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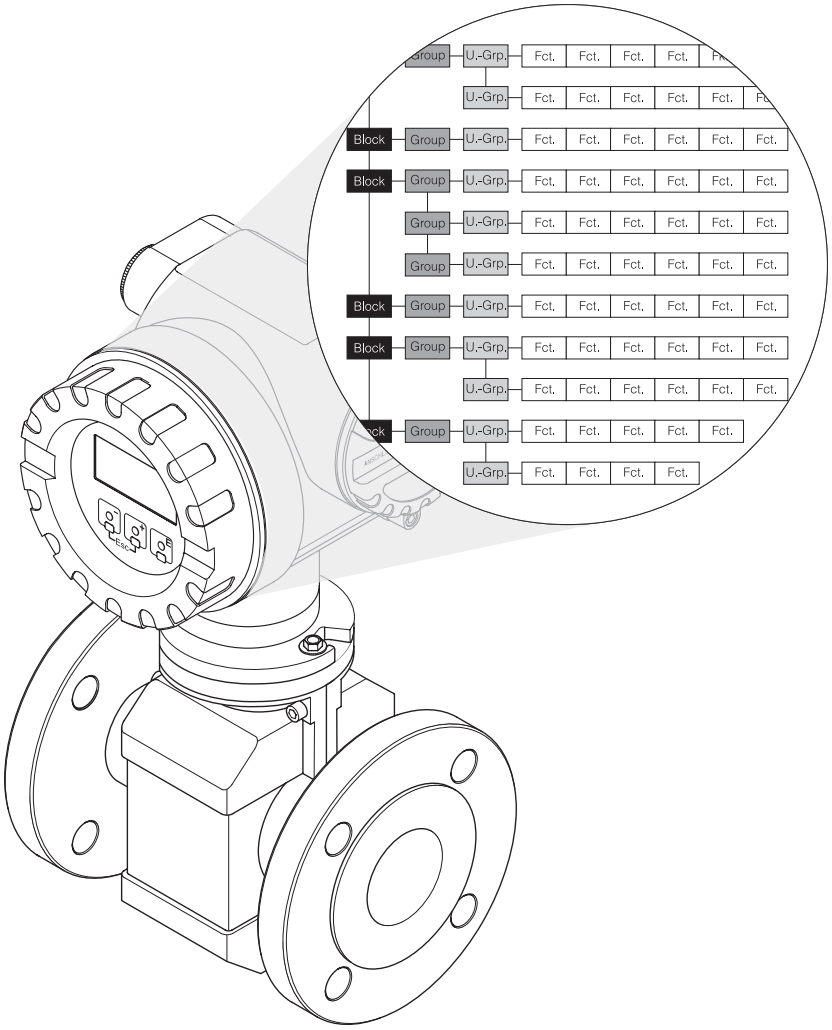
V 2.00.01 (amplifier)
V 2.0X.XX (communication)

PROline promag 23
Electromagnetic Flow Measuring System

Description of Device Functions



Endress+Hauser
The Power of Know How

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S-DAT™, T-DAT™
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1 Notes on using this manual

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

1.1 Using the table of contents to locate a function description

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

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

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

1. All available blocks and their corresponding subgroups are shown 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.

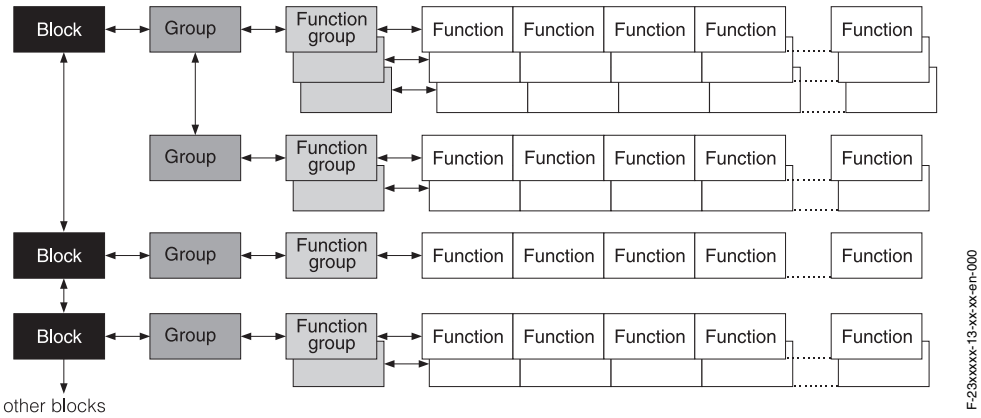
2. The page in question contains a graphic showing the block with all its subordinate groups, function groups and functions. Select the function which you need for your application and use the page reference to locate the detailed function description.

2 Function matrix

2.1 General layout of the function matrix

The function matrix consists of four levels:

Blocks -> Groups -> Function groups -> Functions



2.1.1 Blocks

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

2.1.2 Groups

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 “OUTPUTS” block, for example, include:
CURRENT OUTPUT and PULSE-/FREQ.-OUTPUT.

2.1.3 Function groups

A group consists of one or more function groups. Each function group represents a more detailed selection of the operation options in the higher-order group. Function groups available of group “CURRENT OUTPUT” are for example:
CONFIGURATION and OPERATION.

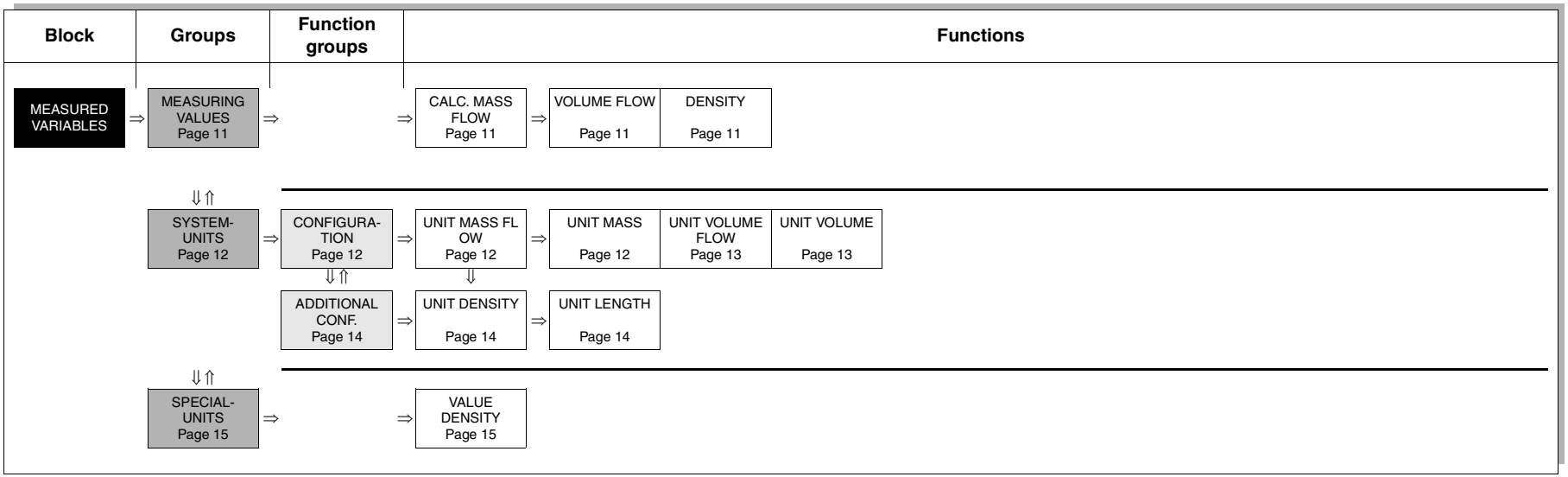
2.1.4 Functions

Each function group consists of one or more functions. The functions are used to operate and parameterize the device. Numerical values can be entered or parameters selected and saved.
The functions in the “CONFIGURATION” function group include ASSIGN CURRENT, CURRENT SPAN, VALUE 4 mA, VALUE 20 mA, etc.
The procedure for changing the current span of the device, for example, is as follows:
1. Select the block “OUTPUTS”.
2. Select the group “CURRENT OUTPUT”.
3. Select the function group “CONFIGURATION”.
4. Select the function “CURRENT SPAN” (this is where the current span can be selected).

2.2 Function matrix PROline Promag 23

BLOCKS	GROUPS	FUNCTION GROUPS
MEASURED VARIABLES (see Page 10)	MEASURING VALUES	see Page 10
	SYSTEM-UNITS	see Page 12
	SPECIAL-UNITS	see Page 15
QUICK SETUP (see Page 16)		see Page 16
USER INTERFACE (see Page 17)	CONTROL	see Page 18
	MAIN LINE	see Page 21
	ADDITION LINE	see Page 23
	INFORMATION LINE	see Page 25
TOTALIZERS (see Page 27)	TOTALIZER 1	see Page 28
	TOTALIZER 2	see Page 28
	HANDLING TOTALIZER	see Page 31
OUTPUTS (see Page 32)	CURRENT OUTPUT	see Page 33
	PULSE-/FREQ.-OUTPUT	see Page 41
BASIC FUNCTION (see Page 60)	HART	see Page 61
	PROCESS PARAMETER	see Page 63
	SYSTEM PARAMETER	see Page 67
	SENSOR DATA	see Page 69
SUPERVISION (see Page 71)	SYSTEM	see Page 72
	VERSION-INFO	see Page 76

3 Block MEASURED VARIABLES



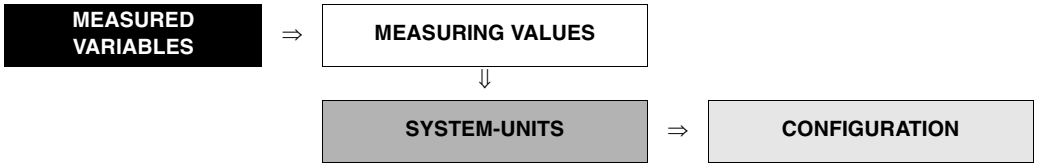
3.1 Group MEASURING VALUES

MEASURED VARIABLES ⇒ **MEASURING VALUES** ⇒ **Measuring values functions**

Function description MEASURED VARIABLES → MEASURING VALUES → Measuring values functions	
✎ Note: • The engineering units of all the measured variables shown here can be set in the “SYSTEM-UNITS” group. • If the fluid in the pipe flows backwards, a negative sign prefixes the flow reading on the display.	
CALCULATED MASS FLOW	The calculated mass flow appears on the display. The mass flow is derived from the measured volume flow and the fixed (or temperature-compensated) density. **User interface** 5-digit floating-point number, including unit and sign (e.g. 462.87 kg/h; - 731.63 lb/min; etc.)
VOLUME FLOW	The volume flow currently measured appears on the display. **User interface** 5-digit floating-point number, including unit and sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; -731.63 gal/d; etc.)
DENSITY	The fixed density appears on the display. **User interface** 5-digit floating-point number, including unit (corresponding to 0.100000...6.00000 kg/dm^3) e.g. 1.2345 kg/dm^3; 993.5 kg/m^3; 1.0015 SG_20 °C; etc.

3.2 Group SYSTEM-UNITS

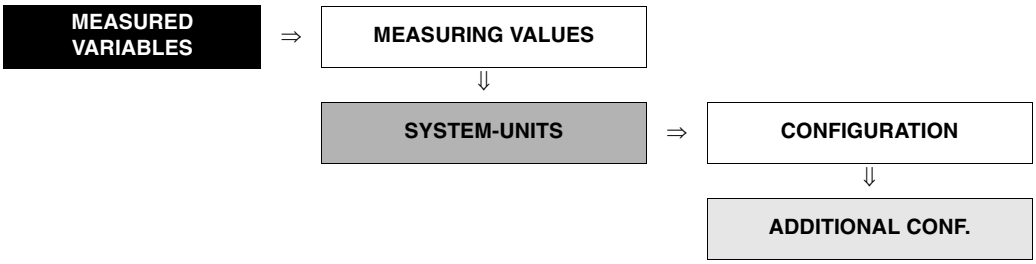
3.2.1 Function group CONFIGURATION



Function description MEASURED VARIABLES → SYSTEM-UNITS → CONFIGURATION	
You can select the units for measured variables in this function group.	
UNIT MASS FLOW	Use this function to select the unit for displaying the calculated mass flow (mass/time). The mass flow is derived from the preset (compensated) specific fluid density and the measured volume flow. The unit you select here is also valid for: • Current output • Frequency output • Status output (limit value for mass flow, flow direction) • Low flow cut off **Options:** Metric: gram → g/s; g/min; g/h; g/day Kilogram → kg/s; kg/min; kg/h; kg/day Metric ton → t/s; t/min; t/h; t/day US: ounce → oz/s; oz/min; oz/h; oz/day pound → lb/s; lb/min; lb/h; lb/day ton → ton/s; ton/min; ton/h; ton/day **Factory setting:** Depends on nominal diameter and country (kg/min...t/h or US-lb/min), corresponding to the full scale value unit (see Page 78 ff.) factory setting.
UNIT MASS	Use this function to select the unit for displaying the calculated mass. The mass is derived from the preset (compensated) specific fluid density (see Page 15) and the measured volume. The unit you select here is also valid for: • Pulse weighting (e.g. kg/p) **Options:** Metric → g; kg; t US → oz; lb; ton **Factory setting:** Depends on nominal diameter or country (kg...t or US-lb), corresponding to the totalizer unit (see Page 78 ff.) factory setting. ✎ Note: The unit for the totalizers is independent of your choice here. The unit for each totalizer is selected separately for the totalizer in question.

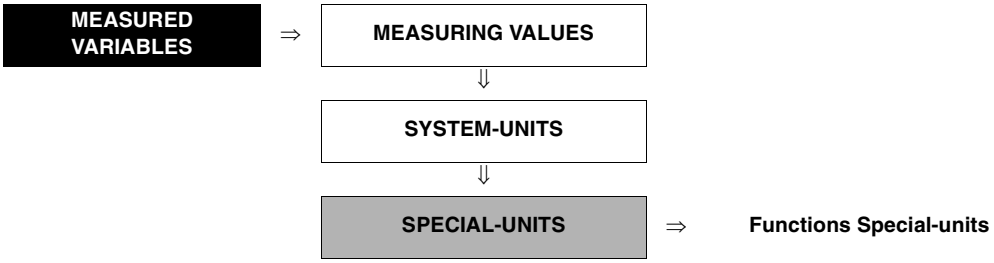
Function description MEASURED VARIABLES → SYSTEM-UNITS → CONFIGURATION	
UNIT VOLUME FLOW	Use this function to select the unit for displaying the volume flow. The unit you select here is also valid for: • Current output • Frequency output • Status output (limit value for volume flow, flow direction) • Low flow cut off **Options:** Metric: Cubic centimeter → cm^3/s; cm^3/min; cm^3/h; cm^3/day Cubic decimeter → dm^3/s; dm^3/min; dm^3/h; dm^3/day Cubic meter → m^3/s; m^3/min; m^3/h; m^3/day Milliliter → ml/s; ml/min; Ml/h; ml/day Liter → l/s; l/min; l/h; l/day Hectoliter → hl/s; hl/min; hl/h; hl/day Megaliter → Ml/s; ml/min; Ml/h; ml/day US: Cubic centimeter → cc/s; cc/min; cc/h; cc/day Acre foot → af/s; af/min; af/h; af/day Cubic foot → ft^3/s; ft^3/min; ft^3/h; ft^3/day Fluid ounce → oz f/s; oz f/min; oz f/h; oz f/day Gallon → gal/s; gal/min; gal/h; gal/day Million gallon → Mgal/s; Mgal/min; Mgal/h; Mgal/day Barrel (normal fluids: 31.5 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (beer: 31.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (petrochemicals: 42.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (filling tanks: 55.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Imperial Gallon → gal/s; gal/min; gal/h; gal/day Mega gallon → Mgal/s; Mgal/min; Mgal/h; Mgal/day Barrel (beer: 36.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (petrochemicals: 34.97 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day **Factory setting:** Depends on nominal diameter and country (dm^3/min...m^3/h or US-gal/min), corresponding to the factory setting of the full scale value unit (see Page 78 ff.).
UNIT VOLUME	Use this function to select the unit for displaying the volume. The unit you select here is also valid for: • Pulse weighting (e.g. m^3/p) **Options:** Metric → cm^3; dm^3; m^3; ml; l; hl; Ml US → cc; af; ft^3; oz f; gal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals); bbl (filling tanks) Imperial → gal; Mgal; bbl (beer); bbl (petrochemicals) **Factory setting:** Depends on nominal diameter and country (dm^3...m^3 or US-gal), corresponding to the totalizer unit (see Page 78 ff.) factory setting. ✎ Note: The unit of the totalizers is independent of your choice here. The unit for each totalizer is selected separately for the totalizer in question.

3.2.2 Function group ADDITIONAL CONFIGURATION



Function description MEASURED VARIABLES ➞ SYSTEM-UNITS ➞ ADDITIONAL CONFIGURATION	
UNIT DENSITY	Use this function to select the unit for displaying the fluid density. The unit you select here is also valid for: • Fluid density entry (see VALUE DENSITY function on Page 15) **Options:** Metric → g/cm^3; g/cc; kg/dm^3; kg/l kg/m^3; SD 4 °C, SD 15 °C, SD 20 °C; SG 4 °C, SG 15 °C, SG 20 °C US → lb/ft^3; lb/gal; lb/bbl (normal fluids); lb/bbl (beer); lb/bbl (petrochemicals); lb/bbl (filling tanks) Imperial → lb/gal; lb/bbl (beer); lb/bbl (petrochemicals) **Factory setting:** Country-dependent (kg/l or g/cc), see factory setting Page 78 ff. SD = Specific Density, SG = Specific Gravity The specific density is the ratio of fluid density to water density (at water temperature = 4, 15, 20 °C).
UNIT LENGTH	Use this function to select the unit for displaying the length of the nominal diameter. The unit you select here is also valid for: Nominal diameter of sensor (function NOMINAL DIAMETER on Page 78 ff.) **Options:** MILLIMETER INCH **Factory setting:** Country-dependent (MILLIMETER or INCH), see factory setting Page 78 ff.

3.3 Group SPECIAL-UNITS



Function description MEASURED VARIABLES → SPECIAL-UNITS → Functions Special-units	
DENSITY VALUE	Use this function to enter a density factor preferably at process temperature (or at reference temperature). This density factor is used to convert the volume flow to a mass flow. **User input:** 5-digit floating-point number **Factory setting:** 1 [unit] ✎ Note: The appropriate unit is taken from the function UNIT DENSITY, (see Page 14).

4 Block QUICK SETUP

Block	Group	Function groups	Functions
QUICK SETUP	⇒	⇒	T-DAT SAVE/ LOAD Page 16

Function description QUICK SETUP	
T-DAT SAVE/LOAD	Use this function to save the parameter settings / configuration of the **transmitter** in a transmitter DAT (T-DAT), or to load the parameter settings from the T-DAT into the EEPROM (**manual** security function). Application examples: • After commissioning, the current measuring point parameters can be saved to the T-DAT as a backup. • If the transmitter is replaced for some reason, the data from the T-DAT can be loaded into the new transmitter (EEPROM). **Options:** CANCEL SAVE (from EEPROM to T-DAT) LOAD (from the T-DAT into EEPROM) **Factory setting:** CANCEL ✎ Note: If the power supply fails, the totalizer readings are automatically saved to the EEPROM.

5 Block USER INTERFACE

Block	Groups	Function groups	Functions			
USER INTERFACE	CONTROL Page 18	BASIC CONFI-GURATION Page 18	LANGUAGE Page 18	DISPLAY DAMPING Page 18	CONTRAST LCD Page 18	
		UNLOCKING/ LOCKING Page 19	ACCESS CODE Page 19	DEF. PRIVATE CODE Page 19	STATUS ACCESS Page 19	
		OPERATION Page 20	TEST DISPLAY Page 20			
	MAIN LINE Page 21		ASSIGN Page 21	100%-VALUE Page 21	FORMAT Page 22	
	ADDITION LINE Page 23		ASSIGN Page 23	100%-VALUE Page 24	FORMAT Page 24	DISPLAY MODE Page 24
	INFORMATION LINE Page 25		ASSIGN Page 25	100%-VALUE Page 26	FORMAT Page 26	DISPLAY MODE Page 26

5.1 Group CONTROL

5.1.1 Function group BASIC CONFIGURATION

USER INTERFACE ⇒ **CONTROL** ⇒ **BASIC CONFIGURATION**

Function description USER INTERFACE → CONTROL → BASIC CONFIGURATION	
LANGUAGE	Use this function to select the language for all texts, parameters and messages shown on the local display. ✎ Note: There are two different language software (SW versions) for choose. Option SW 1: ENGLISH - DEUTSCH Option SW 2: FRANCAIS - ITALIANO **Factory setting:** Country-dependent, see factory setting Page 79 ff. ✎ Note: If you press the ⏎ keys simultaneously during startup, the language defaults to "ENGLISH" (SW 1) or "FRANCAIS" (SW 2).
DISPLAY DAMPING	Use this function to enter a time constant defining how the display reacts to severely fluctuating flow variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). **User input:** 0...100 seconds **Factory setting:** 1 s ✎ Note: Setting the time constant to zero seconds switches off damping.
CONTRAST LCD	Use this function to optimize display contrast to suit local operating conditions (for example ambient temperature). **User input:** 10...100% **Factory setting:** 50%

5.1.2 Function group UNLOCKING/ LOCKING

USER INTERFACE ⇒ **CONTROL** ⇒ **BASIC CONFIGURATION**
⇓
UNLOCKING/ LOCKING

Function description USER INTERFACE → CONTROL → UNLOCKING/ LOCKING	
ACCESS CODE	All data of the measuring system are protected against inadvertent change. Programming is disabled and the settings cannot be changed until a code is entered in this function. If you press the ⏎ keys in any function, the measuring system automatically goes to this function and the prompt to enter the code appears on the display (when programming is disabled). You can enable programming by entering your personal code (**factory setting = 23**, see function DEFINE PRIVATE CODE). **User input:** max. 4-digit number: 0 ...9999 ✎ Note: • Programming is disabled if you do not press a key within 60 seconds following automatic return to the HOME position. • You can also disable programming in this function by entering any number (other than the defined private code). • The Endress+Hauser service organization can be of assistance if you mislay your personal code.
DEFINE PRIVATE CODE	Use this function to specify a personal code for enabling programming in the function ACCESS CODE. **User input:** 0...9999 (max. 4-digit number) **Factory setting:** 23 ✎ 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	Use this function to check the access status for the function matrix. **User Interface:** ACCESS CUSTOMER (parameterization possible) LOCKED (parameterization disabled)

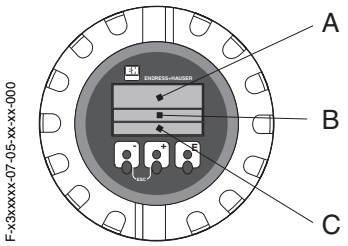
5.1.3 Function group OPERATION

USER INTERFACE ⇒ **CONTROL** ⇒ **BASIC CONFIGURATION**
⇓
UNLOCKING/ LOCKING
⇓
OPERATION

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

5.2 Group MAIN LINE

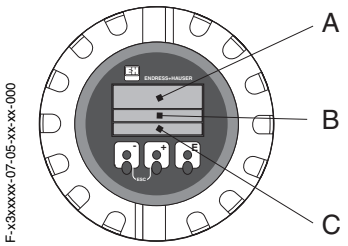
USER INTERFACE ⇒ **CONTROL**
⇓
MAIN LINE ⇒ **Functions main line**

Function description USER INTERFACE → MAIN LINE → Functions main line	
 A = main line, B = additional line, C = information line	
ASSIGN	In this function, a value to be displayed is assigned to the main line (top line in the local display). This value is displayed during normal operation. **Options:** OFF VOLUME FLOW MASS FLOW VOLUME FLOW IN % MASS FLOW IN % ACTUAL CURRENT **optional:** NOMINAL FREQUENCY NOMINAL PULSE NOMINAL STATUS **Factory setting:** VOLUME FLOW
100%-VALUE	✎ Note: This function is only available if VOLUME FLOW IN % or MASS FLOW IN % was selected in the function ASSIGN. Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter and country, [value] / [dm^3/min...m^3/h or US-gal/min], corresponding to the factory setting for the full scale value (see Page 78 ff.).

Function description USER INTERFACE → MAIN LINE → Functions main line	
FORMAT	Use this function to define the maximum number of places after the decimal point displayed for the reading in the main line. **Options:** XXXXX. - XXXX.X - XXX.XX - XX.XXX -X.XXXX **Factory setting:** X.XXXX ✎ Note: • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

5.3 Group ADDITION LINE

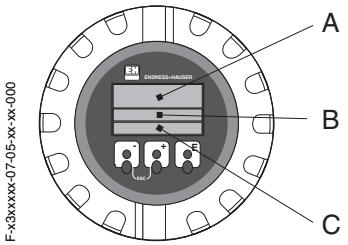
USER INTERFACE ⇒ **CONTROL**
⇓
MAIN LINE
⇓
ADDITION LINE ⇒ **Functions addition line**

Function description USER INTERFACE → ADDITION LINE → Functions addition line	
 A = main line, B = additional line, C = information line	
ASSIGN	In this function, a value to be displayed is assigned to the additional line (middle line in the local display). This value is displayed during normal operation. **Options:** OFF VOLUME FLOW MASS FLOW VOLUME FLOW IN % MASS FLOW IN % VOLUME FLOW BARGRAPH IN % MASS FLOW BARGRAPH IN % FLOW VELOCITY ACTUAL CURRENT TOTALIZER 1 TOTALIZER 2 TAG NAME BLANK LINE **optional:** NOMINAL FREQUENCY NOMINAL PULSE NOMINAL STATUS **Factory setting:** TOTALIZER 1

Function description USER INTERFACE → ADDITION LINE → Functions addition line	
100%-VALUE	✎ Note: This function is not available unless one of the following was selected in the function ASSIGN: • VOLUME FLOW IN % • MASS FLOW IN % • VOLUME FLOW BARGRAPH IN % • MASS FLOW BARGRAPH IN % Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter and country, [value] / [dm^3/min...m^3/h or US-gal/min], corresponding to the factory setting for the full scale value (see Page 78 ff.).
FORMAT	✎ Note: This function is not available unless a number was selected in the function ASSIGN. Use this function to define the maximum number of places after the decimal point displayed for the reading in the additional line. **Options:** XXXXX. - XXXX.X - XXX.XX - XX.XXX -X.XXXX **Factory setting:** X.XXXX ✎ Note: • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.
DISPLAY MODE	✎ Note: This function is only available if VOLUME FLOW BARGRAPH IN % or MASS FLOW BARGRAPH IN % was selected in the function ASSIGN. Use this function to define the format of the bar graph. **Options:** STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign).  F-x3xxxxx-20-xx-xx-xx-000 SYMMETRY (Symmetrical bar graph for positive and negative directions of flow, with –50 / 0 / +50% gradations and integrated sign).  F-x3xxxxx-20-xx-xx-xx-001 **Factory setting:** STANDARD

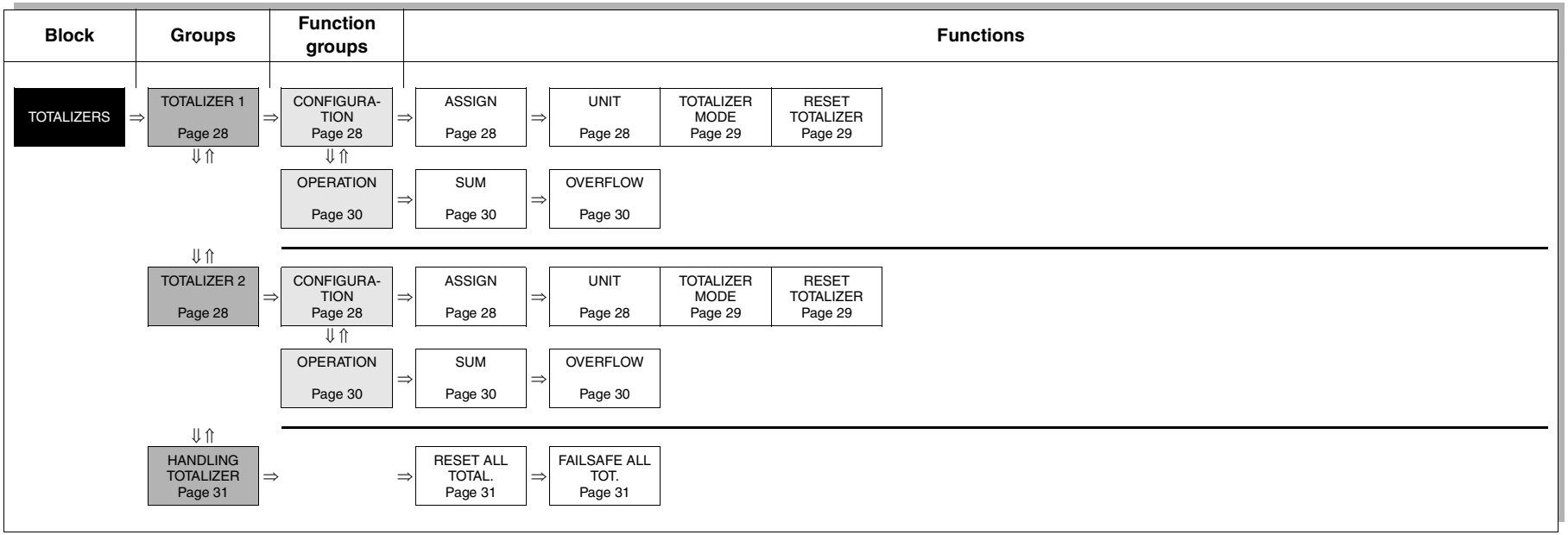
5.4 Group INFORMATION LINE

USER INTERFACE ⇒ **CONTROL**
⇓
MAIN LINE
⇓
ADDITION LINE
⇓
INFORMATION LINE ⇒ **Functions information line**

Function description USER INTERFACE → INFORMATION LINE → Functions information line	
 A = main line, B = additional line, C = information line	
ASSIGN	In this function, a value to be displayed is assigned to the information line (bottom line in the local display). This value is displayed during normal operation. **Options:** OFF VOLUME FLOW IN % MASS FLOW IN % VOLUME FLOW BARGRAPH IN % MASS FLOW BARGRAPH IN % FLOW VELOCITY ACTUAL CURRENT TOTALIZER 1 TOTALIZER 2 TAG NAME OPERATING/SYSTEM CONDITIONS FLOW DIRECTION BLANK LINE **optional:** NOMINAL FREQUENCY NOMINAL PULSE NOMINAL STATUS **Factory setting:** OPERATING/SYSTEM CONDITIONS

Function description USER INTERFACE → INFORMATION LINE → Functions information line	
100%-VALUE	✎ Note: This function is not available unless one of the following was selected in the function ASSIGN: • VOLUME FLOW IN % • MASS FLOW IN % • VOLUME FLOW BARGRAPH IN % • MASS FLOW BARGRAPH IN % Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter and country, [value] / [dm^3/min...m^3/h or US-gal/min], corresponding to the factory setting for the full scale value (see Page 78 ff.).
FORMAT	✎ Note: This function is not available unless a number was selected in the function ASSIGN. Use this function to define the maximum number of places after the decimal point displayed for the reading in the information line. **Options:** XXXXX. - XXXX.X - XXX.XX - XX.XXX -X.XXXX **Factory setting:** X.XXXX ✎ Note: • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In these instances an arrow appears on the display between the measured value and the engineering unit (e.g. 1.2 → kg/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.
DISPLAY MODE	✎ Note: This function is only available if VOLUME FLOW BARGRAPH IN % or MASS FLOW BARGRAPH IN % was selected in the function ASSIGN. Use this function to define the format of the bar graph. **Options:** STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign).  F-x3xxxxx-20-xx-xx-xx-000 SYMMETRY (Symmetrical bar graph for positive and negative directions of flow, with –50 / 0 / +50% gradations and integrated sign).  F-x3xxxxx-20-xx-xx-xx-001 **Factory setting:** STANDARD

6 Block TOTALIZERS



6.1 Group TOTALIZER

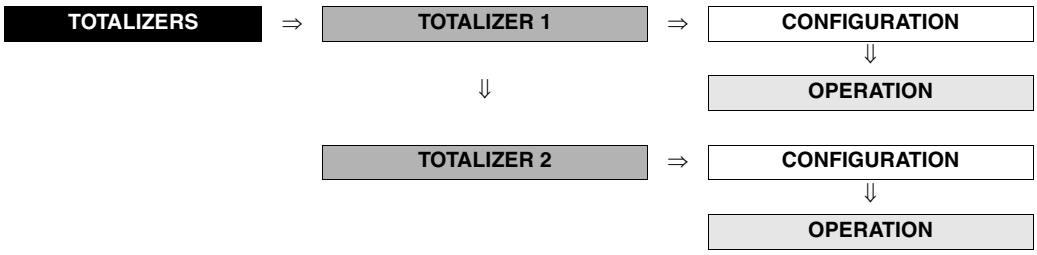
6.1.1 Function group CONFIGURATION

TOTALIZERS ⇒ **TOTALIZER 1** ⇒ **CONFIGURATION**
⇓
TOTALIZER 2 ⇒ **CONFIGURATION**

Function description TOTALIZERS ➞ TOTALIZER 1 and 2 ➞ CONFIGURATION	
The function descriptions below apply to totalizers 1 and 2; the totalizers are independently configurable.	
ASSIGN	Use this function to assign a measured variable to the totalizer in question. **Options:** OFF MASS FLOW VOLUME FLOW **Factory setting:** VOLUME FLOW ✎ Note: • The totalizer is reset to "0" as soon as the selection is changed. • If you select OFF in the function group CONFIGURATION of the totalizer in question, only the ASSIGN function remains visible.
UNIT	Use this function to define the unit for the totalizer's measured variable, as selected beforehand. **Options: (for MASS FLOW assignment):** Metric → g; kg; t US → oz; lb; ton **Factory setting:** Depends on nominal diameter and country (kg...t or US-lb), corresponding to the totalizer unit (see Page 78 ff.) factory setting. **Options (for VOLUME FLOW assignment):** Metric → cm^3; dm^3; m^3; ml; l; hl; Ml US → cc; af; ft^3; oz f; gal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals); bbl (filling tanks) Imperial → gal; Mgal; bbl (beer); bbl (petrochemicals) **Factory setting:** Depends on nominal diameter and country, (dm^3...m^3 or US-gal), correspon-ding to the totalizer unit (see Page 78 ff.) factory setting.

Function description TOTALIZERS → TOTALIZER 1 and 2 → CONFIGURATION	
TOTALIZER MODE	Use this function to define how the flow components are to be totaled. **Options:** BALANCE Positive and negative flow components. The positive and negative flow components are balanced. In other words, net flow in the flow direction is registered. FORWARD Positive flow components only REVERSE Negative flow components only **Factory setting:** Totalizer 1 = BALANCE Totalizer 2 = FORWARDS
RESET TOTALIZER	Use this function to reset the sum and the overflow of the totalizer to zero. **Options:** NO YES **Factory setting:** NO

6.1.2 Function group OPERATION



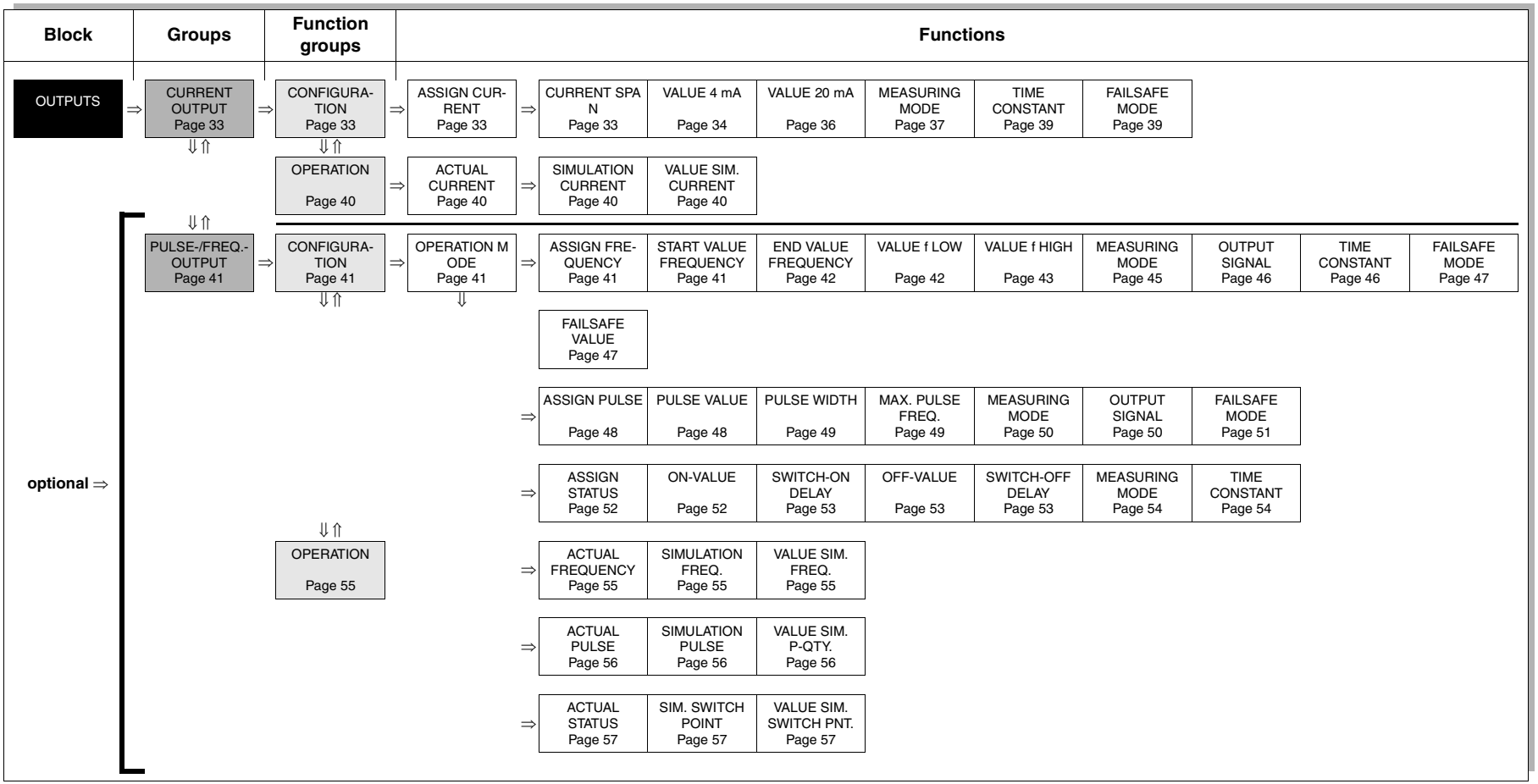
Function description TOTALIZERS ➞ TOTALIZER 1 and 2 ➞ OPERATION	
The function descriptions below apply to totalizers 1 and 2; the totalizers are independently configurable.	
SUM	Use this function to view the total for the totalizer's measured variable aggregated since measuring commenced. The value can be positive or negative, depending on the setting selected in the “TOTALIZER MODE” function and the direction of flow. **User interface:** max. 7-digit floating-point number, including sign and unit (e.g. 15467.04 m^3; -4925.631 kg)! ✎ Note: • The effect of the setting in the “TOTALIZER MODE” function (see Page 29) is as follows: – If the setting is “BALANCE”, the totalizer balances flow in the positive and negative directions. – If the setting is “FORWARD”, the totalizer registers only flow in the positive direction. – If the setting is “REVERSE”, the totalizer registers only flow in the negative direction. • The totalizer's response to faults is defined in the “FAILSAFE ALL TOTALIZERS” function, (see Page 31).
OVERFLOW	Use this function to view the overflow for the totalizer aggregated since measuring commenced. Total flow quantity is represented by a floating-point number consisting of max. 7 digits. You can use this function to view higher numerical values (>9,999,999) as overflows. The effective quantity is thus the total of OVERFLOW plus the value returned by the SUM function. Example: Reading for 2 overflows: $2 \cdot 10^7$ dm^3 (= 20,000.000 dm^3) The value displayed in the function SUM = 196,845.7 dm^3 Effective total quantity = 20,196,845.7 dm^3 **User interface:** integer with exponent, including sign and unit, e.g. $2 \cdot 10^7$ dm^3

6.2 Group HANDLING TOTALIZER

TOTALIZERS ⇒ **TOTALIZER 1**
⇓
TOTALIZER 2
⇓
HANDLING TOTALIZER ⇒ **Functions Handling Totalizer**

Function description TOTALIZERS → HANDLING TOTALIZER → Functions Handling Totalizer	
RESET ALL TOTALIZERS	Use this function to reset the totals (including all overflows) of the totalizers 1 and 2 to zero (= RESET). **Options:** NO YES **Factory setting:** NO
FAILSAFE ALL TOTALIZER	Use this function to define the common response of totalizers 1 and 2 to error. **Options:** STOP The totalizer is paused until the fault is rectified. ACTUAL VALUE The totalizer continues to count is based on the current flow measuring value. The fault is ignored. HOLD VALUE The totalizer continues to count the flow that is based on the last valid flow measuring value (before the fault occurred). **Factory setting:** STOP

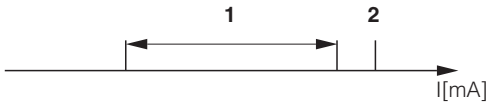
7 Block OUTPUTS

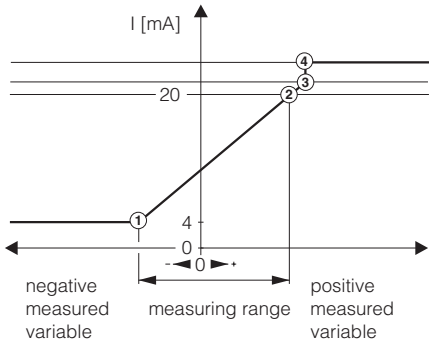


7.1 Group CURRENT OUTPUT

7.1.1 Function group CONFIGURATION

OUTPUTS ⇒ **CURRENT OUTPUT** ⇒ **CONFIGURATION**

Function description OUTPUTS → CURRENT OUTPUT → CONFIGURATION	
ASSIGN CURRENT	Use this function to assign a measured variable to the current output. **Options:** OFF MASS FLOW VOLUME FLOW **Factory setting:** VOLUME FLOW ✎ Note: If you select OFF, the only function shown in the function group CONFIGURATION is this function, in other words, ASSIGN CURRENT OUTPUT.
CURRENT SPAN	When you select this function, the current range appears on the display. **User interface:** 4–20 mA HART 4–20 mA HART NAMUR 4–20 mA HART US **Factory setting:** 4–20 mA HART NAMUR **Current span, operational range and signal on alarm level**  F06-23xxxxxx-05-xx-xx-xx-003 **A** | **1** | **2** 4-20 mA HART | 4 - 20.5 mA | 22 mA 4-20 mA HART NAMUR | 4 - 20.5 mA | 22.6 mA 4-20 mA HART US | 4 - 20.8 mA | 22.6 mA *A = Current span* *1 = Operational range (measuring information)* *2 = Upper signal on alarm level*

Function description OUTPUTS → CURRENT OUTPUT → CONFIGURATION	
VALUE 4 mA	Use this function to assign the 4 mA current a value. The value can be higher or lower than the value assigned to 20 mA (function VALUE 20 mA). Positive and negative values are permissible, depending on the measured variable in question (e.g. volume flow). Example: 4 mA assigned value = - 250 l/h 20 mA assigned value = +750 l/h Calculated current value = 8 mA (at zero flow) Note that values with different signs cannot be entered for 4 mA and 20 mA if SYMMETRY is the setting selected for the MEASURING MODE function. In this case, the message "INPUT RANGE EXCEEDED" appears on the display. Example for STANDARD measuring mode:  F06-23xxxxx-05-xx-xx-en-002 ① *= Initial value (4-20 mA)* ② *= Full scale value (4-20 mA)* *Minimum Range: Q = 0,3 m/s* ③ *= Maximum current value: depending on the parameters set in the function CURRENT SPAN (see Page 33).* ④ *= Failsafe mode (upper signal on alarm level): depending on the parameters set in the functions CURRENT SPAN (see Page 33) and FAILSAFE MODE, (see Page 39)* **User input:** 5-digit floating-point number, with sign **Factory setting:** 0 [unit] (continued on next page)

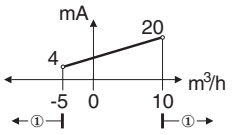
Function description
OUTPUTS → CURRENT OUTPUT → CONFIGURATION

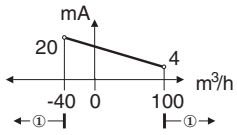
VALUE 4 mA
(continued)

✎ Note:
The appropriate unit is taken from the function UNIT VOLUME FLOW or UNIT MASS FLOW, (see Page 13 or Page 12).

☝ 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.

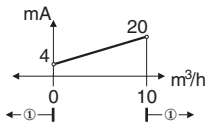
Parameter setting, example 1:
VALUE 4 mA = not equal to zero flow (e.g. –5 m^3/h, 10m^3/h)
VALUE 20 mA = not equal to zero flow (e.g. 100 m^3/h, -40 m^3/h)
MEASURING MODE = STANDARD
When you enter the values for 4 mA and 20 mA, the working range of the measuring device is defined. If the effective flow drops below or exceeds this working range, (see ①), a fault/notice message is generated (#351, current range) and the current output responds in accordance with the parameter settings in the function FAILSAFE MODE.

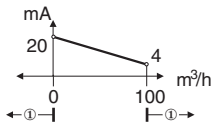




Parameter setting, example 2:
VALUE 4 mA = equal to zero flow (e.g. 0 m^3/h)
VALUE 20 mA = not equal to zero flow (e.g. 10 m^3/h)
or
VALUE 4 mA = not equal to zero flow (e.g. 100 m^3/h)
VALUE 20 mA = equal to zero flow (e.g. 0 m^3/h)
and
MEASURING MODE = STANDARD

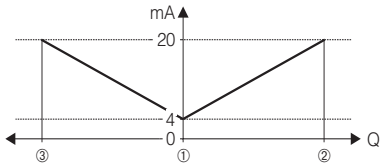
When you enter the values for 4 mA and 20 mA, the working range of the measuring device is defined. In doing so, one of the two values is parameterised as zero flow (e.g. 0 m^3/h).
If the effective flow drops below or exceeds the value parameterised as the zero flow or if the effective flow drops below or exceeds the other value, a fault/notice message is generated (#351, current range) and the current output responds in accordance with the parameter settings in the function FAILSAFE MODE.





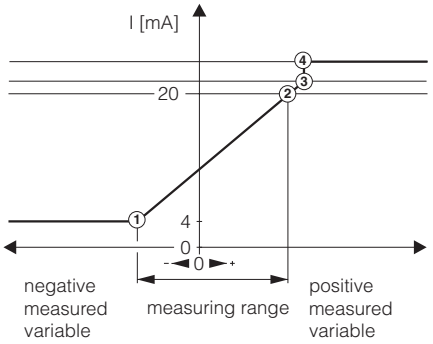
F06-23xxxxxx-05-xx-xx-xx-000

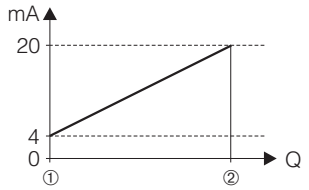
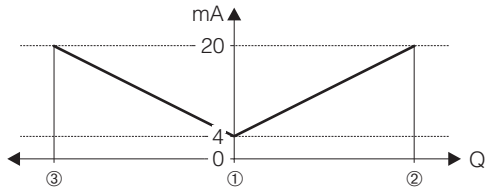
Parameter setting, example 3:
MEASURING MODE = SYMMETRY
The current output signal is independent of the direction of flow (absolute amount of the measured variable). The 4 mA value ① and the 20 mA value ② must have the same sign (+ or -). The “20 mA VALUE” ③ (e.g. backflow) corresponds to the mirrored 20 mA value ② (e.g. flow).

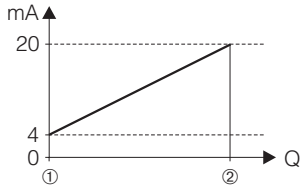
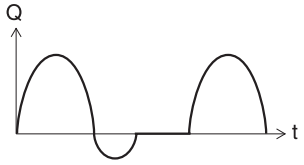
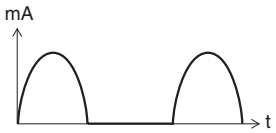
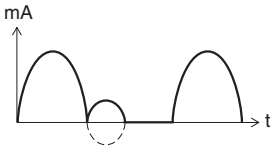
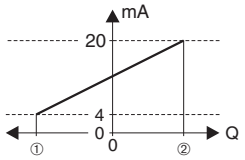
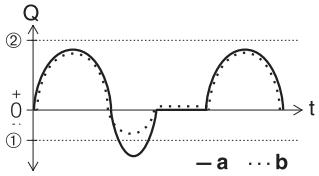


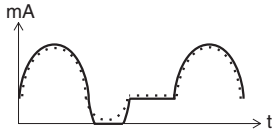
F-xxxxxxxx-05-xx-xx-xx-007

ASSIGN RELAY = FLOW DIRECTION
Flow direction output via a switching contact.

Function description OUTPUTS → CURRENT OUTPUT → CONFIGURATION	
VALUE 20 mA	Use this function to assign the 20 mA current a value. The value can be higher or lower than the value assigned to 4mA (function VALUE 4 mA, see Page 34). Positive and negative values are permissible, depending on the measured variable in question (e.g. volume flow). **Parameter setting:** 4 mA assigned value = - 250 l/h 20 mA assigned value = +750 l/h Calculated current value = 8 mA (at zero flow) Note that values with different signs cannot be entered for 4 mA and 20 mA, if SYMMETRY is the setting selected in the function MEASURING MODE. In this case, the message "INPUT RANGE EXCEEDED". Example for STANDARD measuring mode:  F06-23xxxxx-05-xx-xx-en-002 ① *= Initial value (4-20 mA)* ② *= Full scale value (4-20 mA)* *Minimum Range: Q = 0,3 m/s* ③ *= Maximum current value: depending on the parameters set in the function CURRENT SPAN (see Page 33).* ④ *= Failsafe mode (upper signal on alarm level): depending on the parameters set in the functions CURRENT SPAN (see Page 33) and FAILSAFE MODE, (see Page 39)* **User input:** 5-digit floating-point number, with sign **Factory setting:** Depends on nominal diameter and country, [value] / [dm^3/min...m^3/h or US-gal/min], corresponding to the factory setting for the full scale value (see Page 78 ff.) ✎ Note: The appropriate unit is taken from the function UNIT VOLUME FLOW or UNIT MASS FLOW (see Page 13 resp. Page 12). ☞ Caution: It is very important to read and comply with the information in the function VALUE 4 mA (under " ☞ Caution"; Examples of parameter settings) on Page 35.

Function description OUTPUTS → CURRENT OUTPUT → CONFIGURATION	
MEASURING MODE	Use this function to define the measuring mode for the current output. **Options:** STANDARD SYMMETRY **Factory setting:** STANDARD **Description of the individual options:** • STANDARD The current output signal is proportional to the measured variable. The flow components outside the scaled measuring range (defined by the 4 mA VALUE ① and the 20 mA VALUE ②) are taken into account as follows for signal output. – If one of the values (for example VALUE 4 mA= –5 m^3/h; VALUE 20 mA = 10m^3/h) 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.  F-xxxxxxx-05-xx-xx-xx-003 • SYMMETRY The current output signal is independent of the direction of flow (absolute amount of the measured variable). The 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).  F-xxxxxxx-05-xx-xx-xx-007 ✎ Note: • The direction of flow can be output via the configurable status output. • SYMMETRY cannot be selected unless the values in the VALUE 4 mA and VALUE 20 mA 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 → CURRENT OUTPUT → 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  F-xxxxxxx-05-xx-xx-xx-003 and the following flow behaviour:  F-x3xxxxx-05-xx-xx-xx-008 • STANDARD The current output signal is proportional to the measured variable. The flow components outside the scaled measuring range cannot be taken into account for signal output. A fault message is generated (# 351, current range) and the current output responds in accordance with the parameter settings in the function FAILSAFE MODE  F-x3xxxxx-05-xx-xx-xx-009 • SYMMETRY The current output signal is independent of the direction of flow.  F-x3xxxxx-05-xx-xx-xx-010 2. Defined measuring range (①-②): ① and ② **do not** have the same sign.  F-x3xxxxx-05-xx-xx-xx-002 Flow a (—) outside, b (- -) within the measuring range.  F-x3xxxxx-05-xx-xx-xx-012 (continued on next page)

Function description OUTPUTS → CURRENT OUTPUT → CONFIGURATION	
Detailed explanations and information (continued)	• STANDARD a (—): The flow components outside the scaled measuring range cannot be taken into account at signal output. A fault message is generated (# 351, current range) and the current output responds in accordance with the parameter settings in the function FAILSAFE MODE. b (- -): The current output signal is proportional to the measured variable assigned.  F-x3xxxxx-05-xx-xx-xx-013 • SYMMETRY This option is not available under these circumstances, because the 4 mA value and the 20 mA value have different signs.
TIME CONSTANT	Use this function to enter a time constant defining how the current output signal reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). **User input:** fixed-point number 0.01...100.00 s **Factory setting:** 1.00 s
FAILSAFE MODE	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:** MAX. CURRENT – 22 mA for 4-20 mA HART – 22.6 mA for 4-20 mA HART NAMUR – 22.6 mA for 4-20 mA HART US HOLD VALUE Measuring value output is based on the last measuring value saved before the error occurred. ACTUAL VALUE Measuring value output is based on the current flow measurement. The fault is ignored. **Factory setting:** MAX. CURRENT

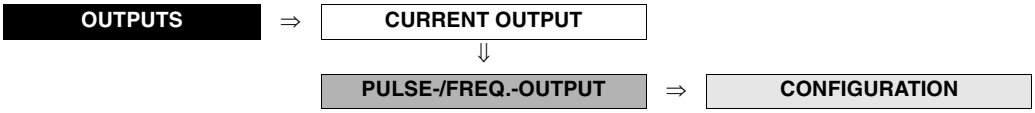
7.1.2 Function group OPERATION

OUTPUTS ⇒ **CURRENT OUTPUT** ⇒ **CONFIGURATION**
⇓
OPERATION

Function description OUTPUTS → CURRENT OUTPUT → OPERATION	
ACTUAL CURRENT	Use this function to view the computed actual value of the output current. **User interface:** 4.00...22.00 mA
SIMULATION CURRENT	Use this function to activate simulation of the current output. **Options:** OFF ON **Factory setting:** OFF ✎ Note: • The "SIMULATION CURRENT OUTPUT" message indicates that simulation is active. • The measuring device continues to measure while simulation is in progress, i.e. the current measuring values are output correctly via the other outputs. ☞ Caution: The setting is not saved if the power supply fails.
VALUE SIMULATION CURRENT	✎ Note: The function is not visible unless the SIMULATION CURRENT function is active (= ON). Use this function to define a freely selectable value (e.g. 12 mA) to be output at the current output. This value is used to test downstream devices and the measuring device itself. **User input:** 4.00...22.00 mA **Factory setting:** 4.00 mA ☞ Caution: The setting is not saved if the power supply fails.

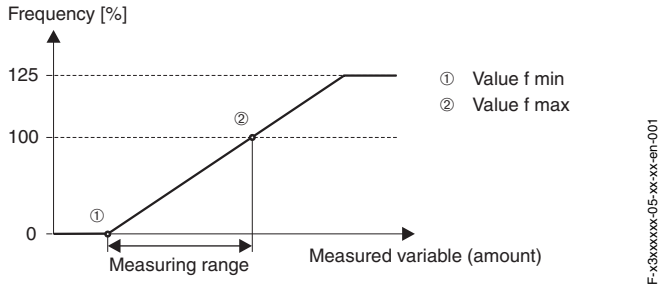
7.2 Group PULSE-/FREQ.-OUTPUT (optional)

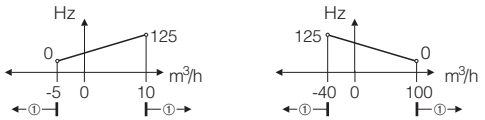
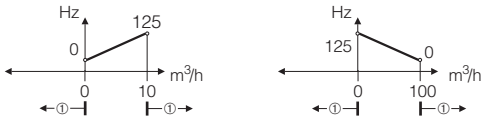
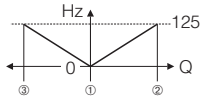
7.2.1 Function group CONFIGURATION

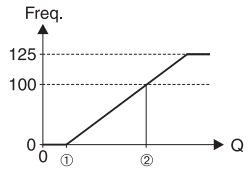
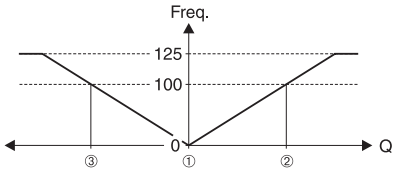


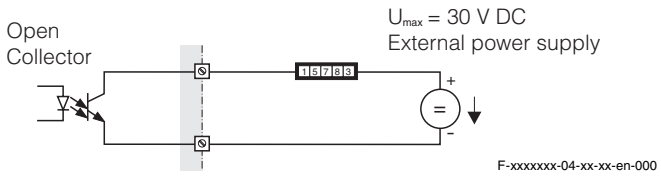
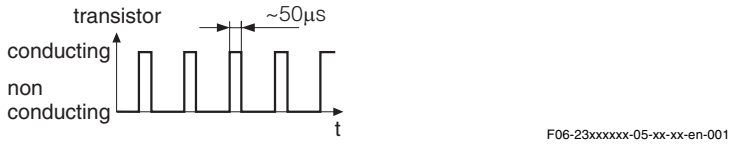
Function description OUTPUTS ➞ PULSE-/FREQ.-OUTPUT ➞ CONFIGURATION (GENERAL / FREQUENCY)	
OPERATION MODE	Use this function to configure the output as a pulse output, frequency output or status output. The functions available in this function group vary, depending on which option you select here. **Options:** FREQUENCY PULSE STATUS **Factory setting:** PULSE
ASSIGN FREQUENCY	✎ Note: This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. Use this function to assign a measured variable to the frequency output. **Options:** OFF MASS FLOW VOLUME FLOW **Factory setting:** VOLUME FLOW ✎ Note: If you select OFF, the only function shown in the CONFIGURATION function group is this function, in other words ASSIGN FREQUENCY.
START VALUE FREQUENCY	✎ Note: This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. Use this function to define an initial frequency for the frequency output. You define the associated measuring value of the measuring range in the VALUE f LOW function described on Page 42. **User input:** 5-digit fixed-point number: 0...10000 Hz **Factory setting:** 0 Hz Example: • VALUE f LOW = 0 l/h, initial frequency = 0 Hz: i.e. a frequency of 0 Hz is output at a flow of 0 l/h. • VALUE f LOW = 1 l/h, initial frequency = 10 Hz: i.e. a frequency of 10 Hz is output at a flow of 1 l/h.

Function description OUTPUTS → PULSE-/FREQ.-OUTPUT → CONFIGURATION (FREQUENCY)	
END VALUE FREQUENCY	✎ Note: This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. Use this function to define a full scale frequency for the frequency output. You define the associated measuring value of the measuring range in the VALUE f HIGH function described on Page 43. **User input:** 5-digit fixed-point number 500...10000 Hz **Factory setting:** 10000 Hz Example: • VALUE f HIGH = 1000 l/h, full scale frequency = 1000 Hz: i.e. a frequency of 1000 Hz is output at a flow of 1000 l/h. • VALUE f HIGH = 3600 l/h, full scale frequency = 1000 Hz: i.e. a frequency of 1000 Hz is output at a flow of 3600 l/h.
VALUE f LOW	✎ Note: This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. Use this function to assign a variable to the start value frequency. The value can be higher or lower than the value assigned to the VALUE f HIGH. Positive and negative values are permissible, depending on the measured variable in question (e.g. volume flow). You define a measuring range by defining the VALUE f LOW and VALUE f HIGH values. **User input:** 5-digit floating-point number **Factory setting:** 0 [unit] ✎ Note: • For graphic illustration of VALUE f LOW see VALUE f HIGH on Page 43. • The appropriate unit is taken from the function UNIT VOLUME FLOW or UNIT MASS FLOW (see Page 13 or Page 12).

Function description OUTPUTS ➞ PULSE-/FREQ.-OUTPUT ➞ CONFIGURATION (FREQUENCY)	
VALUE f HIGH	✎ Note: This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. Use this function to assign a variable to the end value frequency. The value can be higher or lower than the value assigned to the VALUE f LOW. Positive and negative values are permissible, depending on the measured variable in question (e.g. volume flow). You define a measuring range by defining the VALUE f LOW and VALUE f HIGH values. ✎ Note: Note that values with different signs cannot be entered for VALUE f LOW and VALUE f HIGH if SYMMETRY is the setting selected for the MEASURING MODE function. In this case the message "INPUT RANGE EXCEEDED" appears on the display. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter and country, [value / [dm^3/min...m^3/h or US-gal/min], corresponding to the factory setting for the full scale value (see Page 78 ff.).  ☝ Caution: The frequency output responds differently, depending on the parameters set in the various functions. Some examples of parameter settings and their effect on the frequency output are given in the following section. (continued on next page)

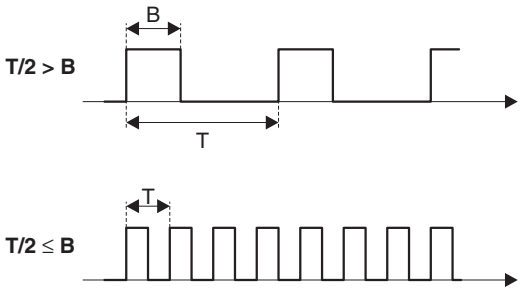
Function description OUTPUTS → PULSE-/FREQ.-OUTPUT → CONFIGURATION (FREQUENCY)	
VALUE f HIGH (continued)	**Parameter setting, example 1:** VALUE f LOW = not equal to zero flow (e.g. –5 m^3/h, 10m^3/h) VALUE f HIGH = not equal to zero flow (e.g. 100 m^3/h, -40 m^3/h) MEASURING MODE = STANDARD When you enter the values for VALUE-f LOW and VALUE-f HIGH, the working range of the measuring device is defined. If the effective flow drops below or exceeds this working range (see ①), a fault or notice message is generated (#351, frequency area) and the frequency output responds in accordance with the parameter settings in the function FAILSAFE MODE.  F06-xxxxxxx-05-xx-xx-xx-009 **Parameter setting, example 2:** VALUE f LOW = equal to zero flow (e.g. 0 m^3/h) VALUE f HIGH = not equal to zero flow (e.g. 10 m^3/h) or VALUE f LOW = not equal to zero flow (e.g. 100 m^3/h) VALUE f HIGH = equal to zero flow (e.g. 0 m^3/h) and MEASURING MODE = STANDARD When you enter the values for VALUE f LOW and VALUE f HIGH, the working range of the measuring device is defined. In doing so, one of the two values is parameterised as zero flow (e.g. 0 m^3/h). If the effective flow drops below or exceeds the value parameterised as the zero flow or the effective flow drops below or exceeds the other value, a fault/notice message is generated (#351, frequency area) and the frequency output responds in accordance with the parameters set in the function FAILSAFE MODE.  F06-xxxxxxxx-05-xx-xx-xx-015 **Parameter setting, example 3:** MEASURING MODE = SYMMETRY The frequency output signal is independent of the direction of flow (absolute amount of the measured variable). The VALUE f LOW ① and VALUE f HIGH ② must have the same sign (+ or -). The "VALUE f HIGH" ③ (e.g. backflow) corresponds to the mirrored VALUE f HIGH ② (e.g. flow).  F06-xxxxxxxx-05-xx-xx-xx-011

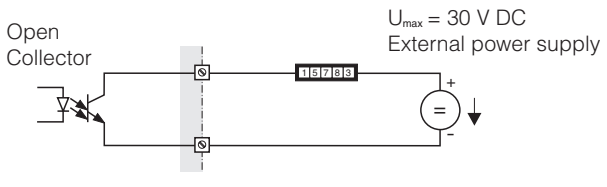
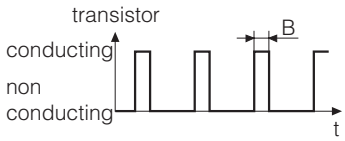
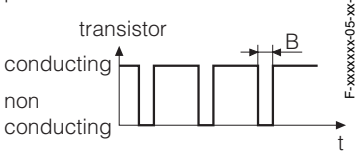
Function description OUTPUTS → PULSE-/FREQ.-OUTPUT → CONFIGURATION (FREQUENCY)	
MEASURING MODE	✎ Note: This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. Use this function to define the measuring mode for the frequency output. **Options:** STANDARD SYMMETRY **Factory setting:** STANDARD **Description of the individual options:** • STANDARD The frequency output signal is proportional to the measured variable. The flow components outside the scaled measuring range (defined by the VALUE f LOW. ① and VALUE f HIGH. ②) are not taken into account for signal output. – If one of the values is defined as equal to the zero flow (e.g.VALUE f LOW = 0 m^3/h) or 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. – If both values defined are not equal to the zero flow (for example VALUE f LOW= –5 m^3/h; VALUE f HIGH = 10m^3/h) the message “FREQUENCY OUTPUT AT FULL SCALE VALUE” appears if the measuring range is exceeded or not achieved and the frequency output responds in accordance with the parameter settings in the function FAILSAFE MODE.  F-x3xxxxx-05-xx-xx-xx-003 SYMMETRY The frequency output signal is independent of the direction of flow (absolute amount of the measured variable). The VALUE f LOW ① and VALUE f HIGH ② must have the same sign (+ or -). The VALUE f HIGH ③ (e.g. backflow) corresponds to the mirrored VALUE f HIGH ② (e.g. forward flow).  F-x3xxxxx-05-xx-xx-xx-004 ✎ Note: • SYMMETRY cannot be selected unless the values in the VALUE f LOW and VALUE f HIGH 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-/FREQ.-OUTPUT → CONFIGURATION (FREQUENCY)	
OUTPUT SIGNAL	✎ Note: This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. Use this function to view the polarity of the frequency. **Factory setting:** PASSIVE - NEGATIVE **PASSIVE:**  ✎ Note: For continuous currents up to 100 mA (I_{max} = 250 mA / 20 ms): **PASSIVE-NEGATIVE** 
TIME CONSTANT	✎ Note: This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. Use this function to enter a time constant defining how the frequency output signal reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). **User input:** fixed-point number 0.00...100.00 s **Factory setting:** 1.00 s

Function description OUTPUTS → PULSE-/FREQ.-OUTPUT → CONFIGURATION (FREQUENCY)	
FAILSAFE MODE	✎ Note: This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. For safety reasons it is advisable to ensure that the frequency output assumes a predefined state in the event of a fault. The setting you select here affects only the frequency output. It has no effect on other outputs and the display (e.g. totalizers). **Options:** FALLBACK VALUE Output is 0 Hz. FAILSAFE VALUE Output is the frequency specified in the FAILSAFE VALUE function. HOLD VALUE Measuring value output is based on the last measuring value saved before the error occurred. ACTUAL VALUE Measuring value output is based on the current flow measurement. The fault is ignored. **Factory setting:** FALLBACK VALUE
FAILSAFE VALUE	✎ Note: This function is not available unless FREQUENCY was selected in the OPERATION MODE function and FAILSAFE VALUE was selected in the FAILSAFE MODE function. Use this function to define the frequency that the measuring device outputs in the event of an error. **User input:** max. 5-digit number: 0...12500 Hz **Factory setting:** 12500 Hz

Function description OUTPUTS → PULSE-/FREQ.-OUTPUT → CONFIGURATION (PULSE)	
ASSIGN PULSE	✎ Note: This function is not available unless the PULSE setting was selected in the OPERATION MODE function. Use this function to assign a measured variable to the pulse output. **Options:** OFF MASS FLOW VOLUME FLOW **Factory setting:** VOLUME FLOW ✎ Note: If you select OFF, the only function shown in the CONFIGURATION function group is this function, in other words ASSIGN PULSE.
PULSE VALUE	✎ Note: This function is not available unless the PULSE setting was selected in the OPERATION MODE function. Use this function to define the flow at which a pulse is triggered. These pulses can be totaled by an external totalizer, and the total flow quantity since measuring started can be registered in this way. **User input:** 5-digit floating-point number [unit] **Factory setting:** Depends on nominal diameter and country, [value] [dm^3...m^3 or US-gal] / pulse (see Page 78 ff.). ✎ Note: The appropriate unit is taken from the function UNIT VOLUME or UNIT MASS (see Page 13 or Page 12).

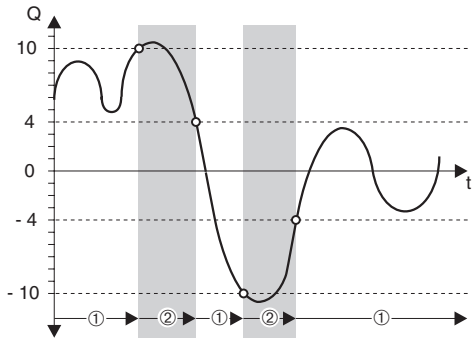
Function description OUTPUTS → PULSE-/FREQ.-OUTPUT → CONFIGURATION (PULSE)	
PULSE WIDTH	✎ Note: This function is not available unless the PULSE setting was selected in the OPERATION MODE function. Use this function to enter the maximum pulse width of the output pulse. **User input:** 0.01...10.00 s **Factory setting:** 10.00 s ✎ Note: If the frequency resulting from the selected pulse weighting and current flow is too high (T/2 < selected pulse width B), the output pulses are automatically reduced to half a period. The on/off ratio is then 1:1 (see illustration)  *B = pulse width* This illustration applies to positive pulses.
MAXIMAL PULSE FREQUENCY	✎ Note: This function is not available unless the PULSE setting was selected in the OPERATION MODE function. Use this function to define a maximum pulse frequency to ensure that an external counter (e.g. mechanical counter, PLC...) can still process the number of pulses. **User input:** Integer: 0...50 Hz **Factory setting:** 50 Hz

Function description OUTPUTS → PULSE-/FREQ.-OUTPUT → CONFIGURATION (PULSE)	
MEASURING MODE	✎ Note: This function is not available unless the PULSE setting was selected in the OPERATION MODE function. Use this function to define the measuring mode for the pulse output. **Options:** STANDARD Only positive flow components are totaled. Negative components are not taken into account. SYMMETRY Positive and negative flow components are taken into account. **Factory setting:** STANDARD
OUTPUT SIGNAL	✎ Note: This function is not available unless the PULSE setting was selected in the OPERATION MODE function. Use this function to configure the output in such a way that it matches an external counter, for example. Depending on the application you can select the direction of the polarity of the pulses, using an external power supply (PASSIVE). **Options:** PASSIVE - POSITIVE PASSIVE - NEGATIVE **Factory setting:** PASSIVE - NEGATIVE **PASSIVE:**  ✎ Note: For continuous currents up to 100 mA (I_{max} = 250 mA / 20 ms). **PASSIVE-NEGATIVE** pulses  **PASSIVE-POSITIVE** pulses  B = Pulse width

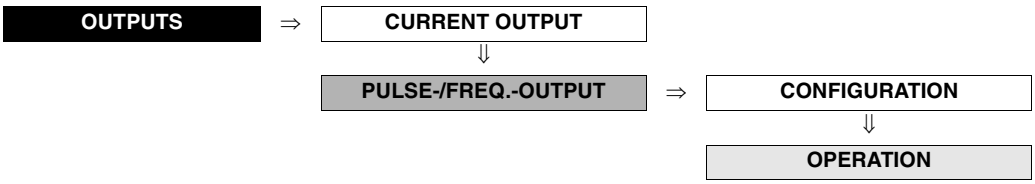
Function description OUTPUTS → PULSE-/FREQ.-OUTPUT → CONFIGURATION (PULSE)	
FAILSAFE MODE	✎ Note: This function is not available unless the PULSE setting was selected in the OPERATION MODE function. For safety reasons it is advisable to ensure that the pulse output assumes a predefined state in the event of a fault. The setting you select here affects only the pulse output. It has no effect on other outputs and the display (e.g. totalizers). **Options:** FALLBACK VALUE Output is 0 pulse. HOLD VALUE Measuring value output is based on the last measuring value saved before the error occurred. ACTUAL VALUE Measuring value output is based on the current flow measurement. The fault is ignored. **Factory setting:** FALLBACK VALUE

Function description OUTPUTS → PULSE-/FREQ.-OUTPUT → CONFIGURATION (STATUS)	
ASSIGN STATUS	✎ Note: This function is not available unless the STATUS setting was selected in the OPERATION MODE function. Use this function to assign a switching function to the status output. **Options:** OFF ON (operation) FAULT MESSAGE NOTICE MESSAGE FAULT MESSAGE or NOTICE MESSAGE EMPTY PIPE DETECTION (only if function is active) FLOW DIRECTION MASS FLOW LIMIT VALUE VOLUME FLOW LIMIT VALUE LIMIT TOTALIZER 1 LIMIT TOTALIZER 2 **Factory setting:** FAULT MESSAGE ✎ Note: • The behaviour of the status output is a normally closed behaviour, in other words the output is closed (transistor conductive) when normal, error-free measuring is in progress. • If you select OFF, the only function shown in the CONFIGURATION function group in this function, in other words ASSIGN STATUS.
ON-VALUE	✎ Note: This function is not available unless the STATUS setting was selected in the OPERATION MODE function and a LIMIT or FLOW DIRECTION was selected in the ASSIGN STATUS function. Use this function to assign a value to the switch-on point (activation of the status output). The value can be equal to, higher than or lower than the switch-off point. Positive or negative values are permissible, depending on the measured variable in question (e.g. volume flow, totalizer reading). See also on Page 58. **User input:** 5-digit floating-point number [unit] **Factory setting:** 0 [unit] ✎ Note: • The appropriate unit is taken from the function UNIT VOLUME FLOW or UNIT MASS FLOW. • 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.

Function description OUTPUTS → PULSE-/FREQ.-OUTPUT → CONFIGURATION (STATUS)	
SWITCH-ON DELAY	✎ Note: This function is not available unless the STATUS setting was selected in the OPERATION MODE function and a LIMIT or FLOW DIRECTION was selected in the ASSIGN STATUS function. Use this function to specify a delay (0...100 seconds) for switching on the status output (i.e. signal changes from 0 to 1). The delay starts when the limit value is reached. The status output does not switch until the delay has timed out. **User input:** fixed-point number: 0.0...100.0 s **Factory setting:** 0.0 s
OFF-VALUE	✎ Note: This function is not available unless STATUS was selected in the OPERATION MODE function and a LIMIT was selected in the ASSIGN STATUS function. Use this function to assign a value to the switch-off point (deactivation of the status output). The value can be equal to, higher than or lower than the switch-on point. Positive and negative values are permissible, depending on the measured variable in question (e.g. volume flow, totalizer reading). See also on Page 58. **User input:** 5-digit floating-point number [unit] **Factory setting:** 0 [unit] ✎ Note: • The appropriate unit is taken from the function UNIT VOLUME FLOW or UNIT MASS FLOW. • If SYMMETRY is selected in the function MEASURING MODE 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	✎ Note: This function is not available unless the STATUS setting was selected in the OPERATION MODE function and a LIMIT was selected in the ASSIGN STATUS function. Use this function to define a delay (0...100 seconds) for switching off the status output (i.e. signal changes from 1 to 0). The delay starts when the limit value is reached. The status output does not switch until the delay has timed out. **User input:** fixed-point number 0.0...100.0 s **Factory setting:** 0.0 s

Function description OUTPUTS → PULSE-/FREQ.-OUTPUT → CONFIGURATION (STATUS)	
MEASURING MODE	✎ Note: This function is not available unless STATUS was selected in the function OPERATION MODE and the status output was assigned a limit value. Use this function to define the measuring mode for the status output. **Options:** STANDARD The status output signal switches at the defined switch points. SYMMETRY The status output signal switches at the defined switch points, irrespective of the sign. If you define a switch point with a positive sign, the status output signal switches as soon as the value is reached in the negative direction (negative sign), see illustration. **Factory setting:** STANDARD Example for the SYMMETRY measuring mode: Switch-on point Q = 4, switch-off point: Q = 10 ① = Status output switched on (conductive) ② = Status output switched off (non-conductive)  ✎ Note: • SYMMETRY cannot be selected unless the values in the ON-VALUE and OFF-VALUE functions have the same sign or one of the values is zero. • If the values have different signs, SYMMETRY cannot be selected and an “ASSIGNMENT NOT POSSIBLE” message is displayed.
TIME CONSTANT	✎ Note: This function is not available unless the STATUS setting was selected in the OPERATION MODE function. Use this function to enter a time constant defining how the measuring signal reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). Damping acts on the measuring signal before the switch status changes, and consequently before switch-on or switch-off delay is activated. The purpose of damping, therefore, is to prevent the status output changing state continuously in response to fluctuations in flow. **User input:** fixed-point number 0.00...100.00 s **Factory setting:** 0.00 s

7.2.2 Function group OPERATION



Function description OUTPUTS ➞ PULSE-/FREQ.-OUTPUT ➞ OPERATION (FREQUENCY)	
ACTUAL FREQUENCY	✎ Note: This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. Use this function to view the computed value of the output frequency. **User Interface:** 0...12500 Hz
SIMULATION FREQUENCY	✎ Note: This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function. Use this function to activate simulation of the frequency output. **Options:** OFF ON **Factory setting:** OFF ✎ Note: • The "SIMULATION FREQUENCY OUTPUT" message indicates that simulation is active. • The measuring device continues to measure while simulation is in progress, i.e. the current measuring values are output correctly via the other outputs. ☝ Caution: The setting is not saved if the power supply fails.
VALUE SIMULATION FREQUENCY	✎ Note: This function is not available unless FREQUENCY was selected in the OPERATION MODE function and the SIMULATION FREQUENCY function is active (= ON). Use this function to define a selectable frequency value (e.g. 500 Hz) to be output at the frequency output. This value is used to test downstream devices and the flowmeter itself. **User input:** 0...12500 Hz **Factory setting:** 0 Hz ☝ Caution: The setting is not saved if the power supply fails.

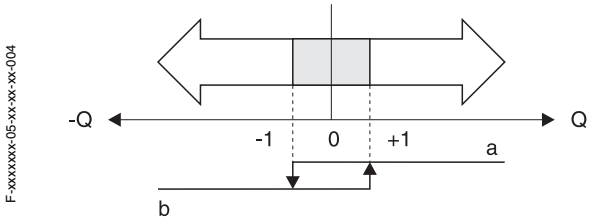
Function description OUTPUTS → PULSE-/FREQ.-OUTPUT → OPERATION (PULSE)	
ACTUAL PULSE	✎ Note: This function is not available unless the PULSE setting was selected in the OPERATION MODE function. Use this function to view the computed value of the pulse frequency. **Display:** 0...50 Hz
SIMULATION PULSE	✎ Note: This function is not available unless the PULSE setting was selected in the OPERATION MODE function. Use this function to activate simulation of the pulse output. **Option:** OFF ON **Factory setting:** OFF ✎ Note: • The "SIMULATION PULSE OUTPUT" message indicates that simulation is active. • The measuring device continues to measure while simulation is in progress, i.e. the current measured values are output correctly via the other outputs. ☞ Caution: The setting is not saved if the power supply fails.
VALUE SIMULATED PULSE QUANTITY	✎ Note: This function is not available unless the PULSE setting was selected in the OPERATION MODE function and the SIMULATION PULSE function is active (= ON). Use this function to define the number of pulses to be output at the pulse output. This value is used to test downstream devices and the flowmeter itself. **User input:** 0...10000 **Factory setting:** 0 ✎ Note: After the setting the pulses are indicated with the pulse width selected. In this function the given pulses are counted backwards to the value zero on the display. The message "SIMULATION PULSE OUTPUT" is active. For a new simulation enter a new setting. ☞ Caution: The setting is not saved if the power supply fails.

Function description OUTPUTS → PULSE-/FREQ.-OUTPUT → OPERATION (STATUS)	
ACTUAL STATUS	✎ Note: This function is not available unless the STATUS setting was selected in the OPERATION MODE function. Use this function to check the current status of the status output. **User Interface:** CONDUCTIVE NOT CONDUCTIVE
SIMULATION SWITCH POINT	✎ Note: This function is not available unless the STATUS setting was selected in the OPERATION MODE function. Use this function to activate simulation of the status output. **Options:** OFF ON **Factory setting:** OFF ✎ Note: • The "SIMULATION SWITCH POINT" message indicates that simulation is active. • The measuring device continues to measure while simulation is in progress, i.e. the current measuring values are output correctly via the other outputs. ☞ Caution: The setting is not saved if the power supply fails.
VALUE SIMULATION SWITCH POINT	✎ Note: This function is not available unless the STATUS setting was selected in the OPERATION MODE function and the SIMULATION SWITCH POINT function is active (= ON). Use this function to define the switching response of the status output during the simulation. This value is used to test downstream devices and the flowmeter itself. **Options:** NOT CONDUCTIVE CONDUCTIVE **Factory setting:** NOT CONDUCTIVE ☞ Caution: The setting is not saved if the power supply fails.

7.2.3 Information on the response of the status output

General
If you have configured the status output signal for “LIMIT” 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 status output switches as shown in the illustrations below.

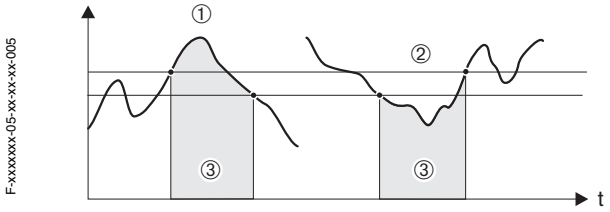
Status output configured for flow direction
The value you entered in the function ON-VALUE defines the switch point for the positive and negative directions of flow.
If, for example, the switch point you define is = 1 m^3/h, the status drops out at –1 m^3/h and pulls up at +1 m^3/h. Set the switch point to 0 if your process calls for direct switchover (no switching hysteresis).
If low flow cut off is used, it is advisable to set hysteresis to a value higher than or equal to the low flow cut off rate.



a = Transistor conductive
b = Transistor not conductive

Status output configured for limit value
The status 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

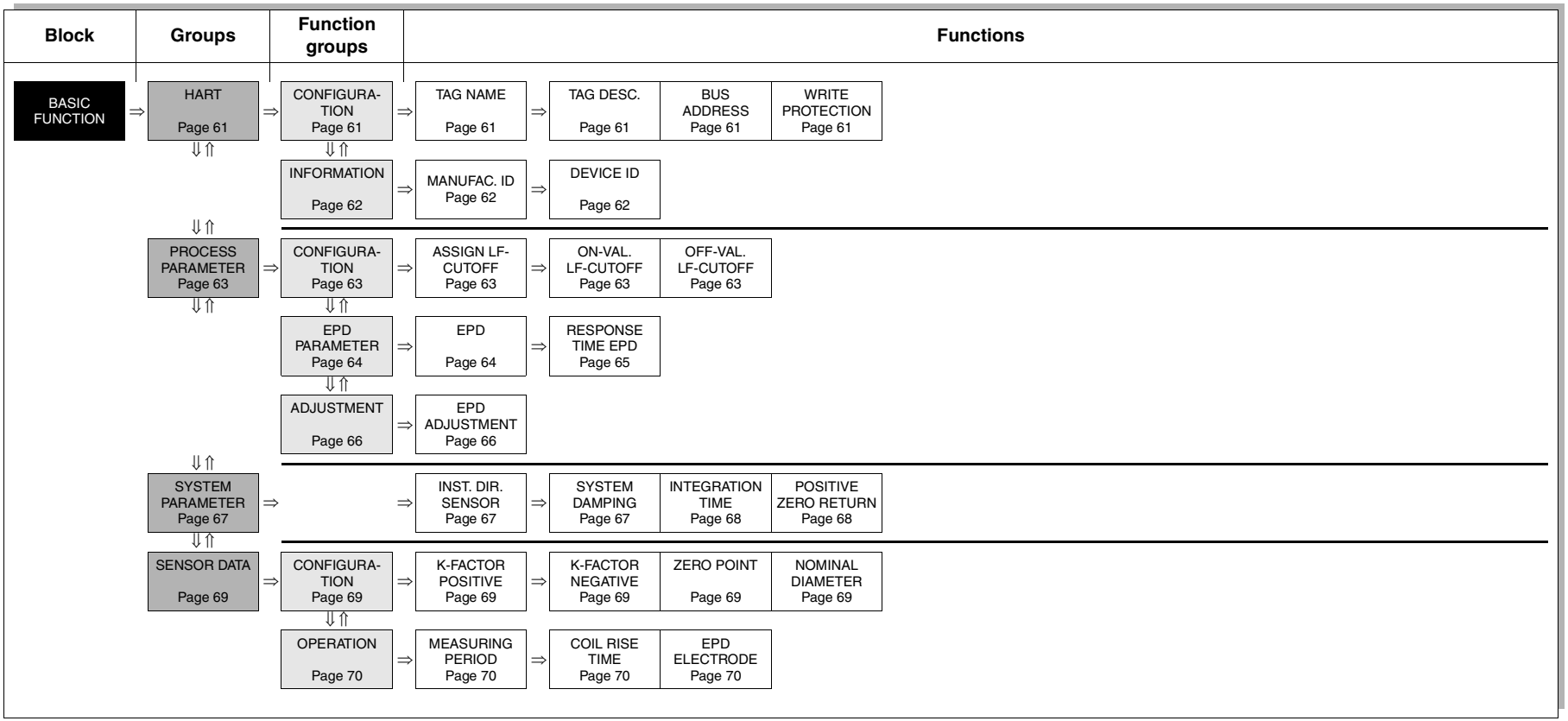


① = ON ≤ SWITCH-OFF POINT (maximum safety)
② = ON > SWITCH-OFF POINT (minimum safety)
③ = Transistor not conductive

7.2.4 Switching response of the status output

Function	State	Output
ON (operation)	System in measuring mode	conductive
	System not in measuring mode (power supply failed)	non conductive
Fault message	System OK	conductive
	(System or process error) Fault → Response to error Outputs / Inputs and totalizers	non conductive
Notice message	System OK	conductive
	(System or process error) Fault → Continuation of measuring	non conductive
Fault message or notice message	System OK	conductive
	(System or process error) Fault → Response to error or Inform. → Continuation of measuring	non conductive
Empty pipe detection (EPD)	Measuring pipe full	conductive
	Measuring tube only partly filled / measuring tube empty	non conductive
Flow direction	forward	conductive
	reverse	non conductive
Limit value - volume flow - totalizers	Limit value not overshot or undershot	conductive
	Limit value overshot or undershot	non conductive

8 Block BASIC FUNCTION



8.1 Group HART

8.1.1 Function group CONFIGURATION

BASIC FUNCTION ⇒ **HART** ⇒ **CONFIGURATION**

Function description BASIC FUNCTION → HART → CONFIGURATION	
TAG NAME	Use this function to enter a tag name for the measuring device. You can edit and read this tag name at the local display or via the HART protocol. **User input:** max. 8-character text, permissible: A-Z, 0-9, +,-, punctuation marks **Factory setting:** "_ _ _ _ _ _ _ _" (no text)
TAG DESCRIPTION	Use this function to enter a tag description for the measuring device. You can edit and read this tag description at the local display or via the HART protocol. **User input:** max. 16-character text, permissible: A-Z, 0-9, +,-, punctuation marks **Factory setting:** "_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _" (No text)
BUS ADDRESS	Use this function to define the address for the exchange of data with the HART protocol. **User input:** 0...15 **Factory setting:** 0 ✎ Note: Adresses 1...15: a constant 4 mA current is applied.
WRITE PROTECTION	Use this function to check whether the measuring device can be write-accessed. **User interface** OFF (Data exchange is possible) ON (Data exchange is disabled) **Factory setting:** OFF ✎ Note: Write protection is activated and deactivated by means of a jumper on the I/O module. (see Operating Instructions *PROline promag 23, BA 045D/06/en)*

8.1.2 Function group INFORMATION

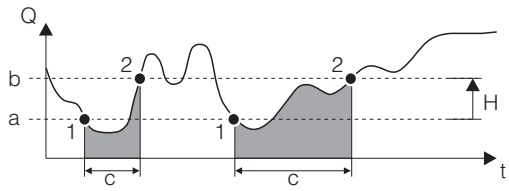
BASIC FUNCTION ⇒ **HART** ⇒ **CONFIGURATION**
⇓
INFORMATION

Function description BASIC FUNCTION → HART → INFORMATION	
MANUFACTURER ID	Use this function to view the manufacturer ID in decimal numerical format. **User Interface:** 17 (≅ 11 hex) for Endress+Hauser
DEVICE ID	Use this function to view the device ID in hexadecimal numerical format. **User Interface:** 46 (≅ 70 dez) for Promag 23

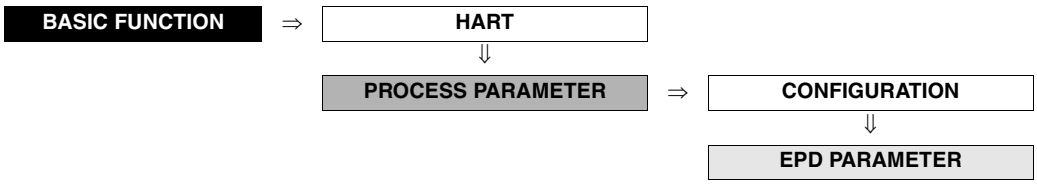
8.2 Group PROCESS PARAMETER

8.2.1 Function group CONFIGURATION

BASIC FUNCTION ⇒ **HART**
⇓
PROCESS PARAMETER ⇒ **CONFIGURATION**

Function description BASIC FUNCTION ➞ PROCESS PARAMETER ➞ CONFIGURATION	
ASSIGN LOW FLOW CUTOFF	Use this function to assign the switch point for low flow cut off. **Options:** OFF MASS FLOW VOLUME FLOW **Factory setting:** VOLUME FLOW
ON-VALUE LOW FLOW CUTOFF	Use this function to enter the switch-on point for low flow cut off. Low flow cut off is active if the value entered is not equal to 0. The sign of the flow value is highlighted on the display to indicate that low flow cut off is active. **User input:** 5-digit floating-point number [unit] **Factory setting:** Depends on nominal diameter and country, [value] / [dm^3...m^3 or US-gal], corresponding to the factory setting for low flow cut off (see Page 78 ff.). ✎ Note: The appropriate unit is taken from the function UNIT VOLUME FLOW or UNIT MASS FLOW (see Page 13 or Page 12).
OFF-VALUE LOW FLOW CUTOFF	Use this function to enter the switch-off point (b) for low flow cut off. Enter the switch-off point as a positive hysteresis (H) from the switch-on point. **User input:** Integer 0...100% **Factory setting:** 50% Example:  Q = Flow [volume/time] t = Time H = Hysteresis a = ON-VALUE LOW FLOW CUT OFF = 200 dm^3/h b = OFF-VALUE LOW FLOW CUT OFF = 10% c = Low flow cut off active 1 = Low flow cut off is switched on at 200 dm^3/h 2 = Low flow cut off is switched off at 220 dm^3/h

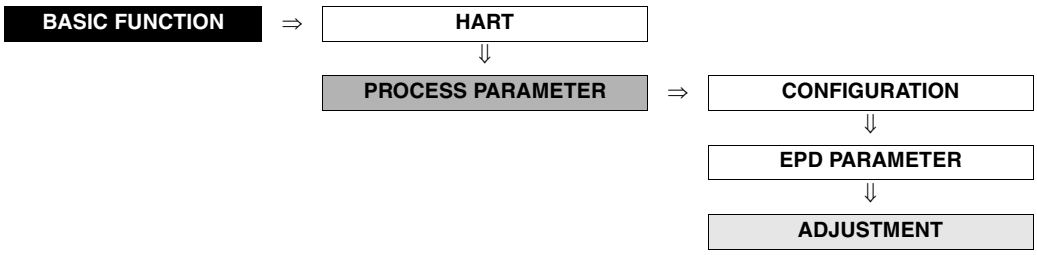
8.2.2 Function group EPD PARAMETER



Function description BASIC FUNCTION ➞ PROCESS PARAMETER ➞ EPD PARAMETER	
✎ Note: This group is not available unless the sensor is fitted with an EPD electrode.	
EMPTY PIPE DETECTION	Use this function to activate empty pipe detection (EPD). **Options:** OFF ON **Factory setting:** OFF ✎ Note: • The default setting for the EPD function when the device is delivered is OFF. The function has to be activated as required. • The EPD electrode is calibrated at the factory with water (500 µS/cm). If the conductivity of certain fluids deviates from this reference, empty pipe/full pipe adjustment (see function EPD ADJUSTMENT on Page 66) has to be performed on site. • The calibration coefficients must be valid before you can activate EPD. If these coefficients are not available, the EPD ADJUSTMENT function, see Page 66, is displayed. • The following messages may appear on the display in the event of incorrect adjustment: – ADJUSTMENT FULL = EMPTY: The adjustment values for empty pipe and full pipe are identical. – ADJUSTMENT NOT OK: Adjustment is not possible as the fluid conductivity values are outside the permitted range. **Notes on Empty Pipe Detection (EPD)** • Flow cannot be measured correctly unless the measuring pipe is completely full. This status can be monitored at all times by means of the EPD. A conductivity measurement between measuring electrode and EDPD electrode is the basis of the EPD. • An empty or partially filled pipe is a process error. A default factory setting defines that a notice message is issued and that this process error has no effect on the outputs. • The EPD process error can be output via the configurable status output. • Use the function ASSIGN PROCESS ERROR, see Page 72, to define whether a notice or warning message should be triggered. (continued on next page)

Function description BASIC FUNCTION → PROCESS PARAMETER → EPD PARAMETER	
EMPTY PIPE DETECTION (continued)	**Response to partially filled pipe** If the EPD is switched on and responds to a partially filled or empty pipe, the notice message “EMPTY PIPE” appears on the display. If the pipe is partially empty and the EPD is **not** switched on, the response can vary in identically configured systems: • Flow reading fluctuates • Zero flow • Excessively high flow values
RESPONSE TIME EPD	Use this function to enter the time span for which the criteria for an empty pipe have to be satisfied without interruption before a notice message or fault message is generated. **User input:** fixed-point number: 1.0...60.0 s **Factory setting:** 1.0 s

8.2.3 Function group ADJUSTMENT



Function description BASIC FUNCTION → PROCESS PARAMETER → ADJUSTMENT	
EPD ADJUSTMENT	Use this function to activate EPD calibration for an empty or full measuring tube. **Options:** OFF FULL PIPE ADJUST EMPTY PIPE ADJUST **Factory setting:** OFF **Procedure for empty-pipe/full-pipe adjustment** 1. Empty the piping. For empty pipe adjustment, the walls of the measuring tube should still be coated with fluid. 2. Start empty pipe adjustment: - Select “EMPTY PIPE ADJUST” and press E to confirm. 3. Fill piping with fluid. 4. Start full pipe adjustment with fluid at a standstill: - Select “FULL PIPE ADJUST” and press E to confirm. 5. Terminate the adjustment procedure by selecting “OFF” and pressing E to confirm. 6. when the adjustment procedure is complete, switch on the detection system: Select “ON” (flashing) in the function EMPTY PIPE DETECTION (see Page 64) and press E to confirm.

8.3 Group SYSTEM PARAMETER

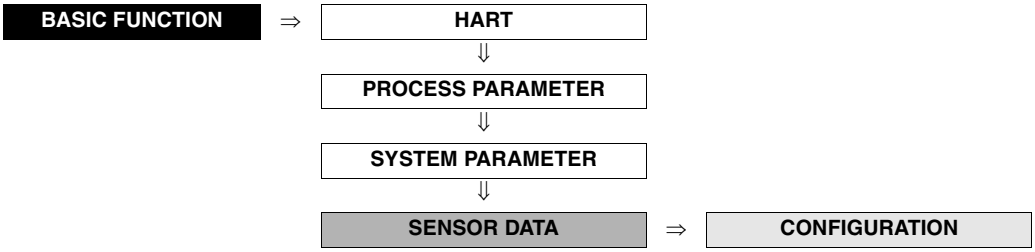
BASIC FUNCTION ⇒ **HART**
⇓
PROCESS PARAMETER
⇓
SYSTEM PARAMETER ⇒ **Functions system parameter**

Function description BASIC FUNCTION → SYSTEM PARAMETER → Functions system parameter	
INSTALLATION DIRECTION SENSOR	Use this function to reverse the sign of the flow quantity, if necessary. **Options:** NORMAL (flow as indicated by the arrow) INVERSE (flow opposite to direction indicated by the arrow) **Factory setting:** NORMAL ✎ Note: Ascertain the actual direction of fluid flow with reference to the direction indicated by the arrow on the sensor (nameplate).
SYSTEM DAMPING	Use this function to set the filter depth of the digital filter. This reduces the sensity of the measuring signal to interference peaks (e.g. high solids content, gas bubbles in the fluid, etc.). The system reaction time decreases with the filter setting. **User input:** 0 ...15 **Factory setting:** 7 ✎ Note: The system damping acts on all functions and outputs of the measuring device.
INTEGRATION TIME	Use this function to set the integration time. Under normal circumstances it is not necessary to change the factory settings. **User input:** 40 ms 33.33 ms **Factory setting:** 40 ms at 50 Hz → mains frequency (e.g. Europe) 33.33 ms at 60 Hz → mains frequency (e.g. USA) ✎ Note: The integration time defines the duration of internal totalling of the induced voltage in the fluid (measured by the measuring electrode), i.e. the time in which the measuring device records the flow (afterwards the magnetic field of opposite polarity for the next integration is created).

Function description BASIC FUNCTION → SYSTEM PARAMETER → Functions system parameter	
POSITIVE ZERO RETURN	Use this function to interrupt evaluation of measured variables. This is necessary when a piping system is being cleaned, for example. The setting acts on all function and outputs of the measuring device. **Options:** OFF ON → Signal output is set to the “ZERO FLOW” value. **Factory setting:** OFF

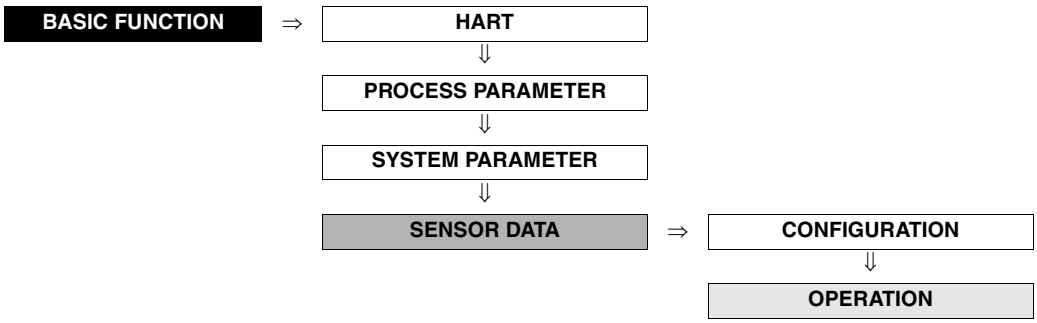
8.4 Group SENSOR DATA

8.4.1 Function group CONFIGURATION



Function description BASIC FUNCTION → SENSOR DATA → CONFIGURATION	
All sensor data (calibration factors, zero (point) and nominal diameter) are set at the factory and saved on the S-DAT sensor memory chip. Caution: Under normal circumstances you should not change the following parameter settings, because changes affect numerous functions of the entire measuring facility in general and the accuracy of the measuring system in particular. For this reason, the functions described below cannot be changed even when you enter your personal code. Contact the E+H service organization if you have any questions about these functions. Note: The individual values of the functions are also provided on the sensor nameplate.	
K-FACTOR POSITIVE	Use this function to display the calibration factor (positive flow direction) for the sensor. The calibration factor is determined and set at the factory.estellt. **User interface** 5-digit fixed-point number: 0.5000 ...2.2000 **Factory setting:** Depends on nominal diameter and calibration
K-FACTOR NEGATIVE	Use this function to display the calibration factor (negative flow direction) for the sensor. The calibration factor is determined and set at the factory. **User interface** 5-digit fixed-point number: 0.5000 ...2.2000 **Factory setting:** Depends on nominal diameter and calibration
ZERO POINT	This function shows the zero-point correction value for the sensor. Zero-point correction is determined and set at the factory. **User interface** max. 4-digit number: -1000 ...+1000 **Factory setting:** Depends on nominal diameter and calibration
NOMINAL DIAMETER	This function shows the nominal diameter for the sensor. The nominal diameter depends on the size of the sensor and is set at the factory. **User interface** 2...200 mm or 1/12...8" **Factory setting:** Depends on the size of the sensor

8.4.2 Function group OPERATION



Function description BASIC FUNCTION → SENSOR DATA → OPERATION	
All sensor data (measuring period, overvoltage time etc.) are set at the factory and saved on the S-DAT sensor memory chip. 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 E+H service organization if you have any questions about these functions.	
MEASURING PERIOD	Use this function to set the time for a full measuring period. The duration of the measuring period is calculated from the rise time of the magnetic field, the brief recovery time, the integration time (which can be set) and the empty pipe detection time. **User input:** 0.0...1000 ms **Factory setting:** Depends on nominal diameter Note: The system checks the time entered and sets the measuring period which is actually used internally to a plausible value.
COIL RISE TIME	Use this function to specify the time in which overvoltage is applied to the coil circuit in order to build up the magnetic field as fast as possible. The overvoltage time is adjusted automatically while measuring is in progress. The overvoltage time depends on the sensor type and the nominal diameter and is set at the factory. **User interface** 4-digit floating-point number 0.0...500.0 ms **Factory setting:** Depends on nominal diameter
EPD ELECTRODE	Use this function to check whether the sensor is equipped with an EPD electrode. **User interface** YES NO **Factory setting:** YES → Electrode fitted as standard

9 Block SUPERVISION

Block	Groups	Function groups	Functions					
SUPERVISION	SYSTEM Page 72	CONFIGURATION Page 72	ASSIGN SYS. ERROR Page 72	ERROR CATEGORY Page 72	ASSIGN PROCESS ERROR Page 72	ERROR CATEGORY Page 73	ACKNOW. FAULTS Page 73	ALARM DELAY Page 73
		OPERATION Page 74	ACTUAL SYS. COND. Page 74	PREV. SYS. COND. Page 74	SIM. FAILSAFE MODE Page 74	SIM. MEASURAND Page 74	VALUE SIM. MEAS. Page 75	SYSTEM RESET Page 75
	VERSION-INFO Page 76	SENSOR Page 76	SERIAL NUMBER Page 76	SENSOR TYPE Page 76	HW REV. NO. SENSOR Page 76	SW REV. NO. S-DAT Page 76		
		AMPLIFIER Page 76	HW REV. NO. AMPLIFIER Page 76	SW REV. NO. AMPLIFIER Page 76				
		I/O-MODULE Page 77	I/O-MODULE TYPE Page 77	HW REV. NO. I/O-MODULE Page 77	SW REV. NO. I/O-MODULE Page 77	SW REV. NO. T-DAT Page 77		

9.1 Group SYSTEM

9.1.1 Function group CONFIGURATION

SUPERVISION ⇒ **SYSTEM** ⇒ **CONFIGURATION**

Function description SUPERVISION → SYSTEM → CONFIGURATION	
ASSIGN SYSTEM ERROR	Use this function to view all system errors and the associated error categories (fault message or notice message). If you select a single system error you can change its error category. **User Interface:** CANCEL List of system errors symbol preceding each entry. ✎ Note: • Press the key E twice to call up the function ERROR CATEGORY. • Use the ⇧ key combination or select "CANCEL" in the system error list to exit the function. • A list of possible system errors is provided in the Operating Instructions *PROline promag 23*, BA050D/06/en.
ERROR CATEGORY	This function is available when a system error has been chosen in ASSIGN SYSTEM ERROR cell. Use this function to define whether a system error triggers a notice message or a fault message. If you select FAULT MESSAGES, all outputs respond to an error in accordance with their defined error response patterns. **Options:** NOTICE MESSAGES (display only) FAULT MESSAGES (outputs and display) ✎ Note: Press the key E twice to call up the function ASSIGN SYSTEM ERROR.
ASSIGN PROCESS ERROR	Use this function to view all process errors and the associated error categories (fault message or notice message). If you select a single process error you can change its error category. **User Interface:** CANCEL List of process errors symbol preceding each entry. ✎ Note: • Press the key E twice to call up the function ERROR CATEGORY. • Use the ⇧ key combination or select "CANCEL" in the process error list to exit the function. • A list of possible process errors is provided in the Operating Instructions *PROline promag 23*, BA050D/06/en.

Function description SUPERVISION → SYSTEM → CONFIGURATION	
ERROR CATEGORY	This function is available when a system error has been chosen in ASSIGN PROCESS ERROR cell. Use this function to define whether a process error triggers a notice message or a fault message. If you select FAULT MESSAGES, all outputs respond to an error in accordance with their defined error response patterns. **Options:** NOTICE MESSAGES (display only) FAULT MESSAGES (outputs and display) ✎ Note: Press the key E twice to call up the function ASSIGN PROCESS ERROR.
ACKNOWLEDGE-MENT FAULTS	Use this function to define the measuring device's response to fault messages. **Application:** A fault message that appeared before is noticed, e. g. during an inspection on site. **Options:** OFF The measuring device resumes normal operation when the fault is rectified. ON The measuring device resumes normal operation when the fault is rectified. The fault message always has to be acknowledged by pressing the E key on the local display before the measuring device can resume normal display operation. **Factory setting:** OFF
ALARM DELAY	Use this function to define a time span in which the criteria for a fault have to be satisfied without interruption before a fault or notice message is generated. Depending on the setting and the type of fault, this suppression acts on: • Display • Current output • Frequency output **User input:** 0...100 s (in steps of one second) **Factory setting:** 0 s ☝ Caution: If this function is activated fault and notice messages are delayed by the time corresponding to the setting before being transmitted to the higher-order controller (process controller, etc.). It is therefore imperative to check in advance in order to make sure whether a delay of this nature could affect the safety requirements of the process. If fault and notice messages may not be suppressed, a value of 0 seconds must be entered here.

9.1.2 Function group OPERATION

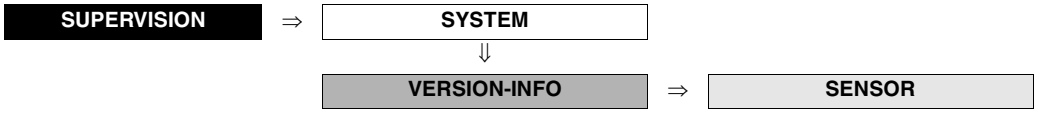
SUPERVISION ⇒ **SYSTEM** ⇒ **CONFIGURATION**
⇓
OPERATION

Function description SUPERVISION → SYSTEM → OPERATION	
ACTUAL SYSTEM CONDITION	Use this function to check the present system condition. **User Interface:** “SYSTEM OK” or the fault / notice message with the highest priority.
PREVIOUS SYSTEM CONDITION	Use this function to view the fifteen most recent fault and notice messages since measuring last started. **User Interface:** The 15 most recent fault or notice messages.
SIMULATION FAILSAFE MODE	Use this function to set all inputs, outputs and totalizers to their defined fail-safe modes, in order to check whether they respond correctly. During this time, the words “SIMULATION FAILSAFE MODE” appear on the display. **Options:** ON OFF **Factory setting:** OFF
SIMULATION MEASURAND	Use this function to set all outputs and totalizers to their defined flow-response modes, in order to check whether they respond correctly. During this time, the words “SIMULATION MEASURAND” appear on the display. **Options:** OFF MASS FLOW VOLUME FLOW **Factory setting:** OFF ☞ Caution: • The measuring device cannot be used for measuring while this simulation is in progress. • The setting is not saved if the power supply fails.

Function description SUPERVISION → SYSTEM → OPERATION	
VALUE SIMULATION MEASURAND	✎ Note: The function is not visible unless the SIMULATION MEASURAND function is active. Use this function to specify a selectable value (e.g. 12 m^3/s). This is used to test the associated functions in the device itself and downstream signal loops. **User input:** 5-digit floating-point number [unit] **Factory setting:** 0 [unit] ☞ Caution: • The setting is not saved if the power supply fails. The appropriate unit is taken from the function group SYSTEM UNITS, (see Page 12).
SYSTEM RESET	Use this function to perform a reset of the measuring system. **Options:** NO RESTART SYSTEM (restart without interrupting power supply) **Factory setting:** NO

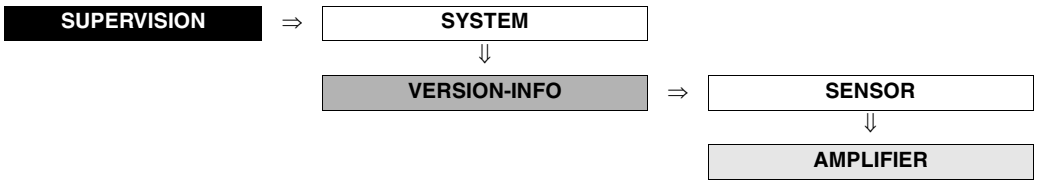
9.2 Group VERSION-INFO

9.2.1 Function group SENSOR



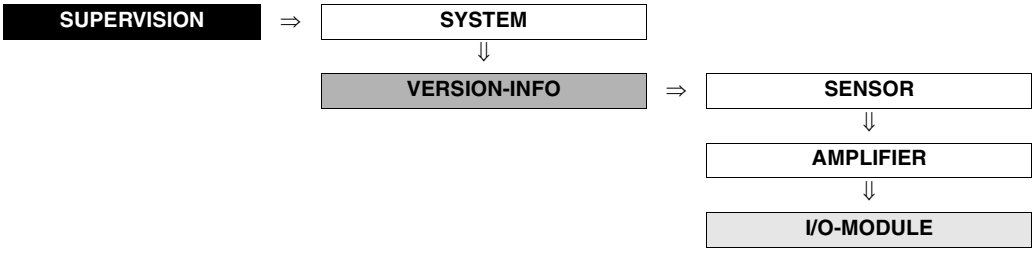
Function description SUPERVISION → VERSION-INFO → SENSOR	
SERIAL NUMBER	Use this function to view the serial number of the sensor.
SENSOR TYPE	Use this function to view the sensor type.
HARDWARE REVISION NUMBER SENSOR	Use this function to view the hardware revision number of the sensor.
SOFTWARE REVISION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

9.2.2 Function group AMPLIFIER



Function description SUPERVISION → VERSION-INFO → AMPLIFIER	
HARDWARE REVISION NUMBER AMPLIFIER	Use this function to view the hardware revision number of the amplifier.
SOFTWARE REVISION NUMBER AMPLIFIER	Use this function to view the software revision number of the amplifier.

9.2.3 Function group I/O-MODULE



Function description SUPERVISION → VERSION-INFO → I/O-MODULE	
I/O-MODULE TYPE	Use this function to view the configuration of the I/O module complete with terminal numbers.
HARDWARE REVISION NUMBER I/O-MODULE	Use this function to view the hardware revision number of the I/O module.
SOFTWARE REVISION NUMBER I/O MODULE	Use this function to view the software revision number of the I/O module.
SOFTWARE REVISION NUMBER T-DAT	Use this function to view the software revision number of the software used to create the content of the T-DAT.

10 Factory settings

10.1 SI units (not for USA and Canada)

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

Nominal diameter		Low flow cut off (approx. v = 0.04 m/s)			Full scale value (approx. v = 2.5 m/s)			Pulse value (approx. 2 pulse/sec. at 2.5 m/s)			Totalizer	
[mm]	[inch]		Volume	Mass		Volume	Mass		Vol.	Mass	Vol.	Mass
2	$^{1}/_{12}$"	0.01	dm^3/min	kg/min	0.5	dm^3/min	kg/min	0.005	dm^3	kg	dm^3	kg
4	$^{5}/_{32}$"	0.05	dm^3/min	kg/min	2	dm^3/min	kg/min	0.025	dm^3	kg	dm^3	kg
8	$^{5}/_{16}$"	0.1	dm^3/min	kg/min	8	dm^3/min	kg/min	0.10	dm^3	kg	dm^3	kg
15	$^{1}/_{2}$"	0.5	dm^3/min	kg/min	25	dm^3/min	kg/min	0.20	dm^3	kg	dm^3	kg
25	1"	1	dm^3/min	kg/min	75	dm^3/min	kg/min	0.50	dm^3	kg	dm^3	kg
32	1 $^{1}/_{4}$"	2	dm^3/min	kg/min	125	dm^3/min	kg/min	1.00	dm^3	kg	dm^3	kg
40	1 $^{1}/_{2}$"	3	dm^3/min	kg/min	200	dm^3/min	kg/min	1.50	dm^3	kg	dm^3	kg
50	2"	5	dm^3/min	kg/min	300	dm^3/min	kg/min	2.50	dm^3	kg	dm^3	kg
65	2 $^{1}/_{2}$"	8	dm^3/min	kg/min	500	dm^3/min	kg/min	5.00	dm^3	kg	dm^3	kg
80	3"	12	dm^3/min	kg/min	750	dm^3/min	kg/min	5.00	dm^3	kg	dm^3	kg
100	4"	20	dm^3/min	kg/min	1200	dm^3/min	kg/min	10.00	dm^3	kg	dm^3	kg
125	5"	30	dm^3/min	kg/min	1850	dm^3/min	kg/min	15.00	dm^3	kg	dm^3	kg
150	6"	2.5	m^3/h	t/h	150	m^3/h	t/h	0.025	m^3	t	m^3	t
200	8"	5.0	m^3/h	t/h	300	m^3/h	t/h	0.05	m^3	t	m^3	t

10.1.2 Language

Country	Language
Australia	English
Austria	Deutsch
Belgium	English
Denmark	English
England	English
Finland	English
France	Français
Germany	Deutsch
Hong Kong	English
Hungary	English
India	English
Instruments International	English
Italy	Italiano
Japan	English
Malaysia	English
Netherlands	English
Norway	English
Singapore	English
South Africa	English
Spain	English
Sweden	English
Switzerland	Deutsch
Thailand	English

10.1.3 Density, length

	Unit
Density	kg/l
Length	mm

10.2 US units (only for USA and Canada)

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

Nominal diameter		Low flow cut off (approx. v = 0.04 m/s)			Full scale value (approx. v = 2.5 m/s)			Pulse value (approx. 2 pulse/sec. at 2.5 m/s)			Totalizer	
[inch]	[mm]		Volume	Mass		Volume	Mass		Vol.	Mass	Vol.	Mass
$^{1}/_{12}$"	2	0.002	gal/min	lb/min	0.1	gal/min	lb/min	0.001	gal	lb	gal	lb
$^{5}/_{32}$"	4	0.008	gal/min	lb/min	0.5	gal/min	lb/min	0.005	gal	lb	gal	lb
$^{5}/_{16}$"	8	0.025	gal/min	lb/min	2	gal/min	lb/min	0.02	gal	lb	gal	lb
$^{1}/_{2}$"	15	0.10	gal/min	lb/min	6	gal/min	lb/min	0.05	gal	lb	gal	lb
1"	25	0.25	gal/min	lb/min	18	gal/min	lb/min	0.20	gal	lb	gal	lb
1 $^{1}/_{4}$"	32	0.50	gal/min	lb/min	30	gal/min	lb/min	0.20	gal	lb	gal	lb
1 $^{1}/_{2}$"	40	0.75	gal/min	lb/min	50	gal/min	lb/min	0.50	gal	lb	gal	lb
2"	50	1.25	gal/min	lb/min	75	gal/min	lb/min	0.50	gal	lb	gal	lb
2 $^{1}/_{2}$"	65	2.0	gal/min	lb/min	130	gal/min	lb/min	1	gal	lb	gal	lb
3"	80	2.5	gal/min	lb/min	200	gal/min	lb/min	2	gal	lb	gal	lb
4"	100	4.0	gal/min	lb/min	300	gal/min	lb/min	2	gal	lb	gal	lb
5"	125	7.0	gal/min	lb/min	450	gal/min	lb/min	5	gal	lb	gal	lb
6"	150	12	gal/min	lb/min	600	gal/min	lb/min	5	gal	lb	gal	lb
8"	200	15	gal/min	lb/min	1200	gal/min	lb/min	10	gal	lb	gal	lb

10.2.2 Language, density, length

	Unit
Language	English
Density	kg/l
Length	mm

Index

F

G

H

I

K

L

M

T

U

V

W

Z

Numerics

Europe

Austria – Wien
❑ Endress+Hauser Ges.m.b.H.
Tel. (01) 88 05 60, Fax (01) 88 05 63 35

Belarus – Minsk
Belorgsintez
Tel. (017) 2 50 84 73, Fax (017) 2 50 85 83

Belgium / Luxembourg – Bruxelles
❑ Endress+Hauser S.A. / N.V.
Tel. (02) 2 48 06 00, Fax (02) 2 48 05 53

Bulgaria – Sofia
Intertech-Automation Ltd.
Tel. (02) 9 62 71 52, Fax (02) 9 62 14 71

Croatia – Zagreb
❑ Endress+Hauser GmbH+Co.
Tel. (01) 6 63 77 85, Fax (01) 6 63 78 23

Cyprus – Nicosia
I+G Electrical Services Co. Ltd.
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