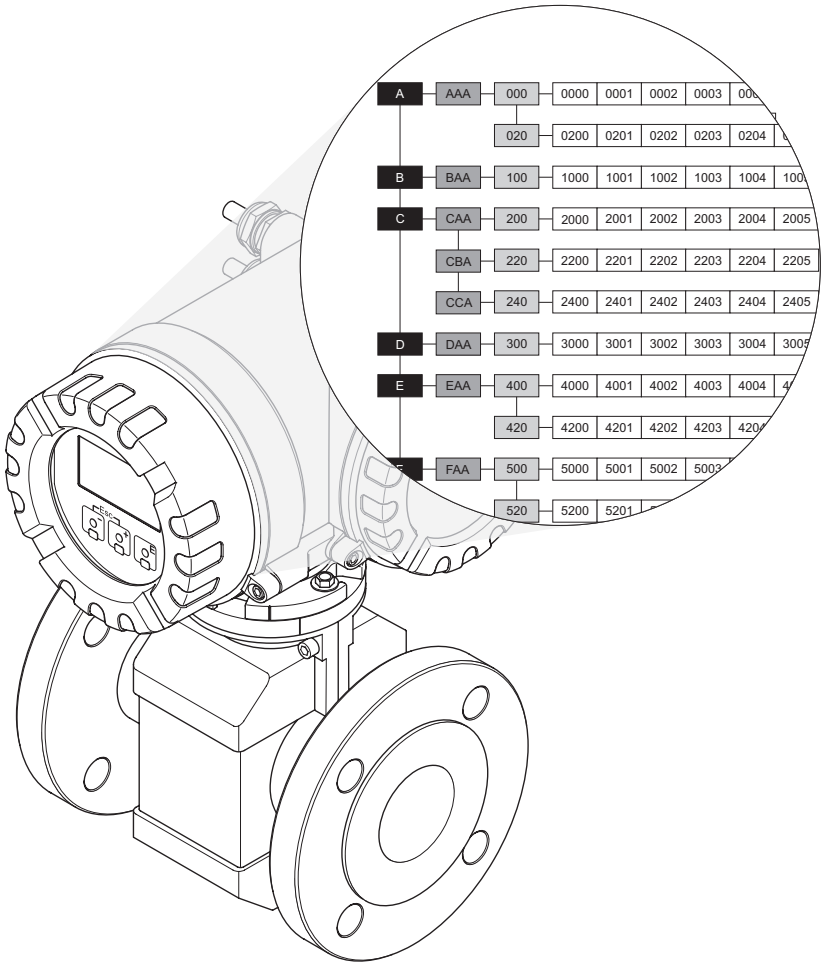
Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Description of Device Functions

Proline Promag 53
FOUNDATION Fieldbus

Electromagnetic Flow Measuring System



BA051D/06/en/07.09
71095611
Valid as of version:
V 3.00.XX (device software)

Endress+Hauser
People for Process Automation

Operation Promag 53 FF

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Registered trademark of the Fieldbus Foundation, Austin, USA

HistoROM™, S-DAT®, T-DAT™, F-CHIP®, FieldCare®, Fieldcheck®, Applicator®
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Table of contents for local operation

1 Using the manual

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

1.1 Using the table of contents to locate a function description

The designations of all the cells in the function matrix are listed in the table of contents. You can use these unambiguous designations (such as USER INTERFACE, INPUTS, OUTPUTS, etc.) to choose whichever functions are applicable to a particular set of conditions. The page references show you exactly where to find the detailed descriptions of the functions in question. The table of contents can be found on Page 5.

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

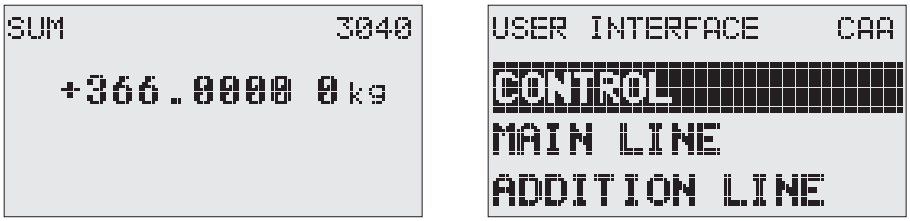
This step-by-step, top-down approach starts with the blocks, the highest level, and works down through the matrix to the description of the function you need:

1. All available blocks, and their corresponding groups, are illustrated on Page 10. Select the block (or the group within the block) which you need for your application and use the page reference to locate the information corresponding to the next level.
2. The page in question contains a graphic showing of the block with all its subordinate groups, function groups and functions. Select the function which you need for your application and use the page reference to locate the detailed function description.

1.3 Using the index of the function matrix to locate a function description

Each "cell" in the function matrix (blocks, groups, function groups, functions) has a unique identifier in the form of a code consisting of one or three letters or a three- or four-digit number. The code identifying a selected "cell" appears at the top right on the local display.

Example:



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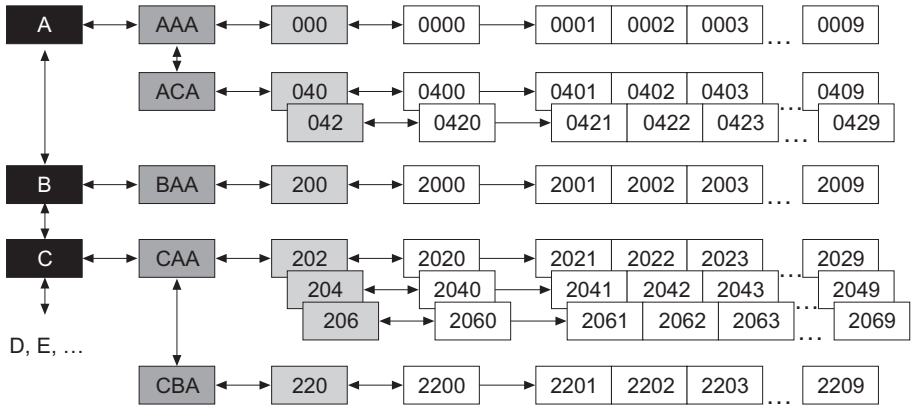
The function matrix index lists the codes for all the available "cells" in alphabetic and consecutive order, complete with the page references for the corresponding functions. The index to the function matrix is on Page 65.

2 Function matrix

2.1 General layout of the function matrix

The function matrix consists of four levels:

Blocks -> Groups -> Function groups -> Functions



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2.1.1 Blocks (A, B, C, etc.)

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

2.1.2 Groups (AAA, AEA, CAA, etc.)

A block consists of one or more groups. Each group represents a more detailed selection of the operation options in the higher-order block. The groups in the USER INTERFACE block, for example, include: CONTROL, MAIN LINE, ADDITIONAL LINE, etc.

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

A group consists of one or more function groups. Each function group represents a more detailed selection of the operation options in the higher-order group. The function groups available in the CONTROL group are for example: BASIC CONFIGURATION, UNLOCKING/LOCKING, OPERATION, etc.

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

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

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

2.1.5 Codes identifying cells

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

Blocks:

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

Groups:

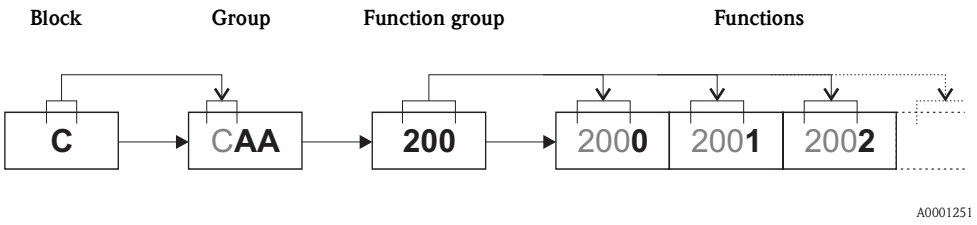
The code consists of three letters (AAA, ABA, BAA, etc.).
The first letter matches the block code (i.e. each group in block A has a code starting with an A _ _; the codes of the groups in block B start with a B _ _, etc.). The other two letters are for identifying the group within the respective block.

Function groups:

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

Functions:

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



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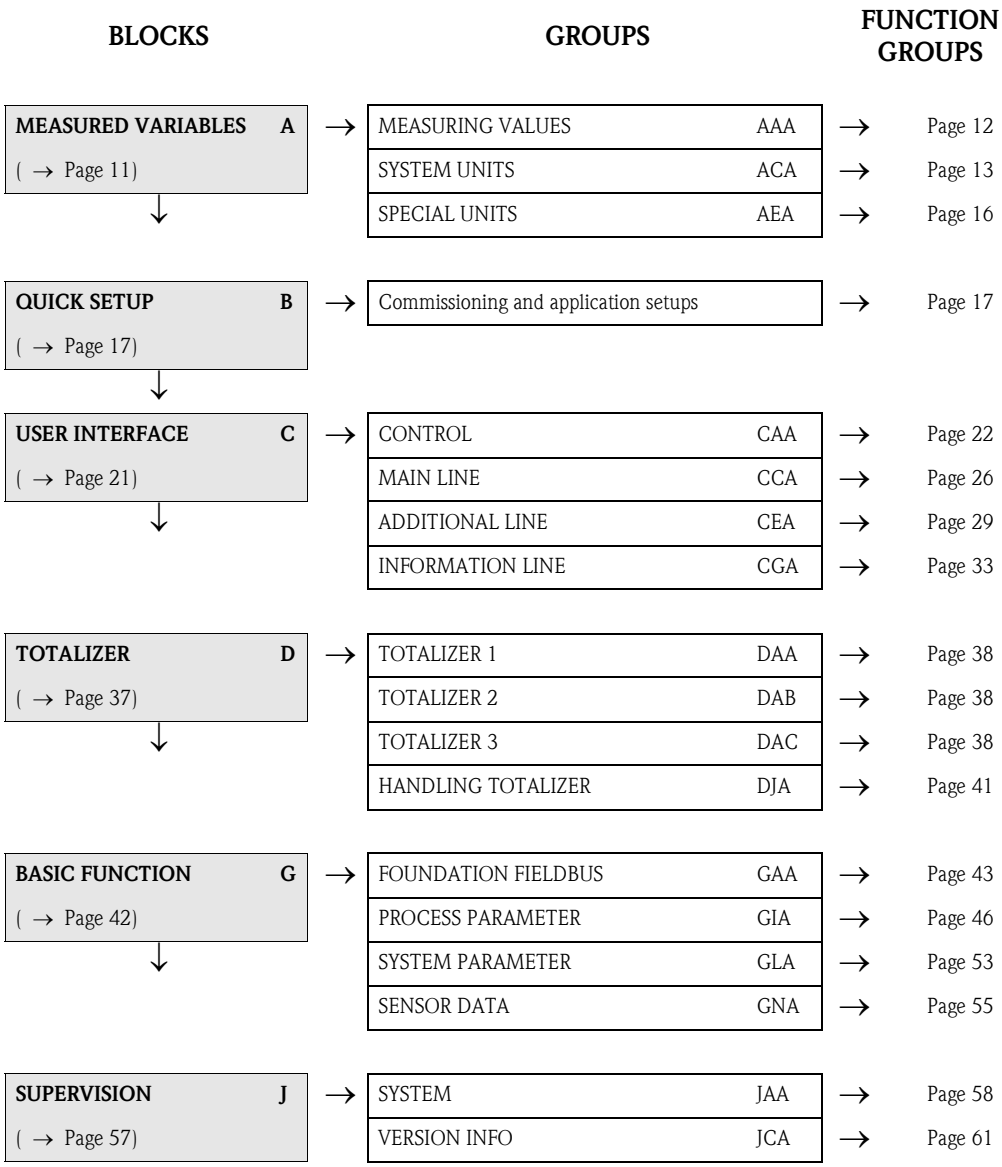
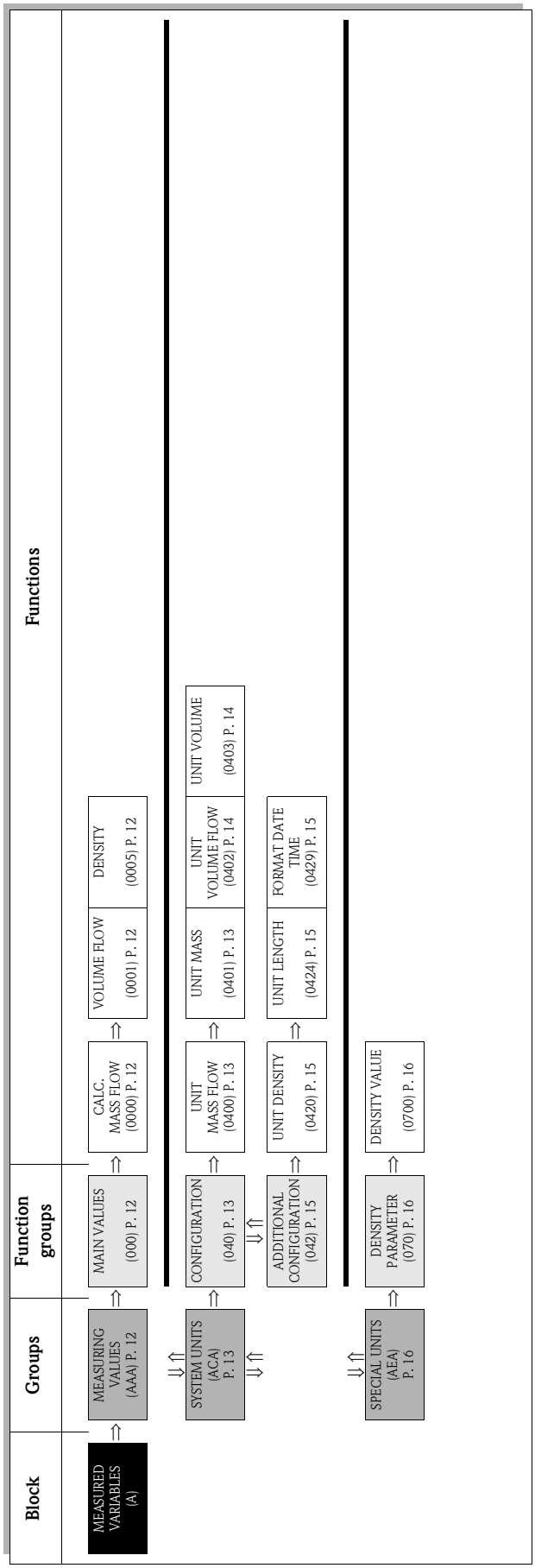
2.2 Function matrix



3 BlockMEASURED VARIABLES



3.1 Group MEASURING VALUES

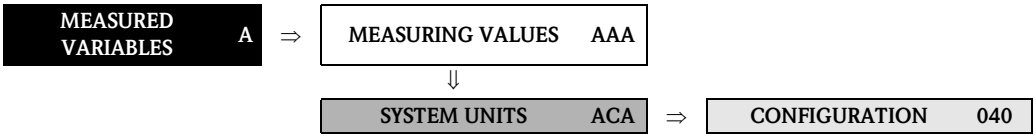
3.1.1 Function group MAIN VALUES

MEASURED VARIABLES A ⇒ **MEASURING VALUES AAA** ⇒ **MAIN VALUES 000**

Function description MEASURED VARIABLES → MEASURING VALUES → MAIN VALUES	
✎ Note! ■ The engineering units of all the measured variables shown here can be set in the SYSTEM UNITS group. ■ If the fluid in the pipe flows backwards, a negative sign prefixes the flow reading on the display.	
CALCULATED MASS FLOW (0000)	Use this function to view the calculated mass flow. 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 (0001)	Use this function to view the actual measured volume flow. **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 (0005)	Use this function to view the set density. **User interface:** 5-digit floating-point number, including unit (corresponding to 0.10000 to 6.0000 kg/dm^3) e.g. 1.2345 kg/dm^3; 993.5 kg/m^3; 1.0015 SG_20 °C; etc.

3.2 Group SYSTEM UNITS

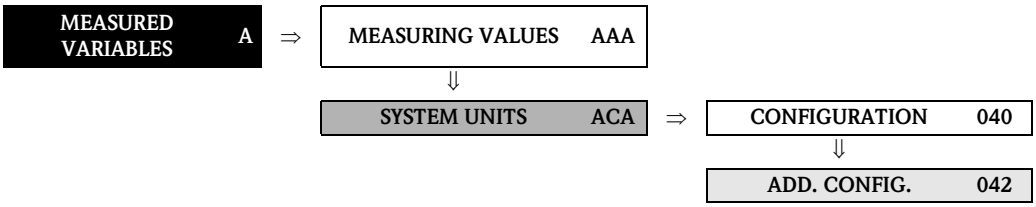
3.2.1 Function group CONFIGURATION



Function description MEASURED VARIABLES → SYSTEM UNITS → CONFIGURATION	
You can select the units for measured variables in this function group. ✎ Note! The units selected here have no effect on the fieldbus. They are only used for the local display and for assigned instrument functions.	
UNIT MASS FLOW (0400)	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: ▪ Switch points (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 → Page 130 ff.
UNIT MASS (0401)	Use this function to select the unit for displaying the calculated mass. The mass is derived from the preset (compensated) specific fluid density and the measured volume. **Options:** Metric → g; kg; t US → oz; lb; ton **Factory setting:** Depends on nominal diameter and country → Page 130 ff. ✎ 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 (0402)	Use this function to select the unit for displaying the volume flow (volume/time). The unit you select here is also valid for: ■ 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 Kilo gallon → Kgal/s; Kgal/min; Kgal/h; Kgal/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 → Page 130 ff.
UNIT VOLUME (0403)	Use this function to select the unit for displaying the volume. **Options:** Metric → cm^3; dm^3; m^3; ml; l; hl; Ml Mega US → cc; af; ft^3; oz f; gal; Kgal; 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 → Page 130 ff. ✎ Note! The unit of the totalizers is independent of your choice here. The unit for each totalizer is selected separately for the totalizer in question.

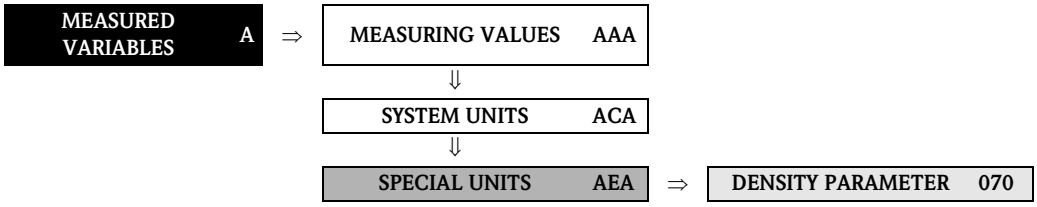
3.2.2 Function group ADDITIONAL CONFIGURATION



Function description MEASURED VARIABLES → SYSTEM UNITS → ADDITIONAL CONFIGURATION	
UNIT DENSITY (0420)	Use this function to select the unit for displaying the fluid density. The unit you select here is also valid for: ■ Fluid density entry **Options:** Metric → g/cm^3; g/l; 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; g/l 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:** kg/l (SI units: not for USA and Canada) g/cc (US units: only for USA and Canada) SD = Specific Density, SG = Specific Gravity The specific density is the ratio of fluid density to water density (at water temperature = 4, 15, 20 °C).
UNIT LENGTH (0424)	Use this function to select the unit for displaying the length of the nominal diameter. The unit you select here is also valid for: ■ Nominal diameter of sensor (function NOMINAL DIAMETER (6804) on Page 55) **Options:** MILLIMETER INCH **Factory setting:** MILLIMETER (SI units: not for USA and Canada) INCH (US units: only for USA and Canada)
FORMAT DATE TIME (0429)	Use this function to select the format for the date and the time. The unit you select here is also valid for: ■ Displaying the current calibration date (function CALIBRATION DATE (6808) on Page 55) **Options:** DD.MM.YY 24H MM/DD/YY 12H A/P DD.MM.YY 12H A/P MM/DD/YY 24H **Factory setting:** DD.MM.YY 24H (SI units) MM/DD/YY 12H A/P (US units)

3.3 Group SPECIAL UNITS

3.3.1 Function group DENSITY PARAMETER



Function description MEASURED VARIABLES → SPECIAL UNITS → DENSITY PARAMETER	
Use this function group to calculate a mass flow from a volume flow. ✎ Note! It is advisable to enter the density factor at process temperature for calculating the mass flow without compensating for thermal expansion. Example of calculated mass flow **without** compensation for thermal expansion of the fluid: $\dot{m} = \dot{V} \cdot \rho = 1\ [dm^3/h] \cdot 0.900\ [kg/l] = 0.900\ [kg/h]$ (mass flow at 20 °C) $\dot{m} = \dot{V} \cdot \rho = 1\ [dm^3/h] \cdot 0.783\ [kg/l] = 0.783\ [kg/h]$ (mass flow at 150 °C)	
DENSITY VALUE (0700)	Use this function to enter a density value preferably at process temperature. This density value is used to convert the volume flow to a mass flow. **User input:** 5-digit floating-point number **Factory setting:** 1 [unit] ✎ Note! The appropriate unit is taken from the function UNIT DENSITY (0420), (see Page 15).

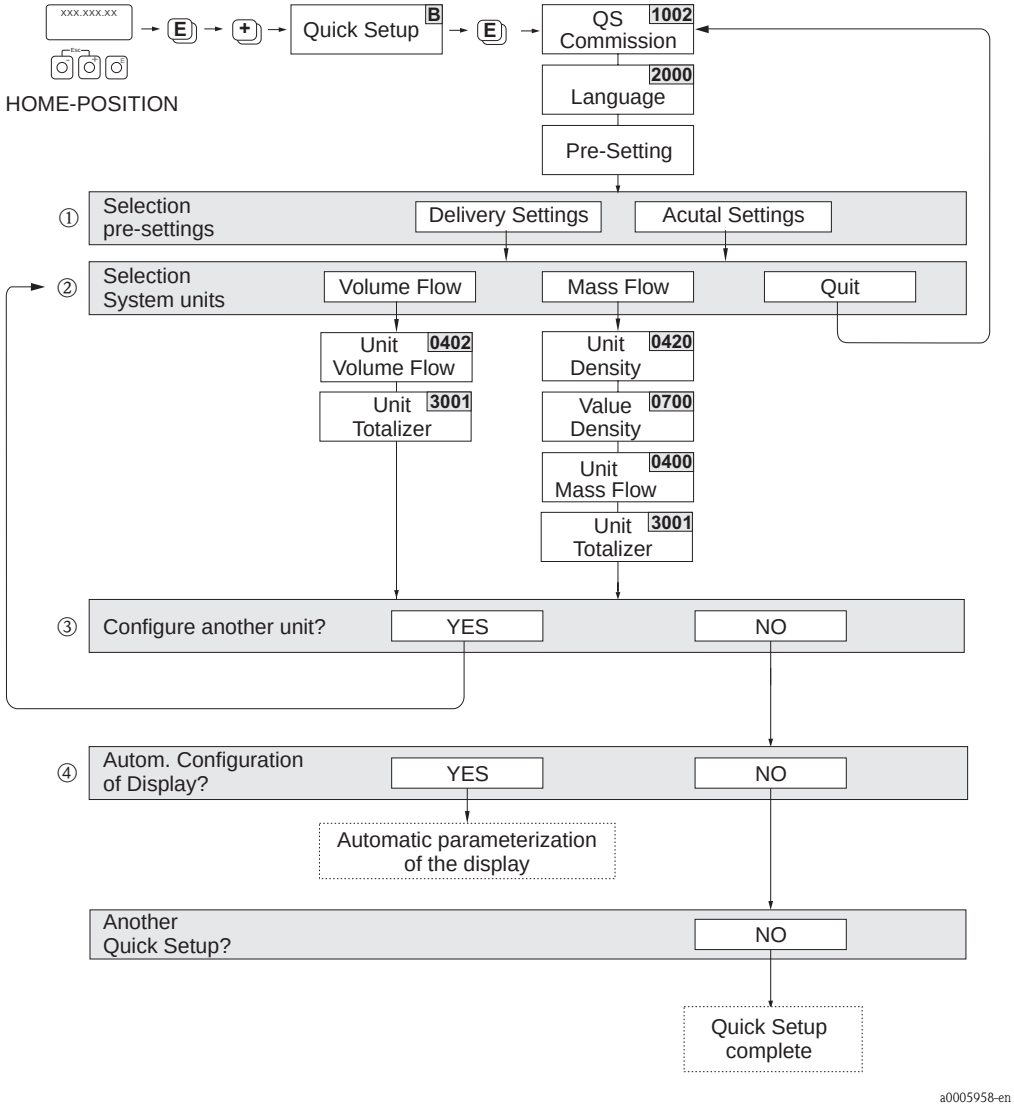
4 Block QUICK SETUP

Block	Group	Function groups	Functions
QUICK SETUP (B)	⇒	⇒	QS COMMISS. (1002) P. 17 ⇒ T-DAT SAVE/LOAD (1009) P. 17

Function description QUICK SETUP	
QUICK SETUP COMMISSIONING (1002)	Use this function to start the Setup menu for commissioning. **Options:** YES NO **Factory setting:** NO ✎ Note! You will find a flowchart of the COMMISSIONING Setup menu on Page 18. For more detailed information on Setup menus, please refer to Operating Instructions *Promag 53*, BA 047D/06.
T-DAT SAVE/LOAD (1009)	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 actual 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 target device has an older software version, the message "TRANSM. SW-DAT" is displayed during startup. Then only the SAVE option is available. ■ LOAD This option is only possible if: – The target device has the same software version as, or a more recent software version than, the source device or – The T-DAT contains valid data that can be retrieved ■ SAVE This option is always available.

4.1 "Commissioning" Quick Setup menu

The "Commissioning" Quick Setup menu guides you systematically through all the important device functions that have to be configured for standard operation.



✎ Note!

- The display returns to the cell SETUP COMMISSIONING (1002) if you press the key combination during parameter interrogation. The stored parameters remain valid.
- The system units selected via the Quick Setup only apply for displaying on the local display and for parameters in the Transducer Blocks. They do not affect the process variables (volume flow, calculated mass flow, totalizer) that are transmitted via FOUNDATION Fieldbus.

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

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

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

④ The "automatic parameterization of the display" option contains the following basic settings/factory settings:

YES Main line = Volume flow
Additional line = Totalizer 1
Information line = Operating/system condition

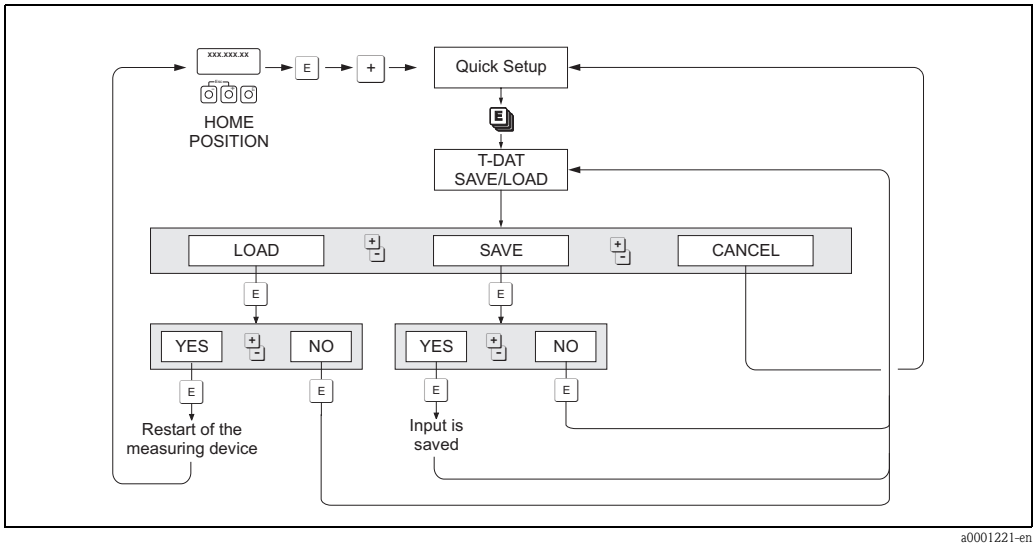
NO The existing (selected) settings remain.

4.2 Data backup/transmission

Using the T-DAT SAVE/LOAD function, you can transfer data (device parameters and settings) between the T-DAT (exchangeable memory) and the EEPROM (device storage unit).

This is required in the following instances:
- Creating a backup: current data are transferred from an EEPROM to the T-DAT.
- Replacing a transmitter: current data are copied from an EEPROM to the T-DAT and then transferred to the EEPROM of the new transmitter.
- Duplicating data: current data are copied from an EEPROM to the T-DAT and then transferred to EEPROMs of identical measuring points.

Note!
Installing and removing T-DAT → See Operating Instructions for Proline Promag 53 FOUNDATION Fieldbus.



Data backup/transmission with T-DAT SAVE/LOAD function

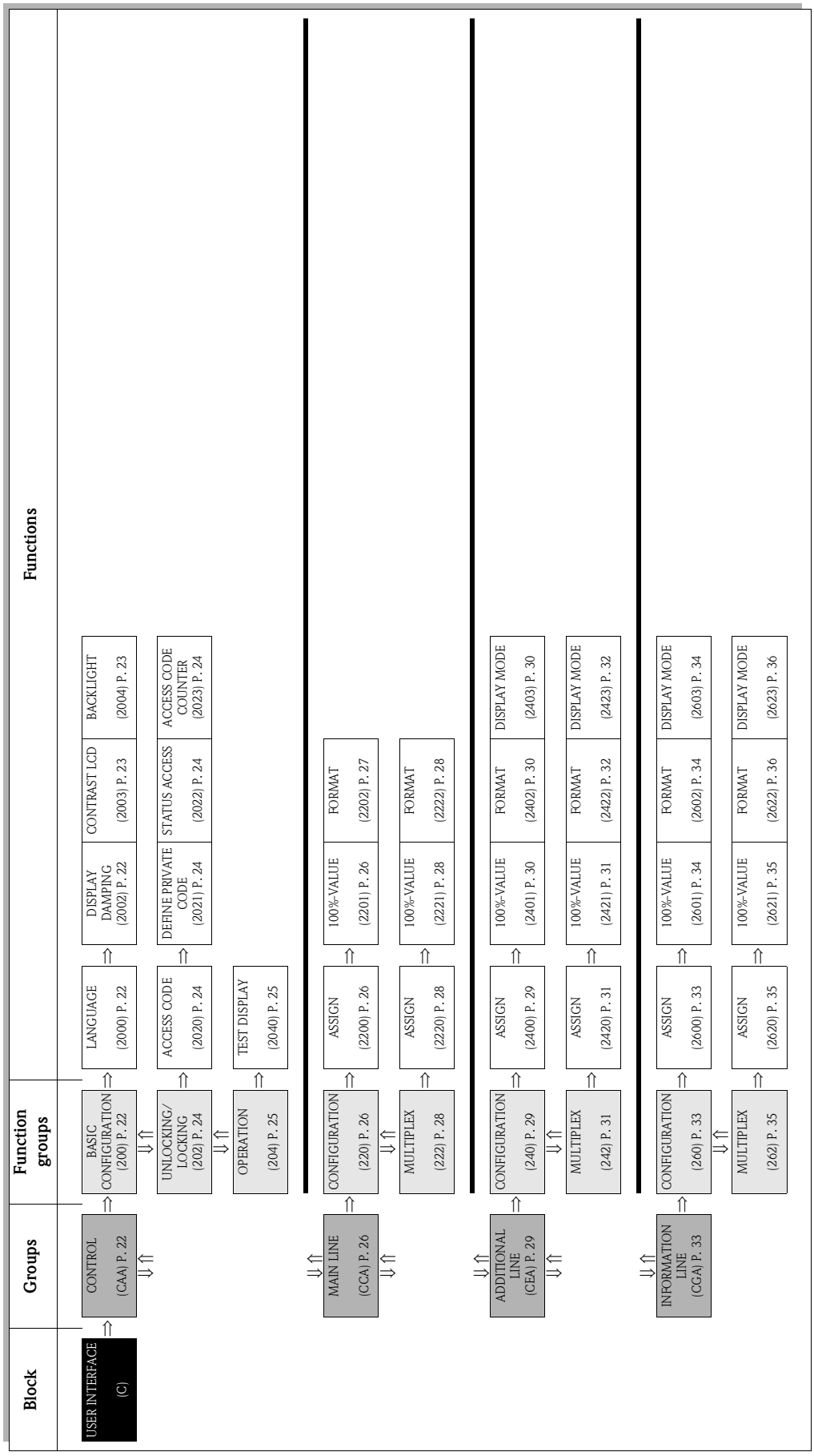
Information on the LOAD and SAVE options available:

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

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

SAVE:
Data are transferred from the EEPROM to the T-DAT

5 Block USER INTERFACE



5.1 Group CONTROL

5.1.1 Function group BASIC CONFIGURATION

USER INTERFACE C ⇒ CONTROL CAA ⇒ BASIC CONFIGURATION 200

Function description USER INTERFACE → CONTROL → BASIC CONFIGURATION	
LANGUAGE (2000)	Use this function to select the language for all texts, parameters and messages shown on the local display. ✎ Note! The displayed options depend on the available language group shown in the LANGUAGE GROUP (8226) function. **OPTIONS:** Language group WEST EU / USA: ENGLISH DEUTSCH FRANCAIS ESPANOL ITALIANO NEDERLANDS PORTUGUESE Language group EAST EU / SCAND: ENGLISH NORSK SVENSKA SUOMI POLISH RUSSIAN CZECH Language group ASIA: ENGLISH BAHASA INDONESIA JAPANESE (syllabary) Language group CHINA: ENGLISH CHINESE **Factory setting:** Country-dependent (→ Page 130 ff.) ✎ Note! ■ If you press the ⊡+⊡ key combination at startup, the language defaults to ENGLISH. ■ You can change the language group via the configuration program FieldCare. Please do not hesitate to contact your Endress+Hauser sales office if you have any questions.
DISPLAY DAMPING (2002)	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 to 100 seconds **Factory setting:** 1 s ✎ Note! Setting the time constant to zero seconds switches off damping.

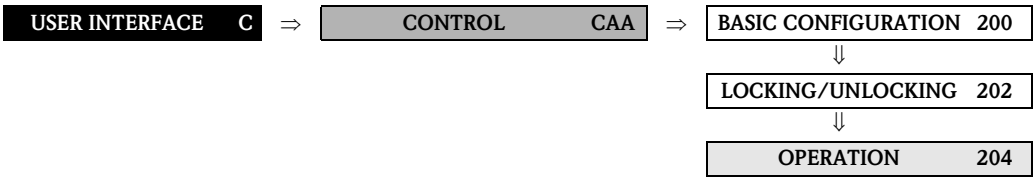
Function description USER INTERFACE → CONTROL → BASIC CONFIGURATION	
CONTRAST LCD (2003)	Use this function to optimize display contrast to suit local operating conditions. **User input:** 10…100% **Factory setting:** 50%
BACKLIGHT (2004)	Use this function to optimize the backlight to suit local operating conditions. **User input:** 0…100% ✎ Note! Entering the value "0" means that the backlight is "switched off". The display then no longer emits any light, i.e. the display texts can no longer be read in the dark. **Factory setting:** 50%

5.1.2 Function group LOCKING/UNLOCKING

USER INTERFACE C ⇒ CONTROL CAA ⇒ BASIC CONFIGURATION 200
⇓
LOCKING/UNLOCKING 202

Function description USER INTERFACE → CONTROL → LOCKING/UNLOCKING	
ACCESS CODE (2020)	✎ Note! This function is only relevant for local operation. If functions or parameters are to be changed via the fieldbus, programming must be enabled separately via the parameter "Access - Code"/Transducer Blocks. 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 ⊡+⊡ key combination 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 seting = 53**, see DEFINE PRIVATE CODE function, 2021). **User input:** Max. 4-digit number: 0 to 9999 ✎ Note! ▪ The programming levels are disabled if you do not press a key within 60 seconds following automatic return to the HOME position. You can also disable programming in this function by entering any number (other than the defined private code). ▪ The Endress+Hauser service organization can be of assistance if you mislay your personal code.
DEFINE PRIVATE CODE (2021)	Use this function to specify a personal code for enabling programming in the function ACCESS CODE (2020). **User input:** 0 to 9999 (max. 4-digit number) **Factory setting:** 53 ✎ Note! ▪ Programming is always enabled with the code "0". ▪ Programming has to be enabled before this code can be changed. When programming is disabled this function is not available, thus preventing others from accessing your personal code.
STATUS ACCESS (2022)	Use this function to check the access status for the function matrix. **User interface:** ACCESS CUSTOMER (parameterization possible) LOCKED (parameterization disabled)
ACCESS CODE COUNTER (2023)	Displays how often the customer code, service code or the digit "0" (code-free) has been entered to gain access to the function matrix. **User interface:** Max. 7-digit number: 0 to 9999999 **Factory setting:** 0

5.1.3 Function group OPERATION

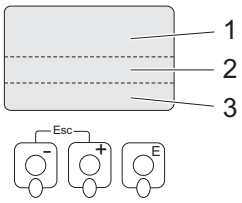


Function description USER INTERFACE → CONTROL → OPERATION	
TEST DISPLAY (2040)	Use this function to test the operability of the local display and its pixels. **Options:** OFF ON **Factory setting:** OFF Test sequence: 1. Start the test by selecting ON. 2. All pixels of the main line, additional line 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

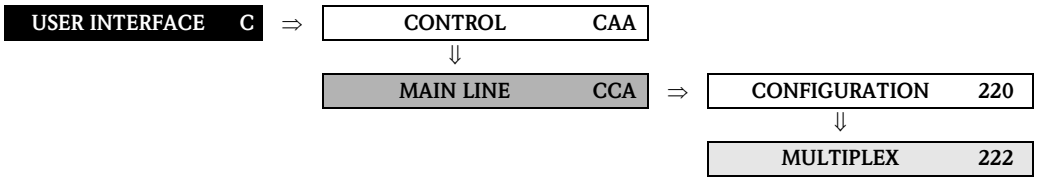
5.2.1 Function group CONFIGURATION

USER INTERFACE C ⇒ CONTROL CAA
⇓
MAIN LINE CCA ⇒ CONFIGURATION 220

Function description USER INTERFACE → MAIN LINE → CONFIGURATION	
 A0001253 1= main line, 2 = additional line, 3 = information line	
ASSIGN (2200)	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 % TOTALIZER (1 to 3) AI (1 to 5) - OUT VALUE AO - DISPLAY VALUE PID - IN VALUE (controlled variable) PID - CAS_IN VALUE (external set point) PID - OUT VALUE (manipulated variable) **Factory setting:** VOLUME FLOW
100%-VALUE (2201)	✎ Note! This function is only available if VOLUME FLOW IN % or MASS FLOW IN % was selected in the function ASSIGN (2200). Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter and country → Page 130 ff.

Function description USER INTERFACE → MAIN LINE → CONFIGURATION	
FORMAT **(2202)**	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 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.

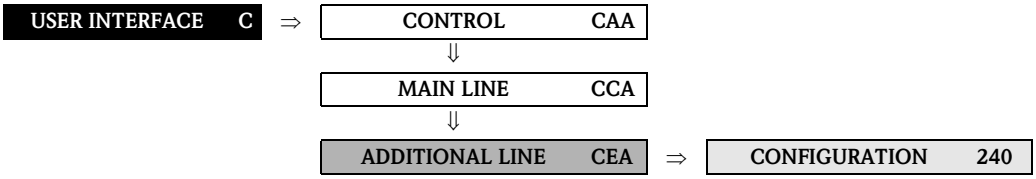
5.2.2 Function group MULTIPLEX

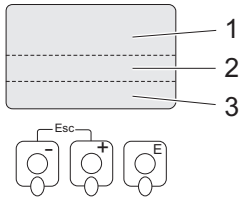


Function description USER INTERFACE → MAIN LINE → MULTIPLEX	
ASSIGN (2220)	Use this function to define the second reading to be displayed in the main line alternately (every 10 seconds) with the value defined in the ASSIGN function (2200). **Options:** OFF VOLUME FLOW MASS FLOW VOLUME FLOW IN % MASS FLOW IN % TOTALIZER (1 to 3) AI (1 to 5) - OUT VALUE AO - DISPLAY VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (external set point) PID - OUT VALUE (manipulated variable) **Factory setting:** OFF
100%-VALUE (2221)	✎ Note! This function is only available if VOLUME FLOW IN % or MASS FLOW IN % was selected in the function ASSIGN (2220). Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter and country → Page 130 ff.
FORMAT (2222)	Use this function to define the maximum number of places after the decimal point for the second value displayed in the main line. **Options:** 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.

5.3 Group ADDITIONAL LINE

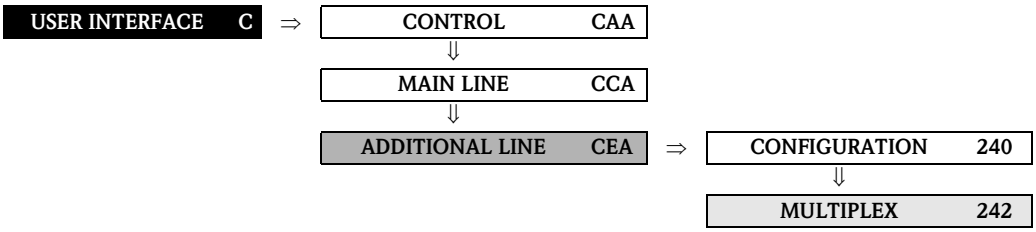
5.3.1 Function group CONFIGURATION



Function description USER INTERFACE → ADDITIONAL LINE → CONFIGURATION	
 A0001253 1= main line, 2 = additional line, 3 = information line	
ASSIGN **(2400)**	In this function, a value to be displayed is assigned to the additional line (middle line in the local display). This value is displayed during normal operation. **Options:** OFF VOLUME FLOW MASS FLOW VOLUME FLOW IN % MASS FLOW IN % VOLUME FLOW BARGRAPH IN % MASS FLOW BARGRAPH IN % FLOW VELOCITY TOTALIZER (1 to 3) AI (1 to 5) - OUT VALUE AO - DISPLAY VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (external set point) PID - OUT VALUE (manipulated variable) DEVICE PD-TAG (tag name) **Factory setting:** TOTALIZER 1

Function description USER INTERFACE → ADDITIONAL LINE → CONFIGURATION	
100%-VALUE (2401)	✎ Note! This function is not available unless one of the following was selected in the ASSIGN function (2400): ■ VOLUME FLOW IN % ■ MASS FLOW IN % ■ VOLUME FLOW BARGRAPH IN % ■ MASS FLOW BARGRAPH IN % Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter and country → Page 130 ff.
FORMAT (2402)	✎ Note! This function is not available unless a number was selected in the ASSIGN function (2400). 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 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 (2403)	✎ Note! This function is only available if VOLUME FLOW BARGRAPH IN % or MASS FLOW BARGRAPH IN % was selected in the function ASSIGN (2400). Use this function to define the format of the bar graph. **Options:** STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign).  A0001258 SYMMETRY (Symmetrical bar graph for positive and negative directions of flow, with –50 / 0 / +50% gradations and integrated sign).  A0001259 **Factory setting:** STANDARD

5.3.2 Function group MULTIPLEX

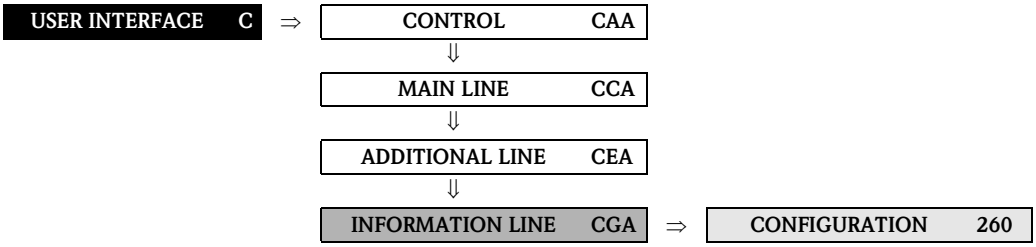


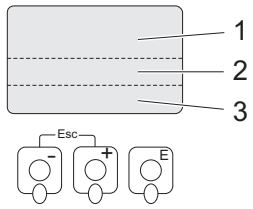
Function description USER INTERFACE → ADDITIONAL LINE → MULTIPLEX	
ASSIGN (2420)	Use this function to define the second reading to be displayed in the additional line alternately (every 10 seconds) with the value defined ASSIGN function (2400). **Options:** OFF VOLUME FLOW MASS FLOW VOLUME FLOW IN % MASS FLOW IN % VOLUME FLOW BARGRAPH IN % MASS FLOW BARGRAPH IN % FLOW VELOCITY TOTALIZER (1 to 3) AI (1 to 5) - OUT VALUE AO - DISPLAY VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (external set point) PID - OUT VALUE (manipulated variable) DEVICE PD-TAG (tag name) **Factory setting:** OFF ✎ Note! Multiplex mode is suspended as soon as a fault / notice message is generated. The message in question appears on the display. Once the fault is eliminated, the measuring device resumes operation in Multiplex mode and the error message is no longer displayed on the local display.
100%-VALUE (2421)	✎ Note! This function is not available unless one of the following was selected in the ASSIGN function (2420): ▪ VOLUME FLOW IN % ▪ MASS FLOW IN % ▪ VOLUME FLOW BARGRAPH IN % ▪ MASS FLOW BARGRAPH IN % Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter and country → Page 130 ff.

Function description USER INTERFACE → ADDITIONAL LINE → MULTIPLEX	
FORMAT **(2422)**	✎ Note! This function is not available unless a number was selected in the ASSIGN function (2420). Use this function to define the maximum number of places after the decimal point for the second value displayed in the additional line. **Options:** 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 **(2423)**	✎ Note! This function is only available if VOLUME FLOW BARGRAPH IN % or MASS FLOW BARGRAPH IN % was selected in the function ASSIGN (2420). Use this function to define the format of the bar graph. **Options:** STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign).  A0001258 SYMMETRY (Symmetrical bar graph for positive and negative directions of flow, with –50 / 0 / +50% gradations and integrated sign).  A0001259 **Factory setting:** STANDARD

5.4 Group INFORMATION LINE

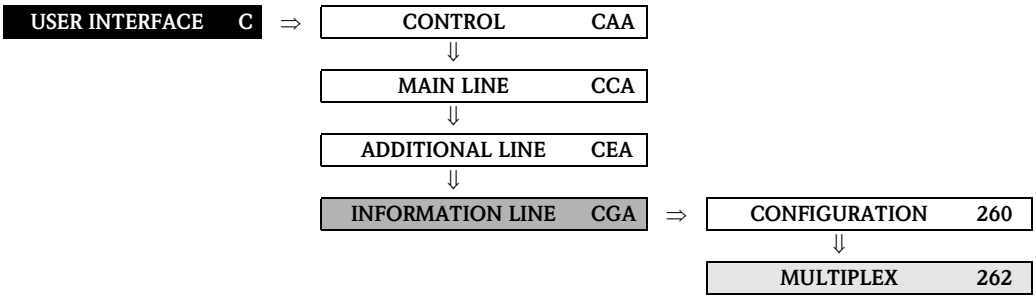
5.4.1 Function group CONFIGURATION



Function description USER INTERFACE → INFORMATION LINE → CONFIGURATION	
 A0001253 1= main line, 2 = additional line, 3 = information line	
ASSIGN (2600)	In this function, a value to be displayed is assigned to the information line (bottom line in the local display). This value is displayed during normal operation. **Options:** OFF VOLUME FLOW IN % MASS FLOW IN % VOLUME FLOW BARGRAPH IN % MASS FLOW BARGRAPH IN % FLOW VELOCITY OPERATING/SYSTEM CONDITIONS FLOW DIRECTION READING AI1 - OUT VALUE AI2 - OUT VALUE AI3 - OUT VALUE AI4 - OUT VALUE AI5 - OUT VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (external set point) PID - OUT VALUE (manipulated variable) DEVICE PD-TAG (tag name) **Factory setting:** OPERATING/SYSTEM CONDITIONS

Function description USER INTERFACE → INFORMATION LINE → CONFIGURATION	
100%-VALUE (2601)	✎ Note! This function is not available unless one of the following was selected in the ASSIGN function (2600): ■ VOLUME FLOW IN % ■ MASS FLOW IN % ■ VOLUME FLOW BARGRAPH IN % ■ MASS FLOW BARGRAPH IN % Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter and country → Page 130 ff.
FORMAT (2602)	✎ Note! This function is not available unless a number was selected in the ASSIGN function (2600). 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 (2603)	✎ Note! This function is only available if VOLUME FLOW BARGRAPH IN % or MASS FLOW BARGRAPH IN % was selected in the function ASSIGN (2600). Use this function to define the format of the bar graph. **Options:** STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign).  A0001258 SYMMETRY (Symmetrical bar graph for positive and negative directions of flow, with –50 / 0 / +50% gradations and integrated sign).  A0001259 **Factory setting:** STANDARD

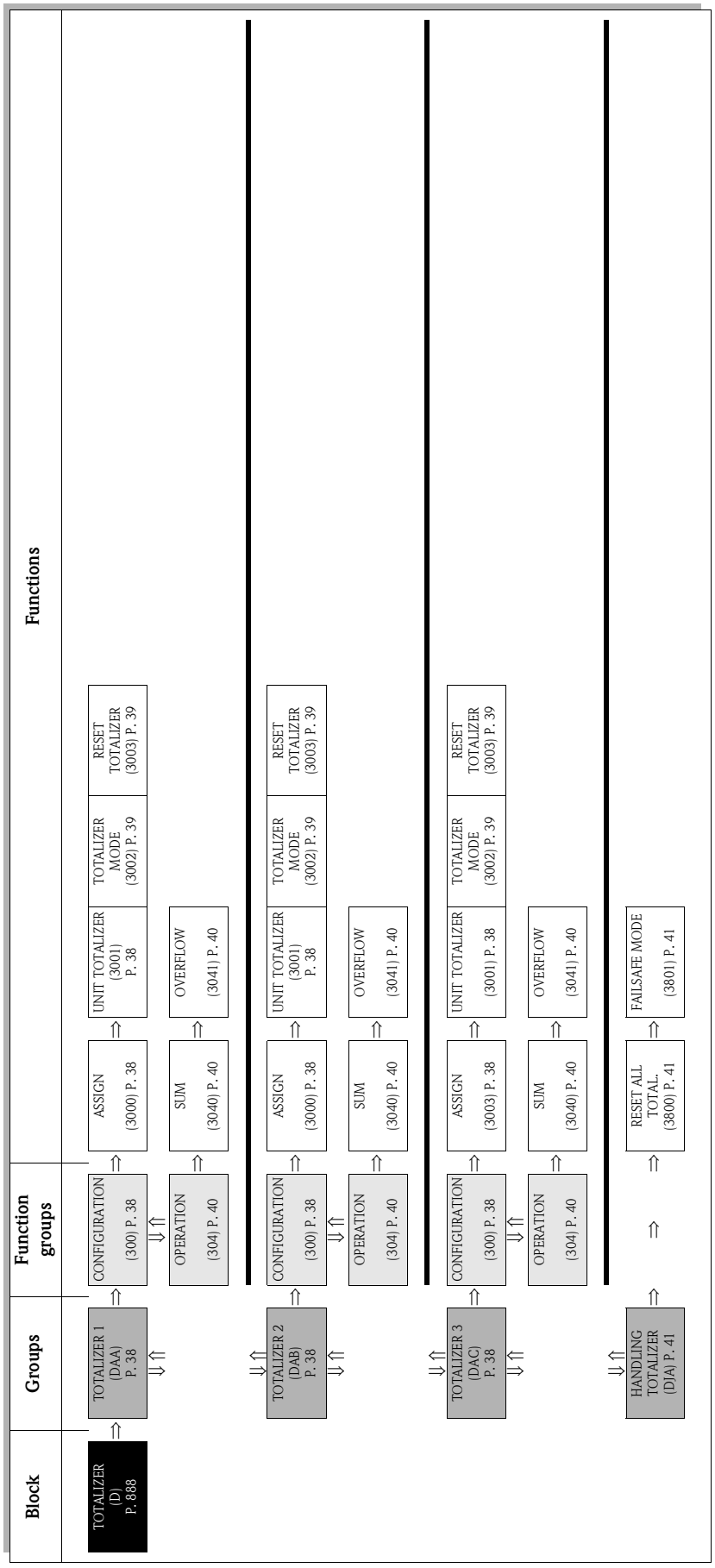
5.4.2 Function group MULTIPLEX



Function description USER INTERFACE → INFORMATION LINE → MULTIPLEX	
ASSIGN (2620)	Use this function to define the second reading to be displayed in the information line alternately (every 10 seconds) with the value defined in the ASSIGN function (2600). **Options:** OFF VOLUME FLOW IN % MASS FLOW IN % VOLUME FLOW BARGRAPH IN % MASS FLOW BARGRAPH IN % FLOW VELOCITY OPERATING/SYSTEM CONDITIONS FLOW DIRECTION READING AI1 - OUT VALUE AI2 - OUT VALUE AI3 - OUT VALUE AI4 - OUT VALUE AI5 - OUT VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (external set point) PID - OUT VALUE (manipulated variable) DEVICE PD-TAG (tag name) **Factory setting:** OFF ✎ Note! Multiplex mode is suspended as soon as a fault / notice message is generated. The message in question appears on the display. Once the fault is eliminated, the measuring device resumes operation in Multiplex mode and the error message is no longer displayed on the local display.
100%-VALUE (2621)	✎ Note! This function is not available unless one of the following was selected in the ASSIGN function (2620): ■ VOLUME FLOW IN % ■ MASS FLOW IN % ■ VOLUME FLOW BARGRAPH IN % ■ MASS FLOW BARGRAPH IN % Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter and country → Page 130 ff.

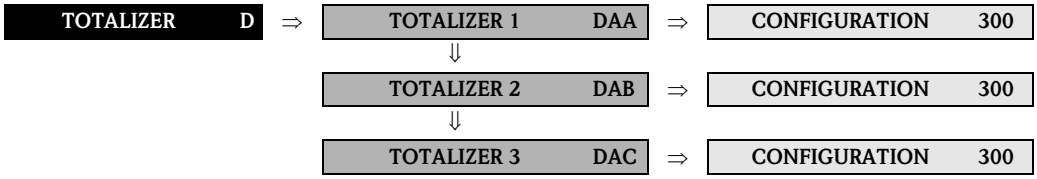
Function description USER INTERFACE → INFORMATION LINE → MULTIPLEX	
FORMAT **(2622)**	✎ Note! This function is not available unless a number was selected in the ASSIGN function (2600). Use this function to define the maximum number of places after the decimal point for the second value displayed in the information line. **Options:** 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 **(2623)**	✎ Note! This function is only available if VOLUME FLOW BARGRAPH IN % or MASS FLOW BARGRAPH IN % was selected in the function ASSIGN (2620). Use this function to define the format of the bar graph. **Options:** STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign).  A0001258 SYMMETRY (Symmetrical bar graph for positive and negative directions of flow, with –50 / 0 / +50% gradations and integrated sign).  A0001258 **Factory setting:** STANDARD

6 Block TOTALIZER



6.1 Group TOTALIZER (1 to 3)

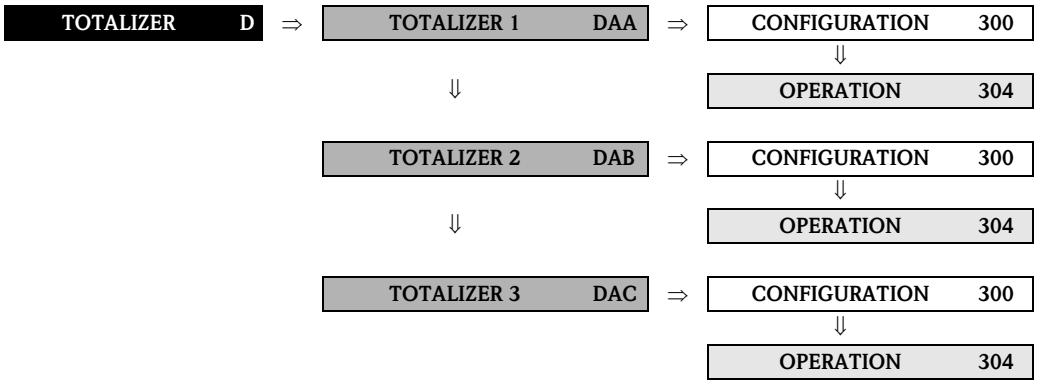
6.1.1 Function group CONFIGURATION



Function description TOTALIZER → TOTALIZER (1 to 3) → CONFIGURATION	
The function descriptions below apply to totalizers 1 to 3; the totalizers are independently configurable.	
ASSIGN (3000)	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, the function group CONFIGURATION (300) of the totalizer in question only displays the ASSIGN (3000) function.
UNIT TOTALIZER (3001)	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 → Page 130 ff. **Options (for VOLUME FLOW assignment):** Metric → cm^3; dm^3; m^3; ml; l; hl; Ml Mega US → cc; af; ft^3; oz f; gal; Kgal; 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 → Page 130 ff.

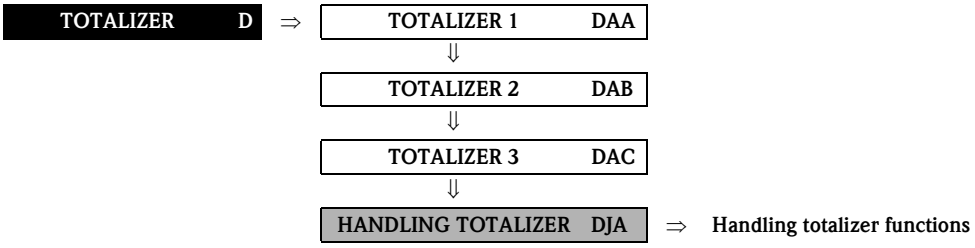
Function description TOTALIZER → TOTALIZER (1 to 3) → CONFIGURATION	
TOTALIZER MODE (3002)	Use this function to define how the flow components are to be totalized. **Options:** BALANCE Positive and negative flow components. The positive and negative flow components are balanced. In other words, net flow in the flow direction is registered. FORWARD Positive flow components only REVERSE Negative flow components only **Factory setting:** Totalizer 1 = BALANCE Totalizer 2 = FORWARD Totalizer 3 = REVERSE
RESET TOTALIZER (3003)	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



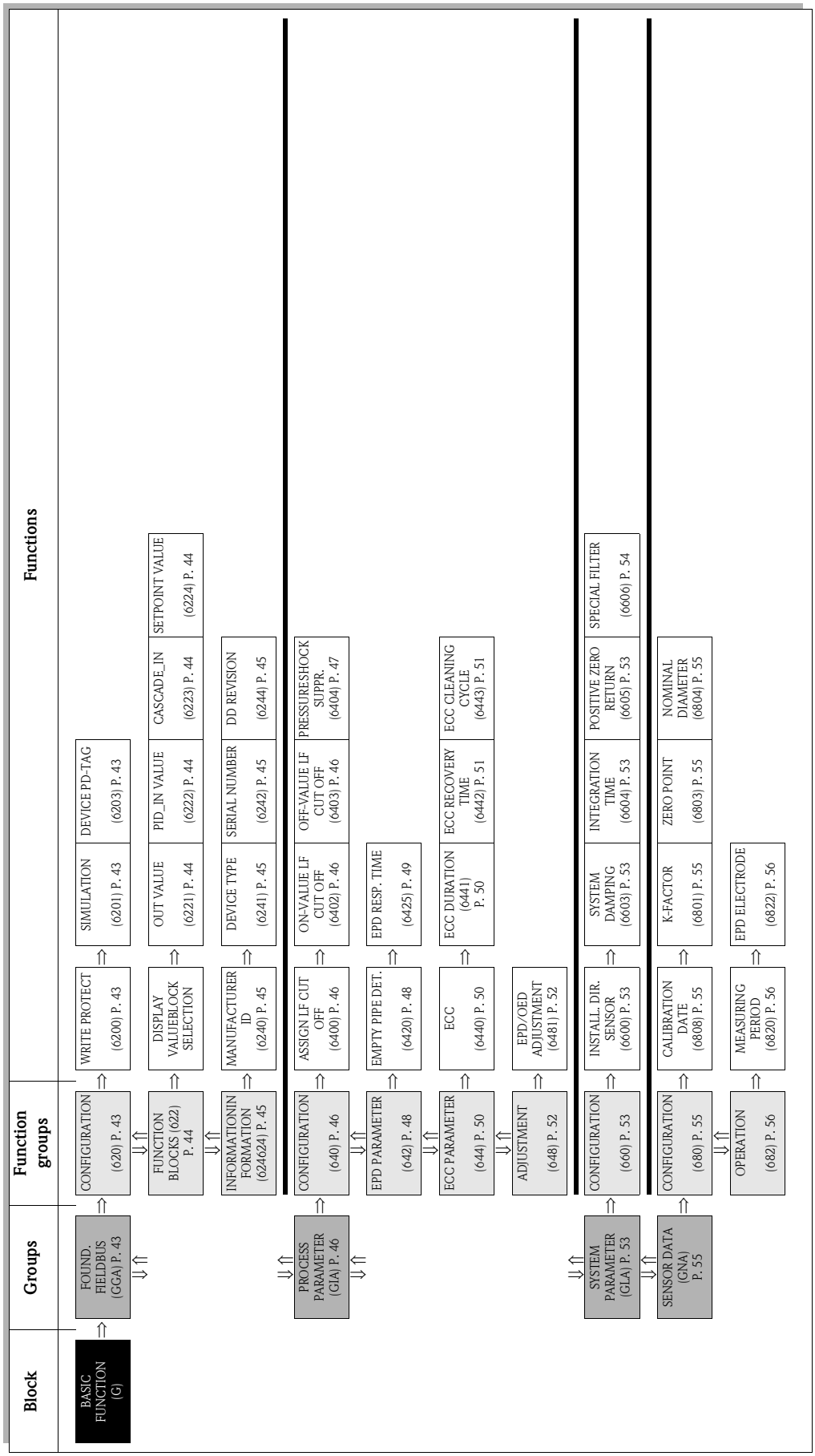
Function description TOTALIZER → TOTALIZER (1 to 3) → OPERATION	
The function descriptions below apply to totalizers 1 to 3; the totalizers are independently configurable.	
SUM **(3040)**	Use this function to view the total for the totalizer's measured variable aggregated since measuring commenced. The value can be positive or negative, depending on the setting selected in the "TOTALIZER MODE" function (3002), 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 (→ Page 39) 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 TOT. function (3801) (→ Page 41).
OVERFLOW **(3041)**	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 (>9999999) 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 (= 20000000 dm^3) The value displayed in the function SUM = 196845.7 dm^3 Effective total quantity = 20196845.7 dm^3 **User interface:** Integer with exponent, including sign and unit, e.g. $2 \cdot 10^7$ dm^3

6.2 Group HANDLING TOTALIZER



Function description TOTALIZER → HANDLING TOTALIZER→ Handling totalizer functions	
RESET ALL TOTALIZERS (3800)	Use this function to reset the totals (including all overflows) of the totalizers (1 to 3) to zero (= RESET). **Options:** NO YES **Factory setting:** NO
FAILSAFE ALL TOT. (3801)	Use this function to define the common response of all totalizers (1 to 3) in case of error. **Options:** STOP The totalizer is paused until the fault is rectified. ACTUAL VALUE The totalizers continue to count based on the actual flow measured value. The fault is ignored. HOLD VALUE The totalizers continue to count the flow based on the last valid flow value (before the fault occurred). **Factory setting:** STOP

7 Block BASIC FUNCTION



7.1 Group FOUNDATION FIELDBUS

7.1.1 Function group CONFIGURATION

BASIC FUNCTION G ⇒ FOUNDATION FIELDBUS GGA ⇒ CONFIGURATION 620

Function description BASIC FUNCTION → FOUNDATION FIELDBUS → CONFIGURATION	
WRITE PROTECT (6200)	Use this function to check whether the measuring device can be write-accessed via the fieldbus. **User interface:** OFF → Write access via FOUNDATION Fieldbus possible ON → Write access via FOUNDATION Fieldbus not possible **Factory setting:** OFF ✎ Note! Hardware write protection is activated and deactivated by means of a jumper on the I/O board (→ see Operating Instructions for Proline Promag 53 FOUNDATION Fieldbus).
SIMULATION (6201)	Use this function to check whether a simulation in the Analog Input or Discrete Output function block is possible. **User interface:** OFF → Simulation in the Analog Input and Discrete Output function block is **not** possible. ON →Simulation in the Analog Input and Discrete Output function block is possible **Factory setting:** ON ✎ Note! ▪ The simulation mode is enabled and disabled by means of a jumper on the I/O board (→ see also Operating Instructions for Proline Promag 53 FOUNDATION Fieldbus). ▪ The status of the simulation mode is also shown in the parameter BLOCK_ERR of the Resource Block.
DEVICE PD-TAG (6203)	Use this function to enter a tag name for the measuring device. **User input:** Max. 32-character text, permissible: A-Z, 0-9, +,–, punctuation marks **Factory setting:** E+H_PROMAG_53_XXXXXXXXXXX

7.1.2 Function group FUNCTION BLOCKS

BASIC FUNCTION G ⇒ FOUNDATION FIELDBUS GGA ⇒ CONFIGURATION 620
⇓
FUNCTION BLOCKS 622

Function description BASIC FUNCTION → FOUNDATION FIELDBUS → FUNCTION BLOCKS	
BLOCK SELECTION (6120)	Use this function to select a function block whose value and status is shown in the subsequent functions. **Options:** ANALOG INPUT 1 to 5 ANALOG OUTPUT 1 PID BLOCK **Factory setting:** ANALOG INPUT 1
OUT VALUE (6121)	Use this function to display the output value OUT, incl. unit and status, of the function block selected in the BLOCK SELECTION function (6120).
DISPLAY VALUE (6122)	✎ Note! This function is not available unless the ANALOG OUTPUT 1 option was selected in the BLOCK SELECTION function (6120). **User interface:** The measured variable (DISPLAY_VALUE module) transmitted from the FOUNDATION Fieldbus master to the measuring device, including the unit and status, is displayed. This is the measured variable to be shown on the local display.
PID_IN VALUE (6222)	✎ Note! This function is not available unless the PID BLOCK option was selected in the BLOCK SELECTION (6120) function. **User interface:** Use this function to display the controlled variable IN, incl. unit and status, of the PID function block.
CASCADE_IN (6223)	✎ Note! This function is not available unless the PID option was selected in the BLOCK SELECTION (6120) function. **User interface:** Display of an analog set value, incl. units and status, taken over from an external function block.
SETPOINT VALUE (6224)	✎ Note! ■ This function is not available unless the PID selection was selected in the BLOCK SELECTION (6220) function. ■ If the service code is used to call this function, this value can be edited. **User interface:** Use this function to display the internal set value, incl. unit and status, for the PID function block.

7.1.3 Function group INFORMATION

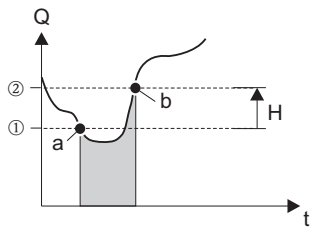
BASIC FUNCTION G ⇒ FOUNDATION FIELDBUS GGA ⇒ CONFIGURATION 620
⇓
FUNCTION BLOCKS 6226 122
⇓
INFORMATION 624

Function description BASIC FUNCTION → FOUNDATION FIELDBUS → INFORMATION	
MANUFACTURER ID (6240)	Use this function to view the manufacturer ID in decimal numerical format. **User interface:** 452B48 (hex) for Endress+Hauser
DEVICE TYPE (6241)	Use this function to view the device ID in hexadecimal numerical format. **User interface:** 1042 (hex) for Promag 53 FF
SERIAL NUMBER (6242)	Use this function to view the serial number. **User interface:** 11-digit number
DEVICE REVISION (6243)	Use this function to view the device revision number. ✎ Note! The information displayed here can be used to ensure that the correct system files (DD = Device Description) are used for integration into the host system. The system files can be downloaded free of charge from the Internet at www.endress.com. Example: Information displayed in the DEVICE REVISION function (6243) → 04 Information displayed in the DD REVISION function (6244) → 01 Required device description files (DD) → 0401.sym / 0401.ffo
DD REVISION (6244)	Use this function to view the revision number of the device description. ✎ Note! The information displayed here can be used to ensure that the correct system files (DD = Device Description) are used for integration into the host system. The system files can be downloaded free of charge from the Internet at www.endress.com. Example: Information displayed in the DEVICE REVISION function (6243) → 04 Information displayed in the DD REVISION function (6244) → 01 Required device description files (DD) → 0401.sym / 0401.ffo

7.2 Group PROCESS PARAMETER

7.2.1 Function group CONFIGURATION

BASIC FUNCTION G ⇒ FOUNDATION FIELDBUS GAA
⇓
PROCESS PARAMETER GIA ⇒ CONFIGURATION 640

Function description BASIC FUNCTION → PROCESS PARAMETER → CONFIGURATION	
ASSIGN LOW FLOW CUT OFF (6400)	Use this function to assign the switch point for the low flow cut off. **Options:** OFF MASS FLOW VOLUME FLOW **Factory setting:** VOLUME FLOW
ON-VALUE LOW FLOW CUT OFF (6402)	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 → Page 130 ff. ✎ Note! The appropriate unit is taken from the function UNIT VOLUME FLOW (0402) or UNIT MASS FLOW (0400) (→ Page 14 or Page 13).
OFF-VALUE LOW FLOW CUT OFF (6403)	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 (**a**). **User input:** Integer 0 to 100% **Factory setting:** 50%  A0003882 *① = switch-on point , ② = switch-off point* *a* *Low flow cut off is switched on* *b* *Low flow cut off is switched off (a + a · H)* *H* *Hysteresis value: 0 to 100%* ■ *Low flow cut off active* *Q* *Flow*

Function description

BASIC FUNCTION → PROCESS PARAMETER → CONFIGURATION

PRESSURE SHOCK SUPPRESSION (6404)

The closure of a valve can cause brief but severe movements of the fluid in the piping system, movements which the measuring system registers. The pulses totaled in this way result in a totalizer reading error, particularly in the case of batching processes. For this reason, the measuring device is equipped with pressure shock suppression (= short-term signal suppression) which can eliminate system-related "disruptions".

✎ Note!
Note that pressure shock suppression cannot be used unless the low flow cut off is active (see ON-VALUE LOW FLOW CUT OFF function on Page 46).

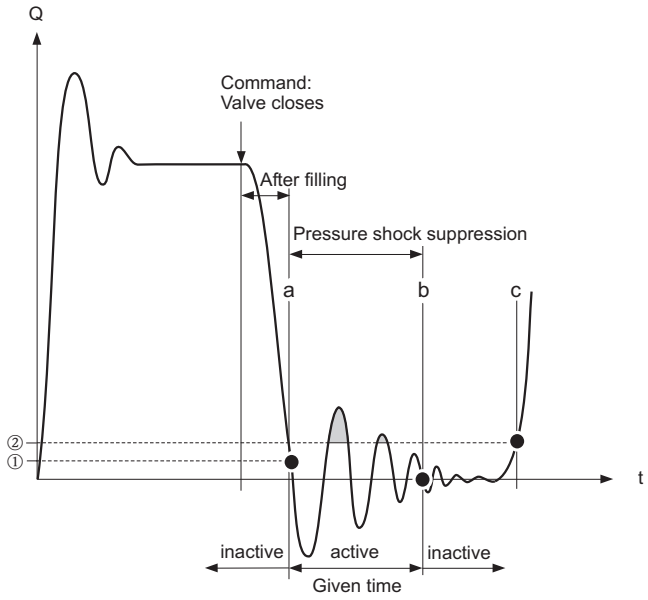
Use this function to define the time span for active pressure shock suppression.

Activation of pressure shock suppression
Pressure shock suppression is activated once the flow falls below the switch-on point of the low flow cut off (see point **a** in graphic).

While pressure shock suppression is active, the following conditions apply:
- Flow reading on display → 0
- Totalizer reading → The totalizers are pegged at the last correct value.

Deactivation of pressure shock suppression
The pressure shock suppression is deactivated after the time interval, set in this function, has passed (see point **b**).

✎ Note!
The actual flow value is displayed and output
when the time interval for the pressure shock suppression has passed and the flow exceeds the switch-off point of the low flow cut off (see point **c** in graphic).

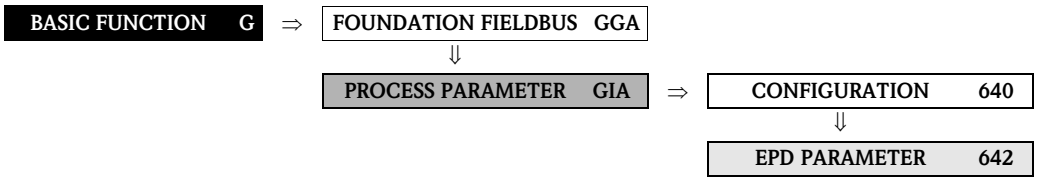


① = on value (low flow cut off), ② = off value (low flow cut off)
a Activated when the on-value for low flow cut off is undershot
b Deactivated once the time specified expires
c Flow values are taken into account again for calculating the pulses
Suppressed values
Q Flow

User input:
Max. 4-digit number, incl. unit: 0.00 to 100.0 s

Factory setting:
0.00 s

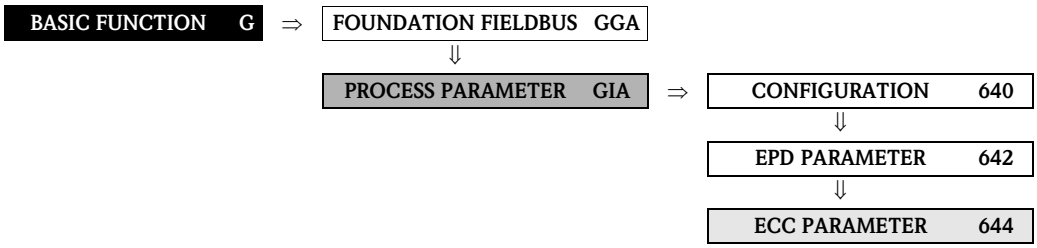
7.2.2 Function group EPD PARAMETER



Function description BASIC FUNCTION → PROCESS PARAMETER → EPD PARAMETER	
EMPTY PIPE DET. (6420)	Flow cannot be measured correctly unless the measuring tube is completely full. This status can be monitored at all times with the Empty Pipe Detection function. To do this, the empty pipe detection (EPD, empty pipe detection by means of EPD electrode) can be activated in this function: **Options:** OFF ON STANDARD **Factory setting:** OFF ✎ Note! ■ The option ON STANDARD is not available unless the sensor is equipped with an EPD electrode. ■ The default setting for the EPD function when the device is delivered is OFF. The function must be activated as required. ■ The devices are already calibrated at the factory with water (approx. 500 µS/cm). If the conductivity of certain fluids deviates from this reference, empty pipe/full pipe adjustment must be performed again on site (see function EPD/OED ADJUSTMENT (6481) on Page 52). ■ The adjustment coefficients must be valid before you can switch on the EPD function. If these coefficients are not available, the function EPD/OED ADJUSTMENT (see Page 52) is displayed. ■ If there are problems with the adjustment, the following error messages appear on the screen: – ADJUSTMENT FULL = EMPTY: The adjustment values for empty pipe and full pipe are identical. In such instances, empty pipe adjustment/full pipe adjustment **must** be carried out **again**. – ADJUSTMENT NOT OK: Adjustment is not possible as the fluid conductivity values are outside the permitted range. **Notes on empty pipe detection (EPD)** ■ Flow cannot be measured correctly unless the measuring tube is completely full. This status can be monitored at all times with the EPD function. ■ An empty or partially filled pipe is a process error. A default factory setting defines that a fault message is issued and that this process error has an effect on the outputs. ■ A plausibility check of the adjustment values will only be executed by activating the empty pipe detection. If an empty or full pipe adjustment is performed when empty pipe detection is active, the empty pipe detection has to be deactivated and activated again after finishing the adjustment in order to start the plausibility check. **Response to partially filled pipes** 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

Function description BASIC FUNCTION → PROCESS PARAMETER → EPD PARAMETER	
EPD RESPONSE TIME (6425)	✎ Note! The function is only available if the function EMPTY PIPE DET. (6420) has been switched on. Use this function to enter the time span for which the criteria for an "empty" pipe have to be satisfied without interruption before a notice message or fault message is generated. **User input:** fixed point number: 1.0 to 100 s **Factory setting:** 1.0 s

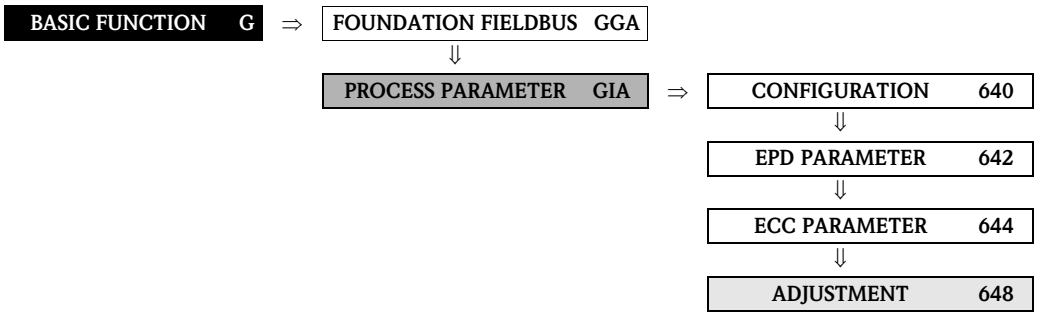
7.2.3 Function group ECC PARAMETER



Function description BASIC FUNCTION → PROCESS PARAMETER → ECC PARAMETER	
ECC **(6440)**	✎ Note! This function is only available if the measuring device is equipped with an electrode cleaning function (optional). Use this function to enable cyclic electrode cleaning (ECC). **Options:** ON (only with the optional electrode cleaning function ECC) OFF **Factory setting:** ON (only if the optional electrode cleaning function ECC is available) **Notes on electrode cleaning (ECC)** Conductive deposits on the electrodes and on the walls of the measuring tube (e.g. magnetite) can falsify measurement values. The Electrode Cleaning Circuitry (ECC) was developed to prevent such conductive deposits accreting in the vicinity of the electrodes. ECC functions as described above for all available electrode materials except tantalum. If tantalum is used as the electrode material, the ECC protects the electrode surface only against oxidation. ☝ Caution! If the ECC is switched off for a prolonged period in applications with conductive deposits, a layer forms inside the measuring tube and this can falsify measurement values. If the layer is allowed to accrete beyond a certain level, it might no longer be possible to remove it by switching on the ECC. If this happens the measuring tube must be cleaned and the layer removed.
ECC DURATION **(6441)**	✎ Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to specify the electrode cleaning duration. **User input:** Fixed-point number: 0.01 to 30.0 s **Factory setting:** 2.0 s

Function description BASIC FUNCTION → PROCESS PARAMETER → ECC PARAMETER	
ECC RECOVERY TIME (6442)	✎ Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to specify the recovery time for which the last flow value measured prior to cleaning is retained. A recovery time is necessary as the signal outputs can fluctuate after electrode cleaning on account of electrochemical interference voltages. **User input:** Max. 3-digit number: 1 to 600 s **Factory setting:** 60 s ☞ Caution! The last value measured prior to cleaning is output for the duration of the recovery time (max. 600 s). This in turn means that the measuring system does not register changes in flow, e.g. stoppage, during this time span.
ECC CLEANING CYCLE (6443)	✎ Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to specify the cleaning cycle for electrode cleaning. **User input:** Integer: 30 to 10080 min **Factory setting:** 40 min

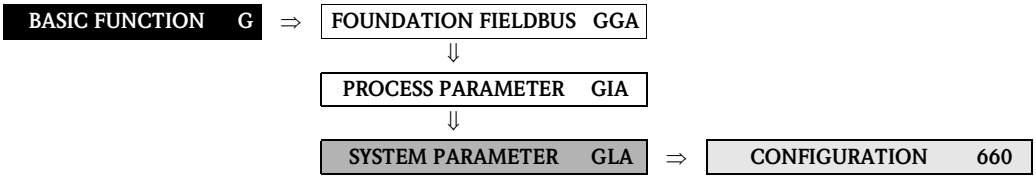
7.2.4 Function group ADJUSTMENT



Function description BASIC FUNCTION → PROCESS PARAMETER → ADJUSTMENT	
EPD/OED ADJUSTMENT (6481)	Use this function to activate the EPD adjustment for an empty or full measuring tube. ✎ Note! A detailed description of the empty pipe detection function can be found on Page 48. **Options:** OFF FULL PIPE ADJUST EMPTY PIPE ADJUST **Factory setting:** OFF **Procedure for EPD empty pipe / full pipe adjustment** 1. Empty the piping. In case of an EPD adjustment, the wall of the measuring tube should be wetted with fluid. 2. Start empty pipe adjustment: Select "EMPTY PIPE ADJUST" and press [E] to confirm. 3. After empty pipe adjustment, fill the piping with fluid. 4. Start full pipe adjustment: Select "FULL PIPE ADJUST" and press [E] to confirm. 5. Having completed the adjustment, select the setting "OFF" and exit the function by pressing [E] . 6. Now select the EMPTY PIPE DET. function (see Page 48). Switch on the empty pipe detection by selecting ON STANDARD and press [E] to confirm. ☝ Caution! The adjustment coefficients must be valid before you can activate the EPD function. If adjustment is incorrect the following messages might appear on the display: – FULL = EMPTY The adjustment values for empty pipe and full pipe are identical. In such instances, empty pipe adjustment/full pipe adjustment must be carried out again. – ADJUSTMENT NOT OK Adjustment is not possible because the fluid's conductivity is out of range.

7.3 Group SYSTEM PARAMETER

7.3.1 Function group CONFIGURATION

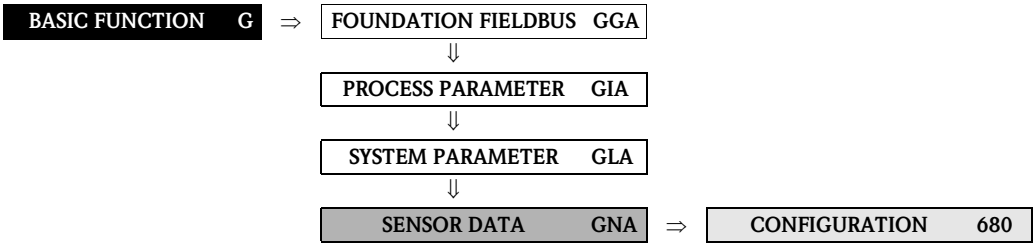


Function description BASIC FUNCTION → SYSTEM PARAMETER → CONFIGURATION	
INSTALLATION DIRECTION SENSOR (6600)	Use this function to reverse the sign of the flow measured variable, if necessary. **Options:** NORMAL (flow as indicated by the arrow) INVERSE (flow opposite to direction indicated by the arrow) **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 (6603)	Use this function to set the filter depth of the digital filter. This reduces the sensitivity of the measuring signal to interference peaks (e.g. high solids content, gas bubbles in the fluid, etc.). The reaction time of the measuring system increases with every increase in 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 (6604)	Use this function to view the set integration time. The integration time defines the duration of internal totaling of the induced voltage in the fluid (measured by the measuring electrode), i.e. the time in which the measuring device records the true flow (afterwards the magnetic field for the next integration is created from the opposite pole). **User interface:** Max. 2-digit number: 1 to 65 ms **Factory setting:** 5 ms
POSITIVE ZERO RETURN (6605)	Use this function to interrupt evaluation of measured variables. This is necessary when a piping system is being cleaned, for example. This setting acts on all function and outputs of the measuring device. **Options:** OFF ON → Signal output is set to the "ZERO FLOW" value. **Factory setting:** OFF

Function description BASIC FUNCTION → SYSTEM PARAMETER → CONFIGURATION	
SPECIAL FILTER (6606)	There is the option of activating two signal filters in this function. These filters make it possible to either suppress the signal caused by severely fluctuating flows (STANDARD option) or to reproduce it completely – both on the display and at the FOUNDATION Fieldbus output (DYNAMIC FLOW option). **Options:** STANDARD For signal output with normal, stable flow. DYNAMIC FLOW For signal output with severely fluctuating or pulsating flow. **Factory setting:** STANDARD Caution! ■ The signal behavior at the outputs also depends on the SYSTEM DAMPING (6603) function. ■ Additional filter settings (e.g. STANDARD CIP or DYNAMIC FLOW CIP) can only be selected with the aid of a special service code. Such settings, which are normally made by a service technician, are deleted, however, when the private code is entered again and can then no longer be activated!

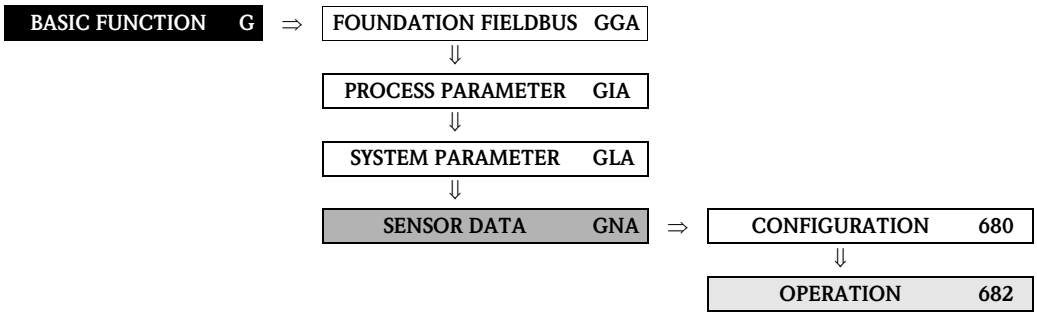
7.4 Group SENSOR DATA

7.4.1 Function group CONFIGURATION



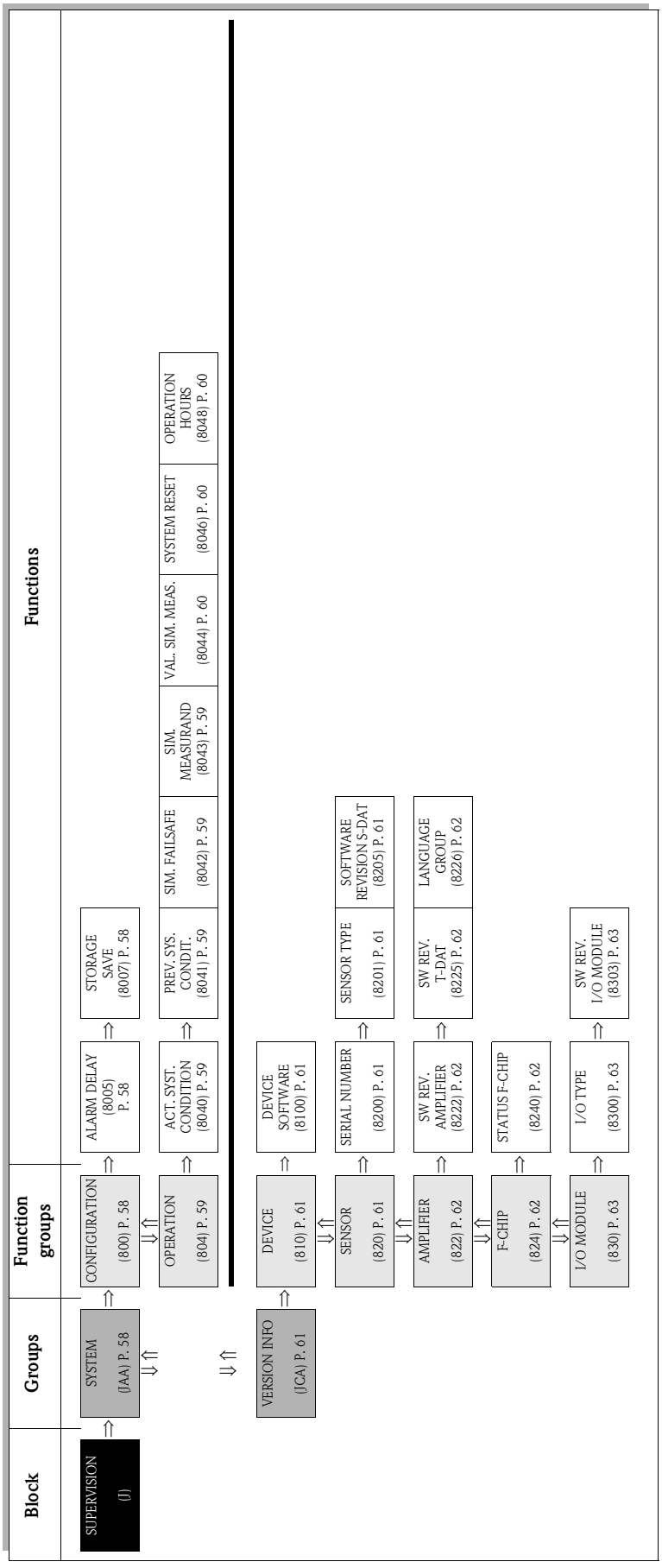
Function description BASIC FUNCTION → SENSOR DATA → CONFIGURATION	
All sensor data (calibration factors, zero (point) and nominal diameter) are set at the factory and saved on the S-DAT sensor memory chip. ✎ Note! The individual values of the functions are also provided on the sensor nameplate. ☞ Caution! Under normal circumstances you should not change the following parameter settings, because changes affect numerous functions of the entire measuring facility in general and the accuracy of the measuring system in particular. For this reason, the functions described below cannot be changed even when you enter your personal code. Contact the Endress+Hauser service organization if you have any questions about these functions.	
CALIBRATION DATE (6808)	Use this function to view the current calibration date and time for the sensor. **User interface:** Calibration date and time **Factory setting:** Calibration date and time of the current calibration. ✎ Note! The calibration date and time format is defined in the FORMAT DATE TIME (0429) function, → Page 15.
K-FACTOR (6801)	Use this function to display the actual calibration factor (positive and 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 to 2.0000 **Factory setting:** Depends on nominal diameter and calibration
ZERO POINT (6803)	Use this function to view the actual zero-point correction value for the sensor. Zero-point correction is determined and set at the factory. **User interface:** Max. 4-digit number: –1000 to +1000 **Factory setting:** Depends on nominal diameter and calibration
NOMINAL DIAMETER (6804)	Use this function to view the nominal diameter of the sensor. The nominal diameter depends on the size of the sensor and is set at the factory. **User interface:** 2 to 2000 mm or 1/12 to 78" **Factory setting:** Depends on the size of the sensor

7.4.2 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 Endress+Hauser service organization if you have any questions about these functions.	
MEASURING PERIOD (6820)	Use this function to view the 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 and the empty pipe detection time. **User interface:** Max. 4-digit number: 10 to 1000 ms **Factory setting:** Depends on nominal diameter
EPD ELECTRODE (6822)	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

8 Block SUPERVISION



8.1 Group SYSTEM

8.1.1 Function group CONFIGURATION

SUPERVISION J ⇒ SYSTEM JAA ⇒ CONFIGURATION 800

Function description SUPERVISION→ SYSTEM → CONFIGURATION	
ALARM DELAY (8005)	Use this function to define a time span in which the criteria for a fault have to be satisfied without interruption before a fault or notice message is generated. Depending on the setting and the type of fault, this suppression acts on: ■ Display ■ Output blocks (AI Blocks) FOUNDATION Fieldbus interface **User input:** 0 to 100 s (in steps of one second) **Factory setting:** 0 s ☝ Caution! If this function is activated, fault and notice messages are delayed by the time corresponding to the setting before being transmitted to the higher-order controller (process controller, etc.). It is therefore imperative to check in advance in order to make sure whether a delay of this nature could affect the safety requirements of the process. If fault and notice messages cannot be suppressed, a value of 0 seconds must be entered here.
PERMANENT STORAGE (8007)	This function displays whether permanent saving of all parameters in the EEPROM is switched on or off. **User interface:** 0 = OFF 1 = ON **Factory setting:** ON ☝ Caution! ■ The options in this function can only be changed by the Endress+Hauser service organization. ■ If the "OFF" option is selected, all the subsequent parameter changes are not stored permanently to the EEPROM. This means, in particular, that these changes are not available after a power failure. The device then starts with the last parameter configuration saved in the EEPROM. **The following also for FOUNDATION Fieldbus devices:** "Flow" Transducer Block/base index 1400 Parameter: Sys. - Permanent Storage Write access with operating mode (MODE_BLK) read only

8.1.2 Function group OPERATION

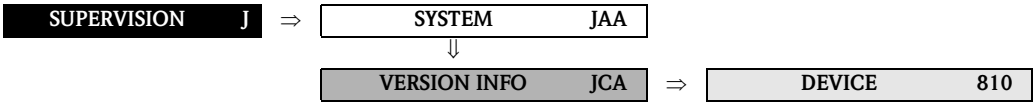
SUPERVISION J ⇒ SYSTEM JAA ⇒ CONFIGURATION 800
⇓
OPERATION 804

Function description SUPERVISION → SYSTEM → OPERATION	
ACTUAL SYSTEM CONDITION (8040)	Use this function to check the present system condition. **User interface:** SYSTEM OK or the fault/notice message with the highest priority.
PREV. SYSTEM CONDITIONS (8041)	Use this function to view the fifteen most recent fault and notice messages since measuring last started. **User interface:** The 15 most recent error or notice messages
SIMULATION FAILSAFE MODE (8042)	Use this function to set the Analog Input and Totalizer function blocks to their defined flow-response modes in order to check whether they respond correctly. During this time, message no. 691 "SIMULATION FAILSAFE MODE" appears on the display. **Options:** OFF ON **Factory setting:** OFF ✎ Note! With the fieldbus, an active simulation is relayed to downstream function blocks and higher-order control systems by means of the status "UNCERTAIN" of the output value OUT (AI Block).
SIMULATION MEASURAND (8043)	Use this function to set all inputs, outputs and totalizers to their defined flow-response modes in order to check whether they respond correctly. During this time, the 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 (8044)	✎ Note! The function is not visible unless the SIMULATION MEASURAND function (8043) is active. Use this function to specify a selectable value (e.g. 12 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 (ACA), (see Page 13).
SYSTEM RESET (8046)	Use this function to perform a reset of the measuring system. **Options:** NO RESTART SYSTEM (restart without interrupting power supply) **Factory setting:** NO
OPERATION HOURS (8048)	Use this function to view the hours of operation of the device. **User interface:** Depends on the number of hours of operation elapsed: Hours of operation < 10 hours → display format = 0:00:00 (hr:min:sec) Hours of operation 10 to 10,000 hours → display format = 0000:00 (hr:min) Hours of operation >10,000 hours → display format = 000000 (hr)

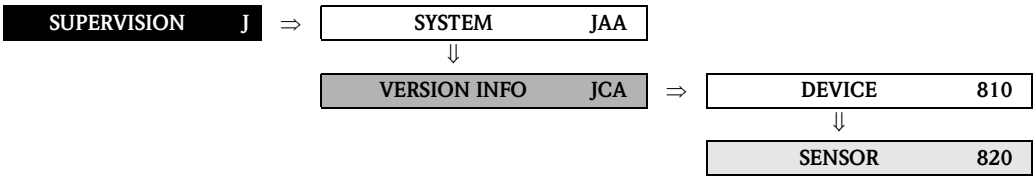
8.2 GroupVERSION INFO

8.2.1 Function group DEVICE



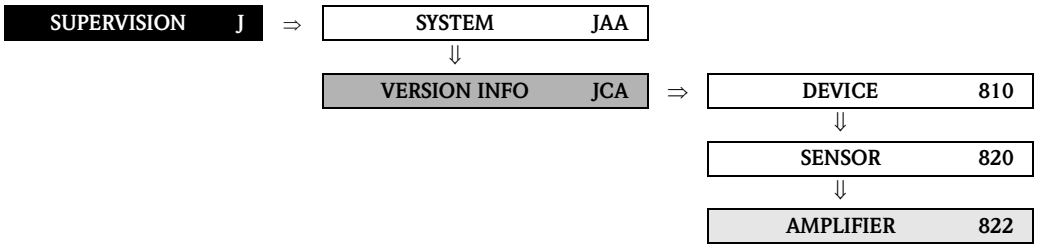
Function description SUPERVISION → VERSION INFO → DEVICE	
DEVICE SOFTWARE (8100)	Use this function to view the current device software version.

8.2.2 Function group SENSOR



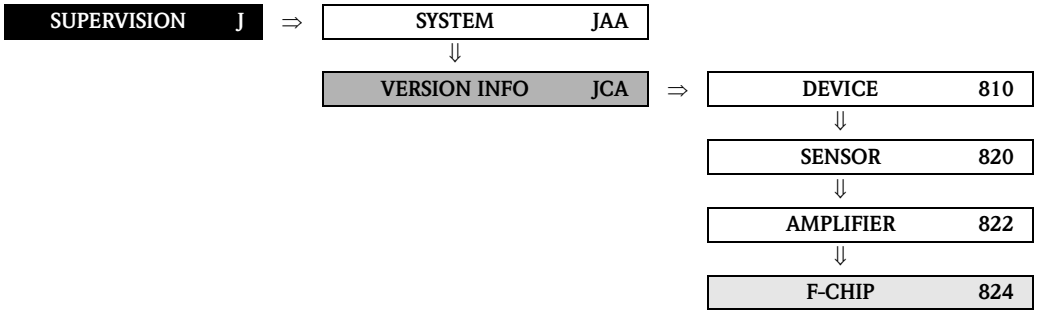
Function description SUPERVISION → VERSION INFO → SENSOR	
SERIAL NUMBER (8200)	Use this function to view the serial number of the sensor.
SENSOR TYPE (8201)	Use this function to view the sensor type.
SOFTWARE REVISION NUMBER S-DAT (8205)	Use this function to view the software revision number of the software used to create the content of the S-DAT.

8.2.3 Function group AMPLIFIER



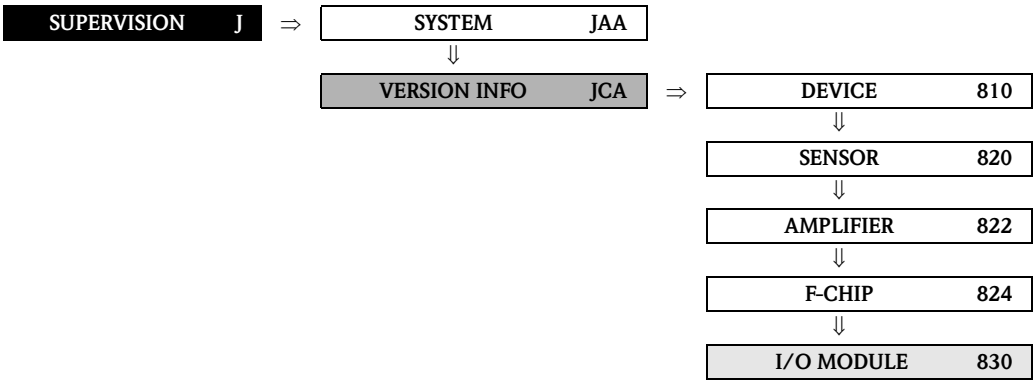
Function description SUPERVISION → VERSION INFO → AMPLIFIER	
SOFTWARE REVISION NUMBER AMPLIFIER (8222)	Use this function to view the software revision number of the amplifier.
SOFTWARE REVISION NUMBER T-DAT (8225)	Use this parameter to view the software revision number of the software used to create the content of the T-DAT.
LANGUAGE GROUP (8226)	Use this function to view the language group. The following language groups can be ordered: WEST EU / USA, EAST EU / SCAND., ASIA, CHINA. **User interface:** available language group ✎ Note! ■ The language options of the available language group are displayed in the LANGUAGE (2000) function. ■ You can change the language group via the configuration program FieldCare. Please do not hesitate to contact your Endress+Hauser sales office if you have any questions.

8.2.4 Function group F-CHIP



Function description SUPERVISION → VERSION INFO → F-CHIP	
STATUS F-CHIP (8240)	Use this function to check whether an F-CHIP is installed and which software options are available.

8.2.5 Function group I/O MODULE



Function description SUPERVISION → VERSION INFO → I/O MODULE	
I/O MODULE TYPE (8300)	Use this function to view the configuration of the I/O module complete with terminal numbers.
SOFTWARE REVISION NUMBER I/O MODULE (8303)	Use this function to view the software revision number of the I/O module.

9 Index key words (Index function matrix)

Numerics

A

B

C

10 Index (local operation)

G

H

I

K

L

M

N

O

Contents (FOUNDATION Fieldbus)

1 Operation via FOUNDATION Fieldbus

1.1 Block model

In the FOUNDATION Fieldbus all the device parameters are categorized according to their functional properties and task and are generally assigned to three different blocks. A block may be regarded as a container in which parameters and the associated functionalities are contained.
A FOUNDATION Fieldbus device has the following block types:

- A Resource Block
  The Resource Block contains all the device-specific characteristics of the device.

- One or more Transducer Blocks (transmission blocks)
  The Transducer Block contains all the measuring technology and device-specific parameters of the device. The measurement principles (e.g. flow, temperature) are depicted in the Transducer Blocks in accordance with the FOUNDATION Fieldbus specification.

- One or more function blocks
  Function blocks contain the automation functions of the device. We distinguish between different function blocks, e.g. Analog Input function block, Analog Output function block, PID function block (PID controller), etc. Each of these function blocks is used to process different application functions.

Different automation tasks can be realized depending on the arrangement and connection of the individual blocks. In addition to these blocks, a field device may have any number of other blocks, e.g. several Analog Input function blocks if more than one process variable is available from the field device.

Blocks used by the ProdType:

- One Resource Block

- Four Transducer Blocks

- Eleven function blocks comprising:
  – Five Analog Input function blocks for the process variables volume flow, calculated mass flow and totalizer 1 to 3.
  – One Discrete Output function block
  – One PID function block (PID controller)
  – One Arithmetic function block
  – One Input Selector function block
  – One Signal Characterizer function block
  – One Integrator function block

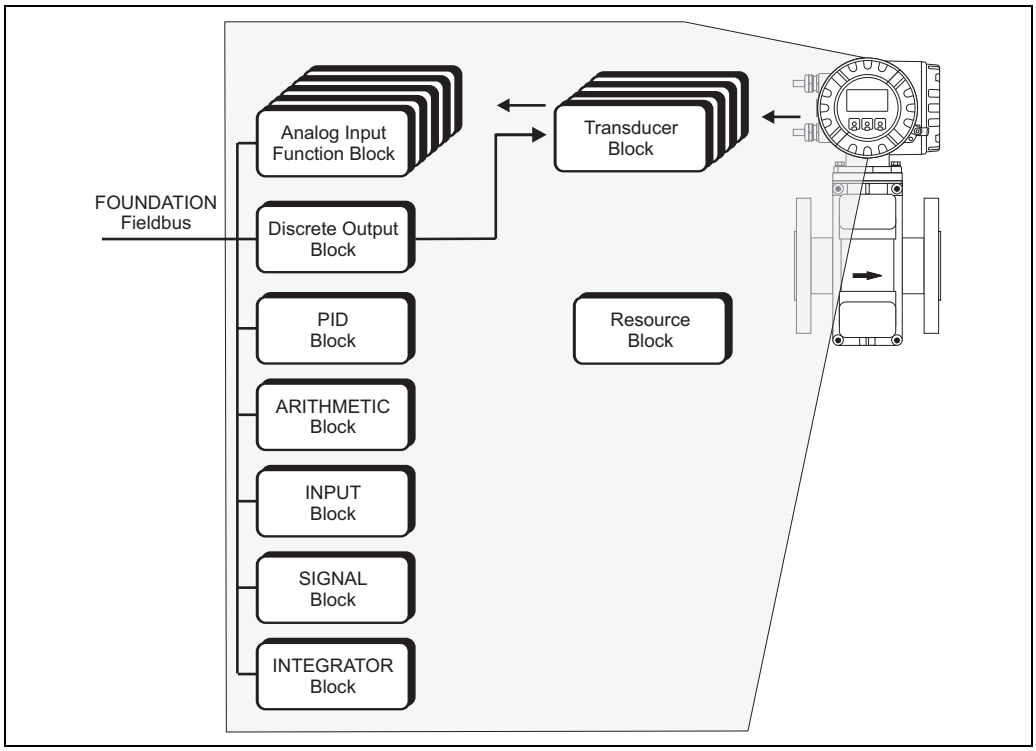


Fig. 1: Promag 53 FOUNDATION Fieldbus blocks

The sensor signal is first prepared specifically for the flow in the measuring block (the **Transducer Block**). The process variables are then passed to the **Analog Input function blocks** for control-related processing (e.g. scaling, limit value processing).

The process variables go through the complete function block algorithm and are available to other function blocks, e.g. the PID block, as a starting variable for connecting the desired application function.

Using the Discrete **Output function block (DO)**, various actions and functions can be initiated and controlled via FOUNDATION Fieldbus in the Device Functions Proline Promag 53 FOUNDATION Fieldbus.

✎ Note!
Other function blocks such as the PID, Arithmetic, Input Selector, Signal Characterizer and Integrator function block are described in the "FOUNDATION Fieldbus Overview" (BA013S) Operating Instructions (acquired at: → www.endress.com → Download).

2 Resource Block

A Resource Block contains all the data that uniquely identifies and characterizes the field device. It is an electronic version of a nameplate on the field device. Parameters of the Resource Block include device type, device name, manufacturer ID, serial number, etc.

A further task of the Resource Blocks is the management of overall parameters and functions that have an influence on the execution of the remaining blocks in the field device. The Resource Block is thus the central unit that also checks the device status and thereby influences or controls the operability of the other blocks and thus also of the device. Since the Resource Block has no block input and block output data, it cannot be linked with other blocks.

The major functions and parameters of the Resource Block are listed below; you will find an overview of all the available parameters starting on Page 77.

2.1 Selecting the operating mode

The operation mode is set by means of the MODE_BLK parameter group. The Resource Block supports the following operating modes:

– AUTO (automatic mode)
– OOS (out of service)

✎ Note!
The block status OOS is also shown via the parameter BLOCK_ERR. In operating mode OOS, if write protection is not enabled, you can access all the write parameters without restriction.

2.2 Block status

The current operating status of the Resource Block is shown in the parameter RS_STATE.

The Resource Block can take on the following states:

– STANDBY	The Resource Block is in OOS operating mode. The remaining blocks cannot be executed.
– ONLINE LINKING	The connections configured between the function blocks have not yet been linked.
– ONLINE	Normal operating status; the Resource Block is in operating mode AUTO. The configured connections between the function blocks have been established.

2.3 Write protection and simulation

Write protection of the device parameters and simulation in the Analog Input and Discrete Output function block can be locked or unlocked via a jumper setting on the FOUNDATION Fieldbus I/O board (→ Operating Instructions for Proline Promag 53 FOUNDATION Fieldbus, BA126D).

The parameter WRITE_LOCK shows the status of the hardware write protection. The following statuses are possible:

- LOCKED = Device data cannot be modified by means of the FOUNDATION Fieldbus interface.
- NOT LOCKED = Device data can be modified by means of the FOUNDATION Fieldbus interface.

The parameter BLOCK_ERR indicates whether a simulation is possible in the Analog Input and Discrete Output function block.

- Simulation Active = Simulation possible in the Analog Input function block via the SIMULATE parameter and in the Discrete Output function block via the SIMULATE_D parameter.

2.4 Alarm detection and processing

Process alarms provide information on particular block statuses and block events. The status of the process alarms is communicated to the fieldbus host system via the parameter BLOCK_ALM. The parameter ACK_OPTION specifies whether an alarm must be acknowledged via the fieldbus host system.

The following process alarms are generated by the Resource Block:

Block process alarms
The following block process alarms of the Resource Block are shown via the parameter BLOCK_ALM:

- OUT OF SERVICE
- SIMULATE ACTVE

Write protect process alarm
If write protection is disabled on the FOUNDATION Fieldbus I/O board, then prior to communicating the change of status to the fieldbus host system the alarm priority specified in the parameter WRITE_PRI is checked. The alarm priority specifies the action taken when the write protection alarm WRITE_ALM is enabled.

Note!
- If the option of a process alarm has **not** been enabled in the parameter ACK_OPTION, this process alarm only has to be acknowledged in the parameter BLOCK_ALM.
- The parameter ALARM_SUM shows the current status of all the process alarms.

2.5 Parameters of the Resource Block

The following table shows all the Endress+Hauser-specific parameters of the Resource Block.

✎ Note!
FOUNDATION Fieldbus parameters are described in the "FOUNDATION Fieldbus Overview" Operating Instructions (BA013S) (acquired at: → www.endress.com → Download).

Resource Block		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Sensor - Serial Number	read only	Use this function to view the sensor serial number.
Amp. - HW Rev.Number	read only	Use this parameter to view the hardware revision number of the amplifier.
Amp. - HW Identification	read only	Use this parameter to view the hardware ID number of the amplifier.
Amp. - SW Rev.Number	read only	Use this function to view the software revision number of the amplifier.
Amp. - SW Identification	read only	Use this parameter to view the software ID number of the amplifier.
Amp. - Prod.-Number	read only	Use this parameter to view the production number of the amplifier.
Amp. - SW-Rev.No. T-DAT	read only	Use this parameter to view the software revision number of the software used to create the content of the T-DAT.
Amp. - Language Group	read only	Use this function to view the language group.
I/O - Type	read only	Use this function to view the I/O module type.
I/O - HW Rev. Number	read only	Use this parameter to view the hardware revision number of the I/O module.
I/O - HW Identification	read only	Use this parameter to view the hardware ID number of the I/O module.
I/O - SW Rev. Number	read only	Use this parameter to view the software revision number of the I/O module.
I/O - SW Identification	read only	Use this parameter to view the software ID number of the I/O module.
I/O - Prod.Number	read only	Use this parameter to view the production number of the I/O module.

3 Transducer Block

The Transducer Blocks contain all the measurement- and device-specific parameters of the flowmeter. All the settings directly connected with the flow measurement/application are made here. They form the interface between the sensor-specific measured value preprocessing and the Analog Input function blocks required for automation.

A Transducer Block allows you to influence the input and output values of a function block. The parameters of a Transducer Block include information on the sensor type, sensor configuration, physical units, calibration, damping, diagnosis, etc. as well as the device-specific parameters. The device-specific parameters and functions are split into several Transducer Blocks that cover different task areas.

"Flow" Transducer Block/base index 1400:
This Block contains all the flow-specific parameters and functions, e.g. calibration functions, sensor data etc. → Page 82

"Diagnosis" Transducer Block/base index 1600:
This Block contains all the parameters for system diagnosis, e.g. current system condition etc. → Page 97

"Display" Transducer Block/base index 1800:
This Block contains all the parameters for the configuration of the local display → Page 101

"Totalizer" Transducer Block/base index 1900:
This Block contains all the parameters for the configuration of the totalizers → Page 115

3.1 Signal processing

The following figure shows the internal structure of the individual Transducer Blocks:

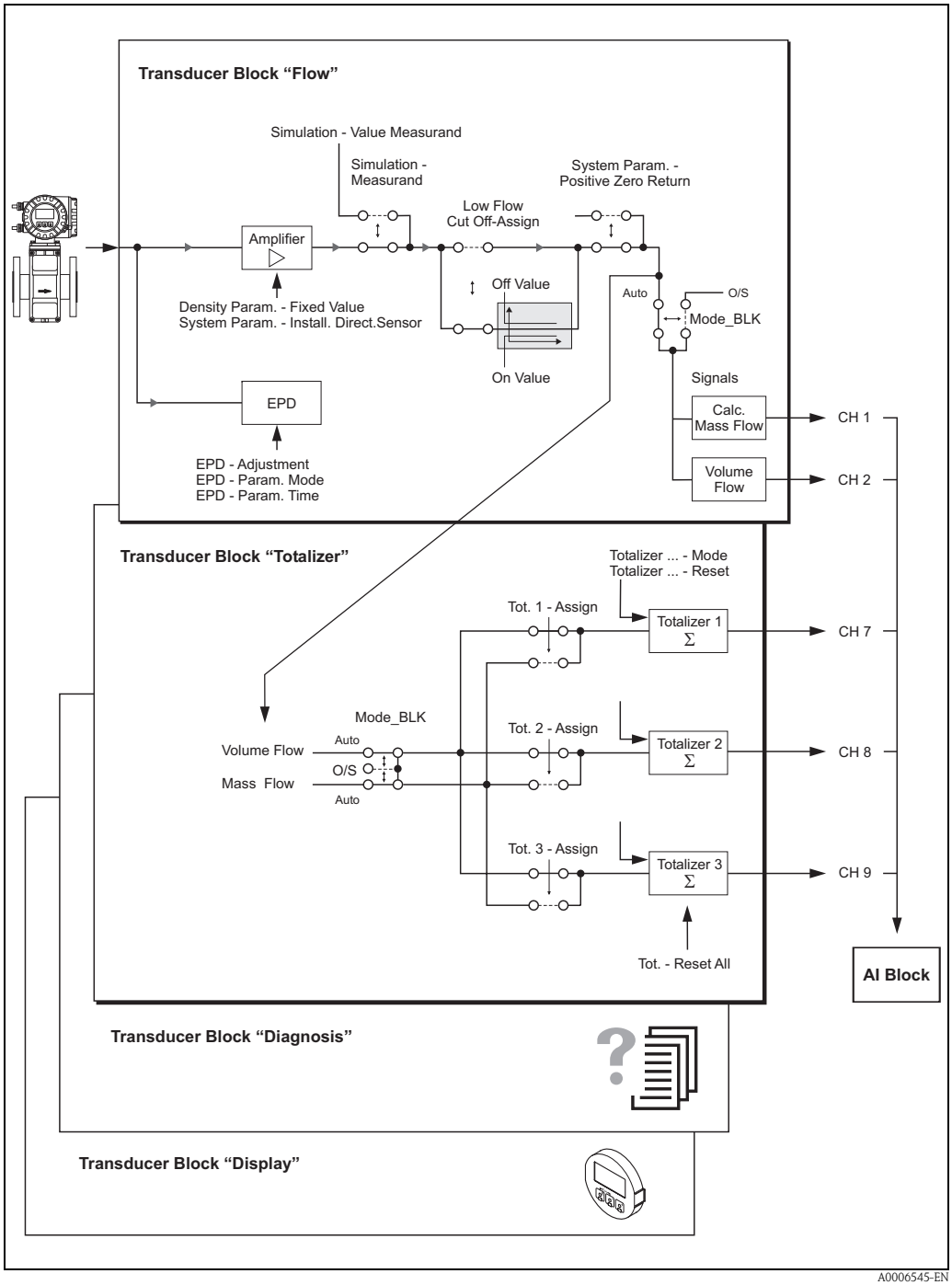


Fig. 2: Internal structure of the individual Transducer Blocks

The "Flow" Transducer Block receives a signal variable (volume) from the sensor as the input signal. The amplifier converts this input signal to volume flow. The amplifier calculates the current mass flow via the "Density Param. - Fixed Value" parameter (→ Page 94) by deriving the value from the measured volume flow.

Optionally, the empty pipe detection function can be adjusted and switched on or off by means of the EPD parameter group.

The parameter "Simulate - Value Measurand" (→ Page 95) allows you to specify a simulation value in order to test assigned parameters in the device and downstream function blocks. The process variable (volume or mass flow) to be simulated is selected by means of the "Simulation - Measurand" parameter (→ Page 95).

The parameter "Low Flow Cut Off - On-Value" (see → Page 87) allows you to define a limit value for low flow cut off. If the measured flow value is below this limit value then the output value of 0 is output.

In addition, the parameter "Sys. - Positive Zero Return" (→ Page 86) allows you to switch the measured value to "Zero Flow". This is necessary when a piping system is being cleaned, for example.

The "Flow" Transducer Block makes the process variables volume and mass flow available to the downstream function blocks. Depending on these two process variables, the "Totalizer" Transducer Block derives the integrated measured variables Totalizer 1 to 3 which are then also made available as a process variable at the output for further processing. In addition, the totalizers are also configured in this Block; for example all totalizers can be reset simultaneously by means of the "Tot. - Reset All" parameter (→ Page 117 ff.).

The "Diagnosis" Transducer Block comprises all the parameters and functions necessary for the diagnosis and maintenance of the device. For example, the "Diag. - Act.Sys.Condition" parameter displays the current system condition or, if an error occurs, provides a detailed reason for the error (→ Page 97 ff.).

If the measuring device is equipped with a local display, various display parameters can be configured by means of the "Display" Transducer Block, e.g. display language, contrast etc. (→ Page 101 ff.).

The "Diagnosis" and "Display" Transducer Blocks do not have any output variables, i.e. they only affect the measuring device itself.

The primary functions and parameters of the Transducer Blocks are listed below. You will find an overview of all the available Endress+Hauser-specific parameters starting on → Page 82 ff.

3.2 Important functions and parameters of the Transducer Blocks

3.2.1 Block output values

The Transducer Blocks make the following output variables (process variables) available:

- "Flow" Transducer Block:
  - Calculated mass flow
  - Volume flow
- "Totalizer" Transducer Block
  - Totalizer 1
  - Totalizer 2
  - Totalizer 3
- The "Diagnosis" and "Display" Transducer Blocks do not have any output variables.

The CHANNEL parameter in the Analog Input function block is used to assign which process variable is read in and processed in the downstream Analog Input function block:

- Process variable calculated mass flow → CHANNEL 1 (Analog Input function block)
- Process variable volume flow → CHANNEL 2 (Analog Input function block)
- Process variable totalizer 1 → CHANNEL 7 (Analog Input function block)
- Process variable totalizer 2 → CHANNEL 8 (Analog Input function block)
- Process variable totalizer 3 → CHANNEL 9 (Analog Input function block)

3.2.2 Selecting the operating mode

The operation mode is set by means of the MODE_BLK parameter group. The Transducer Blocks support the following operation modes:

- AUTO (automatic mode)
- OOS (out of service)

✎ Note!

- The block status OOS is also shown via the parameter BLOCK_ERR. In operating mode OOS, if write protection is not enabled and the access code is entered, you can access all the write parameters without restriction.
- The following applies for the "Flow" and "Totalizer" Transducer Blocks: With the "OOS" operating mode, the process variables are updated but the status of the output value OUT (AI Block) changes to "BAD".
- If problems occur during the configuration of the function blocks → see Operating Instructions for Promag 53 FF (BA126D), "Troubleshooting" section.

3.2.3 Alarm detection and processing

The Transducer Blocks do not generate any process alarms. The status of the process variables is evaluated in the downstream Analog Input function blocks. If the Analog Input function block does not receive an input value that can be evaluated from the "Flow" or "Totalizer" Transducer Blocks, then a process alarm is generated. This process alarm is displayed in the BLOCK_ERR parameter of the Analog Input function block (BLOCK_ERR = Input Failure).

The parameter BLOCK_ERR of the Transducer Blocks displays the device error that produced the input value that could not be evaluated and thus triggered the process alarm in the Analog Input function block.

In addition, the active device error is displayed via the "Diagnosis" Transducer Block in the "Diagnosis - Act.Sys. Condition" parameter (→ Page 97).

For further information on rectifying errors → see Operating Instructions for Promag 53 FF (BA126D), "Troubleshooting" section.

3.2.4 Diagnosis

The status of the device is displayed via the following parameters specified in the FOUNDATION Fieldbus specification:

- BLOCK_ERR
- Transducer Error

More detailed information on the current device status is displayed via the "Diagnosis" Transducer Block in the manufacturer-specific parameter "Diag. - Act.Sys.Condition" (→ Page 97).

For further information on rectifying errors → see Operating Instructions for Promag 53 FF (BA126D), "Troubleshooting" section.

3.2.5 Accessing the device-specific parameters

To access the device-specific parameters the following requirements must be met:

1. Hardware write protection must be deactivated → see Operating Instructions for Proline Promag 53 FOUNDATION Fieldbus (BA126D).
2. The correct code must be entered by means of the corresponding Transducer Block in the "Access - Code" parameter.

3.3 Parameters of the "Flow" Transducer Block

The following table shows all the Endress+Hauser-specific parameters of the "Flow" Transducer Block. These can only be changed after entering an enabling code in the "Access - Code" parameter.

✎ Note!
FOUNDATION Fieldbus parameters are described in the "FOUNDATION Fieldbus Overview" Operating Instructions (BA013S) (acquired at: → www.endress.com → Download).

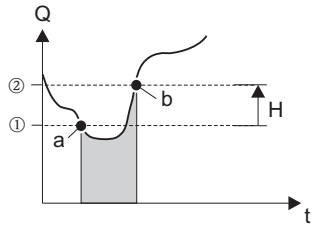
"Flow" Transducer Block/base index 1400		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Access - Code	AUTO - OOS	All data of the measuring system are protected against inadvertent change. Only when the code has been entered in this parameter can the manufacturer-specific parameters be programmed and the device configuration modified. You can enable programming by entering: ■ Code 53 (factory setting) ■ Personal code (→ Page 102) **User input:** Max. 4-digit number (0 to 9999) ✎ Note! ■ If the write protection is enabled then access to the manufacturer-specific parameters is blocked even if the right code is entered. Write protection can be activated and deactivated by means of jumpers on the I/O board (→ see Operating Instructions for Promag 53 FF, BA126D). ■ You can disable programming again by entering any number (other than the access code) in this parameter. ■ The Endress+Hauser service organization can be of assistance if you mislay your personal code. ■ Certain parameters are not accessible unless a special service code is entered. This service code is known only to the Endress+Hauser service organization. Please contact your Endress+Hauser service center if you require clarification. ■ The entry made here does not affect the local display. Thus, programming via the function matrix must be enabled separately.
Access - Status	read only	Use this parameter to display the current status of the possibilities for accessing the manufacturer-specific parameters of the device. **User interface:** ■ LOCKED (parameterization disabled) ■ ACCESS CUSTOMER (parameterization enabled) ■ ACCESS SERVICE (parameterization enabled, access to service level)

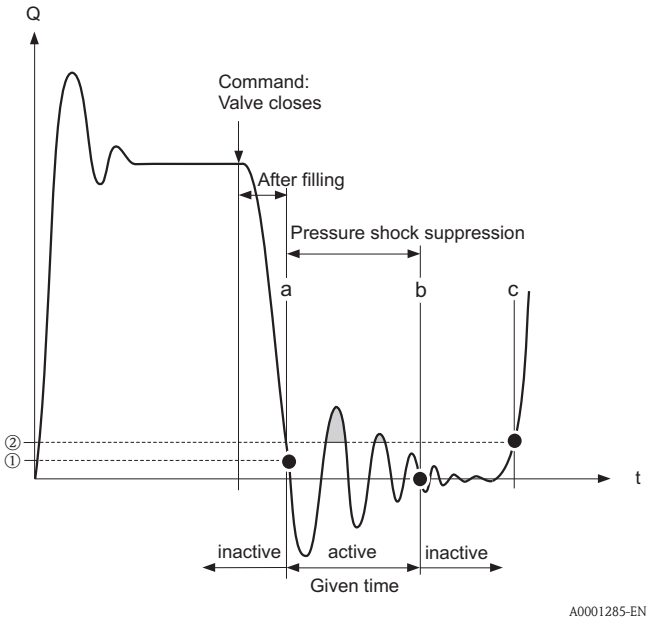
"Flow" Transducer Block/base index 1400		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
System Value - Volume Flow	read only	Use this parameter to view the current volume flow. The volume flow is made available as a process variable to the downstream Analog Input function blocks. ✎ Note! The unit is displayed in the "System Unit - Volume Flow" parameter (→ Page 83).
System Unit - Volume Flow	AUTO - OOS	Use this parameter to select the unit for the volume flow (volume/time). The unit you select here is also valid for: ■ Simulation ■ Low flow cut off ■ Display value (local display) **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 Kilo gallon → Kgal/s; Kgal/min; Kgal/h; Kgal/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 → Page 130 ff. ✎ Note! The unit selected here does not have any effect on the desired volume unit which should be transmitted by means of the FOUNDATION Fieldbus interface. This setting is made separately by means of the corresponding AI Block in the XD_SCALE parameter group.
System Value - Mass Flow	read only	Use this function to view the calculated mass flow. The mass flow is derived from the measured volume flow and the fixed density value (→ Page 94). The calculated mass flow is made available as a process variable to the downstream Analog Input function blocks. ✎ Note! The unit is displayed in the "System Unit - Mass Flow" parameter (→ Page 84).

"Flow" Transducer Block/base index 1400		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
System Unit - Mass Flow	AUTO - OOS	Use this parameter to select the unit for the mass flow (mass/time). The unit you select here is also valid for: ■ Simulation ■ Low flow cut off ■ Display value (local display) **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 (US); oz/min (US); oz/h (US); oz/day (US) 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 → Page 130 ff. ✎ Note! The unit selected here does not have any effect on the desired mass flow unit which should be transmitted by means of the FOUNDATION Fieldbus interface. This setting is made separately by means of the corresponding AI Block in the XD_SCALE parameter group.
System Value - Fixed Density	read only	Use this function to view the set density. This density value can be modified by means of the "Density Param. - Fixed Value" parameter (→ Page 94). **Factory setting:** 1 ✎ Note! The unit is displayed in the "System Unit - Fixed Density" parameter (→ Page 84).
System Unit - Fixed Density	AUTO - OOS	Use this parameter to select the unit for displaying the fluid density. The unit you select here is also valid for: ■ Density entry "Density Param. - Fixed Value", → Page 94) **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; g/l 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:** kg/l (SI units: not for USA and Canada) g/cc (US units: only for USA and Canada) SD = Specific Density, SG = Specific Gravity The specific density is the ratio of fluid density to water density (at water temperature = 4, 15, 20 °C).

"Flow" Transducer Block/base index 1400		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
System Unit - Length	AUTO - OOS	Use this parameter 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 ("Sensor Data - Nominal Diameter", → Page 94) **Options:** MILLIMETER INCH **Factory setting:** MILLIMETER (SI units: not for USA and Canada) INCH (US units: only for USA and Canada)
Sys. - Install. Direction Sensor	AUTO - OOS	Use this parameter to reverse the sign of the flow measured variable, if necessary. **Options:** NORMAL FORWARD (flow as indicated by the arrow) INVERSE REVERSE (flow opposite to direction indicated by the arrow) **Factory setting:** NORMAL FORWARD ✎ Note! Ascertain the actual direction of fluid flow with reference to the direction indicated by the arrow on the sensor (nameplate).
Sys. - System Damping	AUTO - OOS	Use this function to set the filter depth of the digital filter. This reduces the sensitivity of the measuring signal to interference peaks (e.g. high solids content, gas bubbles in the fluid, etc.). The reaction time of the measuring system increases with every increase in the filter setting. The damping acts on all parameters and on all downstream function blocks. **User input:** 0…15 **Factory setting:** 7 ✎ Note! The system damping acts on all functions and outputs of the measuring device.
Sys. - Integration Time	AUTO - OOS	Use this function to view the set integration time. The integration time defines the duration of internal totaling of the induced voltage in the fluid (measured by the measuring electrode), i.e. the time in which the measuring device records the true flow (afterwards the magnetic field for the next integration is created from the opposite pole). **User interface:** Max. 2-digit number: 1 to 65 ms **Factory setting:** 5 ms

"Flow" Transducer Block/base index 1400		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Sys. - Positive Zero Return	AUTO - OOS	Use this parameter to interrupt evaluation of measured variables. This is necessary when a piping system is being cleaned, for example. This setting acts on all parameter and calculations of the measuring device. **Options:** Off (signal output not interrupted) ON (signal output is set to the value for "Positive zero return" or "Zero flow") **Factory setting:** OFF ✎ Note! ■ If positive zero return is active, a flow value of "0" is output via the output value OUT (AI Block). ■ Active positive zero return is relayed to downstream function blocks or higher-order process control systems by means of the status UNCERTAIN of the output value OUT (AI Block). ■ Positive zero return can also be controlled using cyclic data transfer via the Discrete Output function block.
Sys. - Special Filter	AUTO - OOS	There is the option of activating two signal filters in this parameter. These filters make it possible to either suppress the signal caused by severely fluctuating flows (STANDARD option) or to reproduce it completely – both on the display and at the FOUNDATION Fieldbus output (DYNAMIC FLOW option). **Options:** STANDARD For signal output with normal, stable flow. DYNAMIC FLOW For signal output with severely fluctuating or pulsating flow. **Factory setting:** STANDARD ☞ Caution! ■ The signal behavior at the outputs also depends on the "Sys.-Flow Damping" parameter. ■ Additional filter settings (e.g. STANDARD CIP or DYNAMIC FLOW CIP) can only be selected with the aid of a special service code. Such settings, which are normally made by a service technician, are deleted, however, when the private code is entered again and can then no longer be activated!
Sys. - CIP Samples	AUTO - OOS	This parameter is only used in the event of a service.
Sys. - Permanent Storage	read only	This parameter indicates whether permanent saving of all parameters in the EEPROM is switched on or off. **User interface:** OFF ON **Factory setting:** ON

"Flow" Transducer Block/base index 1400		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Low Flow Cut Off - Assign	AUTO - OOS	Use this parameter to assign the switch point for the low flow cut off. **Options:** OFF VOLUME FLOW MASS FLOW **Factory setting:** VOLUME FLOW
Low Flow Cut Off - On Value	AUTO - OOS	Use this function to specify the switch-on point for low flow cut off. Low flow cut off is active if the value entered is not equal to 0. **User input:** 5-digit floating-point number [unit] **Factory setting:** Depends on nominal diameter and country → Page 130 ff. ✎ Note! ■ When the low flow cut off is triggered, a flow value of "0" is output via the output value OUT (AI Block). In addition, the status changes to UNCERTAIN. ■ Choice of unit: see "Low Flow Cut Off - Unit" parameter (→ Page 87).
Low Flow Cut Off - Unit	read only	Use this parameter to view the unit for the low flow cut off. ✎ Note! The unit for low flow cut off is determined by means of the "System Unit - Volume Flow" or "System Unit - Mass Flow" parameter (→ Page 83 ff.).
Low Flow Cut Off - Off Value	AUTO - OOS	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 (**a**). **User input:** Integer 0 to 100% **Factory setting:** 50%  A0003882 *① = switch-on point , ② = switch-off point* *a* *Low flow cut off is switched on* *b* *Low flow cut off is switched off (a + a · H)* *H* *Hysteresis value: 0 to 100%* ■ *Low flow cut off active* *Q* *Flow*

"Flow" Transducer Block/base index 1400		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Process - Pressure Shock Suppression	AUTO - OOS	The closure of a valve can cause brief but severe movements of the fluid in the piping system, movements which the measuring system registers. The pulses totaled in this way result in a totalizer reading error, particularly in the case of batching processes. For this reason, the measuring device is equipped with pressure shock suppression (= short-term signal suppression) which can eliminate system-related "disruptions". ✎ Note! Note that pressure shock suppression cannot be used unless the low flow cut off is active (see the "Low Flow Cut Off - On Value" parameter → Page 87). Use this function to define the time span for active pressure shock suppression. **Activation of pressure shock suppression** Pressure shock suppression is activated once the flow falls below the switch-on point of the low flow cut off (see point **a** in graphic). While pressure shock suppression is active, the following conditions apply: ■ Flow reading on display → 0 ■ Totalizer reading → The totalizers are pegged at the last correct value. **Deactivation of pressure shock suppression** The pressure shock suppression is deactivated after the time interval, set in this function, has passed (see point **b**). ✎ Note! The actual flow value is displayed and output, when the time interval for the pressure shock suppression has passed and the flow exceeds the switch-off point of the low flow cut off (see point **c** in graphic).  *① = on value (low flow cut off), ② = off value (low flow cut off)* **User input:** Max. 4-digit number, incl. unit: 0.00 to 100.0 s **Factory setting:** 0.00 s

"Flow" Transducer Block/base index 1400		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
EPD - Adjustment	AUTO - OOS	Use this parameter to perform EPD adjustment 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. Make sure that hardware write protection is switched off (→ see Operating Instructions for Promag 53 FF, BA0126). 2. In the configuration program, open the "Flow" Transducer Block. 3. Enable the configuration of the device by means of the "Access - Code" parameter (→ Page 82). Check the status by means of the "Access - Status" parameter → ACCESS CUSTOMER (→ Page 82). 4. Empty the pipe. For the following empty pipe adjustment, the wall of the measuring tube should still be wetted with fluid. 5. Start empty pipe adjustment: In this parameter, select the ".... EMPTY PIPE ADJUST" setting and start empty pipe adjustment by sending the setting to the field device. 6. After empty pipe adjustment, fill the piping with fluid. 7. Start full pipe adjustment with fluid at a standstill: In this parameter, select the ".... FULL PIPE ADJUST" setting and start full pipe adjustment by sending the setting to the field device. 8. Having completed the adjustment, select the setting "OFF" and exit the function by sending the setting to the field device. 9. Select "EPD - Empty Pipe Detection" parameter (→ Page 90) and switch on empty pipe detection by selecting the setting "ON". Caution! The adjustment values must be valid before you can switch on the EPD function. If calibration is faulty, the following messages are output in the "Diagnosis" Transducer Block via the "Diag. - Act.Sys.Condition" parameter (→ Page 97): ■ EPD adjustment wrong - Err. No. 463: The adjustment values for empty pipe and full pipe are identical. EPD adjustment must be repeated. This error is relayed to downstream function blocks or higher-order process control systems by means of the status "BAD" of the output value OUT (AI Block). ■ EPD adjustment not possible - Err. No. 461: Adjustment is not possible as the fluid conductivity values are outside the permitted range. This error is relayed to downstream function blocks or higher-order process control systems by means of the status "UNCERTAIN" of the output value OUT (AI Block).

"Flow" Transducer Block/base index 1400		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
EPD - Empty Pipe Detection	AUTO - OOS	This status can be monitored at all times with the Empty Pipe Detection function. To do this, the empty pipe detection (EPD, empty pipe detection by means of EPD electrode) can be activated in this function: **Options:** OFF ON STANDARD **Factory setting:** OFF ✎ Note! ■ The option ON STANDARD is not available unless the sensor is equipped with an EPD electrode (see "EPD - Electrode" parameter, → Page 91). ■ The default setting for the EPD function when the device is delivered is OFF. The function must be activated as required. ■ The devices are already calibrated at the factory with water (approx. 500 µS/cm). If the conductivity of certain fluids deviates from this reference, empty pipe/full pipe adjustment must be performed again on site (see "EPD - Adjustment" parameter → Page 89). ■ The adjustment coefficients must be valid before you can switch on the EPD function (see "EPD - Adjustment" → Page 89). ■ If there are problems with the adjustment, the following error messages appear on the screen: – EPD adjustment wrong - Err. No. 463: The adjustment values for empty pipe and full pipe are identical. In such instances, empty pipe adjustment/full pipe adjustment **must** be carried out **again**. – EPD adjustment not possible - Err. No. 461: 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 tube is completely full. This status can be monitored at all times with the EPD function. ■ 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. ■ A plausibility check of the adjustment values will only be executed by activating the empty pipe detection. If an empty or full pipe adjustment is performed when empty pipe detection is active, the empty pipe detection has to be deactivated and activated again after finishing the adjustment in order to start the plausibility check. **Response to partially filled pipes** If the EPD function is switched on and is triggered by a partially empty or completely empty pipe, this is indicated in the "Diag. - Act.Sys.Condition" parameter (→ Page 97) of the "Diagnosis" Transducer Block with the error message "Empty Pipe detected - Err. No. 401". This process error is relayed to downstream function blocks or higher-order process control systems by means of the status "UNCERTAIN" of the output value OUT (AI Block). 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

"Flow" Transducer Block/base index 1400		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
EPD - Response Time	AUTO - OOS	Use this parameter to enter the time span in which the criteria for an empty pipe have to be satisfied without interruption before an error message is generated. **User input:** fixed point number: 1.0 to 100 s **Factory setting:** 1.0 s
EPD - Threshold	read only	This parameter is only used in the event of a service.
EPD - Electrode	AUTO - OOS	Use this parameter to check whether the sensor is equipped with an EPD electrode. **User interface:** YES - NO **Factory setting:** YES → Electrode fitted as standard
EPD - Empty Pipe Coef.	read only	This parameter is only used in the event of a service.
EPD - Full Pipe Coef.	read only	This parameter is only used in the event of a service.
OED - Period	read only	This parameter is only used in the event of a service.
OED - Empty Value	read only	This parameter is only used in the event of a service.
OED - Full Value	read only	This parameter is only used in the event of a service.
System Option - ECC	read only	This parameter is only used in the event of a service.

"Flow" Transducer Block/base index 1400		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
ECC	AUTO - OOS	✎ Note! This function is only available if the measuring device is equipped with an electrode cleaning function (optional). Use this function to enable cyclic electrode cleaning (ECC). **Options:** ON (only with the optional electrode cleaning function ECC) OFF **Factory setting:** ON (only if the optional electrode cleaning function ECC is available) **Notes on electrode cleaning (ECC)** Conductive deposits on the electrodes and on the walls of the measuring tube (e.g. magnetite) can falsify measurement values. The Electrode Cleaning Circuitry (ECC) was developed to prevent such conductive deposits accreting in the vicinity of the electrodes. ECC functions as described above for all available electrode materials except tantalum. If tantalum is used as the electrode material, the ECC protects the electrode surface only against oxidation. ☝ Caution! If the ECC is switched off for a prolonged period in applications with conductive deposits, a layer forms inside the measuring tube and this can falsify measurement values. If the layer is allowed to accrete beyond a certain level, it might no longer be possible to remove it by switching on the ECC. If this happens the measuring tube must be cleaned and the layer removed.
ECC - Duration	AUTO - OOS	✎ Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to specify the electrode cleaning duration. **User input:** Fixed-point number: 0.01 to 30.0 s **Factory setting:** 2.0 s

"Flow" Transducer Block/base index 1400		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
ECC - Recovery Time	AUTO - OOS	✎ Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to specify the recovery time for which the last flow value measured prior to cleaning is retained. A recovery time is necessary as the signal outputs can fluctuate after electrode cleaning on account of electrochemical interference voltages. **User input:** Max. 3-digit number: 1 to 600 s **Factory setting:** 60 s ☝ Caution! The last value measured prior to cleaning is output for the duration of the recovery time (max. 600 s). This in turn means that the measuring system does not register changes in flow, e.g. stoppage, during this time span.
ECC - Cycle	AUTO - OOS	✎ Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to specify the cleaning cycle for electrode cleaning. **User input:** Integer: 30 to 10080 min **Factory setting:** 40 min
ECC - Polarity	read only	Use this function to display the actual current polarity for optional electrode cleaning (ECC). Electrode cleaning uses either a positive or negative current, depending on the electrode material. The measuring device automatically selects the correct polarity on the basis of the electrode material data stored in the S-DAT. **User interface:** POSITIVE For electrodes made of 1.4435/316L, Alloy C-22, platinum, titanium, tungsten carbide coating (for electrodes made of 1.4435), 1.4310/302. NEGATIVE For electrodes made of tantalum. ☝ Caution! If the incorrect current is applied to the electrodes, the electrode material is destroyed.

"Flow" Transducer Block/base index 1400		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Density Param. - Fixed Value	AUTO - OOS	Use this parameter to enter a density factor (preferably at process temperature or reference temperature) which is used to convert the volume flow to a mass flow. ✎ Note! The unit is taken from the "Density Param. - Unit" parameter (→ Page 94). **User input:** 5-digit floating-point number **Factory setting:** 1 [unit]
Density Param. - Unit	read only	Use this function to display the unit selected in the "System Unit - Fixed Density" parameter for the fixed density value (→ Page 84).
Sensor Data - K-Factor	AUTO - OOS	Use this function to display the actual calibration factor (positive and 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 to 2.0000 **Factory setting:** Depends on nominal diameter and calibration
Sensor Data - Zero Point	AUTO - OOS	Use this function to view the actual zero-point correction value for the sensor. Zero-point correction is determined and set at the factory. **User interface:** Max. 4-digit number: –1000 to +1000 **Factory setting:** Depends on nominal diameter and calibration
Sensor Data - Nominal Diameter	AUTO - OOS	Use this function to view the nominal diameter of the sensor. The nominal diameter depends on the size of the sensor and is set at the factory. **User interface:** 2 to 2000 mm or 1/12 to 78" **Factory setting:** Depends on the size of the sensor

"Flow" Transducer Block/base index 1400		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Sensor Data - Measuring Period	AUTO - OOS	Use this function to view the 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 and the empty pipe detection time. **User interface:** Max. 4-digit number: 10 to 1000 ms **Factory setting:** Depends on nominal diameter ✎ Note! The system checks the time entered and sets the measuring period which is actually used internally to a plausible value. If you enter 0 ms, the system automatically computes the shortest time.
Sensor Data - Overvoltage Time	read only	This parameter is only used in the event of a service.
Simulation - Measurand	AUTO - OOS	Use this parameter to activate the simulation of the volume flow/mass flow. **Options:** OFF VOLUME FLOW MASS FLOW **Factory setting:** OFF ☞ Caution! ■ The measuring device cannot be used for measuring while this simulation is in progress. ■ The simulation acts independently of the position of the jumpers on the I/O board (→ see Operating Instructions for Promag 53 FF, BA126D). ■ The setting is not saved if the power supply fails. ✎ Note! Active simulation is relayed to downstream function blocks or higher-order process control systems by means of the status UNCERTAIN of the output value OUT (AI Block).
Simulation - Value Measurand	AUTO - OOS	Use this parameter to specify a selectable value (e.g. 12 m^3/s). This is used to test the associated parameters in the device itself and downstream signal loops. **User input:** 5-digit floating-point number **Factory setting:** 0 [unit] ✎ Note! The unit is taken from the "System Unit - Volume Flow" or "System Unit - Mass Flow" parameter (→ Page 83 ff.). ☞ Caution! The setting is not saved if the power supply fails.

"Flow" Transducer Block/base index 1400		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Simulation - Unit	read only	Use this parameter to display the current unit for the simulation value in the "Simulation - Measurand Value" parameter. ✎ Note! The unit can be selected in the "System Unit - Volume Flow" or "System Unit - Mass Flow" parameter (→ Page 83).
Service/Analys. - Measuring Period	read only	This parameter is only used in the event of a service.
Service/Analys. - Risetime	read only	This parameter is only used in the event of a service.
Service/Analys. - Electrode Pot. 1	read only	This parameter is only used in the event of a service.
Service/Analys. - Electrode Pot. 2	read only	This parameter is only used in the event of a service.
Sensor - Type	read only	Use this function to view the sensor type.
Sensor - SW Rev.No.S-DAT	read only	Use this function to view the software revision number of the software used to create the content of the S-DAT.
Sensor - HW Rev.Number.	read only	Use this parameter to view the hardware revision number of the sensor.
Sensor - HW Identification	read only	Use this parameter to view the hardware ID number of the sensor.
Sensor - Prod.Number	read only	Use this parameter to view the production number of the sensor.
Amp. Device Type	read only	This parameter is only used in the event of a service.

3.4 Parameters of the "Diagnosis" Transducer Block

The following table shows all the Endress+Hauser-specific parameters of the "Diagnosis" Transducer Block. These can only be changed after entering an enabling code in the "Access - Code" parameter.

✎ Note!
FOUNDATION Fieldbus parameters are described in the "FOUNDATION Fieldbus Overview" Operating Instructions (BA013S) (acquired at: → www.endress.com → Download).

"Diagnosis" Transducer Block/base index 1600		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Diag. - Act. Sys. Condition	read only	Displays the current system status. ✎ Note! An exact error description as well as information on rectifying errors can be found in the Operating Instructions for Promag 53 FF (BA126D).
Diag. - Prev. Sys. Condition	read only	Displays the last error message that occurred.
Access - Code	AUTO - OOS	All data of the measuring system are protected against inadvertent change. Only when the code has been entered in this parameter can the manufacturer-specific parameters be programmed and the device configuration modified. You can enable programming by entering: ■ Code 53 (factory setting) ■ Personal code (→ Page 102) **User input:** Max. 4-digit number (0 to 9999) ✎ Note! ■ If the write protection is enabled then access to the manufacturer-specific parameters is blocked even if the right code is entered. Write protection can be activated and deactivated by means of jumpers on the I/O board (→ see Operating Instructions for Promag 53 FF, BA126D). ■ You can disable programming again by entering any number (other than the access code) in this parameter. ■ The Endress+Hauser service organization can be of assistance if you mislay your personal code. ■ Certain parameters are not accessible unless a special service code is entered. This service code is known only to the Endress+Hauser service organization. Please contact your Endress+Hauser service center if you require clarification. ■ The entry made here does not affect the local display. Thus, programming via the function matrix must be enabled separately.
Access - Status	read only	Use this parameter to display the current status of the possibilities for accessing the manufacturer-specific parameters of the device. **User interface:** ■ LOCKED (parameterization disabled) ■ ACCESS CUSTOMER (parameterization enabled) ■ ACCESS SERVICE (parameterization enabled, access to service level)

"Diagnosis" Transducer Block/base index 1600		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Sys. - Alarm Delay	AUTO - OOS	Use this parameter 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 ■ Output blocks (AI Blocks) FOUNDATION Fieldbus interface **User input:** 0 to 100 s (in steps of one second) **Factory setting:** 0 s ☝ Caution! If this parameter is used, fault and notice messages are delayed by the time corresponding to the setting before being forwarded to the downstream function blocks or the fieldbus host system. 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 cannot be suppressed, a value of 0 seconds must be entered here.
Sys. - Sim. Failsafe Mode	AUTO - OOS	Use this parameter to set the Analog Input and Totalizer function blocks to their defined failsafe modes in order to check whether they respond correctly. The failsafe mode of the totalizers is determined via the "Tot. - Failsafe All" parameter (→ Page 117). **Options:** OFF ON **Factory setting:** OFF ✎ Note! The active simulation mode is relayed to downstream function blocks or higher-order process control systems by means of the status "UNCERTAIN" of the output value OUT (AI Block).
Sys. - Reset	AUTO - OOS	Use this parameter to perform a reset of the measuring system. **Options:** NO RESTART SYSTEM (restart without interrupting power supply) ORIGINAL TRANSMITTER DATA **Factory setting:** NO

"Diagnosis" Transducer Block/base index 1600		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Sys. - Troubleshooting	AUTO - OOS	Use this parameter to rectify errors occurring in the EEPROM. The EEPROM is split into a number of blocks. The error is rectified by selecting the block in question and acknowledging. Caution! When eliminating faults in a block, the parameters of the block selected are also reset to the factory setting. **Options:** CANCEL MEASURING VALUES SYSTEM UNITS DENSITY PARAMETERS QUICK SETUP USER INTERFACE TOTALIZER COMMUNICATION PROCESSPARAMETER SYSTEM PARAMETER SENSOR DATA BATCH FUNCTION ADVANCED DIAGNOSIS AMPLIFIER PARAMETERS SUPERVISION VERSION-INFO SERVICE & ANALYSIS PRODUCTION INFO FILTER PARAMETER **Factory setting:** CANCEL
Sys. - Operation Time	read only	Use this function to view the total operating time since the flowmeter was commissioned (in seconds).
Sys. - Time Since Reset	read only	This parameter is only used in the event of a service.

"Diagnosis" Transducer Block/base index 1600		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Sys. - T-DAT Save/Load	AUTO - OOS	Use this parameter to save the parameter settings/configuration of the **transmitter** in a transmitter DAT (T-DAT), or to load the parameter settings from the T-DAT into the EEPROM (**manual** backup function). Application examples: ■ After commissioning, the actual 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 target device has an older software version, the message "TRANSM. SW-DAT" is displayed during startup. Then only the SAVE option is available. ■ LOAD This option is only possible if: – The target device has the same software version as, or a more recent software version than, the source device or – The T-DAT contains valid data that can be retrieved ■ SAVE This option is always available.

3.5 Parameters of the "Display" Transducer Block

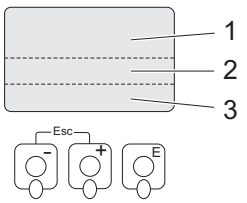
The following table shows all the Endress+Hauser-specific parameters of the "Display" Transducer Block. These can only be changed after entering an enabling code in the "Access - Code" parameter.

✎ Note!
FOUNDATION Fieldbus parameters are described in the "FOUNDATION Fieldbus Overview" Operating Instructions (BA013S) (acquired at: → www.endress.com → Download).

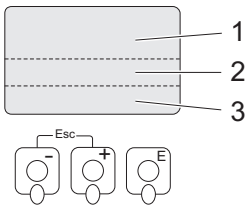
"Display" Transducer Block/base index 1800:		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Access - Code	AUTO - OOS	All data of the measuring system are protected against inadvertent change. Only when the code has been entered in this parameter can the manufacturer-specific parameters be programmed and the device configuration modified. You can enable programming by entering: ■ Code 53 (factory setting) ■ Personal code (→ Page 102) **User input:** Max. 4-digit number (0 to 9999) ✎ Note! ■ If the write protection is enabled then access to the manufacturer-specific parameters is blocked even if the right code is entered. Write protection can be activated and deactivated by means of jumpers on the I/O board (→ see Operating Instructions for Promag 53 FF). ■ You can disable programming again by entering any number (other than the access code) in this parameter. ■ The Endress+Hauser service organization can be of assistance if you mislay your personal code. ■ Certain parameters are not accessible unless a special service code is entered. This service code is known only to the Endress+Hauser service organization. Please contact your Endress+Hauser service center if you require clarification. ■ The entry made here does not affect the local display. Thus, programming via the function matrix must be enabled separately.
Access - Status	read only	Use this parameter to display the current status of the possibilities for accessing the manufacturer-specific parameters of the device. **User interface:** ■ LOCKED (parameterization disabled) ■ ACCESS CUSTOMER (parameterization enabled) ■ ACCESS SERVICE (parameterization enabled, access to service level)
Access - Code Counter	read only	Displays how often the customer code, service code or the digit "0" (code-free) has been entered to gain access to the function matrix. **User interface:** Max. 7-digit number: 0 to 9999999 **Factory setting:** 0

"Display" Transducer Block/base index 1800:		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Access - Def.Private Code	AUTO - OOS	Use this function to specify a personal code for enabling configuration. This applies to both manufacturer-specific parameters in the Transducer Blocks and to operating via the onsite display. **User input:** 0 to 9999 (max. 4-digit number) **Factory setting:** 53 ✎ Note! ■ Programming is always enabled with the code "0". ■ Parameter configuration has to be enabled before this code can be changed.
Config. - Language	AUTO - OOS	Use this parameter to select the language for all texts, parameters and messages shown on the local display. ✎ Note! The displayed options depend on the available language group shown in the "Amp. - Language Group" parameter. **OPTIONS:** Language group WEST EU / USA: ENGLISH DEUTSCH FRANCAIS ESPANOL ITALIANO NEDERLANDS PORTUGUESE Language group EAST EU / SCAND: ENGLISH NORSK SVENSKA SUOMI POLISH RUSSIAN CZECH Language group ASIA: ENGLISH BAHASA INDONESIA JAPANESE (syllabary) Language group CHINA: ENGLISH CHINESE **Factory setting:** Depends on country → Page 130 ff. ✎ Note! You can change the language group via the configuration program FieldCare. Please do not hesitate to contact your Endress+Hauser sales office if you have any questions.

"Display" Transducer Block/base index 1800:		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Config. - Display Damping	AUTO - OOS	Use this parameter 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 to 100 seconds **Factory setting:** 1 s ✎ Note! Setting the time constant to zero seconds switches off damping.
Config. - Contrast LCD	AUTO - OOS	Use this parameter to optimize display contrast to suit local operating conditions. **User input:** 10…100% **Factory setting:** 50%
Config. - Backlight	AUTO - OOS	Use this parameter to optimize the backlight to suit local operating conditions. **User input:** 0…100% ✎ Note! Entering the value "0" means that the backlight is "switched off". The display then no longer emits any light, i.e. the display texts can no longer be read in the dark. **Factory setting:** 50%
Operation - Test Display	AUTO - OOS	Use this parameter to test the operability of the local display and its pixels. **Options:** ON OFF **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 is completed, the local display returns to its initial state.

"Display" Transducer Block/base index 1800:		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
1 = Main line 2 = Additional line 3 = Information line		 A0001253
Main Line - Assign	AUTO - OOS	In this parameter, 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 % TOTALIZER (1 to 3) AI (1 to 5) - OUT VALUE AO - DISPLAY VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (external set point) PID - OUT VALUE (manipulated variable) **Factory setting:** VOLUME FLOW
Main Line - 100%-Value	AUTO - OOS	The entry is not active unless one of the following was selected in the parameter "Main Line - Assign": ■ MASS FLOW IN % ■ VOLUME FLOW 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 → Page 130 ff. ✎ Note! The unit is taken from the "System Unit - Volume Flow" or "System Unit - Mass Flow" parameter (→ Page 83 ff.).

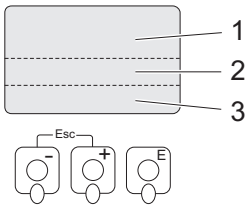
"Display" Transducer Block/base index 1800:		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Main Line - Format	AUTO - OOS	Use this parameter to define the maximum number of places after the decimal point displayed for the reading in the main line. **Options:** XXXXX. – XXXX.X – 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 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.
Main Line Mux - Assign	AUTO - OOS	Use this parameter to define the second reading to be displayed in the main line alternately (every 10 seconds) with the value defined in the parameter "Main Line - Assign". **Options:** OFF VOLUME FLOW MASS FLOW VOLUME FLOW IN % MASS FLOW IN % TOTALIZER (1 to 3) AI (1 to 5) - OUT VALUE AO - DISPLAY VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (external set point) PID - OUT VALUE (manipulated variable) **Factory setting:** OFF
Main Line Mux - 100%-Value	AUTO - OOS	✎ Note! The entry is not active unless one of the following was selected in the parameter "Main Line Mux - Assign": ■ MASS FLOW IN % ■ VOLUME FLOW IN % Use this parameter 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 → Page 130 ff. ✎ Note! The unit is taken from the "System Unit - Volume Flow" or "System Unit - Mass Flow" parameter (→ Page 83 ff.).

"Display" Transducer Block/base index 1800:		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Main Line Mux - Format	AUTO - OOS	Use this parameter 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 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.
1 = Main line **2 = Additional line** 3 = Information line		 A0001253
Add. Line - Assign	AUTO - OOS	Use this parameter to define the display value assigned to the additional line (the middle line of the local display) during normal measuring operation. **Options:** OFF VOLUME FLOW MASS FLOW VOLUME FLOW IN % MASS FLOW IN % VOLUME FLOW BARGRAPH IN % MASS FLOW BARGRAPH IN % FLOW VELOCITY TOTALIZER (1 to 3) AI (1 to 5) - OUT VALUE AO - DISPLAY VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (external set point) PID - OUT VALUE (manipulated variable) DEVICE PD-TAG (tag name) **Factory setting:** TOTALIZER 1

"Display" Transducer Block/base index 1800:		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Add. Line - 100%-Value	AUTO - OOS	✎ Note! The entry is not active unless one of the following was selected in the parameter "Add. Line - Assign": ■ MASS FLOW IN % ■ VOLUME FLOW IN % ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH IN % Use this parameter to define the flow value to be shown on the display as the 100% value. 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 → Page 130 ff. ✎ Note! The unit is taken from the corresponding system unit ("System Unit - Volume Flow" or "System Unit - Mass Flow").
Add. Line - Format	AUTO - OOS	✎ Note! The option is not active unless a number was selected in the parameter "Add. Line - Assign". Use this parameter 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 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" Transducer Block/base index 1800:		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Add. Line - Display Mode	AUTO - OOS	✎ Note! The option is not active unless one of the following was selected in the parameter "Add. Line - Assign": ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH IN % Use this parameter to define the format of the bar graph. **Options:** STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign).  A0001258 SYMMETRY (Symmetrical bar graph for positive and negative directions of flow, with –50 / 0 / +50% gradations and integrated sign).  A0001259 **Factory setting:** STANDARD
Add. Line Mux - Assign	AUTO - OOS	Use this parameter to define the second reading to be displayed in the additional line alternately (every 10 seconds) with the value defined in the parameter "Add. Line - Assign" (→ Page 106). **Options:** OFF VOLUME FLOW MASS FLOW VOLUME FLOW IN % MASS FLOW IN % VOLUME FLOW BARGRAPH IN % MASS FLOW BARGRAPH IN % FLOW VELOCITY TOTALIZER (1 to 3) AI (1 to 5) - OUT VALUE AO - DISPLAY VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (external set point) PID - OUT VALUE (manipulated variable) DEVICE PD-TAG (tag name) **Factory setting:** OFF ✎ Note! Multiplex mode is suspended as soon as a fault / notice message is generated. The message in question appears on the display. Once the fault is eliminated, the measuring device resumes operation in Multiplex mode and the error message is no longer displayed on the local display.

"Display" Transducer Block/base index 1800:		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Add. Line Mux - 100%-Value	AUTO - OOS	✎ Note! The entry is not active unless one of the following was selected in the parameter "Add. Line Mux - Assign": ■ MASS FLOW IN % ■ VOLUME FLOW IN % ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH IN % Use this parameter 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 → Page 130 ff. ✎ Note! The unit is taken from the corresponding system unit ("System Unit - Volume Flow" or "System Unit - Mass Flow").
Add. Line Mux - Format	AUTO - OOS	✎ Note! The option is not active unless a number was selected in the parameter "Add. Line Mux - Assign" (→ Page 108). Use this parameter 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 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" Transducer Block/base index 1800:		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Add. Line Mux - Display Mode	AUTO - OOS	✎ Note! The option is not active unless one of the following was selected in the parameter "Add. Line Mux - Assign" (→ Page 108): ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH IN % Use this parameter to define the format of the bar graph. **Options:** STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign).  A0001258 SYMMETRY (Symmetrical bar graph for positive and negative directions of flow, with –50 / 0 / +50% gradations and integrated sign).  A0001259 **Factory setting:** STANDARD
1 = Main line 2 = Additional line **3 = Information line**		 A0001253
Info Line - Assign	AUTO - OOS	Use this parameter to define the display value assigned to the information line (the bottom line of the local display) during normal measuring operation. **Options:** OFF VOLUME FLOW IN % MASS FLOW IN % VOLUME FLOW BARGRAPH IN % MASS FLOW BARGRAPH IN % FLOW VELOCITY OPERATING/SYSTEM CONDITIONS DISPLAY FLOW DIRECTION TOTALIZER (1 to 3) AI (1 to 5) - OUT VALUE AO - DISPLAY VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (external set point) PID - OUT VALUE (manipulated variable) DEVICE PD-TAG (tag name) **Factory setting:** OPERATING/SYSTEM CONDITIONS

"Display" Transducer Block/base index 1800:		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Info Line - 100%-Value	AUTO - OOS	✎ Note! The entry is not active unless one of the following was selected in the parameter "Info Line - Assign" (→ Page 110): ■ MASS FLOW IN % ■ VOLUME FLOW IN % ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH IN % Use this parameter to define the flow value to be shown on the display as the 100% value. 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 → Page 130 ff. ✎ Note! The unit is taken from the corresponding system unit ("System Unit - Volume Flow" or "System Unit - Mass Flow").
Info Line - Format	AUTO - OOS	✎ Note! The option is not active unless a number was selected in the parameter "Info Line - Assign" (→ Page 110). Use this parameter 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 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" Transducer Block/base index 1800:		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Info Line - Display Mode	AUTO - OOS	✎ Note! The option is not active unless one of the following was selected in the parameter "Info Line - Assign" (→ Page 110): ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH IN % Use this parameter to define the format of the bar graph. **Options:** STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign).  A0001258 SYMMETRY (Symmetrical bar graph for positive and negative directions of flow, with –50 / 0 / +50% gradations and integrated sign).  A0001259 **Factory setting:** STANDARD
Info Line Mux - Assign	AUTO - OOS	Use this parameter to define the second reading to be displayed in the information line alternately (every 10 seconds) with the value defined in the parameter "Info. Line - Assign" (→ Page 110). **Options:** OFF VOLUME FLOW IN % MASS FLOW IN % VOLUME FLOW BARGRAPH IN % MASS FLOW BARGRAPH IN % FLOW VELOCITY OPERATING/SYSTEM CONDITIONS DISPLAY FLOW DIRECTION TOTALIZER (1 to 3) AI (1 to 5) - OUT VALUE AO - DISPLAY VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (external set point) PID - OUT VALUE (manipulated variable) DEVICE PD-TAG (tag name) **Factory setting:** OFF ✎ Note! Multiplex mode is suspended as soon as a fault / notice message is generated. The message in question appears on the display. Once the fault is eliminated, the measuring device resumes operation in Multiplex mode and the error message is no longer displayed on the local display.

"Display" Transducer Block/base index 1800:		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Info Line Mux - 100%-Value	AUTO - OOS	✎ Note! The entry is not active unless one of the following was selected in the parameter "Info Line Mux - Assign" (→ Page 112): ■ MASS FLOW IN % ■ VOLUME FLOW IN % ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH IN % Use this parameter 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 → Page 130 ff. ✎ Note! The unit is taken from the corresponding system unit ("System Unit - Volume Flow" or "System Unit - Mass Flow").
Info Line Mux - Format	AUTO - OOS	✎ Note! The option is not active unless a number was selected in the parameter "Info Line Mux - Assign" (→ Page 112). Use this parameter to define the maximum number of places after the decimal point for the second value displayed 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" Transducer Block/base index 1800:		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Info Line Mux - Display Mode	AUTO - OOS	✎ Note! The option is not active unless one of the following was selected in the parameter "Info Line Mux - Assign" (→ Page 112): ■ MASS FLOW BARGRAPH IN % ■ VOLUME FLOW BARGRAPH IN % Use this parameter to define the format of the bar graph. **Options:** STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign).  A0001258 SYMMETRY (Symmetrical bar graph for positive and negative directions of flow, with –50 / 0 / +50% gradations and integrated sign).  A0001258 **Factory setting:** STANDARD

3.6 Parameters of the "Totalizer" Transducer Block

The following table shows all the Endress+Hauser-specific parameters of the "Totalizer" Transducer Block. These can only be changed after entering an enabling code in the "Access - Code" parameter.

✎ Note!
FOUNDATION Fieldbus parameters are described in the "FOUNDATION Fieldbus Overview" Operating Instructions (BA013S) (acquired at: → www.endress.com → Download).

"Totalizer" Transducer Block/base index 1900:		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Access - Code	AUTO - OOS	All data of the measuring system are protected against inadvertent change. Only when the code has been entered in this parameter can the manufacturer-specific parameters be programmed and the device configuration modified. You can enable programming by entering: ■ Code 53 (factory setting) ■ Personal code (→ Page 102) **User input:** Max. 4-digit number (0 to 9999) ✎ Note! ■ If the write protection is enabled then access to the manufacturer-specific parameters is blocked even if the right code is entered. Write protection can be activated and deactivated by means of jumpers on the I/O board (→ see Operating Instructions for Promag 53 FF, BA126D). ■ You can disable programming again by entering any number (other than the access code) in this parameter. ■ The Endress+Hauser service organization can be of assistance if you mislay your personal code. ■ Certain parameters are not accessible unless a special service code is entered. This service code is known only to the Endress+Hauser service organization. Please contact your Endress+Hauser service center if you require clarification. ■ The entry made here does not affect the local display. Thus, programming via the function matrix must be enabled separately.
Access - Status	read only	Use this parameter to display the current status of the possibilities for accessing the manufacturer-specific parameters of the device. **User interface:** ■ LOCKED (parameterization disabled) ■ ACCESS CUSTOMER (parameterization enabled) ■ ACCESS SERVICE (parameterization enabled, access to service level)

"Totalizer" Transducer Block/base index 1900:		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Tot. 1 to 3 - Sum	AUTO - OOS	Use this parameter 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 parameter "Tot. 1 to 3 - Mode" (→ Page 117), and the direction of flow. ✎ Note! ■ The effect of the setting in the parameter "Tot. 1 to 3 - Mode" 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 parameter "Tot. - Failsafe All".
Tot. 1 to 3 - Unit	AUTO - OOS	Use this parameter 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 → Page 130 ff. **Options (for VOLUME FLOW assignment):** Metric → cm^3; dm^3; m^3; ml; l; hl; Ml Mega US → cc; af; ft^3; oz f; gal; Kgal; 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 → Page 130 ff. ✎ Note! The unit selected here does not have any effect on the desired volume unit which should be transmitted by means of the FOUNDATION Fieldbus interface. This setting is made separately by means of the corresponding AI Block in the XD_SCALE parameter group.
Tot. 1 to 3 - Assign	AUTO - OOS	Use this parameter to assign a measured variable to the totalizer. **Options:** OFF MASS FLOW VOLUME FLOW **Factory setting:** VOLUME FLOW ✎ Note! The totalizer is reset to "0" as soon as the selection is changed.

"Totalizer" Transducer Block/base index 1900:		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Tot. 1 to 3 - Mode	AUTO - OOS	Use this parameter to define how the flow components are to be totaled by the totalizer. **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 = FORWARD Totalizer 3 = REVERSE
Tot. 1 to 3 - Reset	AUTO - OOS	Resets the totalizer ("Tot. 1 to 3 - Sum" parameter) to zero. **Options:** NO YES **Factory setting:** NO ✎ Note! Totalizer resetting can also be controlled or triggered by means of cyclic data transfer via the Discrete Output function block.
Tot. - Reset All	AUTO - OOS	Resets all totalizers ("Tot. 1 to 3 - Sum" parameter) simultaneously to zero. **Options:** NO YES **Factory setting:** NO ✎ Note! Totalizer resetting can also be controlled or triggered by means of cyclic data transfer via the Discrete Output function block.
Tot. - Failsafe All	AUTO - OOS	Use this parameter to define the common response of all totalizers (1 to 3) in case of error. **Options** STOP → The totalizers are paused until the fault is rectified. ACTUAL VALUE → The totalizers continue to count based on the actual flow measured value. The fault is ignored. HOLD VALUE → The totalizers continue to count the flow based on the last valid flow value (before the fault occurred). **Factory setting:** STOP

4 Function blocks

The function blocks contain the basic automation functions of the field device. We distinguish between different function blocks, e.g. Analog Input function block, PID function block (PID controller), etc.

Each of these function blocks is used to execute different application functions. This means that local control functions, for example, can be carried out directly in the field, and device errors such as amplifier errors are reported to the automation system automatically.

The function blocks process the input values in accordance with their specific algorithm and their internally available parameters. They generate output values that are made available to other function blocks for further processing by linking the individual function blocks with each other.

5 Analog Input function block

In the Analog Input function block (AI) the process variables from the Transducer Block are prepared for the subsequent automation functions (e.g. scaling, limit value processing). The automation function is defined by the connections of the outputs.

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OUT = output value and output status of the Analog Input function block

5.1 Signal processing

The figure shows the internal structure of the Analog Input function blocks:

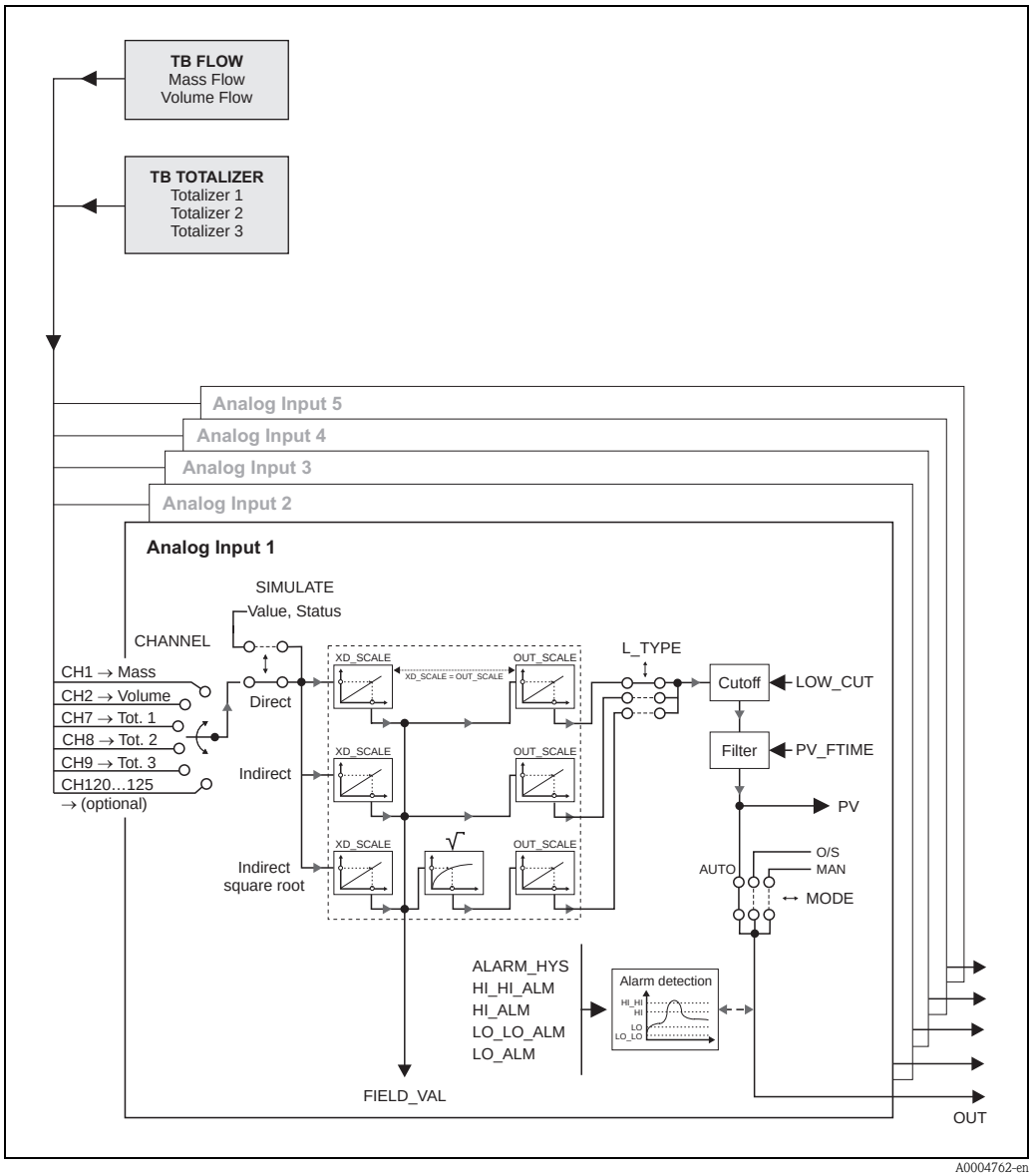

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Fig. 3: Internal structure of the individual Analog Input function blocks

The Analog Input function block receives its input value from the Transducer Block.
The parameter CHANNEL is used to select which input value is to be processed by the Analog Input function block. The ProdType is configured in the factory as follows:

- CHANNEL = 1 → Calculated mass flow
- CHANNEL = 2 → Volume flow
- CHANNEL = 7 → Totalizer 1
- CHANNEL = 8 → Totalizer 2
- CHANNEL = 9 → Totalizer 3

The parameter group SIMULATE allows you to replace the input value with a simulation value and to activate simulation. By specifying the status and the simulation value the reaction of the complete Analog Input function block can be tested.

Note!
The simulation mode is enabled by means of the corresponding jumpers on the I/O board (→ see Operating Instructions for Promag 53 FF, BA126D).

The parameter L_TYPE is used to select the linearization type of the input or simulation value:

- Direct signal conversion
  The value is forwarded without conversion (XD_SCALE = OUT_SCALE). Select this option if the input value is already in the physical unit you want.

- Indirect signal conversion
  With this setting the measured value from the Transducer Block (input value) is re-scaled linearly via the input scaling XD_SCALE to the desired output range OUT_SCALE (further information on rescaling of the input value can be found on → Page 123).

- Indirect signal conversion with square root
  With this setting the measured value from the Transducer Block (input value) is re-scaled via the parameter group XD_SCALE and recalculated using a square root function. It is then rescaled again to the desired output range via the parameter group OUT_SCALE.

The parameter LOW_CUT allows a limit value to be specified for the low flow cut off. The low flow cut off is activated via the parameter IO_OPTS. If the converted primary value (PV) is below the limit value then it is set to a value of "Zero".

In the parameter PV_FTIME a filter time can be specified for filtering the converted primary value (PV). If a time of 0 seconds is specified then no filtration takes place.

The parameter group MODE_BLK is used to select the operating mode of the Analog Input function block. If the operating mode MAN (manual) is selected then the output value OUT can be specified directly.

The output value OUT is compared with warning and alarm limits (e.g. HI_LIM, LO_LO_LIM, etc.) that can be entered via various parameters. If one of these limit values is violated then a limit value process alarm (e.g. HI_ALM, LO_LO_ALM, etc.) is triggered.

5.2 Important functions and parameters of the Analog Input function blocks

The primary functions and parameters of the Analog Input function blocks are listed below.

✎ Note!
All FOUNDATION Fieldbus parameters available are described in the "FOUNDATION Fieldbus Overview" Operating Instructions (BA013S) (acquired at: → www.endress.com → Download).

5.2.1 Selecting the operating mode

The operation mode is set by means of the MODE_BLK parameter group. The Analog Input function block supports the following operation modes:
- AUTO (automatic mode)
- MAN (manual mode)
- OOS (out of service)

✎ Note!
The block status OOS is also shown via the parameter BLOCK_ERR. In operating mode OOS, if write protection is not enabled, you can access all the write parameters without restriction.

5.2.2 Assignment of the process variable

The ProdType has five Analog Input function blocks. The process variables of the Transducer Block that are to be processed are assigned via the parameter CHANNEL. The ProdType is configured in the factory as follows:

- CHANNEL = 1 → Calculated mass flow
- CHANNEL = 2 → Volume flow
- CHANNEL = 7 → Totalizer 1
- CHANNEL = 8 → Totalizer 2
- CHANNEL = 9 → Totalizer 3

5.2.3 Linearization types

In the Analog Input function block the input value can be linearized by the Transducer Block using the parameter L_TYPE. The following types of linearization are available:

- Direct
  With this setting the measured value from the Transducer Block (input value) avoids the linearization function and is looped unchanged with the same unit through the Analog Input function block.

- Indirect
  With this setting the measured value from the Transducer Block (input value) is re-scaled linearly via the input scaling XD_SCALE to the desired output range OUT_SCALE.

- Indirect Square Root
  With this setting the measured value from the Transducer Block (input value) is re-scaled via the parameter group XD_SCALE and recalculated using an evolution function. It is then rescaled again to the desired output range via the parameter group OUT_SCALE.

5.2.4 Selection of units

The XD_SCALE parameter group is used to determine with which physical unit the input value from the Transducer Blocks should be read in and processed in the Analog Input function block. The output value OUT is defined via the OUT_SCALE parameter group → For an example for rescaling the input value, see Page 123.

The choice of units depends on the corresponding channel:
- Channel = 1 → Only units for the mass flow are valid
- Channel = 2 → Only units for the volume flow are valid
- Channel = 7 → Only units for totalizer 1 are valid
- Channel = 8 → Only units for totalizer 2 are valid
- Channel = 9 → Only units for totalizer 3 are valid

If an unsuitable unit is selected, the function block changes to the OOS (out of service) operating mode.

Note!
- If the "Direct" type of linearization is selected via the L_TYPE parameter, the setting for the XD_SCALE and OUT_SCALE parameter groups must be identical; otherwise, the function block remains in the OOS mode and the "BLOCK CONFIG ERROR" block error is displayed in the BLOCK_ERROR parameter.
- The system units selected in the Transducer Blocks in question do not have any effect on the setting of the system units in the Analog Input function block. The units are specified independently of one another and must be configured separately. The unit selected in the Transducer Blocks is only used for the local display, EPD adjustment, low flow cut off and for simulation.

5.2.5 Status of the output value OUT

The status of the parameter group OUT communicates to the downstream function blocks the status of the Analog Input function block and the validity of the output value OUT. The following status values can be displayed:

- GOOD_NON_CASCADE
  The output value OUT is valid and can be used for further processing.

- UNCERTAIN
  The output value OUT can only be used for further processing to a limited extent. The status signals to the downstream function blocks that a "notice message" is present in the device, e.g. arising from active positive zero return or simulation.

- BAD
  The output value OUT is invalid. The following causes are possible:
  – The Analog Input function block is in the OOS operating mode.
  – The Resource Block is in operating mode OOS.
  – The status "BLOCK CONFIG ERROR" is displayed via the BLOCK_ERR parameter.
  – The "Flow" or "Totalizer" Transducer Block is in the OOS operating mode. The Analog Input function block can only process the input value of the Transducer Block in question if the operating mode is set to AUTO.
  – A "fault message" is present in the device arising from a critical device error, e.g. an electronics module defect.

Note!
In the "Diagnosis" Transducer Block, the cause of the error message (notice/fault message) is displayed via the "Diag. - Act. Sys. Condition" parameter. A list of all the error messages, including remedial measures, is provided in the Operating Instructions forPromag 53 FF (BA126D).

5.2.6 Simulation of input/output

Parameters of the Analog Input function block allow simulation of the input and output of the function block:

1. Simulation of the input of the Analog Input function block:
   The parameter group SIMULATE can be used to specify the input value (measured value and status). Since the simulation value runs through the entire function block, all the parameter settings of the block can be checked.

✎ Note!
If simulation is blocked by the jumper on the I/O board then simulation mode cannot be activated in the parameter SIMULATE. In the Resource Block, the parameter BLOCK_ERROR shows whether simulation of the Analog Input function block is possible.

2. Simulation of the output of the Analog Input function block:
   Set the operating mode in the parameter group MODE_BLK to MAN and specify the desired output value directly in the parameter OUT.

5.2.7 Diagnosis

Block errors and diagnosis information are displayed in the Analog Input function block via the BLOCK_ERR parameter.

✎ Note!
Further information on troubleshooting during the configuration of the Analog Input function block is provided in the Operating Instructions for Promag 53 FOUNDATION Fieldbus (BA0126).

5.2.8 Rescaling the input value

In the Analog Input function block the input value or input range can be scaled in accordance with the automation requirements.

Example:
- The system unit in the Transducer Block is m^3/h.
- The measuring range of the sensor is 0 to 30 m^3/h.
- The output range to the process control system should be 0 to 100%.

The Analog Input function block must be configured as follows:
- Parameter CHANNEL
  Option: CHANNEL → 2 = Volume flow

- Parameter L_TYPE
  Option: L_TYPE = Indirect
  The "Volume flow" process variable of the "Flow" Transducer Block is rescaled linearly in the AI Block via the input scaling XD_SCALE to the desired output range OUT_SCALE.

- XD_SCALE parameter group

XD_SCALE 0 %	= 0
XD_SCALE 100 %	= 30
XD_SCALE UNIT	= m^3/h

- OUT_SCALE parameter group

  OUT_SCALE 0 % = 0

  OUT_SCALE 100% = 100

  OUT_SCALE UNIT = %

The result is that with an input value of, for example, 15 m^3/h a value of 50% is output via the parameter OUT.

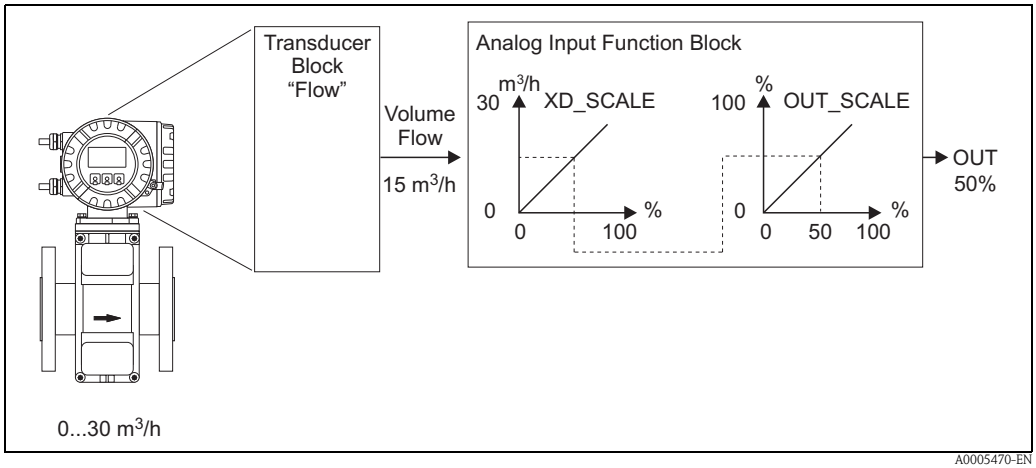


Fig. 4: Example for rescaling the input value

5.2.9 Limit values

The limit values are based on the output value OUT. If the output value OUT exceeds or does not reach the defined limit values then an alarm is sent to the fieldbus host system via the limit value process alarms.

The following limit values can be defined:
- HI_HI_LIM (upper alarm limit)
- HI_LIM (upper early warning limit)
- LO_LO_LIM (lower alarm limit)
- LO_LIM (lower early warning limit)

5.2.10 Alarm detection and processing

Process alarms provide information on particular block statuses and block events. The status of the process alarms is communicated to the fieldbus host system via the parameter BLOCK_ALM. The parameter ACK_OPTION specifies whether an alarm must be acknowledged via the fieldbus host system.

The following process alarms are generated by the Analog Input function block:

Block process alarms
A block process alarm is triggered via the BLOCK_ERR parameter. The parameter BLOCK_ALM is used to show the block process alarms and communicate them to the fieldbus host system. The following process alarms can be generated by the Analog Input function block:
- SIMULATE ACTIVE
- INPUT FAILURE
- OUT OF SERVICE
- BLOCK CONFIG ERROR

If the option of the process alarm (BLOCK ALM) has **not** been enabled in the parameter ACK_OPTION, the process alarms must be acknowledged in the parameter BLOCK_ALM.

Limit value process alarms
If a limit value is infringed then the priority specified for the limit value alarm will be checked before the limit value violation is communicated to the fieldbus host system. The priority that specifies the action in the event of an active limit value violation is determined by the following parameters:
– HI_HI_PRI
– HI_PRI
– LO_LO_PRI
– LO_PRI

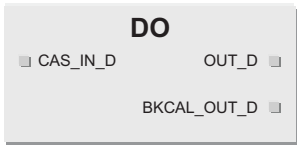
The status of the limit value process alarms is communicated to the fieldbus host system via the following parameters:
– HI_HI_ALM
– HI_ALM
– LO_LO_ALMI
– LO_ALM

If the option of a limit value process alarm has **not** been enabled in the parameter ACK_OPTION then this must be acknowledged directly in its parameter (see list).

Note!
The parameter ALARM_SUM shows the current status of all the process alarms.

6 Discrete Output Function block

The Discrete Output function block (DO, Discrete Output) processes a discrete setpoint value received from an upstream function block or higher level process control system, with which various instrument functions (e.g. zero point adjustment or totalizer reset) can be initiated in the downstream Transducer Block.



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CAS_IN _D = Remote setpoint value from another function block
OUT_D = Discrete output value and status
BKCAL_OUT_D = Discrete output value and status required by BKCAL_IN_D input of another block for output

6.1 Signal processing

The figure shows the internal structure of the Discrete Output function blocks ProdType:

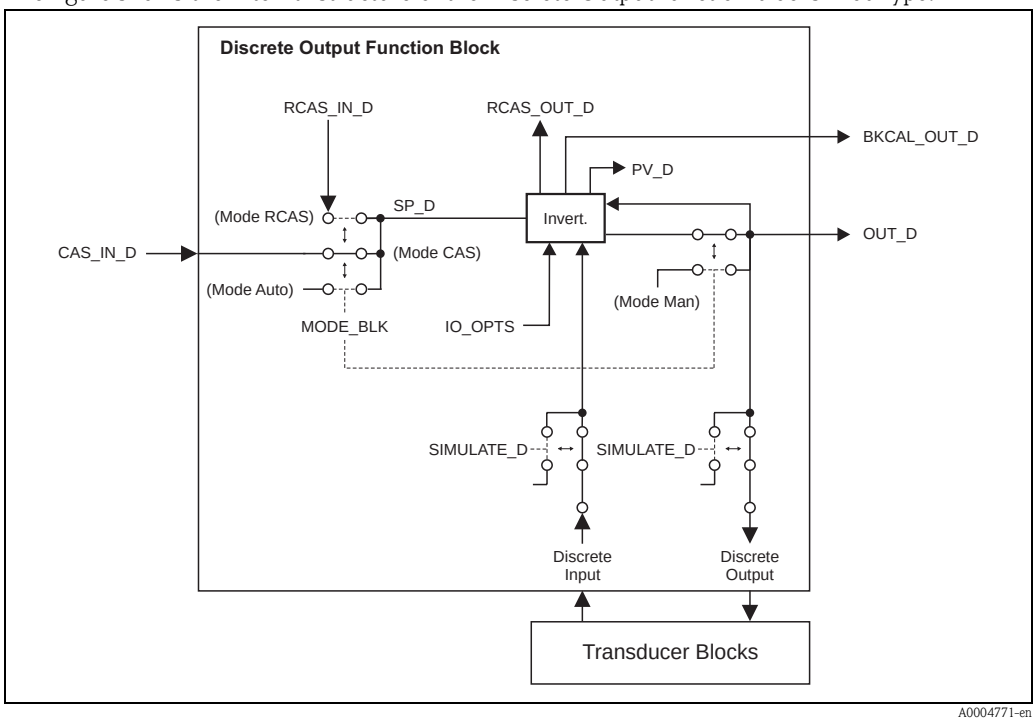

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Fig. 5: Signal processing in the Discrete Output function block

In the CAS operating mode (cascade operation), the Discrete Output function block receives, via the function block input CAS_IN_D, a discrete signal from an upstream function block. This signal controls the setpoint value (parameter SP_D) of the function block, and after internal calculation is sent as an output signal (parameter OUT_D) to the Transducer Block for control of instrument functions (e.g. zero point adjustment). The output value and status of the Discrete Output function block is communicated to the upstream block via the output BKCAL_OUT_D.

Signal processing in the RCAS operating mode (remote cascade operation) is largely identical to the CAS operating mode. However, in this operating mode, control of the parameter SP_D does not take place via an upstream function block but through a process control system. The output value and status of the Discrete Output function block is communicated to the process control system as an answer message via parameter RCAS_OUT_D.

In the AUTO operating mode (automatic operation), the set point value (parameter SP_D) is prescribed directly in the Discrete Output function block. In this case, the parameter CAS_IN_D is not taken into consideration in the internal calculation.

In the MAN operating mode (HAND), the output value (parameter OUT_D) can be prescribed directly in the Discrete Output function block. No internal calculation takes place.

6.2 Important functions and parameters of the Discrete Output function block

The primary functions and parameters of the Discrete Output function block are listed below.

✎ Note!
All FOUNDATION Fieldbus parameters available are described in the "FOUNDATION Fieldbus Overview" Operating Instructions (BA013S) (acquired at: → www.endress.com → Download).

6.2.1 Selecting the operating mode

The operation mode is set by means of the MODE_BLK parameter group. The Discrete Output function block supports the following operation modes:
- AUTO
- MAN
- CAS
- RCAS
- OOS

6.2.2 Safety behavior

There is a safety default available (fault state) for the Discrete Output function block. This is activated when a fault condition (of the corresponding valid set point value) exists longer than defined in the parameter FSTATE_TIME, or when the parameter SET_FSTATE in the Resource Block is activated. The safety operation is determined via the parameters FSTATE_TIME, FSTATE_VAL_D, and IO_OPTS.

6.2.3 Assignment between the Discrete Output Function block and the Transducer Block

The assignment or connection between the Discrete Output function block and the Transducer Block takes place in the Discrete Output function block via the parameter CHANNEL.

→ Parameter CHANNEL → 16 (= Discrete Output function block)

6.2.4 Values for the parameters CAS_IN_D, RCAS_IN_D, OUT_D, and SP_D

Via the Discrete Output function block, different instrument functions in the Transducer Block can be initiated via manufacturer-specific, fixed set point values from an upstream function block.

Here it must be observed that the desired function is only then executed when a status change from the value 0 (Discrete state 0) to the corresponding function value (following table) takes place. The value 0 always serves as the starting point for the corresponding control of instrument functions. A status change from a value not equal to zero to another value has no effect.

Input allocation of the parameter CAS_IN_D, RCAS_IN_D, OUT_D, SP_D

Status changes			Action
Discrete state 0	→	Discrete state 1	Reserved
Discrete state 0	→	Discrete state 2	Positive Zero Return ON
Discrete state 0	→	Discrete state 3	Positive Zero Return OFF
Discrete state 0	→	Discrete state 4	Reserved
Discrete state 0	→	Discrete state 5	Reserved
Discrete state 0	→	Discrete state 6	Reserved
Discrete state 0	→	Discrete state 7	Reset Totalizers 1, 2, 3
Discrete state 0	→	Discrete state 8	Reset Totalizer 1
Discrete state 0	→	Discrete state 9	Reset Totalizer 2
Discrete state 0	→	Discrete state 10	Reset Totalizer 3

Example for the control of positive zero return via the Discrete Output function block.
The following example is intended to illustrate how positive zero return can be activated and deactivated during a rinsing process by an upstream function block via the Discrete Output function block.

1. In the first step, the connection between the Discrete Output function block and the Transducer Block must be established. Here, the value 16 must be assigned to the parameter CHANNEL in the Discrete Output function block.

   → Parameter CHANNEL → 16 (= Discrete Output function block)

2. In the CAS operating mode, the Discrete Output function block processes the set point value prescribed at the input CAS_IN_D by the upstream function block and transfers it to the Transducer Block.

   Activating positive zero return
   With a starting value of 0 (Discrete state 0), the positive zero return is activated by a status change from 0 to 2 at input CAS_IN_D.

   Deactivating positive zero return
   Positive zero return can only then be deactivated when the input value at CAS_IN_D has first been set to output value 0 (Discrete state 0). Only then can positive zero return be deactivated through a status change from 0 to 2 at input CAS_IN_D.

7 Additional function blocks

Note!
Other function blocks such as the PID, Arithmetic, Input Selector, Signal Characterizer and Integrator function block are described in the "FOUNDATION Fieldbus Overview" (BA013S) Operating Instructions (acquired at: → www.endress.com → Download).

8 Factory settings

8.1 SI units (not for USA and Canada)

Low flow cut off, full scale value

Nominal diameter	Low flow cut off (approx. v = 0.04 m/s)			Full scale value (approx. v = 2.5 m/s)		
[mm]		Volume	Mass		Volume	Mass
15	0.5	dm^3/min	kg/min	25	dm^3/min	kg/min
25	1	dm^3/min	kg/min	75	dm^3/min	kg/min
32	2	dm^3/min	kg/min	125	dm^3/min	kg/min
40	3	dm^3/min	kg/min	200	dm^3/min	kg/min
50	5	dm^3/min	kg/min	300	dm^3/min	kg/min
65	8	dm^3/min	kg/min	500	dm^3/min	kg/min
80	12	dm^3/min	kg/min	750	dm^3/min	kg/min
100	20	dm^3/min	kg/min	1200	dm^3/min	kg/min
125	30	dm^3/min	kg/min	1850	dm^3/min	kg/min
150	2.5	m^3/h	t/h	150	m^3/h	t/h
200	5.0	m^3/h	t/h	300	m^3/h	t/h
250	7.5	m^3/h	t/h	500	m^3/h	t/h
300	10	m^3/h	t/h	750	m^3/h	t/h
350	15	m^3/h	t/h	1000	m^3/h	t/h
400	20	m^3/h	t/h	1200	m^3/h	t/h
450	25	m^3/h	t/h	1500	m^3/h	t/h
500	30	m^3/h	t/h	2000	m^3/h	t/h
600	40	m^3/h	t/h	2500	m^3/h	t/h

Language

Country	Language
Australia	English
Austria	Deutsch
Belgium	English
China	Chinese
Czech Republic	Czech
Denmark	English
England	English
Finland	Suomi
France	Francais
Germany	Deutsch
Hong Kong	English
Hungary	English
India	English
Indonesia	Bahasa Indonesia
Instruments International	English
Italy	Italiano
Japan	Japanese
Malaysia	English
Netherlands	Nederlands
Norway	Norsk

Country	Language
Poland	Polish
Portugal	Portuguese
Russia	Russian
Singapore	English
South Africa	English
Spain	Espanol
Sweden	Svenska
Switzerland	Deutsch
Thailand	English

Density, length, temperature

	Unit
Density	kg/l
Length	mm
Temperature	° C

8.2 US units (only for USA and Canada)

Low flow cut off, full scale value

Nominal diameter	Low flow cut off (approx. v = 0.13 ft/s)			Full scale value (approx. v = 8.2 ft/s)		
[inch]		Volume	Mass		Volume	Mass
$^1/_2$"	0.10	gal/min	lb/min	6	gal/min	lb/min
1"	0.25	gal/min	lb/min	18	gal/min	lb/min
1 $^1/_4$"	0.50	gal/min	lb/min	30	gal/min	lb/min
1 $^1/_2$"	0.75	gal/min	lb/min	50	gal/min	lb/min
2"	1.25	gal/min	lb/min	75	gal/min	lb/min
2 $^1/_2$"	2.0	gal/min	lb/min	130	gal/min	lb/min
3"	2.5	gal/min	lb/min	200	gal/min	lb/min
4"	4.0	gal/min	lb/min	300	gal/min	lb/min
5"	7.0	gal/min	lb/min	450	gal/min	lb/min
6"	12	gal/min	lb/min	600	gal/min	lb/min
8"	15	gal/min	lb/min	1200	gal/min	lb/min
10"	30	gal/min	lb/min	1500	gal/min	lb/min
12"	45	gal/min	lb/min	2400	gal/min	lb/min
14"	60	gal/min	lb/min	3600	gal/min	lb/min
16"	60	gal/min	lb/min	4800	gal/min	lb/min
18"	90	gal/min	lb/min	6000	gal/min	lb/min
20"	120	gal/min	lb/min	7500	gal/min	lb/min
24"	180	gal/min	lb/min	10500	gal/min	lb/min

Language, density, length, temperature

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

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