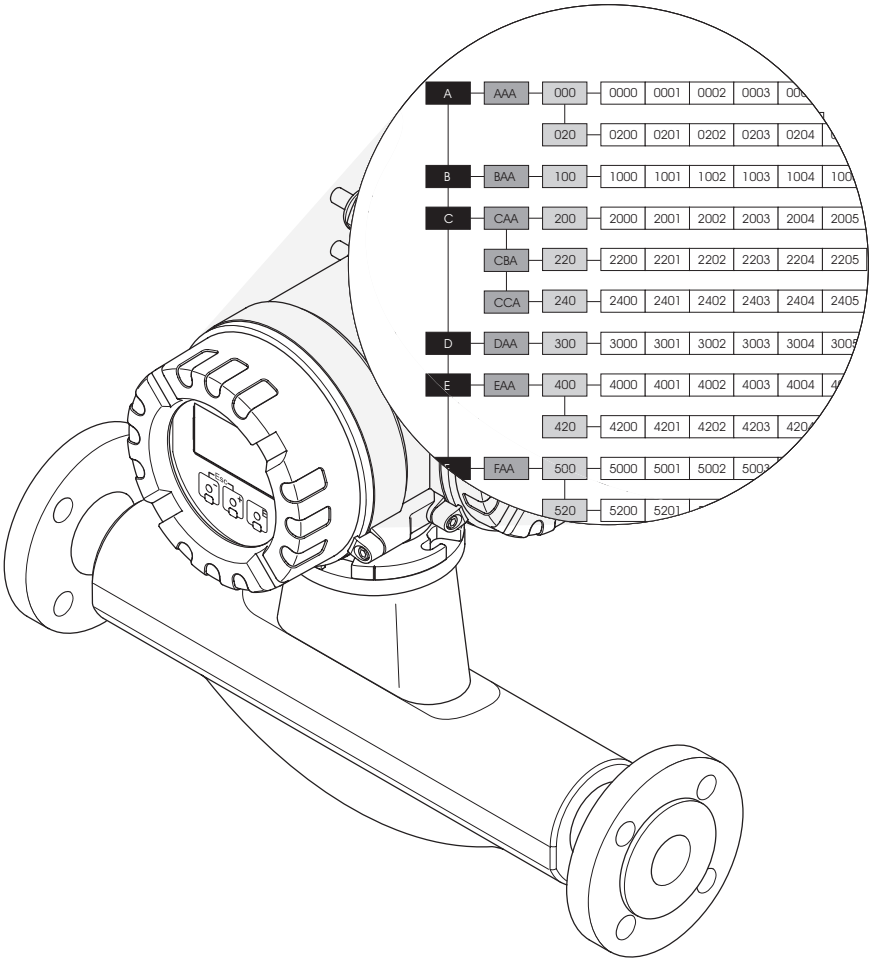
Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Description of Device Functions

Proline Promass 83 MODBUS RS485

Coriolis Mass Flow Measuring System



BA108D/06/en/11.08
71085231
Valid as of software version:
V 3.02.XX (device software)

Endress+Hauser

People for Process Automation

Table of contents

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 factory down through the matrix to the description of the function you need:

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

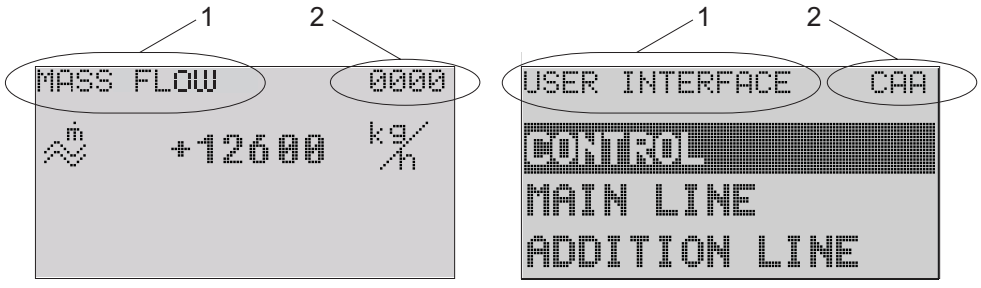


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Fig. 1 : Local display

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 181.

2 Function Matrix

2.1 General layout of the function matrix

The function matrix consists of four levels:
Blocks -> Groups -> Function groups -> Functions

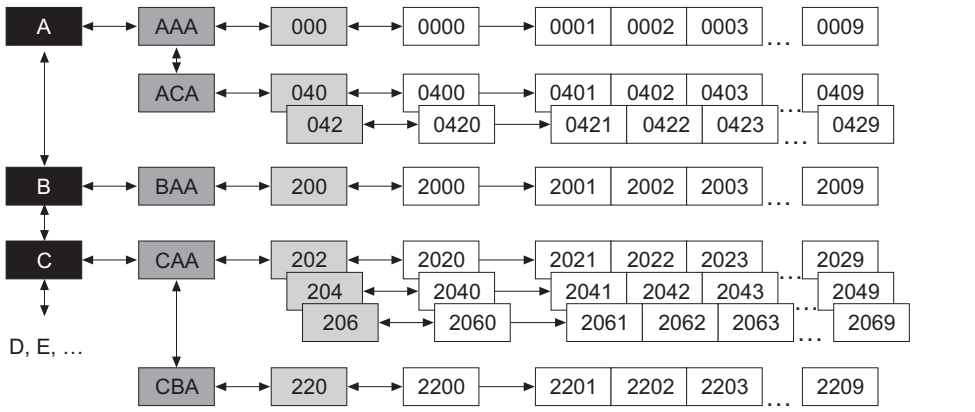


Fig. 2 : Layout of the function matrix

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. Function groups available of “CONTROL” group are for example: BASIC CONFIGURATION, UNLOCKING/LOCKING, OPERATION, etc.

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

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

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

2.1.5 Codes identifying cells

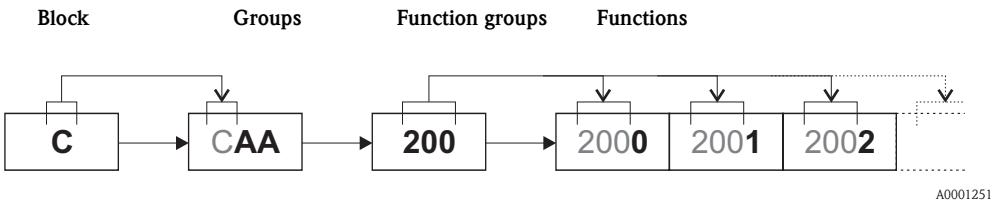
Each cell (block, group, function group and function)
in the function matrix has an individual, unique code.

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

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

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

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



2.2 Illustration of the function descriptions

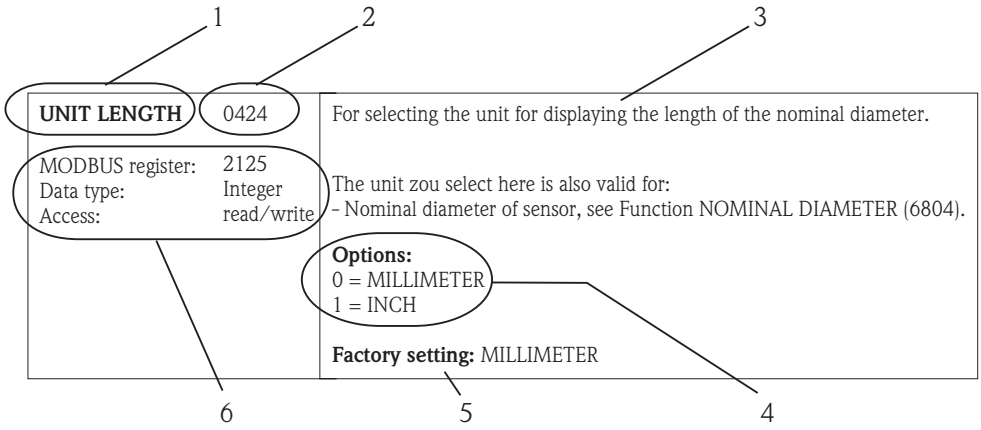


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Fig. 3 : Example for the description of a function

1 Name of the function
2 Number of the function (appears on the local display; is **not** *identical to the MODBUS RS485 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 RS485 register (information in decimal numerical format)
– Data type: float (length = 4 bytes), integer (length = 2 bytes), string (length = depends on function)
– Possible ways of accessing the function:
read = read access via function code 03, 04 or 23
write = write access via function code 06, 16 or 23

Note!
If a nonvolatile device parameter is modified via the MODBUS RS485 function codes 06, 16 or 23, this change is saved in the EEPROM of the measuring device. The number of writes to the EEPROM is technically restricted to a maximum of 1 million. Attention must be paid to this limit since, if exceeded, it results in data loss and measuring device failure. For this reason, avoid constantly writing nonvolatile device parameters via the MODBUS RS485!

2.3 Display lines on the local display

The local display is split into various display lines.

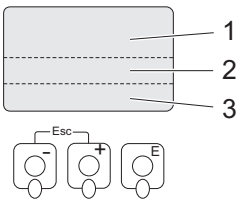

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Fig. 4 : Local display

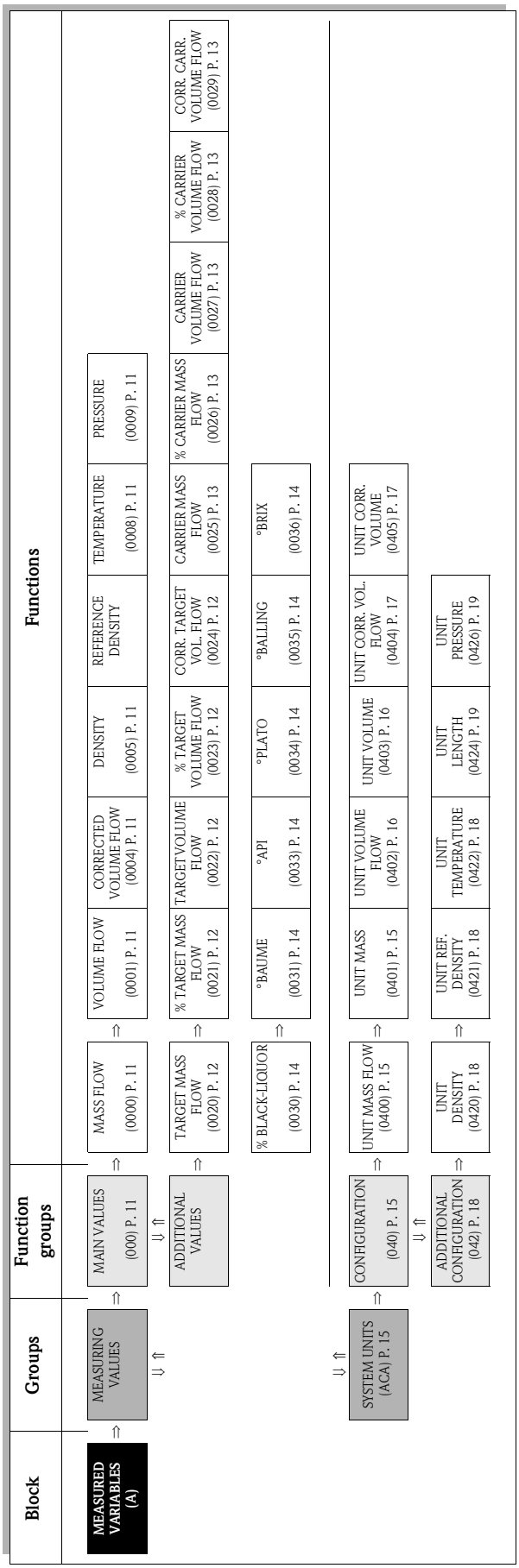
1 Main line
2 Additional line
3 Information line

The values are assigned to the individual lines in the USER INTERFACE block, see Page 33.

2.4 Function matrix Proline Promass 83

Blocks		Groups		Function groups
MEASURED VARIABLES (see P. 10)	**A**	MEASURING VALUES	AAA	see Page 11
		SYSTEM UNITS	ACA	see Page 15
QUICK SETUP (see P. 20)	**B**	Commissioning and application setups		see Page 20
USER INTERFACE (see P. 32)	**C**	CONTROL	CAA	see Page 33
		MAIN LINE	CCA	see Page 37
		ADDITIONAL LINE	CEA	see Page 41
		INFORMATION LINE	CGA	see Page 47
TOTALIZER (see P. 53)	**D**	TOTALIZER 1	DAA	see Page 54
		TOTALIZER 2	DAB	see Page 54
		TOTALIZER 3	DAC	see Page 54
		HANDLING TOTALIZER	DJA	see Page 57
OUTPUTS (see P. 58)	**E**	CURRENT OUTPUT 1	EAA	see Page 59
		PULSE/FREQ. OUTPUT 1	ECA	see Page 68
		RELAY OUTPUT 1	EGA	see Page 93
		RELAY OUTPUT 2	EGB	see Page 93
INPUTS (see P. 102)	**F**	STATUS INPUT	FAA	see Page 103
BASIC FUNCTION (see P. 106)	**G**	MODBUS RS485	GDA	see Page 107
		PROCESS PARAMETER	GIA	see Page 109
		SYSTEM PARAMETER	GLA	see Page 118
		SENSOR DATA	GNA	see Page 119
SPECIAL FUNCTION (see P. 123)	**H**	DENSITY FUNCTIONS	HAA	see Page 125
		BATCHING FUNCTION	HCA	see Page 131
		ADVANCED DIAGNOSTICS	HEA	see Page 149
SUPERVISION (see P. 167)	**J**	SYSTEM	JAA	see Page 168
		VERSION INFO	JCA	see Page 171

3 Block MEASURED VARIABLES



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 to 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 113). **Display:** 5-digit floating point number, incl. unit, corresponding to 0.1000 to 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

MEASURED VARIABLES A → MEASURING VALUES AAA → MAIN VALUES 000
↓
ADDITIONAL VALUES 002

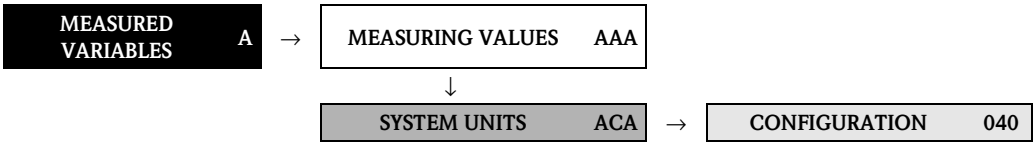
Function description MEASURED VARIABLES → MEASURING VALUES → ADDITIONAL VALUES	
TARGET MASS FLOW **0020** MODBUS register: 2023 Data type: Float Access: read	✎ Note! Function is not available unless one of the following was selected: ■ in the function DENSITY FUNCTION (7000), see Page 125: – % MASS / % VOLUME – FLEXIBLE and in the function MODE (7021), see Page 127, 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 125: – % MASS / % VOLUME – FLEXIBLE and in the function MODE (7021), see Page 127, 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 125: – % MASS / % VOLUME – FLEXIBLE and in the function MODE (7021), see Page 127, 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 125: – % MASS / % VOLUME – FLEXIBLE and in the function MODE (7021), see Page 127, 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 125). 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** MODBUS register: 2035 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 125: – % MASS / % VOLUME – FLEXIBLE and in the function MODE (7021), see Page 127, 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** MODBUS register: 2037 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 125: – % MASS / % VOLUME – FLEXIBLE and in the function MODE (7021), see Page 127, 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** MODBUS register: 2039 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 125: – % MASS / % VOLUME – FLEXIBLE and in the function MODE (7021), see Page 127, 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** MODBUS register: 2041 Data type: Float Access: read	✎ Note! Function is not available unless % MASS / % VOLUME was selected in the DENSITY FUNCTION function (7000), (see Page 125). 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** MODBUS register: 2043 Data type: Float Access: read	✎ Note! Function is not available unless % MASS / % VOLUME was selected in the DENSITY FUNCTION function (7000), (see Page 125). 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** MODBUS register: 2027 Data type: Float Access: read	✎ Note! Function is not available unless %-BLACK LIQUOR was selected in the DENSITY FUNCTION function (7000), (see Page 125). The concentration in %-BLACK LIQUOR is displayed. **Display:** 5-digit floating-point number, including units
°BAUME **0031** MODBUS register: 2045 Data type: Float Access: read	✎ Note! Function is not available unless °BAUME was selected in the DENSITY FUNCTION function (7000), (see Page 125). The concentration in °BAUME is displayed. **Display:** 5-digit floating-point number, including units
°API **0033** MODBUS register: 2049 Data type: Float Access: read	✎ Note! Function is not available unless °API was selected in the DENSITY FUNCTION function (7000), (see Page 125). The concentration in °API is displayed. **Display:** 5-digit floating-point number, including units
°PLATO **0034** MODBUS register: 2051 Data type: Float Access: read	✎ Note! Function is not available unless °PLATO was selected in the DENSITY FUNCTION function (7000), (see Page 125). The concentration in °PLATO is displayed. **Display:** 5-digit floating-point number, including units
°BALLING **0035** MODBUS register: 2053 Data type: Float Access: read	✎ Note! Function is not available unless °BALLING was selected in the DENSITY FUNCTION function (7000), (see Page 125). The concentration in °BALLING is displayed. **Display:** 5-digit floating-point number, including units
°BRIX **0036** MODBUS register: 2055 Data type: Float Access: read	✎ Note! Function is not available unless °BRIX was selected in the DENSITY FUNCTION function (7000), (see Page 125). The concentration in °BRIX is displayed. **Display:** 5-digit floating-point number, including units

3.2 Group SYSTEM UNITS

3.2.1 Function group CONFIGURATION

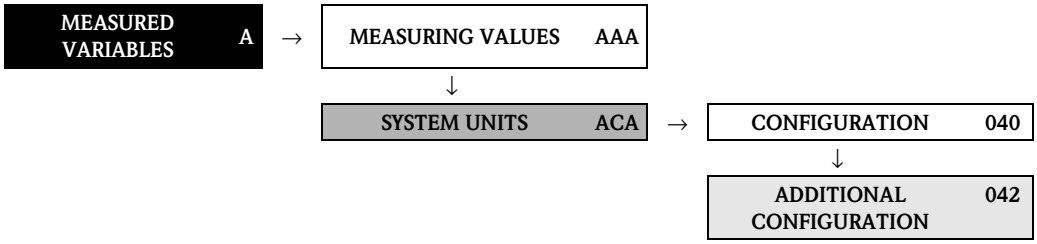


Function description MEASURED VARIABLES → SYSTEM UNITS → CONFIGURATION	
You can select the units for measured variables in this function group.	
UNIT MASS FLOW **0400** MODBUS register: 2101 Data type: Integer Access: read/write	For selecting the unit for displaying the mass flow (mass/time). The unit you select here is also valid for: ■ Current output ■ Frequency output ■ Relay switch points (limit value for mass flow, flow direction) ■ Low flow cut off **Options:** Metric: 0 to 3 = gram → g/s; g/min; g/h; g/day 4 to 7 = kilogram → kg/s; kg/min; kg/h; kg/day 8 to 11 = ton → t/s; t/min; t/h; t/day US: 12 to 15 = ounce → oz/s; oz/min; oz/h; oz/day 16 to 19 = pound → lb/s; lb/min; lb/h; lb/day 20 to 23 = ton → ton/s; ton/min; ton/h; ton/day **Factory setting:** Country-dependent (kg/h or US-lb/min)
UNIT MASS **0401** MODBUS register: 2102 Data type: Integer Access: read/write	For selecting the unit for displaying the mass. The unit you select here is also valid for: ■ Pulse value (e.g. kg/p) **Options:** Metric: 0 = g 1 = kg 2 = t US: 3 = oz 4 = lb 5 = ton **Factory setting:** 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 → SYSTEM UNITS → CONFIGURATION	
UNIT VOLUME FLOW **0402** MODBUS register: 2103 Data type: Integer Access: read/write	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 to 3 = cubic centimeter → cm^3/s; cm^3/min; cm^3/h; cm^3/day 4 to 7 = cubic decimeter → dm^3/s; dm^3/min; dm^3/h; dm^3/day 8 to 11 = cubic meter → m^3/s; m^3/min; m^3/h; m^3/day 12 to 15 = milliliter → ml/s; ml/min; ml/h; ml/day 16 to 19 = liter → l/s; l/min; l/h; l/day 20 to 23 = hectoliter → hl/s; hl/min; hl/h; hl/day 24 to 27 = megaliter → Ml/s; Ml/min; Ml/h; Ml/day US: 28 to 31 = cubic centimeter → cc/s; cc/min; cc/h; cc/day 32 to 35 = acre foot → af/s; af/min; af/h; af/day 36 to 39 = cubic foot → ft^3/s; ft^3/min; ft^3/h; ft^3/day 40 to 43 = fluid ounce → oz f/s; oz f/min; oz f/h; oz f/day 44 to 47 = gallon → gal/s; gal/min; gal/h; gal/day 88 to 92 = kilo gallon → Kgal/s; Kgal/min; Kgal/h; Kgal/day 48 to 51 = million gallon → Mgal/s; Mgal/min; Mgal/h; Mgal/day 52 to 55 = barrel (normal fluids: 31.5 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day 56 to 59 = barrel (beer: 31.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day 60 to 63 = barrel (petrochemicals: 42.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day 64 to 67 = barrel (filling tanks: 55.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Imperial: 68 to 71 = gallon → gal/s; gal/min; gal/h; gal/day 72 to 75 = mega gallon → Mgal/s; Mgal/min; Mgal/h; Mgal/day 76 to 79 = barrel (beer: 36.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day 80 to 83 = barrel (petrochemicals: 34.97 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day **Factory setting:** Country-dependent (m^3/h or US-Mgal/day)
UNIT VOLUME **0403** MODBUS register: 2104 Data type: Integer Access: read/write	For selecting the unit for displaying the volume. The unit you select here is also valid for: Pulse weighting (e.g. m^3/p) **Options:** 0 to 6 = metric → cm^3; dm^3; m^3; ml; l; hl; Ml Mega 7 to 16 = US → cc; af; ft^3; oz f; gal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals); bbl (filling tanks); 22 = Kgal 17 to 20 = Imperial → gal; Mgal; bbl (beer); bbl (petrochemicals) **Factory setting:** m^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.

Function description MEASURED VARIABLES → SYSTEM UNITS → CONFIGURATION	
UNIT CORRECTED VOLUME FLOW **0404** MODBUS register: 2105 Data type: Integer Access: read/write	For selecting the unit for displaying the corrected volume flow (corrected volume/time). 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 = Nl/s 1 = Nl/min 2 = Nl/h 3 = Nl/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** MODBUS register: 2106 Data type: Integer Access: read/write	For selecting the unit for displaying the corrected volume. The unit you select here is also valid for: ■ Pulse value (e.g. Nm^3/p) **Options:** Metric: 0 = Nm^3 1 = Nl 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 → SYSTEM UNITS → ADDITIONAL CONFIGURATION	
UNIT DENSITY **0420** MODBUS register: 2107 Data type: Integer Access: read/write	For selecting the unit for displaying the fluid density. The unit you select here is also valid for: ■ Current output ■ Frequency output ■ Relay switch points (limit value for density) ■ Density response value for EPD ■ Density adjustment value **Options:** 0 to 10 = metric → g/cm^3; g/cc; kg/dm^3; kg/l; kg/m^3; SD 4 °C, SD 15 °C, SD 20 °C; SG 4 °C, SG 15 °C, SG 20 °C 11 to 16 = US → lb/ft^3; lb/gal; lb/bbl (normal fluids); lb/bbl (beer); lb/bbl (petrochemicals); lb/bbl (filling tanks) 17 to 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** MODBUS register: 2108 Data type: Integer Access: read/write	For selecting the unit for displaying the reference density. The unit you select here is also valid for: ■ Current output ■ Frequency output ■ Relay switch points (limit value for density) ■ Fixed reference density (for calculation of corrected volume flow) **Options:** Metric: 1 = kg/Nl 2 = kg/Nm^3 US: 0 = g/Scc 3 = kg/Sm^3 4 = lb/Scf **Factory setting:** kg/Nl
UNIT TEMPERATURE **0422** MODBUS register: 2109 Data type: Integer Access: read/write	For selecting the unit for displaying the temperature. The unit you select here is also valid for: ■ Current output ■ Frequency output ■ Relay switch points (limit value for temperature) ■ Reference temperature (for corrected vol. measurement with measured reference density) **Options:** 0 = °C (Celsius) 1 = K (Kelvin) 2 = °F (Fahrenheit) 3 = °R (Rankine) **Factory setting:** °C

Function description MEASURED VARIABLES → SYSTEM UNITS → ADDITIONAL CONFIGURATION	
UNIT LENGTH **0424** MODBUS register: 2125 Data type: Integer Access: 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 119) **Options:** 0 = MILLIMETER 1 = INCH **Factory setting:** MILLIMETER
UNIT PRESSURE **0426** MODBUS register: 2130 Data type: Integer Access: 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 117) **Options:** 0 = bara 1 = barg 2 = psia 3 = psig **Factory setting:** barg

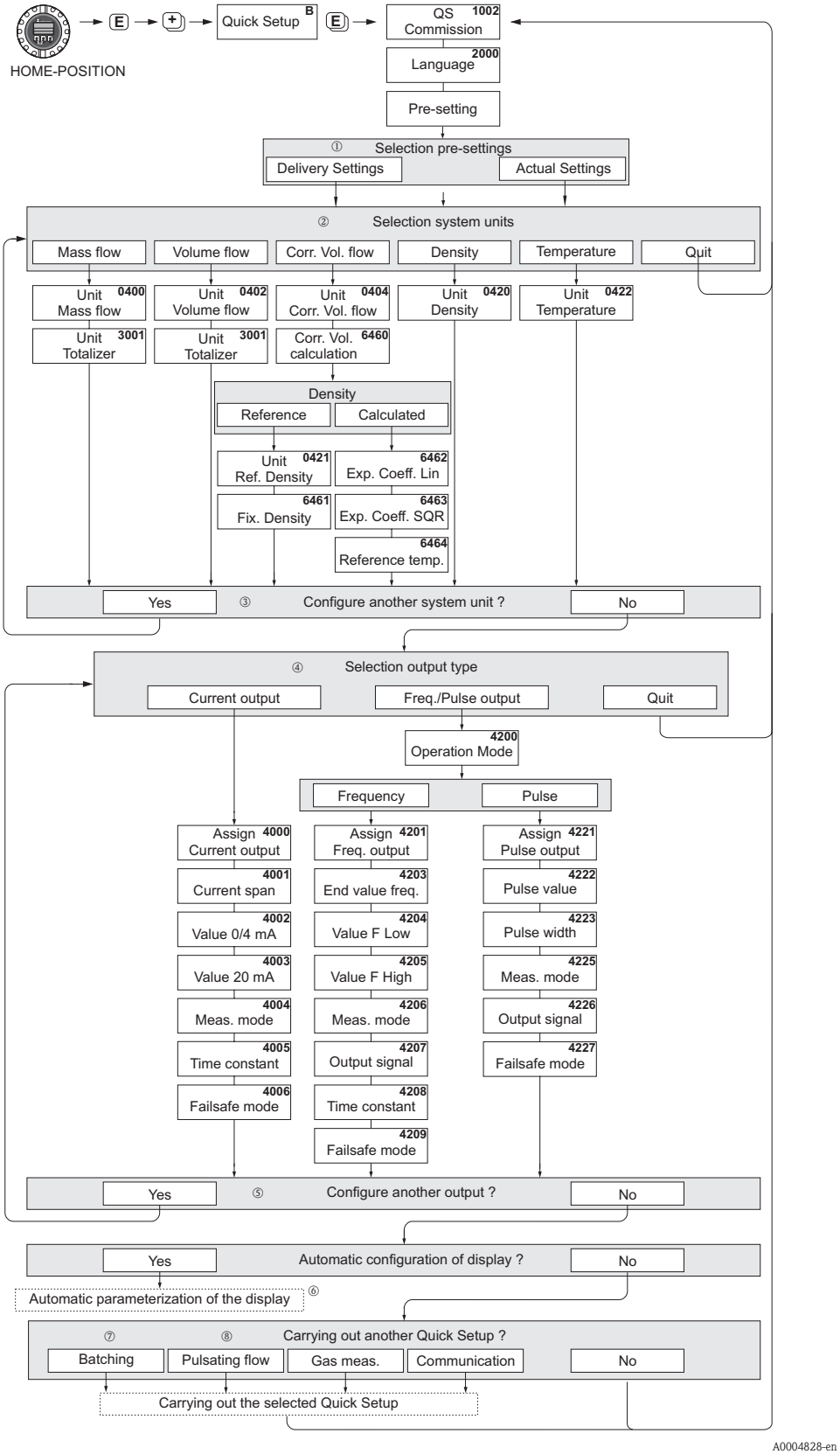
4 Block QUICK SETUP

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

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! ■ If the target device has an older software version, the message "TRANSM. SW-DAT" is displayed during startup. Then only the SAVE function is available. ■ LOAD This function is only possible if the target device has the same software version as, or a more recent software version than, the source device. ■ SAVE This function is always available.

4.1 "Commissioning" Quick Setup menu



Note!

- The display returns to the cell SETUP COMMISSION (1002) if you press the key combination during parameter interrogation. The stored parameters remain valid.
- The "Commissioning" Quick Setup must be carried out **before** one of the Quick Setups explained below is run.

① The DELIVERY SETTINGS option sets every selected unit to the factory setting.
The ACTUAL SETTING accepts the units you configured beforehand.

② Only units not yet configured in the current Setup are offered for selection in each cycle. The unit for mass, volume and corrected volume is derived from the corresponding flow unit.

③ The "YES" option remains visible until all the units have been configured.
"NO" is the only option displayed when no further units are available.

④ The prompt only appears if a current output and/or a pulse/frequency output is available. Only the outputs not yet configured in the current Setup are offered for selection in each cycle.

⑤ The "YES" option remains visible until all the outputs have been parameterized. "NO" is the only option displayed when no further outputs are available.

⑥ The "automatic parameterization of the display" option contains the following basic settings/factory settings:

YES: Main line = Mass flow; Additional line = Totalizer 1; Information line = Operating/system conditions
NO: The existing (selected) settings remain.

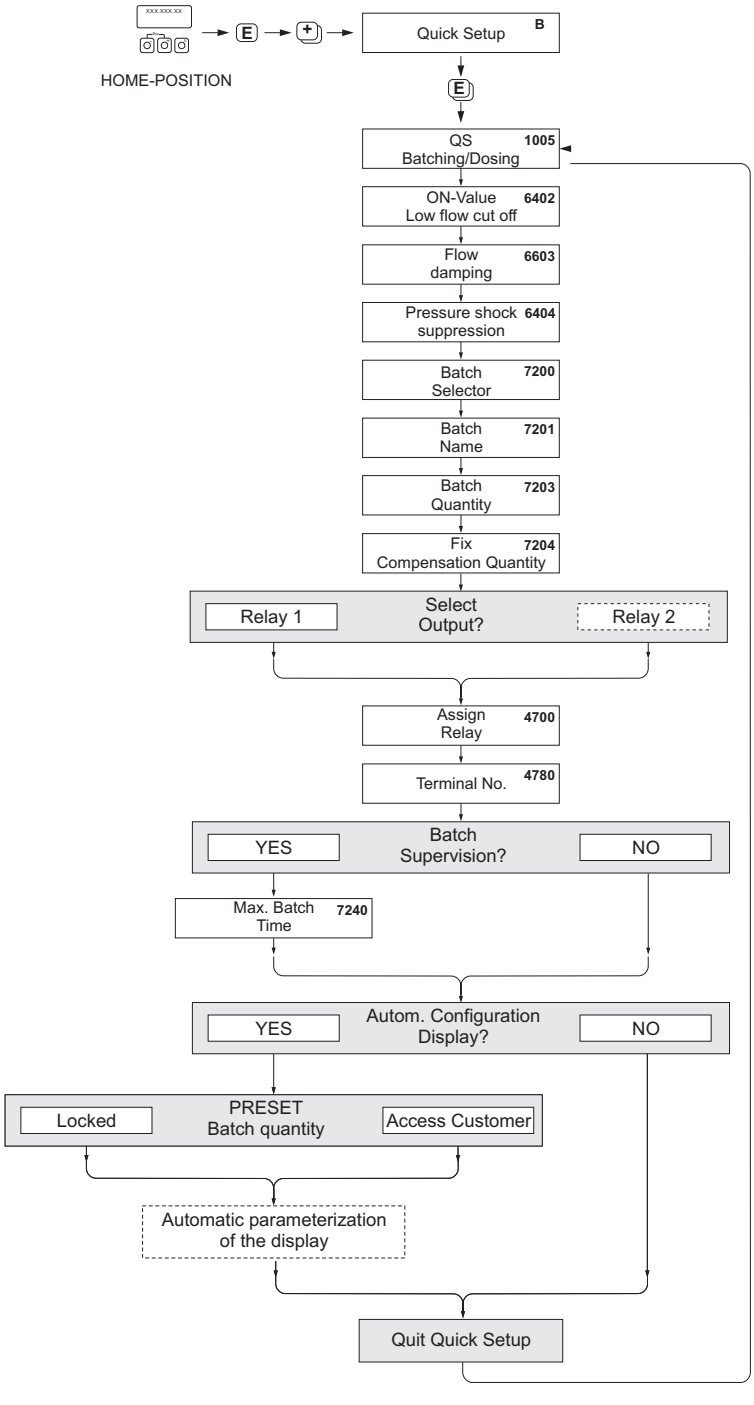
⑦ The BATCHING QUICK SETUP is only available when the optional software package BATCHING is installed.

⑧ The PULSATING FLOW QUICK SETUP is only available if the measuring device has a current output or pulse/frequency output.

4.2 “Batching” Quick Setup menu

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

This Quick Setup guides the user systematically through all the device functions that have to be adjusted and configured for batching operation. These basic settings allow simple (one step) batching processes.
Additional settings, e.g. for multi-stage batching processes, have to be made via the function matrix itself.



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Caution!
The “Batching” Quick Setup sets certain device parameters for discontinuous measurement operation. If the measuring device is used for continuous flow measurement at a later time, we recommend at you rerun the “Commissioning” and/or “Pulsating Flow” Quick Setup.

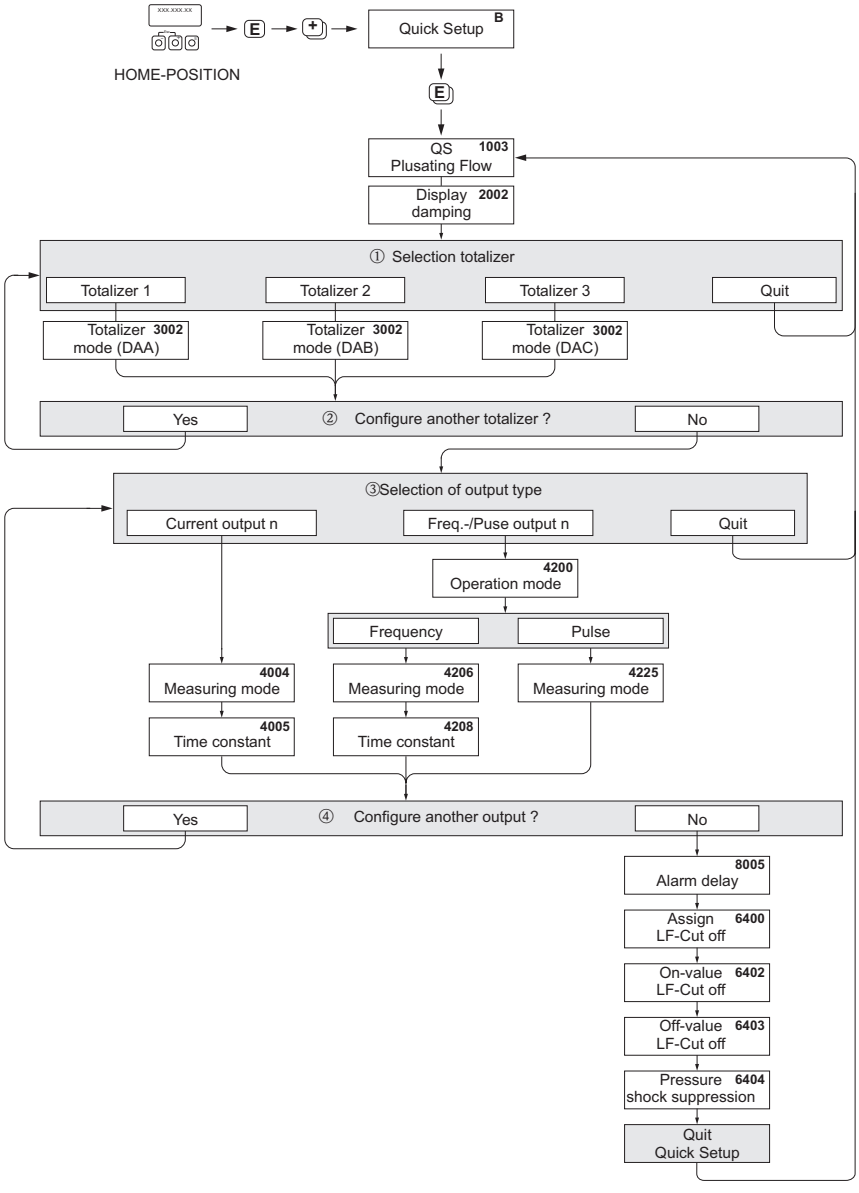
Note!
- The display returns to the function QUICK SETUP BATCHING/DOSING (1005) if you press the ESC key combination during parameter interrogation.
- At the start of the Setup, general device parameters are optimally configured for measuring signal processing and output response.
- Then you can enter the specific batching parameters, starting with the options list “Batching 1 to 6”. In this way, by running through the Setup menu a number of times, up to six different batching parameter sets (incl. special naming) can be created and called up as necessary.
- In order to enjoy full functionality, it is advisable to let the display parameters be set automatically. This means that the lowest display line is parameterized 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.

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 P. 20
1005	QUICK SETUP BATCHING/DOSING	YES	see P. 20
Settings (functions with a gray background are set automatically):			
6400	ASSIGN LOW FLOW CUT OFF	Mass	see P. 109
6402	ON-VALUE LOW FLOW CUTOFF	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 50* = 180 [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, 50 “FB” = Full bore versions of Promass I	see P. 109
6403	OFF-VALUE LOW FLOW CUT OFF	50%	see P. 109
6603	FLOW DAMPING	0 seconds	see P. 118
6404	PRESSURE SHOCK SUPPRESSION	0 seconds	see P. 110
7200	BATCH SELECTOR	BATCH #1	see P. 131
7201	BATCH NAME	BATCH #1	see P. 132
7202	ASSIGN BATCH VARIABLE	Mass flow	see P. 131
7203	BATCH QUANTITY	0	see P. 132
7204	FIX COMPENSATION QUANTITY	0	see P. 133
7205	COMPENSATION MODE	OFF	see P. 133
7208	BATCH STAGES	1	see P. 136
7209	INPUT FORMAT	Value input	see P. 137
4700	ASSIGN RELAY	BATCHING VALVE 1	see P. 93
4780	TERMINAL NUMBER	Output (display only)	see P. 98
7220	OPEN VALVE 1	0% or 0 [unit]	see P. 138
7240	MAXIMUM BATCHING TIME	0 seconds (Off)	see P. 143
7241	MINIMUM BATCHING QUANTITY	0 seconds	see P. 143
7242	MAXIMUM BATCHING QUANTITY	0 seconds	see P. 144
2200	ASSIGN (Main line)	BATCH NAME	see P. 37
2220	ASSIGN (Multiplex main line)	Off	see P. 39
2400	ASSIGN (Additional line)	BATCH DOWNWARDS	see P. 41
2420	ASSIGN (Multiplex additional line)	Off	see P. 44
2600	ASSIGN (Info line)	BATCHING KEYS	see P. 47
2620	ASSIGN (Multiplex info line)	Off	see P. 50

4.3 "Pulsating flow" Quick Setup menu

Note!
The Quick Setup "Pulsating flow" is only available if the device has a current output or a pulse/frequency output. Certain types of pump such as reciprocating, peristaltic and cam-type pumps, for example, create a flow characterized by severe periodic fluctuations. Negative flows can occur with pumps of these types on account of the closing volume of the valves or valve leaks.

Note!
Before carrying out the Quick Setup "Pulsating Flow" the Quick Setup "Commissioning" (see Page 22) has to be executed.



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 pulse/frequency output is available. Only the outputs not yet configured in the current Quick Setup are offered for selection in each cycle.

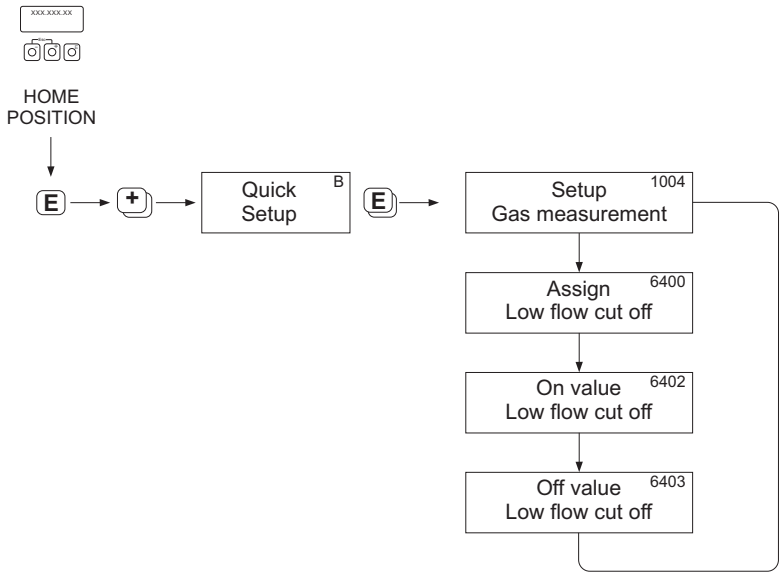
④ The "YES" option remains visible until all the outputs have been parameterized. "NO" is the only option displayed when no further outputs are available.

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

Settings for the Pulsating Flow Setup menu:

Fct. code	Function name	Suggested settings	Description
Call up through the function matrix:			
B	QUICK SETUP	QUICK SETUP PULSATING FLOW	see P. 20
1003	QUICK SETUP PULSATING	YES	see P. 20
Basic configuration:			
2002	DISPLAY DAMPING	1 second	see P. 34
3002	TOTALIZER MODE (DAA)	BALANCE	see P. 55
3002	TOTALIZER MODE (DAB)	BALANCE	see P. 55
3002	TOTALIZER MODE (DAC)	BALANCE	see P. 55
Select the signal type: CURRENT OUTPUT 1			
4004	MEASURING MODE	PULSATING FLOW	see P. 62
4005	TIME CONSTANT	1 second	see P. 65
Select the signal type: FREQ./PULSE OUTPUT 1 / operating mode: FREQUENCY			
4206	MEASURING MODE	PULSATING FLOW	see P. 66
4208	TIME CONSTANT	0 seconds	see P. 78
Select the signal type: FREQ./PULSE OUTPUT 1 / operating mode: PULSE			
4225	MEASURING MODE	PULSATING FLOW	see P. 80
Other settings:			
8005	ALARM DELAY	0 seconds	see P. 168
6400	ASSIGN LF CUT OFF	MASS FLOW	see P. 109
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 50* = 180 [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, 50 "FB" = Full bore versions of Promass I	see P. 109
6403	OFF-VALUE LOW FLOW CUT OFF	50%	see P. 109
6404	PRESSURE SHOCK SUPPRESSION	0 s	see P. 110

4.4 "Gas measurement" Quick Setup menu



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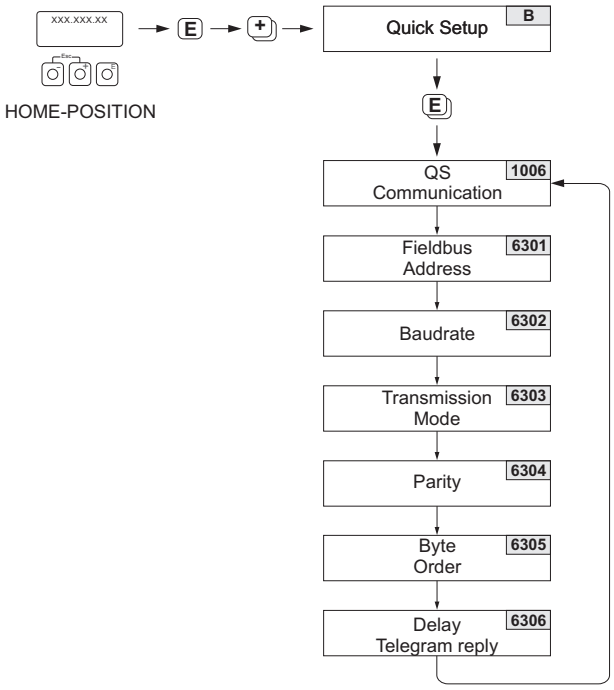
Settings for the Gas Measurement Setup menu:

Fct. code	Function name	Suggested settings	Description
Call up through the function matrix:			
B	QUICK SETUP	QUICK SETUP GAS MEASUR.	see P. 20
1004	QUICK SETUP GAS MEASUR.	YES	see P. 20
Basic configuration:			
6420	EMPTY PIPE DETECTION	No entry possible, the selection changes automatically to OFF.	see P. 111
6400	ASSIGN LOW FLOW CUT OFF	For gas measurement we recommend to switch off the low flow cut off. OFF	see P. 109
6402	ON-VALUE LOW FLOW CUT OFF	If you don't switch off the low flow cut off: 0.0000	see P. 109
6403	OFF-VALUE LOW FLOW CUT OFF	If you don't switch off the low flow cut off: 50%	see P. 109

4.5 "Communication" Quick Setup menu

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



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Settings for the Communication Setup menu:

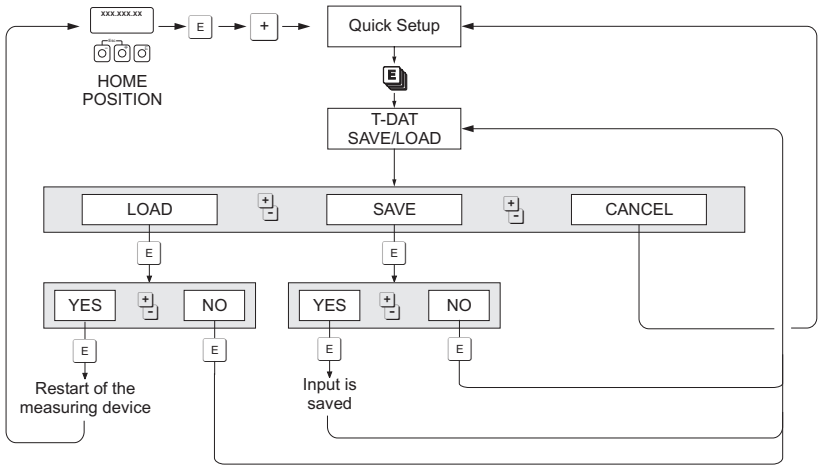
Fct. code	Function name	Suggested settings	Description
Call up through the function matrix:			
B	QUICK SETUP	QUICK SETUP COMMUNICATION	see P. 20
1006	QUICK SETUP COMMUNICATION	YES	see P. 20
Basic configuration:		**Factory setting:**	
6301	FIELDBUS ADDRESS	247	see P. 107
6302	BAUDRATE	19200 BAUD	see P. 107
6303	TRANSMISSION MODE	RTU	see P. 107
6304	PARITY	EVEN	see P. 107
6305	BYTE ORDER	1 - 0 - 3- 2	see P. 108
6306	DELAY TELEGRAM REPLY	10 ms	see P. 108

4.6 Data back-up/transfer

You can use the T-DAT SAVE/LOAD function to transfer data (device parameters and settings) between the T-DAT (removable memory) and the EEPROM (device memory).

This is required for the following applications:
- Creating a backup: current data are transmitted from an EEPROM to the T-DAT.
- Replacing a transmitter: current data are copied from an EEPROM to the T-DAT, then transmitted to the EEPROM of the new transmitter.
- Duplicating data: current data are copied from an EEPROM to the T-DAT, then transmitted to EEPROMs of identical measuring points.

Note!
Installing and removing the T-DAT → Operating Instructions of the Promass 83 (BA107D)



Data storage/transmission with T-DAT SAVE/LOAD

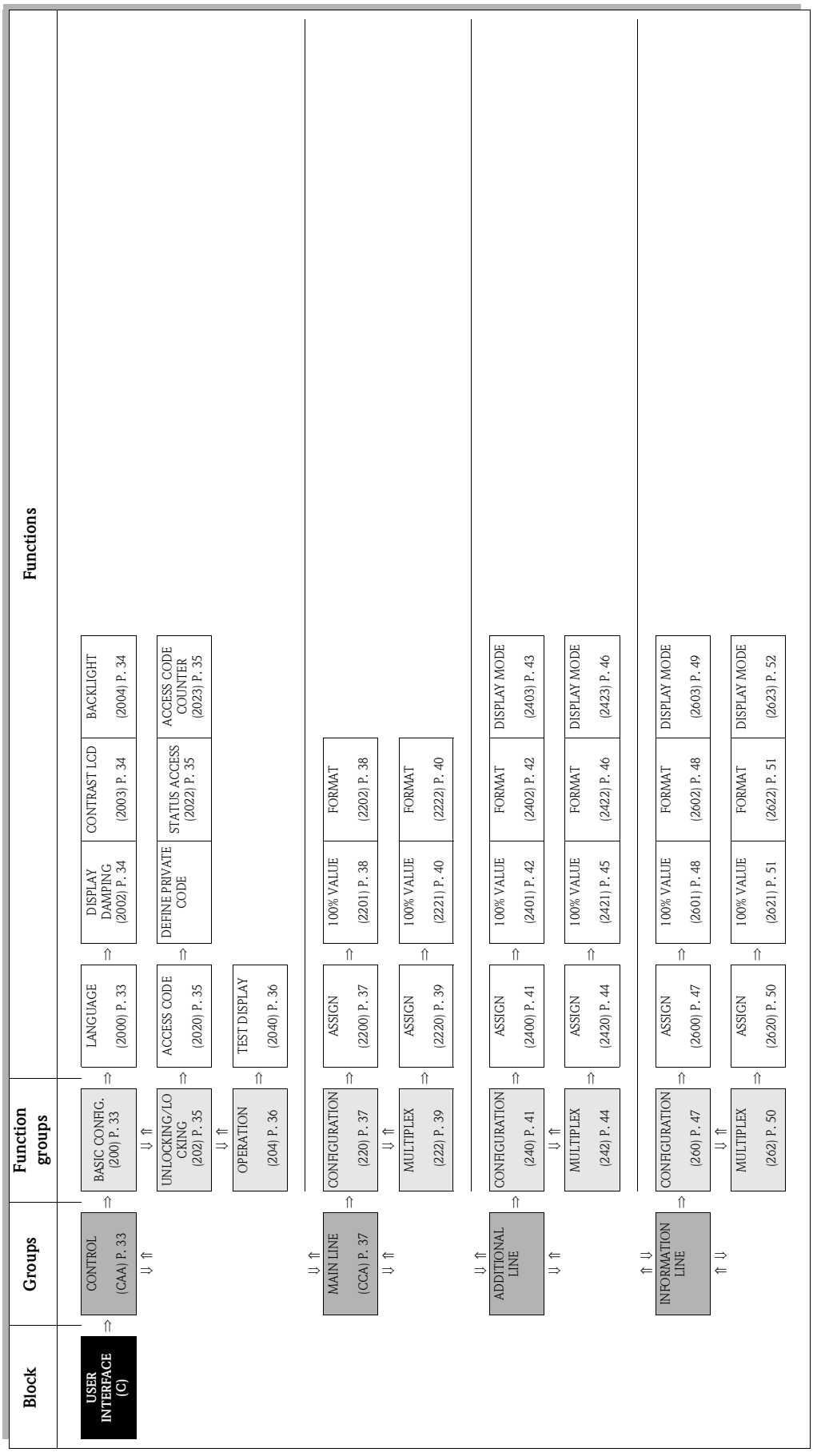
Notes on the LOAD and SAVE options:

LOAD:
Data are transmitted from the T-DAT to the EEPROM.

Note!
- Previously saved settings on the EEPROM are deleted.
- This selection is available only if the T-DAT contains valid data.
- This selection can be made only if the software version of the T-DAT is the same or newer than that of the EEPROM. Otherwise, the error message "TRANSM. SW-DAT" appears after the restart and the LOAD function is subsequently no longer available.

SAVE:
Data are transmitted from the EEPROM to the T-DAT.

5 Block USER INTERFACE



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** MODBUS register: 2502 Data type: Integer Access: read/write	For selecting the language for all texts, parameters and messages shown on the local display. ✎ 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 173). **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 179) ✎ Note! ■ If you press the ⊞/⊟ keys simultaneously at startup, the language defaults to "ENGLISH". ■ You can change the language group via the configuration software FieldCare. Please do not hesitate to contact your Endress+Hauser sales office if you have any questions.

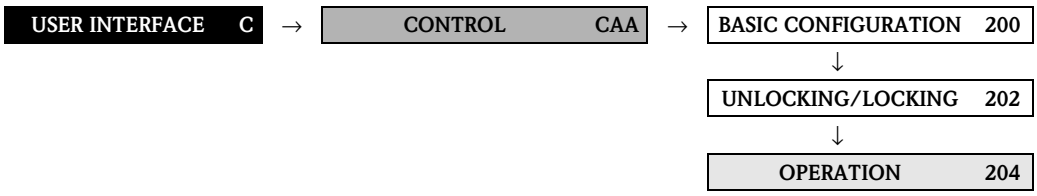
Function description USER INTERFACE → CONTROL → BASIC CONFIGURATION	
DISPLAY DAMPING **2002** MODBUS register: 2503 Data type: Float Access: read/write	For entering a time constant which defines how the display reacts to severely fluctuating flow variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). **User input:** 0 to 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 to 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 to 100% ✎ Note! Entering the value “0” means that the backlight is “switched off”. The display then no longer emits any light, i.e. the display texts can no longer be read in the dark. **Factory setting:** 50%

5.1.2 Function group UNLOCKING/LOCKING

USER INTERFACE C → CONTROL CAA → BASIC CONFIGURATION 200
↓
UNLOCKING/LOCKING 202

Function description USER INTERFACE → CONTROL → UNLOCKING/LOCKING	
ACCESS CODE **2020** MODBUS register: 2508 Data type: Float Access: read/write	✎ Note! This function is only relevant for local operation and has no effect on access via MODBUS RS485 communication. All data of the measuring system are protected against inadvertent change. Programming is disabled and the settings cannot be changed until a code is entered in this function. If you press the ⊞ / ⊟ keys in any function, the measuring system automatically goes to this function and the prompt to enter the code appears on the display (when programming is disabled). You can enable programming by entering your personal code (**Factory setting = 83,** see function DEFINE PRIVATE CODE (2021)). **User input:** max. 4-digit number: 0 to 9999 ✎ Note! ■ Programming is disabled if you do not press a key within 60 seconds following automatic return to the HOME position. ■ You can also disable programming in this function by entering any number (other than the defined private code). ■ The Endress+Hauser service organization can be of assistance if you mislay your personal code.
DEFINE PRIVATE CODE **2021** MODBUS register: 2510 Data type: Float Access: read/write	✎ Note! This function is only relevant for local operation and has no effect on access via MODBUS RS485 communication. For specifying a personal code for enabling programming in the function ACCESS CODE. **User input:** 0 to 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 to 9999999 **Factory setting:** 0

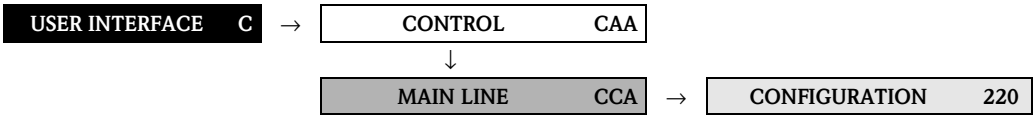
5.1.3 Function group OPERATION



Function description USER INTERFACE → CONTROL → OPERATION		
TEST DISPLAY	**2040**	For testing the operability of the local display and its pixels.
MODBUS register: Data type: Access:	2513 Integer 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 seconds. 3. Main line, additional line and information line show an “8” in each field for minimum 0.75 seconds. 4. Main line, additional line and information line show a “0” in each field for minimum 0.75 seconds. 5. Main line, additional line and information line show nothing (blank display) for minimum 0.75 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

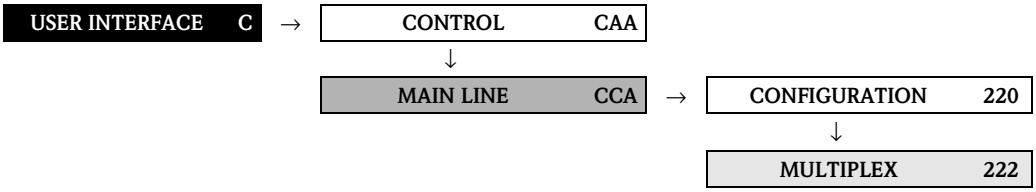
5.2.1 Function group CONFIGURATION



Function description USER INTERFACE → CONTROL → CONFIGURATION	
ASSIGN **2200** MODBUS register: 2514 Data type: Integer Access: read/write	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 96 = OPERATING FREQUENCY FLUCTUATION DEVIATION 97 = TUBE DAMPING FLUCTUATION 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 Nl/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

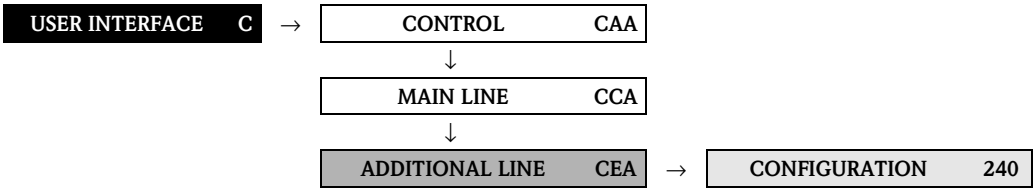


Function description USER INTERFACE → CONTROL → MULTIPLEX	
ASSIGN **2220** MODBUS register: 2522 Data type: Integer Access: read/write	For assigning a second reading to be displayed in the main line alternately (every 10 seconds) with the value defined in the ASSIGN function (2200). **Options:** (standard) 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)

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 96 = OPERATING FREQUENCY FLUCTUATION DEVIATION 97 = TUBE DAMPING FLUCTUATION 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 Nl/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

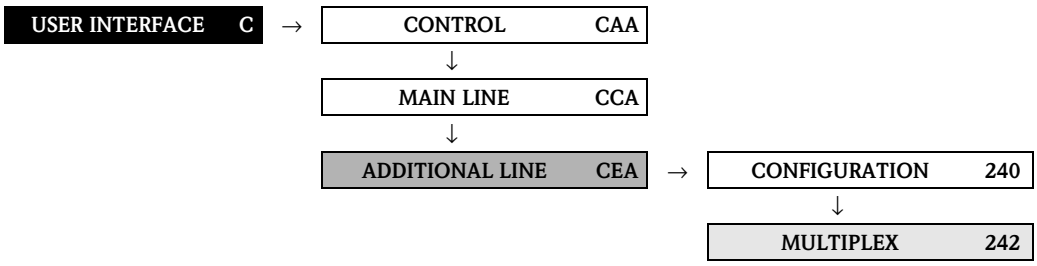


Function description USER INTERFACE → ADDITIONAL LINE → CONFIGURATION	
ASSIGN **2400** MODBUS register: 2527 Data type: Integer Access: read/write	For assigning a value to be displayed to the additional line (middle line in the local display). This value is displayed during normal operation. **Options:** 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 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. (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 96 = OPERATING FREQUENCY FLUCTUATION DEVIATION 97 = TUBE DAMPING FLUCTUATION 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 Nl/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 MODE **2403** 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**  A0001258 *Fig. 5 : Bar graph for STANDARD option Simple bar graph with 25 / 50 / 75% gradations and integrated sign.*  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



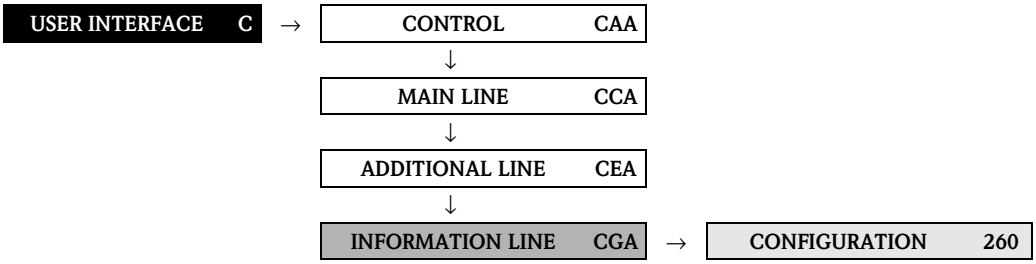
Function description USER INTERFACE → ADDITIONAL LINE → MULTIPLEX	
ASSIGN **2420** MODBUS register: 2532 Data type: Integer Access: read/write	For assigning a second reading to be displayed in the main line alternately (every 10 seconds) with the value defined in the ASSIGN function (2400). **Options:** 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 **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 96 = OPERATING FREQUENCY FLUCTUATION DEVIATION 97 = TUBE DAMPING FLUCTUATION 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 Nl/s

Function description USER INTERFACE → ADDITIONAL LINE → MULTIPLEX	
FORMAT **2422** MODBUS register: 2533 Data type: Integer Access: 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 **2423** MODBUS register: 2536 Data type: Integer Access: 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 *Fig. 7 : Bar graph for STANDARD option Simple bar graph with 25 / 50 / 75% gradations and integrated sign.*  A0001259 *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.*

5.4 Group INFORMATION LINE

5.4.1 Function group CONFIGURATION

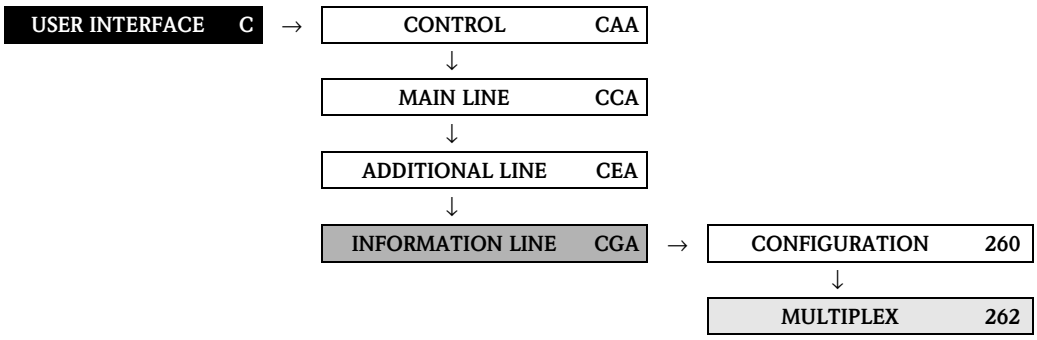


Function description USER INTERFACE → INFORMATION LINE → CONFIGURATION	
ASSIGN **2600** MODBUS register: 2537 Data type: Integer Access: read/write	For assigning a value to be displayed to the information line (bottom line in the local display). This value is displayed during normal operation. **Options:** 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 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:** 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 96 = OPERATING FREQUENCY FLUCTUATION DEVIATION 97 = TUBE DAMPING FLUCTUATION 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 Nl/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.

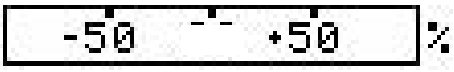
Function description USER INTERFACE → INFORMATION LINE → CONFIGURATION	
DISPLAY MODE **2603** MODBUS register: 2541 Data type: Integer Access: read/write	✎ Note! Function is not available unless one of the following was selected in the ASSIGN function (2600): ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH 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**  A0001258 *Fig. 9 : Bar graph for STANDARD option* *Simple bar graph with 25 / 50 / 75% gradations and integrated sign.*  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

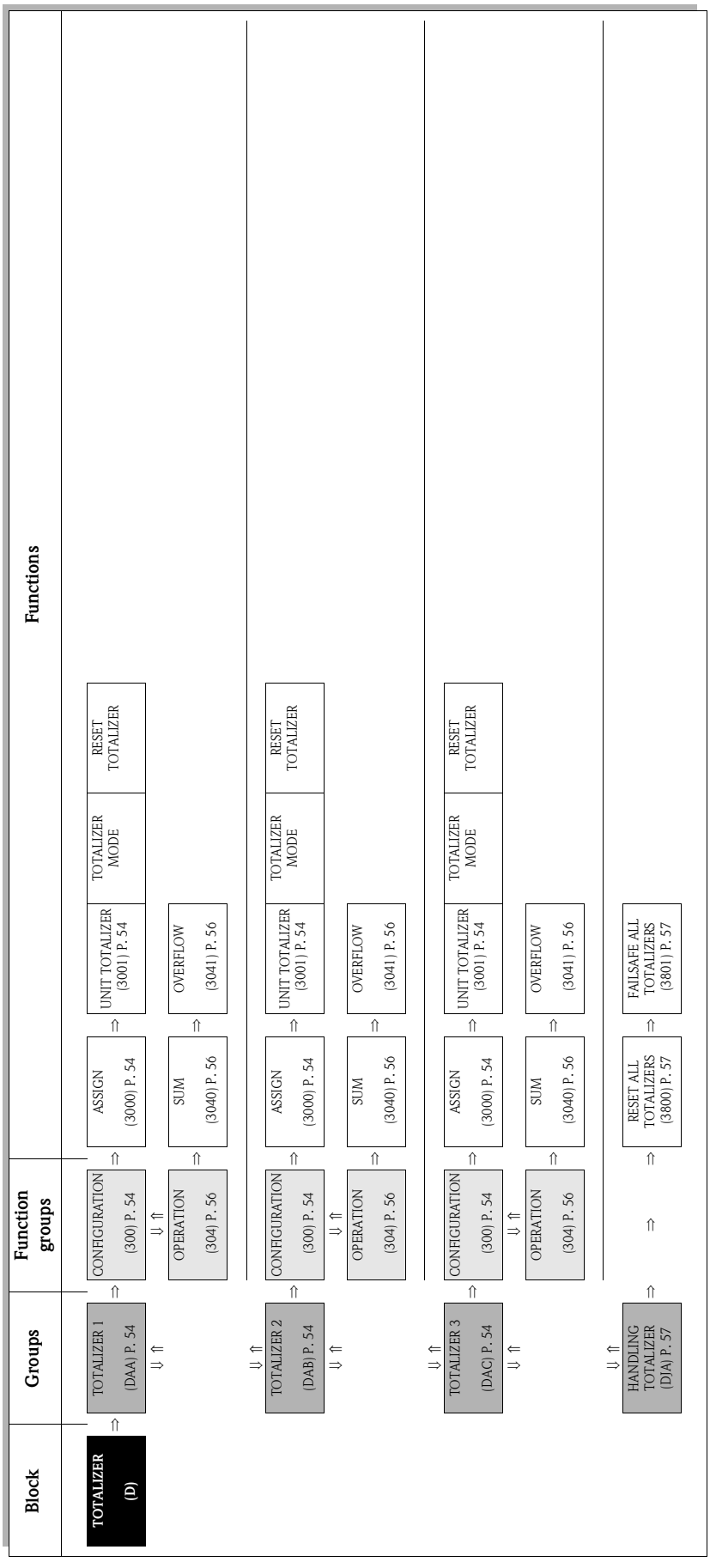


Function description USER INTERFACE → INFORMATION LINE → MULTIPLEX	
✎ Note! If you select the BATCHING OPERATING KEYS in the function ASSIGN (2600), the multiplex display functionality is not available in the information line.	
ASSIGN **2620** MODBUS register: 2542 Data type: Integer Access: read/write	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). **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)

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 96 = OPERATING FREQUENCY FLUCTUATION DEVIATION 97 = TUBE DAMPING FLUCTUATION 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 Nl/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.

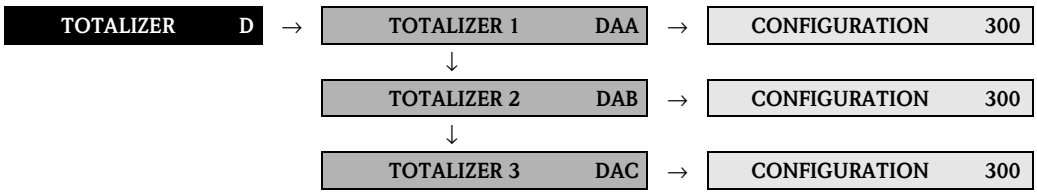
Function description USER INTERFACE → INFORMATION LINE → MULTIPLEX	
DISPLAY MODE **2623** MODBUS register: 2546 Data type: Integer Access: read/write	✎ Note! Function is not available unless one of the following was selected in the ASSIGN function (2620): ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH 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**  A0001258 *Fig. 11 : Bar graph for STANDARD option* *Simple bar graph with 25 / 50 / 75% gradations and integrated sign.*  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 to 3)

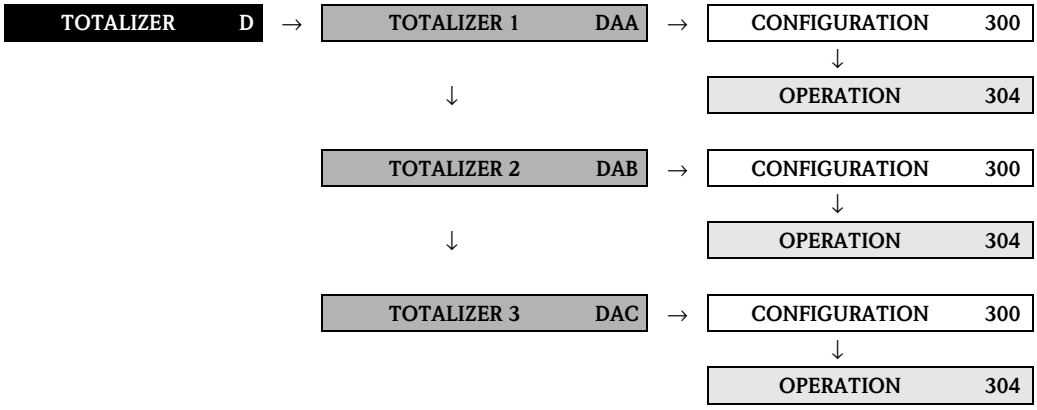
6.1.1 Function group CONFIGURATION



Function description TOTALIZER → TOTALIZER (1 to 3) → CONFIGURATION	
✎ Note! The function descriptions below apply to totalizers 1 to 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 1 = MASS FLOW 2 = VOLUME FLOW 3 = CORRECTED VOLUME FLOW **Factory setting:** MASS 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 ✎ 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 – Volume flow 2602 – Corr. vol. flow 2603 ■ Totalizer 2 2604 – Mass flow – Volume flow 2802 – Corr. vol. flow 2803 ■ Totalizer 3 2804 – Mass flow – Volume flow 3002 – Corr. vol. flow 3003 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 to 2 = metric → g; kg; t 3 to 4 = US → oz; lb; ton **Factory setting:** kg **Options:** for the VOLUME FLOW assignment 0 to 6 = metric → cm^3; dm^3; m^3; ml; l; hl; Ml Mega 7 to 16 = US → cc; af; ft^3; oz f; gal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals); bbl (filling tanks) 22 = Kgal 17 to 20 = Imperial → gal; Mgal; bbl (beer); bbl (petrochemicals) **Factory setting:** m^3 **Options:** for the CORRECTED VOLUME FLOW assignment 0 to 1 = metric → Nl; Nm^3 2 to 3 = US → Sm^3; Scf **Factory setting:** Nm^3

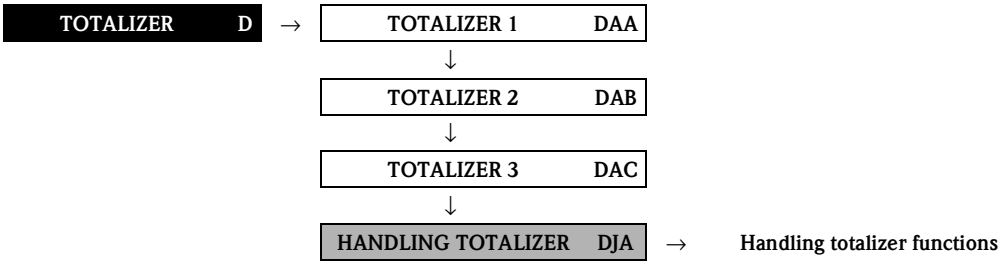
Function description TOTALIZER → TOTALIZER (1 to 3) → CONFIGURATION		
TOTALIZER MODE	**3002**	For selecting how the totalizer should operate. **Options:** 0 = BALANCE Positive and negative flow components. The positive and negative flow components are balanced. In other words, net flow in the flow direction is registered. 1 = FORWARD Only positive flow components 2 = REVERSE Only negative flow components **Factory setting:** Totalizer 1 = BALANCE Totalizer 2 = FORWARD Totalizer 3 = REVERSE
MODBUS register: Totalizer 1 Totalizer 2 Totalizer 3 Data type: Access:	 2605 2805 3005 Integer read/write	
RESET TOTALIZER	**3003**	Resets the total and the overflow of the totalizer to zero. **Options:** 0 = NO 1 = YES **Factory setting:** NO ✎ Note! If the device is equipped with a status input, with the appropriate configuration a reset for each individual totalizer can also be triggered by a pulse (see the function ASSIGN STATUS INPUT (5000) on Page 103).
MODBUS register: Totalizer 1 Totalizer 2 Totalizer 3 Data type: Access:	 2608 2808 3008 Integer read/write	

6.1.2 Function group OPERATION



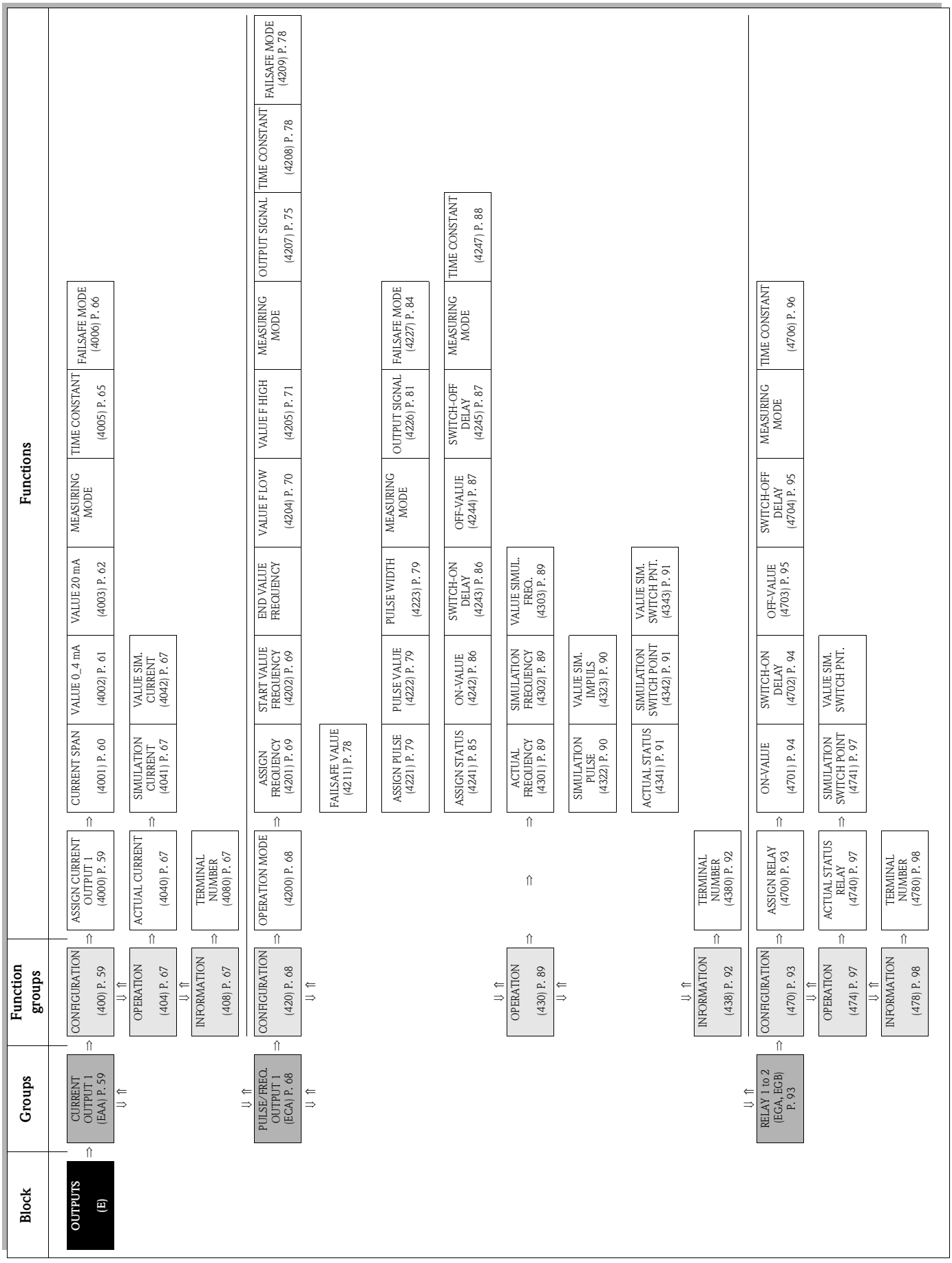
Function description TOTALIZER → TOTALIZER (1 to 3) → OPERATION	
✎ Note! The function descriptions below apply to totalizers 1 to 3; the totalizers are independently configurable.	
SUM **3040** MODBUS register: Totalizer 1 2610 259 261 Totalizer 2 2810 Totalizer 3 3010 Data type: Float Access: read	Displays 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 m^3; –4925.631 kg) ✎ Note! ■ The effect of the setting in the "TOTALIZER MODE" function (see Page 55) 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 57).
OVERFLOW **3041** MODBUS register: Totalizer 1 2612 Totalizer 2 2812 Totalizer 3 3012 Data type: Float Access: read	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 E7 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. 2E7 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 to 3) can also be triggered by a pulse (see the ASSIGN STATUS INPUT function (5000) on Page 103).
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 to 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 OUTPUTS



7.1 Group CURRENT OUTPUT

7.1.1 Function group CONFIGURATION

OUTPUTS E → **CURRENT OUTPUT 1 EAA** → **CONFIGURATION 400**

Function description OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION	
ASSIGN CURRENT OUTPUT 1 **4000** MODBUS register: 5801 Data type: Integer Access: read/write	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 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 86 = OPERATING FREQUENCY FLUCTUATION DEVIATION 87 = TUBE DAMPING FLUCTUATION 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 1 (4000).

Function description
OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION

CURRENT SPAN **4001**

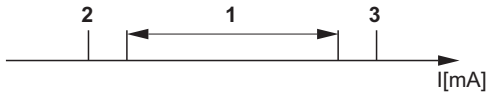
MODBUS register: 5802
Data type: Integer
Access: read/write

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).



a	1	2	3
0-20 mA (25 mA)	0 - 24 mA	0	25
4-20 mA (25 mA)	4 - 24 mA	2	25
0-20 mA	0 - 20.5 mA	0	22
4-20 mA	4 - 20.5 mA	2	22
4-20 mA NAMUR	3.8 - 20.5 mA	3.5	22.6
4-20 mA US	3.9 - 20.8 mA	3.75	22.6

A0002959

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 to 354, current span).
- In case of a fault the behavior of the current output is according to the selected option in the function FAILSAFE MODE (4006).

Function description
OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION

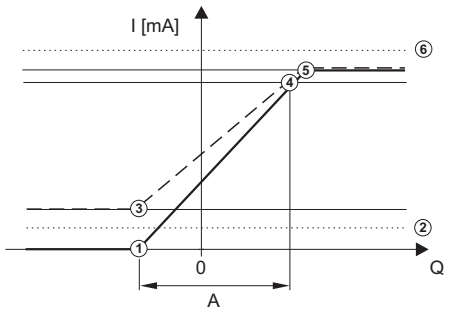
VALUE 0_4 mA **4002**

MODBUS register: 5803
Data type: Float
Access: read/write

Use this function to assign the 0/4 mA current a value.
The value can be higher or lower than the value assigned to 20 (function VALUE 20 mA (4003), see Page 62). 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!
Note that values with different signs cannot be entered for 0/4 mA and 20 mA (function 4003) if SYMMETRY is the setting selected for the MEASURING MODE function (4004). In this case the message "INPUT RANGE EXCEEDED" appears on the display.



A0001223

Fig. 14 : Example for the STANDARD measuring mode

1 Initial value (0 to 20 mA)
2 Lower signal on alarm level: depends on the setting in the function CURRENT SPAN
3 Initial value (4 to 20 mA): depends on the setting in the function CURRENT SPAN
4 Full scale value (0/4 to 20 mA): depends on the setting in the function CURRENT SPAN
5 Maximum current value: depends on the setting in the function CURRENT SPAN
6 Failsafe mode (upper signal on alarm level): depends on the setting in the functions CURRENT SPAN and FAILSAFE MODE
A Measuring range

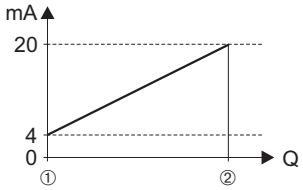
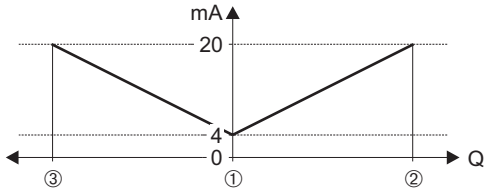
User input: 5-digit floating-point number, with sign

Factory setting: 0 [kg/h] or 0.5 [kg/l] or –50 [°C]

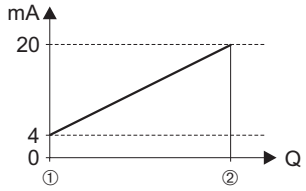
✎ Note!
- The appropriate unit is taken from the following functions:
  – UNIT MASS FLOW (0400)
  – UNIT VOLUME FLOW (0402)
  – UNIT CORRECTED VOLUME FLOW (0404)
  – UNIT DENSITY (0420)
  – UNIT REFERENCE DENSITY (0421)
  – UNIT TEMPERATURE (0422)
  (see Page 15 till Page 18).

☞ Caution!
The current output responds differently, depending on the parameters set in the various functions. Some examples of parameter settings and their effect on the current output are given in the following section.

Function description OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION	
VALUE 20 mA **4003** MODBUS register: 5805 Data type: Float Access: 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 61). 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 for the MEASURING MODE function (4004). In this case the message "INPUT RANGE EXCEEDED" appears on the display. **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). ■ 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 63. ☝ 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 61.
MEASURING MODE **4004** MODBUS register: 5807 Data type: Integer Access: 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)

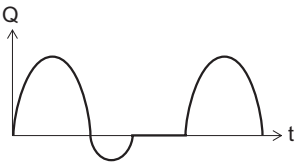
Function description OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION		
MEASURING MODE (continued)	**4004**	**Description of the individual options:** STANDARD The current output signal is proportional to the measured variable. The flow components outside the scaled measuring range (defined by the 0_4 mA VALUE 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 m^3/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 m^3/h, VALUE 20 mA = 10m^3/h), the message "CURRENT OUTPUT AT FULL SCALE VALUE" appears if the measuring range is exceeded or not achieved and the current output responds in accordance with the parameter settings in the function FAILSAFE MODE (4006).  A0001248 *Fig. 15 : Example for STANDARD measuring mode* SYMMETRY The current output signal is independent of the direction of flow (absolute amount of the measured variable). The 0_4 mA VALUE ① and the 20 mA VALUE ② must have the same sign (+ or -). The "20 mA value" ③ (e.g. backflow) corresponds to the mirrored 20 mA value ② (e.g. flow).  A0001249 *Fig. 16 : Example for 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 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.

Function description OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION	
Detailed explanations and information	**How the current output responds at a defined measuring range ①-② (see Fig. 17) and flow behavior (see Fig. 18):**



A0001248

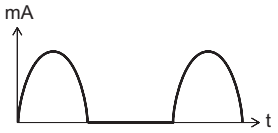
Fig. 17 : Defined measuring range: ① and ② with the same sign



A0001265

Fig. 18 : Flow behavior

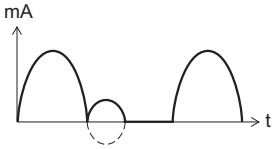
For STANDARD measuring mode
The current output signal is proportional to the measured variable.
The flow components outside the scaled measuring range are not taken into account for signal output.



A0001267

Fig. 19 : Behavior of current output for STANDARD measuring mode

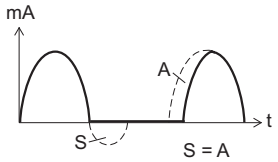
For SYMMETRY measuring mode
The current output signal is independent of the direction of flow.



A0001268

Fig. 20 : Behavior of current output for SYMMETRY measuring mode

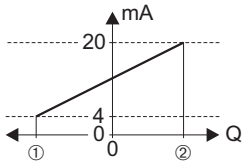
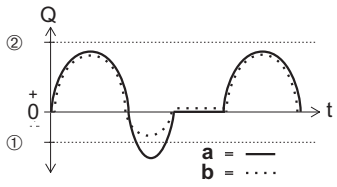
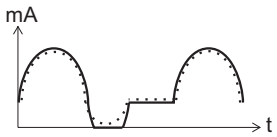
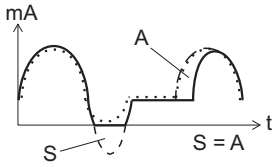
For PULSATING FLOW measuring mode
Flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 seconds.



A0001269

Fig. 21 : Behavior of current output for PULSATING FLOW measuring mode

(continued on next page)

Function description OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION	
Detailed explanations and information (continued)	**How the current output responds at a defined measuring range ①-② (see Fig. 22) and flow behavior (see Fig. 23):**  A0001272 *Fig. 22 : Defined measuring range: ① and ② do not have the same sign*  A0001273 *Fig. 23 : Flow a (—) outside, b (- - -) within the measuring range* **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 to 354, current range) and the current output responds in accordance with the parameter settings in the function FAILSAFE MODE (4006). b (- - -): The current output signal is proportional to the measured variable assigned.  A0001274 *Fig. 24 : Behavior of current output for STANDARD measuring mode* **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.  A0001275 *Fig. 25 : Behavior of current output for PULSATING FLOW measuring mode*
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 to 100.00 s **Factory setting:** 1.00 s

Function description OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION	
FAILSAFE MODE **4006** MODBUS register: 5810 Data type: Integer Access: read/write	For safety reasons it is advisable to ensure that the current output assumes a predefined state in the event of a fault. The setting you select here affects only the current output. It has no effect on other outputs and the display (e.g. totalizers). **Options:** 0 = MIN. CURRENT The current output adopts the value of the lower signal on alarm level (as defined in the function CURRENT SPAN (4001), see Page 60). 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 60). 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

7.1.2 Function group OPERATION

OUTPUTS E → CURRENT OUTPUT 1 EAA → CONFIGURATION 400
↓
OPERATION 404

Function description OUTPUTS → CURRENT OUTPUT 1 → OPERATION	
ACTUAL CURRENT **4040** MODBUS register: 5811 Data type: Float Access: read	Use this function to view the computed actual value of the output current. **Display:** 0.00 to 25.00 mA
SIMULATION CURRENT **4041** MODBUS register: 5813 Data type: Integer Access: read/write	Activates simulation of the current output. **Options:** 0 = OFF 1 = ON **Factory setting:** OFF ✎ 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** MODBUS register: 5814 Data type: Float Access: read/write	✎ 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 to 25.00 mA **Factory setting:** 0.00 mA ☝ Caution! The setting is not saved in the event of a power failure.

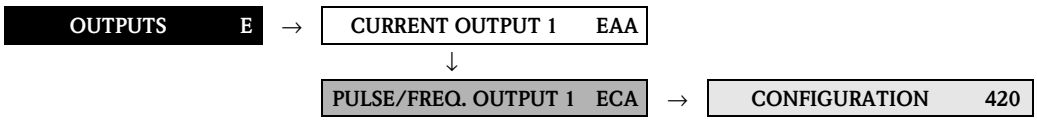
7.1.3 Function group INFORMATION

OUTPUTS E → CURRENT OUTPUT 1 EAA → CONFIGURATION 400
↓
OPERATION 404
↓
INFORMATION 408

Function description OUTPUTS → CURRENT OUTPUT 1 → INFORMATION	
TERMINAL NUMBER **4080** MODBUS register: 5816 Data type: Integer Access: read	Displays the: ■ Numbers of the terminals used by the current output (in the connection compartment) ■ Polarity **Display:** 3 = 20 (+) / 21 (–)

7.2 Group PULSE/FREQUENCY OUTPUT 1

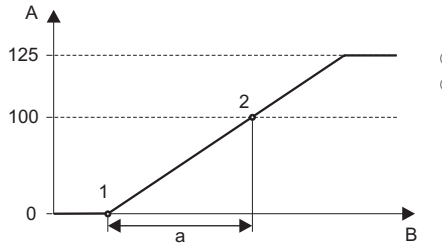
7.2.1 Function group CONFIGURATION

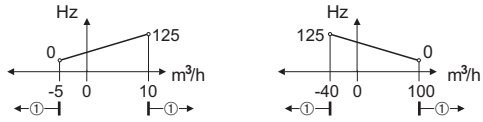
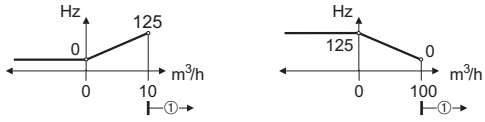
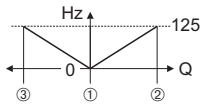


Function description OUTPUTS→PULSE/FREQUENCY OUTPUT 1→CONFIGURATION	
OPERATION MODE **4200** MODBUS register: 3201 Data type: Integer Access: read/write	Configuration of the output as a pulse, frequency or status output. The functions available in this function group vary, depending on which option you select here. **Options:** 0 = PULSE 1 = FREQUENCY 2 = STATUS **Factory setting:** PULSE

Function description OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (FREQUENCY)	
ASSIGN FREQUENCY **4201** MODBUS register: 3202 Data type: Integer Access: 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 79 = OPERATING FREQUENCY FLUCTUATION DEVIATION 80 = TUBE DAMPING FLUCTUATION 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 **4202** MODBUS register: 3203 Data type: Float Access: 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 70. **User input:** 5-digit fixed-point number: 0 to 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 OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (FREQUENCY)	
END VALUE FREQUENCY **4203** MODBUS register: 3205 Data type: Float Access: read/write	✎ 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 71. **User input:** 5-digit fixed-point number: 2 to 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.
VALUE F LOW **4204** MODBUS register: 3207 Data type: Float Access: read/write	✎ 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).

Function description OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (FREQUENCY)	
VALUE F HIGH **4205** MODBUS register: 3209 Data type: Float Access: read/write	✎ 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.  A0004823 *Fig. 26 : Behavior 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 OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → 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 m^3/h, 10m^3/h) VALUE F HIGH (4205) = not equal to zero flow (e.g. 100 m^3/h, –40m^3/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 (#355-358, frequency area) and the frequency output responds in accordance with the parameters set in the function FAILSAFE MODE (4209).  A0001276 **Parameter setting example 2:** VALUE F LOW (4204) = equal to zero flow (e.g. 0 m^3/h) VALUE F HIGH (4205) = not equal to zero flow (e.g. 10 m^3/h) or VALUE F LOW (4204) = not equal to zero flow (e.g. 100 m^3/h) VALUE F HIGH (4205) = equal to zero flow (e.g. 0 m^3/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 parameterized as zero flow (e.g. 0 m^3/h). If the effective flow drops below or exceeds the value parameterized as the zero flow, no fault/notice message is generated and the frequency output retains its value. If the effective flow drops below or exceeds the other value, a fault/notice message is generated (#355-358, frequency area) and the frequency output responds in accordance with the parameters set in the function FAILSAFE MODE (4209).  A0001277 Deliberately only one flow direction is output with this setting and flow values in the other flow direction are suppressed. **Parameter setting example 3:** MEASURING MODE (4206) = SYMMETRY The frequency output signal is independent of the direction of flow (absolute amount of the measured variable). The VALUE F LOW ① and VALUE F HIGH ② must have the same sign (+ or -). The “VALUE F HIGH” ③ (e.g. backflow) corresponds to the mirrored VALUE F HIGH ② (e.g. flow).  A0001278 ASSIGN RELAY (4700) = FLOW DIRECTION Flow direction output via a switching contact. **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
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (FREQUENCY)

MEASURING MODE **4206**

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).

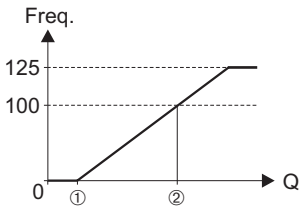
Use this function to define the measuring mode for the frequency output.

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 m^3/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 m^3/h; VALUE F HIGH = 10m^3/h), the message "FREQUENCY OUTPUT AT FULL SCALE VALUE" appears if the measuring range is exceeded or not achieved and the frequency output responds in accordance with the parameter settings in the function FAILSAFE MODE (4209).

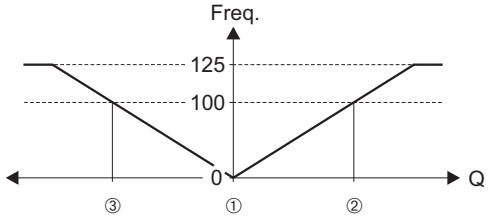


A0001279

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).



A0001280

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 OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → 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
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → 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 function (4200).

For selecting the output configuration of the frequency output.

Options:
0 = PASSIVE - POSITIVE
1 = PASSIVE - NEGATIVE
2 = ACTIVE - POSITIVE
3 = ACTIVE - NEGATIVE

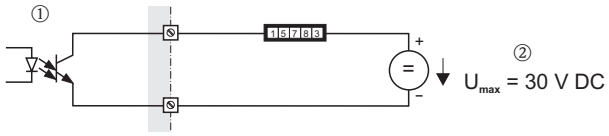
Factory setting: PASSIVE - POSITIVE

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

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

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

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

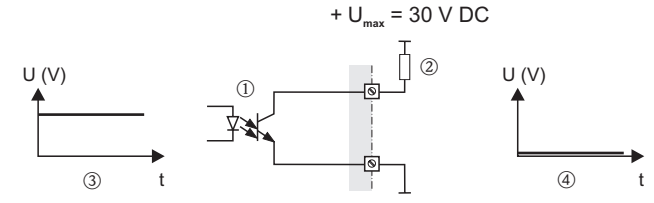


A0001225

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

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

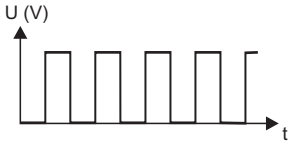
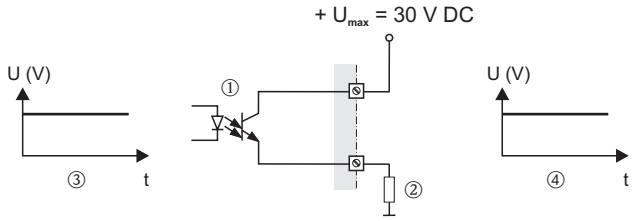
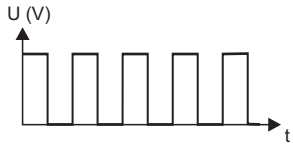
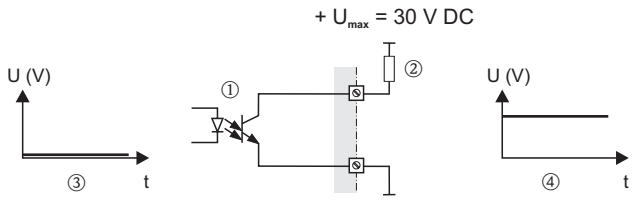
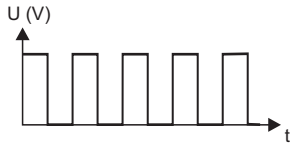
Example for output configuration PASSIVE-POSITIVE:
Output configuration with an external pull-up resistance.
In the quiescent state (at zero flow), the output signal level at the terminals is 0 V.

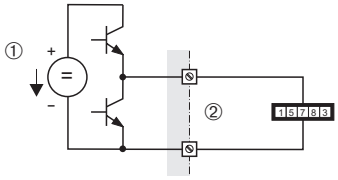
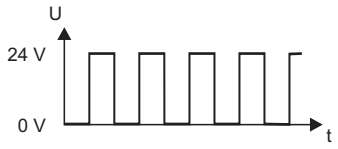
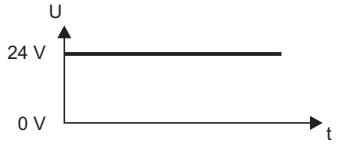
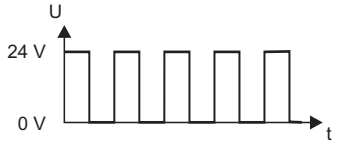


A0004687

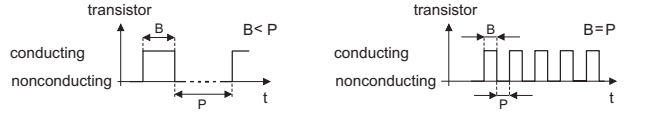
① = *Open collector*
② = *Pull-Up-Resistance*
③ = *Transistor activation in "POSITIVE" quiescent state (at zero flow)*
④ = *Output signal level in quiescent state (at zero flow)*

(continued on next page)

Function description OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (FREQUENCY)	
OUTPUT SIGNAL **4207** (continued)	In the operating status (flow present), the output signal level changes from 0 V to a positive voltage level.  A0001975 **Example for output configuration PASSIVE-POSITIVE:** Output configuration with an external pull-down resistance. In the quiescent state (at zero flow), a positive voltage level is measured via the pull-down resistance.  A0004689 ① = *Open collector* ② = *Pull-Down-Resistance* ③ = *Transistor activation in "POSITIVE" quiescent state (at zero flow)* ④ = *Output signal level in quiescent state (at zero flow)* In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V.  A0001981 **Example for output configuration PASSIVE-NEGATIVE:** Output configuration with an external pull-up resistance. In the quiescent state (at zero flow), the output signal level at the terminals is at a positive voltage level.  A0004690 ① = *Open collector* ② = *Pull-Up-Resistance* ③ = *Transistor activation in "NEGATIVE" quiescent state (at zero flow)* ④ = *Output signal level in quiescent state (at zero flow)* In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V.  A0001981 (continued on next page)

Function description OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (FREQUENCY)	
OUTPUT SIGNAL **4207** (continued)	**Example for active output circuit (ACTIVE):** With an active circuit, the internal power supply is 24 V. The frequency output is short-circuit proof.  A0004691 ① = *24 V DC internal power supply* ② = *Short-circuit proof output* The signal levels are to be seen as analogous to the passive circuit. The following applies for the output configuration **ACTIVE-POSITIVE**: In the quiescent state (at zero flow), the output signal level at the terminals is 0 V.  A0004694 In the operating status (flow present), the output signal level changes from 0 V to a positive voltage level.  A0004692 The following applies for the output configuration **ACTIVE-NEGATIVE**: In the quiescent state (at zero flow), the output signal level at the terminals is at a positive voltage level.  A0004693 In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V.  A0004710

Function description OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (FREQUENCY)	
TIME CONSTANT **4208** MODBUS register: 3213 Data type: Float Access: read/write	✎ 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 to 100.00 s **Factory setting:** 0.00 s
FAILSAFE MODE **4209** MODBUS register: Data type: 3215 Access: Integer read/write	✎ 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
FAILSAFE VALUE **4211** MODBUS register: 3216 Data type: Float Access: read/write	✎ 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 to 12500 Hz **Factory setting:** 12500 Hz

Function description OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (PULSE)	
ASSIGN PULSE **4221** MODBUS register: 3223 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 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 = TARGET CORRECTED VOLUME FLOW 16 = CARRIER MASS FLOW 18 = CARRIER VOLUME FLOW 20 = CARRIER CORRECTED 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 **4222** MODBUS register: 3224 Data type: Float 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 flow at which a pulse is triggered. These pulses can be totaled by an external totalizer, and the total flow quantity since measuring started can be registered in this way. **User input:** 5-digit floating-point number, [unit] **Factory setting:** Depends on nominal diameter ✎ 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 **4223** MODBUS register: 3226 Data type: Float Access: 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 to 2000 ms **Factory setting:** 100 ms Pulse output is **always** with the pulse width (B) entered in this function. The pauses (P) between the individual pulses are automatically configured. However, they must at least correspond to the pulse width (B = P).  A0001233-EN *Fig. 29 : Pulse Width* *B = Pulse width entered (the illustration applies to positive pulses)* *P = Pauses between the individual pulses* (continued on next page)

Function description OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → 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 79) 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 to 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 totaled. Negative components are not taken into account. 1 = SYMMETRY Positive and negative flow components are taken into account. ✎ Note! The direction of flow can be output via the relay output. 2 = PULSATING FLOW If flow is characterized by severe fluctuations as is the case, for example, with reciprocating pumps, the positive and negative flow components are totaled, with the signs taken into account (e.g. -10 l and +25 l = 15 l). Flow components outside the maximum pulse number per second (value/width) are buffered, balanced and output after a maximum delay of 60 seconds. If the buffered data cannot be processed within approx. 60 seconds, a fault/notice message appears. Under certain plant conditions, flow values can aggregate in the buffer, for example in the case of prolonged and unwanted fluid backflow. However, this buffer is reset in all relevant programming adjustments which affect the pulse output. 3 = STANDARD REVERSE Only negative flow components are totaled. Positive components are not taken into account. **Factory setting:** STANDARD

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

OUTPUT SIGNAL **4226**

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

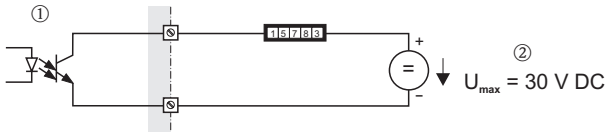
Factory setting: PASSIVE - POSITIVE

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

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

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

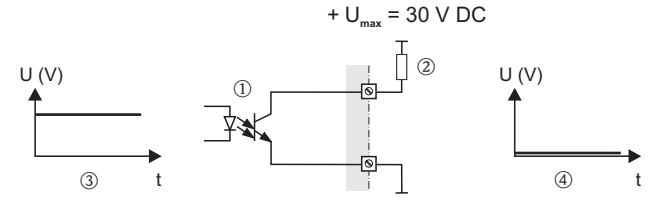


A0001225

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

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

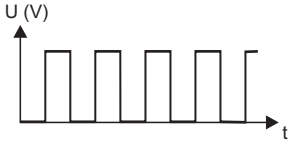
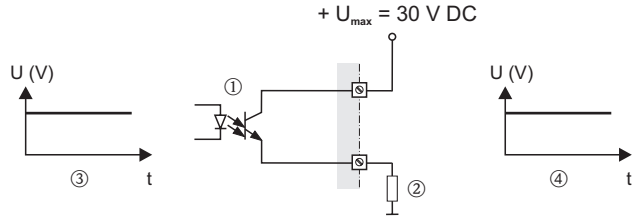
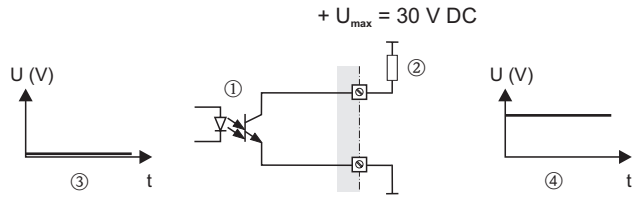
Example for output configuration PASSIVE-POSITIVE:
Output configuration with an external pull-up resistance.
In the quiescent state (at zero flow), the output signal level at the terminals is 0 V.

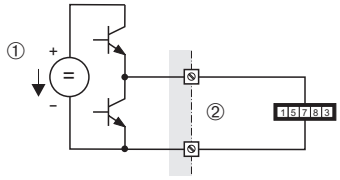
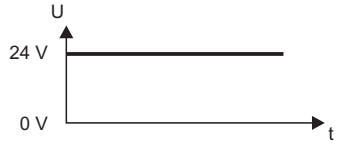
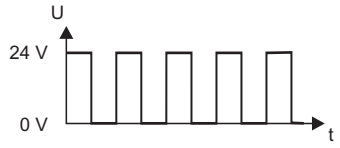


A0004687

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

(continued on next page)

Function description OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (PULSE)	
OUTPUT SIGNAL **4226** (continued)	In the operating status (flow present), the output signal level changes from 0 V to a positive voltage level.  A0001975 **Example for output configuration PASSIVE-POSITIVE:** Output configuration with an external pull-down resistance. In the quiescent state (at zero flow), a positive voltage level is measured via the pull-down resistance.  A0004689 ① = *Open collector* ② = *Pull-Down-Resistance* ③ = *Transistor activation in "POSITIVE" quiescent state (at zero flow)* ④ = *Output signal level in quiescent state (at zero flow)* In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V.  A0001981 **Example for output configuration PASSIVE-NEGATIVE:** Output configuration with an external pull-up resistance. In the quiescent state (at zero flow), the output signal level at the terminals is at a positive voltage level.  A0004690 ① = *Open collector* ② = *Pull-Up-Resistance* ③ = *Transistor activation in "NEGATIVE" quiescent state (at zero flow)* ④ = *Output signal level in quiescent state (at zero flow)* In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V.  A0001981 (continued on next page)

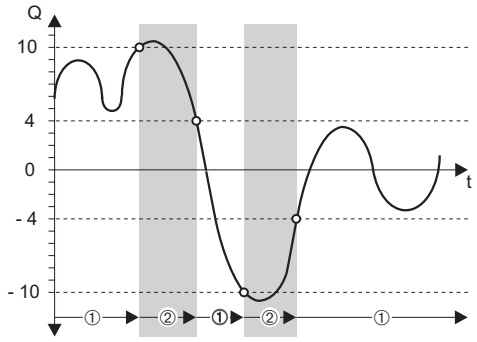
Function description OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (PULSE)	
OUTPUT SIGNAL **4226** (continued)	**Example for active output circuit (ACTIVE):** With an active circuit, the internal power supply is 24 V. The pulse output is short-circuit proof.  A0004691 ① = *24 V DC internal power supply* ② = *Short-circuit proof output* The signal levels are to be seen as analogous to the passive circuit. The following applies for the output configuration **ACTIVE-POSITIVE**: In the quiescent state (at zero flow), the output signal level at the terminals is 0 V.  A0004694 In the operating status (flow present), the output signal level changes from 0 V to a positive voltage level.  A0004692 The following applies for the output configuration **ACTIVE-NEGATIVE**: In the quiescent state (at zero flow), the output signal level at the terminals is at a positive voltage level.  A0004693 In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V.  A0004710

Function description OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (PULSE)	
FAILSAFE MODE **4227** MODBUS register: 3230 Data type: Integer Access: read/write	✎ 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. 3 = ACTUAL VALUE Measured value output is based on the current flow measurement. The fault is ignored. **Factory setting:** FALLBACK VALUE

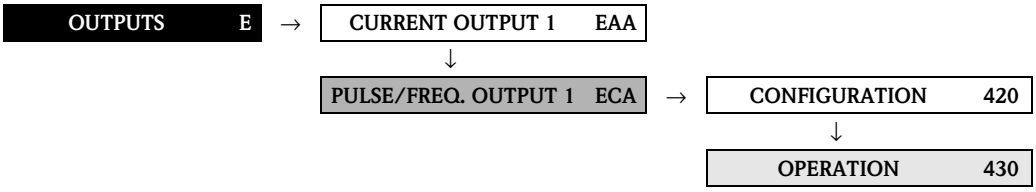
Function description OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (STATUS)	
ASSIGN STATUS **4241** MODBUS register: 3236 Data type: Integer Access: read/write	✎ Note! Function is not available unless the STATUS setting was selected in the OPERATION MODE function (4200). Use this function to assign 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 112 = OPERATING FREQUENCY FLUCTUATION DEVIATION 113 = TUBE DAMPING FLUCTUATION DEVIATION **Factory setting:** FAULT MESSAGE ✎ Note! ■ The behavior of the status output is a normally closed behavior, in other words the output is closed (transistor conductive) when normal, error-free measuring is in progress. – “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 100 ■ 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 100.

Function description OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (STATUS)	
ON-VALUE **4242** MODBUS register: 3237 Data type: Float Access: read/write	✎ 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.
SWITCH-ON DELAY **4243** MODBUS register: 3239 Data type: Float Access: read/write	✎ 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 to 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 to 100.0 s **Factory setting:** 0.0 s

Function description OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (STATUS)	
OFF-VALUE **4244** MODBUS register: 3241 Data type: Float Access: 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 **4245** MODBUS register: 3243 Data type: Float Access: 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 to 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 to 100.0 s **Factory setting:** 0.0 s

Function description OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (STATUS)	
MEASURING MODE **4246** MODBUS register: 3245 Data type: Integer Access: read/write	✎ Note! 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  A0001247 *Fig. 30 : Example for the SYMMETRY measuring mode* *Switch-on point Q = 4* *Switch-off point Q = 10* ① *= Status output switched on (conductive)* ② *= Status output switched off (nonconductive)* ✎ 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 to 100.00 s **Factory setting:** 0.00 s

7.2.2 Function group OPERATION

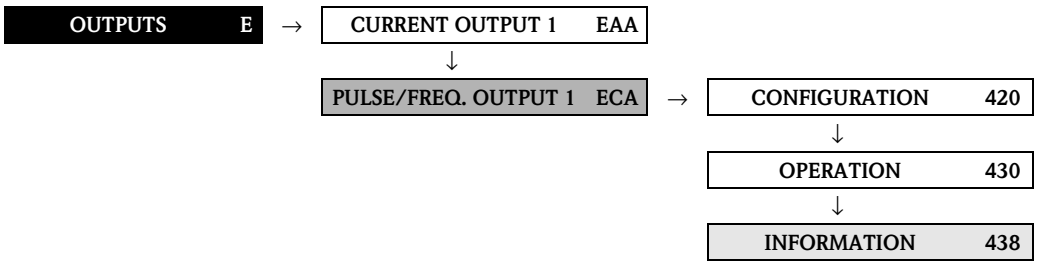


Function description OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → OPERATION (FREQUENCY)	
ACTUAL FREQUENCY **4301** MODBUS register: 3218 Data type: Float Access: read	✎ Note! Function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to view the computed actual value of the output frequency. **Display:** 0 to 12500 Hz
SIMULATION FREQUENCY **4302** MODBUS register: 3220 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 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 **4303** MODBUS register: 3221 Data type: Float Access: read/write	✎ 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 to 12500 Hz **Factory setting:** 0 Hz ☞ Caution! The setting is not saved in the event of a power failure.

Function description OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → OPERATION (PULSE)	
SIMULATION PULSE **4322** MODBUS register: 3233 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 E key. ✎ Note! Simulation is started by confirming the CONTINUOUSLY option with the E 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 **4323** MODBUS register: 3234 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 E key. The display remains at 0 if the specified pulses have been output. **User input:** 0 to 10 000 **Factory setting:** 0 ✎ Note! Simulation is started by confirming the simulation value with the E 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 OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → OPERATION (STATUS)	
ACTUAL STATUS **4341** MODBUS register: 3248 Data type: Integer Access: 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 **4342** MODBUS register: 3249 Data type: Integer Access: 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 **4343** MODBUS register: 3250 Data type: Integer Access: 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.

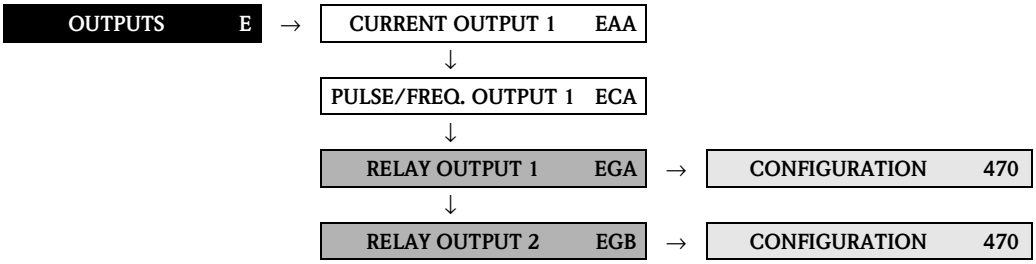
7.2.3 Function group INFORMATION



Function description OUTPUTS→PULSE/FREQUENCY OUTPUT 1→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. **Display:** 2 = 22(+) / 23 (–)
MODBUS register: Data type: Access:	3251 Integer read	

7.3 Group RELAY OUTPUT (1 to 2)

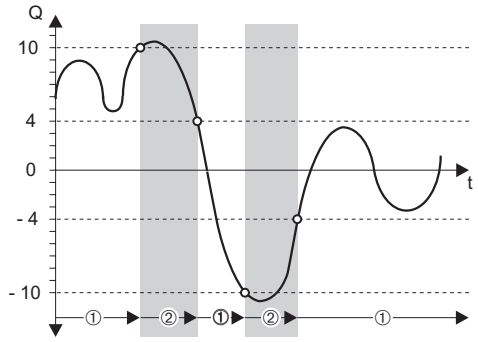
7.3.1 Function group CONFIGURATION



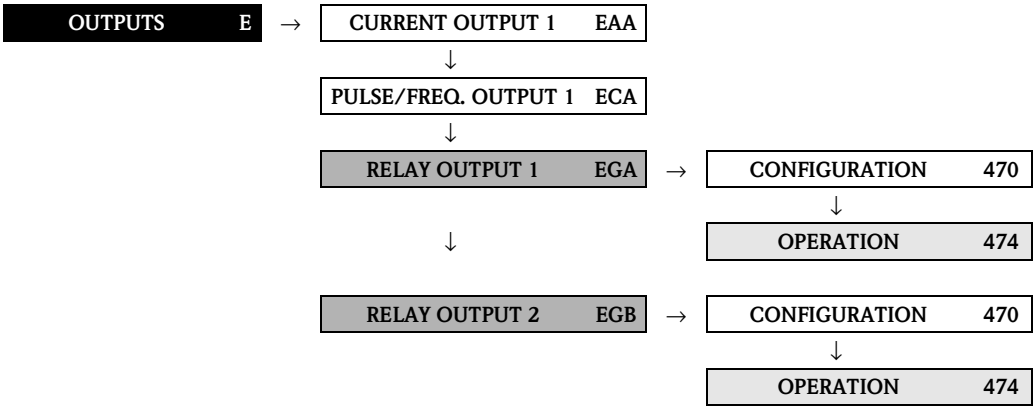
Function description OUTPUTS → RELAY OUTPUT (1 to 2) → CONFIGURATION	
ASSIGN RELAY **4700** MODBUS register: Relay output 1 3801 Relay output 2 4001 Data type: Integer Access: read/write	Use this function to assign a switching function to the relay output. **Options:** (standard) 0 = OFF 1 = ON (operation) 2 = FAULT MESSAGE 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 to 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 OUTPUTS → RELAY OUTPUT (1 to 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 112 = OPERATING FREQUENCY FLUCTUATION DEVIATION 113 = TUBE DAMPING FLUCTUATION 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 100). ■ 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 to 100 seconds) for pull-up (i.e. signal changes from 0 to 1) of the relay output. The delay starts when the limit value is reached. The relay output does switch when the delay has timed out and the switch on condition has been valid over the delay time. **User input:** fixed-point number 0.0 to 100.0 s **Factory setting:** 0.0 s

Function description OUTPUTS → RELAY OUTPUT (1 to 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 to 100 seconds) for dropout (i.e. signal changes from 1 to 0) of the relay output. The delay starts when the limit value is reached. The relay output does switch when the delay has timed out and the switch off condition has been valid over the delay time. **User input:** fixed-point number 0.0 to 100.0 s **Factory setting:** 0.0 s

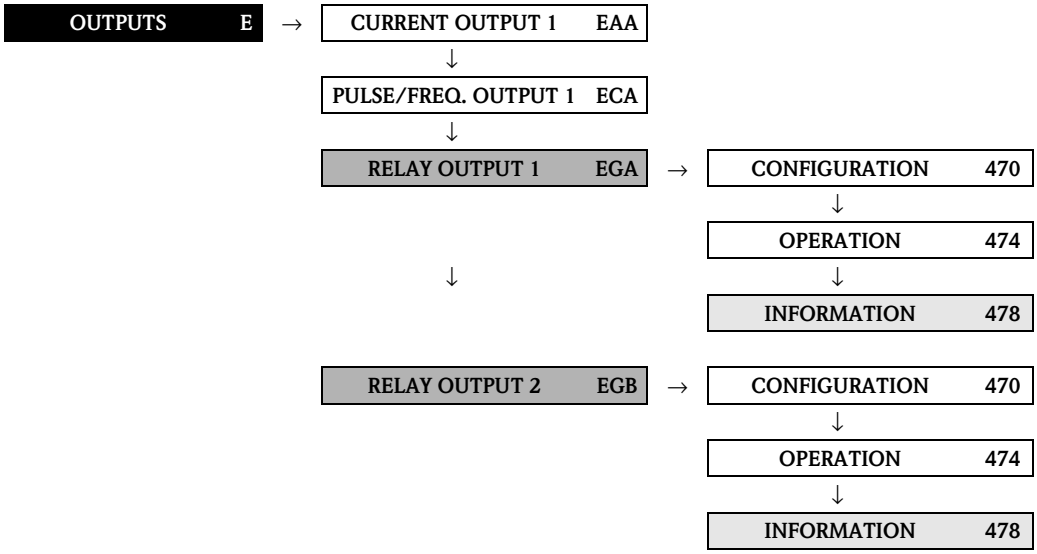
Function description OUTPUTS → RELAY OUTPUT (1 to 2) → CONFIGURATION	
MEASURING MODE **4705** MODBUS register: Relay output 1 3810 Relay output 2 4010 Data type: Integer Access: read/write	✎ Note! This function is not visible unless a limit value was assigned to the relay output. Use this function to 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 *Fig. 31 : Example for the SYMMETRY measuring mode* *Switch-on point Q = 4* *Switch-off point Q = 10* ① = *Relay energized* ② = *Relay de-energized* ✎ 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 to 100.00 s **Factory setting:** 0.00 s

7.3.2 Function group OPERATION



Function description OUTPUTS → RELAY OUTPUT (1 to 2) → OPERATION	
ACTUAL STATUS RELAY **4740** 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 (4700) function, the functional test takes place by means of the BATCH PROCEDURE function (7260), see Page 146. ☝ 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 OUTPUTS → RELAY OUTPUT (1 to 2) → INFORMATION	
TERMINAL NUMBER **4780** MODBUS register: Relay output 1 3816 Relay output 2 4016 Data type: Integer Access: read	Use this function to view the numbers of the terminals (in the connection compartment) and the polarity used by the relay output. **Display:** 2 = 22 (+) / 23 (–) → RELAY OUTPUT 1 3 = 20 (+) / 21 (–) → RELAY OUTPUT 2

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 m^3/h, the relay drops out at –1 m^3/h and pulls up at +1 m^3/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.

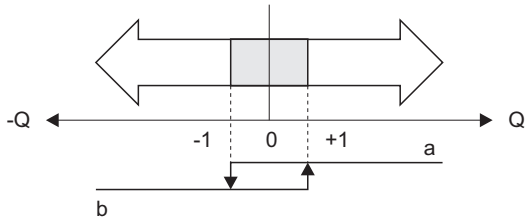


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Fig. 32 : Relay output configured for "flow direction"
a Relay energized
b Relay de-energized

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.

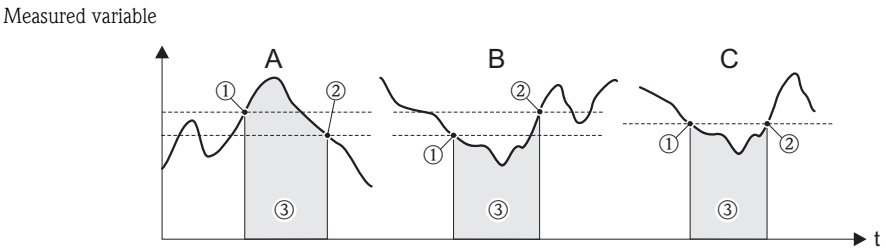

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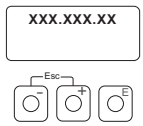
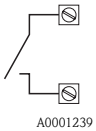
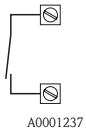
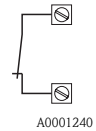
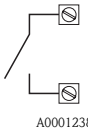
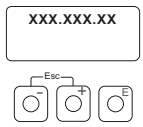
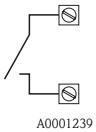
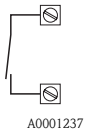
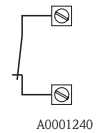
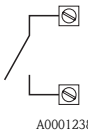
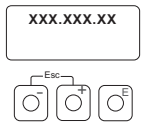
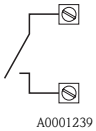
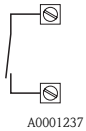
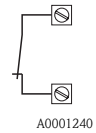
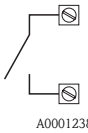
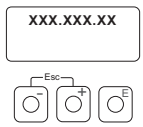
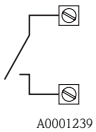
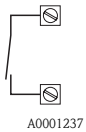
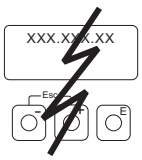
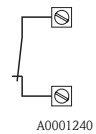
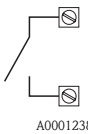
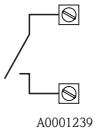
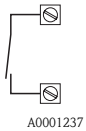
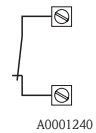
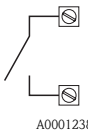
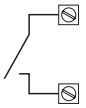
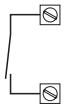
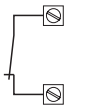
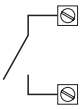
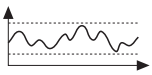
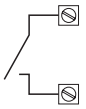
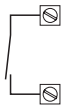
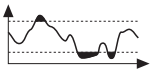
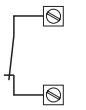
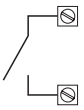
Fig. 33 : Relay output configured for "limit value"
① = Switch-off point, ② = Switch-on point, ③ = Relay de-energized

A = Maximum safety (SWITCH-OFF POINT > SWITCH-ON POINT)
B = Minimum safety (SWITCH-OFF POINT < SWITCH-ON POINT)
C = Minimum safety (SWITCH-OFF POINT = SWITCH-ON POINT, this configuration is to be avoided)

7.3.5 Switching response of the relay output

Function	State		Relay coil	Contact*	
				NC	NO
ON (operation)	System in measuring mode		energized	 A0001239	 A0001237
	System not in measuring mode (power supply failed)		de-energized	 A0001240	 A0001238
Fault message	System OK		energized	 A0001239	 A0001237
	(System or process error) Fault → Response to error, outputs /inputs and totalizers		de-energized	 A0001240	 A0001238
Notice message	System OK		energized	 A0001239	 A0001237
	(System or process error) Fault → Continuation of measuring		de-energized	 A0001240	 A0001238
Fault message or Notice message	System OK		energized	 A0001239	 A0001237
	(System or process error) Fault → Response to error or Note → Continuation of measuring		de-energized	 A0001240	 A0001238
Empty pipe detection (EPD)	Measuring tube full		energized	 A0001239	 A0001237
	Measuring tube partially filled /empty measuring tube		de-energized	 A0001240	 A0001238

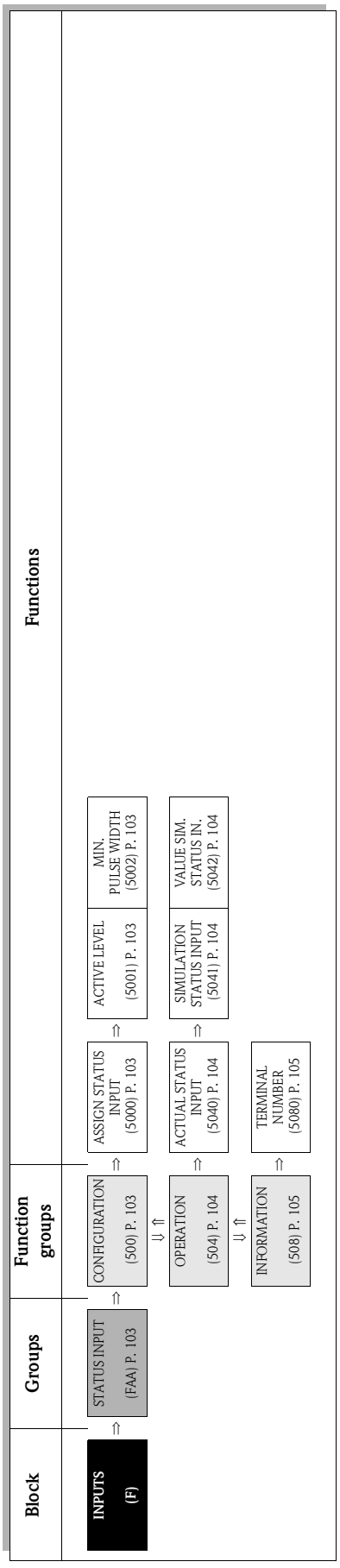
Function	State		Relay coil	Contact* NC	Contact* NO
Flow direction	forward	 A0001241	energized	 A0001239	 A0001237
	reverse	 A0001242	de-energized	 A0001240	 A0001238
Limit value – Mass flow – Volume flow – Corrected volume flow – Density – Reference density – Temperature – Totalizer	Limit value **not** overshot or undershot	 A0001243	energized	 A0001239	 A0001237
	Limit value overshot or undershot	 A0001244	de-energized	 A0001240	 A0001238

* Terminal numbers in accordance with the TERMINAL NUMBER function (4780) on Page 98.

✎ Note!
If the measuring device has two relays, the factory setting is:
- Relay 1 → normally open contact (NO)
- Relay 2 → normally closed contact (NC)

☝ Caution!
When using the optional software package BATCHING, it is advisable for the contacts (either normally open or normally closed contacts) to have the same switching response for all relay outputs used.

8 Block INPUTS



8.1 Group STATUS INPUT

8.1.1 Function group CONFIGURATION

INPUTS F → **STATUS INPUT FAA** → **CONFIGURATION 500**

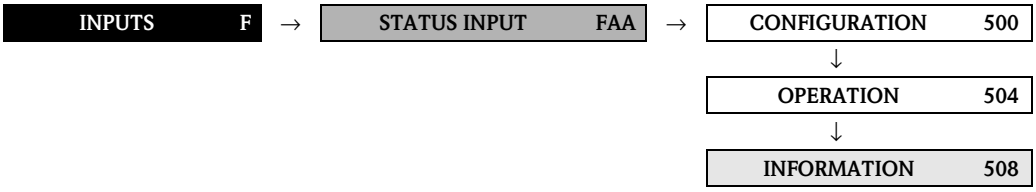
Function description INPUTS → STATUS INPUT → CONFIGURATION	
ASSIGN STATUS INPUT **5000** MODBUS register: 4301 Data type: Integer Access: read/write	Use this function to assign a switching function to the status input. **Options:** 0 = OFF 1 = RESET TOTALIZER 1 2 = RESET TOTALIZER 2 3 = RESET TOTALIZER 3 4 = RESET ALL TOTALIZERS 5 = POSITIVE ZERO RETURN 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) 27 = RESET TOTALIZER 3 & START BATCHING (reset totalizer 3, followed by start) ☞ Caution! If there is an input pulse during a running batching process, the batching process is aborted immediately. Totalizer 3 is not reset however. This makes it possible to read out partial filling correctly. **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** MODBUS register: 4302 Data type: Integer Access: read/write	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** MODBUS register: 4303 Data type: Float Access: read/write	Use this function to define a minimum pulse width which the input pulse must achieve in order to trigger the selected switching function, (see function ASSIGN STATUS INPUT (5000)). **User input:** 20 to 100 ms **Factory setting:** 50 ms

8.1.2 Function group OPERATION

INPUTS F → STATUS INPUT FAA → CONFIGURATION 500
↓
OPERATION 504

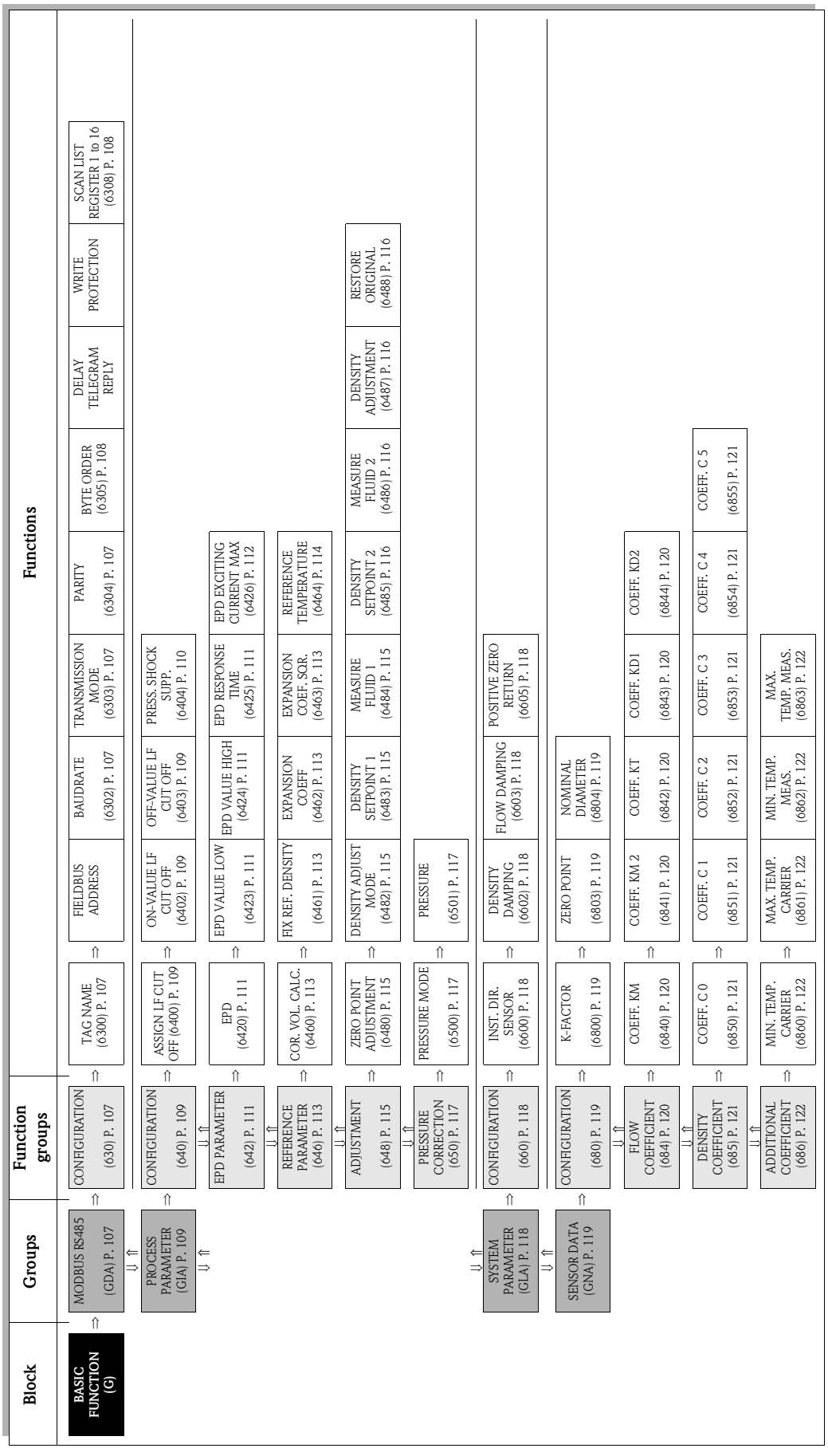
Function description INPUTS → STATUS INPUT → OPERATION		
ACTUAL STATUS INPUT	**5040**	Use this function to view the current level of the status input. **Display:** 0 = LOW 1 = HIGH
MODBUS register: Data type: Access:	4305 Integer read	
SIMULATION STATUS INPUT	**5041**	Use this function to simulate the status input, in other words to trigger the function assigned to the status input (see the function ASSIGN STATUS INPUT (5000) on Page 103). **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.
MODBUS register: Data type: Access:	4306 Integer read/write	
VALUE SIMULATION STATUS INPUT	**5042**	✎ 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.
MODBUS register: Data type: Access:	4307 Integer read/write	

8.1.3 Function group INFORMATION



Function description INPUTS → 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. **Display:** 1 = 24 (+) / 25 (–)
MODBUS register: Data type: Access	4308 Integer read	

9 Block BASIC FUNCTION



9.1 Group MODBUS RS485

9.1.1 Function group CONFIGURATION

BASIC FUNCTION G → **MODBUS RS485 GDA** → **CONFIGURATION 630**

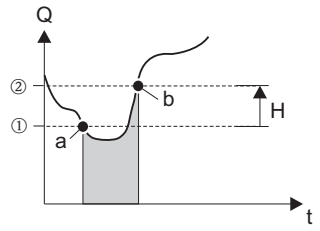
Function description BASIC FUNCTION → MODBUS RS485 → CONFIGURATION		
TAG NAME	**6300**	For entering a tag name for the measuring device. You can edit and read this tag name via the local display or the MODBUS RS485 protocol. **User input:** max. 16-character text, permissible: A-Z, 0-9, +, –, punctuation marks **Factory setting:** "_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _" (No text)
MODBUS register: Data type: Access:	4901 String (16) read/write	
FIELDBUS ADDRESS	**6301**	For entering the device address. **User input:** 1 to 247 **Factory setting:** 247
MODBUS register: Data type: Access:	4910 Integer read/write	
BAUDRATE	**6302**	For selecting the baudrate. **Options:** 0 = 1200 BAUD 1 = 2400 BAUD 2 = 4800 BAUD 3 = 9600 BAUD 4 = 19200 BAUD 5 = 38400 BAUD 6 = 57600 BAUD 7 = 115200 BAUD **Factory setting:** 19200 BAUD
MODBUS register: Data type: Access:	4912 Integer read/write	
TRANSMISSION MODE	**6303**	For selecting the data transfer mode. **Options:** 0 = RTU 1 = ASCII **Factory setting:** RTU ✎ Note! ■ RTU = transmission of data in binary form. Error protection via CRC16. ■ RTU = transmission of data in the form of readable ASCII characters. Error protection via LRC.
MODBUS register: Data type: Access:	4913 Integer read/write	
PARITY	**6304**	For selecting whether no parity bit or an even or uneven parity bit should be transmitted. ✎ Note! The options available depend on the TRANSMISSION MODE function: **Options:** (for TRANSMISSION MODE = RTU) 0 = EVEN 1 = ODD 2 = NONE **Options:** (for TRANSMISSION MODE = ASCII) 0 = EVEN 1 = ODD **Factory setting:** EVEN
MODBUS register: Data type: Access:	4914 Integer read/write	

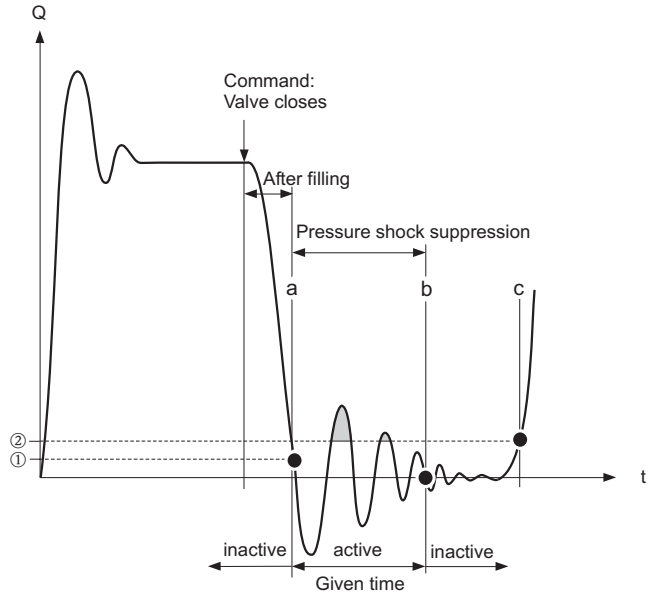
Function description BASIC FUNCTION → MODBUS RS485 → CONFIGURATION	
BYTE ORDER **6305** MODBUS register: 4915 Data type: Integer Access: read/write	For selecting the byte transmission sequence for the Integer, Float and String data types. **Options:** 0 = 0-1-2-3 1 = 3-2-1-0 2 = 2-3-0-1 3 = 1-0-3-2 **Factory setting:** 1-0-3-2 ✎ Note! ■ The transmission sequence must suit the MODBUS master. ■ More information can be found in Operating Instructions BA107D under the keyword “Byte transmission sequence”.
DELAY TELEGRAM REPLY **6306** MODBUS register: 4916 Data type: Float Access: 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 RS485 masters. **User input:** 0 to 100 ms **Factory setting:** 10 ms
WRITE PROTECTION **6307** MODBUS register: 4918 Data type: Integer Access: read	Indicates whether write access to the measuring device is possible via local operation or MODBUS RS485. **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 to 16 **6308** MODBUS register: SCAN LIST REG. 1 5001 SCAN LIST REG. 2 5002 SCAN LIST REG. 3 5003 SCAN LIST REG. 4 5004 SCAN LIST REG. 5 5005 SCAN LIST REG. 6 5006 SCAN LIST REG. 7 5007 SCAN LIST REG. 8 5008 SCAN LIST REG. 9 5009 SCAN LIST REG. 10 5010 SCAN LIST REG. 11 5011 SCAN LIST REG. 12 5012 SCAN LIST REG. 13 5013 SCAN LIST REG. 14 5014 SCAN LIST REG. 15 5015 SCAN LIST REG. 16 5016 Data type: Integer Access: read/write	By entering the register address, up to 16 device parameters can be grouped in the auto-scan buffer where they are assigned to the scan list registers 1 to 16. The data of the device parameters assigned here are read out via the register addresses 5051 to 5081. **User input:** 0 to 9999 **Factory setting:** 0 ✎ Note! More detailed information and examples of using the auto-scan buffer are provided in Operating Instructions BA107D.

9.2 Group PROCESS PARAMETER

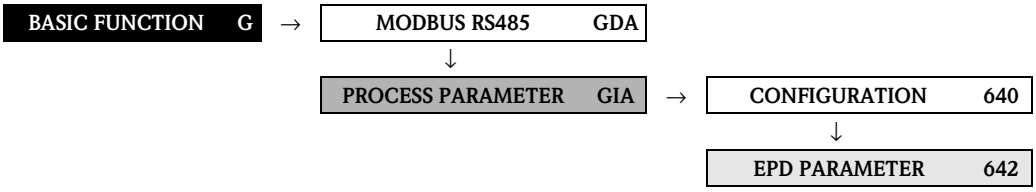
9.2.1 Function group CONFIGURATION

BASIC FUNCTION G → MODBUS RS485 GDA
↓
PROCESS PARAMETER GIA → CONFIGURATION 640

Function description BASIC FUNCTION → PROCESS PARAMETER → CONFIGURATION	
ASSIGN LOW FLOW CUT OFF **6400** MODBUS register: 5101 Data type: Integer Access: 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 **6402** MODBUS register: 5138 Data type: Float Access: 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 **6403** MODBUS register: 5104 Data type: Float Access: read/write	Enter the off-value (**b**) of the low flow cut off. Enter the switch-off point as a positive hysteresis (H) from the switch-on point (**a**). **User input:** Integer 0 to 100% **Factory setting:** 50%  A0003882 *Fig. 34 : Example for low flow cut off on-value and off-value* ① = *On-value* ② = *Off-value* *a* *Low flow cut off is switched on* *b* *Low flow cut off is switched off (a + a · H)* *H* *Hysteresis: 0 to 100%* ■ *Low flow cut off active* *Q* *Flow*

Function description BASIC FUNCTION → PROCESS PARAMETER → CONFIGURATION	
PRESSURE SHOCK SUPPRESSION **6404** MODBUS register: 5140 Data type: Float Access: 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 totaled in this way result in a totalizer reading error, particularly in the case of batching processes. For this reason, the measuring device is equipped with pressure shock suppression (= short-term signal suppression) which can eliminate system-related “disruptions”. ✎ Note! Note that pressure shock suppression cannot be used unless the low flow cut off is active, (see function ON-VALUE LOW FLOW CUT OFF (6402) on Page 109). 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 **a** 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 **b** 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 **c** in graphic).  *Fig. 35 : Pressure shock suppression* *① = Off-value (low flow cut off)* *② = On-VALUE (low flow cut off)* *a Active when value falls below the on-value of the low flow cut off* *b Deactivated after specified time expires* *c Flow values are again used to calculate the pulses* *Suppressed values* *Q Flow* **User input:** max. 4-digit number, incl. unit: 0.00 to 100.0 s **Factory setting:** 0.00 s

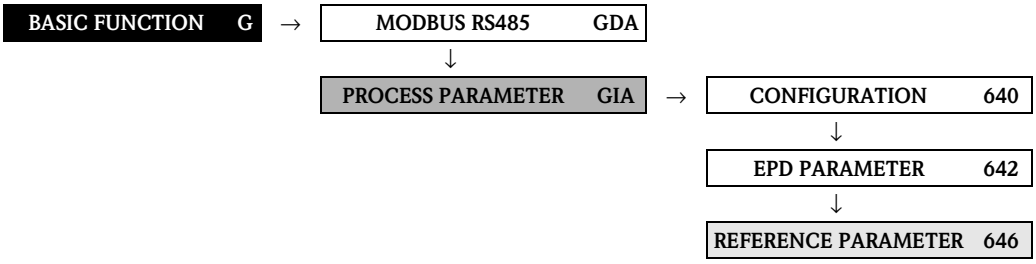
9.2.2 Function group EPD PARAMETER



Function description BASIC FUNCTION → PROCESS PARAMETER → EPD PARAMETER	
EMPTY PIPE DETECTION **6420** 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:** Liquid: ON Gas: OFF 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 to 60 s **Factory setting:** 1.0 s

Function description BASIC FUNCTION → PROCESS PARAMETER → EPD PARAMETER		
EPD EXCITING CURRENT MAX MODBUS register: Data type: Access:	**6426** 5233 Float read/write	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 overshot, error message #700 “EPD ACTIVE” is output similar to the EPD VALUE LOW () 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.

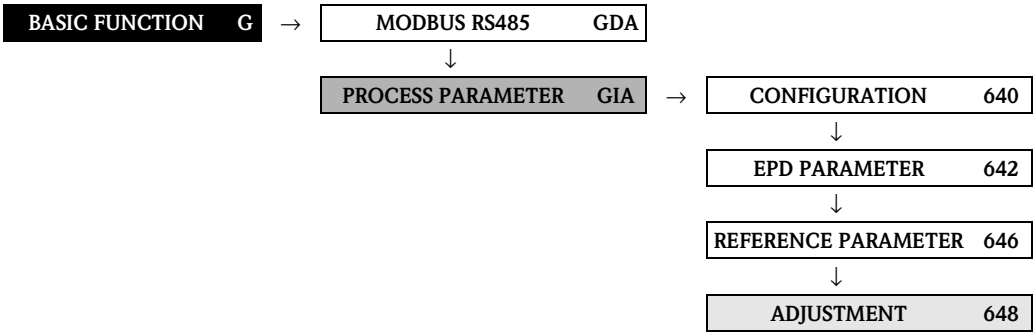
9.2.3 Function group REFERENCE PARAMETER



Function description BASIC FUNCTION → PROCESS PARAMETER → REFERENCE PARAMETER	
CORRECTED VOLUME CALCULATION **6460** MODBUS register: 5129 Data type: Integer Access: read/write	This function is used to set the reference density for calculating the corrected volume flow. **Options:** 0 = CALCULATED REFERENCE DENSITY 1 = FIXED REFERENCE DENSITY **Factory setting:** CALCULATED REFERENCE DENSITY
FIXED REFERENCE DENSITY **6461** MODBUS register: 5130 Data type: Float Access: read/write	✎ 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 **6462** MODBUS register: 5132 Data type: Float Access: read/write	✎ 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 114). **User input:** 5-digit floating-point number **Factory setting:** 0.5000 e-3 [1/K]
EXPANSION COEFFICIENT SQUARE **6463** MODBUS register: 5134 Data type: Float Access: read/write	Use this function to enter a square expansion coefficient, if the temperature compensation follows a nonlinear behavior (see REFERENCE TEMPERATURE (6464) function on Page 114). **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** MODBUS register: 5136 Data type: Float Access: read/write	✎ 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 [$1/K^2$]

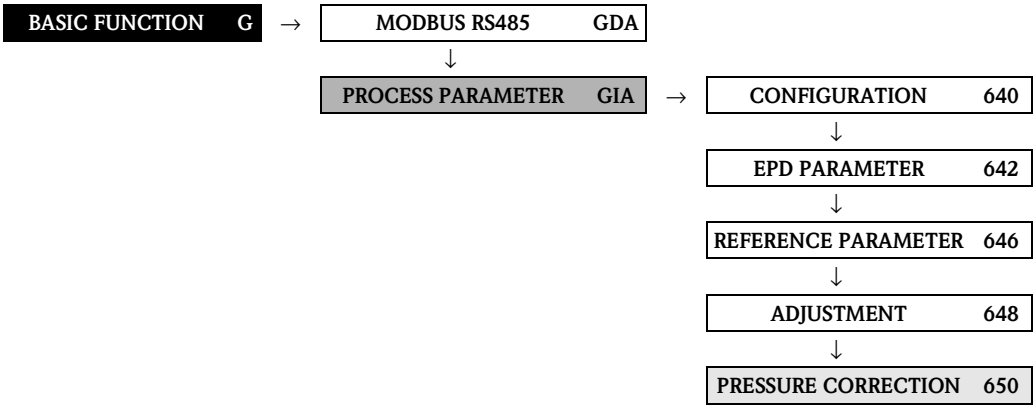
9.2.4 Function group ADJUSTMENT



Function description BASIC FUNCTION → PROCESS PARAMETER → ADJUSTMENT	
ZERO POINT ADJUSTMENT **6480** MODBUS register: 5121 Data type: Integer Access: read/write	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 canceled, 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 **6482** MODBUS register: 5180 Data type: Integer Access: read/write	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 **6483** MODBUS register: 5124 Data type: Float Access: read/write	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 ±10%. ■ The appropriate unit is taken from the function group SYSTEM UNITS (see Page 15).
MEASURE FLUID 1 **6484** MODBUS register: 5126 Data type: Integer Access: read/write	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** MODBUS register: 5181 Data type: Float Access: read/write	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 ±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** MODBUS register: 5183 Data type: Integer Access: read/write	In this function the current density of the second fluid is measured for density adjustment. **Options:** 0 = CANCEL 1 = START
DENSITY ADJUSTMENT **6487** MODBUS register: 5127 Data type: Integer Access: read/write	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** MODBUS register: 5128 Data type: Integer Access: read/write	With this function the original density coefficient determined at the factory are restored. **Options:** 0 = NO 1 = YES **Factory setting:** NO

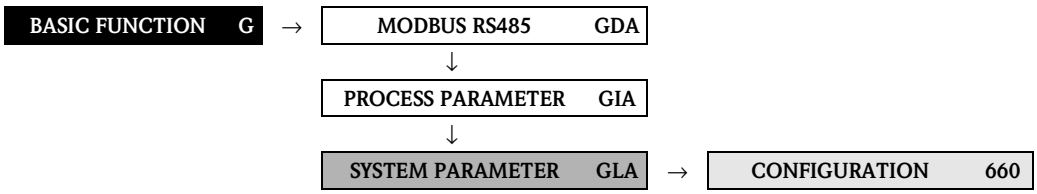
9.2.5 Function group PRESSURE CORRECTION



Function description BASIC FUNCTION → PROCESS PARAMETER → PRESSURE CORRECTION	
PRESSURE MODE **6500** 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 1 = FIX (a fixed process pressure for pressure correction is specified). **Factory setting:** OFF
PRESSURE **6501** 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

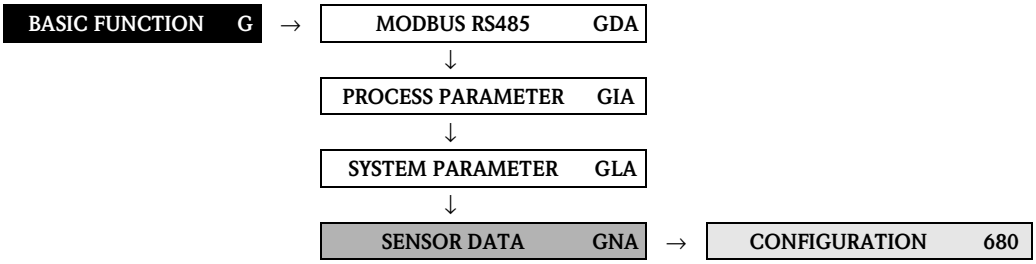
9.3.1 Function group CONFIGURATION



Function description BASIC FUNCTION → SYSTEM PARAMETER → CONFIGURATION	
INSTALLATION DIRECTION SENSOR **6600** MODBUS register: 5501 Data type: Integer Access: read/write	Use this function to reverse the sign of the flow direction, if necessary. ✎ Note! Ascertain the actual direction of fluid flow with reference to the direction indicated by the arrow on the sensor (nameplate). **Options:** 0 = NORMAL (flow as indicated by the arrow) 1 = INVERSE (flow opposite to direction indicated by the arrow) **Factory setting:** NORMAL
DENSITY DAMPING **6602** MODBUS register: 5508 Data type: Float Access: read/write	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 to 100.00 s **Factory setting:** 0.00 s
FLOW DAMPING **6603** MODBUS register: 5510 Data type: Float Access: read/write	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 to 100 s **Factory setting:** Liquid: 0.0 s Gas: 0.25 s
POSITIVE ZERO RETURN **6605** MODBUS register: 5503 Data type: Integer Access: read/write	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

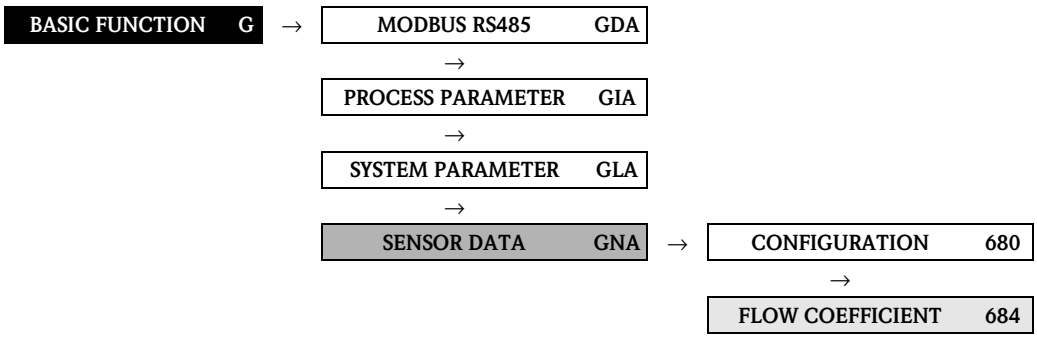
9.4 Group SENSOR DATA

9.4.1 Function group CONFIGURATION



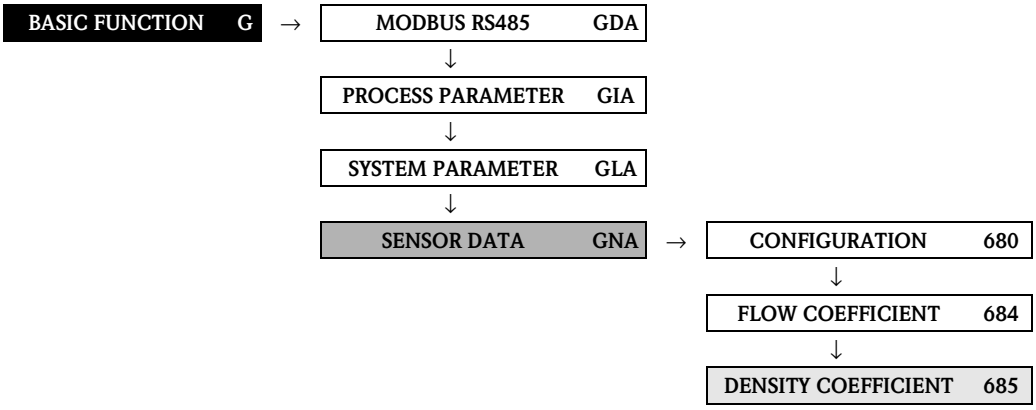
Function description BASIC FUNCTION → SENSOR DATA → CONFIGURATION		
All sensor data (calibration factor, zero point and nominal diameter) are set at the factory and saved on the S-DAT sensor memory chip. ☝ Caution! Under normal circumstances you should not change the following parameter settings, because 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 MODBUS register: Data type: Access:	**6800** 7513 Float read	This function shows the current calibration factor for the sensor. **Factory setting:** Depends on nominal diameter and calibration
ZERO POINT MODBUS register: Data type: Access:	**6803** 7527 Float read/write	This function shows the current zero point correction value for the sensor. **Display:** max. 5-digit number: -99999 to +99999 **Factory setting:** Depends on calibration
NOMINAL DIAMETER MODBUS register: mm inch Data type: Access:	**6804** 7525 7526 Integer 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



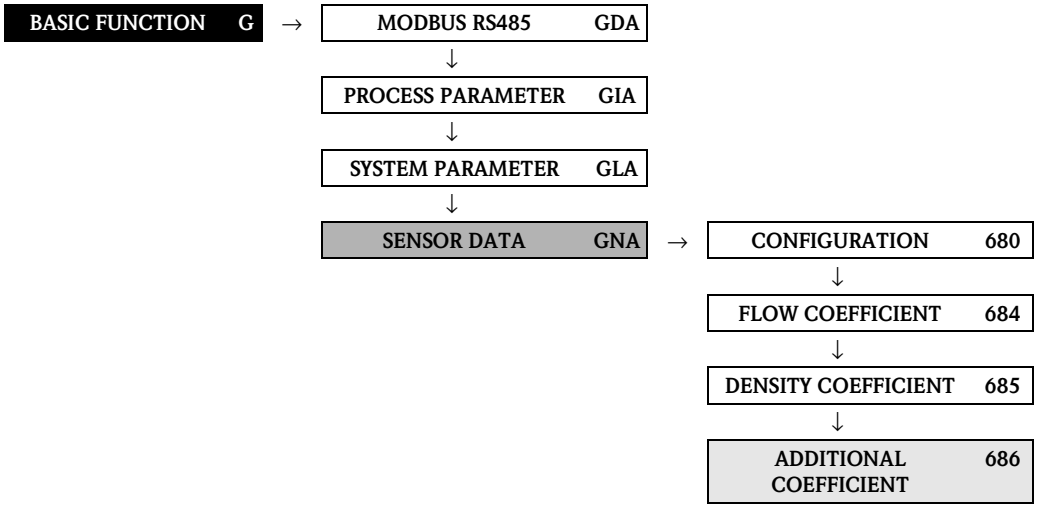
Function description BASIC FUNCTION → SENSOR DATA → FLOW COEFFICIENT	
All flow coefficients are set at the factory. All the sensor's parameter settings are saved on the S-DAT memory chip. Contact the Endress+Hauser service organization if you have any questions about these functions.	
TEMPERATURE COEFFICIENT KM **6840** MODBUS register: 7519 Data type: Float Access: read	This function shows the temperature coefficient KM.
TEMPERATURE COEFFICIENT KM2 **6841** MODBUS register: 7521 Data type: Float Access: read	This function shows the temperature coefficient KM2.
TEMPERATURE COEFFICIENT KT **6842** MODBUS register: 7523 Data type: Float Access: read	This function shows the temperature coefficient KT.
CALIBRATION COEFFICIENT KD 1 **6843** MODBUS register: 7515 Data type: Float Access: read	This function shows the calibration coefficient KD 1.
CALIBRATION COEFFICIENT KD 2 **6844** MODBUS register: 7517 Data type: Float Access: read	This function shows the calibration coefficient KD 2.

9.4.3 Function group DENSITY COEFFICIENT



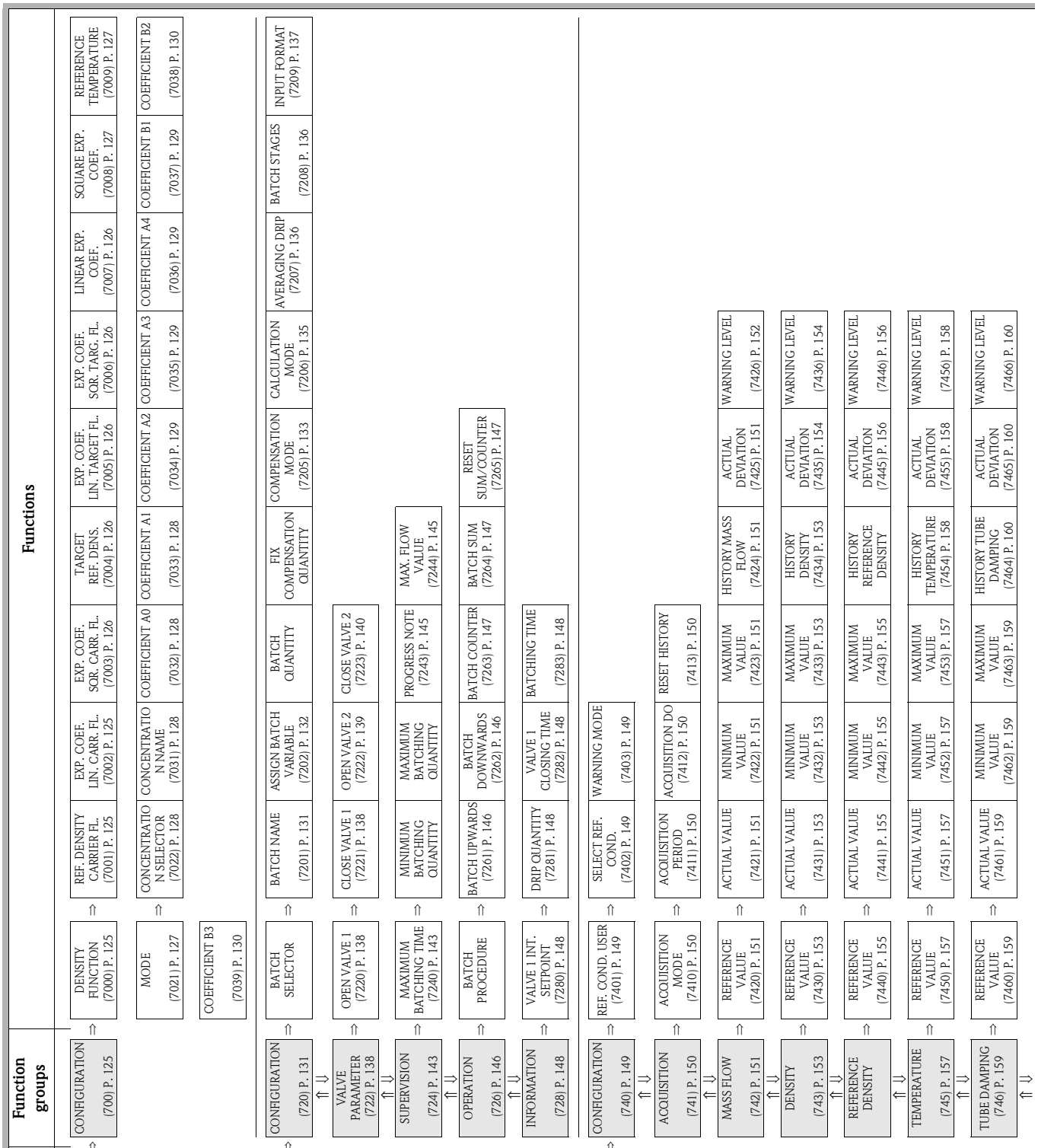
Function description BASIC FUNCTION → SENSOR DATA → DENSITY COEFFICIENT	
All density coefficients are set at the factory. All the sensor's parameter settings are saved on the S-DAT memory chip. Contact the Endress+Hauser service organization if you have any questions about these functions.	
DENSITY COEFF. C 0 **6850** MODBUS register: 7501 Data type: Float Access: 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 **6851** MODBUS register: 7503 Data type: Float Access: 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 **6852** MODBUS register: 7505 Data type: Float Access: 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 **6853** MODBUS register: 7507 Data type: Float Access: 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 **6854** MODBUS register: 7509 Data type: Float Access: 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 **6855** MODBUS register: 7511 Data type: Float Access: 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 **6860** MODBUS register: 7529 Data type: Float Access: read	The lowest fluid temperature measured appears on the display.
MAXIMAL TEMPERATURE MEASURED **6861** MODBUS register: 7531 Data type: Float Access: read	The highest fluid temperature measured appears on the display.
MINIMAL TEMPERATURE CARRIER TUBE **6862** MODBUS register: 7533 Data type: Float Access: read	✎ Note! This function is not available for the Promass E measuring device. The lowest carrier tube temperature measured appears on the display.
MAXIMAL TEMPERATURE CARRIER TUBE **6863** MODBUS register: 7535 Data type: Float Access: read	✎ Note! This function is not available for the Promass E measuring device. The highest carrier tube temperature measured appears on the display.

10 Block SPECIAL FUNCTION



Block	Groups	Function groups			Functions (continued)					
		⇑ ⇓								
		ELECTRODYNA MIC SENSORS (747) P. 161	⇒	REFERENCE VALUE (7470) P. 161	⇒	ACTUAL VALUE (7471) P. 161	MINIMUM VALUE (7472) P. 161	MAXIMUM VALUE (7473) P. 161	HISTORY EL.DYN.SENS. (7474) P. 162	ACTUAL DEVIATION (7475) P. 162	WARNING LEVEL (7476) P. 162
		⇑ ⇓									
		FREQU. FLUCTUATION (748) P. 163	⇒	REFERENCE VALUE	⇒	ACTUAL VALUE (7481) P. 163	MINIMUM VALUE (7482) P. 163	MAXIMUM VALUE (7483) P. 163	HISTORY FREQU. FLUCTUATION	ACTUAL DEVIATION	WARNING LEVEL (7486) P. 164
		⇑ ⇓									
		TUBE DAMP. FLUCT. (749) P. 165	⇒	REFERENCE VALUE	⇒	ACTUAL VALUE (7491) P. 165	MINIMUM VALUE (7492) P. 165	MAXIMUM VALUE (7493) P. 166	HISTORY TUBE DAMP FLUCT.	ACTUAL DEVIATION	WARNING LEVEL (7496) P. 166

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** MODBUS register: 2207 Data type: Integer Access: read/write	For selecting the density function which is used to calculate special density values or the percentage proportion of components in two-phase fluids. **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** MODBUS register: 2208 Data type: Float Access: read/write	✎ 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** MODBUS register: 2210 Data type: Float Access: read/write	✎ 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 **7003** MODBUS register: 2212 Data type: Float Access: read/write	✎ 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 nonlinear 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/K^2]
REFERENCE DENSITY TARGET FLUID **7004** MODBUS register: 2214 Data type: Float Access: read/write	✎ 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 **7005** MODBUS register: 2216 Data type: Float Access: read/write	✎ 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 **7006** MODBUS register: 2218 Data type: Float Access: read/write	✎ 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 nonlinear 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/K^2]
LINEAR EXPANSION COEFFICIENT **7007** MODBUS register: 2222 Data type: Float Access: read/write	✎ 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 **7008** MODBUS register: 2224 Data type: Float Access: read/write	✎ 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 nonlinear 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 [$1/K^2$]
REFERENCE TEMPERATURE **7009** MODBUS register: 2220 Data type: Float Access: read/write	✎ 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 **7021** MODBUS register: 2226 Data type: Integer Access: read/write	✎ 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 by Endress+Hauser e.g. via a coefficient calculation program and transmitted to the measuring device.

Function description SPECIAL FUNCTION → DENSITY FUNCTIONS → CONFIGURATION		
CONCENTRATION SELECTOR MODBUS register: Data type: Access:	**7022** 2291 Integer read/write	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 batching specification (CONC. # 1 to 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 MODBUS register: Data type: Access:	**7031** See Note String (8) read/write	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 MOBBUS 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 MODBUS register: Data type: Access:	**7032** See Note Float read/write	Coefficient A0 entry. **User input:** 5-digit floating-point number **Factory setting:** 0 ✎ Note for MODBUS! The MOBBUS 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 MODBUS register: Data type: Access:	**7033** See Note Float read/write	Coefficient A1 entry. **User input:** 5-digit floating-point number **Factory setting:** 0 ✎ Note for MODBUS! The MOBBUS 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 MODBUS register: Data type: Access:	**7034** See Note Float read/write	Coefficient A2 entry. **User input:** 5-digit floating-point number **Factory setting:** 0 ✎ Note for MODBUS! The MOBBUS 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
COEFFICIENT A3 MODBUS register: Data type: Access:	**7035** See Note Float read/write	Coefficient A3 entry. **User input:** 5-digit floating-point number **Factory setting:** 0 ✎ Note for MODBUS! The MOBBUS 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
COEFFICIENT A4 MODBUS register: Data type: Access:	**7036** See Note Float read/write	Coefficient A4 entry. **User input:** 5-digit floating-point number **Factory setting:** 0 ✎ Note for MODBUS! The MOBBUS 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
COEFFICIENT B1 MODBUS register: Data type: Access:	**7037** See Note Float read/write	✎ 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 MOBBUS 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

Function description SPECIAL FUNCTION → DENSITY FUNCTIONS → CONFIGURATION	
COEFFICIENT B2 **7038** MODBUS register: See Note Data type: Float Access: read/write	✎ 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 MOBBUS 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
COEFFICIENT B3 **7039** MODBUS register: See Note Data type: Float Access: read/write	✎ 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 MOBBUS 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

10.2 Group BATCHING FUNCTION

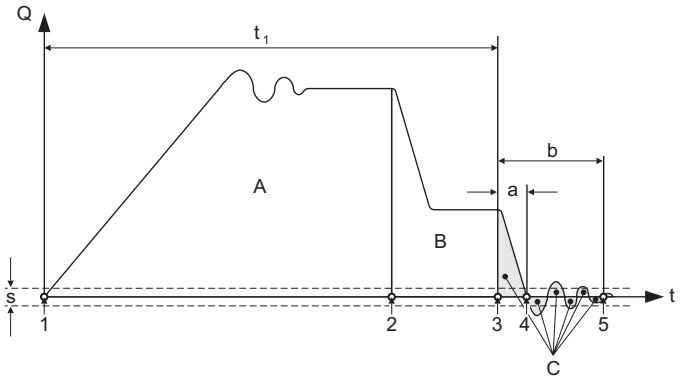
10.2.1 Function group CONFIGURATION

SPECIAL FUNCTION H → DENSITY FUNCTIONS HCA
↓
BATCHING FUNCTION HCA → CONFIGURATION 720

Function description SPECIAL FUNCTION → BATCHING FUNCTION → CONFIGURATION	
BATCH SELECTOR **7200** MODBUS register: 6301 Data type: Integer Access: read/write	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 to 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 the settings in the following functions of this function group are valid only for the batching specification selected in the function BATCH SELECTOR (7200). In other words, the entry or option is assigned to the batching specification currently selected (e.g. in the factory setting BATCH # 1).
BATCH NAME **7201** MODBUS register: See Note Data type: String (8) Access: read/write	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 MOBBUS 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 2 = MASS FLOW 5 = VOLUME FLOW 6 = CORRECTED VOLUME FLOW **Advanced selection:** with the optional SW package CONCENTRATION: 7 = TARGET MASS FLOW 8 = TARGET VOLUME FLOW 9 = TARGET CORRECTED VOLUME FLOW 10 = CARRIER MASS FLOW 11 = CARRIER VOLUME FLOW 12 = 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 MOBBUS 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 138). ✎ Note for MODBUS! The MOBBUS 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 MOBBUS 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 (see function PRESSURE SHOCK SUPPRESSION on Page 110). ✎ Note for MODBUS! The MOBBUS 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)

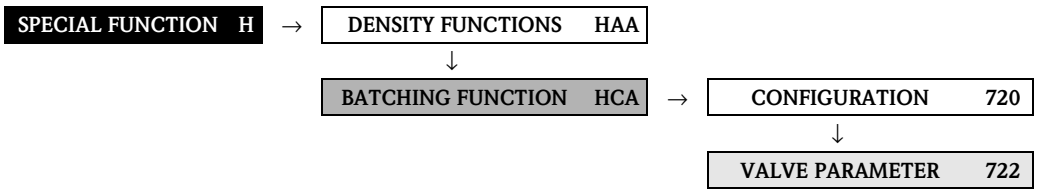
Function description SPECIAL FUNCTION → BATCHING FUNCTION → CONFIGURATION	
COMPENSATION MODE **7205** (continued)	■ Response when MODE 1 is selected: For short batchings and for batching cycles that follow on quickly from one other. Batching ends before the quantity specified in the function BATCH QUANTITY (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.  A0004711 *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** MODBUS register: See Note Data type: Integer Access: read/write	✎ 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 startup, delay correction and distort real reproducibility. By selecting “SELECT”, these “extreme values” are not taken into account. ✎ Note for MODBUS! The MOBBUS 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.

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 MOBBUS 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 to 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:** 0 = 1-stage (1 valve or 1-stage batching) 1 = 2-stage (2 valves or 2-stage batching) **Factory setting:** 1-stage (1 valve or 1-stage batching) ✎ Note! ■ The batching stage selection (number of valves) is directly dependent on the configuration of the outputs. For 2-stage batching two relay outputs must be available in the measuring device. ■ The functions available in the function group VALVE PARAMETER (Page 138) are dependent on the number of batching stages (number of valves) selected in this function. ✎ Note for MODBUS! The MOBBUS 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 MODBUS register: Offset address: Data type: Access: Storage class:	**7209** See Note See Note Integer read/write Volatile	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 138) and SUPERVISION (Page 143). ✎ Note for MODBUS! The MOBBUS register depends on the option selected in the function BATCH SELECTOR (7200): ■ BATCH # 1 = MODBUS register 6386 ■ BATCH # 2 = MODBUS register 6387 ■ BATCH # 3 = MODBUS register 6388 ■ BATCH # 4 = MODBUS register 6389 ■ BATCH # 5 = MODBUS register 6390 ■ BATCH # 6 = MODBUS register 6391

10.2.2 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 to max. value or 0 to 100% (related to the batching quantity) **Factory setting:** 0 [unit] or 0 [%] ✎ Note! ▪ Dynamic tracking for %-data: If the value is entered as a %, this %-value always refers to the batching quantity (e.g. 70% of a batching quantity of 10 liters = 7 liters). If the BATCH QUANTITY (7203) is adjusted (reduced/increased), the effective quantity switch point is automatically and dynamically adjusted (e.g. taking 70% and changing the batching quantity from 10 to 20 liters, the quantity switch point is adjusted from 7 liters to 14 liters). ▪ Dynamic tracking for value-data: If you enter value-input, this value is "absolute" for batching quantities that do not change (e.g. always 7 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 MOBBUS 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 132). 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** MODBUS register: See Note Data type: Float Access: read/write	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 to max. value or 0 to 100% (related to the batching quantity) **Factory setting:** 0 [unit] or 0 [%] ✎ Note! ■ Dynamic tracking for % data: If the value is entered as a %, this % value always refers to the batching quantity (e.g. 70% of 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 MOBBUS 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

Function description SPECIAL FUNCTION → BATCHING FUNCTION → VALVE PARAMETER		
CLOSE VALVE 2 MODBUS register: Data type: Access:	**7223** See Note Float read/write	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 MOBBUS 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.

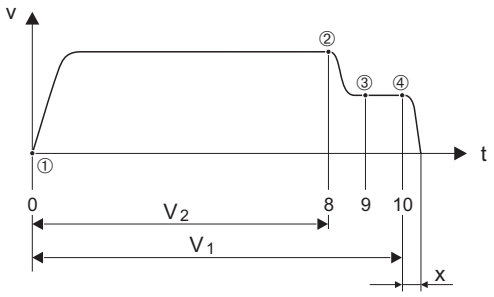


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Fig. 37 : Example 1
v = Flow velocity [m/s]
t = Time
V_1 = Valve 1 open
V_2 = Valve 2 open
① = Start batching/coarse batching, valves 1 (7220) and 2 (7222) open
② = Valve 2 (7223) closes, coarse batching quantity achieved
③ = Batching progress message ≃ 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 132 = MASS FLOW
- Enter the batching quantity:
  Function BATCH QUANTITY (7203) Page 132 = 10 [kg]
- Select the entry format:
  Function BATCH STAGES (7208) Page 136 = 2-stage
- Select the entry format:
  Function INPUT FORMAT (7209) Page 137 = VALUE-INPUT
- Quantity data for when the first valve should open:
  Function OPEN VALVE 1 (7220) Page 138 = 0 [kg]
  (valve 1 closes automatically when the batching quantity is achieved = 10 [kg], display in function CLOSE VALVE 1 (7221) Page 138)
- Quantity data for when the second valve should open:
  Function OPEN VALVE 2 (7222) Page 139 = 0 [kg]
- Quantity data for when the second valve should close:
  Function CLOSE VALVE 2 (7223) Page 140 = 8 [kg]
- Quantity data for when the message should be generated:
  Function PROGRESS NOTE (7243) Page 145 = 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 132 = 20 [kg]
- New quantity data for when the message should be generated:
  Function PROGRESS NOTE (7243) Page 145 = 18 [kg]

The following functions are **automatically** adjusted to suit the new batching quantity:
- Function OPEN VALVE 1 (7220) Page 138 = 0 [kg]
- Function OPEN VALVE 2 (7222) Page 139 = 0 [kg]
- Function CLOSE VALVE 2 (7223) Page 140 = 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.

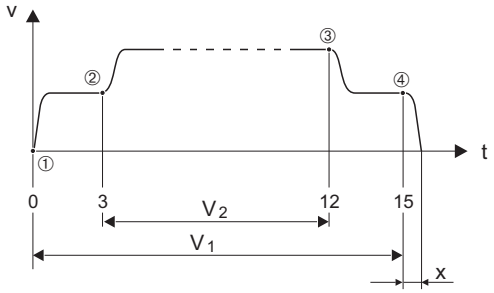

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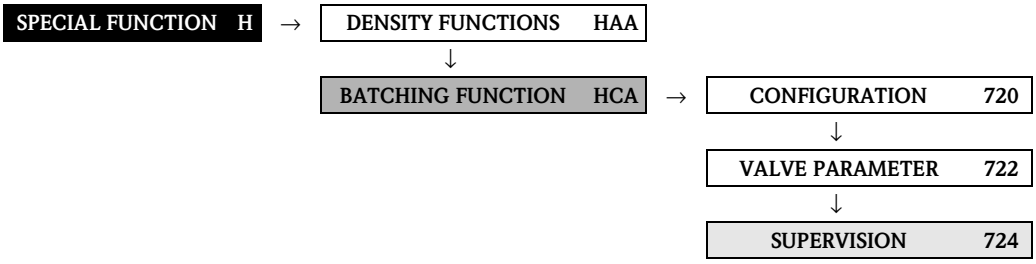
Fig. 38 : Example 2
v = Flow velocity [m/s]
t = Time
V_1 = Valve 1 open
V_2 = Valve 2 open
① = Start batching, valve 1 (7220) opens
② = Valve 2 (7222) opens, coarse batching quantity starts
③ = Valve 2 (7223) closes, coarse batching quantity achieved
④= Valve 1 (7221) closes, end of batching
x = After 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 132 = MASS FLOW
- Enter the batching quantity:
  Function BATCH QUANTITY (7203) Page 132 = 15 [kg]
- Select the entry format:
  Function BATCH STAGES (7208) Page 136 = 2-stage
- Select the entry format:
  Function INPUT FORMAT (7209) Page 137 = %-INPUT
- Percentage data for when the first valve should open:
  Function OPEN VALVE 1 (7220) Page 138 = 0 [%]
  (Valve 1 closes automatically when the batching quantity is achieved = 15 [kg], display in function CLOSE VALVE 1 (7221) Page 138)
- Percentage data for when the second valve should open:
  Function OPEN VALVE 2 (7222) Page 139 = 20 [%] corresponds to 3 kg
- Percentage data for when the second valve should close:
  Function CLOSE VALVE 2 (7223) Page 140 = 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 132 = 45 [kg]
The following functions are **automatically** adjusted to suit the new batching quantity:
- Function OPEN VALVE 1 (7220) Page 138 = 0 [%]
- Function OPEN VALVE 2 (7222) Page 139 = 20 [%] corresponds to 9 kg.
- Function CLOSE VALVE 2 (7223) Page 140 = 80 [%] corresponds to 36 kg.

10.2.4 Function group SUPERVISION

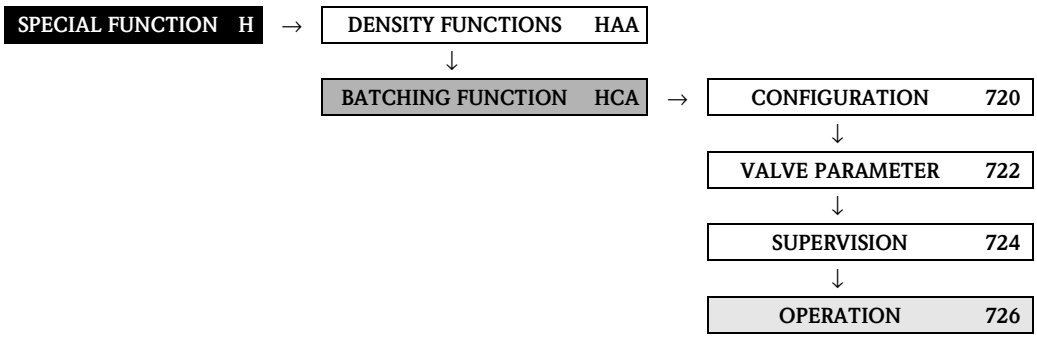


Function description SPECIAL FUNCTION → BATCHING FUNCTION → SUPERVISION	
MAXIMUM BATCHING TIME **7240** MODBUS register: See Note Data type: Float Access: read/write	For specifying a maximum batching time. All valves close once the specified batching time elapses, (see function CLOSE VALVE 1 (7221), Page 138 and CLOSE VALVE 2 (7223), Page 140). This function can be used for safety reasons, for example, to ensure all batching valves close in the event of a system fault. **User input:** 0 to 30000 s **Factory setting:** 0 s (= deactivated) ☝ Caution! ■ When the batching quantity is adjusted (reduced/increased), (see function BATCH QUANTITY (7203) on Page 132) there is no automatic adjustment, i.e. this value must be determined again and reentered, (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 **7241** MODBUS register: See Note Data type: Float Access: 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 to max. value or 0 to 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 132) there is no automatic adjustment, i.e. this value must be determined again and reentered, (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 to 2 x max. value or 0 to 200% (related to the batching quantity) **Factory setting:** 0 [unit] (= deactivated) Caution! ■ When the batching quantity is adjusted (reduced/increased), (see function BATCH QUANTITY (7203) on Page 132) there is no automatic adjustment, i.e. this value must be determined again and reentered, (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 MODBUS register: Data type: Access:	**7243** See Note Float read/write	For specifying the batching quantity at which a message should be generated. When the specified batching quantity is achieved, the message is generated and signaled via the output. The quantity value is entered as a % or as an absolute value, depending on the option in the function INPUT FORMAT (7209). **Application:**For longer batching processes when preparing or taking measures related to production (e.g. preparing to replace container, etc.). **User input:** 0 to max. value or 0 to 100% (related to the batching quantity) **Factory setting:** 0 [unit] (= deactivated) ☝ Caution! When the batching quantity is adjusted (reduced/increased), (see function BATCH QUANTITY (7203) on Page 132), there is no automatic adjustment, i.e. this value must be determined again and reentered, (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 MODBUS register: Data type: Access:	**7244** See Note Float read/write	For specifying a maximum flow value. The batching process is aborted and all the valves are closed if the specified flow value is overshot. **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 overshot, the parameter BATCH COUNTER (7263) is not incremented. ■ The error message #474 > MAX. FLOW is output if the maximum flow is overshot. 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 8111 ■ BATCH # 2 = MODBUS register 8113 ■ BATCH # 3 = MODBUS register 8115 ■ BATCH # 4 = MODBUS register 8117 ■ BATCH # 5 = MODBUS register 8119 ■ BATCH # 6 = MODBUS register 8121

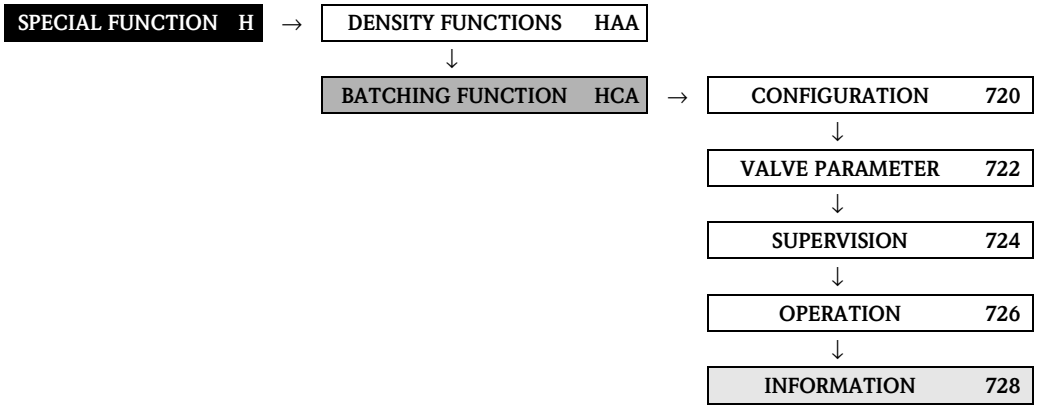
10.2.5 Function group OPERATION



Function description SPECIAL FUNCTION → BATCHING FUNCTION → OPERATION	
BATCH PROCEDURE **7260** MODBUS register: 6392 Data type: Integer Access: 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 error message # 471, # 472, # 473, # 474) **Factory setting:** STOP ✎ Note! ■ This function can also be controlled via the status input, (see function ASSIGN STATUS INPUT (5000) on Page 103). ■ If the information line has been assigned to BATCHING MENU (see Page 47), the application-specific functions of the minus key (START-STOP) and the plus key (HOLD / GO ON / PRESET) are defined locally. In this way, a direct batching control station is available locally at the measuring device by means of the user interface (not access-protected). ■ In the event of a fault: – during the batching process, the batching is canceled (STOP) and the local display alternates between displaying the batching menu and the fault message. ■ If the positive zero return is activated: – during the batching process, the batching is canceled (STOP). – during a pause in the batching (option HOLD), the batching cannot be restarted, (see also notice messages # 571 and # 572 in the Operating Instructions BA107D, “Troubleshooting” section).
BATCH UPWARDS **7261** MODBUS register: 6393 Data type: Float Access: 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 or until the quantity specified in the BATCH QUANTITY function (7203) is achieved. **Display:**Floating-point number incl. unit ✎ Note! The value of this function can be output via the current output.
BATCH DOWNWARDS **7262** MODBUS register: 6395 Data type: Float Access: read	In this function the batching progress can be read downwards, i.e. **starting from the batching quantity, (BATCH QUANTITY (7203))** the quantity displayed decreases until the batching process is complete. **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 MODBUS register: Data type: Access:	**7263** 6397 Float read	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).
BATCH SUM MODBUS register: Data type: Access:	**7264** 6399 Float read	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).
RESET SUM/COUNTER MODBUS register: Data type: Access:	**7265** 6401 Integer read/write	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) .

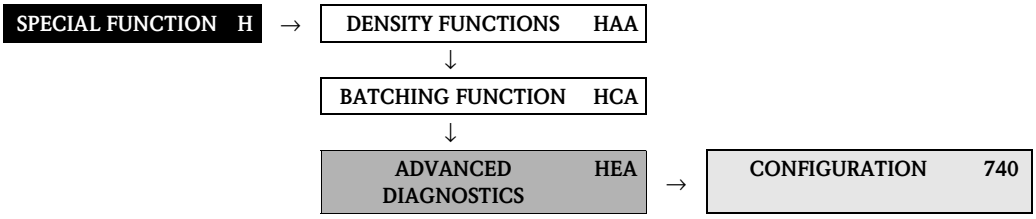
10.2.6 Function group INFORMATION



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 (see function CLOSE VALVE 1 on Page 138). 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 optimize the internal switch point of valve 1. **User input:** max. 7-digit floating-point number [unit] ✎ Note! ▪ If an after run quantity is specified in this function, it is only used for the first batching process. The device uses the after run quantity calculated internally as of the second batching process. ▪ 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! ▪ Behavior when controlling the batching process by means of the BATCH PROCEDURE function: – STOP → BATCHING TIME is not reset and remains at the current value. – START → BATCHING TIME is reset and starts at 0. – HOLD → BATCHING TIME is not reset and remains at the current value. – GO ON → BATCHING TIME is not reset and continues updating based on the last time value. ▪ The BATCHING TIME is also updated during the batching process

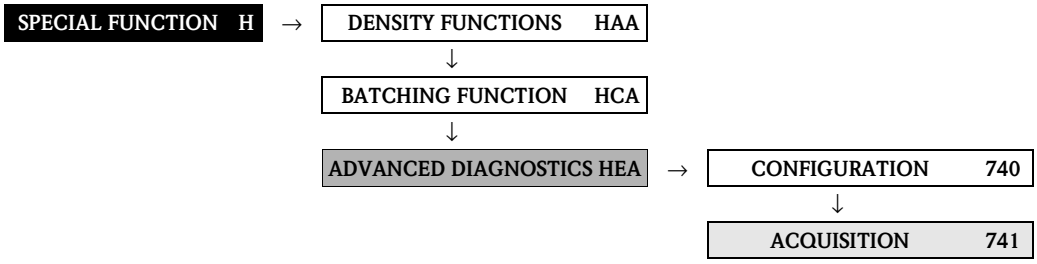
10.3 Group ADVANCED DIAGNOSTICS

10.3.1 Function group CONFIGURATION



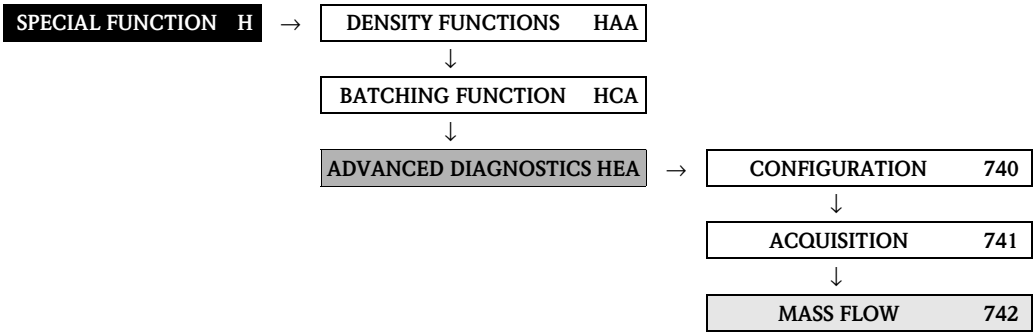
Function description SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → CONFIGURATION	
REFERENCE CONDITION USER **7401** MODBUS register: 6707 Data type: Integer Access: read/write	Use this function to start determining the user reference status. The following values are determined: ■ MASS FLOW ■ DENSITY ■ REFERENCE DENSITY ■ TEMPERATURE ■ TUBE DAMPING ■ ELECTRODYNAMIC SENSORS ■ OPERATING FREQUENCY FLUCTUATION ■ TUBE DAMPING FLUCTUATION **Options:** 0 = CANCEL 1 = START **Factory setting:** CANCEL
SELECT REFERENCE CONDITION **7402** MODBUS register: 6708 Data type: Integer Access: read/write	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 150). **Options:** 0 = FACTORY 1 = USER **Factory setting:** FACTORY
WARNING MODE **7403** MODBUS register: 6709 Data type: Integer Access: read/write	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: ■ MASS FLOW (7421) ■ DENSITY (7431) ■ REFERENCE DENSITY (7441) ■ TEMPERATURE (7451) ■ TUBE DAMPING (7461) ■ ELECTRODYNAMIC SENSORS (7471) ■ OPERATING FREQUENCY FLUCTUATION (7481) ■ TUBE DAMPING FLUCTUATION (7491) **Options:** 0 = OFF 1 = ON **Factory setting:** OFF

10.3.2 Function group ACQUISITION



Function description SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → ACQUISITION	
ACQUISITION MODE **7410** MODBUS register: 6710 Data type: Integer Access: read/write	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 **7411** MODBUS register: 6501 Data type: Float Access: read/write	✎ 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 to 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 **7412** MODBUS register: 6711 Data type: Integer Access: read/write	✎ 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 **7413** MODBUS register: 6712 Data type: Integer Access: read/write	Use this function to delete all history values. **User input:** 0 = NO 1 = YES **Factory setting:** NO

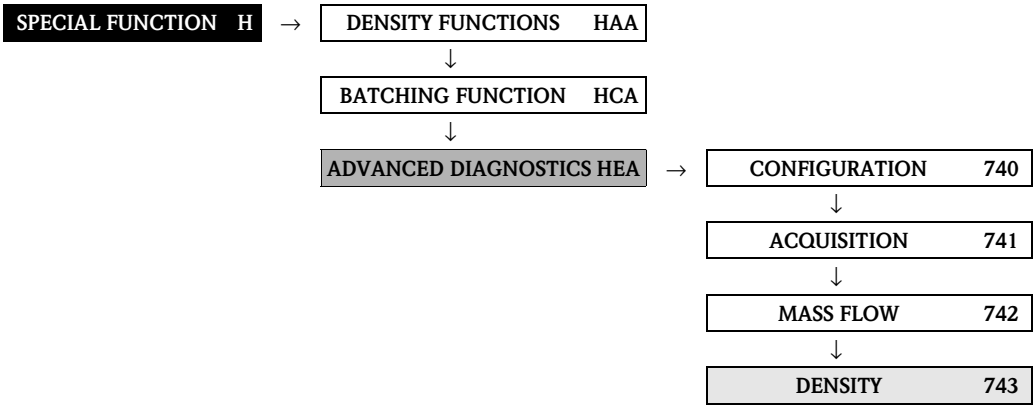
10.3.3 Function group MASS FLOW



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 option selected in the function SELECT REFERENCE CONDITION: ■ Option = FACTORY → MODBUS register = 6503 ■ Option = USER → MODBUS register = 6505
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	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 MOBBUS 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 149, 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** MODBUS register: 6533 Data type: Float Access: 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 mass flow. A notice message is generated if the limit value is exceeded. **User input:** 0 to 99999 [Mass flow unit] **Factory setting:** 90000 kg/h

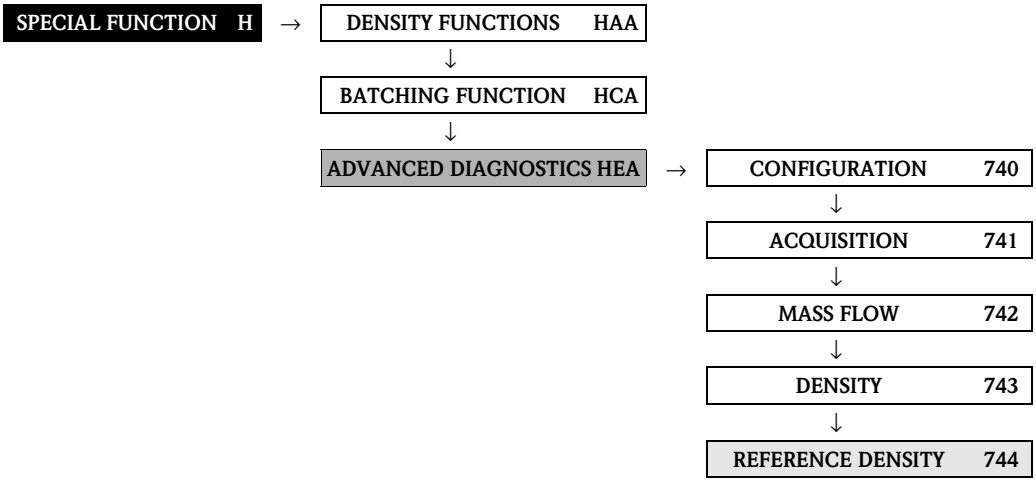
10.3.4 Function group DENSITY



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 option selected 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	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 MOBBUS 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 149, 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 to 99999 [%] **Factory setting:** 100%
MODBUS register: Data type: Access:	6567 Float read/write	

10.3.5 Function group REFERENCE DENSITY



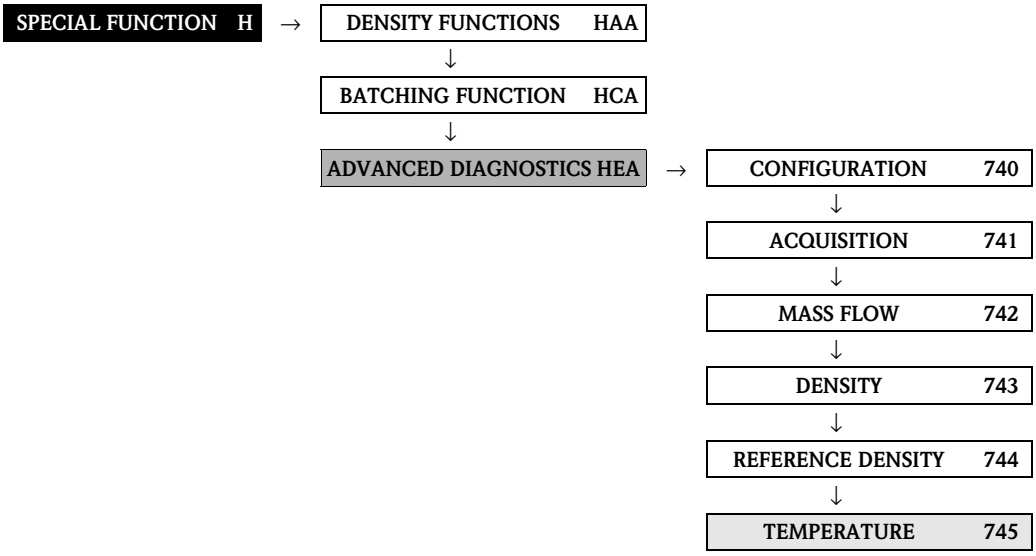
Function description
SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → REFERENCE DENSITY

✎ 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 option selected 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

Function description SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → REFERENCE DENSITY		
HISTORY REFERENCE DENSITY MODBUS register: Data type: Access:	**7444** See Note Float read	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 MOBBUS 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
ACTUAL DEVIATION MODBUS register: Data type: Access:	**7445** 6603 Float read	This function displays the deviation between the measured reference density and the reference values (FACTORY or USER), seePage 149, selected in the function SELECT REFERENCE CONDITION (7402). **Display:** 5-digit floating-point number, including units
WARNING LEVEL MODBUS register: Data type: Access:	**7446** 6601 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 reference density. A notice message is generated if the limit value is exceeded. **User input:** 0 to 99999 [%] **Factory setting:** 100%

10.3.6 Function group TEMPERATURE



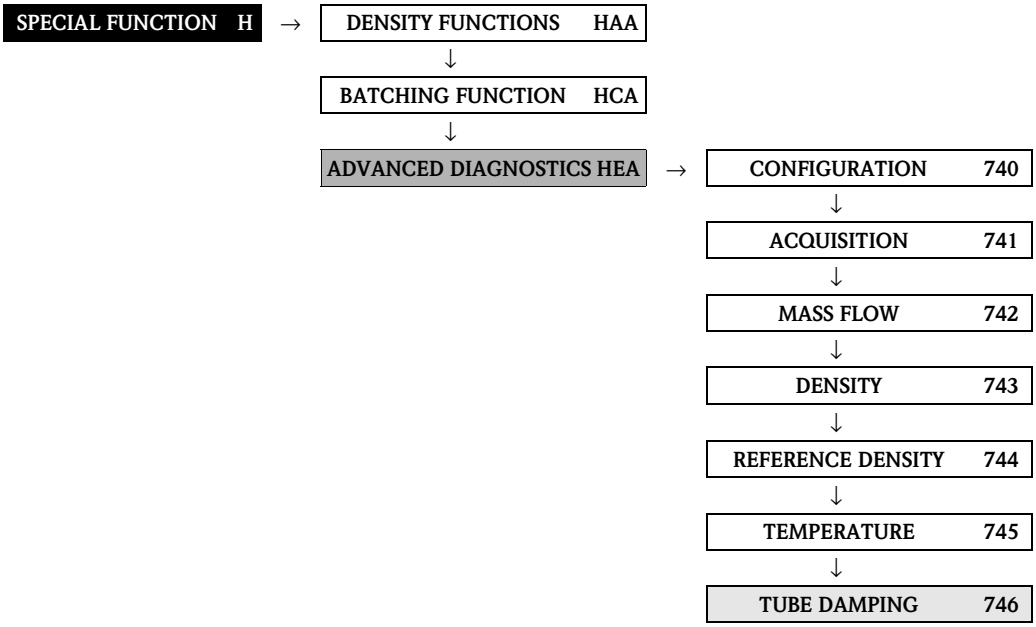
Function description
SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → TEMPERATURE

✎ 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 option selected 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	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 MOBBUS 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 149, 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 to 99999 [°C] **Factory setting:** 100 °C

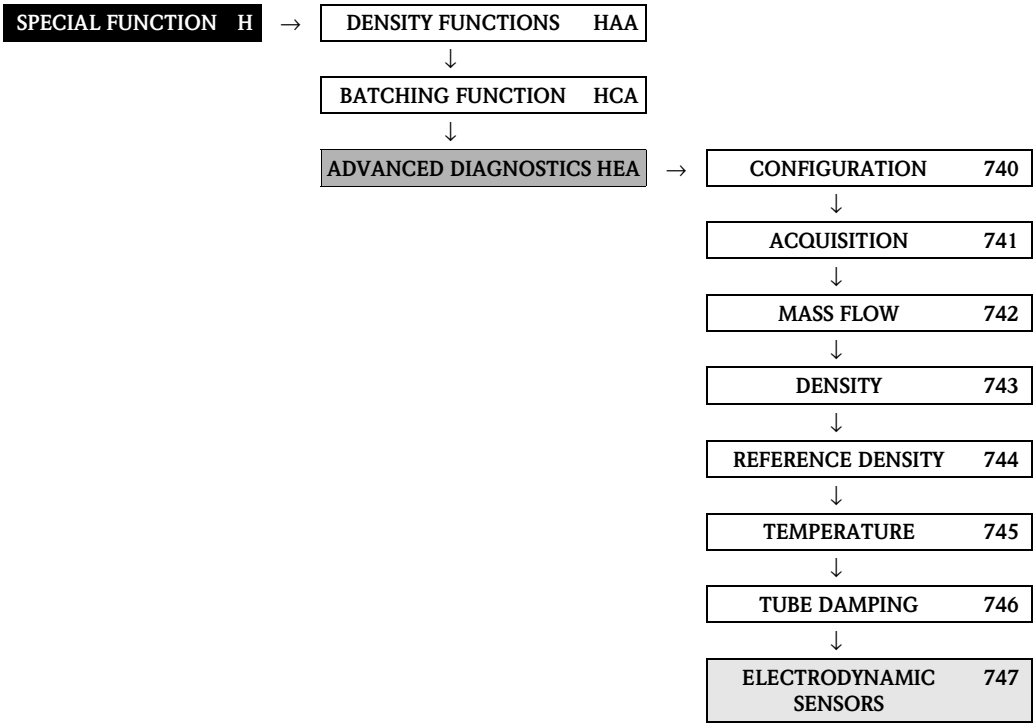
10.3.7 Function group TUBE DAMPING



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

Function description SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → TUBE DAMPING		
HISTORY TUBE DAMPING	**7464**	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 MOBBUS 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
MODBUS register: Data type: Access:	See Note Float read	
ACTUAL DEVIATION	**7465**	This function displays the deviation between the measured tube damping and the reference values (FACTORY or USER), see Page 149, selected in the function SELECT REFERENCE CONDITION (7402). **Display:** 5-digit floating-point number
MODBUS register: Data type: Access:	6671 Float read	
WARNING LEVEL	**7466**	✎ 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 to 99999 [%] **Factory setting:** 1000%
MODBUS register: Data type: Access:	6669 Float read/write	

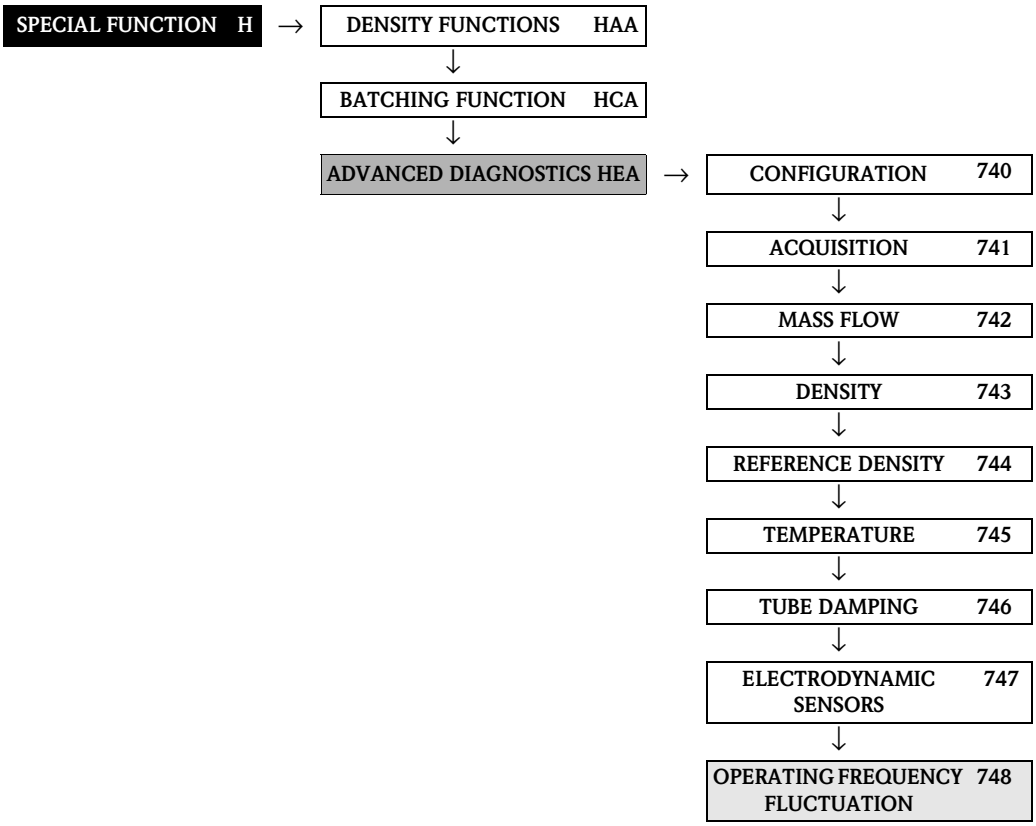
10.3.8 Function group ELECTRODYNAMIC SENSORS



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 option selected 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** MODBUS register: See Note Data type: Float Access: read	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 MOBBUS 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** MODBUS register: 6705 Data type: Float Access: read	This function displays the deviation between the measuring values for the electrodynamic sensors and the reference values (FACTORY or USER), see Page 149, selected in the function SELECT REFERENCE CONDITION (7402) is displayed. **Display:** 5-digit floating-point number
WARNING LEVEL **7476** MODBUS register: 6703 Data type: Float Access: 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 electrodynamic sensors. A notice message is generated if the limit value is exceeded. **User input:** 0 to 99999 [%] **Factory setting:** 100%

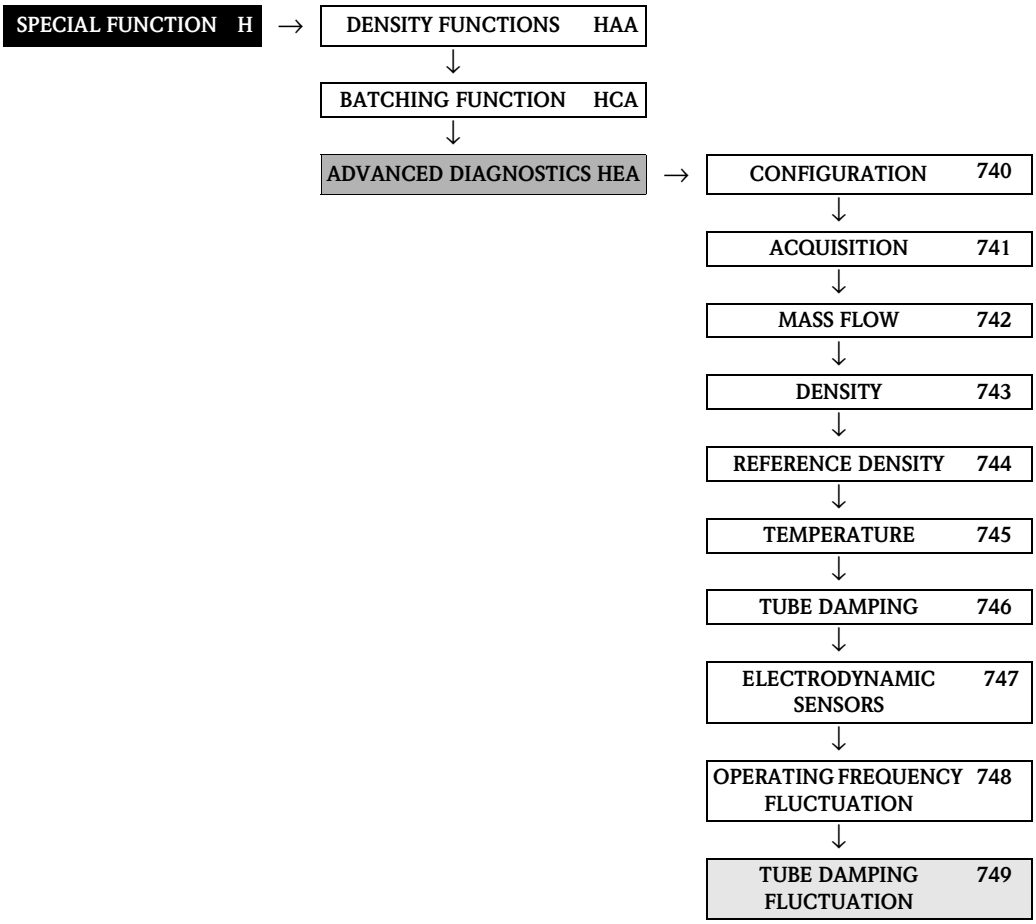
10.3.9 Function group OPERATING FREQUENCY FLUCTUATION



Function description SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → FREQU. FLUCTUATION	
REFERENCE VALUE 7480 MODBUS register: See Note Data type: Float Access: read	The reference value for the fluctuation of the operating frequency appears on the display. **User interface:** 5-digit floating-point number, Hz ✎ Note for MODBUS! Depends on the option selected in the function SELECT REFERENCE CONDITION: ■ Option = FACTORY → MODBUS register = 6713 ■ Option = USER → MODBUS register = 6715
ACTUAL VALUE 7481 MODBUS register: 6717 Data type: Float Access: read	The measured fluctuation in the operating frequency appears on the display. **User interface:** 5-digit floating-point number, Hz
MINIMUM VALUE 7482 MODBUS register: 6719 Data type: Float Access: read	The lowest value of the operating frequency fluctuation since the saved values were last reset appears on the display. **User interface:** 5-digit floating-point number, Hz
MAXIMUM VALUE 7483 MODBUS register: 6721 Data type: Float Access: read	The highest value of the operating frequency fluctuation since the saved values were last reset appears on the display. **User interface:** 5-digit floating-point number, Hz

Function description SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → FREQU. FLUCTUATION		
HISTORY OPERATING FREQUENCY FLUCTUATION MODBUS register: Data type: Access:	**7484** See Note Float read	The last ten values of the operating frequency fluctuation since the saved values were last reset appear on the display. **User interface:** 5-digit floating-point number, Hz ✎ Note for MODBUS! The various histories are available via the following MOBBUS registers: ■ History 1 = MODBUS register 6723 ■ History 2 = MODBUS register 6725 ■ History 3 = MODBUS register 6727 ■ History 4 = MODBUS register 6729 ■ History 5 = MODBUS register 6731 ■ History 6 = MODBUS register 6733 ■ History 7 = MODBUS register 6735 ■ History 8 = MODBUS register 6737 ■ History 9 = MODBUS register 6739 ■ History 10 = MODBUS register 6741
ACTUAL DEVIATION MODBUS register: Data type: Access:	**7485** 6745 Float read	This function displays the deviation between the measured fluctuation in operating frequency and the reference values (FACTORY or USER) selected in the SELECT REF. COND. (7402) function, see Page 149. **User interface:** 5-digit floating-point number, Hz
WARNING LEVEL MODBUS register: Data type: Access:	**7486** 6743 Float read/write	✎ Note! This function is not available unless the ON setting was selected in the WARNING MODE function (7403). Use this function to specify a limit value for the fluctuation of the operating frequency. A notice message is generated if the limit value is exceeded. **Input:** 0 to 99999 Hz **Factory setting:** 1000 Hz

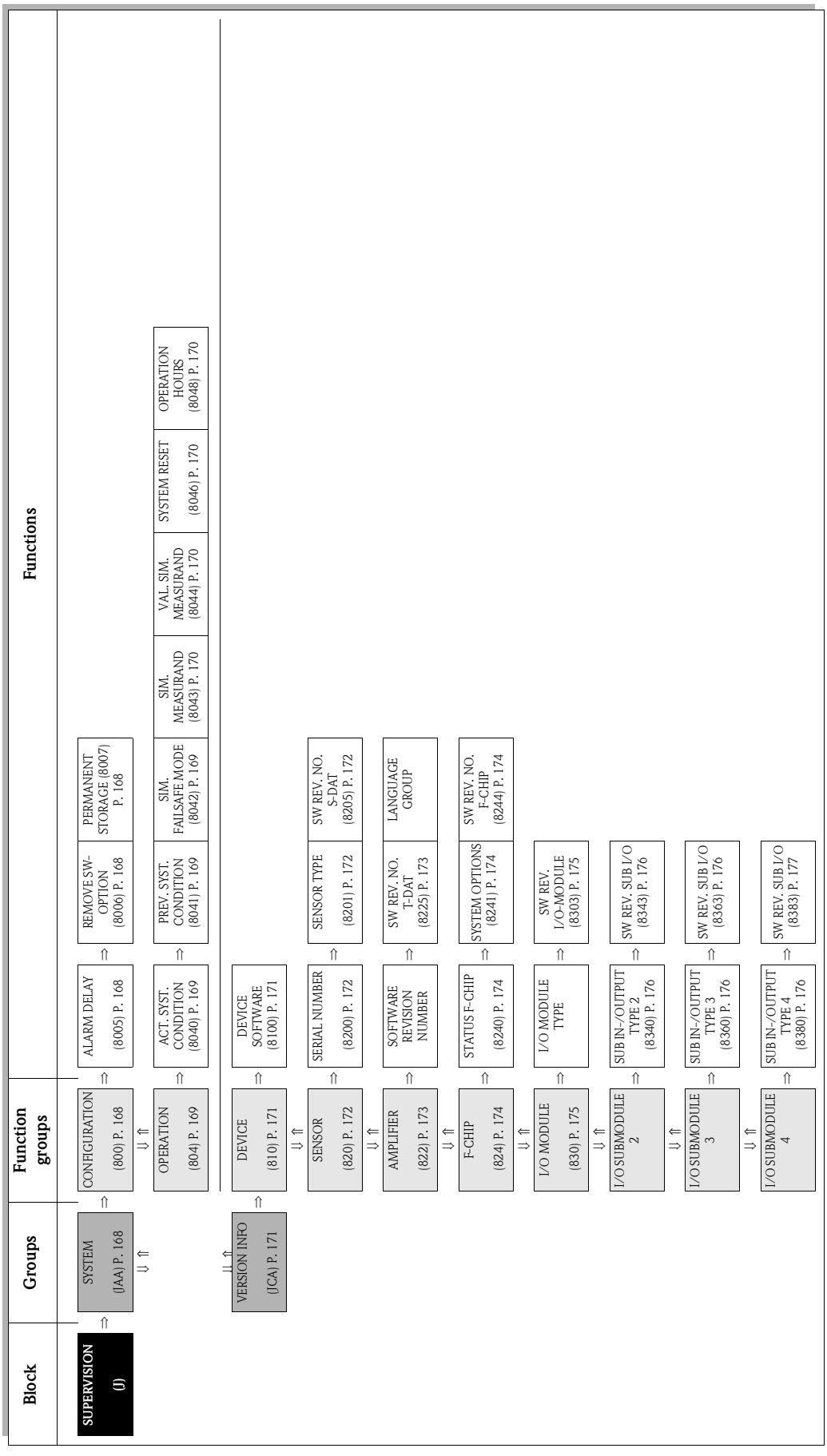
10.3.10 Function group TUBE DAMPING FLUCTUATION



Function description SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → TUBE DAMP. FLUCT.	
REFERENCE VALUE 7490 MODBUS register: See Note Data type: Float Access: read	The reference value for the fluctuation of the tube damping appears on the display. **User interface:** 5-digit floating-point number ✎ Note for MODBUS! Depends on the option selected in the function SELECT REFERENCE CONDITION: ■ Option = FACTORY → MODBUS register = 6747 ■ Option = USER → MODBUS register = 6749
ACTUAL VALUE 7491 MODBUS register: 6751 Data type: Float Access: read	The measured fluctuation of the tube damping appears on the display. **User interface:** 5-digit floating-point number
MINIMUM VALUE 7492 MODBUS register: 6753 Data type: Float Access: read	The lowest value of the tube damping fluctuation since the saved values were last reset appears on the display. **User interface:** 5-digit floating-point number

Function description SPECIAL FUNCTION → ADVANCED DIAGNOSTICS → TUBE DAMP. FLUCT.	
MAXIMUM VALUE **7493** MODBUS register: 6755 Data type: Float Access: read	The highest value of the tube damping fluctuation since the saved values were last reset appears on the display. **User interface:** 5-digit floating-point number
HISTORY TUBE DAMPING FLUCTUATION **7494** MODBUS register: See Note Data type: Float Access: read	The last ten values of the tube damping fluctuation since the saved values were last reset appear on the display. **User interface:** 5-digit floating-point number ✎ Note for MODBUS! The various histories are available via the following MOBBUS registers: ■ History 1 = MODBUS register 6757 ■ History 2 = MODBUS register 6759 ■ History 3 = MODBUS register 6761 ■ History 4 = MODBUS register 6763 ■ History 5 = MODBUS register 6765 ■ History 6 = MODBUS register 6767 ■ History 7 = MODBUS register 6769 ■ History 8 = MODBUS register 6771 ■ History 9 = MODBUS register 6773 ■ History 10 = MODBUS register 6775
ACTUAL DEVIATION **7495** MODBUS register: 6779 Data type: Float Access: read	This function displays the deviation between the measured fluctuation of tube damping and the reference values (FACTORY or USER) selected in the function SELECT REF. COND. (7402), see Page 149. **User interface:** 5-digit floating-point number
WARNING LEVEL **7496** MODBUS register: 6777 Data type: Float Access: read	✎ Note! This function is not available unless the ON setting was selected in the WARNING MODE function (7403). Use this function to specify a limit value for the fluctuation of the tube damping. A notice message is generated if the limit value is exceeded. **Input:** 0 to 99999 **Factory setting:** 1000

11 Block SUPERVISION



11.1 Group SYSTEM

11.1.1 Function group CONFIGURATION

SUPERVISION J → SYSTEM JAA → CONFIGURATION 800

Function description SUPERVISION → SYSTEM → CONFIGURATION	
ALARM DELAY **8005** MODBUS register: 6808 Data type: Float Access: read/write	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. This suppression acts on: ■ Display ■ Current output ■ Frequency output ■ Relay output ■ MODBUS RS485 **User input:** 0 to 100 s (in steps of one second) **Factory setting:** 0 s ☝ Caution! If this function is activated, fault and notice messages are delayed by the time corresponding to the setting before being transmitted to the higher-order controller (process controller, etc.). It is therefore imperative to check in advance in order to make sure whether a delay of this nature could affect the safety requirements of the process. If fault and notice messages may not be suppressed, a value of 0 seconds must be entered here.
REMOVE SW OPTION **8006** MODBUS register: 6876 Data type: Integer Access: read/write	✎ 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.
PERMANENT STORAGE **8007** MODBUS register: 6907 Data type: Integer Access: read	Displays whether permanent saving of all the parameters in the EEPROM is switched on or off. **User interface:** 0 = OFF 1 = ON **Factory setting:** ON ☝ Caution! ■ This function can only be configured via the MODBUS protocol. ■ If the “OFF” option is selected, all the subsequent parameter changes are not stored permanently to the EEPROM. This means, in particular, that these changes are not available after a power failure. The device then starts with the last parameter configuration saved in the EEPROM.

11.1.2 Function group OPERATION

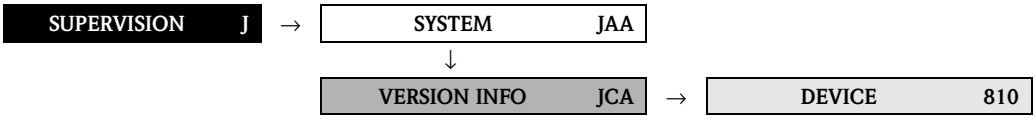
SUPERVISION J → SYSTEM JAA → CONFIGURATION 800
↓
OPERATION 804

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 CONDITIONS **8041** MODBUS register: See Note Data type: Integer Access: read	Use this function to view the sixteen most recent fault and notice messages since measuring last started. **Display:** The 16 most recent fault or notice messages. ✎ Note for MODBUS! The various previous system conditions are available via the following MOBBUS registers (data MODBUS register Integer/String): ■ Fault/notice message 1 = MODBUS register 6860 ■ Fault/notice message 2 = MODBUS register 6861 ■ Fault/notice message 3 = MODBUS register 6862 ■ Fault/notice message 4 = MODBUS register 6863 ■ Fault/notice message 5 = MODBUS register 6864 ■ Fault/notice message 6 = MODBUS register 6865 ■ Fault/notice message 7 = MODBUS register 6866 ■ Fault/notice message 8 = MODBUS register 6867 ■ Fault/notice message 9 = MODBUS register 6868 ■ Fault/notice message 10 = MODBUS register 6869 ■ Fault/notice message 11 = MODBUS register 6870 ■ Fault/notice message 12 = MODBUS register 6871 ■ Fault/notice message 13 = MODBUS register 6872 ■ Fault/notice message 14 = MODBUS register 6873 ■ Fault/notice message 15 = MODBUS register 6874 ■ Fault/notice message 16 = MODBUS register 6875 ✎ Note! More information can be found in Operating Instructions 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 **8043** MODBUS register: 6813 Data type: Integer Access: read/write	Use this function to set all inputs, outputs and totalizers to their defined flow-response modes, in order to check whether they respond correctly. During this time, the message "SIMULATION MEASURAND" appears on the display. **Options:** 0 = OFF 1 = 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 **8044** MODBUS register: 6814 Data type: Float Access: read/write	✎ Note! The function is not visible unless the function SIMULATION MEASURAND (8043) is active. For entering a freely selectable value (e.g. 12 m^3/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 **8046** MODBUS register: 6817 Data type: Integer Access: read/write	Use this function to perform a reset of the measuring system. **Options:** 0 = NO 1 = RESTART SYSTEM (restart without interrupting power supply) **Factory setting:** NO
OPERATION HOURS **8048** MODBUS register: 6810 Data type: Float Access: read	The hours of operation of the device appear on the display. **Display:** depends on the number of hours of operation elapsed ■ Hours of operation < 10 hours → display format = 0:00:00 (hr:min:sec) ■ Hours of operation 10 to 10,000 hours → display format = 0000:00 (hr:min) ■ Hours of operation > 10,000 hours → display format = 000000 (hr)

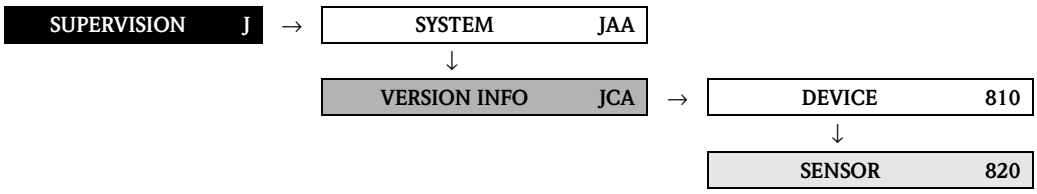
11.2 Group VERSION INFO

11.2.1 Function group DEVICE



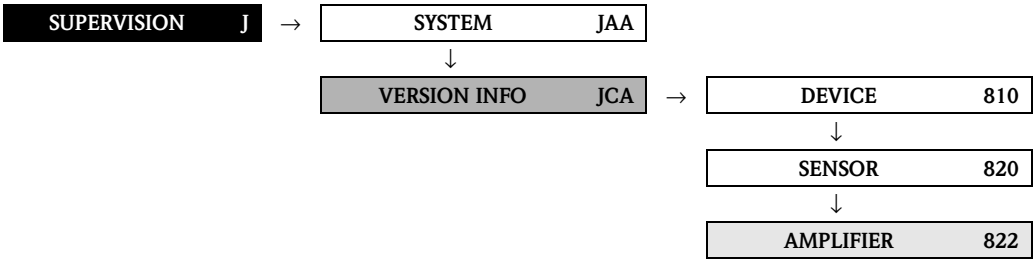
Function description SUPERVISION → VERSION INFO → DEVICE	
DEVICE SOFTWARE **8100** MODBUS register: 7277 Data type: String (16) Access: read	Displays the current device software version.

11.2.2 Function group SENSOR



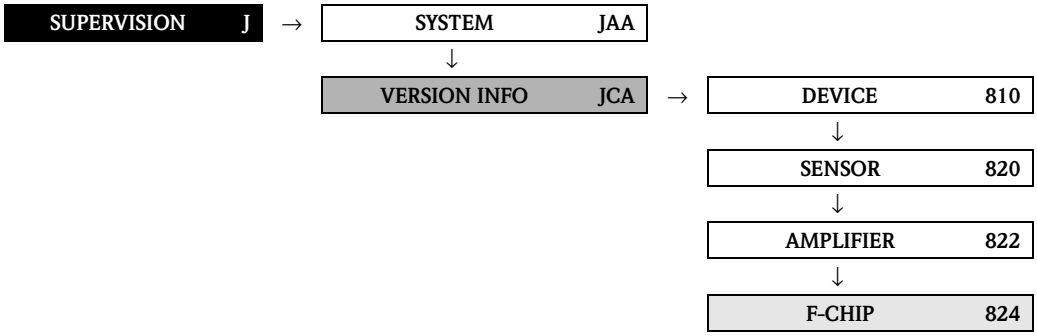
Function description SUPERVISION → VERSION INFO → SENSOR		
SERIAL NUMBER	**8200**	Use this function to view the serial number of the sensor.
MODBUS register: Data type: Access:	7003 String (16) read	
SENSOR TYPE	**8201**	Use this function to view the sensor type (e.g. Promass F).
MODBUS register: Data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

11.2.3 Function group AMPLIFIER



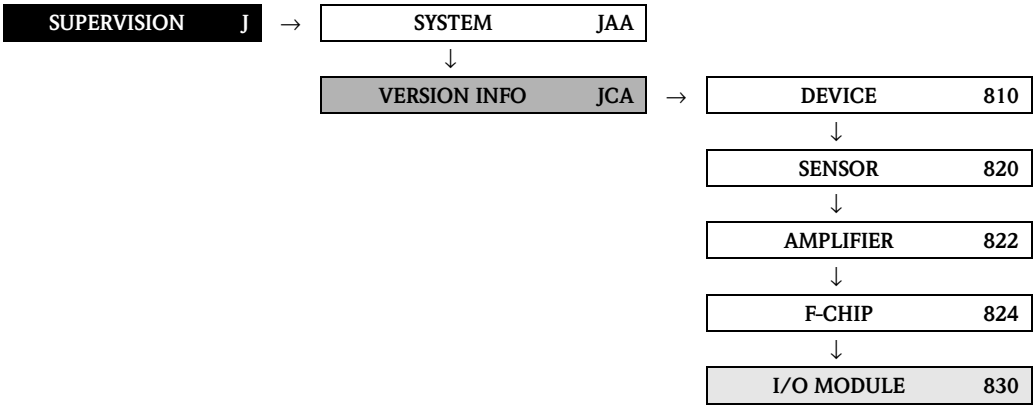
Function description SUPERVISION → VERSION INFO → AMPLIFIER	
SOFTWARE REVISION NUMBER AMPLIFIER **8222** MODBUS register: 7039 Data type: String (16) Access: read	Use this function to view the software revision number of the amplifier.
SOFTWARE REVISION NUMBER T-DAT **8225** MODBUS register: 7048 Data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

11.2.4 Function group F-CHIP



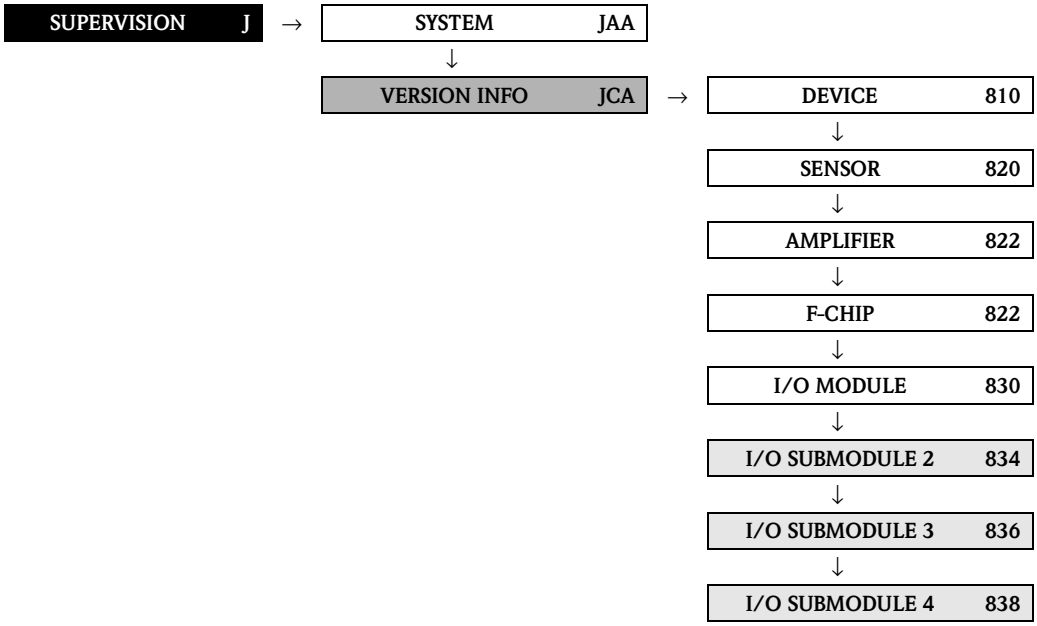
Function description SUPERVISION → VERSION INFO → F-CHIP	
STATUS F-CHIP **8240** MODBUS register: 7057 Data type: Integer Access: read	Use this function to check whether an F-CHIP is installed and which software options are available. **Display:** 0 = NO F-CHIP HW 1 = F-CHIP OK 2 = DEMONSTRATION 3 = SERVICE&ANALYSIS 4 = P-TYPE F-CHIP 5 = TYPE UNKNOWN 6 = SER. NUM. WRONG 7 = FAILURE 8 = CRITICAL FAIL. 9 = DEVICE ID
SYSTEM OPTIONS **8241** MODBUS register: 7058 Data type: Integer Access: read	✎ Note! 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 4 = DENSITY FUNCTION 5 = BATCH FUNCTION 6 = ADV. DIAGNOSTIC 7 = VISCOSITY
SW REV. NO. 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**	Displays the configuration of the I/O module. **Display:** 12 = MODBUS RS485
MODBUS register: Data type: Access:	7086 Integer read	
SW REV. NO. I/O MODULE	**8303**	Use this function to view the software revision number of the I/O module.
MODBUS register: Data type: Access:	7078 String (18) read	

11.2.6 Function groups I/O SUBMODULE 2 to 4



Function description SUPERVISION → VERSION INFO → I/O SUBMODULE 2 to 4		
SUB IN-/OUTPUT TYPE 2	**8340**	Displays the configuration of the I/O submodule. **Display:** 7 = STATUS INPUT
MODBUS register: Data type: Access:	7106 Integer read	
SOFTWARE REVISION NUMBER SUB IN-/OUTPUT TYPE 2	**8343**	Use this function to view the software revision number of the corresponding submodule.
MODBUS register: Data type: Access:	7190 String (18) read	
SUB IN-/OUTPUT TYPE 3	**8360**	Displays the configuration of the I/O submodule. **Display:** 0 = TYPE UNKNOWN 5 = PULS/FREQ. OUT. 6 = STATUS/REL. OUT
MODBUS register: Data type: Access:	7107 Integer read	
SOFTWARE REVISION NUMBER SUB IN-/OUTPUT TYPE 3	**8363**	Use this function to view the software revision number of the corresponding submodule.
MODBUS register: Data type: Access:	7199 String (18) read	
SUB IN-/OUTPUT TYPE 4	**8380**	Displays the configuration of the I/O submodule. **Display:** 0 = TYPE UNKNOWN 4 = CURRENT OUTPUT 6 = STATUS/REL. OUT
MODBUS register: Data type: Access:	7108 Integer read	

Function description SUPERVISION → VERSION INFO → I/O SUBMODULE 2 to 4	
SOFTWARE REVISION NUMBER SUB IN-/OUTPUT TYPE 44 **8383** MODBUS register: 7199 Data type: String (18) Access: read	Use this function to view the software revision number of the corresponding submodule.

12 Factory settings

12.1 SI units (not for USA and Canada)

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

Nominal diam. [mm]	Low flow cut off (approx. v = 0.04 m/s)		Full scale value (approx. v = 2.0 m/s)		Pulse value (approx. 2 pulse/s at 2.0 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
50 FB	720.00	kg/h	36000	kg/h	10.000	kg/h
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, 50 “FB” = Full bore versions of Promass I						

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

Nom. diameter [mm]	Low flow cut off (approx. v = 0.01 m/s)		Full scale value (approx. v = 2 m/s)		Pulse value (approx. 2 pulse/s at 2 m/s)	
1	0.02	kg/h	4	kg/h	0.001	kg/p
2	0.10	kg/h	20	kg/h	0.010	kg/p
4	0.45	kg/h	90	kg/h	0.010	kg/p
8	2.00	kg/h	400	kg/h	0.100	kg/p
15	6.50	kg/h	1300	kg/h	0.100	kg/p
15 FB	18.00	kg/h	3600	kg/h	1.000	kg/p
25	18.00	kg/h	3600	kg/h	1.000	kg/p
25 FB	45.00	kg/h	9000	kg/h	1.000	kg/p
40	45.00	kg/h	9000	kg/h	1.000	kg/p
40 FB	75.00	kg/h	15000	kg/h	10.000	kg/p
50	75.00	kg/h	15000	kg/h	10.000	kg/p
50 FB	180.00	kg/h	36000	kg/h	10.000	kg/p
80	180.00	kg/h	36000	kg/h	10.000	kg/p
100	300.00	kg/h	60000	kg/h	10.000	kg/p
150	650.00	kg/h	130000	kg/h	100.000	kg/p
250	1800.00	kg/h	360000	kg/h	100.000	kg/p
DN 15, 25, 40, 50 “FB” = Full bore versions Promass I						

12.1.3 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		

12.1.4 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 – Liquid

Nominal diam. [mm]	Low flow cut off (approx. v = 0.04 m/s)		Full scale value (approx. v = 2.0 m/s)		Pulse value (approx. 2 pulse/s at 2.0 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
50 FB	26.000	lb/min	1300.00	lb/min	20.000	lb/min
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, 50 “FB” = Full bore versions of Promass I						

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

Nominal diameter [mm]	Low flow cut off (approx. v = 0.01 m/s)		Full scale value (approx. v = 2 m/s)		Pulse value (approx. 2 pulse/s at 2 m/s)	
1	0.001	lb/min	0.15	lb/min	0.002	lb/p
2	0.004	lb/min	0.75	lb/min	0.020	lb/p
4	0.046	lb/min	3.30	lb/min	0.020	lb/p
8	0.075	lb/min	15.00	lb/min	0.200	lb/p
15	0.250	lb/min	50.00	lb/min	0.200	lb/p
15 FB	0.650	lb/min	130.00	lb/min	2.000	lb/p
25	0.650	lb/min	130.00	lb/min	2.000	lb/p
25 FB	1.650	lb/min	330.00	lb/min	2.000	lb/p
40	1.650	lb/min	330.00	lb/min	2.000	lb/p
40 FB	2.750	lb/min	550.00	lb/min	20.000	lb/p
50	2.750	lb/min	550.00	lb/min	20.000	lb/p
50 FB	6.500	lb/min	1300.00	lb/min	20.000	lb/p
80	6.500	lb/min	1300.00	lb/min	20.000	lb/p
100	11.000	lb/min	2200.00	lb/min	20.000	lb/p
150	23.750	lb/min	4800.00	lb/min	200.000	lb/p
250	65.000	lb/min	13000.00	lb/min	200.000	lb/p
DN 15, 25, 40, 50 “FB” = Full bore versions Promass I						

12.2.3 Language, density, length, temperature

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

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Blocks

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Function groups

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Functions 3...

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Functions 5...

Functions 6...

Functions 7...

Functions 8...

Index key words

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E

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S

T

U

V

W

Z

Numerics

Symbols

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