



Füllstand



Druck



Durchfluss



Temperatur



Flüssigkeits-
analyse



Registrierung



Systeme
Komponenten



Services



Solutions

Description of Device Functions

Proline Promass 84 MODBUS RS485

Coriolis Mass Flow Measuring System

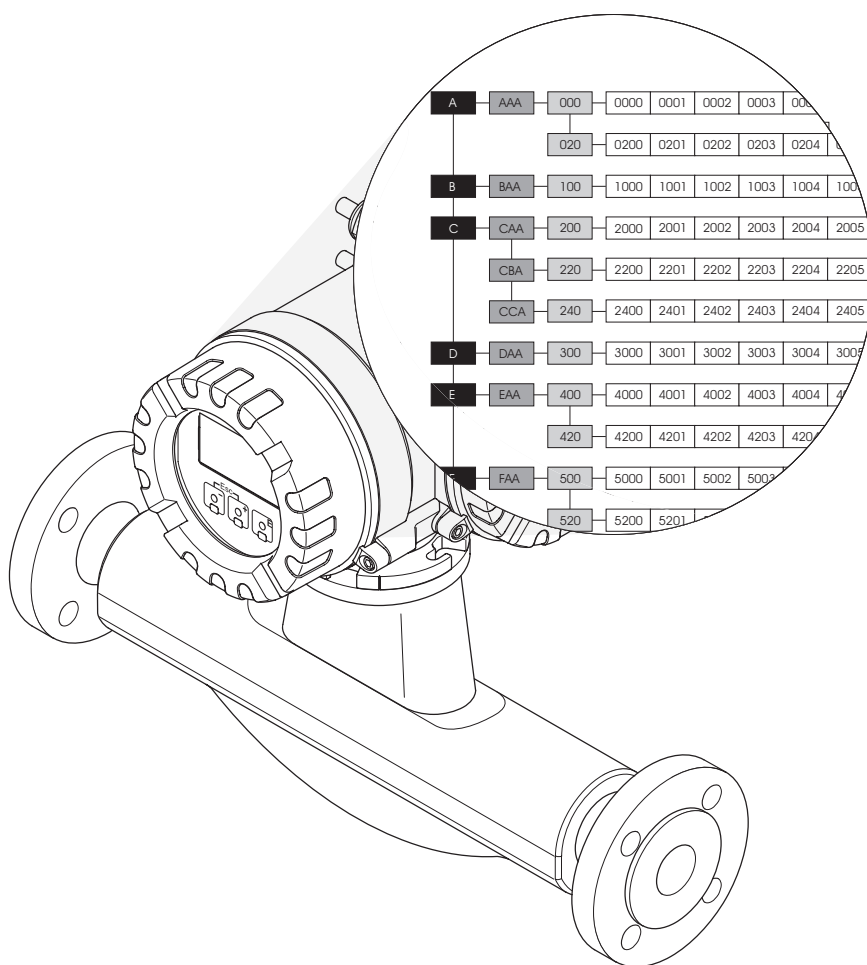


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1 Using this manual

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.

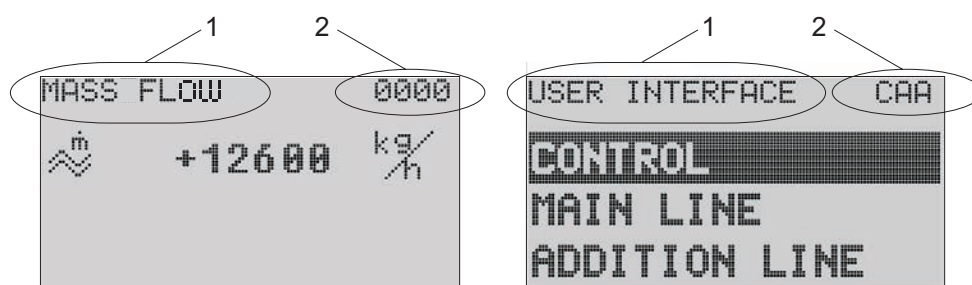


Fig. 1: Local display

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

The index for the function matrix is on Page 131.

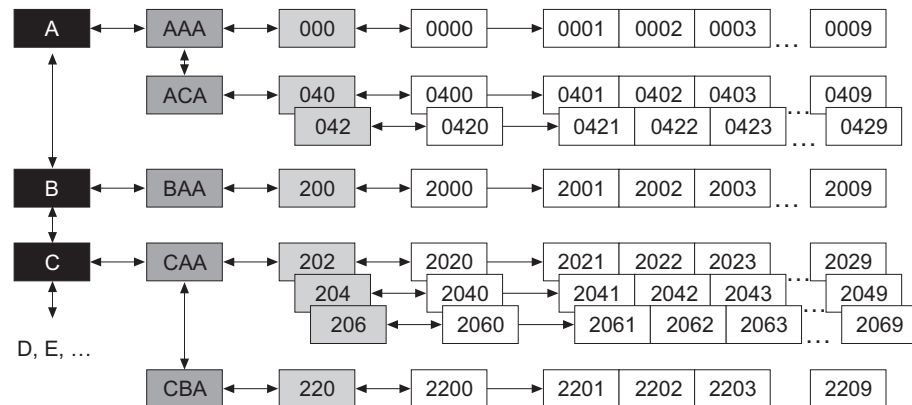
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2 Function matrix

2.1 General layout of the function matrix

The function matrix consists of four levels:

Blocks -> Groups -> Function groups -> Functions



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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, ADDITION LINE, etc.

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

A group consists of one or more function groups. Each function group represents a more detailed selection of the operation options in the higher-order group. The function groups in the "CONTROL" group, for example, include: BASIC CONFIG., UNLOCKING/LOCKING, CONTROL, 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 measuring instrument. 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 CONFIG.".
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:

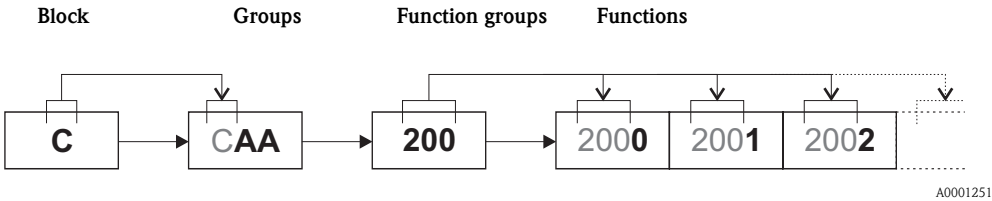
The code consists of three digits (000, 001, 100, etc.).

Functions:

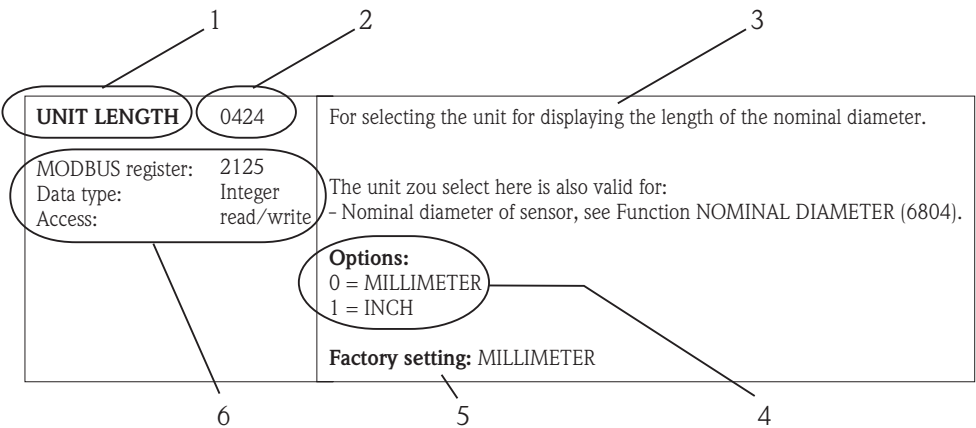
The code consists of four digits (0000, 0001, 0201, etc.).

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

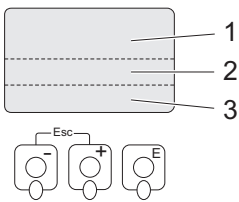


Note!

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 29.

2.4 Function matrix Proline Promass 84

Blocks		Groups		Function groups
CUSTODY TRANSFER Z (see P. 10)	→		→	see Page 10
↓↑				
MEASURED VARIABLES A (see P. 12)	→	MEASURING VALUES AAA SYSTEM UNITS ACA	→	see Page 13 see Page 14
↓↑				
QUICK SETUP B (see P. 19)	→	Commissioning and application setups	→	see Page 19
↓↑				
USER INTERFACE C (see P. 28)	→	CONTROL CAA MAIN LINE CCA ADDITIONAL LINE CEA INFORMATION LINE CGA	→	see Page 29 see Page 33 see Page 37 see Page 41
↓↑				
TOTALIZER D (see P. 45)	→	TOTALIZER 1 DAA TOTALIZER 2 DAB TOTALIZER 3 DAC HANDLING TOTALIZER DJA	→	see Page 46 see Page 46 see Page 46 see Page 49
↓↑				
OUTPUTS E (see P. 50)	→	CURRENT OUTPUT EAA PULSE/FREQ. OUTPUT 1 ECA RELAY OUTPUT 1 EGA RELAY OUTPUT 2 EGB	→	see Page 51 see Page 62 see Page 89 see Page 89
↓↑				
INPUTS F (see P. 98)	→	STATUS INPUT FAA	→	see Page 99
↓↑				
BASIC FUNCTION G (see P. 102)	→	MODBUS RS485 GDA PROCESS PARAMETER GIA SYSTEM PARAMETER GLA SENSOR DATA GNA	→	see Page 103 see Page 106 see Page 115 see Page 116
↓↑				
SUPERVISION J (see P. 120)	→	SYSTEM JAA VERSION-INFO JCA	→	see Page 121 see Page 124

3 Block CUSTODY TRANSFER

Block	Group	Function groups	Functions			
CUSTODY TRANSFER (Z)	⇒	⇒	CUSTODY TRANSFER Z000 P. 10	PULSE OUT.1 C.T. Z001 P. 10	CURR. OUT. 1 C.T. Z003 P. 10	TOTALIZER 1 C.T. Z006 P. 11
			TOTALIZER 2 C.T. Z007 P. 11	TOTALIZER 3 C.T. Z008 P. 11	MODBUS CFG C.T. Z009 P. 11	

Function description CUSTODY TRANSFER		
 Note! ■ If the measuring device is configured in accordance with the NTEP or MC approvals, this block (CUSTODY TRANSFER) is not available. ■ If the measuring system is set to custody transfer and the hardware is sealed, then all the measuring instrument functions marked with a lock symbol  are protected against access. For additional information on this topic, refer to the Operating Instructions for Proline Promass 84 MODBUS RS485 (BA129D) in Chapter 7.3.1, "Setting up custody transfer measurement". ■ These functions are not available to be used again until you disable custody transfer mode of the measuring system. For additional information on this topic, refer to the Operating Instructions for Proline Promass 84 MODBUS RS485 (BA129D) in Chapter 7.3.2, "Disabling custody transfer measurement".		
CUSTODY TRANSFER MODBUS register: Data type: Access:	Z000 7550 Integer read	Use this function to check whether the measuring point is set to custody transfer. Display: 0 = C.T. NO 1 = C.T. YES Factory setting: C.T. NO
PULSE OUTPUT 1 CUSTODY TRANSFER  MODBUS register: Data type: Access:	Z001 7551 Integer read/write	 Note! This function is available only if the measuring instrument has a pulse output 1. Selection of the pulse output 1 for transferring the calibrated signal. Options: 0 = NO 1 = YES Factory setting: NO
CURRENT OUTPUT 1 CUSTODY TRANSFER  MODBUS register: Data type: Access:	Z003 7553 Integer read/write	 Note! This function is available only if the measuring instrument has a current output 1. Selection of the current output 1 for transferring the calibrated signal. Options: 0 = NO 1 = YES Factory setting: NO

Function description CUSTODY TRANSFER		
TOTALIZER 1 CUSTODY TRANSFER  MODBUS register: Data type: Access:	Z006 7556 Integer read/write	Selection of the totalizer 1 for transferring the calibrated signal. Options: 0 = NO 1 = YES Factory setting: NO
TOTALIZER 2 CUSTODY TRANSFER  MODBUS register: Data type: Access:	Z007 7557 Integer read/write	Selection of the totalizer 2 for transferring the calibrated signal. Options: 0 = NO 1 = YES Factory setting: NO
TOTALIZER 3 CUSTODY TRANSFER  MODBUS register: Data type: Access:	Z008 7558 Integer read/write	Selection of the totalizer 3 for transferring the calibrated signal. Options: 0 = NO 1 = YES Factory setting: NO
MODBUS CONFIGURATION CUSTODY TRANSFER  MODBUS register: Data type: Access:	Z009 7559 Integer read/write	Selection of the MODBUS communication for transferring the calibrated signal. Options: 0 = NO 1 = YES Factory setting: NO

4 Block MEASURED VARIABLES

Block	Groups	Function groups	Functions							
MEASURED VARIABLES (A)	MEASURING VALUES (AAA) P. 13	MAIN VALUES (000) P. 13	⇒	MASS FLOW (0000) P. 13	⇒	VOLUME FLOW (0001) P. 13	CORRECTED VOLUME FLOW (0004) P. 13	DENSITY (0005) P. 13	REFERENCE DENSITY (0006) P. 13	TEMPERATURE (0008) P. 13
	SYSTEM UNITS (ACA) P. 14	CONFIGURATION (040) P. 14	⇒	UNIT MASS FLOW (0400) P. 14	⇒	UNIT MASS (0401) P. 14	UNIT VOL. FLOW (0402) P. 15	UNIT VOLUME (0403) P. 15	UNIT CORR. FLOW (0404) P. 16	UNIT CORR. VOLUME (0405) P. 16

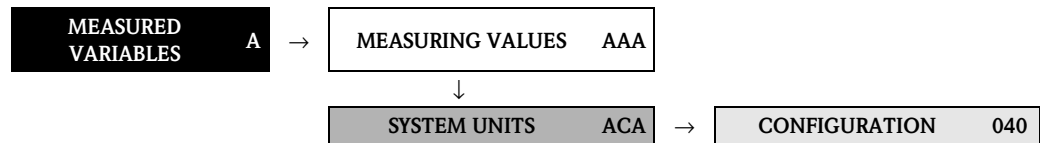
4.1 Group MEASURING VALUES

4.1.1 Function group MAIN VALUES

MEASURED VARIABLES A		→	MEASURING VALUES AAA	→	MAIN VALUES 000
Function description MEASURED VARIABLES → MEASURING VALUES → MAIN VALUES					
 Note! ■ The 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	The currently measured mass flow appears on the display.			
MODBUS register:	2007 247	Display: 5-digit floating-point number, including unit and sign (e.g. 462.87 kg/h; -731.63 lb/min; etc.)			
Data type:	Float				
Access:	read				
VOLUME FLOW	0001	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.			
MODBUS register:	2009 253	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.)			
Data type:	Float				
Access:	read				
CORRECTED VOLUME FLOW	0004	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).			
MODBUS register:	2011	Display: 5-digit floating-point number, including unit and sign (e.g. 1.3549 Nm ³ /h; 7.9846 scm/day; etc.)			
Data type:	Float				
Access:	read				
DENSITY	0005	The currently measured density or its specific gravity appears on the display.			
MODBUS register:	2013 249	Display: 5-digit floating point number, incl. unit (e.g. 1.2345 kg/dm ³ ; 993.5 kg/m ³ ; 1.0015 SG_20 °C; etc.)			
Data type:	Float				
Access:	read				
REFERENCE DENSITY	0006	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 110).			
MODBUS register:	2015	Display: 5-digit floating point number, incl. unit (e.g. 1.2345 kg/dm ³ ; 993.5 kg/m ³ ; 1.0015 SG_20 °C; etc.)			
Data type:	Float				
Access:	read				
TEMPERATURE	0008	The currently measured temperature appears on the display.			
MODBUS register:	2017 251	Display: Max. 4-digit fixed-point number, including unit and sign (e.g. -23.4 °C; 160.0 °F; 295.4 K; etc.)			
Data type:	Float				
Access:	read				

4.2 Group SYSTEM UNITS

4.2.1 Function group CONFIGURATION

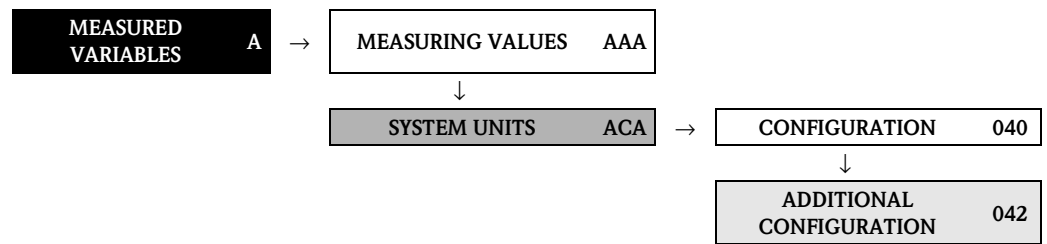


Function description MEASURED VARIABLES → SYSTEM UNITS → CONFIGURATION		
You can select the units for measured variables in this function group.		
UNIT MASS FLOW 0400  MODBUS register: 2101 Data type: Integer Access: read/write		For selecting the unit for displaying the mass flow. The unit you select 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 for the totalizers is independent of the selection made here and is selected separately for each totalizer.

Function description MEASURED VARIABLES → SYSTEM UNITS → CONFIGURATION		
UNIT VOLUME FLOW  MODBUS register: Data type: Access:	0402 2103 Integer read/write	For selecting the unit for displaying the volume flow. 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 → cm³/s; cm³/min; cm³/h; cm³/day 4 to 7 = cubic decimeter → dm³/s; dm³/min; dm³/h; dm³/day 8 to 11 = cubic meter → m³/s; m³/min; m³/h; m³/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 → ft³/s; ft³/min; ft³/h; ft³/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 48 to 51 = kilo gallon → Kgal/s; Kgal/min; Kgal/h; Kgal/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 (m³/h or US-Mgal/day)
UNIT VOLUME  MODBUS register: Data type: Access:	0403 2104 Integer read/write	For selecting the unit for displaying the volume. The unit you select here is also valid for: ■ Pulse value (e.g. m³/p) Options: 0 to 6 = metric → cm³; dm³; m³; ml; l; hl; Ml Mega 7 to 16 = US → cc; af; ft³; 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: m³  Note! The unit for the totalizers is independent of the selection made here and is selected separately for each totalizer.

Function description MEASURED VARIABLES → SYSTEM UNITS → CONFIGURATION		
UNIT CORRECTED VOLUME FLOW  MODBUS register: Data type: Access:	0404 2105 Integer read/write	For selecting the unit for displaying the corrected volume flow. 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  MODBUS register: Data type: Access:	0405 2106 Integer read/write	For selecting the unit for displaying the corrected volume. The unit you select here is also valid for: ■ Pulse value (e.g. Nm³/p) Options: Metric: 0 = Nm ³ 1 = Nl US: 2 = Sm ³ 3 = Scf Factory setting: Nm ³  Note! The unit for the totalizers is independent of the selection made here and is selected separately for each totalizer.

4.2.2 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 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/cm³; g/cc; kg/dm³; kg/l; kg/m³; SD 4 °C, SD 15 °C, SD 20 °C; SG 4 °C, SG 15 °C, SG 20 °C 11 to 16 = US → lb/ft³; 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/Nm³ US: 0 = g/Sc 3 = kg/Sm³ 4 = lb/Scf Factory setting: kg/Nl

Function description MEASURED VARIABLES → SYSTEM UNITS → ADDITIONAL CONFIGURATION		
UNIT TEMPERATURE  MODBUS register: Data type: Access:	0422 2109 Integer 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
UNIT LENGTH  MODBUS register: Data type: Access:	0424 2125 Integer read/write	For selecting the unit for displaying the length of the nominal diameter. The unit you select here is valid for: ■ Nominal diameter of sensor (function NOMINAL DIAMETER (6804) on Page 116) Options: 0 = MILLIMETER 1 = INCH Factory setting: MILLIMETER
UNIT PRESSURE  MODBUS register: Data type: Access:	0426 2130 Integer read/write	For selecting the unit for displaying the pressure. The unit you select here is valid for: ■ Specified pressure (function PRESSURE (6501) on Page 114) Options: 0 = bara 1 = barg 2 = psia 3 = psig Factory setting: bar g

5 Block QUICK SETUP

Block	Group / Function groups	Functions					
QUICK SETUP (B)	⇒	OS COMMISSION (1002) P. 19	⇒	OS - PULS. FLOW (1003) P. 19	OS - GAS MEASUREMENT (1004) P. 19	OS - COM- MUNICATION (1006) P. 19	T-DAT SAVE/LOAD (1009) P. 20

Function description QUICK SETUP		
 Note! ■ The Quick Setups are only available by means of the local display. ■ The flowcharts of the various Quick Setups are provided on the pages to follow. ■ For additional information on the Setups, refer to the Operating Instructions for Proline Promass 84 MODBUS RS485, BA129D.		
QUICK SETUP COMMISSIONING 	1002	For starting the Setup menu. Options: NO YES Factory setting: NO
QUICK SETUP PULSATING FLOW 	1003	 Note! Function only available for measuring devices with a current or frequency output. For starting the Setup menu. Options: NO YES Factory setting: NO
QUICK 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 backup 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.

5.1 Quick Setup

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

If the measuring device is equipped with a local display, all the important device parameters for standard operation can be configured quickly and easily by means of the "Commissioning" Quick Setup menu.

- Quick Setup Commissioning, see below
- Quick Setup Pulsating Flow → Page 23
- Quick Setup Gas Measurement → Page 25
- Quick Setup Communication → Page 26

5.1.1 Quick Setup Commissioning

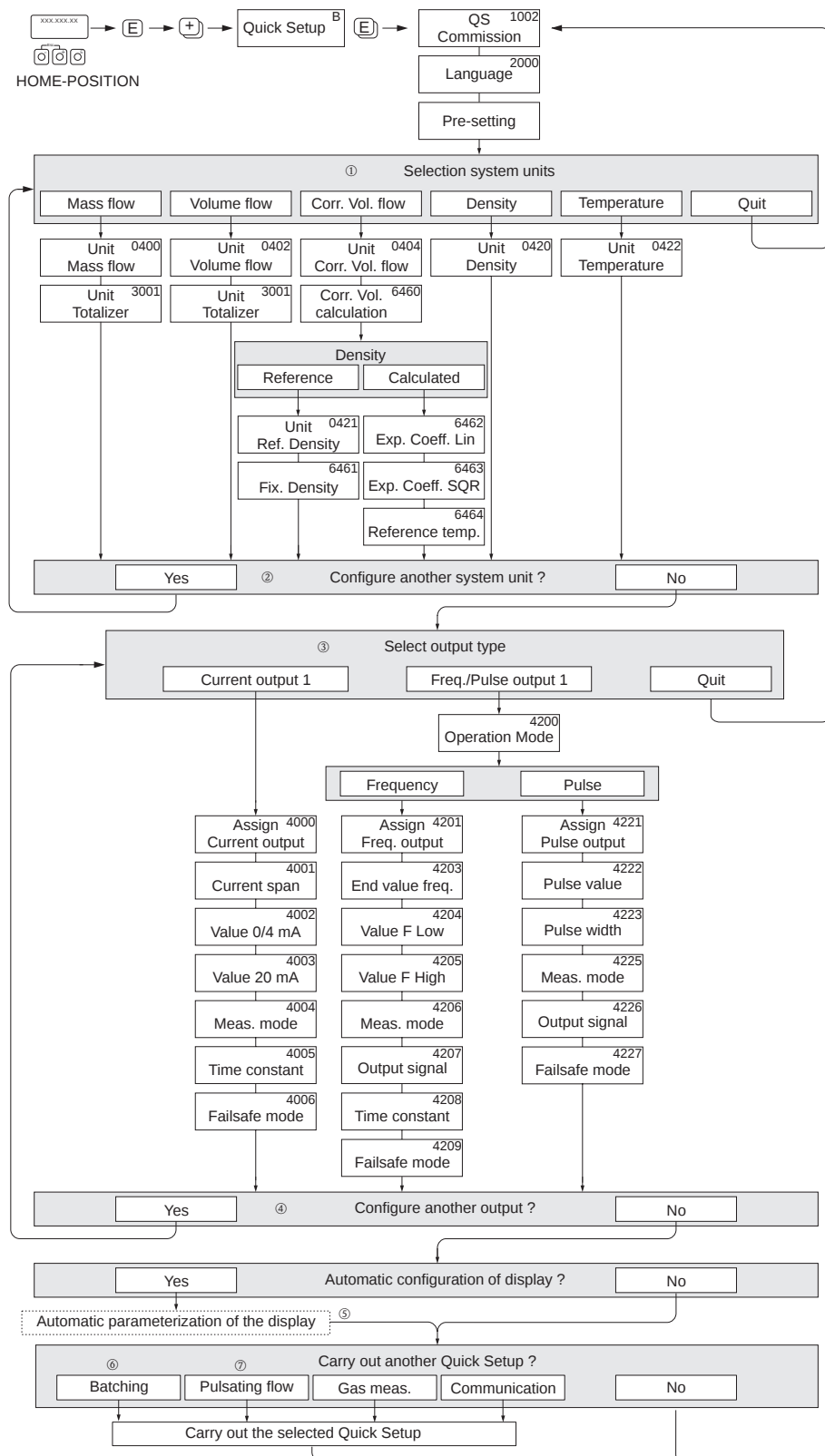


Note!

- The display returns to the function SETUP COMMISSIONING (1002) if you press the key combination during parameter interrogation. The stored parameters remain valid.
- The "COMMISSIONING" Quick Setup must be carried out before another Quick Setup is run.

- ① The "DELIVERY SETTINGS" option sets every selected unit to the factory setting.
The "ACTUAL SETTING" option accepts the units you previously configured.
- ② Only units not yet configured in the current Setup are offered for selection in each cycle.
The unit for mass, volume and corrected volume is derived from the corresponding flow unit.
- ③ The "YES" option remains visible until all the units have been configured.
"NO" is the only option displayed when no further units are available.
- ④ The prompt only appears if a current output and/or 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 configured.
"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:

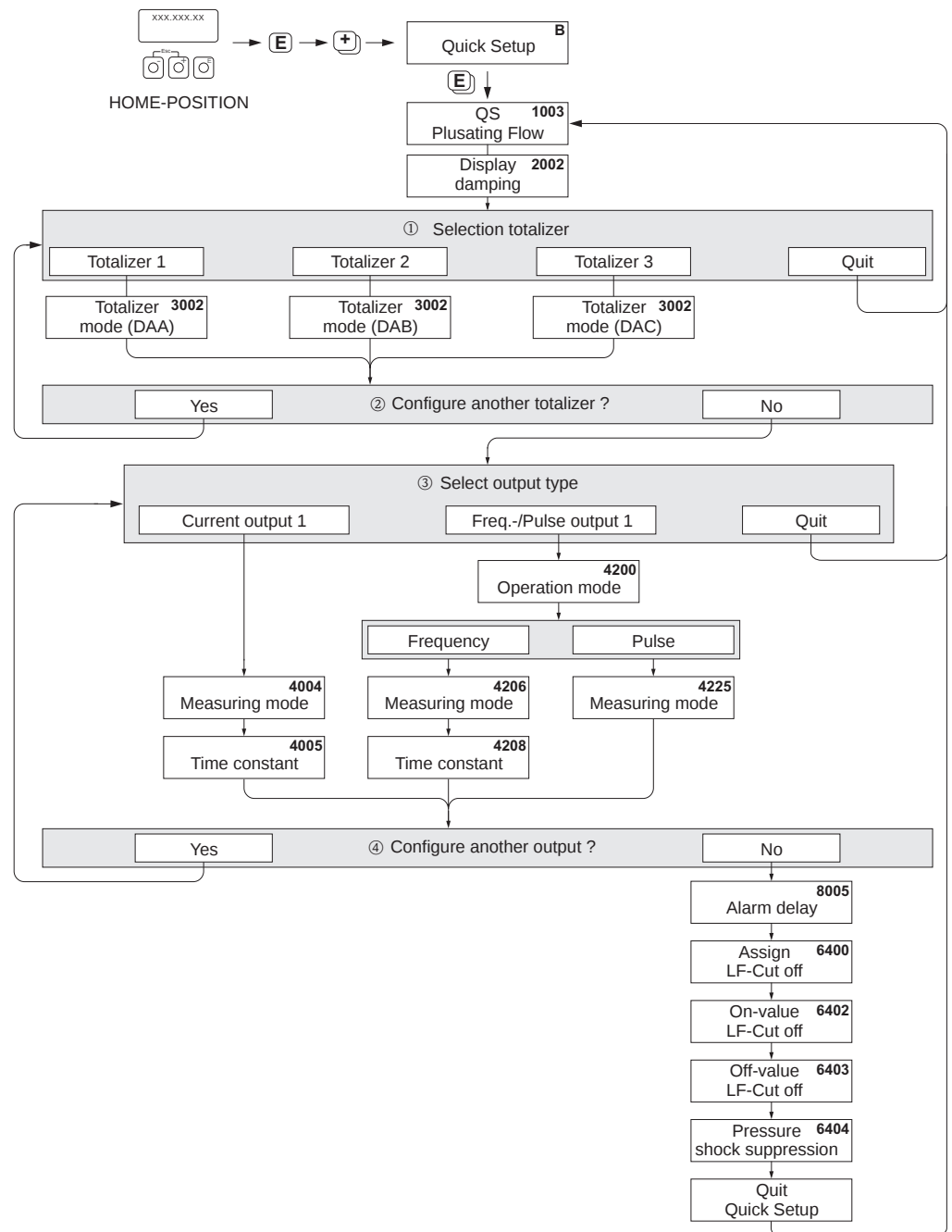
YES	Main line = mass flow Additional line = totalizer 1 Information line = operating/system condition
NO	The existing (selected) settings remain.
- ⑦ The execution of other Quick Setups are described in the following chapters.



a0003255-en

Fig. 5: "QUICK SETUP COMMISSIONING"- menu for straightforward configuration of the major device functions

5.1.2 Quick Setup Pulsating Flow



a0004431-en

Fig. 6: "QUICK SETUP PULSATING FLOW" menu for operation with severely pulsating flow.
Recommended settings are found on the following page.

- ① Only totalizers not yet configured in the current Setup are offered for selection in each cycle.
- ② The "YES" option remains visible until all the totalizers have been configured.
"NO" is the only option displayed when no further totalizers are available.
- ③ Only the output not yet configured in the current Setup is offered for selection in the second cycle.
- ④ The "YES" option remains visible until both outputs have been parameterized.
"NO" is the only option displayed when no further outputs are available.

**Note!**

- The display returns to the cell QUICK SETUP PULSATING FLOW (1003) if you press the Q 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).

Quick Setup "Pulsating Flow"		
HOME position → → MEASURAND → → QUICK SETUP → → QS PULSATING FLOW (1003)		
Function No.	Function name	Selection with To next function with
1003	QS PULS. FLOW	YES After is pressed by way of confirmation, the Quick Setup menu calls up all the subsequent functions in succession.



Basic configuration		
2002	DISPLAY DAMPING	1 s
3002	TOTALIZER MODE (DAA)	BALANCE (Totalizer 1)
3002	TOTALIZER MODE (DAB)	BALANCE (Totalizer 2)
3002	TOTALIZER MODE (DAC)	BALANCE (Totalizer 3)
Signal type for "CURRENT OUTPUT 1"		
4004	MEASURING MODE	PULS. FLOW
4005	TIME CONSTANT	1 s
Signal type for "FREQ./PULSE OUTPUT 1" (for FREQUENCY operating mode)		
4206	MEASURING MODE	PULS. FLOW
4208	TIME CONSTANT	0 s
Signal type for "FREQ./PULSE OUTPUT 1" (for PULSE operating mode)		
4225	MEASURING MODE	PULS. FLOW
Other settings		
8005	ALARM DELAY	0 s
6400	ASSIGN LOW FLOW CUTOFF	MASS FLOW
6402	ON-VALUE LOW FLOW CUT OFF	Setting depends on diameter: DN 2 = 0.10 [kg/h] or [l/h] DN 4 = 0.45 [kg/h] or [l/h] DN 8 = 2.0 [kg/h] or [l/h] DN 15 = 6.5 [kg/h] or [l/h] DN 25 = 18 [kg/h] or [l/h] DN 40 = 45 [kg/h] or [l/h] DN 50 = 70 [kg/h] or [l/h] DN 80 = 180 [kg/h] or [l/h] DN 100 = 350 [kg/h] or [l/h] DN 150 = 650 [kg/h] or [l/h] DN 250 = 1800 [kg/h] or [l/h]
6403	OFF-VALUE LOW FLOW CUTOFF	50%
6404	PRESSURE SHOCK SUPPRESSION	0 s



Back to the HOME position:

→ Press and hold down Esc key for longer than three seconds or

→ Repeatedly press and release Esc key → Exit the function matrix step by step

5.1.3 Quick Setup Gas Measurement

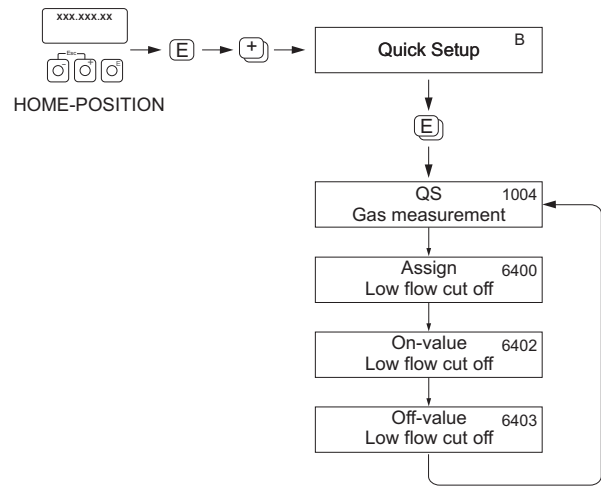


Fig. 7: QUICK SETUP GAS MEASUREMENT menu

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Quick Setup "Gas measurement"		
HOME position → → MEASURED VARIABLE (A) MEASURED VARIABLE → → QUICK SETUP (B) QUICK SETUP → → QS-GAS MEASUREMENT (1004)		
Function No.	Function name	Setting to be selected () (to next function with)
1004	QS GAS MEASUREMENT	YES After is pressed by way of confirmation, the Quick Setup menu calls up all the subsequent functions in succession.
▼		
6400	ASSIGN LOW FLOW CUTOFF	On account of the low mass flow involved when gas flows are measured, it is advisable not use a low flow cutoff. Setting: OFF
6402	ON-VALUE LOW FLOW CUT OFF	If the ASSIGNMENT LOW FLOW CUTOFF function was not set to "OFF", the following applies: Setting: 0.0000 [unit] User input: Flow rates for gas measurements are low, so the value for the switch-on point (= low flow cutoff) must be correspondingly low.
6403	OFF-VALUE LOW FLOW CUTOFF	If the ASSIGNMENT LOW FLOW CUTOFF function was not set to "OFF", the following applies: Setting: 50% User input: Enter the switch-off point as a positive hysteresis in %, referenced to the switch-on point.
▼		
Back to the HOME position: → Press and hold down Esc key for longer than three seconds or → Repeatedly press and release Esc key → Exit the function matrix step by step		



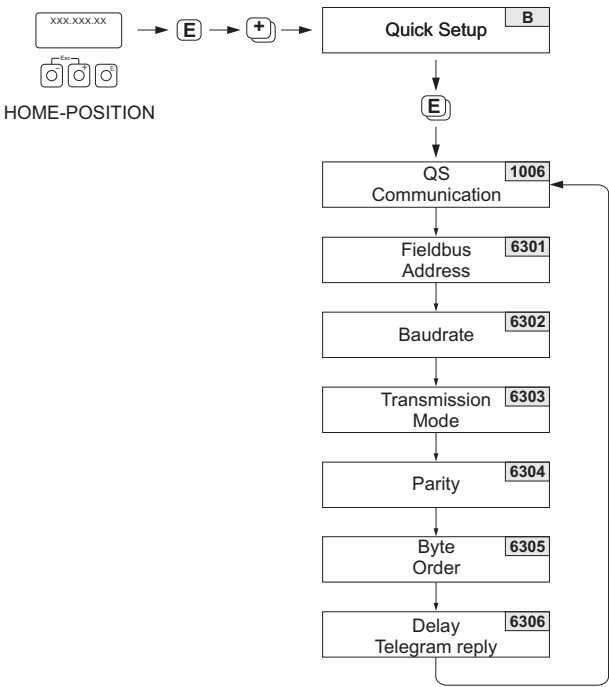
Note!

Quick Setup automatically deactivates the function EMPTY PIPE DETECTION (6420) so that the instrument can measure flow at low gas pressures.

5.1.4 Quick Setup Communication

To establish serial data transfer, various arrangements between the MODBUS master and MODBUS slave are required which have to be taken into consideration when configuring various functions.

These functions can be configured quickly and easily by means of the "Communication" Quick Setup. The following table explains the parameter configuration options in more detail.



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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. 19
1006	QUICK SETUP COMMUNICATION	YES	see P. 19
Basic configuration:		Factory setting:	
6301	FIELDBUS ADDRESS	247	see P. 103
6302	BAUDRATE	19200 BAUD	see P. 103
6303	TRANSMISSION MODE	RTU	see P. 104
6304	PARITY	EVEN	see P. 104
6305	BYTE ORDER	1 - 0 - 3- 2	see P. 104
6306	DELAY TELE. REPLY	10 ms	see P. 105

5.2 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).

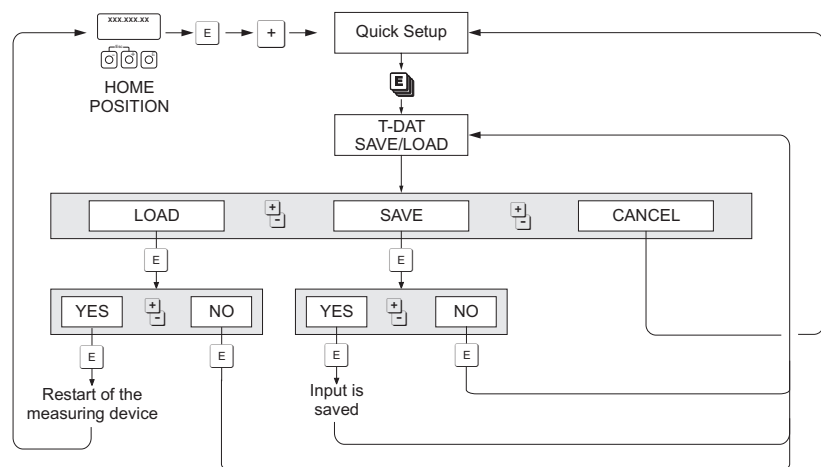
This is required for the following applications:

- 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 and then transferred to the EEPROM of the new transmitter.
- Duplicating data: current data are copied from an EEPROM to the T-DAT and then transferred to EEPROMs of identical measuring points.



Note!

Installing and removing the T-DAT → Operating Instructions for Proline Promass 84 MODBUS RS485, BA129D



Data storage/transmission with T-DAT SAVE/LOAD

a0001221-en

Information on the LOAD and SAVE options available:

LOAD:

Data are transferred from the T-DAT to the EEPROM.



Note!

- Any settings already saved on the EEPROM are deleted.
- This option is only available if the T-DAT contains valid data.
- This option can only be executed if the software version of the T-DAT is the same as, or more recent than, that of the EEPROM. If this is not the case, the error message "TRANSM. SW-DAT" appears after restarting and the LOAD function is then no longer available.

SAVE:

Data are transferred from the EEPROM to the T-DAT.

6 Block USER INTERFACE

Block	Groups	Function groups	Functions
USER INTERFACE (C)	CONTROL (CAA) P. 29 ⇕ ⇑	⇒ BASIC CONFIG. (200) P. 29 ⇕ ⇑	⇒ LANGUAGE (2000) P. 29 ⇕ ⇑ ⇒ CONTRAST LCD (2003) P. 30 ⇕ ⇑ ⇒ DISPLAY DAMPING (2002) P. 30 ⇕ ⇑ ⇒ BACKLIGHT (2004) P. 30
		⇕ ⇑ UNLOCKING/LOCKING (202) P. 31 ⇕ ⇑	⇕ ⇑ ACCESS CODE (2020) P. 31 ⇕ ⇑ ⇒ STATUS ACCESS (2022) P. 31 ⇕ ⇑ ⇒ ACCESS CODE COUNTER (2023) P. 31
		⇕ ⇑ OPERATION (204) P. 32	⇕ ⇑ TEST DISPLAY (2040) P. 32
	MAIN LINE (CCA) P. 33 ⇕ ⇑	⇕ ⇑ CONFIGURATION (220) P. 33 ⇕ ⇑	⇕ ⇑ 100% VALUE (2201) P. 33 ⇕ ⇑ ⇒ FORMAT (2202) P. 34
		⇕ ⇑ MULTIPLY (222) P. 35	⇕ ⇑ 100% VALUE (2221) P. 35 ⇕ ⇑ ⇒ FORMAT (2222) P. 36
	ADDITIONAL LINE (CEA) P. 37 ⇕ ⇑	⇕ ⇑ CONFIGURATION (240) P. 37 ⇕ ⇑	⇕ ⇑ 100% VALUE (2401) P. 37 ⇕ ⇑ ⇒ FORMAT (2402) P. 38 ⇕ ⇑ ⇒ DISPLAY MODE (2403) P. 38
		⇕ ⇑ MULTIPLY (242) P. 39	⇕ ⇑ 100% VALUE (2421) P. 39 ⇕ ⇑ ⇒ FORMAT (2422) P. 40 ⇕ ⇑ ⇒ DISPLAY MODE (2423) P. 40
	INFORMATION LINE (CGA) P. 41 ⇕ ⇑	⇕ ⇑ CONFIGURATION (260) P. 41 ⇕ ⇑	⇕ ⇑ 100% VALUE (2601) P. 41 ⇕ ⇑ ⇒ FORMAT (2602) P. 42 ⇕ ⇑ ⇒ DISPLAY MODE (2603) P. 42
		⇕ ⇑ MULTIPLY (262) P. 43	⇕ ⇑ 100% VALUE (2621) P. 43 ⇕ ⇑ ⇒ FORMAT (2622) P. 44 ⇕ ⇑ ⇒ DISPLAY MODE (2623) P. 44

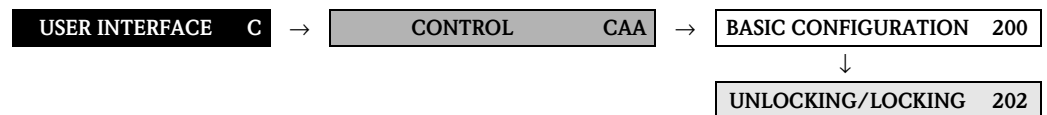
6.1 Group CONTROL

6.1.1 Function group BASIC CONFIGURATION

USER INTERFACE C →		CONTROL CAA →	BASIC CONFIGURATION 200
Function description USER INTERFACE → CONTROL → BASIC CONFIGURATION			
LANGUAGE	2000	For selecting the language for all texts, parameters and messages shown on the local display.  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 126). 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: Depends on country, see Page 129  Note! ■ If you press the / keys simultaneously at startup, the language defaults to "ENGLISH". ■ You can change the language group via the configuration software ToF Tool - Fieldtool Package. Please do not hesitate to contact your Endress+Hauser sales office if you have any questions.	
 (only for NTEP, MC)			
MODBUS register:	2502		
Data type:	Integer		
Access:	read/write		

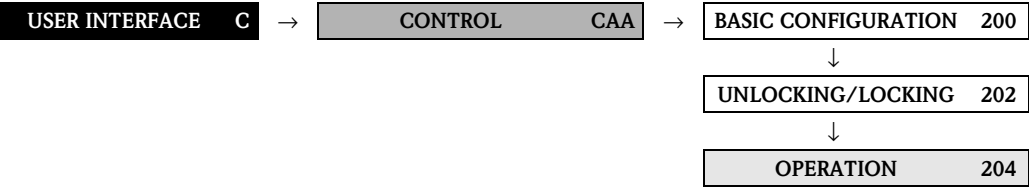
Function description USER INTERFACE → CONTROL → BASIC CONFIGURATION		
DISPLAY DAMPING ① (only for NTEP, MC) MODBUS register: 2503 Data type: Float Access: read/write	2002	For entering a time constant which defines how the display reacts to severely fluctuating flow variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). Input: 0 to 100 seconds Factory setting: 1 s  Note! Entering the value "0" (seconds) means that the damping is switched off.
CONTRAST LCD ① (only for NTEP, MC) MODBUS register: 2505 Data type: Float Access: read/write	2003	For adjusting the display contrast to suit local operating conditions. Input: 10 to 100% Factory setting: 50%
BACKLIGHT ① (only for NTEP, MC) MODBUS register: 2566 Data type: Float Access: read/write	2004	For adjusting the backlight to suit local operating conditions. 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%

6.1.2 Function group UNLOCKING/LOCKING



Function description		
USER INTERFACE → CONTROL → UNLOCKING/LOCKING		
ACCESS CODE 2020 MODBUS register: 2508 Data type: Float Access: read/write		 Note! This function is only relevant for local operation and has no effect on access via MODBUS RS485 communication. All data of the measuring system are protected against inadvertent change. Programming is disabled and the settings cannot be changed until a code is entered in this function. If you press the  or  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 = 84, see function DEFINE PRIVATE CODE (2021)). To set the measuring instrument to access-protection mode, enter the custody code 8400 here. This locks all the functions that are marked with a keyhole symbol (). 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  (only for NTEP, MC) 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. Input: 0 to 9999 (max. 4-digit number) Factory setting: 84  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

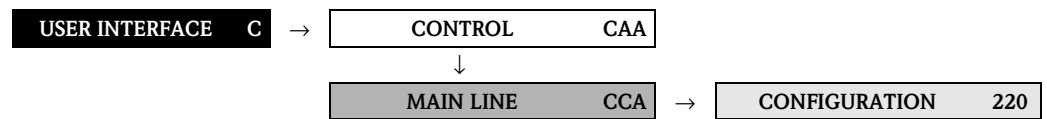
6.1.3 Function group OPERATION



Function description		
USER INTERFACE → CONTROL → OPERATION		
TEST DISPLAY MODBUS register: Data type: Access:	2040 2513 Integer read/write	For testing the operability of the local display and its pixels. 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".

6.2 Group MAIN LINE

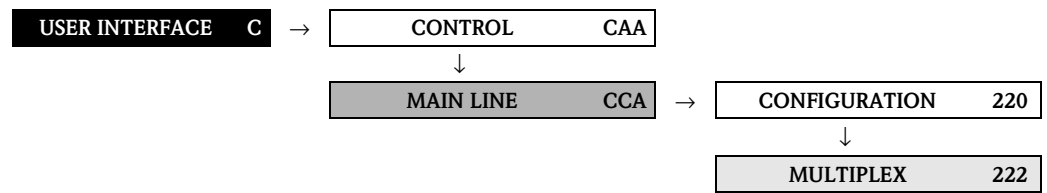
6.2.1 Function group CONFIGURATION



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 98 = CUSTODY TRANSFER Factory setting: MASS FLOW
100% VALUE 2201  MODBUS register: 2519 Data type: Float Access: read/write		 Note! This 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: depends on nominal diameter and country → Page 129 ff.

Function description		
USER INTERFACE → CONTROL → CONFIGURATION		
FORMAT 	2202 MODBUS register: 2516 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.

6.2.2 Function group MULTIPLEX

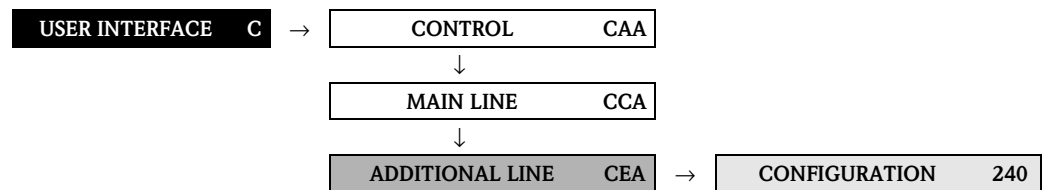


Function description USER INTERFACE → CONTROL → CONFIGURATION		
ASSIGN 2220  MODBUS register: 2522 Data type: Integer Access: read/write		For assigning a second reading to be displayed in the main line alternately (every 10 seconds) with the value defined in the ASSIGN function (2200). Options: (standard) 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 98 = CUSTODY TRANSFER Factory setting: OFF
100% VALUE 2221  MODBUS register: 2524 Data type: Float Access: read/write		 Note! This 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: depends on nominal diameter and country → Page 129 ff.

Function description		
USER INTERFACE → CONTROL → CONFIGURATION		
FORMAT 	2222	For selecting the maximum number of places after the decimal point to be displayed for the display value.
MODBUS register: Data type: Access:	2523 Integer read/write	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.

6.3 Group ADDITIONAL LINE

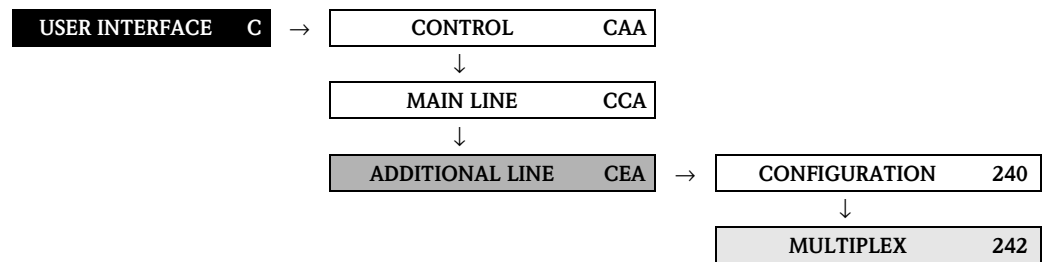
6.3.1 Function group CONFIGURATION



Function description USER INTERFACE → ADDITIONAL LINE → CONFIGURATION		
ASSIGN 	2400	For assigning a value to be displayed to the additional line (middle line in the local display). This value is displayed during normal operation. Options: 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 22 = TOTALIZER 3 98 = CUSTODY TRANSFER 23 = TAG NAME Factory setting: TOTALIZER 1
100% VALUE 	2401	Note! This 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: depends on nominal diameter and country → Page 129 ff.

Function description		
USER INTERFACE → ADDITIONAL LINE → CONFIGURATION		
FORMAT ① 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.
DISPLAY MODE ① MODBUS register: Data type: Access:	2403 2531 Integer read/write	✎ Note! This function is not available unless one of the following was selected in the ASSIGN function (2400): ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH IN % ■ CORRECTED VOLUME FLOW BARGRAPH IN % Use this function to define the format of the bar graph. Options: 0 = STANDARD 1 = SYMMETRY Factory setting: STANDARD Illustration of bar graph +25 +50 +75 % A0001258 Fig. 8: Bar graph for STANDARD option Simple bar graph with 25 / 50 / 75% gradations and integrated sign. -50 - +50 % A0001259 Fig. 9: Bar graph for SYMMETRY option Symmetrical bar graph for positive and negative directions of flow, with -50 / 0 / +50% gradations and integrated sign.

6.3.2 Function group MULTIPLEX

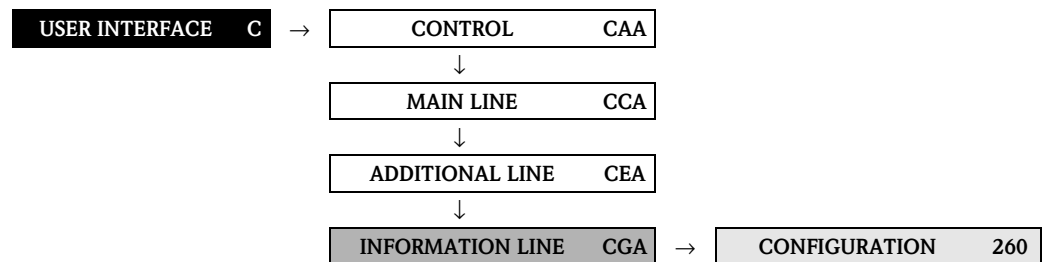


Function description USER INTERFACE → ADDITIONAL LINE → MULTIPLEX		
ASSIGN 2420 MODBUS register: 2532 Data type: Integer Access: read/write		For assigning a second reading to be displayed in the main line alternately (every 10 seconds) with the value defined in the ASSIGN function (2400). Options: 0 = 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 98 = CUSTODY TRANSFER 23 = TAG NAME Factory setting: OFF
100% VALUE 2421 MODBUS register: 2534 Data type: Float Access: read/write		Note! This 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: depends on nominal diameter and country → Page 129 ff.

Function description		
USER INTERFACE → ADDITIONAL LINE → MULTIPLEX		
FORMAT ① MODBUS register: 2533 Data type: Integer Access: read/write	2422	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.

6.4 Group INFORMATION LINE

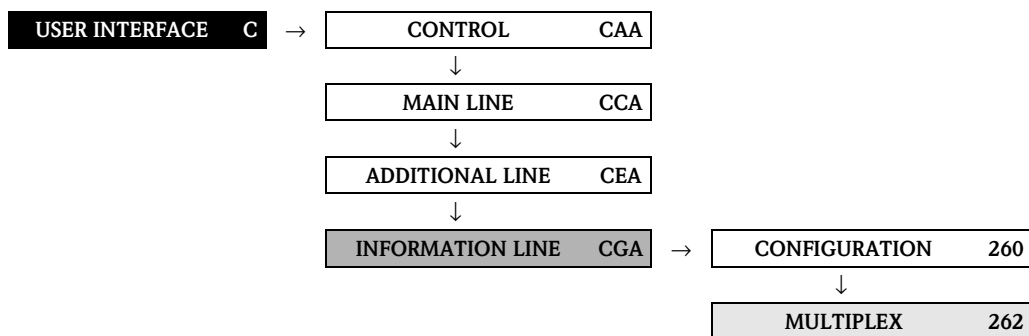
6.4.1 Function group CONFIGURATION



Function description		
USER INTERFACE → INFORMATION LINE → CONFIGURATION		
ASSIGN 	2600	For assigning a value to be displayed to the information line (bottom line in the local display). This value is displayed during normal operation. Options: 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 22 = TOTALIZER 3 98 = CUSTODY TRANSFER 23 = TAG NAME 24 = OPERATING/SYSTEM CONDITIONS 26 = DISPLAY FLOW DIRECTION Factory setting: OPERATING/SYSTEM CONDITIONS
100% VALUE 	2601	Note! This 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: depends on nominal diameter and country → Page 129 ff.

Function description		
USER INTERFACE → INFORMATION LINE → CONFIGURATION		
FORMAT ① MODBUS register: 2538 Data type: Integer Access: read/write	2602	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 ① MODBUS register: 2541 Data type: Integer Access: read/write	2603	✎ Note! This function is not available unless one of the following was selected in the ASSIGN function (2600): ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH IN % ■ CORRECTED VOLUME FLOW BARGRAPH IN % Use this function to define the format of the bar graph. Options: 0 = STANDARD 1 = SYMMETRY Factory setting: STANDARD Illustration of bar graph +25 +50 +75 % A0001258 Fig. 12: Bar graph for STANDARD option Simple bar graph with 25 / 50 / 75% gradations and integrated sign. -50 - +50 % A0001259 Fig. 13: Bar graph for SYMMETRY option Symmetrical bar graph for positive and negative directions of flow, with -50 / 0 / +50% gradations and integrated sign.

6.4.2 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: 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 98 = CUSTODY TRANSFER 23 = TAG NAME 24 = OPERATING/SYSTEM CONDITIONS 26 = DISPLAY FLOW DIRECTION Factory setting: OFF
100% VALUE 2621 MODBUS register: 2544 Data type: Float Access: read/write		Note! This 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: depends on nominal diameter and country → Page 129 ff.

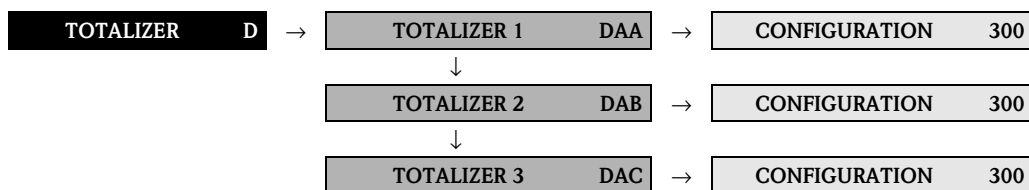
Function description		
USER INTERFACE → INFORMATION LINE → MULTIPLEX		
FORMAT ① MODBUS register: 2543 Data type: Integer Access: read/write	2622	For selecting the maximum number of places after the decimal point to be displayed for the display value. Options: 0 = XXXXX 1 = XXXX.X 2 = XXX.XX 3 = XX.XXX 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 ① MODBUS register: 2546 Data type: Integer Access: read/write	2623	✎ Note! This function is not available unless one of the following was selected in the ASSIGN function (2620): ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH IN % ■ CORRECTED VOLUME FLOW BARGRAPH IN % Use this function to define the format of the bar graph. Options: 0 = STANDARD 1 = SYMMETRY Factory setting: STANDARD Illustration of bar graph +25+50+75% A0001258 Fig. 14: Bar graph for STANDARD option Simple bar graph with 25 / 50 / 75% gradations and integrated sign. -50--+50% A0001259 Fig. 15: Bar graph for SYMMETRY option Symmetrical bar graph for positive and negative directions of flow, with -50 / 0 / +50% gradations and integrated sign.

7 Block TOTALIZER

Block	Groups	Function groups	Functions
TOTALIZER (D)	TOTALIZER 1 (DAA) P. 46	⇓ ⇑ CONFIGURATION (300) P. 46	⇓ ⇑ ASSIGN (3000) P. 46
		⇓ ⇑ OPERATION (304) P. 48	⇓ ⇑ SUM (3040) P. 48
			⇓ ⇑ UNIT TOTALIZER (3001) P. 46
			⇓ ⇑ OVERFLOW (3041) P. 48
	TOTALIZER 2 (DAB) P. 46	⇓ ⇑ CONFIGURATION (300) P. 46	⇓ ⇑ ASSIGN (3000) P. 46
		⇓ ⇑ OPERATION (304) P. 48	⇓ ⇑ SUM (3040) P. 48
			⇓ ⇑ UNIT TOTALIZER (3001) P. 46
			⇓ ⇑ OVERFLOW (3041) P. 48
	TOTALIZER 3 (DAC) P. 46	⇓ ⇑ CONFIGURATION (300) P. 46	⇓ ⇑ ASSIGN (3000) P. 46
		⇓ ⇑ OPERATION (304) P. 48	⇓ ⇑ SUM (3040) P. 48
			⇓ ⇑ UNIT TOTALIZER (3001) P. 46
			⇓ ⇑ OVERFLOW (3041) P. 48
	HANDLING TOTALIZER (DJA) P. 49	⇓ ⇑ ⇓ ⇑ ⇓ ⇑ RESET ALL TOTALIZERS (3800) P. 49	⇓ ⇑ ⇓ ⇑ ⇓ ⇑ FAILSAFE MODE (3801) P. 49
			⇓ ⇑ TOTALIZER MODE (3002) P. 47
			⇓ ⇑ RESET TOTALIZER (3003) P. 47

7.1 Group TOTALIZER (1 to 3)

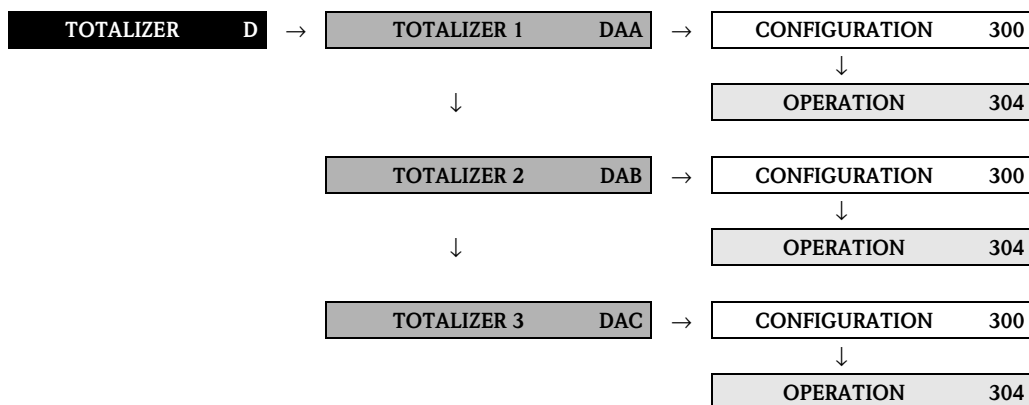
7.1.1 Function group CONFIGURATION



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: 0 = OFF 1 = MASS FLOW 2 = VOLUME FLOW 3 = CORRECTED VOLUME FLOW Factory setting: MASS FLOW  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for the available functions Z006 to Z008 in the CUSTODY TRANSFER block. ■ The totalizer is reset to "0" as soon as the selection is changed. ■ If you select OFF in the function group CONFIGURATION of the totalizer in question, only the ASSIGN (3000) function remains visible.
UNIT TOTALIZER 3001  MODBUS register: ■ Totalizer 1 – Mass flow 2602 – Volume flow 2603 – Corr. vol. flow 2604 ■ Totalizer 2 – Mass flow 2802 – Volume flow 2803 – Corr. vol. flow 2804 ■ Totalizer 3 – Mass flow 3002 – Volume flow 3003 – Corr. vol. flow 3004 Data type: Integer Access: read/write		For selecting the unit for the measured variable assigned in the function ASSIGN (3000). Options: for the MASS FLOW assignment 0 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 (continued on next page)

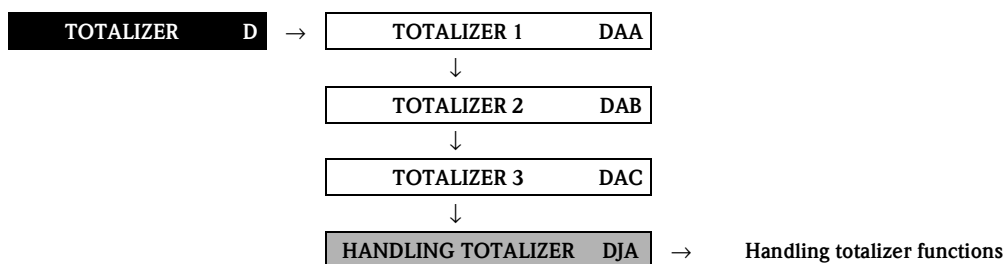
		Function description
		TOTALIZER → TOTALIZER (1 to 3) → CONFIGURATION
UNIT TOTALIZER (continued)	3001	Options: for the CORRECTED VOLUME FLOW assignment 0 to 1 = metric → Nm³ 2 to 3 = US → Sm³; Scf Factory setting: Nm³  Note! This function cannot be changed if: ■ The measuring device has been configured in accordance with NTEP or MC approval. ■ The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for the available functions Z006 to Z008 in the CUSTODY TRANSFER block.
TOTALIZER MODE  MODBUS register: Totalizer 1 2605 Totalizer 2 2805 Totalizer 3 3005 Data type: Integer Access: read/write	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  Note! This function cannot be changed if: ■ The measuring device has been configured in accordance with NTEP or MC approval. ■ The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for the available functions Z006 to Z008 in the CUSTODY TRANSFER block.
RESET TOTALIZER  MODBUS register: Totalizer 1 2608 Totalizer 2 2808 Totalizer 3 3008 Data type: Integer Access: read/write	3003	Resets the total and the overflow of the totalizer to zero. Options: 0 = NO 1 = YES Factory setting: NO  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for the available functions Z006 to Z008 in the CUSTODY TRANSFER block. ■ 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 99).

7.1.2 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 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 m³; -4925.631 kg) Note! ■ The effect of the setting in the "TOTALIZER MODE" function (see Page 47) is as follows: – If the setting is "BALANCE", the totalizer balances flow in the positive and negative directions. – If the setting is "FORWARD", the totalizer registers only flow in the positive direction. – If the setting is "REVERSE", the totalizer registers only flow in the negative direction. ■ The totalizer's response to faults is defined in the "FAILSAFE MODE" function (3801), (see Page 49).
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

7.2 Group HANDLING TOTALIZER



Function description		
TOTALIZER → HANDLING TOTALIZER → Handling totalizer functions		
RESET ALL TOTALIZERS  MODBUS register: 2609 Data type: Integer Access: read/write	3800	Resets the totals and the overflows of all totalizers to zero. Options: 0 = NO 1 = YES Factory setting: NO  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMi, METAS or BEV approval and YES has been selected for the available functions Z006 to Z008 in the CUSTODY TRANSFER block. ■ 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 99).
FAILSAFE MODE  MODBUS register: 2607 Data type: Integer Access: read/write	3801	Use this function to define the common response of all totalizers (1 to 3) to error. Options: 0 = STOP The totalizers are 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 totalizers continue to count the flow based on the last valid flow value (before the error occurred). Factory setting: STOP  Note! This function cannot be changed if: ■ The measuring device has been configured in accordance with NTEP or MC approval. ■ The measuring device has been configured in accordance with PTB, NMi, METAS or BEV approval and YES has been selected for the available functions Z006 to Z008 in the CUSTODY TRANSFER block.

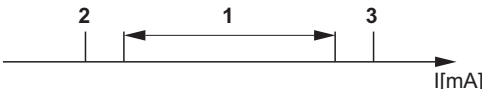
8 Block OUTPUTS

Block	Groups	Function groups	Functions												
OUTPUTS (E)	CURRENT OUTPUT (EAA) P. 51	⇕ ⇕	CONFIGURATION (400) P. 51	⇒	ASSIGN CURRENT OUTPUT (4000) P. 51	⇒	CURRENT SPAN (4001) P. 52	VALUE 0_4 mA (4002) P. 53	VALUE 20 mA (4003) P. 55	MEASURING MODE (4004) P. 55	TIME CONSTANT (4005) P. 58	FAILSAFE MODE (4006) P. 59			
			OPERATION (404) P. 60	⇒	ACTUAL CURRENT (4040) P. 60	⇒	SIMULATION CURRENT (4041) P. 60	VALUE SIM. CURRENT (4042) P. 60							
			INFORMATION (408) P. 61	⇒	TERMINAL NUMBER (4080) P. 61										
	PULSE/FREQ. OUTPUT (ECA) P. 62	⇕ ⇕	CONFIGURATION (420) P. 62	⇒	OPERATION MODE (4200) P. 62	⇒	ASSIGN FREQUENCY (4201) P. 63	START VALUE FREQUENCY (4202) P. 63	END VALUE FREQUENCY (4203) P. 64	VALUE f LOW (4204) P. 64	VALUE f HIGH (4205) P. 65	MEASURING MODE (4206) P. 67	OUTPUT SIGNAL (4207) P. 68	TIME CONSTANT (4208) P. 70	FAILSAFE MODE (4209) P. 71
							FAILSAFE VALUE (4211) P. 71								
							ASSIGN PULSE (4221) P. 72	PULSE VALUE (4222) P. 72	PULSE WIDTH (4223) P. 73	MEASURING MODE (4225) P. 74	OUTPUT SIGNAL (4226) P. 75	FAILSAFE MODE (4227) P. 77			
		⇕ ⇕	OPERATION (430) P. 83	⇒		⇒	ASSIGN STATUS (4241) P. 78	ON-VALUE (4242) P. 79	SWITCH-ON DELAY (4243) P. 79	OFF-VALUE (4244) P. 80	SWITCH-OFF DELAY (4245) P. 80	MEASURING MODE (4246) P. 81	TIME CONSTANT (4247) P. 82		
						ACTUAL FREQUENCY (4301) P. 83	SIMULATION FREQUENCY (4302) P. 83	VALUE SIMUL. FREQ. (4303) P. 84							
						SIMULATION PULSE (4322) P. 85	VALUE SIM. IMPULS (4323) P. 86								
		⇕ ⇕	INFORMATION (438) P. 88	⇒	TERMINAL NUMBER (4380) P. 88		ACTUAL STATUS (4341) P. 87	SIMULATION SWITCH POINT (4342) P. 87	VALUE SIM. SWITCH PNT. (4343) P. 87						
	RELAY 1 to 2 (EGA, EGB) P. 89		⇕ ⇕	CONFIGURATION (470) P. 89	⇒	ASSIGN RELAY (4700) P. 89	⇒	ON-VALUE (4701) P. 90	SWITCH-ON DELAY (4702) P. 90	OFF-VALUE (4703) P. 90	SWITCH-OFF DELAY (4704) P. 91	MEASURING MODE (4705) P. 91	TIME CONSTANT (4706) P. 92		
				OPERATION (474) P. 93	⇒	ACTUAL STATUS RELAY (4740) P. 93	⇒	SIMULATION SWITCH POINT (4741) P. 93	VALUE SIM. SWITCH PNT. (4742) P. 93						
		INFORMATION (478) P. 94		⇒	TERMINAL NUMBER (4780) P. 94										

8.1 Group CURRENT OUTPUT

8.1.1 Function group CONFIGURATION

OUTPUTS		E	→	CURRENT OUTPUT		EAA	→	CONFIGURATION		400
Function description										
OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION										
ASSIGN CURRENT OUTPUT		4000		For assigning a measured variable to the current output.						
		Options: 0 = OFF 2 = MASS FLOW 5 = VOLUME FLOW 6 = CORRECTED VOLUME FLOW 7 = DENSITY 8 = REFERENCE DENSITY 9 = TEMPERATURE								
MODBUS register:		5801		Factory setting: MASS FLOW						
Data type:		Integer		 Note!						
Access:		read/write		■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMi, METAS or BEV approval and YES has been selected for function Z003 in the CUSTODY TRANSFER block. ■ If you select OFF, the only function shown in the CONFIGURATION function group is this function, in other words ASSIGN CURRENT OUTPUT (4000).						

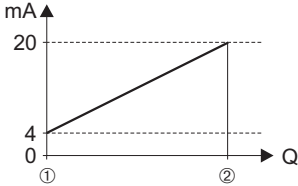
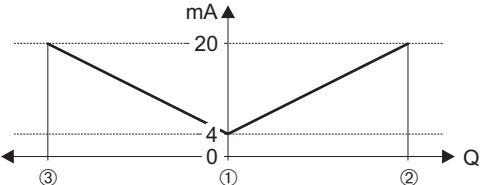
Function description																														
OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION																														
CURRENT SPAN	4001	For selecting the current span. The selection specifies the operational range and the lower and upper signal on alarm.																												
																														
MODBUS register:	5802																													
Data type:	Integer																													
Access:	read/write																													
		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 or 4–20 mA US																												
		 Note!																												
		■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z003 in the CUSTODY TRANSFER block. ■ 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 for Proline Promass 84 MODBUS RS485, BA129D).																												
																														
		<table><tr><th>a</th><th>1</th><th>2</th><th>3</th></tr><tr><td>0-20 mA (25 mA)</td><td>0 - 24 mA</td><td>0</td><td>25</td></tr><tr><td>4-20 mA (25 mA)</td><td>4 - 24 mA</td><td>2</td><td>25</td></tr><tr><td>0-20 mA</td><td>0 - 20.5 mA</td><td>0</td><td>22</td></tr><tr><td>4-20 mA</td><td>4 - 20.5 mA</td><td>2</td><td>22</td></tr><tr><td>4-20 mA NAMUR</td><td>3.8 - 20.5 mA</td><td>3.5</td><td>22.6</td></tr><tr><td>4-20 mA US</td><td>3.9 - 20.8 mA</td><td>3.75</td><td>22.6</td></tr></table>	a	1	2	3	0-20 mA (25 mA)	0 - 24 mA	0	25	4-20 mA (25 mA)	4 - 24 mA	2	25	0-20 mA	0 - 20.5 mA	0	22	4-20 mA	4 - 20.5 mA	2	22	4-20 mA NAMUR	3.8 - 20.5 mA	3.5	22.6	4-20 mA US	3.9 - 20.8 mA	3.75	22.6
a	1	2	3																											
0-20 mA (25 mA)	0 - 24 mA	0	25																											
4-20 mA (25 mA)	4 - 24 mA	2	25																											
0-20 mA	0 - 20.5 mA	0	22																											
4-20 mA	4 - 20.5 mA	2	22																											
4-20 mA NAMUR	3.8 - 20.5 mA	3.5	22.6																											
4-20 mA US	3.9 - 20.8 mA	3.75	22.6																											
		A0002959 Fig. 16: 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).																												

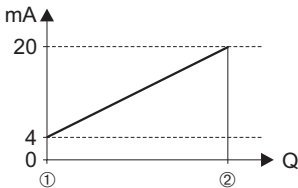
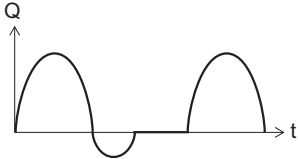
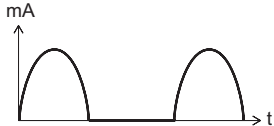
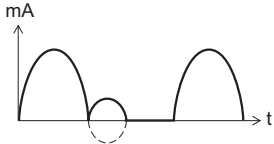
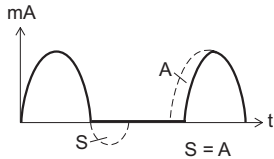
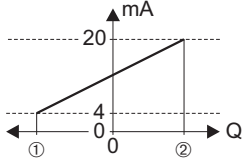
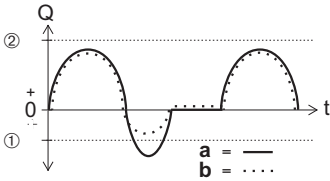
Function description		
OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION		
VALUE 0_4 mA 4002 ① MODBUS register: 5803 Data type: Float Access: read/write		Use this function to assign the 0/4 mA current a value. The value can be higher or lower than the value assigned to 20 (function VALUE 20 mA (4003), see Page 55). 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! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z003 in the CUSTODY TRANSFER block. ■ 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. Example for STANDARD measuring mode: ① = Lower range-value (0 to 20 mA) ② = Lower signal on alarm level: depends on the setting in the function CURRENT SPAN ③ = Lower range-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 (see Page 52) and FAILSAFE MODE (see Page 59) 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 14 to 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. (continued on next page)

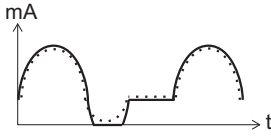
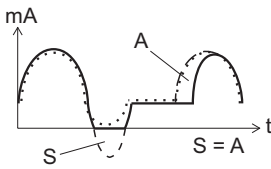
A0001223

Function description		
OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION		
VALUE 0_4 mA (continued)	4002	Parameter setting example A: - VALUE 0_4 mA (4002) = not equal to zero flow (e.g. -5 kg/h) VALUE 20 mA (4003) = not equal to zero flow (e.g. 10 kg/h) or - VALUE 0_4 mA (4002) = not equal to zero flow (e.g. 100 kg/h) VALUE 20 mA (4002) = not equal to zero flow (e.g. -40 kg/h) and MEASURING MODE (4004) = STANDARD When you enter the values for 0/4 mA and 20 mA, the working range of the measuring device is defined. If the effective flow drops below or exceeds this working range (see Fig. ①), a fault/notice 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). 1) 2) A0001262 Parameter setting example B: - VALUE 0_4 mA (4002) = equal to zero flow (e.g. 0 kg/h) VALUE 20 mA (4003) = not equal to zero flow (e.g. 10 kg/h) or - VALUE 0_4 mA (4002) = not equal to zero flow (e.g. 100 kg/h) VALUE 20 mA (4003) = equal to zero flow (e.g. 0 kg/h) and MEASURING MODE (4004) = STANDARD When you enter the values for 0/4 mA and 20 mA, the working range of the measuring device is defined. In doing so, one of the two values is parameterized as zero flow (e.g. 0 kg/h). If the effective flow drops below or exceeds the value parameterized as the zero flow, no fault/notice message is generated and the current output retains its value. If the effective flow drops below or exceeds the other value, a fault/notice message is generated (#351 to 354, current range) and the current output responds in accordance with the parameter settings in the function FAILSAFE MODE (4006). 1) 2) A0001264 Deliberately only one flow direction is output with this setting and flow values in the other flow direction are suppressed. Parameter setting example C: MEASURING MODE (4004) = SYMMETRY The current output signal is independent of the direction of flow (absolute amount of the measured variable). The 0_4 mA value ① and the 20 mA value ② must have the same sign (+ or -). The 20 mA VALUE ③ (e.g. backflow) corresponds to the mirrored 20 mA VALUE ② (e.g. flow). A0001249 ASSIGN STATUS (4241) = FLOW DIRECTION With this setting e.g. the flow direction output via a switching contact can be made. Parameter setting example D: MEASURING MODE (4004) = PULSATING FLOW → Page 55 ff.

Function description		
OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION		
VALUE 20 mA  MODBUS register: Data type: Access:	4003 5805 Float read/write	Use this function to assign the 20 mA current a value. The value can be higher or lower than the value assigned to 0/4 (function VALUE 0_4 mA (4002), see Page 53). 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! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMi, METAS or BEV approval and YES has been selected for function Z003 in the CUSTODY TRANSFER block. ■ 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 14 to Page 18). ■ The appropriate unit is taken from the function UNIT MASS FLOW (0400), (see Page 14). ■ An example for selecting the STANDARD option in the function MEASURING MODE (4004) can be found on Page 56.  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 53.
MEASURING MODE  MODBUS register: Data type: Access:	4004 5807 Integer read/write	For selecting the measuring mode for the current output. Options: 0 = STANDARD 1 = SYMMETRY 2 = PULSATING FLOW Factory setting: STANDARD  Note! This function cannot be changed if: ■ The measuring device has been configured in accordance with NTEP or MC approval. ■ The measuring device has been configured in accordance with PTB, NMi, METAS or BEV approval and YES has been selected for function Z003 in the CUSTODY TRANSFER block. (continued on next page)

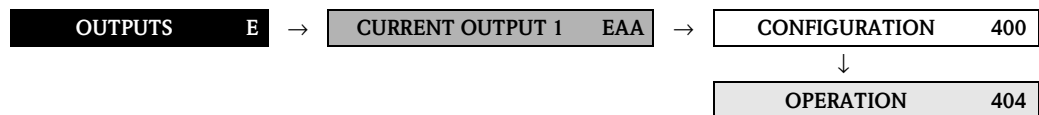
Function description		
OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION		
MEASURING MODE (continued)	4004	Description of the individual options: STANDARD The current output signal is proportional to the measured variable. The flow components outside the scaled measuring range (defined by the 0_4 mA VALUE ① 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 m³/h), no message is given if this value is exceeded or not achieved and the current output retains its value (in example 4 mA). If the other value is exceeded or not achieved, the message "CURRENT OUTPUT AT FULL SCALE VALUE" appears and the current output responds in accordance with the parameter setting in the function FAILSAFE MODE (4006). ■ If both values defined are not equal to the zero flow (for example VALUE 0_4 mA = -5 m³/h, VALUE 20 mA = 10m³/h), the message "CURRENT OUTPUT AT FULL SCALE VALUE" appears if the measuring range is exceeded or not achieved and the current output responds in accordance with the parameter settings in the function FAILSAFE MODE (4006).  Fig. 17: Example for STANDARD measuring mode A0001248 SYMMETRY The current output signal is independent of the direction of flow (absolute amount of the measured variable). The 0_4 mA value ① and the 20 mA value ② must have the same sign (+ or -). The "20 mA value" ③ (e.g. backflow) corresponds to the mirrored 20 mA value ② (e.g. flow).  Fig. 18: Example for SYMMETRY measuring mode A0001249  Note! ■ The direction of flow can be output via the configurable relay or status outputs. ■ SYMMETRY cannot be selected unless the values in the VALUE 0_4 mA (4002) and VALUE 20 mA (4003) functions have the same sign or one of the values is zero. If the values have different signs, SYMMETRY cannot be selected and an "ASSIGNMENT NOT POSSIBLE" message is displayed. PULSATING FLOW If flow is characterized by severe fluctuations as is the case, for example, with reciprocating pumps, flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 seconds. If the buffered data cannot be processed within approx. 60 seconds, a fault/notice message appears. Under certain plant conditions, flow values can aggregate in the buffer, for example in the case of prolonged and unwanted fluid backflow. However, this buffer is reset in all relevant programming adjustments which affect the current output.

Function description	
OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION	
Detailed explanations and information	How the current output responds under the following postulated conditions: 1. Defined measuring range (①–②): ① and ② have the same sign  A0001248 and the following flow behavior:  A0001265 ■ STANDARD The current output signal is proportional to the measured variable. The flow components outside the scaled measuring range are not taken into account for signal output.  A0001267 ■ SYMMETRY The current output signal is independent of the direction of flow.  A0001268 ■ PULSATING FLOW Flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 seconds.  A0001269 2. Defined measuring range (①–②): ① and ② do not have the same sign.  A0001272 Flow a (—) outside, b (---) within the measuring range.  A0001273 (continued on next page)

Function description			
OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION			
Detailed explanations and information (continued)	■ STANDARD a (—): The flow components outside the scaled measuring range cannot be taken into account for signal output. A fault message is generated (#351 to 354, current range) and the current output responds in accordance with the parameter settings in the function FAILSAFE MODE (4006). b (–): The current output signal is proportional to the measured variable assigned.  A0001274		
	■ SYMMETRY This option is not available under these circumstances because the 0_4 mA value and the 20 mA value have different signs.		
	■ PULSATING FLOW Flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 seconds.  A0001275		
TIME CONSTANT ① MODBUS register: Data type: Access:	4005 5808 Float 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 Note! This function cannot be changed if: ■ The measuring device has been configured in accordance with NTEP or MC approval. ■ The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z003 in the CUSTODY TRANSFER block.	

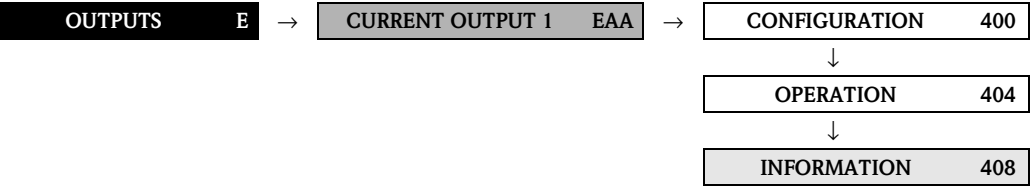
Function description		
OUTPUTS → CURRENT OUTPUT 1 → CONFIGURATION		
FAILSAFE MODE  MODBUS register: Data type: Access:	4006 5810 Integer read/write	For safety reasons it is advisable to ensure that the current output assumes a predefined state in the event of a fault. The setting you select here affects 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 52). 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 52). 2 = HOLD VALUE (not recommended) Measured value output is based on the last measured value saved before the error occurred. 3 = ACTUAL VALUE Measured value output is based on the current flow measurement. The fault is ignored. Factory setting: MIN. CURRENT  Note! This function cannot be changed if: ■ The measuring device has been configured in accordance with NTEP or MC approval. ■ The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z003 in the CUSTODY TRANSFER block.

8.1.2 Function group OPERATION



Function description OUTPUTS → CURRENT OUTPUT → 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! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z003 in the CUSTODY TRANSFER block. ■ 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		Use this function to define a freely selectable value (e.g. 12 mA) to be output at the current output. This value is used to test downstream devices and the measuring device itself. User input: 0.00 to 25.00 mA Factory setting: 0.00 mA  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z003 in the CUSTODY TRANSFER block. ■ This function is displayed only if the function SIMULATION CURR. (4041) is active (= ON).  Caution! The setting is not saved in the event of a power failure.

8.1.3 **Function group INFORMATION**



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

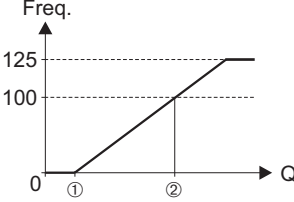
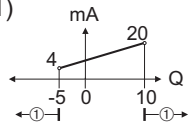
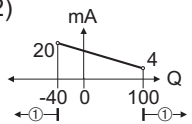
8.2 Group PULSE/FREQUENCY OUTPUT 1

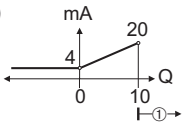
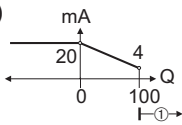
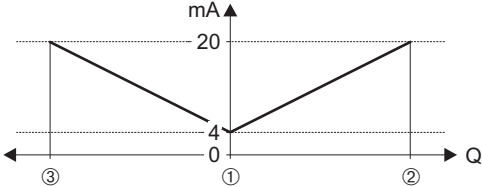
8.2.1 Function group CONFIGURATION

OUTPUTS E		→	CURRENT OUTPUT 1 EAA	
			↓	
			PULSE/FREQ. OUTPUT 1 ECA	→ CONFIGURATION 420
Function description				
OUTPUTS→PULSE/FREQUENCY OUTPUT 1→CONFIGURATION				
OPERATION MODE	4200	Configuration of the output as a pulse, frequency or status output.		
①		The functions available in this function group vary, depending on which option you select here.		
MODBUS register:	3201	Options:		
Data type:	Integer	0 = PULSE		
Access:	read/write	1 = FREQUENCY		
		2 = STATUS		
		Factory setting:		
		PULSE		

Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (FREQUENCY)		
ASSIGN FREQUENCY  MODBUS register: 3202 Data type: Integer Access: read/write	4201	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 Factory setting: MASS FLOW  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMi, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). ■ If you select OFF, the only function shown in the CONFIGURATION function group is ASSIGN FREQUENCY (4201).
START VALUE FREQUENCY  MODBUS register: 3203 Data type: Float Access: read/write	4202	For defining an initial frequency for the frequency output. You define the associated measured value of the measuring range in the function VALUE f LOW (4204). User input: 5-digit fixed-point number: 0 to 10000 Hz Factory setting: 0 Hz Example: ■ VALUE f LOW = 0 kg/h, start value frequency = 0 Hz This means that at a flow rate of 0 kg/h, a frequency of 0 Hz is output. ■ VALUE f LOW = 1 kg/h, start value frequency = 10 Hz This means that at a flow rate of 1 kg/h, a frequency of 10 Hz is output.  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMi, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200).

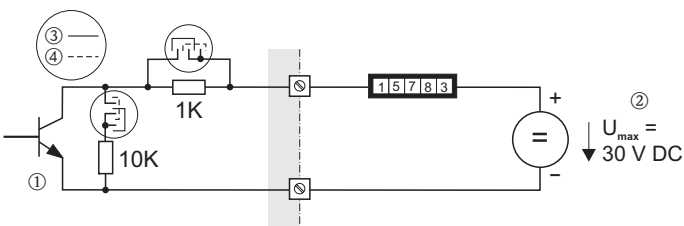
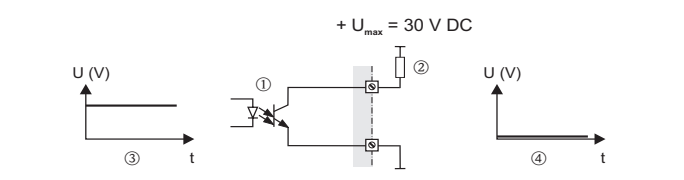
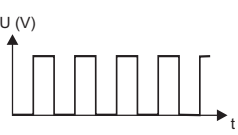
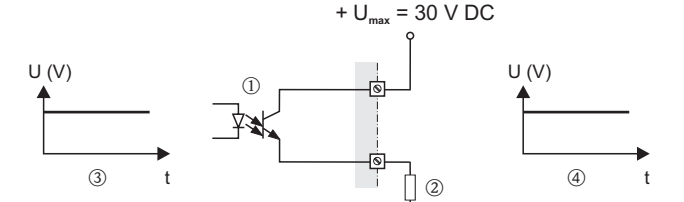
Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (FREQUENCY)		
END VALUE FREQUENCY  MODBUS register: Data type: Access:	4203 3205 Float read/write	For defining a full scale frequency for the frequency output. You define the associated measured value of the measuring range in the function VALUE-f HIGH (4205). User input: 5-digit fixed-point number: 2 to 10000 Hz Factory setting: 10000 Hz Example: ■ VALUE f HIGH = 10000 kg/h, full scale value = 10000 Hz This means that at a flow rate of 10000 kg/h, a frequency of 10000 Hz is output. ■ VALUE f HIGH = 3600 kg/h, full scale value = 10000 Hz This means that at a flow rate of 3600 kg/h, a frequency of 10000 Hz is output.  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). ■ 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  MODBUS register: Data type: Access:	4204 3207 Float read/write	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. Input: 5-digit floating-point number Factory setting: 0 [kg/h] or 0 [kg/l] or -50 [°C]  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). ■ 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 14 to Page 18).

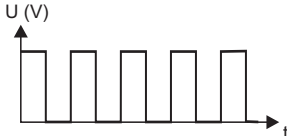
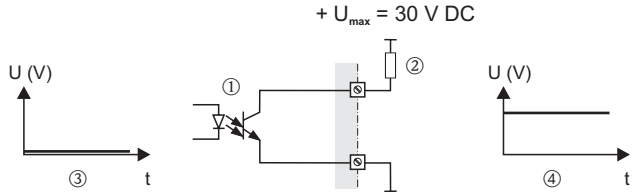
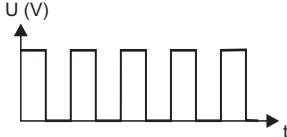
Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (FREQUENCY)		
VALUE-f HIGH ① MODBUS register: Data type: Access:	4205 3209 Float read/write	Use this function to assign a variable to the END VALUE FREQUENCY (4203). The value can be higher or lower than the value assigned to the 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. Input: 5-digit floating-point number Factory setting: Depends on nominal diameter [kg/h] or 2 [kg/l] or 200 [°C] Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). ■ Note that values with different signs cannot be entered for VALUE F LOW and VALUE F HIGH, if SYMMETRY is the setting selected for the MEASURING MODE function (4206). In this case, the message "INPUT RANGE EXCEEDED" appears on the display.  ① = Value f low ② = Value f high Parameter setting example 1: 1. VALUE f LOW (4204) = not equal to zero flow (e.g. –5 kg/h) VALUE-f HIGH (4205) = not equal to zero flow (e.g. 10 kg/h) or 2. VALUE f LOW (4204) = not equal to zero flow (e.g. 100 kg/h) VALUE-f HIGH (4205) = not equal to zero flow (e.g. –40 kg/h) and MEASURING MODE (4206) = STANDARD When you enter the values for VALUE f LOW and VALUE f HIGH the working range of the measuring device is defined. If the effective flow drops below or exceeds this working range (see Fig. ①), a fault/notice message is generated (#355 to 358, frequency range) and the frequency output responds in accordance with the parameter settings in the function FAILSAFE MODE (4209). 1)  2) 

Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (FREQUENCY)		
VALUE-f HIGH (continued)	4205	Parameter setting example 2: 1. VALUE f LOW (4204) = not equal to zero flow (e.g. 0 kg/h) VALUE-f HIGH (4205) = not equal to zero flow (e.g. 10 kg/h) or 2. VALUE f LOW (4204) = not equal to zero flow (e.g. 100 kg/h) VALUE-f HIGH (4205) = not equal to zero flow (e.g. 0 kg/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 kg/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 to 358, frequency range) and the frequency output responds in accordance with the parameter settings in the function FAILSAFE MODE (4209). 1)  2)  A0001264 Deliberately only one flow direction is output with this setting and flow values in the other flow direction are suppressed. Parameter setting example 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).  A0001249 ASSIGN STATUS (4241) = FLOW DIRECTION With this setting e.g. the flow direction output via a switching contact can be made. Parameter setting example 4: MEASURING MODE (4206) = PULSATING FLOW → Page 67 ff.

		Function description
		OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (FREQUENCY)
MEASURING MODE	4206	Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to define the measuring mode for the frequency output. MODBUS register: 3211 Data type: Integer Access: read/write Options: 0 = STANDARD 1 = SYMMETRY 2 = PULSATING FLOW Factory setting: STANDARD Note! This function cannot be changed if: ■ The measuring device has been configured in accordance with NTEP or MC approval. ■ The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for the available functions Z001 in the CUSTODY TRANSFER block. Description of the individual options: STANDARD The frequency output signal is proportional to the measured variable. The flow components outside the scaled measuring range (defined by the VALUE f LOW ① and the VALUE f HIGH ②) are not taken into account for signal output. ■ If one of the values is defined as equal to the zero flow (e.g. VALUE f LOW = 0 m³/h), no message is given if this value is exceeded or not achieved and the frequency output retains its value (0 Hz in the example). If the other value is exceeded or not achieved, the message "FREQUENCY OUTPUT AT FULL SCALE VALUE" appears and the frequency output responds in accordance with the parameter setting in the function FAILSAFE MODE (4209). ■ If both values defined are not equal to the zero flow (for example VALUE f LOW = -5 m³/h; VALUE F HIGH = 10m³/h), the message "FREQUENCY OUTPUT AT FULL SCALE VALUE" appears if the measuring range is exceeded or not achieved and the frequency output responds in accordance with the parameter settings in the function FAILSAFE MODE (4209). Freq. 125 100 0 ① ② Q Fig. 19: STANDARD measuring mode A0001279 SYMMETRY The frequency output signal is independent of the direction of flow (absolute amount of the measured variable). The VALUE f LOW ① and VALUE f HIGH ② must have the same sign (+ or -). The VALUE F HIGH ③ (e.g. backflow) corresponds to the mirrored VALUE F HIGH ② (e.g. flow). Freq. 125 100 0 ③ ① ② Q Fig. 20: SYMMETRY measuring mode A0001280 (continued on next page)

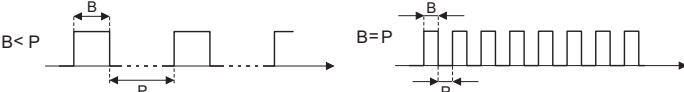
Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (FREQUENCY)	
MEASURING MODE (continued)	4206  Note! ■ The direction of flow can be output via the configurable relay or status outputs. ■ SYMMETRY cannot be selected unless the values in the VALUE f LOW (4204) and VALUE-f HIGH (4205) 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. 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.
OUTPUT SIGNAL  MODBUS register: Data type: Access:	4207 3212 Integer read/write For selecting the output configuration of the frequency output. Options: 0 = PASSIVE - POSITIVE 1 = PASSIVE - NEGATIVE 2 = ACTIVE - POSITIVE (this selection is not supported) 3 = ACTIVE - NEGATIVE (this selection is not supported) Factory setting: PASSIVE - POSITIVE Explanation PASSIVE = power is supplied to the frequency output by means of an external power supply. Configuring the output signal level (POSITIVE or NEGATIVE) determines the quiescent behavior (at zero flow) of the frequency output. The internal transistor is activated as follows: ■ If POSITIVE is selected, the internal transistor is activated with a positive signal level. ■ If NEGATIVE is selected, the internal transistor is activated with a negative signal level (0 V).  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMi, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). ■ With the passive output configuration, the output signal levels of the frequency output depend on the external circuit (see examples). (continued on next page)

Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (FREQUENCY)	
OUTPUT SIGNAL 4207 (continued)	Example for passive output circuit (PASSIVE) If PASSIVE is selected, the frequency output is configured as an open collector.  A0002147 ① = Open collector ② = External power supply ③ = Line monitoring off ④ = Line monitoring on (default) Note! For continuous currents up to 25 mA ($I_{\max} = 250 \text{ mA} / 20 \text{ ms}$). Example for output configuration PASSIVE-POSITIVE: Output configuration with an external pull-up resistance. In the quiescent state (at zero flow), the output signal level at the terminals is 0 V.  a0004687 ① = Open collector ② = Pull-Up-Resistance ③ = Transistor activation in POSITIVE quiescent state (at zero flow) ④ = Output signal level in quiescent state (at zero flow) In the operating status (flow present), the output signal level changes from 0 V to a positive voltage level  a0001975 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) (continued on next page)

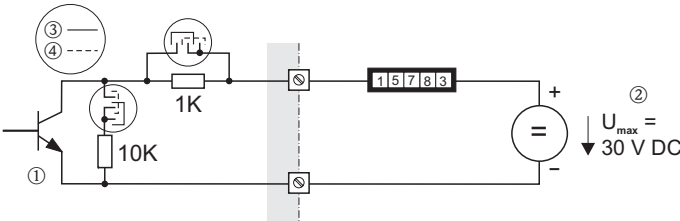
Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (FREQUENCY)		
OUTPUT SIGNAL 4207 (continued)	In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V.  A0001981 Example for output configuration PASSIVE-NEGATIVE: Output configuration 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 = <i>Open collector</i> ② = <i>Pull-Up-Resistance</i> ③ = <i>Transistor activation in NEGATIVE quiescent state (at zero flow)</i> ④ = <i>Output signal level in quiescent state (at zero flow)</i> In the operating status (flow present), the output signal level changes from a positive voltage level to 0 V.  A0001981	
TIME CONSTANT 4208  MODBUS register: 3213 Data type: Float Access: read/write	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  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200).	

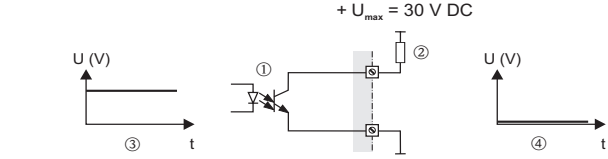
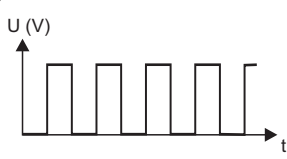
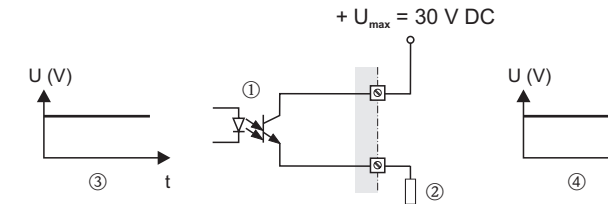
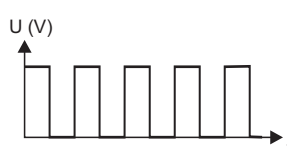
		Function description
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (FREQUENCY)		
FAILSAFE MODE 4209  MODBUS register: 3215 Data type: Integer Access: read/write		For safety reasons it is advisable to ensure that the frequency output assumes a predefined state in the event of a fault. The setting 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 LEVEL Output is the frequency specified in the FAILSAFE LEVEL function (4211). 2 = HOLD VALUE Measured value output is based on the last measured value saved before the error occurred. 3 = ACTUAL VALUE Measured value output is based on the current flow measurement. The fault is ignored. Factory setting: FALLBACK VALUE  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200).
FAILSAFE LEVEL 4211  MODBUS register: 3216 Data type: Float Access: read/write		 Note! This function is not available unless FREQUENCY was selected in the OPERATION MODE function (4200) and FAILSAFE LEVEL 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  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless FREQUENCY was selected in the OPERATION MODE function (4200) and FAILSAFE LEVEL was selected in the FAILSAFE MODE function (4209).

Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (PULSE)		
ASSIGN PULSE 4221  MODBUS register: 3223 Data type: Integer Access: read/write		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 Factory setting: MASS FLOW  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless the PULSE setting was selected in the OPERATION MODE function (4200). ■ 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		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! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless the PULSE setting was selected in the OPERATION MODE function (4200). ■ The appropriate unit is taken from the UNIT MASS FLOW (0400), UNIT VOLUME FLOW (0402) or UNIT CORRECTED VOLUME FLOW (0404) function (see Page 14 to Page 18).

Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (PULSE)		
PULSE WIDTH	4223	
		Note! This function is not available unless the PULSE setting was selected in the OPERATION MODE function (4200). Use this function to enter the pulse width of the output pulse.
MODBUS register:	3226	
Data type:	Float	
Access:	read/write	
		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).  <i>Fig. 21: Pulse width</i> <i>B = Pulse width entered (the illustration applies to positive pulses)</i> <i>P = Pauses between the individual pulses</i>  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMi, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless the PULSE setting was selected in the OPERATION MODE function (4200). ■ 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 72) 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.

Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (PULSE)		
MEASURING MODE  MODBUS register: Data type: Access:	4225 3228 Integer read/write	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  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless the PULSE setting was selected in the OPERATION MODE function (4200).

Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (PULSE)		
OUTPUT SIGNAL 4226  MODBUS register: 3229 Data type: Integer Access: read/write	For selecting the output configuration of the pulse output. Options: 0 = PASSIVE - POSITIVE 1 = PASSIVE - NEGATIVE 2 = ACTIVE - POSITIVE (this selection is not supported) 3 = ACTIVE - NEGATIVE (this selection is not supported) Factory setting: PASSIVE - POSITIVE Explanation PASSIVE = power is supplied to the pulse output by means of an external power supply. Configuring the output signal level (POSITIVE or NEGATIVE) determines the quiescent behavior (at zero flow) of the pulse output. The internal transistor is activated as follows: ■ If POSITIVE is selected, the internal transistor is activated with a positive signal level. ■ If NEGATIVE is selected, the internal transistor is activated with a negative signal level (0 V).  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless the PULSE setting was selected in the OPERATION MODE function (4200). ■ 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.	 A0002147 ① = Open collector ② = External power supply ③ = Line monitoring off ④ = Line monitoring on (default)  Note! For continuous currents up to 25 mA ($I_{\max} = 250 \text{ mA} / 20 \text{ ms}$).
(continued on next page)		

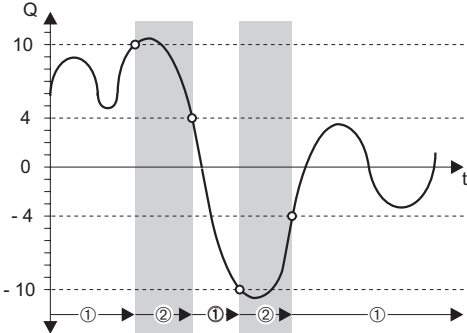
Function description	
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (PULSE)	
OUTPUT SIGNAL 4226 (continued)	Example for output configuration PASSIVE-POSITIVE: Output configuration with an external pull-up resistance. In the quiescent state (at zero flow), the output signal level at the terminals is 0 V. + U_{max} = 30 V DC  The diagram shows an open collector transistor (1) connected to a pull-up resistor (2) leading to +U_{max} = 30 V DC. The output voltage U(V) is shown in two graphs: (3) during transistor activation, the voltage drops from 30V to 0V; (4) in the quiescent state, the voltage is at 30V. a0004687 ① = Open collector ② = Pull-Up-Resistance ③ = Transistor activation in POSITIVE quiescent state (at zero flow) ④ = Output signal level in quiescent state (at zero flow) In the operating status (flow present), the output signal level changes from 0 V to a positive voltage level.  The graph shows the output voltage U(V) over time t, with pulses representing the signal when flow is present. 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. + U_{max} = 30 V DC  The diagram shows an open collector transistor (1) connected to a pull-down resistor (2) leading to ground. The output voltage U(V) is shown in two graphs: (3) during transistor activation, the voltage drops from 30V to 0V; (4) in the quiescent state, the voltage is at 30V. 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.  The graph shows the output voltage U(V) over time t, with pulses representing the signal when flow is present. A0001981 (continued on next page)

Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (PULSE)		
OUTPUT SIGNAL 4226 (continued)	Example for output configuration PASSIVE-NEGATIVE: Output configuration with an external pull-up resistance. In the quiescent state (at zero flow), the output signal level at the terminals is at a positive voltage level. ① = Open collector ② = Pull-Up-Resistance ③ = Transistor activation in <i>NEGATIVE</i> 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.	a0004690 A0001981
FAILSAFE MODE 4227 MODBUS register: 3230 Data type: Integer Access: read/write	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. 4 = MAX. PULSE RATE Outputs the maximum pulse rate $f = 1/(2 \times T)$ Factory setting: FALLBACK VALUE Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless the PULSE setting was selected in the OPERATION MODE function (4200).	

Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (STATUS)		
ASSIGN STATUS	4241	Use this function to assign a switching function to the status output.
 MODBUS register: 3236 Data type: Integer Access: read/write		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 Factory setting: FAULT MESSAGE  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is available only if the STATUS setting was selected in the OPERATION MODE (4200) function. ■ 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 fault or notice message present. – Switching response like relay output, see Page 96 ■ 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 96.

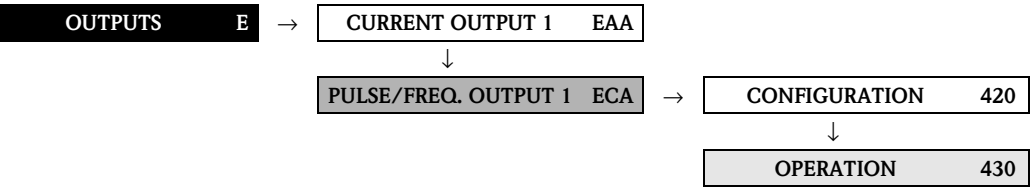
Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (STATUS)		
ON-VALUE 4242  MODBUS register: 3237 Data type: Float Access: read/write		Use this function to assign a value to the switch-on point (activation of the status output). The value can be higher or lower than the switch-off 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! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless STATUS was selected in the OPERATION MODE function (4200) and LIMIT VALUE or FLOW DIRECTION was selected in the ASSIGN STATUS function (4241). ■ 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		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  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless STATUS was selected in the OPERATION MODE function (4200) and LIMIT VALUE or FLOW DIRECTION was selected in the ASSIGN STATUS function (4241).

Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (STATUS)		
OFF-VALUE  MODBUS register: Data type: Access:	4244 3241 Float read/write	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! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless STATUS was selected in the OPERATION MODE function (4200) and LIMIT VALUE was selected in the ASSIGN STATUS function (4241). ■ The appropriate unit is taken from the function UNIT VOLUME FLOW (0402) or UNIT MASS FLOW (0400). ■ If SYMMETRY is selected in the function MEASURING MODE (4246) and values with different signs are entered for the switch-on and switch-off points, the notice message "INPUT RANGE EXCEEDED" appears.
SWITCH-OFF DELAY  MODBUS register: Data type: Access:	4245 3243 Float read/write	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  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless the STATUS setting was selected in the OPERATION MODE function (4200).

Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (STATUS)		
MEASURING MODE MODBUS register: 3245 Data type: Integer Access: read/write	4246	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  Fig. 22: 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! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMi, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless STATUS was selected in the OPERATION MODE function (4200) and the status output was assigned a limit value. ■ SYMMETRY cannot be selected unless the values in the ON-VALUE (4242) and OFF-VALUE (4244) functions have the same sign or one of the values is zero. ■ If the values have different signs, SYMMETRY cannot be selected and an "ASSIGNMENT NOT POSSIBLE" message is displayed.

Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → CONFIGURATION (STATUS)		
TIME CONSTANT 4247 ① MODBUS register: 3246 Data type: Float Access: read/write	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  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless the STATUS setting was selected in the OPERATION MODE function (4200).	

8.2.2 Function group OPERATION



Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → OPERATION (FREQUENCY)		
ACTUAL FREQUENCY MODBUS register: Data type: Access:	4301 3218 Float read	Use this function to view the computed actual value of the output frequency. Display: 0 to 12500 Hz  Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200).
SIMULATION FREQUENCY  MODBUS register: Data type: Access:	4302 3220 Integer read/write	Activates simulation of the frequency output. Options: 0 = OFF 1 = ON Factory setting: OFF  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMi, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). ■ 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.

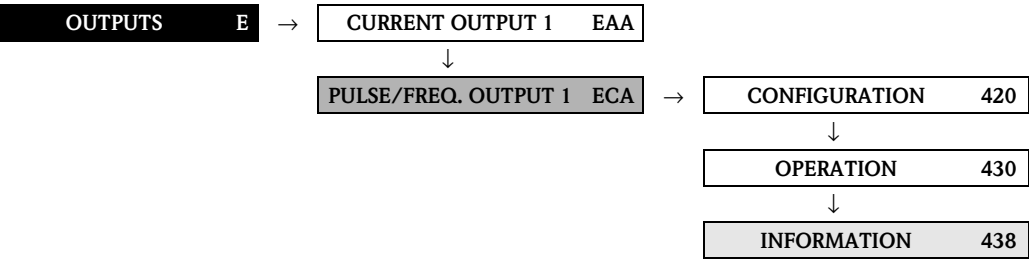
Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → OPERATION (FREQUENCY)		
VALUE SIMULATION FREQUENCY  MODBUS register: 3221 Data type: Float Access: read/write	4303	Define a selectable frequency value (e.g. 500 Hz) which should be output at the frequency output (with maximum pulse frequency 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  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless FREQUENCY was selected in the OPERATION MODE function (4200) and the SIMULATION FREQUENCY function (4302) is active (= ON).  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	Activates simulation of the pulse output. Options: 0 = OFF 1 = COUNTDOWN The pulses specified in the VALUE SIMULATION PULSE function are output. 2 = CONTINUOUSLY Pulses are continuously output with the pulse width specified in the PULSE WIDTH function. Simulation is started once the CONTINUOUSLY option is confirmed with the  key.  Note! Simulation is started by confirming the CONTINUOUSLY option with the  key. The simulation can be switched off again via the SIMULATION PULSE function. Factory setting: OFF  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMi, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is available only if the PULSE setting was selected in the OPERATION MODE (4200) function. ■ 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.

Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → OPERATION (PULSE)		
VALUE SIMULATION PULSE 	4323 MODBUS register: 3234 Data type: Float Access: read/write	Specify the number of pulses (e.g. 50) to be output during the simulation. This value is used to test downstream devices and the measuring device itself. The pulses are output with the pulse width specified in the PULSE WIDTH function. The on/off ratio is 1:1. Simulation is started once the specified value is confirmed with the  key. The display remains at 0 if the specified pulses have been output. User input: 0 to 10 000 Factory setting: 0  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless the COUNTDOWN setting was selected in the function SIMULATION PULSE. ■ Simulation is started by confirming the simulation value with the  key. The simulation can be switched off again via the SIMULATION PULSE function.  Caution! The setting is not saved in the event of a power failure.

Function description		
OUTPUTS → PULSE/FREQUENCY OUTPUT 1 → OPERATION (STATUS)		
ACTUAL STATUS 4341 MODBUS register: 3248 Data type: Integer Access: read		Use this function to check the current status of the status output. Display: 0 = NOT CONDUCTIVE 1 = CONDUCTIVE  Note! This function is not available unless the STATUS setting was selected in the OPERATION MODE function (4200).
SIMULATION SWITCH POINT 4342  MODBUS register: 3249 Data type: Integer Access: read/write		Use this function to activate simulation of the status output. Options: 0 = OFF 1 = ON Factory setting: OFF  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is available only if the STATUS setting was selected in the OPERATION MODE (4200) function. ■ 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		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  Note! ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z001 in the CUSTODY TRANSFER block. ■ This function is not available unless STATUS was selected in the OPERATION MODE function (4200) and the SIMULATION SWITCH POINT function (4342) is active (= ON).  Caution! The setting is not saved in the event of a power failure.

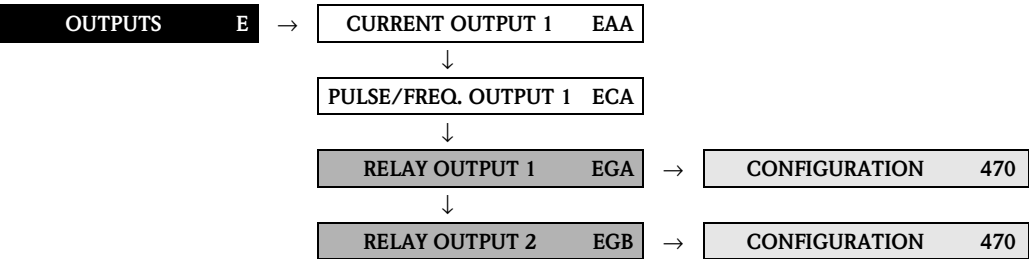
8.2.3 Function groupINFORMATION



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:	3251	
Data type:	Integer	
Access:	read	

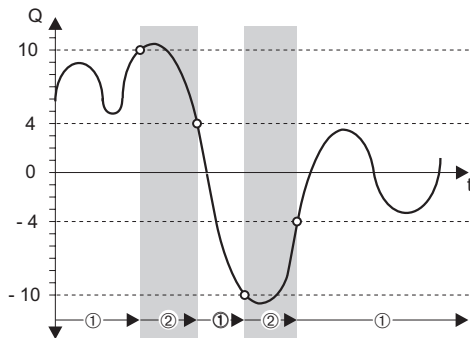
8.3 Group RELAY OUTPUT (1 to 2)

8.3.1 Function group CONFIGURATION



Function description		
OUTPUTS → RELAY OUTPUT (1 to 2) → CONFIGURATION		
ASSIGN RELAY	4700	Use this function to assign a switching function to the relay output.
		Options: (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
MODBUS register:		
Relay output 1	3801	
Relay output 2	4001	
Data type:	Integer	
Access:	read/write	
		Factory setting: FAULT MESSAGE
		Note!
		■ It is very important to read and comply with the information on the switching characteristics of the relay output, (see Page 96). ■ It is advisable to configure at least one relay output as a fault output and define the outputs' failsafe mode. ■ 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).

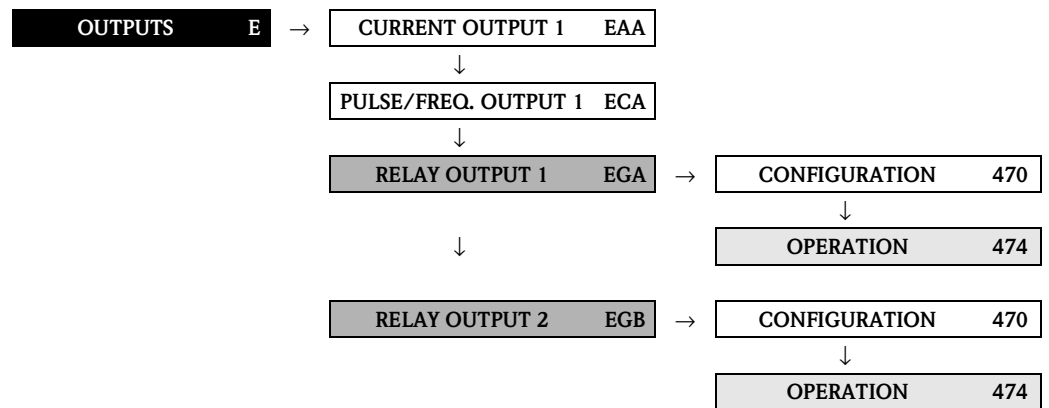
		Function description
		OUTPUTS → RELAY OUTPUT (1 to 2) → CONFIGURATION
ON-VALUE 4701  MODBUS register: Relay output 1 3802 Relay output 2 4002 Data type: Float Access: read/write		 Note! This function is not available unless LIMIT VALUE or FLOW DIRECTION was selected in the ASSIGN RELAY function (4700). 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 4702  MODBUS register: Relay output 1 3804 Relay output 2 4004 Data type: Float Access: read/write		 Note! This 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
OFF-VALUE 4703  MODBUS register: Relay output 1 3806 Relay output 2 4006 Data type: Float Access: read/write		 Note! This function is not available unless LIMIT VALUE was selected in the ASSIGN RELAY function (4700). Use this function to assign a value to the switch-off point (relay drops out). The value can be 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.

Function description		
OUTPUTS → RELAY OUTPUT (1 to 2) → CONFIGURATION		
SWITCH-OFF DELAY 4704  MODBUS register: Relay output 1 3808 Relay output 2 4008 Data type: Float Access: read/write		 Note! This function is not available unless LIMIT 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
MEASURING MODE 4705  MODBUS register: Relay output 1 3810 Relay output 2 4010 Data type: Integer Access: read/write		 Note! This function is not available unless LIMIT VALUE was selected in the ASSIGN RELAY function (4700). 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  <i>Fig. 23: Example for the SYMMETRY measuring mode</i> 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.

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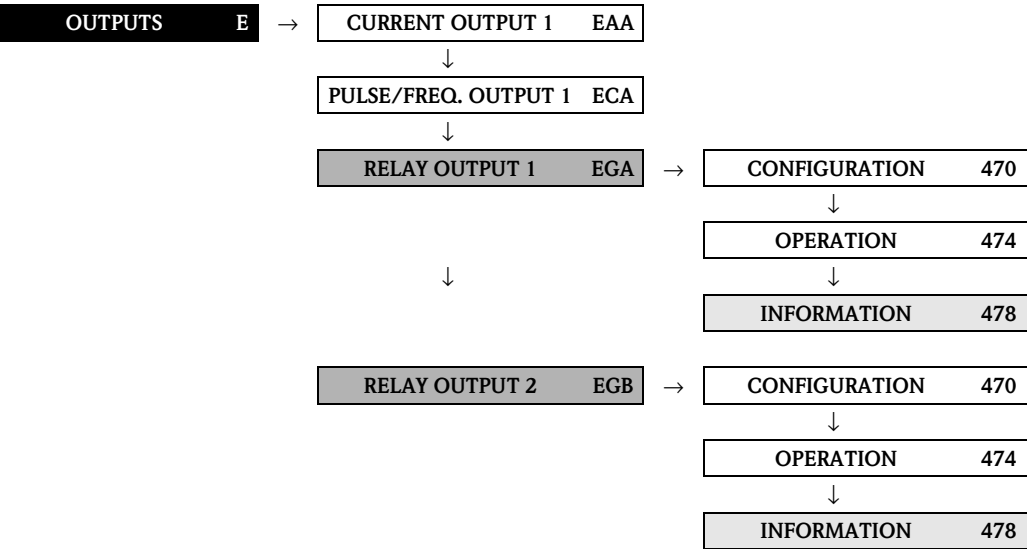
Function description		
OUTPUTS → RELAY OUTPUT (1 to 2) → CONFIGURATION		
TIME CONSTANT	4706	Entering a time constant defines how the measuring signal reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). Damping 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 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
①		
MODBUS register:		
Relay output 1	3811	
Relay output 2	4011	
Data type:	Float	
Access:	read/write	

8.3.2 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 maker) or normally closed (NC or breaker) contact (see Operating Instructions for Proline Promass 84 MODBUS RS485, BA129D). Display: 0 = BREAK CONTACT OPEN 1 = BREAK CONTACT CLOSED 2 = MAKE CONTACT OPEN 3 = MAKE CONTACT CLOSED
SIMULATION SWITCH POINT  MODBUS register: Relay output 1 3814 Relay output 2 4014 Data type: Integer Access: read/write	4741	Use this function to activate simulation of the relay output. Options: 0 = OFF 1 = ON Factory setting: OFF  Note! - The "SIMULATION RELAY" message indicates that simulation is active. - The measuring device continues to measure while simulation is in progress, i.e. the current measured values are output correctly via the other outputs.  Caution! The setting is not saved in the event of a power failure.
VALUE SIMULATION SWITCH POINT  MODBUS register: Relay output 1 3815 Relay output 2 4015 Data type: Integer Access: read/write	4742	 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 NC (breaker) contact 0 = BREAK CONTACT OPEN 1 = BREAK CONTACT CLOSED Options: Relay output configured as NO (maker) contact 2 = MAKE CONTACT OPEN 3 = MAKE CONTACT CLOSED  Caution! The setting is not saved in the event of a power failure.

8.3.3 Function group INFORMATION



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

8.3.4 Information on the response of the relay output

General

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

Relay output configured for "flow direction"

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

If, for example, the switch point you define is $1 \text{ m}^3/\text{h}$, the relay drops out at $-1 \text{ m}^3/\text{h}$ and pulls up at $+1 \text{ m}^3/\text{h}$. Set the switch point to 0 if your process calls for direct switchover (no switching hysteresis). If low flow cut off is used, it is advisable to set hysteresis to a value higher than or equal to the low flow cut off rate.

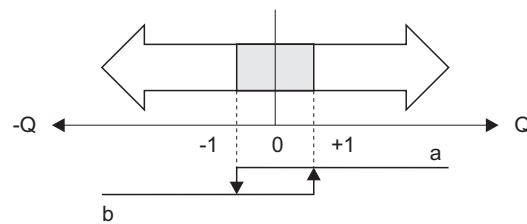


Fig. 24: Relay output configured for "flow direction"

- a Relay energized
b Relay de-energized

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Relay output configured for "limit value"

The relay output signal switches as soon as the measured variable undershoots or overshoots a defined switch point.

Application: Monitoring flow or process-related boundary conditions.

Measured variable

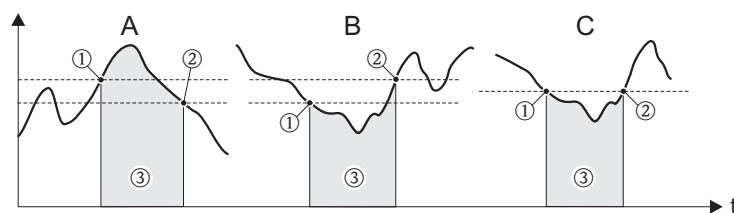


Fig. 25: Relay output configured for "limit value"

- ① = Switch-off point, ② = Switch-on point, ③ = Relay de-energized

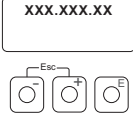
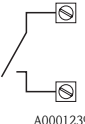
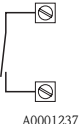
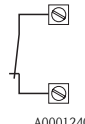
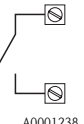
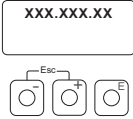
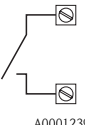
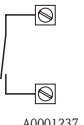
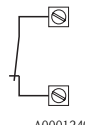
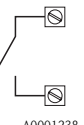
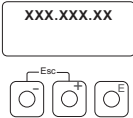
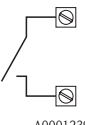
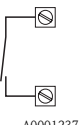
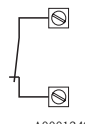
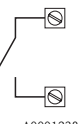
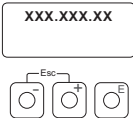
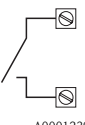
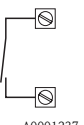
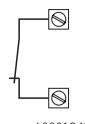
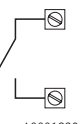
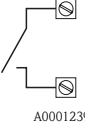
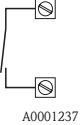
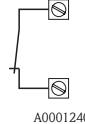
A = Maximum safety (SWITCH-OFF POINT > SWITCH-ON POINT)

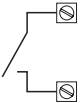
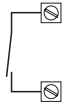
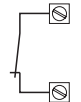
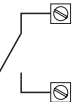
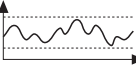
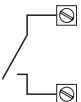
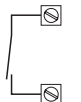
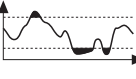
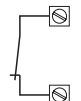
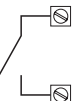
B = Minimum safety (SWITCH-OFF POINT < SWITCH-ON POINT)

C = Minimum safety (SWITCH-OFF POINT = SWITCH-ON POINT, this configuration is to be avoided)

A0001235

8.3.5 Switching behavior 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 → Failsafe mode, 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	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 overshoot or undershot  A0001243	energized	 A0001239	 A0001237
	Limit value overshoot or undershot  A0001244	de-energized	 A0001240	 A0001238
* Terminal numbers in accordance with the TERMINAL NUMBER function (4780) on Page 94.  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.				

9 Block INPUTS

Block	Groups	Function groups	Functions
INPUTS (F)	STATUS INPUT (FAA) P. 99	CONFIGURATION (500) P. 99	ASSIGN STATUS INPUT (5000) P. 99
			ACTIVE LEVEL (5001) P. 99
	OPERATION (504) P. 100	OPERATION (504) P. 100	MIN. PULSE WIDTH (5002) P. 99
			SIMULATION STATUS INPUT (5041) P. 100
	INFORMATION (508) P. 101	INFORMATION (508) P. 101	VALUE SIM. STATUS IN. (5042) P. 100
			TERMINAL NUMBER (5080) P. 101

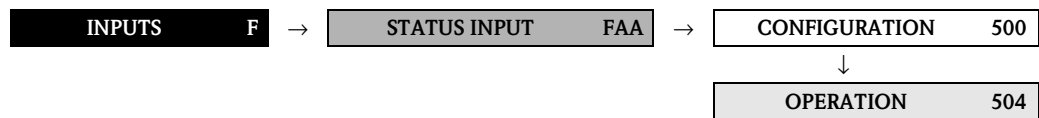
9.1 Group STATUS INPUT

9.1.1 Function group CONFIGURATION

INPUTS	F	→	STATUS INPUT	FAA	→	CONFIGURATION	500
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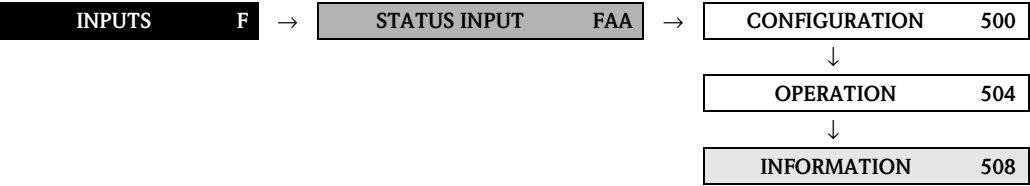
Function description			INPUTS → STATUS INPUT → CONFIGURATION	
ASSIGN STATUS INPUT	5000	Use this function to assign a switching function to the status input. Options: 0 = OFF 1 = RESET TOTALIZER 1 2 = RESET TOTALIZER 2 3 = RESET TOTALIZER 3 4 = RESET ALL TOTALIZERS 5 = POSITIVE ZERO RETURN 8 = ZEROPOINT ADJUST 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.	MODBUS register: 4301 Data type: Integer Access: read/write	
ACTIVE LEVEL	5001	Use this function to define whether the assigned function (see function ASSIGN STATUS INPUT(5000)) is released when the signal level is present (HIGH) or not present (LOW). Options: 1 = HIGH 0 = LOW Factory setting: HIGH	MODBUS register: 4302 Data type: Integer Access: read/write	
MINIMUM PULSE WIDTH	5002	Use this function to define a minimum pulse width which the input pulse must achieve in order to trigger the selected switching function, (see function ASSIGN STATUS INPUT (5000)). User input: 20 to 100 ms Factory setting: 50 ms	MODBUS register: 4303 Data type: Float Access: read/write	

9.1.2 Function group OPERATION



Function description INPUTS → STATUS INPUT → OPERATION		
ACTUAL STATUS INPUT MODBUS register: Data type: Access:	5040 4305 Integer read	Use this function to view the current level of the status input. Display: 0 = LOW 1 = HIGH
SIMULATION STATUS INPUT  MODBUS register: Data type: Access:	5041 4306 Integer read/write	Use this function to simulate the status input, in other words to trigger the function assigned to the status input (see the function ASSIGN STATUS INPUT (5000) on Page 99). Display: 0 = OFF 1 = ON Factory setting: OFF  Note! ■ The "SIMULATION STATUS INPUT" notice message indicates that simulation is active. ■ The measuring device continues to measure while simulation is in progress, i.e. the current measured values are output correctly via the other outputs.  Caution! The setting is not saved in the event of a power failure.
VALUE SIMULATION STATUS INPUT  MODBUS register: Data type: Access:	5042 4307 Integer read/write	 Note! The function is not visible unless the function SIMULATION STATUS INPUT (5041) is active. Use this function to define the level to be assumed at the status output during the simulation. This value is used to test downstream devices and the measuring device itself. Options: 0 = LOW 1 = HIGH Factory setting: LOW  Caution! The setting is not saved in the event of a power failure.

9.1.3 Function group INFORMATION



Function description		
INPUTS → STATUS INPUT → INFORMATION		
TERMINAL NUMBER MODBUS register: Data type: Access	5080 4308 Integer read	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 (-)

10 Block BASIC FUNCTION

Block	Groups	Function groups	Functions									
			TAG NAME (6300) P. 103	⇒	FIELD BUS ADDRESS (6301) P. 103	BAUDRATE (6302) P. 103	TRANSMISSION MODE (6303) P. 104	PARITY (6304) P. 104	BYTE ORDER (6305) P. 104	DELAY TELE. REPLY (6306) P. 105	WRITE PROTECTION (6307) P. 105	SCAN LIST REGISTER 1 to 16 (6308) P. 105
BASIC FUNCTION (G)	MODBUS RS485 (GDA) P. 103	CONFIGURATION (630) P. 103	⇒									
		PROCESS PARAMETER (GIA) P. 106	⇒									
		CONFIGURATION (640) P. 106	⇒	ASSIGN LF CUT OFF (6400) P. 106	⇒	ON-VALUE LF CUT OFF (6402) P. 106	OFF-VALUE LF CUT OFF (6403) P. 106					
		EPD PARAMETER (642) P. 108	⇒	EPD (6420) P. 108	⇒	EPD VALUE LOW (6423) P. 108	EPD VALUE HIGH (6424) P. 108	EPD RESPONSE TIME (6425) P. 108	EPD EXC. CURR. (6426) P. 109			
		REFERENCE PARAMETER (646) P. 110	⇒	COR. VOL. CALC. (6460) P. 110	⇒	FIXED REFERENCE DENSITY	EXPANSION COEFF (6462) P. 110	EXPANSION COEF. SQR. (6463) P. 110	REFERENCE TEMPERATURE (6464) P. 111			
		ADJUSTMENT (648) P. 112	⇒	ZERO POINT ADJUSTMENT (6480) P. 112	⇒	DENSITY ADJUST MODE (6482) P. 112	DENSITY SET VALUE 1 (6483) P. 112	MEASURE FLUID 1 (6484) P. 112	DENSITY SET VALUE 2 (6485) P. 113	MEASURE FLUID 2 (6486) P. 113	DENSITY ADJUSTMENT (6487) P. 113	RESTORE ORIGINAL (6488) P. 113
		PRESSURE CORRECTION (650) P. 114	⇒	PRESSURE MODE (6500) P. 114	⇒	PRESSURE						
		CONFIGURATION (660) P. 115	⇒	INST. DIR. SENSOR (6600) P. 115	⇒	DENSITY DAMPING (6602) P. 115	FLOW DAMPING (6603) P. 115	POSITIVE ZERO RETURN (6605) P. 115				
	SYSTEM PARAMETER (GIA) P. 115	CONFIGURATION (680) P. 116	⇒	K-FACTOR (6800) P. 116	⇒	ZERO POINT (6803) P. 116	NOMINAL DIAMETER (6804) P. 116					
		FLOW COEFF. (684) P. 117	⇒	COEFF. KM (6840) P. 117	⇒	COEFF. KM 2 (6841) P. 117	COEFF. KT (6842) P. 117	COEFF. KD1 (6843) P. 117	COEFF. KD2 (6844) P. 117			
		DENSITY COEFFICIENT (685) P. 118	⇒	COEFF. C 0 (6850) P. 118	⇒	COEFF. C 1 (6851) P. 118	COEFF. C 2 (6852) P. 118	COEFF. C 3 (6853) P. 118	COEFF. C 4 (6854) P. 118	COEFF. C 5 (6855) P. 118		
		ADDITIONAL COEFFICIENT (686) P. 119	⇒	MIN. TEMP. MEAS. (6860) P. 119	⇒	MAX. TEMP. MEAS. (6861) P. 119	MIN. TEMP. CARRIER (6862) P. 119	MAX. TEMP. CARRIER (6863) P. 119				
	SENSOR DATA (GNA) P. 116											

10.1 Group MODBUS RS485

10.1.1 Function group CONFIGURATION

BASIC FUNCTION	G	→	MODBUS RS485	GDA	→	CONFIGURATION	630
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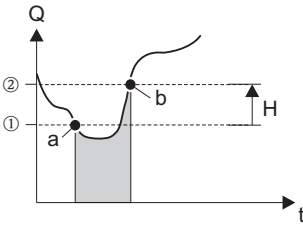
Function description			
BASIC FUNCTION → MODBUS RS485 → CONFIGURATION			
TAG NAME 	6300		For entering a tag name for the measuring device. You can edit and read this tag name via the local display or the MODBUS RS485 protocol.
MODBUS register: Data type: Access:	4901 String (16) read/write		User input: max. 16-character text, permissible: A-Z, 0-9, +, -, punctuation marks Factory setting: "-----" (No text)  Note! This function cannot be changed if: ■ The measuring device has been configured in accordance with NTEP or MC approval. ■ The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z009 in the CUSTODY TRANSFER block.
FIELD BUS ADDRESS 	6301		For entering the device address.
MODBUS register: Data type: Access:	4910 Integer read/write		User input: 1 to 247 Factory setting: 247  Note! This function cannot be changed if: ■ The measuring device has been configured in accordance with NTEP or MC approval. ■ The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z009 in the CUSTODY TRANSFER block.
BAUDRATE 	6302		For selecting the baudrate.
MODBUS register: Data type: Access:	4912 Integer read/write		Options: 0 = 1200 BAUD 1 = 2400 BAUD 2 = 4800 BAUD 3 = 9600 BAUD 4 = 19200 BAUD 5 = 38400 BAUD 6 = 57600 BAUD 7 = 115200 BAUD Factory setting: 19200 BAUD  Note! This function cannot be changed if: ■ The measuring device has been configured in accordance with NTEP or MC approval. ■ The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z009 in the CUSTODY TRANSFER block.

Function description BASIC FUNCTION → MODBUS RS485 → CONFIGURATION		
TRANSMISSION MODE  MODBUS register: 4913 Data type: Integer Access: read/write	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. ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z009 in the CUSTODY TRANSFER block.
PARITY  MODBUS register: 4914 Data type: Integer Access: read/write	6304	For selecting whether no parity bit or an even or uneven parity bit should be transmitted. The options available depend on the TRANSMISSION MODE function: Options: (for TRANSMISSION MODE = RTU) 0 = EVEN 1 = UNEVEN 2 = NONE Options: (for TRANSMISSION MODE = ASCII) 0 = EVEN 1 = UNEVEN Factory setting: EVEN  Note! This function cannot be changed if: ■ The measuring device has been configured in accordance with NTEP or MC approval. ■ The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z009 in the CUSTODY TRANSFER block.
BYTE ORDER  MODBUS register: 4915 Data type: Integer Access: read/write	6305	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. ■ For additional information, refer to the "Byte transmission order" section in the Operating Instructions for Proline Promass 84 MODBUS RS485, BA129D. ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z009 in the CUSTODY TRANSFER block.

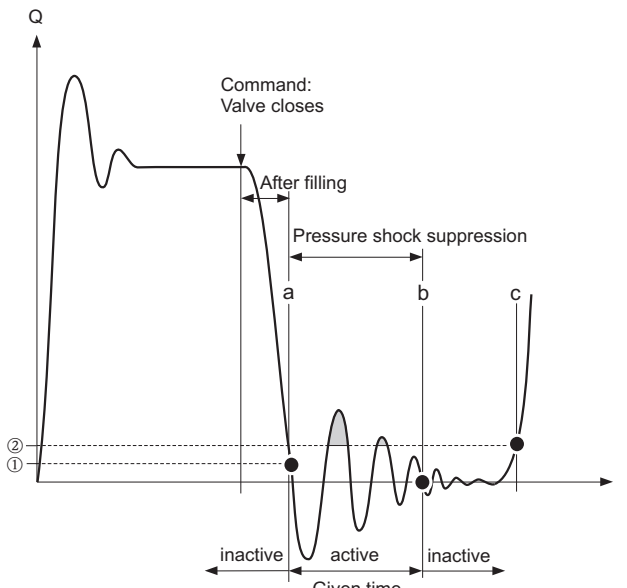
Function description BASIC FUNCTION → MODBUS RS485 → CONFIGURATION		
DELAY TELE. REPLY  MODBUS register: 4916 Data type: Float Access: read/write	6306	For entering a delay time after which the measuring device replies to the request telegram of the MODBUS master. This allows communication to be adapted to slow MODBUS RS485 masters. User input: 0 to 100 ms Factory setting: 10 ms  Note! This function cannot be changed if: ■ The measuring device has been configured in accordance with NTEP or MC approval. ■ The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z009 in the CUSTODY TRANSFER block.
WRITE PROTECTION MODBUS register: 4918 Data type: Integer Access: read	6307	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 board (see Operating Instructions for Proline Promass 84 MODBUS RS485, BA129D).
SCAN LIST REGISTER 1 to 16  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	6308	By entering the register address, up to 16 device parameters can be grouped in the auto-scan buffer where they are assigned to the scan list registers 1 to 16. The data of the device parameters assigned here are read out via the register addresses 5051 to 5081. User input: 0 to 9999 Factory setting: 0  Note! ■ For additional information and examples of using the auto-scan buffer, refer to the Operating Instructions for Proline Promass 84 MODBUS RS485, BA129D. ■ This function cannot be changed if: – The measuring device has been configured in accordance with NTEP or MC approval. – The measuring device has been configured in accordance with PTB, NMI, METAS or BEV approval and YES has been selected for function Z009 in the CUSTODY TRANSFER block.

10.2 Group PROCESS PARAMETER

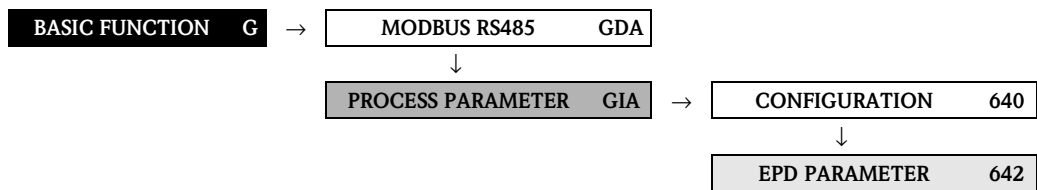
10.2.1 Function group CONFIGURATION

BASIC FUNCTION G		→	MODBUS RS485 GDA	
			↓	
			PROCESS PARAMETER GIA	→ CONFIGURATION 640
Function description				
BASIC FUNCTION → PROCESS PARAMETER → CONFIGURATION				
ASSIGN LOW FLOW CUTOFF	6400		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	
MODBUS register:	5101			
Data type:	Integer			
Access:	read/write			
ON-VALUE LOW FLOW CUT OFF	6402		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 14).	
MODBUS register:	5138			
Data type:	Float			
Access:	read/write			
OFF-VALUE LOW FLOW CUTOFF	6403		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%	
MODBUS register:	5104			
Data type:	Float			
Access:	read/write			
				
			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	

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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 on Page 106). Use this function to define the time span for active pressure shock suppression. Activation of the pressure shock suppression Pressure shock suppression is activated after the flow falls below the switch-on point of the low flow cut off (see point ① in graphic). While pressure shock suppression is active, the following conditions apply: ■ Flow reading on display → 0 ■ Totalizer reading → the totalizers are pegged at the last correct value. Deactivation of the pressure shock suppression The pressure shock suppression is deactivated after the time interval, set in this function, has passed (see point ② in graphic).  Note! The actual flow value is displayed and output, when the time interval for the pressure shock suppression has passed and the flow exceeds the switch-off point of the low flow cut off (see point ② in graphic).	 A0001285-EN 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		

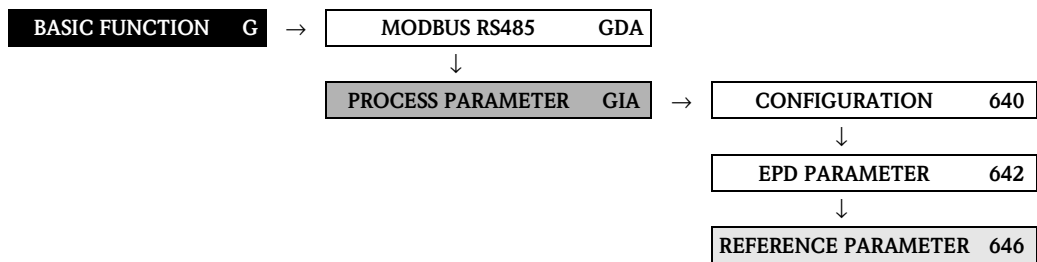
10.2.2 Function group EPD PARAMETER



Function description		
BASIC FUNCTION → PROCESS PARAMETER → EPD PARAMETER		
EMPTY PIPE DETECTION  MODBUS register: 5106 Data type: Integer Access: read/write	6420	Use this function to activate the empty pipe detection (EPD). With empty measuring tubes the density of the fluid falls below the value specified in the function EPD VALUE LOW. Options: 0 = OFF 1 = ON Factory setting: ON  Caution! ■ Select a correspondingly low EPD response value in the function EPD VALUE LOW, so that the difference to the effective density of the fluid is sufficiently large enough. This ensures that totally empty measuring tubes and not partially filled ones are detected. ■ For gas measurement we strongly recommend to switch off empty pipe detection.
EPD VALUE LOW  MODBUS register: 5110 Data type: Float Access: read/write	6423	 Note! This 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  MODBUS register: 5112 Data type: Float Access: read/write	6424	 Note! This 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  MODBUS register: 5108 Data type: Float Access: read/write	6425	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 EXC.CURR.	6426	Empty pipe detection (EPD) can be switched on in this function.
		
MODBUS register:	5233	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.
Data type:	Float	
Access:	read/write	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.

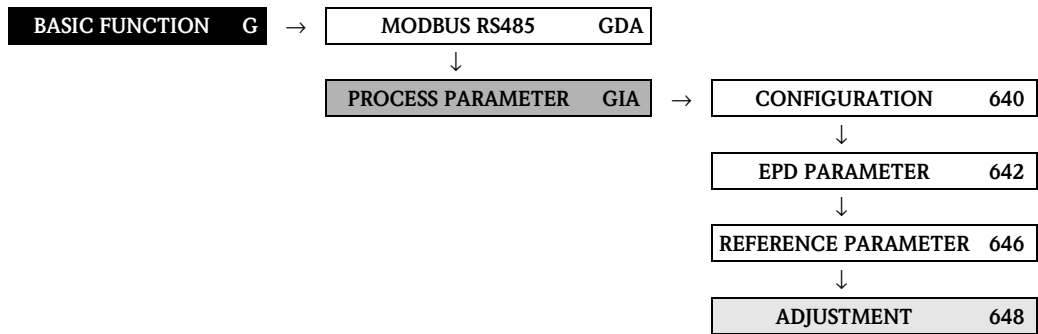
10.2.3 Function group REFERENCE PARAMETER



Function description		
BASIC FUNCTION → PROCESS PARAMETER → REFERENCE PARAMETER		
CORRECTED VOLUME CALCULATION MODBUS register: 5129 Data type: Integer Access: read/write	6460	This function is used to set the reference density for calculating the corrected volume flow. Options: 0 = CALCULATED REFERENCE DENSITY 1 = FIXED REFERENCE DENSITY Factory setting: CALCULATED REFERENCE DENSITY
FIXED REFERENCE DENSITY MODBUS register: 5130 Data type: Float Access: read/write	6461	Note! This function is not available unless the FIXED REFERENCE DENSITY setting was selected in the CORRECTED VOLUME CALCULATION function (6460). In this function, a fixed value for the reference density can be entered, with which the corrected volume flow or corrected volume is calculated. User input: 5-digit floating-point number Factory setting: 1 kg/Nl
EXPANSION COEFFICIENT MODBUS register: 5132 Data type: Float Access: read/write	6462	Note! This 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 111). User input: 5-digit floating-point number Factory setting: 0.5000 e-3 [1/K]
EXPANSION COEFFICIENT SQUARE MODBUS register: 5134 Data type: Float Access: read/write	6463	Use this function to enter a square expansion coefficient, if the temperature compensation follows a nonlinear behavior (see REFERENCE TEMPERATURE (6464) function on Page 111). 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  MODBUS register: 5136 Data type: Float Access: read/write	6464	 Note! This 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 volumetric expansion coefficient of the fluid, unit [1/K²]

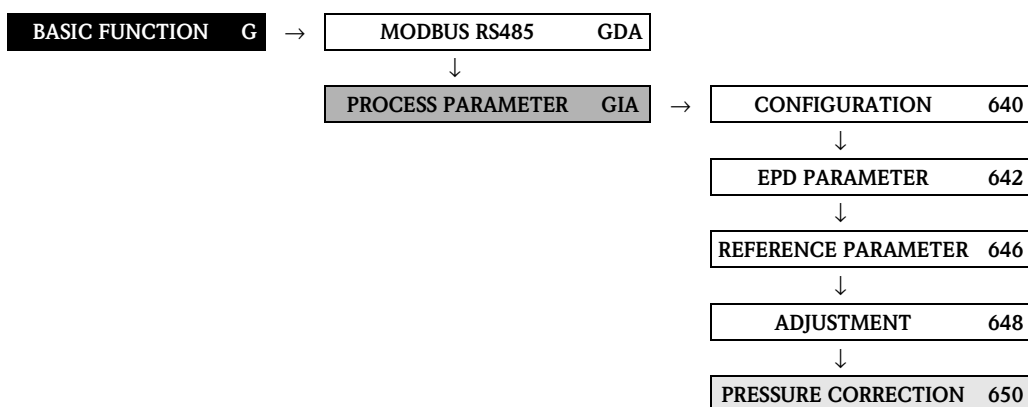
10.2.4 Function group ADJUSTMENT



Function description		
BASIC FUNCTION → PROCESS PARAMETER → ADJUSTMENT		
ZERO POINT ADJUSTMENT  MODBUS register: 5121 Data type: Integer Access: read/write	6480	This function enables a zero point adjustment to be automatically carried out. The new zero point determined by the measuring system is adopted by the function ZERO POINT. Options: 0 = CANCEL 1 = START Factory setting: CANCEL  Caution! Before carrying this out, please refer to the Operating Instructions for Proline Promass 84 MODBUS RS485, BA129D 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 84 measuring electronics are fitted with a status input, then the zero point adjustment can also be activated by using this input.
DENSITY ADJUST MODE  MODBUS register: 5180 Data type: Integer Access: read/write	6482	Use this function to select whether a 1-point or a 2-point density adjustment should be carried out. Options: 0 = CANCEL 1 = 1-POINT 2 = 2-POINT
DENSITY SET VALUE 1  MODBUS register: 5124 Data type: Float Access: read/write	6483	Use this function to enter the density setpoint value for the first fluid for which you want to carry out field density adjustment. User input: 5-digit floating-point number, incl. unit  Note! ■ The preset density entered here should not vary from the actual fluid density by a more than $\pm 10\%$. ■ The appropriate unit is taken from the function group SYSTEM UNITS (see Page 14).
MEASURE FLUID 1  MODBUS register: 5126 Data type: Integer Access: read/write	6484	In this function the actual density of the first fluid is measured for density adjustment. Options: 0 = CANCEL 1 = START

Function description BASIC FUNCTION → PROCESS PARAMETER → ADJUSTMENT		
DENSITY SET VALUE 2  MODBUS register: Data type: Access:	6485 5181 Float 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, incl. unit  Note! ■ The preset density entered here should not vary from the actual fluid density by a more than $\pm 10\%$. ■ The difference between the density setpoint values must be at least 0.2 kg/l. ■ The appropriate unit is taken from the function group SYSTEM UNITS (see Page 14).
MEASURE FLUID 2  MODBUS register: Data type: Access:	6486 5183 Integer read/write	In this function the current density of the second fluid is measured for density adjustment. Options: 0 = CANCEL 1 = START
DENSITY ADJUSTMENT  MODBUS register: Data type: Access:	6487 5127 Integer 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 for Proline Promass 84 MODBUS RS485, BA129D 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 measure exactly the density value that the user expects on the basis of laboratory analyses. ■ The fluid properties are outside the measuring points set at the factory, or the reference operating conditions used to calibrate the measuring device. ■ 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  MODBUS register: Data type: Access:	6488 5128 Integer read/write	With this function the original density coefficient determined at the factory are restored. Options: 0 = NO 1 = YES Factory setting: NO

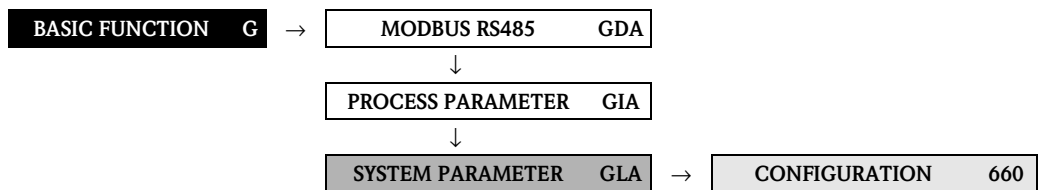
10.2.5 Function group PRESSURE CORRECTION



Function description		
BASIC FUNCTION → PROCESS PARAMETER → PRESSURE CORRECTION		
PRESSURE MODE MODBUS register: Data type: Access:	6500 5184 Integer 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 can be compensated, (see also Operating Instructions for Proline Promass 84 MODBUS RS485, BA129D, "Performance characteristics" section). Options: 0 = OFF 1 = FIX (a fixed process pressure for pressure correction is specified). Factory setting: OFF
PRESSURE MODBUS register: Data type: Access:	6501 5185 Float read/write	Note! This function is not available unless the FIXED 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 14).

10.3 Group SYSTEM PARAMETER

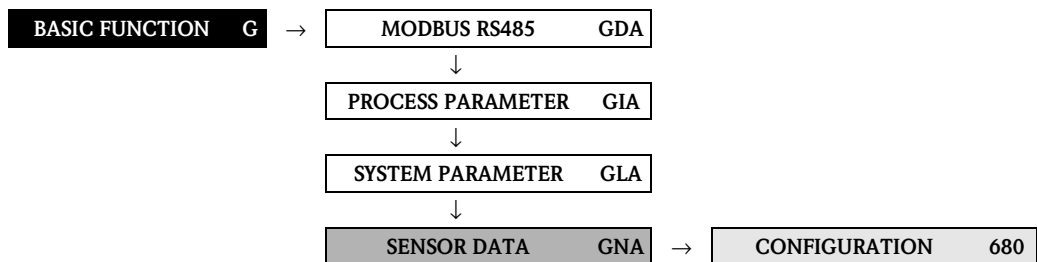
10.3.1 Function group CONFIGURATION



Function description		
BASIC FUNCTION → SYSTEM PARAMETER → CONFIGURATION		
INSTALLATION DIRECTION SENSOR  MODBUS register: 5501 Data type: Integer Access: read/write	6600	Use this function to reverse the sign of the flow direction, if necessary.  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  MODBUS register: 5508 Data type: Float Access: read/write	6602	The density filter allows the sensitivity of the density measuring signal to be lowered with respect to variations in the density of the fluid, e.g. with inhomogeneous liquids. The damping acts on all functions and outputs of the measuring device. User input: max. 5-digit number, including unit: 0.00 to 100.00 s Factory setting: 0.00 s
FLOW DAMPING  MODBUS register: 5510 Data type: Float Access: read/write	6603	Setting the filter depth of the digital filter. The sensitivity of the flow measurement signal can be reduced with respect to interference peaks (e.g. in the event of a high solid content, gas bubbles in the fluid etc.). The reaction time of the measuring device increases with every increase in the filter setting. The damping acts on all functions and outputs of the measuring device. User input: 0 to 100 s Factory setting: 0 s
POSITIVE ZERO RETURN  MODBUS register: 5503 Data type: Integer Access: read/write	6605	Use this function to interrupt evaluation of measured variables. This is necessary when a piping system is being cleaned, for example. This setting acts on all function and outputs of the measuring device. Options: 0 = OFF 1 = ON (signal output is set to the "ZERO FLOW" value, temperature and density are still output) Factory setting: OFF

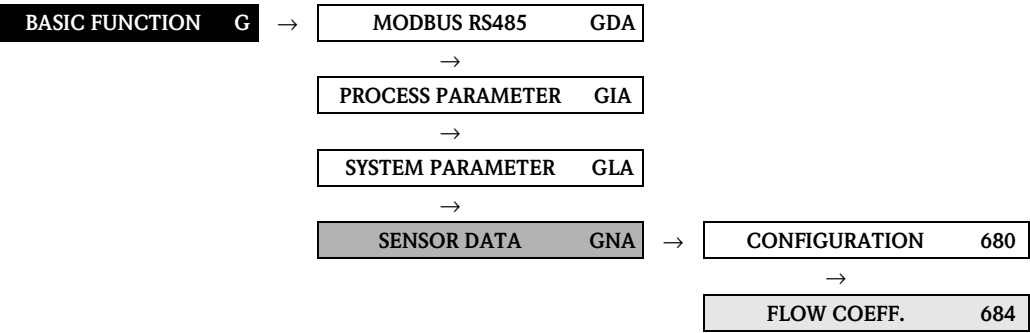
10.4 Group SENSOR DATA

10.4.1 Function group CONFIGURATION



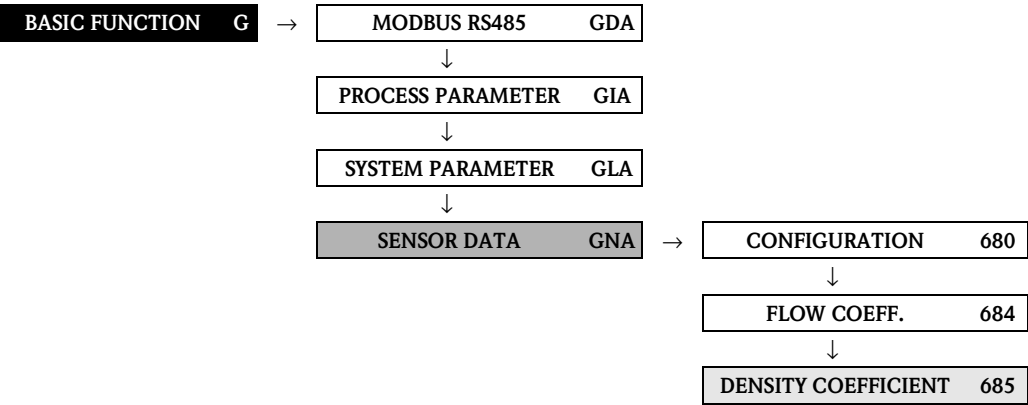
Function description		
BASIC FUNCTION → SENSOR DATA → CONFIGURATION		
All sensor data (calibration factor, zero point and nominal diameter) are set at the factory and saved on the S-DAT sensor memory chip.  Caution! Under normal circumstances you should not change the following parameter settings, because changes affect numerous functions of the entire measuring facility in general and the accuracy of the measuring system in particular. For this reason, the functions described below cannot be changed even when you enter your personal code. Contact the Endress+Hauser service organization if you have any questions about these functions.  Note! The individual values of the functions are also provided on the sensor nameplate.		
K-FACTOR 6800  MODBUS register: 7513 Data type: Float Access: read		This function shows the current calibration factor for the sensor. Factory setting: Depends on nominal diameter and calibration
ZERO POINT 6803  MODBUS register: 7527 Data type: Float Access: read/write		This function shows the current zero point correction value for the sensor. Display: max. 5-digit number: -99999 to +99999 Factory setting: Depends on calibration
NOMINAL DIAMETER 6804  MODBUS register: 7525 mm: 7526 inch: 7526 Data type: Integer Access: read		Display: Nominal diameter of 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" 10 = DN 20 or 3/4" 11 = DN 25 or 1" 13 = DN 32 or 1 1/4" 14 = DN 40 or 1 1/2" 16 = DN 50 or 2" 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"

10.4.2 Function group FLOW COEFFICIENT



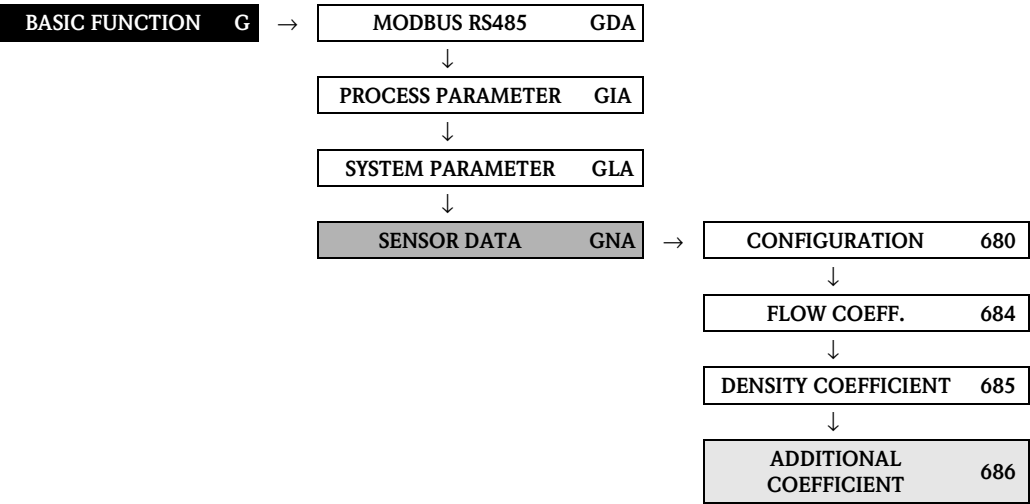
Function description		
BASIC FUNCTION → SENSOR DATA → FLOW COEFFICIENT		
All flow coefficients are set at the factory. All the sensor's parameter settings are saved on the S-DAT memory chip.		
Contact the Endress+Hauser service organization if you have any questions about these functions.		
TEMPERATURE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

10.4.3 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. C0 6850  MODBUS register: 7501 Data type: Float Access: read	This function shows the actual density coefficient C0.  Caution! A density adjustment can alter the calibration value of this coefficient.	
DENSITY COEFF. C1 6851  MODBUS register: 7503 Data type: Float Access: read	This function shows the actual density coefficient C1.  Caution! A density adjustment can alter the calibration value of this coefficient.	
DENSITY COEFF. C2 6852  MODBUS register: 7505 Data type: Float Access: read	This function shows the actual density coefficient C2.  Caution! A density adjustment can alter the calibration value of this coefficient.	
DENSITY COEFF. C3 6853  MODBUS register: 7507 Data type: Float Access: read	This function shows the actual density coefficient C3.  Caution! A density adjustment can alter the calibration value of this coefficient.	
DENSITY COEFF. C4 6854  MODBUS register: 7509 Data type: Float Access: read	This function shows the actual density coefficient C4.  Caution! A density adjustment can alter the calibration value of this coefficient.	
DENSITY COEFF. C5 6855  MODBUS register: 7511 Data type: Float Access: read	This function shows the actual density coefficient C5.  Caution! A density adjustment can alter the calibration value of this coefficient.	

10.4.4 Function group ADDITIONAL COEFFICIENT



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

11 Block SUPERVISION

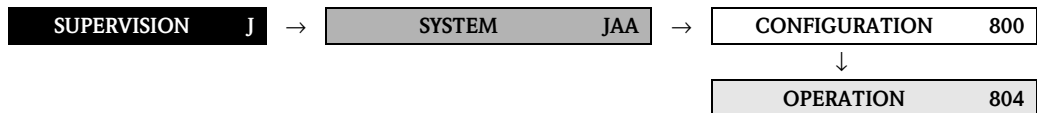
Block	Groups	Function groups	Functions							
SUPERVISION (I)	SYSTEM (JAA) P. 121	⇒ ⇕ ↑	CONFIGURATION (800) P. 121	⇒	ALARM DELAY (8005) P. 121	⇒	STORAGE (8007) P. 121			
			OPERATION (804) P. 122	⇒	ACT. SYST. CONDITION (8040) P. 122	⇒	PREV. SYST. CONDITION (8041) P. 122	⇒	SIM. MEASURAND (8043) P. 123	VAL. SIM. MEASURAND (8044) P. 123
	VERSION-INFO (JCA) P. 124	⇕ ↑	DEVICE (810) P. 124	⇒	DETECT. SYST. CONDITION (8040) P. 122	⇒	SIM. MEASURAND (8043) P. 123	⇒	SYSTEM RESET (8046) P. 123	OPERATION HOURS (8048) P. 123
			SENSOR (820) P. 125	⇒	ACT. SYST. CONDITION (8040) P. 122	⇒	SIM. MEASURAND (8043) P. 123	⇒	SYSTEM RESET (8046) P. 123	OPERATION HOURS (8048) P. 123
	F-CHIP (824) P. 127	⇕ ↑	AMPLIFIER (822) P. 126	⇒	ACT. SYST. CONDITION (8040) P. 122	⇒	SIM. MEASURAND (8043) P. 123	⇒	SYSTEM RESET (8046) P. 123	OPERATION HOURS (8048) P. 123
			SENSOR (820) P. 125	⇒	ACT. SYST. CONDITION (8040) P. 122	⇒	SIM. MEASURAND (8043) P. 123	⇒	SYSTEM RESET (8046) P. 123	OPERATION HOURS (8048) P. 123
	I/O MODULE (830) P. 127	⇕ ↑	AMPLIFIER (822) P. 126	⇒	ACT. SYST. CONDITION (8040) P. 122	⇒	SIM. MEASURAND (8043) P. 123	⇒	SYSTEM RESET (8046) P. 123	OPERATION HOURS (8048) P. 123
			SENSOR (820) P. 125	⇒	ACT. SYST. CONDITION (8040) P. 122	⇒	SIM. MEASURAND (8043) P. 123	⇒	SYSTEM RESET (8046) P. 123	OPERATION HOURS (8048) P. 123
	I/O SUBMODULE 2 (834) P. 128	⇕ ↑	AMPLIFIER (822) P. 126	⇒	ACT. SYST. CONDITION (8040) P. 122	⇒	SIM. MEASURAND (8043) P. 123	⇒	SYSTEM RESET (8046) P. 123	OPERATION HOURS (8048) P. 123
			SENSOR (820) P. 125	⇒	ACT. SYST. CONDITION (8040) P. 122	⇒	SIM. MEASURAND (8043) P. 123	⇒	SYSTEM RESET (8046) P. 123	OPERATION HOURS (8048) P. 123
	I/O SUBMODULE 3 (836) P. 128	⇕ ↑	AMPLIFIER (822) P. 126	⇒	ACT. SYST. CONDITION (8040) P. 122	⇒	SIM. MEASURAND (8043) P. 123	⇒	SYSTEM RESET (8046) P. 123	OPERATION HOURS (8048) P. 123
			SENSOR (820) P. 125	⇒	ACT. SYST. CONDITION (8040) P. 122	⇒	SIM. MEASURAND (8043) P. 123	⇒	SYSTEM RESET (8046) P. 123	OPERATION HOURS (8048) P. 123
	I/O SUBMODULE 4 (838) P. 128	⇕ ↑	AMPLIFIER (822) P. 126	⇒	ACT. SYST. CONDITION (8040) P. 122	⇒	SIM. MEASURAND (8043) P. 123	⇒	SYSTEM RESET (8046) P. 123	OPERATION HOURS (8048) P. 123
			SENSOR (820) P. 125	⇒	ACT. SYST. CONDITION (8040) P. 122	⇒	SIM. MEASURAND (8043) P. 123	⇒	SYSTEM RESET (8046) P. 123	OPERATION HOURS (8048) P. 123
	I/O SUBMODULE 4 (838) P. 128	⇕ ↑	AMPLIFIER (822) P. 126	⇒	ACT. SYST. CONDITION (8040) P. 122	⇒	SIM. MEASURAND (8043) P. 123	⇒	SYSTEM RESET (8046) P. 123	OPERATION HOURS (8048) P. 123
			SENSOR (820) P. 125	⇒	ACT. SYST. CONDITION (8040) P. 122	⇒	SIM. MEASURAND (8043) P. 123	⇒	SYSTEM RESET (8046) P. 123	OPERATION HOURS (8048) P. 123

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		Enter the 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 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.	
STORAGE 8007  MODBUS register: 6907 Data type: Integer Access: read		Displays whether the automatic, permanent storage of parameter changes in the EEPROM is switched on or off. Display: 0 = OFF 1 = ON Factory setting: ON  Caution! ■ The selection in the function can be changed by the Endress+Hauser service organization. ■ If you select OFF, all parameter changes are not stored permanently in the EEPROM. This means that these parameter changes are no longer available after a power failure. In this case, the measuring instrument starts up with the last parameter configurations saved in the EEPROM.	

11.1.2 Function group OPERATION



Function description SUPERVISION → SYSTEM → OPERATION		
ACTUAL SYSTEM CONDITION MODBUS register: 6859 Data type: Integer Access: read MODBUS register: 6821 Data type: String (18) Access: read	8040	Displays the present system condition. Display: 1 = "SYSTEM OK" or The fault / notice message with the highest priority.  Note! For additional information, refer to the "System or process error messages" section in the Operating Instructions for Proline Promass 84 MODBUS RS485, BA129D.
PREVIOUS SYSTEM CONDITIONS MODBUS register: See Note Data type: Integer Access: read	8041	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 to MODBUS! The various previous system conditions are available via the following MODBUS 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! For additional information, refer to the "System or process error messages" section in the Operating Instructions for Proline Promass 84 MODBUS RS485, BA129D.
SIMULATION FAILSAFE MODE  MODBUS register: 6812 Data type: Integer Access: read/write	8042	Use this function to set all inputs, outputs and totalizers to their defined failsafe modes, in order to check whether they respond correctly. During this time, the message "SIMULATION FAILSAFE MODE" appears on the display. Options: 0 = OFF 1 = ON Factory setting: OFF

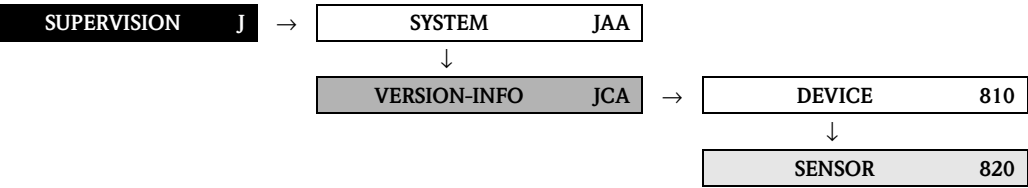
Function description SUPERVISION → SYSTEM → OPERATION		
SIMULATION MEASURAND  MODBUS register: 6813 Data type: Integer Access: read/write	8043	Use this function to set all inputs, outputs and totalizers to their defined flow-response modes, in order to check whether they respond correctly. During this time, the message "SIMULATION MEASURAND" appears on the display. Options: 0 = OFF 1 = MASS FLOW 2 = VOLUME FLOW 3 = CORRECTED VOLUME FLOW 4 = DENSITY 5 = REFERENCE DENSITY 6 = TEMPERATURE Factory setting: OFF  Caution! ■ The measuring device cannot be used for measuring while this simulation is in progress. ■ The setting is not saved in the event of a power failure.
VALUE SIMULATION MEASURAND  MODBUS register: 6814 Data type: Float Access: read/write	8044	 Note! The function is not visible unless the function SIMULATION MEASURAND (8043) is active. For entering a freely selectable value (e.g. 12 m³/s) to check the associated functions in the device itself and downstream signal loops. User input: 5-digit floating-point number [unit] Factory setting: 0 [unit]  Caution! ■ The setting is not saved in the event of a power failure. ■ The appropriate unit is taken from the function group SYSTEM UNITS (ACA) (see Page 14).
SYSTEM RESET  MODBUS register: 6817 Data type: Integer Access: read/write	8046	Use this function to perform a reset of the measuring system. Options: 0 = NO 1 = RESTART SYSTEM (restart without interrupting power supply) Factory setting: NO
OPERATION HOURS MODBUS register: 6810 Data type: Float Access: read	8048	The hours of operation of the device appear on the display. Display: Depends on the number of hours of operation elapsed ■ Hours of operation < 10 hours → display format = 0:00:00 (hr:min:sec) ■ Hours of operation 10 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

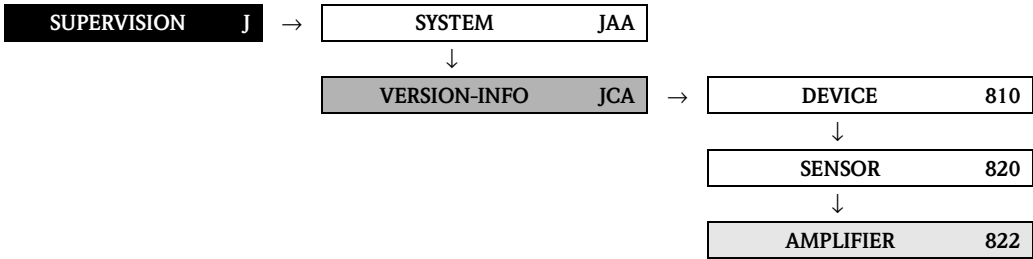
SUPERVISIONJ		→	SYSTEMJAA	
			↓	
			VERSION-INFOJCA	→
				DEVICE810
Function description				
SUPERVISION → VERSION-INFO → DEVICE				
DEVICE SOFTWARE	8100	Displays the current device software version.		
MODBUS register:	7277			
Data type:	String (16)			
Access:	read			

11.2.2 Function group SENSOR



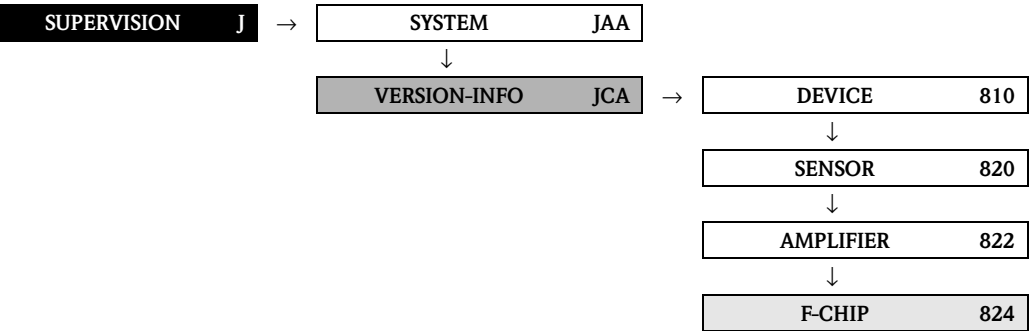
Function description		
SUPERVISION → VERSION-INFO → SENSOR		
SERIAL NUMBER 8200 MODBUS register: 7003 Data type: String (16) Access: read		Use this function to view the serial number of the sensor.
SENSOR TYPE 8201 MODBUS register: 7012 Data type: String (16) Access: read		Use this function to view the sensor type (e.g. Promass F).
SW REV. NO. 8205 S-DAT MODBUS register: 7021 Data type: String (16) Access: read		Use this function to view the software revision number of the software used to create the content of the S-DAT.

11.2.3 Function group AMPLIFIER



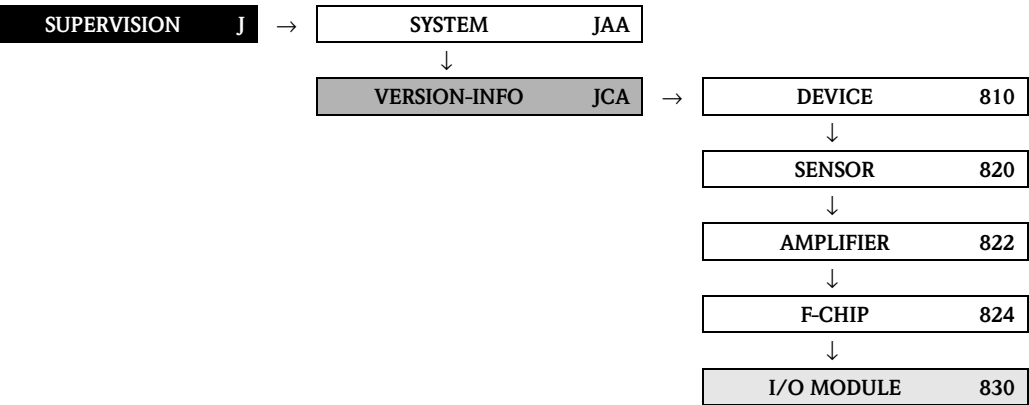
Function description		
SUPERVISION → VERSION-INFO → AMPLIFIER		
SW REV. NO. AMPLIFIER MODBUS register: 7039 Data type: String (16) Access: read	8222	Use this function to view the software revision number of the amplifier.
SW REV. NO. T-DAT MODBUS register: 7048 Data type: String (16) Access: read	8225	Use this function to view the software revision number of the software used to create the content of the T-DAT.
LANGUAGE GROUP MODBUS register: 7262 Data type: Integer Access: read	8226	Displays the installed language group. Display: 0 = TYPE UNKNOWN 1 = WEST EU / USA 2 = EAST EU / SCAND 3 = ASIA. 4 = CHINA Note! ■ The language options of the available language group are displayed in the LANGUAGE (2000) function. ■ You can change the language group via the configuration software ToF Tool – Fieldtool Package. Please do not hesitate to contact your Endress+Hauser sales office if you have any questions.

11.2.4 Function group F-CHIP



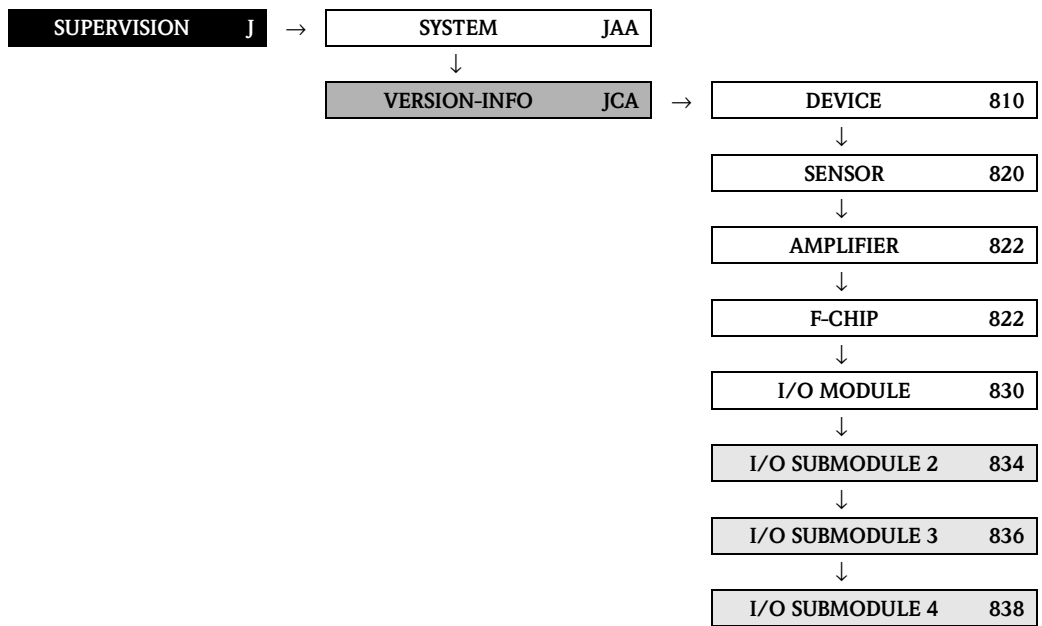
Function description		
SUPERVISION → VERSION-INFO → F-CHIP		
STATUS F-CHIP 8240		Use this function to check whether an F-CHIP is installed and which software options are available. Display: 0 = NO F-CHIP HW 7 = FAILURE 8 = CRITICAL FAIL. 9 = DEVICE ID
MODBUS register:	7057	
Data type:	Integer	
Access:	read	

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:	7086	
Data type:	Integer	
Access:	read	
SW REV. NO. I/O MODULE 8303		Use this function to view the software revision number of the I/O module.
MODBUS register:	7078	
Data type:	String (18)	
Access:	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 MODBUS register: 7106 Data type: Integer Access: read	8340	Displays the configuration of the I/O submodule. Display: 7 = STATUS INPUT
SW REV. NO. SUB IN-/OUTPUT TYPE 2 MODBUS register: 7190 Data type: String (18) Access: read	8343	Use this function to view the software revision number of the corresponding submodule.
SUB IN-/OUTPUT TYPE 3 MODBUS register: 7107 Data type: Integer Access: read	8360	Displays the configuration of the I/O submodule. Display: 0 = TYPE UNKNOWN 5 = PULS/FREQ. OUT. 6 = STATUS/REL. OUT
SW REV. NO. SUB IN-/OUTPUT TYPE 3 MODBUS register: 7199 Data type: String (18) Access: read	8363	Use this function to view the software revision number of the corresponding submodule.
SUB IN-/OUTPUT TYPE 4 MODBUS register: 7108 Data type: Integer Access: read	8380	Displays the configuration of the I/O submodule. Display: 0 = TYPE UNKNOWN 4 = CURRENT OUTPUT 6 = STATUS/REL. OUT
SW REV. NO. SUB IN-/OUTPUT TYPE 4 MODBUS register: 7199 Data type: String (18) Access: read	8383	Use this function to view the software revision number of the corresponding submodule.

12 Factory settings

12.1 SI units (not for USA and Canada)

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

Nominal diameter [mm]	Low flow cut off (approx. $v = 0.04$ m/s)		Full scale value (approx. $v = 2.5$ m/s)		Pulse value (approx. 2 pulse/s at 2.5 m/s)	
1	0.08	kg/h	4	kg/h	0.001	kg/p
2	0.40	kg/h	20	kg/h	0.010	kg/p
4	1.80	kg/h	90	kg/h	0.010	kg/p
8	8.00	kg/h	400	kg/h	0.100	kg/p
15	26.00	kg/h	1300	kg/h	0.100	kg/p
25	72.00	kg/h	3600	kg/h	1.000	kg/p
40	180.00	kg/h	9000	kg/h	1.000	kg/p
50	300.00	kg/h	15000	kg/h	10.000	kg/p
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

12.1.2 Language

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

12.1.3 Density, length, temperature

	Unit
Density	kg/l
Length	mm
Temperature	°C

12.2 US units (only for USA and Canada)

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

Nominal diameter [mm]	Low flow cut off (approx. $v = 0.04$ m/s)		Full scale value (approx. $v = 2.5$ m/s)		Pulse value (approx. 2 pulse/s at 2.5 m/s)	
1	0.003	lb/min	0.15	lb/min	0.002	lb/p
2	0.015	lb/min	0.75	lb/min	0.020	lb/p
4	0.066	lb/min	3.30	lb/min	0.020	lb/p
8	0.300	lb/min	15.00	lb/min	0.200	lb/p
15	1.000	lb/min	50.00	lb/min	0.200	lb/p
25	2.600	lb/min	130.00	lb/min	2.000	lb/p
40	6.600	lb/min	330.00	lb/min	2.000	lb/p
50	11.000	lb/min	550.00	lb/min	20.000	lb/p
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

12.2.2 Language, density, length, temperature

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

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