SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → ELECTRODYNAMIC SENSORS		
HISTORY ELECTR. SENSORS	7474	The last ten values of the electrodynamic sensors since the saved values were last reset appear on the display. Display: 5-digit floating-point number  Note for MODBUS! The various histories are available via the following MODBUS registers: ■ History 1 = MODBUS register 6683 ■ History 2 = MODBUS register 6685 ■ History 3 = MODBUS register 6687 ■ History 4 = MODBUS register 6689 ■ History 5 = MODBUS register 6691 ■ History 6 = MODBUS register 6693 ■ History 7 = MODBUS register 6695 ■ History 8 = MODBUS register 6697 ■ History 9 = MODBUS register 6699 ■ History 10 = MODBUS register 6701
ACTUAL DEVIATION	7475	This function displays the deviation between the measuring values for the electrodynamic sensors and the reference values (FACTORY or USER), see Page 147, selected in the function SELECT REFERENCE CONDITION (7402) is displayed. Display: 5-digit floating-point number
WARNING LEVEL	7476	 Note! Function is not available unless ON was selected in the WARNING MODE function (7403). Use this function to specify a limit value for the electrodynamic sensors. A notice message is generated if the limit value is exceeded. User input: 0...99999 [%] Factory setting: 100%

11 Block SUPERVISION

Block	Groups	Function groups	Functions
SUPERVISION (U)	SYSTEM (JAA) P. 162	CONFIGURATION (800) P. 162	ALARM DELAY (8005) P. 162
		OPERATION (804) P. 163	ACT. SYST. CONDITION (8041) P. 163
			PREV. SYST. CONDITION (8041) P. 163
			SIM. FAILSAFE MODE (8042) P. 163
			SIM. MEASURAND/8043 P. 164
			VAL. SIM. MEASURAND (8044) P. 164
			SYSTEM RESET (8046) P. 164
			OPERATION HOURS (8048) P. 164
	VERSION INFO (JCA) P. 165	DEVICE (810) P. 165	DEVICE SOFTWARE (8100) P. 165
		SENSOR (820) P. 166	SERIAL NUMBER (8200) P. 166
			SENSOR TYPE (8201) P. 166
		AMPLIFIER (822) P. 167	SW REV.-NO. T-DAT (8225) P. 167
			LANGUAGE GROUP (8226) P. 167
		F-CHIP (824) P. 168	STATUS F-CHIP (8240) P. 168
			SYSTEM OPTIONS (8241) P. 168
		I/O MODULE (830) P. 169	I/O MODULE TYPE (8300) P. 169
			SW REV. I/O-MODULE (8303) P. 169
		I/O SUBMODULE 2 (834) P. 170	SUB IN-/OUTPUT TYPE 2 (8340) P. 170
			SW REV. SUB I/O (8343) P. 170
		I/O SUBMODULE 3 (836) P. 170	SUB IN-/OUTPUT TYPE 3 (8360) P. 170
			SW REV. SUB I/O (8363) P. 170
		I/O SUBMODULE 4 (838) P. 170	SUB IN-/OUTPUT TYPE 4 (8380) P. 171
			SW REV. SUB I/O (8383) P. 171

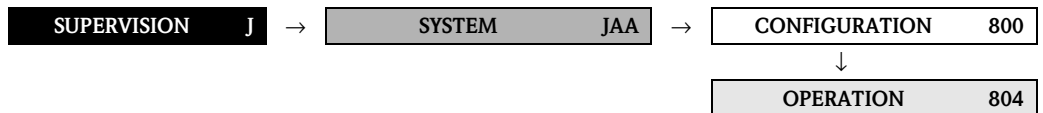
11.1 Group SYSTEM

11.1.1 Function group CONFIGURATION

SUPERVISION	J	→	SYSTEM	JAA	→	CONFIGURATION	800
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		Function description SUPERVISION → SYSTEM → CONFIGURATION
ALARM DELAY	8005	For entering a time span for which the criteria for an error have to be satisfied without interruption before a fault or notice message is generated. MODBUS register: 6808 Data type: Float Access: read/write This suppression acts on: ■ Display ■ Current output ■ 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, density functions, 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. If reconfiguration does not take place, the local display and the totalizer are set to the factory setting and the outputs are set to OFF.

11.1.2 Function group OPERATION

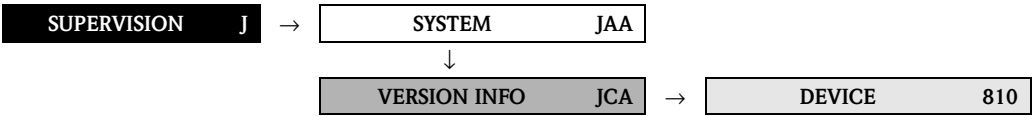


Function description SUPERVISION → SYSTEM → OPERATION		
ACTUAL SYSTEM CONDITION 8040 MODBUS register: 6859 Data type: Integer Access: read MODBUS register: 6821 Data type: String (18) Access: read		Displays the present system condition. Display: 1 = SYSTEM OK” or The fault / notice message with the highest priority.  Note! More information can be found in Operating Instructions BA107D under the keyword “System or process error messages.”
PREVIOUS SYSTEM CONDITION 8041 MODBUS register: See Note Data type: Integer Access: read MODBUS register: See Note Data type: String (18) Access: read		Use this function to view the fifteen most recent fault and notice messages since measuring last started. Display: The 15 most recent fault or notice messages.  Note for MODBUS! The various previous system conditions are available via the following MODBUS registers (data MODBUS register Integer/String): ■ Fault/notice message 1 = MODBUS register 6802/6830 ■ Fault/notice message 2 = MODBUS register 6802/6830 ■ Fault/notice message 3 = MODBUS register 6802/6830 ■ Fault/notice message 4 = MODBUS register 6802/6830 ■ Fault/notice message 5 = MODBUS register 6802/6830 ■ Fault/notice message 6 = MODBUS register 6802/6830 ■ Fault/notice message 7 = MODBUS register 6802/6830 ■ Fault/notice message 8 = MODBUS register 6802/6830 ■ Fault/notice message 9 = MODBUS register 6802/6830 ■ Fault/notice message 10 = MODBUS register 6802/6830 ■ Fault/notice message 11 = MODBUS register 6802/6830 ■ Fault/notice message 12 = MODBUS register 6802/6830 ■ Fault/notice message 13 = MODBUS register 6802/6830 ■ Fault/notice message 14 = MODBUS register 6802/6830 ■ Fault/notice message 15 = MODBUS register 6802/6830  Note! More information can be found in Operating Instructions BA107D 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 = OFF 1 = ON Factory setting: OFF

Function description		
SUPERVISION → SYSTEM → OPERATION		
SIMULATION MEASURAND MODBUS register: 6813 Data type: Integer Access: read/write	8043	Use this function to set all inputs, outputs and totalizers to their defined flow-response modes, in order to check whether they respond correctly. During this time, the message "SIMULATION MEASURAND" appears on the display. Options: 0 = OFF 1 = MASS FLOW 2 = VOLUME FLOW 3 = CORRECTED VOLUME FLOW 4 = DENSITY 5 = REFERENCE DENSITY 6 = TEMPERATURE Factory setting: OFF  Caution! ■ The measuring device cannot be used for measuring while this simulation is in progress. ■ The setting is not saved in the event of a power failure.
VALUE SIMULATION MEASURAND MODBUS register: 6814 Data type: Float Access: read/write	8044	 Note! The function is not visible unless the function SIMULATION MEASURAND (8043) is active. For entering a freely selectable value (e.g. 12 m³/s) to check 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 in the event of a power failure. ■ The appropriate unit is taken from the function group SYSTEM UNITS (ACA), (see Page 15).
SYSTEM RESET MODBUS register: 6817 Data type: Integer Access: read/write	8046	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: 6810 Data type: Float Access: read	8048	The hours of operation of the device appear on the display. Display: depends on the number of hours of operation elapsed ■ Hours of operation < 10 hours → display format = 0:00:00 (hr:min:sec) ■ Hours of operation 10...10,000 hours → display format = 0000:00 (hr:min) ■ Hours of operation > 10,000 hours → display format = 000000 (hr)

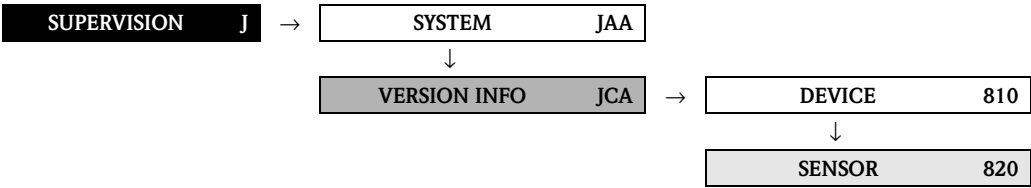
11.2 Group VERSION INFO

11.2.1 Function group DEVICE



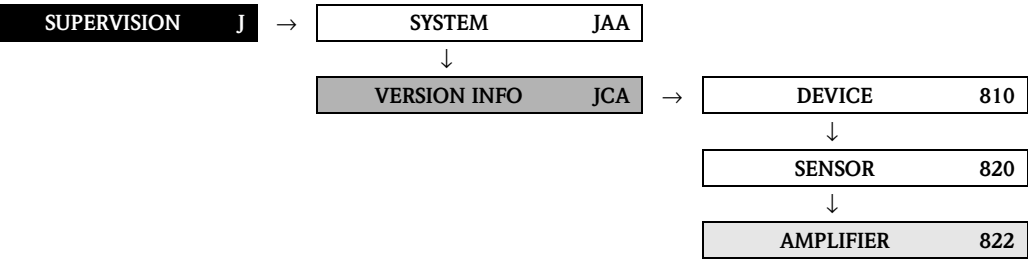
Function description		
SUPERVISION → VERSION INFO → DEVICE		
DEVICE SOFTWARE	8100	Displays the current device software version.
MODBUS register:	7277	
Data type:	String (16)	
Access:	read	

11.2.2 Function group SENSOR



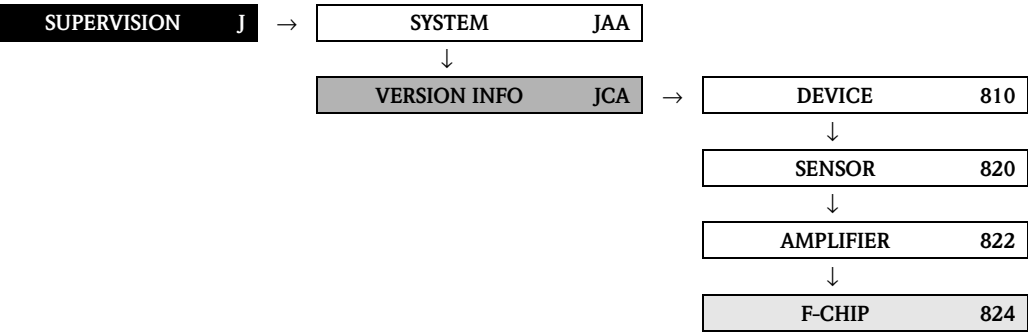
Function description		
SUPERVISION → VERSION INFO → SENSOR		
SERIAL NUMBER 8200 MODBUS register: 7003 Data type: String (16) Access: read		Use this function to view the serial number of the sensor.
SENSOR TYPE 8201 MODBUS register: 7012 Data type: String (16) Access: read		Use this function to view the sensor type (e.g. Promass F).
SOFTWARE REVISION NUMBER S-DAT 8205 MODBUS register: 7021 Data type: String (16) Access: read		Use this function to view the software revision number of the software used to create the content of the S-DAT.

11.2.3 Function group AMPLIFIER



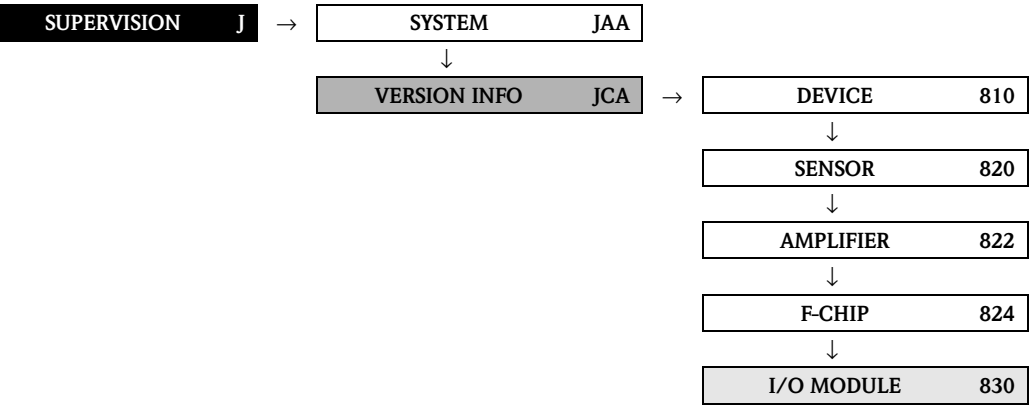
Function description		
SUPERVISION → VERSION INFO → AMPLIFIER		
SOFTWARE REVISION NUMBER AMPLIFIER MODBUS register: 7039 Data type: String (16) Access: read	8222	Use this function to view the software revision number of the amplifier.
SOFTWARE REVISION NUMBER T-DAT MODBUS register: 7048 Data type: String (16) Access: read	8225	Use this function to view the software revision number of the software used to create the content of the T-DAT.
LANGUAGE GROUP MODBUS register: 7262 Data type: Integer Access: read	8226	Displays the installed language group. Display: 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 FieldTool. Please do not hesitate to contact your Endress+Hauser sales office if you have any questions.

11.2.4 Function group F-CHIP



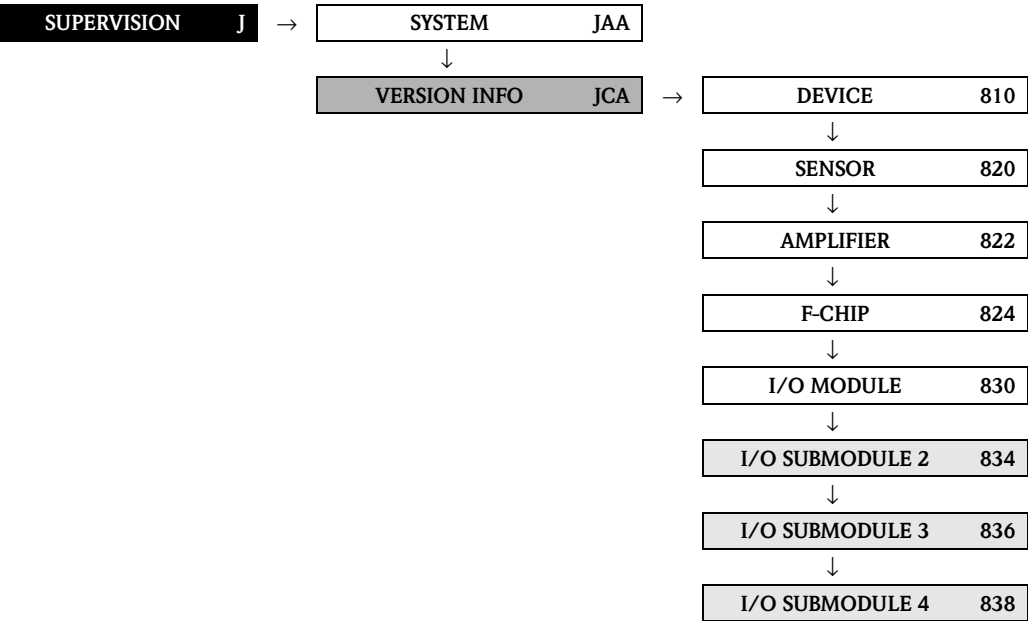
Function description		
SUPERVISION → VERSION INFO → F-CHIP		
STATUS F-CHIP 8240 MODBUS register: 7057 Data type: Integer Access: read		Use this function to check whether an F-CHIP is installed and which software options are available. Display: 0 = NO F-CHIP HW 1 = F-CHIP OK 2 = DEMONSTRATION 3 = SEVICE&ANALYSIS 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! Function is not available unless the measuring device is equipped with an F-CHIP. The software options available in the measuring device appear on the display. Display: 0 = NO ENTRY 1 = ECC 2 = ADV. DIAGNOSTIC 3 = BATCH FUNCTION 4 = DENSITY FUNCTION 5 = BATCH FUNCTION 6 = DENSITY FUNCTION 7 = VISCOSITY
SOFTWARE REVISION NUMBER F-CHIP 8244 MODBUS register: 7059 Data type: String (16) Access: read		Note! The F-CHIP must be available in order to access this function. 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: 7086 Data type: Integer Access: read	Displays the configuration of the I/O module. Display: 0 = TYPE UNKNOWN 4 = CURRENT OUTPUT 5 = PULS/FREQ. OUT. 6 = STATUS/REL. OUT 7 = STATUS INPUT 12 = MODBUS RS485	
SOFTWARE REVISION NUMBER I/O MODULE 8303 MODBUS register: 7078 Data type: String (18) Access: read	Use this function to view the software revision number of the I/O module.	

11.2.6 Function groups I/O SUBMODULE 2...4



Function description		
SUPERVISION → VERSION INFO → I/O SUBMODULE 2...4		
SUB IN-/OUTPUT TYPE 2 MODBUS register: 7106 Data type: Integer Access: read	8340	Displays the configuration of the I/O submodule. Display: 0 = TYPE UNKNOWN 4 = CURRENT OUTPUT 5 = PULS/FREQ. OUT. 6 = STATUS/REL. OUT 7 = STATUS INPUT 12 = MODBUS RS485
SOFTWARE REVISION NUMBER SUB IN-/OUTPUT TYPE 2 MODBUS register: 7190 Data type: String (18) Access: read	8343	Use this function to view the software revision umber of the corresponding submodule.
SUB IN-/OUTPUT TYPE 3 MODBUS register: 7107 Data type: Integer Access: read	8360	Displays the configuration of the I/O submodule. Display: 0 = TYPE UNKNOWN 4 = CURRENT OUTPUT 5 = PULS/FREQ. OUT. 6 = STATUS/REL. OUT 7 = STATUS INPUT 12 = MODBUS RS485
SOFTWARE REVISION NUMBER SUB IN-/OUTPUT TYPE 3 MODBUS register: 7199 Data type: String (18) Access: read	8363	Use this function to view the software revision umber of the corresponding submodule

Function description		
SUPERVISION → VERSION INFO → I/O SUBMODULE 2...4		
SUB IN-/OUTPUT TYPE 4 MODBUS register: Data type: Access:	8380 7108 Integer read	Displays the configuration of the I/O submodule. Display: 0 = TYPE UNKNOWN 4 = CURRENT OUTPUT 5 = PULS/FREQ. OUT. 6 = STATUS/REL. OUT 7 = STATUS INPUT 12 = MODBUS RS485
SOFTWARE REVISION NUMBER SUB IN-/OUTPUT TYPE 4 MODBUS register: Data type: Access:	8383 7199 String (18) read	Use this function to view the software revision umber of the corresponding submodule.

12 Factory settings

12.1 SI units (not for USA and Canada)

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

Nominal diameter [mm]	Low flow cut off (approx. v = 0.04 m/s)		Full scale value (approx. v = 2.5 m/s)		Pulse value (approx. 2 pulse/s at 2.5 m/s)	
1	0.08	kg/h	4	kg/h	0.001	kg/p
2	0.40	kg/h	20	kg/h	0.010	kg/p
4	1.80	kg/h	90	kg/h	0.010	kg/p
8	8.00	kg/h	400	kg/h	0.100	kg/p
15	26.00	kg/h	1300	kg/h	0.100	kg/p
15 FB	72.00	kg/h	3600	kg/h	1.000	kg/p
25	72.00	kg/h	3600	kg/h	1.000	kg/p
25 FB	180.00	kg/h	9000	kg/h	1.000	kg/p
40	180.00	kg/h	9000	kg/h	1.000	kg/p
40 FB	300.00	kg/h	15000	kg/h	10.000	kg/p
50	300.00	kg/h	15000	kg/h	10.000	kg/p
80	720.00	kg/h	36000	kg/h	10.000	kg/p
100	1200.00	kg/h	60000	kg/h	10.000	kg/p
150	2600.00	kg/h	130000	kg/h	100.000	kg/p
250	7200.00	kg/h	360000	kg/h	100.000	kg/p
* DN 15, 25, 40 "FB" = Full bore versions Promass I						

12.1.2 Language

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

12.1.3 Density, length, temperature

	Unit
Density	kg/l
Length	mm
Temperature	°C

12.2 US units (only for USA and Canada)

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

Nominal diameter [mm]	Low flow cut off (approx. $v = 0.04$ m/s)		Full scale value (approx. $v = 2.5$ m/s)		Pulse value (approx. 2 pulse/s at 2.5 m/s)	
1	0.003	lb/min	0.15	lb/min	0.002	lb/p
2	0.015	lb/min	0.75	lb/min	0.020	lb/p
4	0.066	lb/min	3.30	lb/min	0.020	lb/p
8	0.300	lb/min	15.00	lb/min	0.200	lb/p
15	1.000	lb/min	50.00	lb/min	0.200	lb/p
15 FB	2.600	lb/min	130.00	lb/min	2.000	lb/p
25	2.600	lb/min	130.00	lb/min	2.000	lb/p
25 FB	6.600	lb/min	330.00	lb/min	2.000	lb/p
40	6.600	lb/min	330.00	lb/min	2.000	lb/p
40 FB	11.000	lb/min	550.00	lb/min	20.000	lb/p
50	11.000	lb/min	550.00	lb/min	20.000	lb/p
80	26.000	lb/min	1300.00	lb/min	20.000	lb/p
100	44.000	lb/min	2200.00	lb/min	20.000	lb/p
150	95.000	lb/min	4800.00	lb/min	200.000	lb/p
250	260.000	lb/min	13000.00	lb/min	200.000	lb/p
* DN 15, 25, 40 "FB" = Full bore versions Promass I						

12.2.2 Language, density, length, temperature

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

Index function matrix

Blocks

A = MEASURED VARIABLES	10
B = QUICK SETUP	20
C = USER INTERFACE	31
D = TOTALIZER	52
E = OUTPUT	57
F = INPUT	101
G = BASIC FUNCTION	105
H = SPECIAL FUNCTION	122
J = SUPERVISION	161

Groups

AAA = MEASURING VALUES	11
ACA = SYSTEM UNITS	15
CAA = CONTROL	32
CCA = MAIN LINE	36
CEA = ADDITIONAL LINE	40
CGA = INFORMATION LINE	46
DAA = TOTALIZER 1	53
DAB = TOTALIZER 2	53
DAC = TOTALIZER 3	53
DJA = HANDLING TOTALIZER	56
EAA = OUTPUTS	58
ECA = PULSE/FREQUENCY OUTPUT	67
EGA = RELAY OUTPUT 1	92
EGB = RELAY OUTPUT 2	92
FAA = STATUS INPUT	102
GDA = MODBUS RS485	106
GIA = PROCESS PARAMETER	108
GLA = SYSTEM PARAMETER	117
GNA = SENSOR DATA	118
HAA = DENSITY FUNCTIONS	123
HCA = BATCHING FUNCTION	129
HEA = ADVANCED DIAGNOSTICS	147
JAA = SYSTEM	162
JCA = VERSION INFO	165

Function groups

000 = MAIN VALUES	11
002 = ADDITIONAL VALUES	12
040 = CONFIGURATION	15
042 = ADDITIONAL CONFIGURATION	18
200 = BASIC CONFIGURATION	32
202 = UNLOCKING/LOCKING	34
204 = OPERATION	35
220 = CONFIGURATION	36
222 = MULTIPLEX	38
240 = CONFIGURATION	40
242 = MULTIPLEX	43
260 = CONFIGURATION	46
262 = MULTIPLEX	49

300 = CONFIGURATION	53
304 = OPERATION	55
400 = CONFIGURATION	58
404 = OPERATION	66
408 = INFORMATION	66
420 = CONFIGURATION	67
430 = OPERATION	88
438 = INFORMATION	91
470 = CONFIGURATION	92
474 = OPERATION	96
478 = INFORMATION	97
500 = CONFIGURATION	102
504 = OPERATION	103
508 = INFORMATION	104
630 = CONFIGURATION	106
640 = CONFIGURATION	108
642 = EPD PARAMETER	110
646 = REFERENCE PARAMETER	112
648 = ADJUSTMENT	114
650 = PRESSURE CORRECTION	116
660 = CONFIGURATION	117
680 = CONFIGURATION	118
684 = FLOW COEFFICIENT	119
685 = DENSITY COEFFICIENT	120
686 = ADDITIONAL COEFFICIENT	121
700 = CONFIGURATION	123
720 = CONFIGURATION	129
722 = VALVE PARAMETER	136
724 = SUPERVISION	141
726 = OPERATION	144
728 = INFORMATION	146
740 = CONFIGURATION	147
741 = ACQUISITION	148
742 = MASS FLOW	149
743 = DENSITY	151
744 = REFERENCE DENSITY	153
745 = TEMPERATURE	155
746 = TUBE DAMPING	157
747 = EL-DYN. SENSORS	159
800 = CONFIGURATION	162
804 = OPERATION	163
810 = DEVICE	165
820 = SENSOR	166
822 = AMPLIFIER	167
824 = F-CHIP	168
830 = I/O MODULE	169
832 = INPUT/OUTPUT 1	170
834 = I/O SUBMODULE 2	170
836 = I/O SUBMODULE 3	170
838 = I/O SUBMODULE 4	170

Funktionen 0...

0000 = MASS FLOW	11
0000 = TEMPERATURE	11
0001 = VOLUME FLOW	11
0004 = CORRECTED VOLUME FLOW	11
0005 = DENSITY	11
0006 = REFERENCE DENSITY	11
0009 = PRESSURE	11
0020 = TARGET MASS FLOW	12
0021 = % TARGET MASS FLOW	12
0022 = TARGET VOLUME FLOW	12
0023 = % TARGET VOLUME FLOW	12
0024 = CORRECTED TARGET VOLUME FLOW	12
0025 = CARRIER MASS FLOW	13
0026 = % CARRIER MASS FLOW	13
0027 = CARRIER VOLUME FLOW	13
0028 = % CARRIER VOLUME FLOW	13
0029 = CORRECTED CARRIER VOLUME FLOW	13
0030 = % BLACK-LIQUOR	14
0031 = ° BAUME	14
0033 = ° API	14
0034 = ° PLATO	14
0035 = ° BALLING	14
0036 = ° BRIX	14
0400 = UNIT MASS FLOW	15
0401 = UNIT MASS	15
0402 = UNIT VOLUME FLOW	16
0403 = UNIT VOLUME	16
0404 = UNIT CORRECTED VOLUME FLOW	17
0405 = UNIT CORRECTED VOLUME	17
0420 = UNIT DENSITY	18
0421 = UNIT REFERENCE DENSITY	18
0422 = UNIT TEMPERATURE	18
0424 = UNIT LENGTH	19
0426 = UNIT PRESSURE	19

Functions 1...

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

Functions 2...

2000 = LANGUAGE	32
2002 = DISPLAY DAMPING	33
2003 = CONTRAST LCD	33
2004 = BACKLIGHT	33
2020 = ACCESS CODE	34
2021 = DEFINE PRIVATE CODE	34
2022 = STATUS ACCESS	34
2023 = ACCESS CODE	34
2040 = TEST DISPLAY	35
2200 = ASSIGN	36
2201 = 100% VALUE	37
2202 = FORMAT	37
2220 = ASSIGN	38
2221 = 100% VALUE	39
2222 = FORMAT	39
2400 = ASSIGN	40

2401 = 100% VALUE	41
2402 = FORMAT	41
2403 = DISPLAY MODE	42
2420 = ASSIGN	43
2421 = 100% VALUE	44
2422 = FORMAT	45
2423 = DISPLAY MODE	45
2600 = ASSIGN	46
2601 = 100% VALUE	47
2602 = FORMAT	47
2603 = DISPLAY MODE	48
2620 = ASSIGN	49
2621 = 100% VALUE	50
2622 = FORMAT	50
2623 = DISPLAY MODE	51

Functions 3...

3000 = ASSIGN	53
3001 = UNIT TOTALIZER	53
3002 = TOTALIZER MODE	54
3003 = RESET TOTALIZER	54
3040 = SUM	55
3041 = OVERFLOW	55
3800 = RESET ALL TOTALIZERS	56
3801 = FAILSAFE MODE	56

Functions 4...

4000 = ASSIGN CURRENT OUTPUT	58
4001 = CURRENT SPAN	59
4002 = VALUE 0_4 mA	60
4003 = VALUE 20 mA	61
4004 = MEASURING MODE	61
4005 = TIME CONSTANT	64
4006 = FAILSAFE MODE	65
4040 = ACTUAL CURRENT	66
4041 = SIMULATION CURRENT	66
4042 = VALUE SIMULATION CURRENT	66
4080 = TERMINAL NUMBER	66
4200 = OPERATION MODE	67
4201 = ASSIGN FREQUENCY	68
4202 = START VALUE FREQUENCY	68
4203 = END VALUE FREQUENCY	69
4204 = VALUE F LOW	69
4205 = VALUE F HIGH	70
4206 = MEASURING MODE	72
4207 = OUTPUT SIGNAL	74
4208 = TIME CONSTANT	77
4209 = FAILSAFE MODE	77
4301 = ACTUAL FREQUENCY	88
4302 = SIMULATION FREQUENCY	88
4303 = VALUE SIMULATION FREQUENCY	88
4322 = SIMULATION PULSE	89
4323 = VALUE SIMULATION PULSE	89
4341 = ACTUAL STATUS	90
4342 = SIMULATION SWITCH POINT	90
4343 = VALUE SIMULATION SWITCH POINT	90
4380 = TERMINAL NUMBER	91
4700 = ASSIGN RELAY	92
4701 = ON-VALUE	93

Functions 4... (continued)

4702 = SWITCH-ON DELAY	93
4703 = OFF-VALUE	94
4704 = SWITCH-OFF DELAY	94
4705 = MEASURING MODE	95
4706 = TIME CONSTANT	95
4740 = ACTUAL STATUS RELAY OUTPUT	96
4741 = SIMULATION SWITCH POINT	96
4742 = VALUE SIMULATION SWITCH POINT	96
4780 = TERMINAL NUMBER	97

Functions 5...

5000 = ASSIGN STATUS INPUT	102
5001 = ACTIVE LEVEL	102
5002 = MINIMUM PULSE WIDTH	102
5040 = ACTUAL STATUS INPUT	103
5041 = SIMULATION STATUS INPUT	103
5042 = VALUE SIMULATION STATUS INPUT	103
5080 = TERMINAL NUMBER	104

Functions 6...

6300 = TAG NAME	106
6301 = FIELD BUS ADDRESS	106
6302 = BAUDRATE	106
6303 = TRANSMISSION MODE	106
6304 = PARITY	106
6305 = BYTE ORDER	107
6306 = DELAY TELEGRAM REPLY	107
6307 = WRITE PROTECTION	107
6308 = SCAN LIST REGISTER 1...16	107
6400 = ASSIGN LOW FLOW CUT OFF	108
6402 = ON-VALUE LOW FLOW CUT OFF	108
6403 = OFF-VALUE LOW FLOW CUT OFF	108
6404 = PRESSURE SHOCK SUPPRESSION	109
6420 = EMPTY PIPE DETECTION	110
6423 = EPD VALUE LOW	110
6424 = EPD VALUE HIGH	110
6425 = EPD RESPONSE TIME	110
6426 = EPD EXCITING CURRENT MAX	111
6460 = CORRECTED VOLUME CALCULATION	112
6461 = FIXED REFERENCE DENSITY	112
6462 = EXPANSION COEFFICIENT	112
6463 = EXPANSION COEFFICIENT SQUARE	112
6464 = REFERENCE TEMPERATURE	113
6480 = ZEROPOINT ADJUST	114
6482 = DENSITY ADJUST MODE	114
6483 = DENSITY SETPOINT 1	114
6484 = MEASURE FLUID 1	114
6485 = DENSITY SETPOINT 2	115
6486 = MEASURE FLUID 2	115
6487 = DENSITY ADJUST	115
6488 = RESTORE ORIGINAL	115
6500 = PRESSURE MODE	116
6501 = PRESSURE	116
6600 = INSTALLATION DIRECTION SENSOR	117
6602 = DENSITY DAMPING	117
6603 = FLOW DAMPING	117
6605 = POSITIVE ZERO RETURN	117
6800 = K-FACTOR	118
6803 = ZERO POINT	118

6804 = NOMINAL DIAMETER	118
6840 = TEMPERATURE COEFFICIENT KM	119
6841 = TEMPERATURE COEFFICIENT KM2	119
6842 = TEMPERATURE COEFFICIENT KT	119
6843 = CALIBRATION COEFFICIENT KD 1	119
6844 = CALIBRATION COEFFICIENT KD 2	119
6850 = DENSITY COEFFICIENT C 0	120
6851 = DENSITY COEFFICIENT C 1	120
6852 = DENSITY COEFFICIENT C 2	120
6853 = DENSITY COEFFICIENT C 3	120
6854 = DENSITY COEFFICIENT C 4	120
6855 = DENSITY COEFFICIENT C 5	120
6860 = MIN. TEMPERATURE MEASURED	121
6861 = MAX. TEMPERATURE MEASURED	121
6862 = MIN. TEMPERATURE CARRIER TUBE	121
6863 = MAX. TEMPERATURE CARRIER TUBE	121

Functions 7...

7000 = DENSITY FUNCTION	123
7001 = REFERENCE DENSITY CARRIER FLUID	123
7002 = EXPANSION COEFF. LIN. CARRIER FLUID	123
7003 = EXPANSION COEFF. SQR. CARRIER FLUID	124
7004 = REFERENCE DENSITY TARGET FLUID	124
7005 = EXPANSION COEFF. LIN. TARGET FLUID	124
7006 = EXPANSION COEFF. SQR. TARGET FLUID	124
7007 = LIN. EXPANSION COEFF.	124
7008 = SQR. EXPANSION COEFF.	125
7009 = REFERENCE TEMPERATURE	125
7021 = MODE	125
7022 = CONCENTRATION SELECTOR	126
7031 = CONCENTRATION NAME	126
7032 = COEFFICIENT A0	126
7033 = COEFFICIENT A1	126
7034 = COEFFICIENT A2	127
7035 = COEFFICIENT A3	127
7036 = COEFFICIENT A4	127
7037 = COEFFICIENT B1	127
7038 = COEFFICIENT B2	128
7039 = COEFFICIENT B3	128
7200 = BATCH SELECTOR	129
7201 = BATCH NAME	129
7202 = ASSIGN BATCH VARIABLE	130
7203 = BATCH QUANTITY	130
7204 = FIXED COMPENSATION QUANTITY	131
7205 = COMPENSATION MODE	131
7206 = CALCULATION MODE	133
7207 = CALCULATING DRIP	134
7208 = BATCH STAGES	134
7209 = INPUT FORMAT	135
7220 = OPEN VALVE 1	136
7221 = CLOSE VALVE 1	136
7222 = OPEN VALVE 2	137
7223 = CLOSE VALVE 2	138
7240 = MAX. BATCHING TIME	141
7241 = MIN. BATCHING QUANTITY	141
7242 = MAX. BATCHING QUANTITY	142
7243 = PROGRESS NOTE	143
7244 = MAX. FLOW VALUE	143
7260 = BATCH PROCEDURE	144

Functions 7... (continued)

7261 = BATCH UPWARDS	144
7262 = BATCH DOWNWARDS	144
7263 = BATCH COUNTER	145
7264 = BATCH SUM	145
7265 = RESET SUM/COUNTER	145
7280 = VALVE 1 INTERNAL SWITCH POINT	146
7281 = DRIP QUANTITY	146
7282 = VALVE 1 CLOSING TIME	146
7283 = BATCHING TIME	146
7401 = REF. CONDITION USER	147
7402 = SELECT REF. CONDITION	147
7403 = WARNING MODE	147
7410 = ACQUISITION MODE	148
7411 = ACQUISITION PERIOD	148
7412 = ACQUISITION DO	148
7413 = RESET HISTORY	148
7420 = REFERENCE VALUE	149
7421 = ACTUAL VALUE	149
7422 = MIN. VALUE	149
7423 = MAX. VALUE	149
7424 = HISTORY MASS FLOW	149
7425 = ACTUAL DEVIATION	149
7426 = WARNING LEVEL	150
7430 = REFERENCE VALUE	151
7431 = ACTUAL VALUE	151
7432 = MIN. VALUE	151
7433 = MAX. VALUE	151
7434 = HISTORY DENSITY	151
7435 = ACTUAL DEVIATION	152
7436 = WARNING LEVEL	152
7440 = REFERENCE VALUE	153
7441 = ACTUAL VALUE	153
7442 = MIN. VALUE	153
7443 = MAX. VALUE	153
7444 = HISTORY REFERENCE DENSITY	153
7445 = ACTUAL DEVIATION	154
7446 = WARNING LEVEL	154
7450 = REFERENCE VALUE	155
7451 = ACTUAL VALUE	155
7452 = MIN. VALUE	155
7453 = MAX. VALUE	155
7454 = HISTORY TEMPERATURE	156
7455 = ACTUAL DEVIATION	156
7456 = WARNING LEVEL	156
7460 = REFERENCE VALUE	157
7461 = ACTUAL VALUE	157
7462 = MIN. VALUE	157
7463 = MAX. VALUE	157
7464 = HISTORY TUBE DAMPING	158
7465 = ACTUAL DEVIATION	158
7466 = WARNING LEVEL	158
7470 = REFERENCE VALUE	159
7471 = ACTUAL VALUE	159
7472 = MIN. VALUE	159
7473 = MAX. VALUE	159
7474 = HISTORY ELECTR. SENSORS	160
7475 = ACTUAL DEVIATION	160
7476 = WARNING LEVEL	160

Functions 8...

8005 = ALARM DELAY	162
8006 = ENTFERNEN SW-OPTION	162
8040 = ACTUAL SYSTEM CONDITION	163
8041 = PREVIOUS SYSTEM CONDITION	163
8042 = SIMULATION FAILSAFE MODE	163
8043 = SIMULATION MEASURAND	164
8044 = VALUE SIMULATION MEASURAND	164
8046 = SYSTEM RESET	164
8048 = OPERATION HOURS	164
8100 = DEVICE SOFTWARE	165
8200 = SERIAL NUMBER	166
8201 = SENSOR TYPE	166
8205 = SW-REV. NUMBER S-DAT	166
8225 = SW-REV. NUMBER T-DAT	167
8226 = LANGUAGE GROUP	167
8240 = STATUS F-CHIP	168
8241 = SYSTEM OPTION	168
8244 = SW-REV. NUMBER F-CHIP	168
8300 = I/O MODULE TYPE	169
8340 = SUB I/O MODULE TYPE 2	170
8360 = SUB I/O MODULE TYPE 3	170
8380 = SUB I/O MODULE TYPE 4	171
8383 = SW-REV NO. SUB I/O MODULE TYPE 4	171

Index key words

A

Access type	8
Acquisition (Advanced diagnosis)	
Do	148
Mode	148
Period	148
Active level	102
Actual	
Current	66
Frequency	88
Relay output	96
Status	90
Status input	103
Actual system condition	163
Additional coefficient	121
Additional configuration	18
Additional line	
Assign	40
Configuration	40
Display mode	42
Format	41
Multiplex	43
Assign	43
Display mode	45
Format	45
100% Value	44
100% Value	41
Additional values	12
Advanced diagnostics	
Acquisition	148
Configuration	147
Density	151
Electrodyn. sensors	159
Mass flow	149
Reference density	153
Temperature	155
Tube damping	157
Alarm delay	162
Amplifier (Version Info)	167
Assign	
Additional line	40
Additional line (Multiplex)	43
Batch variable	130
Frequency (pulse/freq. output)	68
Information line	46
Information line (Multiplex)	49
Low flow cut off	108
Main line	36
Main line (Multiplex)	38
Pulse (pulse/freq. output)	78
Relay output	92
Status input	102
Status (pulse/freq. output)	84
Totalizer	53, 56
Assign current output	58
Averaging drip	134

B

Backlight	33
Basic configuration (user interface)	32
Basic function	105
Batch	
Counter	145
Downwards	144
Name	129
Options	129
Procedure	144
Quantity	130
Stages	134
Total quantity	145
Upwards	144
Batch sum	145
Batching	
Time	146
Batching function	129
Batching processes (examples of setting parameters)	138
Baudrate	106
Block	
Basic function	105
Inputs	101
Measured variables	10
Outputs	57
Quick Setup	20
Special function	122
Supervision	161
Totalizer	52
User interface	31
Byte order	107

C

Calculation mode	133
Calibration coefficient	
KD1	119
KD2	119
Carrier fluid	
Corrected volume flow	13
Mass flow	13
Volume flow	13
Close	
Valve 1	136
Valve 2	138
Code	
Access	34
Access counter	34
Coefficient	
A0	126
A1	126
A2	127
A3	127
A4	127
B1	127
B2	128
B3	128

C (continued)

Compensation mode	131
Concentration	
Name	126
Options	126
Configuration	
Additional line	40
Advanced diagnostics	147
Batching function	129
Current output	58
Density functions	123
Information line	46
Main line	36
MODBUS	
RS485	106
Process parameter	108
Pulse/frequency output	67
Relay output	92
Sensor data	118
Status input	102
System	162
System parameter	117
System units	15
Totalizer	53
Contrast LCD	33
Control	
Basic configuration	32
Operation	35
Unlocking/locking	34
Corrected volume calculation	112
Corrected volume flow	11
Current output	
Actual current	66
Assign	58
Configuration	58
Current span	59
Failsafe mode	65
Information	66
Measuring mode	61
Operation	66
Simulation current	66
Terminal number	66
Time constant	64
Value simulation current	66
Value 0...4 mA	60
Value 20 mA	61
Current span	59

D

Damping	
Density	117
Display	33
Data type	8
Define private code	34
Delay telegram reply	107
Density	11, 151
Density adjustment	115
Density coefficient	
C0	120
C1	120
C2	120
C3	120
C4	120
C5	120
Density function	123
Density functions	
Configuration	123
Deviation	
Density	152
Electrodynamic sensors	160
Mass flow	149
Reference density	154
Temperature	156
Tube damping	158
Device software	165
Display lines of local operation	8
Display mode	
Additional line	42
Additional line (Multiplex)	45
Information line	48
Information line (Multiplex)	51
Drip quantity	146

E

EEPROM	8
Electrodynamic sensors	159
Empty pipe detection (EPD)	110
End value frequency	69
Entfernen der SW-Optionen	162
EPD	
Empty pipe detection	110
EXCITING CURRENT MAX	111
Parameter	110
Response time	110
Value high	110
Value low	110
Expansion coefficient	112
Linear	124
Carrier fluid	123
Target fluid	124
Square	
Carrier fluid	124
Target fluid	124
Square (density functions)	125
Square (reference parameter)	112

F

Factory settings		Configuration (density functions)	123
Full scale value	172	Density	
Low flow cut off	172	Advanced diagnostics	151
Pulse value	172	Density coefficient	120
Failsafe mode		Device	165
Current span	65	Function group (continued)	
Frequency (pulse/freq. output)	77	Electrodyn. sensors	
Pulse (pulse/freq. output)	83	Advanced diagnostics	159
Totalizer	56	EPD parameter	110
F-CHIP (Version Info)	168	F-CHIP	168
Fieldbus address	106	Flow coefficient	119
Fix		Information	
Compensation quantity	131	Batching function	146
Fixed		Current output	66
Reference density	112	Pulse/frequency output	91
Float	8	Relay output	97
Flow damping	117	Status input	104
Flow value (max.)	143	Input/output	170
Format		I/O module	169
Additional line	41	Main values	11
Additional line (Multiplex)	45	Mass flow	
Information line	47	Advanced diagnostics	149
Information line (Multiplex)	50	Multiplex	
Main line	37	Additional line	43
Main line (Multiplex)	39	Information line	49
Function group		Main line	38
Acquisition		Operation	
Advanced diagnostics	148	Batching function	144
Additional coefficient	121	Current output	66
Additional configuration	18	Pulse/frequency output	88
Additional values	12	Relay output	96
Adjustment	114	Status input	103
Amplifier	167	System	163
Basic configuration (user interface)	32	Totalizer	55
Configuration		Operation (user interface)	35
Additional line	40	Pressure correction	116
Advanced diagnostics	147	Reference density	
Batching function	129	Advanced diagnostics	153
Current output	58	Reference parameter	112
Density functions	123	Sensor	165, 166
Information line	46	Supervision	
Main line	36	Batching function	141
MODBUS		Temperature	
RS485	106	Advanced diagnostics	155
Process parameter	108	Tube damping	
Pulse/freq. output	67	Advanced diagnostics	157
Relay output	92	Unlocking/locking (user interface)	34
Sensor data	118	Valve parameter	
Status input	102	Batching function	136
System	162	Function matrix	
System parameter	117	Codes identifying	7
System units	15	General layout	6
Totalizer	53	Overview	9

G

Group	
Additional line	40
Advanced diagnostics	147
Batching function	129
Control (user interface)	32
Current output	58
Density functions	123
Handling totalizer	56
Information line	46
Main line	36
Measuring values	11
MODBUS RS485	106
Process parameter	108
Pulse/frequency output	67
Relay output	92
Sensor data	118
Status input	102
System	162
System parameter	117
System units	15
Version Info	165

H

Handling totalizer	56
History	
Density	151
Electrodynamic sensors	160
Mass flow	149
Reference density	153
Temperature	156
Tube damping	158

I

Illustration of function description	8
Information	
Batching function	146
Current output	66
Pulse/frequency output	91
Relay output	97
Status input	104
Information line	
Assign	46
Configuration	46
Display mode	48
Format	47
Multiplex	49
Assign	49
Display mode	51
Format	50
100% value	50
100% value	47
Input format	135
Inputs	101
Input/output 2...4	170
Installation direction sensor	117
Integer	8
I/O module	169
I/O module type	169

I/O submodule	
Type 2	170
Type 3	170
Type 4	171

K

K-Factor	118
----------	-----

L

Language	32
Factory setting (country)	172
Language group	167
Local operation (display lines)	8
Low flow cut off	
Assign	108
Off value	108
On value	108

M

Main line	
Assign	36
Configuration	36
Format	37
Multiplex	38
Assign	38
Format	39
100% value	39
100% value	37
Main values	11
Mapping reg. 1...16	107
Mass flow	11, 149
Maximal	
Batch quantity	142
Temperature carrier tube	121
Temperature measured	121
Maximum	
Batching time	141
Density	151
Electrodynamic sensors	159
Mass flow	149
Reference density	153
Temperature	155
Tube damping	157
Max. flow value	143
Max. writes	8
Measure	
Fluid 1	114
Fluid 2	115
Measure fluid 1	114
Measure fluid 2	115
Measured variables	10
Measuring mode	
Current span	61
Frequency (pulse/freq. output)	72
Pulse (pulse/freq. output)	79
Relay output	95
Status (pulse/freq. output)	87

M (continued)

Measuring values	11
Additional values	12
Main values	11
Minimal	
Batch quantity	141
Temperature carrier tube	121
Temperature measured	121
Minimum	
Density	151
Electrodynamic sensors	159
Mass flow	149
Reference density	153
Temperature	155
Tube damping	157
Minimum pulse width (status input)	102
MODBUS register	8
MODBUS RS485	106
Mode	
Density adjustment	114
Density functions	125
Transmission	106
Multiplex	
Additional line	43
Information line	49
Main line	38
N	
Nominal diameter	118
O	
Off value	
Low flow cut off	108
Pulse/freq. output	86
Relay output	94
On value	
Low flow cut off	108
Pulse/freq. output	85
Relay output	93
Open	
Valve 1	136
Valve 2	137
Operation	
Batching function	144
Current output	66
Pulse/frequency output	88
Relay output	96
Status input	103
System	163
Totalizer	55
User interface	35
Operation hours	164
Output signal	
Frequency (pulse/freq. output)	74
Pulse (pulse/freq. output)	80
Outputs	57
Overflow	55

P

Parity	106
Positive zero return	117
Pressure	11, 116
Correction	116
Mode	116
Pressure shock suppression	109
Previous system condition	163
Process parameter	
Adjustment	114
Configuration	108
EPD parameter	110
Pressure correction	116
Reference parameter	112
Progress note	143
Pulse	
Value	78
Width	78
Pulse/frequency output	
Configuration	67
Information	91
Operation	88
Pulse/freq. output	
Frequency	
Actual	88
Assign frequency	68
End value frequency	69
Failsafe mode	77
Failsafe value frequency	77
Measuring mode	72
Output signal	74
Simulation	88
Start value frequency	68
Time constant	77
Value F high	70
Value F low	69
Value simulation	88
Operation	67
Pulse	
Assign pulse	78
Failsafe mode	83
Measuring mode	79
Output signal	80
Pulse value	78
Pulse width	78
Simulation	89
Value simulation	89
Status	
Actual	90
Assign status	84
Measuring mode	87
Off value	86
On value	85
Simulation	90
Switch-off delay	86
Switch-on delay	85
Time constant	87
Value simulation	90
Terminal number	91

Q

Quick Setup	20
Batching/dosing	20
Commission	20
Communication	20
Gas measurement	20
Pulsating flow	20

R

Read	8
Reference condition user	147
Reference density	11, 153
Carrier fluid	123
Fixed	112
Target fluid	124
Reference temperature	113, 125
Reference value	
Density	151
Electrodynamic sensors	159
Mass flow	149
Reference density	153
Temperature	155
Tube damping	157
Relay output	
Actual	96
Assign	92
Configuration	92
Flow direction	98
General	98
Information	97
Limit value	98
Measuring mode	95
Off value	94
On value	93
Operation	96
Simulation switch point	96
Switching action	99
Switch-off delay	94
Switch-on delay	93
Terminal number	97
Time constant	95
Value simulation switch point	96
Reset	
All totalizers	56
History	148
Sum/counter	145
System	164
Totalizer	54
Restore original	115

S

Select reference condition	147
Sensor data	
Additional coefficient	121
Configuration	118
Density coefficient	120
Flow coefficient	119
Sensor type	166
Sensor (Version info)	166

Sensor (version info)	165
Serial number	166
Setpoint	
Density 1	114
Density 2	115
Simulation	
Current	66
Failsafe mode	163
Frequency	88
Measured variable	164
Pulse	89
Relay output	96
Status input	103
Switch point	90
Special function	122
Start value frequency	68
Status access	34
Status F-Chip	168
Status input	
Active level	102
Actual	103
Assign	102
Configuration	102
Information	104
Minimum pulse width	102
Operation	103
Simulation	103
Terminal number	104
Value simulation	103
String	8
Sum	55
Supervision	161
Batching function	141
SW revision number	
Amplifier	167
F-CHIP	168
I/O module	169
I/O submodule	
Type 2	170
Type 3	170
Type 4	171
S-DAT	166
T-DAT	167
Switching action of the relay output	99
Switch-off delay	
Pulse/freq. output	86
Relay output	94
Switch-on delay	
Pulse/freq. output	85
Relay output	93
System	
Configuration	162
Operation	163
Option	168
System condition	
Actual	163
Previous	163
System parameter	117
System reset	164

S (continued)

System units	
Additional configuration	18
Configuration	15

T

Tag name	106
Target fluid	
Corrected volume flow	12
Mass flow	12
Volume flow	12
T-DAT save/load	21
Temperature	11, 155
Temperature coefficient	
KM	119
KM2	119
KT	119
Terminal number	
Current output	66
Pulse/freq. output	91
Relay output	97
Status input	104
Test display	35
Time constant	
Current span	64
Frequency (pulse/freq. output)	77
Relay output	95
Status (pulse/freq. output)	87
Totalizer	52
Assign	53
Configuration	53
Failsafe mode	56
Operation	55
Overflow	55
Reset all totalizers	56
Reset totalizer	54
Sum	55
Totalizer mode	54
Unit	53
Totalizer mode	54
Tube damping	157

U

Unit	
Corrected volume	17
Corrected volume flow	17
Density	18
Length	19
Mass	15
Mass flow	15
Reference density	18
Temperature	18
Totalizer	53
Volume	16
Volume flow	16
Unlocking/locking (user interface)	34

User interface	31
----------------	----

V

Value	
EPD value high	110
EPD value low	110
F low	69
Failsafe value	77
Simulation current	66
Simulation frequency	88
Simulation measurand	164
Simulation pulse	89
Simulation relay output	96
Simulation status input	103
Simulation switch point	90
0...4 mA	60
20 mA	61
Value F high	70
Valve parameter	
Batching function	136
Valve 1 closing time	146
Valve 1 internal switch point	146
Version info	
Amplifier	167
F-CHIP	168
Input/output 1...4	170
I/O module	169
Sensor	165
Volume flow	11

W

Warning level	
Density	152
Electrodynamic sensors	160
Mass flow	150
Reference density	154
Temperature	156
Tube damping	158
Warning mode	147
Write	8
Write protection	107
Writes (max.)	8

Z

Zero point	118
Zero point adjust	114

Numerics

100% Value	
Additional line	41
Additional line (Multiplex)	44
Information line	47
Information line (Multiplex)	50
Main line	37
Main line (Multiplex)	39

Symbols

% Black Liquor	14
% Carrier	
Mass flow	13
Volume flow	13
% Target	
Mass flow	12
Volume flow	12
°Api	14
°Balling	14
°Baume	14
°Brix	14
°Plato	14

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