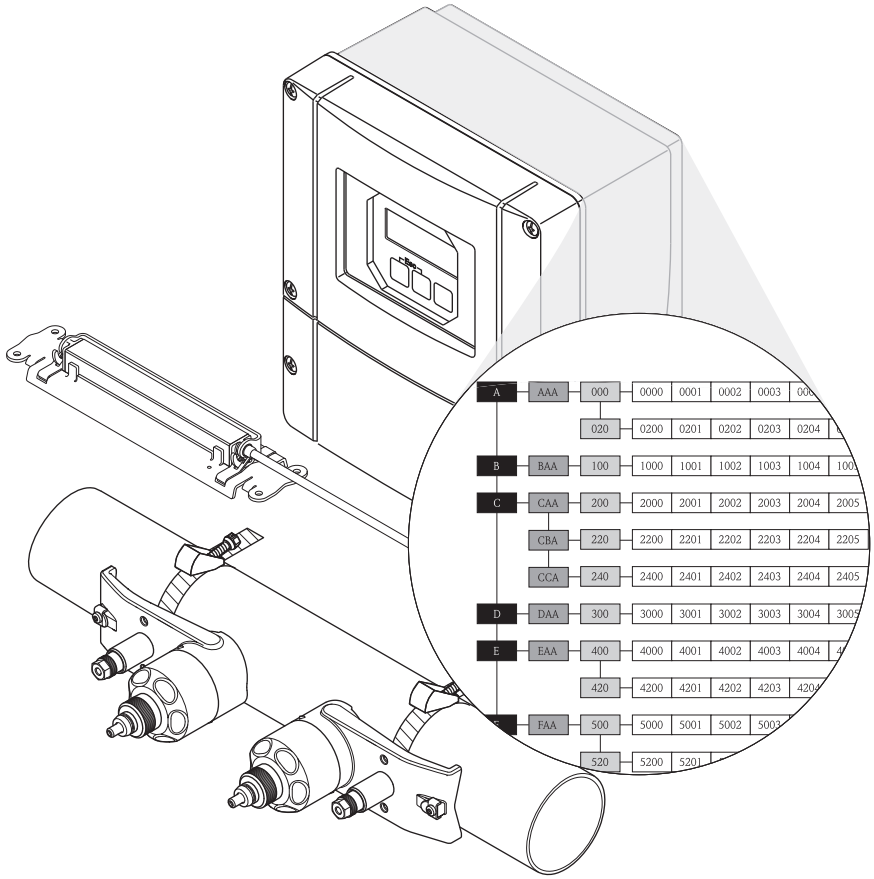
Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Description of Device Functions

Proline Prosonic Flow 93 FOUNDATION Fieldbus

Ultrasonic flow measuring system

Fieldbus™ Foundation



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Valid as of version:
V 2.03.XX

Endress+Hauser

People for Process Automation

Operation of Proline Prosonic Flow 93 FOUNDATION Fieldbus

- with local operation: see Page 3

- with FOUNDATION Fieldbus: see Page 84

Content for Local operation

1 Using this Manual 5

1.1 Using the table of contents to locate a function description 5
1.2 Using the graphic of the function matrix to locate a function description 5
1.3 Using the index of the function matrix to locate a function description 5

2 Function matrix 6

2.1 General layout of the function matrix 6
2.1.1 Blocks (A, B, C, etc.) 6
2.1.2 Groups (AAA, AEA, CAA, etc.) 6
2.1.3 Function groups (000, 020, 060, etc.) 6
2.1.4 Functions (0000, 0001, 0002, etc.) 6
2.1.5 Codes identifying cells 7
2.2 Illustration of the function descriptions 7
2.3 Display lines on the local display 8
2.4 Function matrix of the Prosonic Flow 93 FOUNDATION Fieldbus 8

3 Block MEASURED VARIABLES 9

3.1 Group MEASURING VALUES 10
3.1.1 Function group MAIN VALUES CH1 10
3.1.2 Function group MAIN VALUES CH2 11
3.1.3 Function group CALCULATED MAIN VALUES 12
3.2 SYSTEM UNITS groups 13
3.2.1 Function group CONFIGURATION 13
3.2.2 Function group ADDITIONAL CONFIGURATION 15

4 Block QUICK-SETUP 17

4.1 Quick Setup 18
4.1.1 Quick Setup "Sensor Installation" 18
4.1.2 Quick Setup "Commissioning" 20
4.1.3 Data backup/transmission 21

5 Block USER INTERFACE 22

5.1 Group CONTROL 23
5.1.1 Function group BASIC CONFIGURATION 23
5.1.2 Function group UNLOCKING/LOCKING 25
5.1.3 Function group OPERATION 26
5.2 Group MAIN LINE 27
5.2.1 Function group CONFIGURATION 27
5.2.2 Function group MULTIPLEX 29
5.3 Group ADDITION LINE 31
5.3.1 Function group CONFIGURATION 31
5.3.2 Function group MULTIPLEX 33
5.4 Group INFORMATION LINE 35
5.4.1 Function group CONFIGURATION 35
5.4.2 Function group MULTIPLEX 37

6 Block TOTALIZERS 39

6.1 Group TOTALIZER (1 to 3) 40
6.1.1 Function group CONFIGURATION 40
6.1.2 Function group OPERATION 43
6.2 Group HANDLING TOTAL. 44

7 Block BASIC FUNCTION 45

7.1 Group FOUNDATION FIELDBUS 46
7.1.1 Function group CONFIGURATION 46
7.1.2 Function group FUNCTION BLOCKS 47
7.1.3 Function group INFORMATION 48
7.2 Group PROCESS PARAMETER (CH1 to CH2) 49
7.2.1 Function group CONFIGURATION 49
7.2.2 Function group ADJUSTMENT 51
7.2.3 Function group PIPE DATA 52
7.2.4 Function group LIQUID DATA 57
7.3 Group SYSTEM PARAMETER (CH1 to CH2) 60
7.3.1 Function group CONFIGURATION 60
7.4 Group SENSOR DATA (CH1 to CH2) 62
7.4.1 Function group CONFIGURATION 62
7.4.2 Function group SENSOR PARAMETER 63
7.4.3 Function group CALIBRATION DATA 67
7.4.4 Function group ORIG. FACT. CALIBR. 69

8 Block SUPERVISION 70

8.1 Group SYSTEM (SYSTEM CH2) 71
8.1.1 Function group CONFIGURATION 71
8.1.2 Function group OPERATION 72
8.2 Group VERSION INFO 75
8.2.1 Function group DEVICE 75
8.2.2 Function group SENSOR 75
8.2.3 Function group AMPLIFIER 75
8.2.4 Function group F-CHIP 76
8.2.5 Function group I/O MODULE 76

9 Factory settings 77

9.1 SI units 77
9.2 US units (for USA and Canada only) 77
9.3 Language 77

10 Index Function matrix 78

11 Index Local operation 80

1 Using this Manual

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

1.1 Using the table of contents to locate a function description

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

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

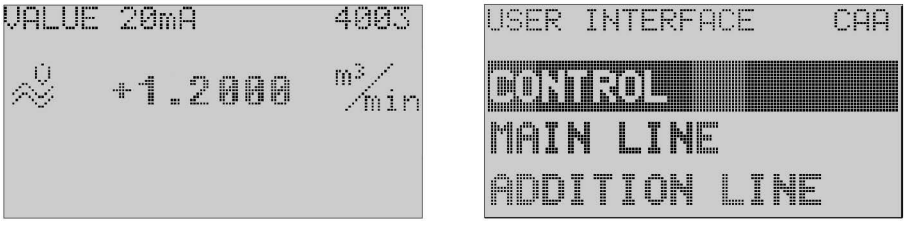
This step-by-step, top-down approach starts with the blocks, the highest level, and works down through the matrix to the description of the function you need:

1. All blocks available, and their related groups, are illustrated on Page 6. 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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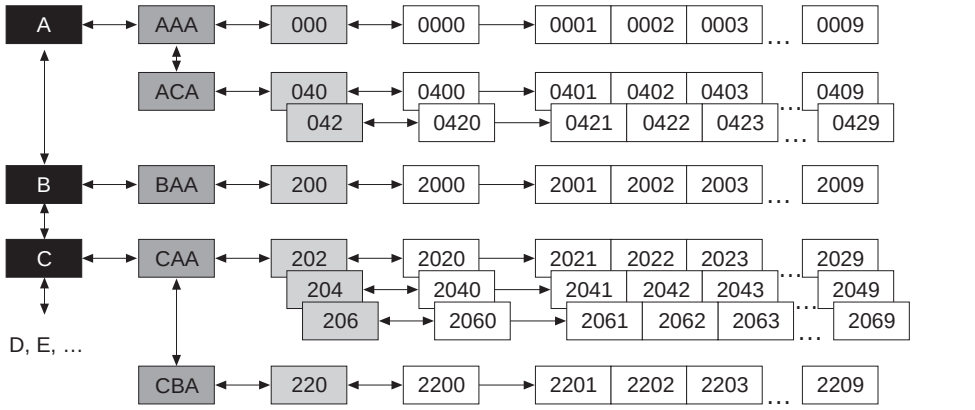
The function matrix index lists the codes for all the available "cells" in alphabetic and consecutive order, complete with the page references for the corresponding functions.
The index to the function matrix is on Page 78.

2 Function matrix

2.1 General layout of the function matrix

The function matrix consists of four levels:

Blocks -> Groups -> Function groups -> Functions



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

The blocks are the "highest-level grouping" of the operation options for the device. Examples of blocks available are MEASURED VARIABLES, QUICK SETUP, USER INTERFACE, TOTALIZERS, etc.

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

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

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

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

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

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

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

2.1.5 Codes identifying cells

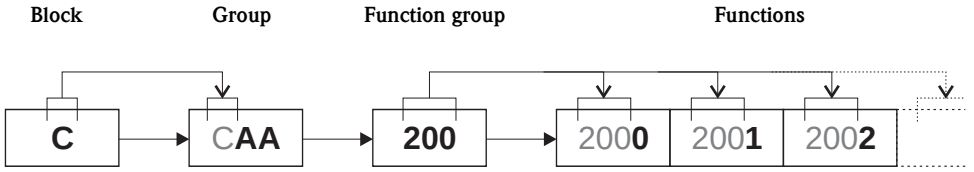
Each cell (block, group, function group and function) in the function matrix has an individual, unique code.

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

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

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

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



2.2 Illustration of the function descriptions

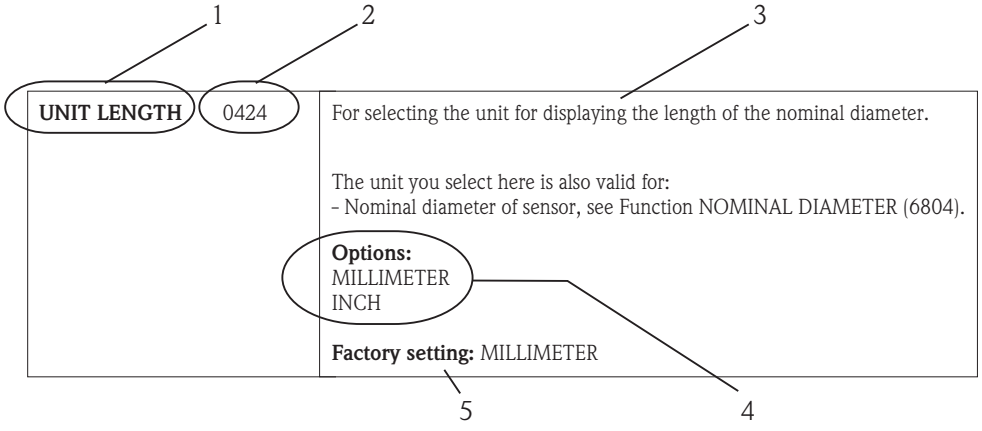


Fig. 1: Example for the description of a function

1 Name of the function
2 Number of the function (appears on the local display)
3 Description of the function
4 Selection or entry options or display
5 Factory setting (the measuring device is delivered with this setting/selected option)

2.3 Display lines on the local display

The local display is split into various display lines.

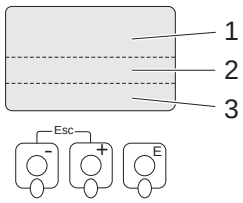


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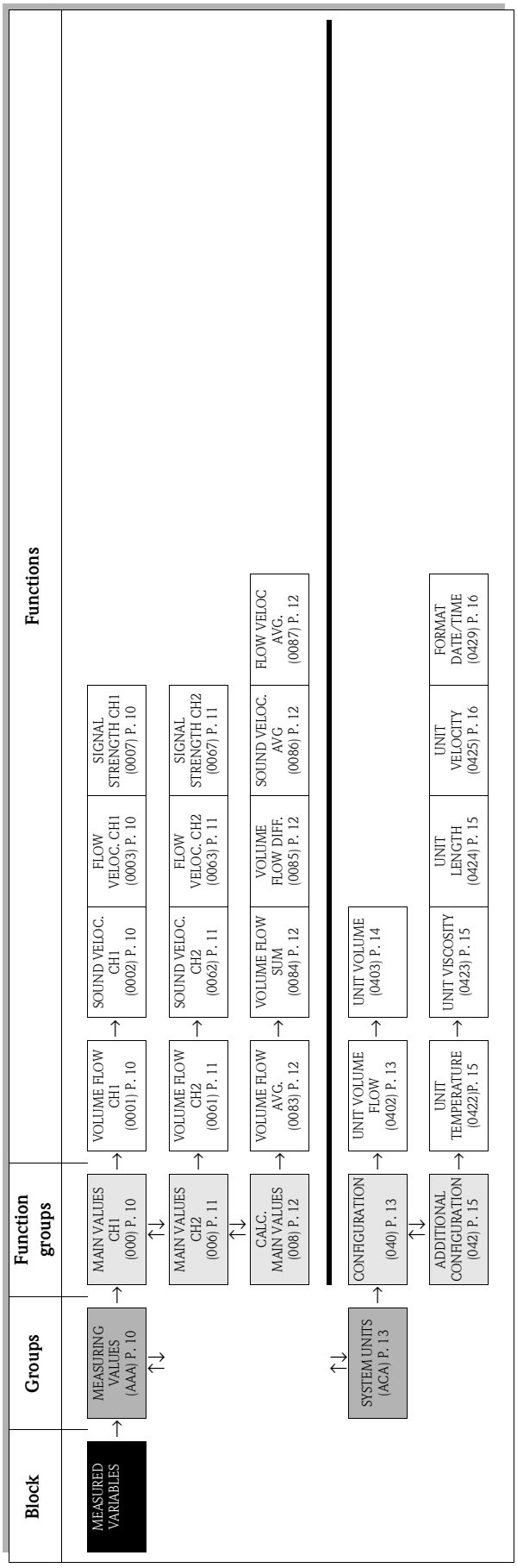
Fig. 2: Local display
1 Main line
2 Additional line
3 Information line

The values are assigned to the individual lines in the USER INTERFACE block,→ Page 22.

2.4 Function matrix of the Prosonic Flow 93 FOUNDATION Fieldbus

BLOCKS		GROUPS			FUNCTION GROUPS
MEASURED VARIABLES (→ Page 9)	**A**	MEASURING VALUES	AAA	→	Page 10
		SYSTEM UNITS	ACA	→	Page 13
QUICK-SETUP (→ Page 17)	**B**	Commissioning and application setups		→	Page 17
USER INTERFACE (→ Page 22)	**C**	CONTROL	CAA	→	Page 23
		MAIN LINE	CCA	→	Page 27
		ADDITION LINE	CEA	→	Page 31
		INFORMATION LINE	CGA	→	Page 35
TOTALIZERS (→ Page 39)	**D**	TOTALIZER 1	DAA	→	Page 40
		TOTALIZER 2	DAB	→	Page 40
		TOTALIZER 3	DAC	→	Page 40
		HANDLING TOTALIZER	DJA	→	Page 44
BASIC FUNCTION (→ Page 45)	**G**	FOUNDATION FIELDBUS	GGA	→	Page 46
		PROCESS PARAMETER (CH1 to CH2)	GIA, GIB	→	Page 49
		SYSTEM PARAMETER (CH1 to CH2)	GLA, GLB	→	Page 60
		Sensor data (CH1 to CH2)	GNA, GNB	→	Page 62
SUPERVISION (→ Page 70)	**J**	SYSTEM	JAA	→	Page 71
		SYSTEM CH2	JAB	→	Page 71
		VERSION INFO	JCA	→	Page 75

3 Block MEASURED VARIABLES



3.1 Group MEASURING VALUES

3.1.1 Function group MAIN VALUES CH1

MEASURED VARIABLES A → MEASURING VALUES AAA → MAIN VALUES CH1 000

Functional description MEASURED VARIABLES → MEASURING VALUES → MAIN VALUES CH1	
The measuring values of channel 1 currently being measured are displayed in this function group. ✎ 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.	
VOLUME FLOW CH1 (0001)	The volume flow currently measured appears on the display (channel 1). **Display:** 5-digit floating-point number, including unit and sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; –731.63 gal/d; etc.)
SOUND VELOCITY CH1 (0002)	The sound velocity currently measured in the liquid appears on the display (channel 1). **Display:** 5-digit fixed-point number, incl. units (e.g. 1400.0 m/s, 5249.3 ft/s)
FLOW VELOCITY CH1 (0003)	The flow velocity currently measured appears on the display (channel 1). **Display:** 5-digit floating-point number, including unit and sign (e.g. 8.0000 m/s, 26.247 ft/s)
SIGNAL STRENGTH CH1 (0007)	The signal strength appears on the display (channel 1). **Display:** 4-digit fixed point number (e.g. 80.0) ✎ Note! To ensure reliable measurement takes place, Prosonic Flow requires a signal strength of > 30.

3.1.2 Function group MAIN VALUES CH2

MEASURED VARIABLES A → MEASURING VALUES AAA → MAIN VALUES CH2 006

Functional description MEASURED VARIABLES → MEASURING VALUES → MAIN VALUES CH2	
The measuring values of channel 2 currently being measured are displayed in this function group. ✎ 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.	
VOLUME FLOW CH2 (0061)	The volume flow currently measured appears on the display (channel 2). **Display:** 5-digit floating-point number, including unit and sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; –731.63 gal/d; etc.)
SOUND VELOCITY CH2 (0062)	The sound velocity currently measured in the liquid appears on the display (channel 2). **Display:** 5-digit fixed-point number, incl. units (e.g. 1400.0 m/s, 5249.3 ft/s)
FLOW VELOCITY CH2 (0063)	The flow velocity currently measured appears on the display (channel 2). **Display:** 5-digit floating-point number, including unit and sign (e.g. 8.0000 m/s, 26.247 ft/s)
SIGNAL STRENGTH CH2 (0067)	The signal strength appears on the display (channel 2). **Display:** 4-digit fixed-point number (e.g. 80.0) ✎ Note! To ensure reliable measurement takes place, Prosonic Flow requires a signal strength of > 30.

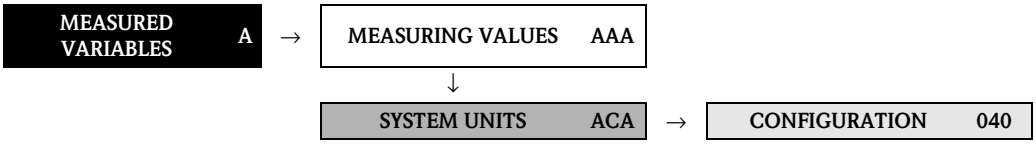
3.1.3 Function group CALCULATED MAIN VALUES

MEASURED VARIABLES A → MEASURING VALUES AAA → CALC. MAIN VALUES 008

Functional description MEASURED VARIABLES → MEASURING VALUES → CALCULATED MAIN VALUES	
The calculated measured values appear on the display. The measured values of both channels are used when calculating the 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.	
VOLUME FLOW AVG (0083)	The average volume flow appears on the display. Calculated from the measured values: (VOLUME FLOW CH1 + VOLUME FLOW CH2) · 1/2 **Display:** 5-digit floating-point number, including unit and sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; –731.63 gal/d; etc.)
VOLUME FLOW SUM (0084)	The total volume flow appears on the display. Calculated from the measured values: (VOLUME FLOW CH1 + VOLUME FLOW CH2) **Display:** 5-digit floating-point number, including unit and sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; –731.63 gal/d; etc.)
VOLUME FLOW DIFFERENCE (0085)	The difference between the volume flows appears on the display. Calculated from the measured values: VOLUME FLOW CH1 – VOLUME FLOW CH2 **Display:** 5-digit floating-point number, including unit and sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; –731.63 gal/d; etc.)
SOUND VELOCITY AVERAGE (0086)	The average sound velocity appears on the display. Calculated from the measured values: (SOUND VELOCITY CH1 + SOUND VELOCITY CH2) · 1/2 **Display:** 5-digit fixed-point number, incl. units (e.g. 1400.0 m/s, 5249.3 ft/s)
FLOW VELOCITY AVERAGE (0087)	The average flow velocity appears on the display. Calculated from the measured values: (FLOW VEL. CH1 + FLOW VEL. CH2) · 1/2 **Display:** 5-digit floating-point number, including unit and sign (e.g. 8.0000 m/s, 26.247 ft/s)

3.2 SYSTEM UNITS groups

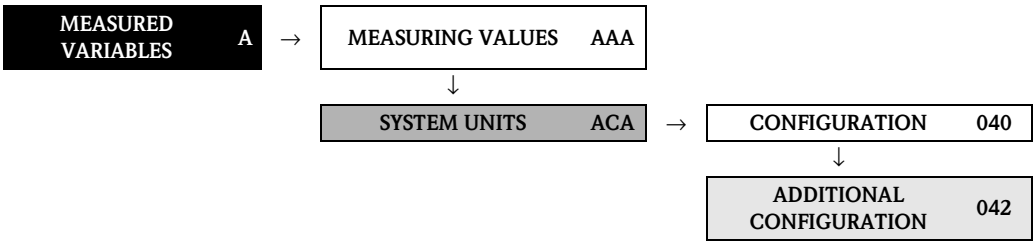
3.2.1 Function group CONFIGURATION



Functional 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 FOUNDATION Fieldbus. They are only used for the local display and for assigned instrument functions.	
UNIT VOLUME FLOW (0402)	Use this function to select the unit for displaying the volume flow. The unit you select here is also valid for: ■ Simulation ■ Low flow cut off **Options:** ✎ Note! The following units of time (…) can be selected: s = second, m = minute, h = hour, d = day *Metric:* Cubic centimeter → cm³/… Cubic decimeter → dm³/… Cubic meter → m³/… Milliliter → ml/… Liter → l/… Hectoliter → hl/… Megaliter → Ml/… MEGA *US:* Cubic centimeter → cc/… Acre foot → af/… Cubic foot → ft³/… Fluid ounce → oz f/… Gallon → US gal/… Million gallon → US Mgal/… Barrel (normal fluids: 31.5 gal/bbl) → US bbl/… NORM. Barrel (beer: 31.0 gal/bbl) → US bbl/… BEER Barrel (petrochemicals: 42.0 gal/bbl) → US bbl/… PETR. Barrel (filling tanks: 55.0 gal/bbl) → US bbl/… TANK *Imperial:* Gallon → imp. gal/… Mega gallon → imp. Mgal/… Barrel (beer: 36.0 gal/bbl) → imp. bbl/… BEER Barrel (petrochemicals: 34.97 gal/bbl) → imp. bbl/… PETR. **Factory setting:** Depends on country (dm³/m...m³/h or US gal/m...US Mgal/d)

Functional description MEASURED VARIABLES → SYSTEM UNITS → CONFIGURATION	
UNIT VOLUME (0403)	Use this function to select the unit for displaying the volume. **Options:** *Metric:* Cubic centimeter → cm^3 Cubic decimeter → dm^3 Cubic meter → m^3 Milliliter → ml Liter → l Hectoliter → hl Megaliter → Ml MEGA *US:* Cubic centimeter → cc Acre foot → af Cubic foot → ft^3 Fluid ounce → oz f Gallon → US gal Million gallon → US Mgal Barrel (normal fluids: 31.5 gal/bbl) → US bbl NORM.FL. Barrel (beer: 31.0 gal/bbl) → US bbl BEER Barrel (petrochemicals: 42.0 gal/bbl) → US bbl PETROCH. Barrel (filling tanks: 55.0 gal/bbl) → US bbl TANK *Imperial:* Gallon → imp. gal Mega gallon → imp. Mgal Barrel (beer: 36.0 gal/bbl) → imp. bbl BEER Barrel (petrochemicals: 34.97 gal/bbl) → imp. bbl PETROCH. **Factory setting:** Depends on country (dm^3/m...m^3/h or US gal/m...US Mgal/d)→ Page 77. ✎ 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. ■ The unit selected in this function is only for showing the values on the local display, i.e. the measuring system does not use it for further processing of the measured variables.

3.2.2 Function group ADDITIONAL CONFIGURATION



Functional description MEASURED VARIABLES → SYSTEM UNITS → ADDITIONAL CONFIGURATION	
✎ Note! The units selected here have no effect on the FOUNDATION Fieldbus. They are only used for the local display and for assigned instrument functions.	
UNIT TEMPERATURE (0422)	Use this function to select the unit for displaying the fluid temperature. ✎ Note! The fluid temperature is entered in the TEMPERATURE function (→ Page 57). **Options:** °C (Celsius) K (Kelvin) °F (Fahrenheit) R (Rankine) **Factory setting:** Depends on country (°C or °F) → Page 77
UNIT VISCOSITY (0423)	Use this function to select the unit for fluid viscosity. ✎ Note! The viscosity is entered in the function (→ Page 58). **Options:** mm^2/s cSt St **Factory setting:** mm^2/s
UNIT LENGTH (0424)	Use this function to select the unit for the measure of length. The unit you select here is valid for: ■ Nominal diameter ■ Diameter ■ Wall thickness ■ Liner thickness ■ Path length ■ Wire length ■ Sensor spacing **Options:** MILLIMETER INCH **Factory setting:** Depends on country (MILLIMETER or INCH) → Page 77

Functional description MEASURED VARIABLES → SYSTEM UNITS → ADDITIONAL CONFIGURATION	
UNIT VELOCITY (0425)	Use this function to select the unit for displaying the velocity. The unit you select here is also valid for: ■ Sound velocity ■ Flow velocity **Options:** m/s ft/s **Factory setting:** m/s
FORMAT DATE/TIME (0429)	Use this function to select the date and time format of the calibration history. **Options:** DD.MM.YY 24 H MM/DD/YY 12 H A/P DD.MM.YY 12 H A/P MM/DD/YY 24 H **Factory setting:** DD.MM.YY 24 H

4 Block QUICK-SETUP

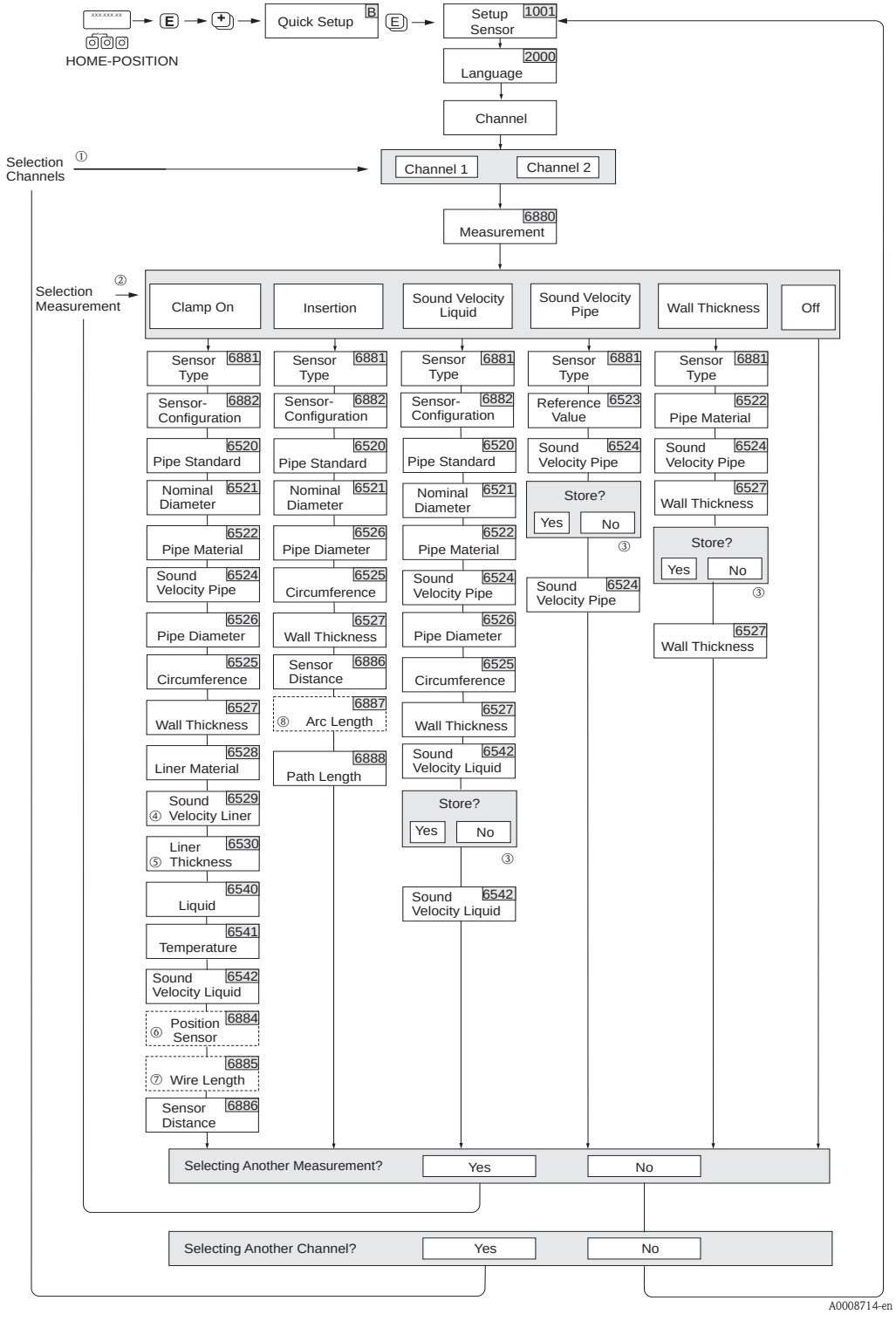
Block	Group	Function groups	Functions		
QUICK-SETUP (B)	→	→	SETUP SENSOR (1001) P. 17	→	OS-COMMISSION. (1002) P. 17 / T-DAT SAVE/LOAD (1009) P. 17

Functional description QUICK-SETUP	
QUICK SETUP SENSOR (1001)	Use this function to start the Quick Setup menu for assembling the ultrasonic sensors. **Options:** YES NO **Factory setting:** NO ✎ Note! You will find a flowchart of the "SENSOR INSTALLATION" Quick Setup menu on Page 18. Please refer to the Operating Instructions for Prosonic Flow 93 FOUNDATION Fieldbus, BA0078D, for more information on Quick Setup menus.
SETUP COMMISSIONING (1002)	Use this function to start the Quick Setup menu for commissioning. **Options:** YES NO **Factory setting:** NO ✎ Note! You will find a flowchart of the "SENSOR INSTALLATION" Quick Setup menu on Page 18. Please refer to the Operating Instructions for Prosonic Flow 93 FOUNDATION Fieldbus, BA0078D, for more information on Quick Setup menus.
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 current measuring point parameters can be saved to the T-DAT as a backup. ■ If the transmitter is replaced for some reason, the data from the T-DAT can be loaded into the new transmitter (EEPROM). **Options:** CANCEL SAVE (from EEPROM to T-DAT) LOAD (from the T-DAT into EEPROM) **Factory setting:** CANCEL ✎ Note! ■ If the power supply fails, the totalizer readings are automatically saved to the EEPROM. ■ The option "LOAD" cannot be executed if the T-DAT is empty or faulty. ■ The option "LOAD" and "SAVE" cannot be executed if no T-DAT is present.

4.1 Quick Setup

In the case of measuring devices without a local display, the individual parameters and functions must be configured via the operating program, e.g. FieldCare.
If the measuring device is equipped with a local display, all the important device parameters for standard operation, as well as additional functions, can be configured quickly and easily by means of the following Quick Setup menus.

4.1.1 Quick Setup "Sensor Installation"



Note!
The display returns to the cell SETUP SENSOR (1001) if you press the ESC key combination during interrogation.

① If a channel is selected for which a Quick Setup has already been executed, the previous values are overwritten.

② During each run, all the options can be selected. If settings were made during a previous run, these are overwritten.

③ "Save?" prompt for pipe sound velocity:
- YES = The value measured during Quick Setup is accepted in the appropriate function.
- NO = The measurement is discarded and the original value remains.

④ The SOUND VELOCITY LINER (6529) only appears if:
- The LINER MATERIAL is selected to something ohter than NONE (6528).

⑤ The LINER THICKNESS (6530) only appears if:
- The LINER MATERIAL is selected to something ohter than NONE (6528).

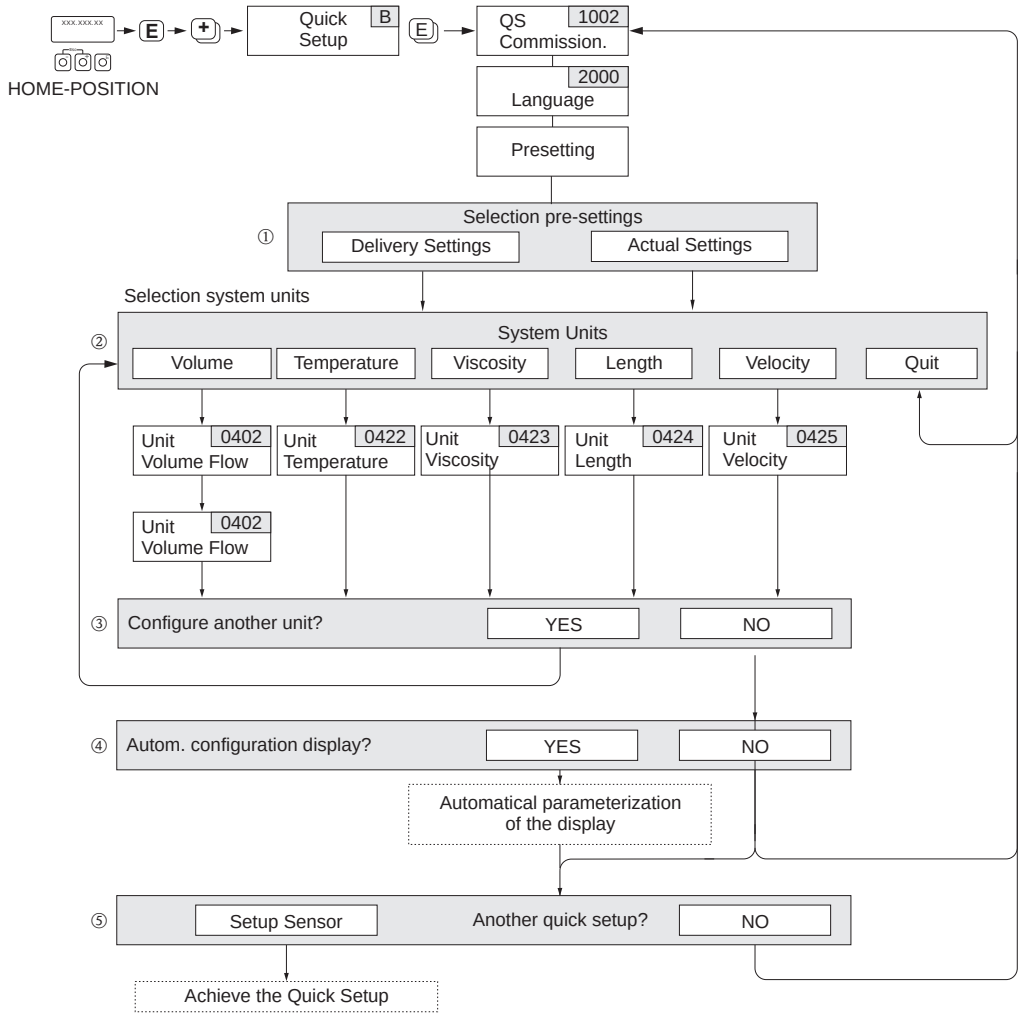
⑥ The POSITION SENSOR function (6884) only appears if:
- The CLAMP ON option is selected in the MEASUREMENT function (6880)
  and
- Two traverses are selected in the SENSOR CONFIGURATION function (6882)

⑦ The WIRE LENGTH function (6885) only appears if:
- The CLAMP ON option is selected in the MEASUREMENT function (6880)
  and
- One traverse is selected in the SENSOR CONFIGURATION function (6882)

⑧ The ARC LENGTH function (6887) only appears if:
- The INSERTION option is selected in the MEASUREMENT function (6880)
  and
- The DUAL-PATH option is selected in the SENSOR CONFIGURATION function (6882

4.1.2 Quick Setup "Commissioning"

The installation distances needed to install the sensors can be determined using the "Sensor Installation" Quick Setup menu.
In the case of measuring devices without a local display, the installation distances can be determined via the FieldCare operating program or with the Applicator online tool.



a0014889-en

Note!

- The display returns to the function SETUP COMMISSIONING (1002) if you press the ESC key combination during parameter interrogation.
- The "Commissioning" Quick Setup must be carried out before one of the Quick Setups explained below is run.

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

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

⑤ The execution of other Quick Setups is described in the following sections.

4.1.3 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!
For information on installing and removing the T-DAT, see Operating Instructions Prosonic Flow 93 FOUNDATION Fieldbus, BA0078D.

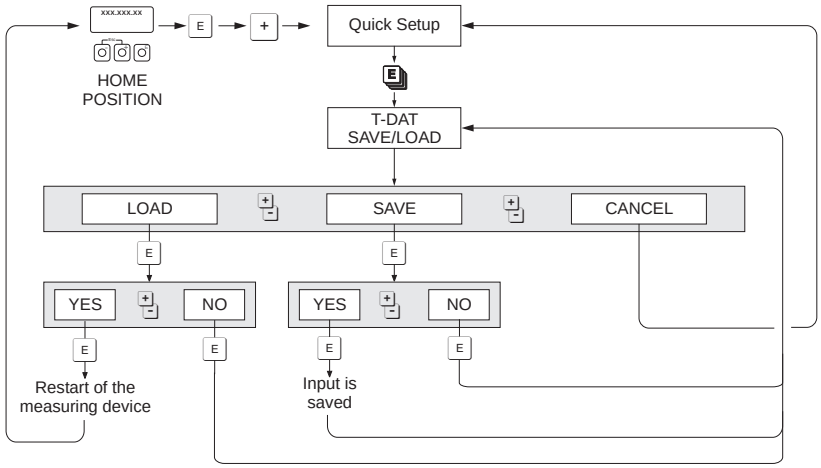


Fig. 3: Data backup/transmission with T-DAT SAVE/LOAD function

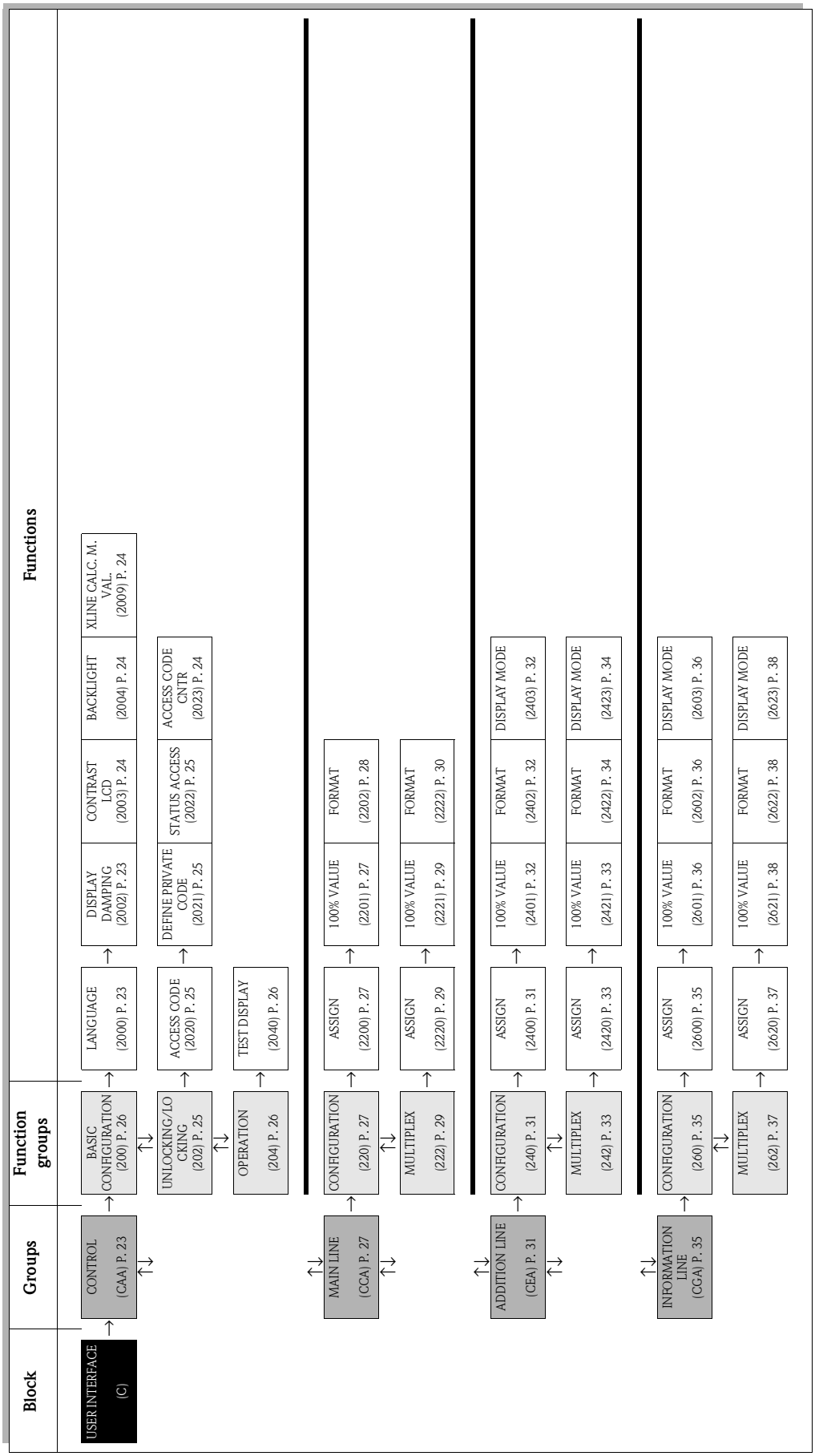
Information on the LOAD and SAVE options available:

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**

Functional 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 function (8226). **Options:** Language group WEST EU / USA: ENGLISH, DEUTSCH, FRANCAIS, ESPANOL, ITALIANO, NEDERLANDS, PORTUGUESE Language group EAST EU / SCAND.: ENGLISH, NORSK, SVENSKA, SUOMI, POLISH, CZECH, RUSSIAN Language group ASIA: ENGLISH, BAHASA INDONESIA, JAPANESE (syllabary) Language group CHINESE: CHINESE, ENGLISH **Factory setting:** Depends on country → Page 77 ✎ Note! ■ If you press the ⊡+ keys simultaneously when starting, the language is set to ENGLISH. ■ You can change the language group via the configuration software FieldCare. Please do not hesitate to contact your Endress+Hauser sales office if you have any questions.
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.

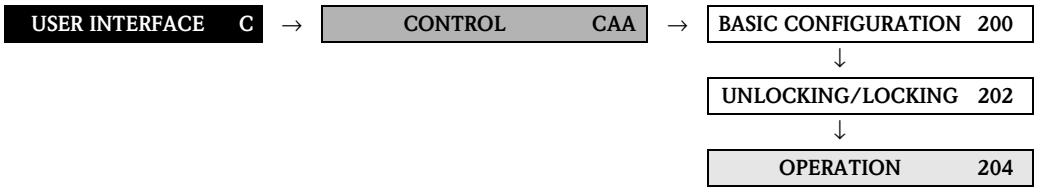
Functional description USER INTERFACE → CONTROL → BASIC CONFIGURATION	
CONTRAST LCD (2003)	Use this function to optimize display contrast to suit local operating conditions. **User input:** 10…100% **Factory setting:** 50%
BACKLIGHT **(2004)**	Use this function to optimize the backlight to suit local operating conditions. **User input:** 10…100% **Factory setting:** 50%
X-LINE CALCULATED MAIN VALUES (2009)	Use this function to indicate which "calculated main value" from the measured values of both channels is displayed. The option CALCULATED VOLUME FLOW must be selected in the ASSIGN function (2200, main line), (2400, additional line), (2600, information line) so that the value appears in the line desired. ✎ Note! This function does **not** appear if OFF was selected on at least one channel in the MEASUREMENT function (6880). **Options:** (CH1 + CH2)/2 CH1 + CH2 CH1 - CH2 **Factory setting:** (CH1 + CH2)/2

5.1.2 Function group UNLOCKING/LOCKING

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

Functional description DISPLAY → CONTROL → UNLOCKING/LOCKING	
ACCESS CODE (2020)	All data of the measuring system are protected against inadvertent change. Programming is disabled and the settings cannot be changed until a code is entered in this function. If you press the ⊞ keys in any function, the measuring system automatically goes to this function and the prompt to enter the code appears on the display (when programming is disabled). You can enable programming by entering your personal code (**factory setting = 93**, see DEF.PRIVATE CODE (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. • In this function, access to programming is only valid for local configuration. If functions or parameters are to be changed via the FOUNDATION Fieldbus, programming must be enabled separately in the parameter "Un/Locking - Access Code" (Transducer Blocks).
DEF. PRIVATE CODE (2021)	Use this function to specify a personal code number for enabling programming in the ACCESS CODE function. **User input:** 0 to 9999 (max. 4-digit number) **Factory setting:** 93 ✎ 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. **Display:** ACCESS CUSTOMER (parameterization possible) LOCKED (parameterization disabled)
ACCESS CODE COUNTER (2023)	The number of times the private or service code was entered to access the device appears on the display. **Display:** Integer (delivery status: 0)

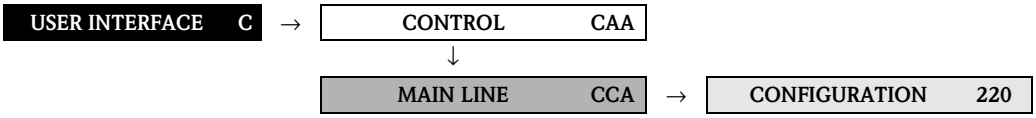
5.1.3 Function group OPERATION

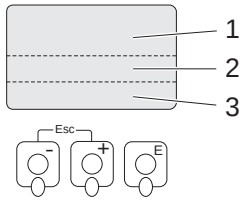


Functional description USER INTERFACE → CONTROL → OPERATION	
TEST DISPLAY (2040)	Use this function to test the operability of the local display and its pixels. **Options:** OFF ON **Factory setting:** OFF Test sequence: 1. Start the test by selecting ON. 2. All pixels of the main line, additional line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

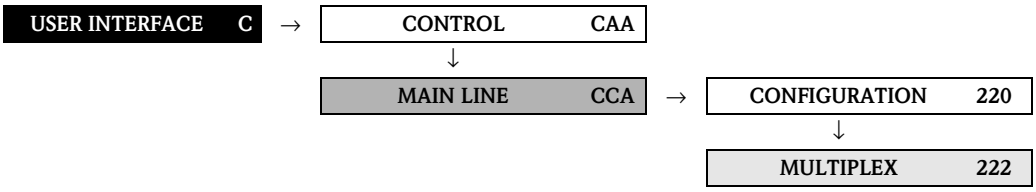
5.2.1 Function group CONFIGURATION



Functional description DISPLAY→ MAIN LINE → CONFIGURATION	
1 = Main line 2 = Additional line 3 = Information line  A0001253	
ASSIGN **(2200)**	Use this function to define the display value assigned to the main line (the top line of the local display) during normal measuring operation. **Options:** OFF VOLUME FLOW (CH1 to CH2) CALCULATED VOLUME FLOW VOLUME FLOW % (CH1 to CH2) CALCULATED VOLUME FLOW IN % SOUND VELOCITY (CH1 to CH2) SOUND VELOCITY AVERAGE SIGNAL STRENGTH (CH1 to CH2) FLOW VELOCITY (CH1 to CH2) FLOW VELOCITY AVERAGE TOTALIZER 1 TO 3 AI1 to AI8 - OUT VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (external set point) PID - OUT VALUE (manipulated variable) ✎ Note! If a channel is not visible, it does not appear in the options. Channels can be displayed or hidden by means of the MEASUREMENT function (6880). **Factory setting:** VOLUME FLOW CH1
100% VALUE **(2201)**	✎ Note! This function is only available if VOLUME FLOW % or CALCULATED VOLUME FLOW % is selected in the ASSIGN function (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 country [10 l/s or 200 us.gal/min) → Page 77.

Functional description DISPLAY→ 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 such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → m^3/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

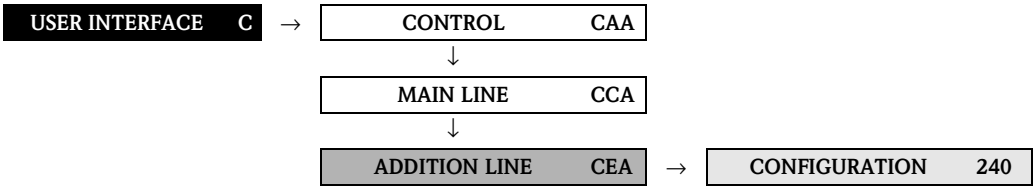


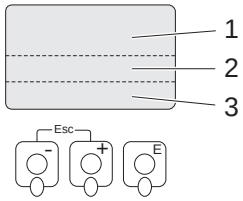
Functional description USER INTERFACE → MAIN LINE → MULTIPLEX	
ASSIGN (2220)	Use this function to define a second reading to be displayed in the main line alternatively (every 10 seconds) with the reading defined in the ASSIGN function (2200). **Options:** OFF VOLUME FLOW (CH1 to CH2) CALCULATED VOLUME FLOW VOLUME FLOW % (CH1 to CH2) CALCULATED VOLUME FLOW IN % SOUND VELOCITY (CH1 to CH2) SOUND VELOCITY AVERAGE SIGNAL STRENGTH (CH1 to CH2) FLOW VELOCITY (CH1 to CH2) FLOW VELOCITY AVERAGE TOTALIZER 1 TO 3 AI1 to AI8 - OUT VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (external set point) PID - OUT VALUE (manipulated variable) ✎ Note! If a channel is not visible, it does not appear in the options. Channels can be displayed or hidden by means of the MEASUREMENT function (6880). **Factory setting:** OFF
100% VALUE (2221)	✎ Note! This function is only available if VOLUME FLOW % or CALCULATED VOLUME FLOW % is selected in the ASSIGN function (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 country [10 l/s or 200 us.gal/min) → Page 77.

Functional description USER INTERFACE → MAIN LINE → MULTIPLEX	
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 such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → m^3/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

5.3 Group ADDITION LINE

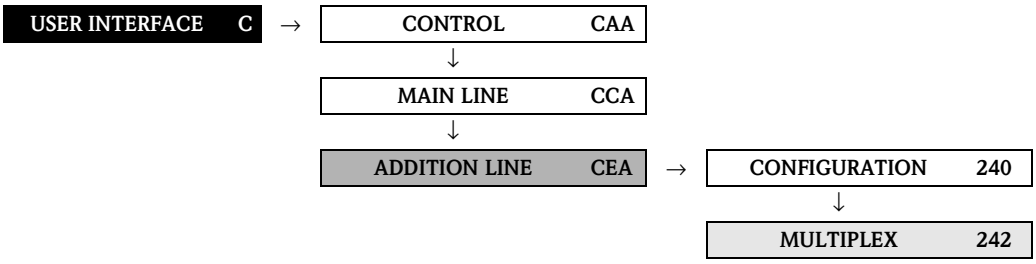
5.3.1 Function group CONFIGURATION



Functional description DISPLAY→ ADDITIONAL LINE→ CONFIGURATION	
1 = Main line **2 = Additional line** 3 = Information line	 A0001253
ASSIGN **(2400)**	Use this function 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 (CH1 to CH2) CALCULATED VOLUME FLOW VOLUME FLOW % (CH1 to CH2) CALCULATED VOLUME FLOW IN % SOUND VELOCITY (CH1 to CH2) SOUND VELOCITY AVERAGE SIGNAL STRENGTH (CH1 to CH2) FLOW VELOCITY (CH1 to CH2) FLOW VELOCITY AVERAGE VOLUME FLOW BARGRAPH IN % (CH1 to CH2) CALCULATED VOLUME FLOW BARGRAPH % SIGNAL STRENGTH BARGRAPH % (CH1 to CH2) TOTALIZER (1 to 3) FLOW DIRECTION (CH1 to CH2) CALCULATED FLOW DIRECTION AI1 to AI8 - 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:** TOTALIZER 1 ✎ Note! If a channel is not visible, it does not appear in the options. Channels can be displayed or hidden by means of the MEASUREMENT function (6880).

Functional description DISPLAY→ 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 % ▪ VOLUME FLOW BARGRAPH % ▪ CALCULATED VOLUME FLOW IN % ▪ CALCULATED VOLUME FLOW BARGRAPH % 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 country [10 l/s or 200 us.gal/min) → Page 77.
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 such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → m^3/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 CALCULATED VOLUME FLOW BARGRAPH IN % was selected in the ASSIGN function (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

5.3.2 Function group MULTIPLEX

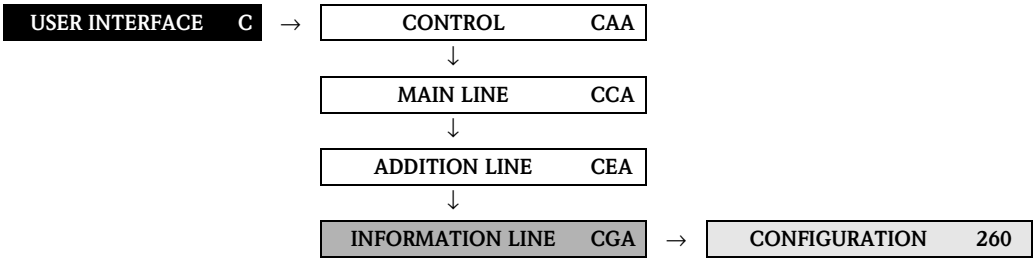


Functional description USER INTERFACE → ADDITION LINE → MULTIPLEX	
ASSIGN **(2420)**	Use this function to define a second reading to be displayed in the additional line alternatively (every 10 seconds) with the reading defined in the ASSIGN function (2400). **Options:** OFF VOLUME FLOW (CH1 to CH2) CALCULATED VOLUME FLOW VOLUME FLOW % (CH1 to CH2) CALCULATED VOLUME FLOW IN % SOUND VELOCITY (CH1 to CH2) SOUND VELOCITY AVERAGE SIGNAL STRENGTH (CH1 to CH2) FLOW VELOCITY (CH1 to CH2) FLOW VELOCITY AVERAGE VOLUME FLOW BARGRAPH IN % (CH1 to CH2) CALCULATED VOLUME FLOW BARGRAPH % SIGNAL STRENGTH BARGRAPH % (CH1 to CH2) TOTALIZER (1 to 3) FLOW DIRECTION (CH1 to CH2) CALCULATED FLOW DIRECTION AI1 to AI8 - 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. ■ If a channel is not visible, it does not appear in the options. Channels can be displayed or hidden by means of the MEASUREMENT function (6880).
100% VALUE **(2421)**	✎ Note! This function is not available unless one of the following was selected in the ASSIGN function (2420): ■ VOLUME FLOW % ■ VOLUME FLOW BARGRAPH % ■ CALCULATED VOLUME FLOW IN % ■ CALCULATED VOLUME FLOW BARGRAPH % 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 country [10 l/s or 200 us.gal/min) → Page 77.

Functional description USER INTERFACE → ADDITION 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 such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 m^3/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 CALCULATED VOLUME FLOW BARGRAPH IN % was selected in the ASSIGN function (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

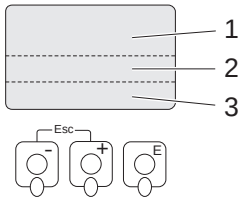
5.4 Group INFORMATION LINE

5.4.1 Function group CONFIGURATION



Functional description
DISPLAY→ INFORMATION LINE→ CONFIGURATION

1 = Main line
2 = Additional line
3 = Information line

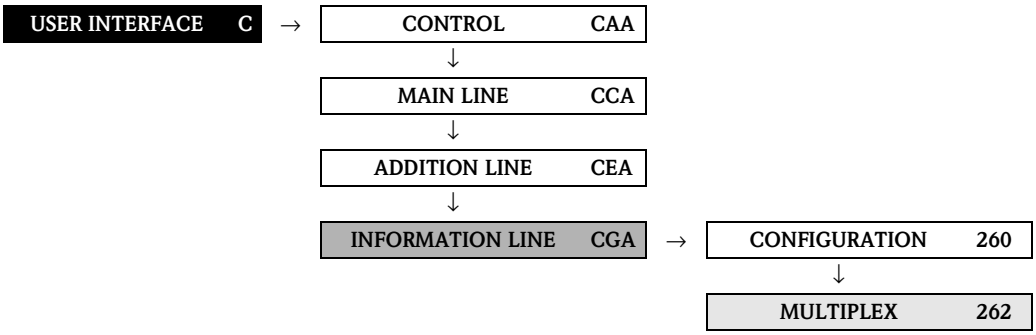


A0001253

ASSIGN (2600)	Use this function 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 (CH1 to CH2) CALCULATED VOLUME FLOW VOLUME FLOW % (CH1 to CH2) CALCULATED VOLUME FLOW IN % SOUND VELOCITY (CH1 to CH2) SOUND VELOCITY AVERAGE SIGNAL STRENGTH (CH1 to CH2) FLOW VELOCITY (CH1 to CH2) FLOW VELOCITY AVERAGE VOLUME FLOW BARGRAPH IN % (CH1 to CH2) CALCULATED VOLUME FLOW BARGRAPH % SIGNAL STRENGTH BARGRAPH % (CH1 to CH2) TOTALIZER (1 to 3) OPERATING/SYSTEM CONDITIONS FLOW DIRECTION (CH1 to CH2) CALCULATED FLOW DIRECTION AI1 to AI8 - 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 ✎ Note! If a channel is not visible, it does not appear in the options. Channels can be displayed or hidden by means of the MEASUREMENT function (6880).

Functional description DISPLAY→ INFORMATION LINE→ CONFIGURATION	
100% VALUE (2601)	✎ Note! This function is not available unless one of the following was selected in the ASSIGN function (2400): ■ VOLUME FLOW % ■ VOLUME FLOW BARGRAPH % ■ CALCULATED VOLUME FLOW IN % ■ CALCULATED VOLUME FLOW BARGRAPH % 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 country [10 l/s or 200 us.gal/min) → Page 77.
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 such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → m^3/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 CALCULATED VOLUME FLOW BARGRAPH IN % was selected in the ASSIGN function (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

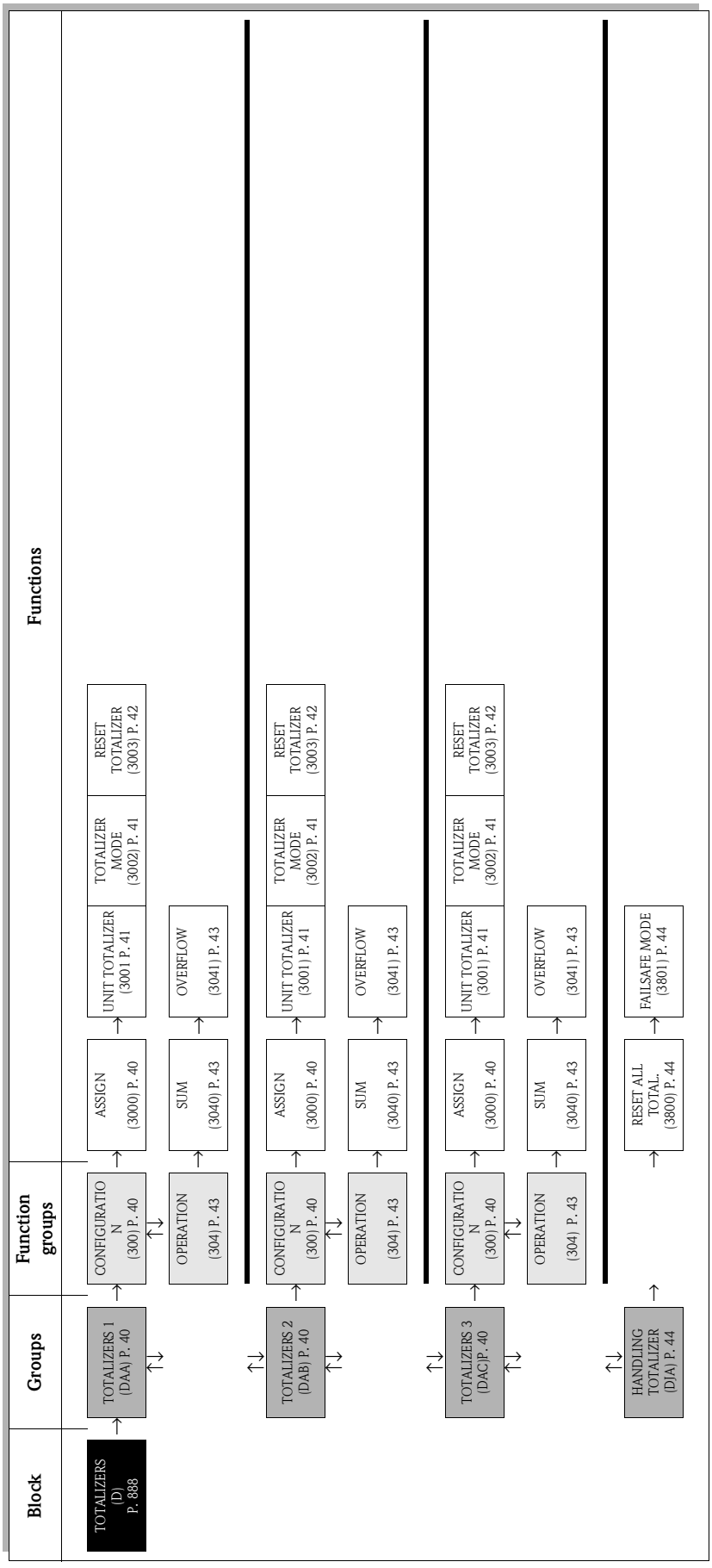
5.4.2 Function group MULTIPLEX



Functional description USER INTERFACE → INFORMATION LINE → MULTIPLEX	
ASSIGN (2620)	Use this function to define a second reading to be displayed in the information line alternatively (every 10 seconds) with the reading defined in the ASSIGN function (2600). **Options:** OFF VOLUME FLOW (CH1 to CH2) CALCULATED VOLUME FLOW VOLUME FLOW % (CH1 to CH2) CALCULATED VOLUME FLOW IN % SOUND VELOCITY (CH1 to CH2) SOUND VELOCITY AVERAGE SIGNAL STRENGTH (CH1 to CH2) FLOW VELOCITY (CH1 to CH2) FLOW VELOCITY AVERAGE VOLUME FLOW BARGRAPH IN % (CH1 to CH2) CALCULATED VOLUME FLOW BARGRAPH % (CH1 to CH2) SIGNAL STRENGTH BARGRAPH % (CH1 to CH2) TOTALIZER (1 to 3) OPERATING/SYSTEM CONDITIONS FLOW DIRECTION (CH1 to CH2) CALCULATED FLOW DIRECTION AI1 to AI8 - 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. ■ If a channel is not visible, it does not appear in the options. Channels can be displayed or hidden by means of the MEASUREMENT function (6880).

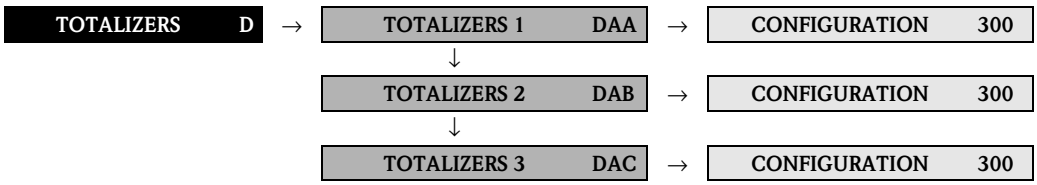
Functional description USER INTERFACE → INFORMATION LINE → MULTIPLEX	
100% VALUE (2621)	✎ Note! This function is not available unless one of the following was selected in the ASSIGN function (2400): ■ VOLUME FLOW % ■ VOLUME FLOW BARGRAPH % ■ CALCULATED VOLUME FLOW IN % ■ CALCULATED VOLUME FLOW BARGRAPH % 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 country [10 l/s or 200 us.gal/min) → Page 77.
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 such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → m^3/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 CALCULATED VOLUME FLOW BARGRAPH IN % was selected in the ASSIGN function (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).  A0001259 **Factory setting:** STANDARD

6 Block TOTALIZERS



6.1 Group TOTALIZER (1 to 3)

6.1.1 Function group CONFIGURATION

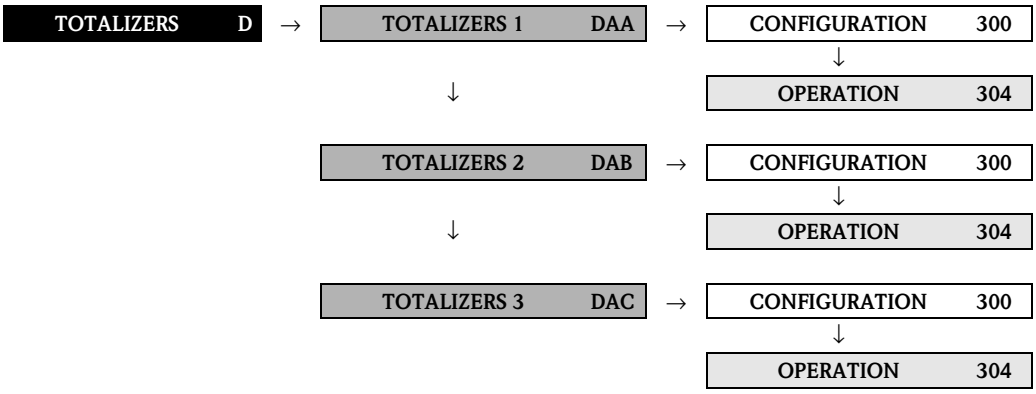


Functional description TOTALIZERS → TOTALIZERS (1...3) → CONFIGURATION	
The function descriptions below apply to totalizers 1 to 3; the totalizers are independently configurable.	
ASSIGN (3000)	Use this function to assign a measured variable to the totalizer. **Options (standard):** OFF VOLUME FLOW (CH1 to CH2) VOLUME FLOW AVERAGE VOLUME FLOW SUM VOLUME FLOW DIFFERENCE **Factory setting:** VOLUME FLOW CH1 ✎ Note! ■ The totalizer is reset to "0" as soon as the selection is changed. ■ If you select OFF, the only function shown in the CONFIGURATION function group is the ASSIGN function (3000).

Functional description TOTALIZERS → TOTALIZERS (1...3) → CONFIGURATION	
UNIT TOTALIZER (3001)	Use this function to define the unit for the totalizer's measured variable, as selected beforehand. **Options:** *Metric:* Cubic centimeter →cm^3 Cubic decimeter → dm^3 Cubic meter → m^3 Milliliter →ml Liter → l Hectoliter → hl Megaliter → Ml MEGA *US:* Cubic centimeter → cc Acre foot → af Cubic foot → ft^3 Fluid ounce → oz f Gallon → US gal Million gallon → US Mgal Barrel (normal fluids: 31.5 gal/bbl) →US bbl NORM.FL. Barrel (beer: 31.0 gal/bbl) →US bbl BEER Barrel (petrochemicals: 42.0 gal/bbl) →US bbl PETROCH. Barrel (filling tanks: 55.0 gal/bbl) →US bbl TANK *Imperial:* Gallon → imp. gal Mega gallon → imp. Mgal Barrel (beer: 36.0 gal/bbl) → imp. bbl BEER Barrel (petrochemicals: 34.97 gal/bbl) → imp. bbl PETROCH. **Factory setting:** Depends on country [m^3 or us.gal) → Page 77. ✎ Note! The unit selected here has no effect on the FOUNDATION Fieldbus. It is only used for the local display and for assigned instrument functions.
TOTALIZER MODE (3002)	Use this function 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 Only positive flow components REVERSE Negative flow components only **Factory setting:** Totalizer 1 = BALANCE Totalizer 2 = FORWARD Totalizer 3 = REVERSE

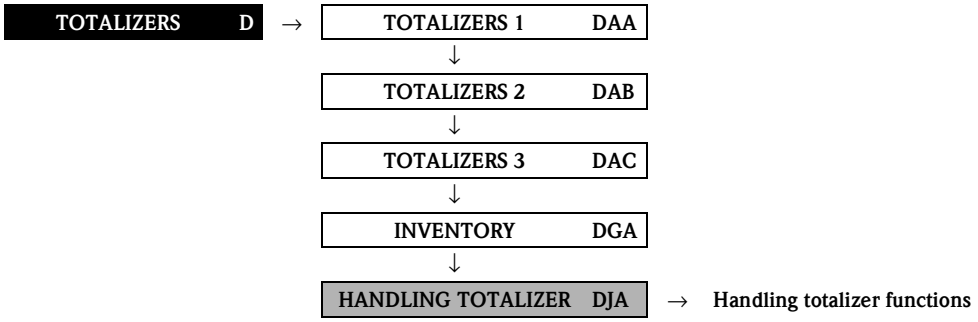
Functional description TOTALIZERS → TOTALIZERS (1...3) → CONFIGURATION	
RESET TOTALIZER (3003)	Use this function to reset the sum and the overflow of the totalizer to zero. **Options:** NO YES **Factory setting:** NO

6.1.2 Function group OPERATION



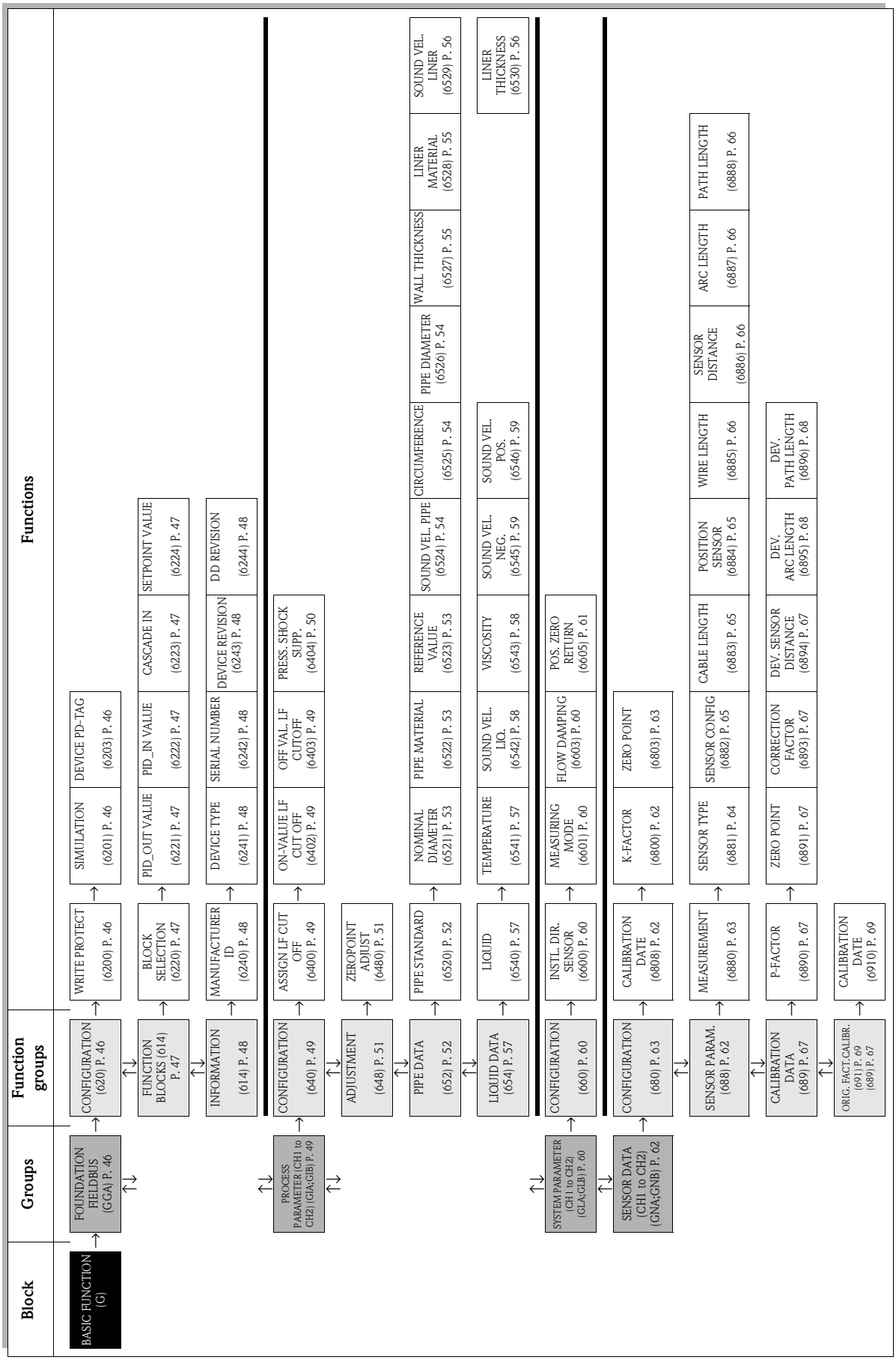
Functional description TOTALIZERS → TOTALIZERS (1...3) → OPERATION	
The function descriptions below apply to totalizers 1 to 3; the totalizers are independently configurable.	
SUM (3040)	Use this function to view the total for the totalizer's measured variable aggregated since measuring commenced. The value can be positive or negative, depending on the setting selected in the function TOTALIZER MODE (3002) and the flow direction. **Display:** Max. 7-digit floating-point number, including unit and sign (e.g. 15467.04m^3; –4925.631 kg) ✎ Note! ■ The effect of the setting in the TOTALIZER MODE function (3002) 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 totalizers' response to faults is defined in the "FAILSAFE MODE" function (3801).
OVERFLOW (3041)	Use this function to view the totaled 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 10^7 kg (= 20000000 kg). The value returned by the SUM function = 196845.7 kg Effective total quantity = 20196845.7 kg **Display:** Integer with exponent, including sign and unit, e.g. 2 10^7 kg

6.2 Group HANDLING TOTAL.



Functional description TOTALIZERS→ 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 MODE (3801)	Use this function 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 current 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**

Functional 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. **Display:** OFF Write access via FOUNDATION Fieldbus possible ON Write protection via FOUNDATION Fieldbus blocked **Factory setting:** OFF ✎ Note! Hardware write protection is activated and deactivated by means of a jumper on the I/O module (see Operating Instructions Prosonic Flow 93 FOUNDATION Fieldbus, BA00078D).
SIMULATION (6201)	Use this function to check whether a simulation in the Analog Input function block is possible. **Display:** 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! ■ Simulation mode is enabled and disabled by means of a jumper on the I/O module (see Operating Instructions Prosonic Flow 93 FOUNDATION Fieldbus, BA00078D). ■ 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_PROSONIC_FLOW_93_XXXXXXXXXXX (XXXXXXXXXXX = Serial number)

7.1.2 Function group FUNCTION BLOCKS

BASIC FUNCTION G → FOUNDATION FIELDBUS GGA → CONFIGURATION 620
↓
FUNCTION BLOCKS 622

Functional description BASIC FUNCTION → FOUNDATION FIELDBUS → FUNCTION BLOCKS	
BLOCK SELECTION (6220)	In this function, a function block can be selected, whose value and status is shown in the following functions. **Options:** ANALOG INPUT 1 to 8 PID **Factory setting:** ANALOG INPUT 1
OUT VALUE (6221)	Displays the output value OUT, incl. unit and status of the Analog Input or PID function block selected in the function BLOCK SELECTION (6220).
IN VALUE (6222)	✎ Note! This function is not available unless the PID option was selected in the BLOCK SELECTION (6220) function. **Display:** Displays the controlled variable IN, incl. unit and status of the Analog Input or PID function block selected in the function BLOCK SELECTION (6220).
CASCADE_IN VALUE (6223)	✎ Note! This function is not available unless the PID option was selected in the BLOCK SELECTION (6220) function. **Display:** Displays 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 option was selected in the BLOCK SELECTION (6220) function. ■ If the service code is used to call this function, this value can be edited. **Display:** Displays the internal set value, incl. units and status, for the PID function block.

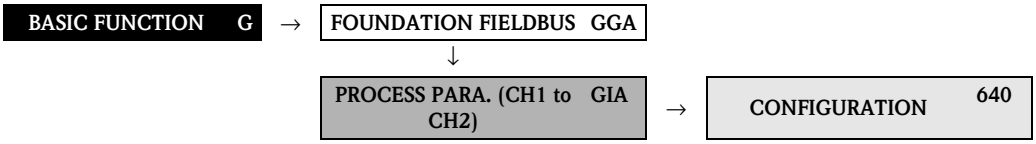
7.1.3 Function group INFORMATION

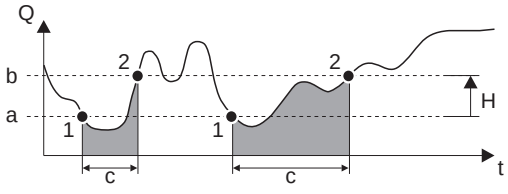
BASIC FUNCTION G → FOUNDATION FIELDBUS GGA → CONFIGURATION 620
↓
FUNCTION BLOCKS 622
↓
INFORMATION 624

Functional description BASIC FUNCTION → FOUNDATION FIELDBUS → INFORMATION	
MANUFACT ID (6240)	Use this function to view the manufacturer ID in decimal numerical format. **Display:** 452B48 (hex) for Endress+Hauser
DEVICE TYPE (6241)	Use this function to view the device ID in hexadecimal numerical format. **Display:** 1059 (hex) for Prosonic Flow 93 FOUNDATION Fieldbus
SERIAL NUMBER (6242)	Use this function to view the serial number. **Display:** 11-digit number
DEVICE REVISION (6243)	Use this function to view the device revision number. **Display:** 1 ✎ Note! The information displayed here helps ensure that the correct system files (DD = Device Description) are used for integration into the host system. The system files can be downloaded from the Internet free of charge (www.endress.com). Example: Display in the function DEVICE REVISION (6243) → 03 Information displayed in the function DD REVISION (6244) → 01 Device description files required (DD) → 0301.sym / 0301.ffo
DD REVISION (6244)	Use this function to view the revision number of the Device Description. **Display:** 1 ✎ Note! The information displayed here helps ensure that the correct system files (DD = Device Description) are used for integration into the host system. The system files can be downloaded from the Internet free of charge (www.endress.com). Example: Display in the function DEVICE REVISION (6243) → 03 Information displayed in the function DD REVISION (6244) → 01 Device description files required (DD) → 0301.sym / 0301.ffo

7.2 Group PROCESS PARAMETER (CH1 to CH2)

7.2.1 Function group CONFIGURATION



Functional description BASIC FUNCTION → PROCESS PARAMETER (CH1 to CH2)→ CONFIGURATION	
ASSIGN LOW FLOW CUTOFF (6400)	Use this function to assign the switching point for low flow cut off. **Options:** OFF VOLUME FLOW **Factory setting:** VOLUME FLOW
ON-VALUE LOW FLOW CUT OFF (6402)	Use this function to assign a value to the switch-on point for low flow cut off. Low flow cut off is active if the value entered is not equal to 0. The sign of the flow value is highlighted on the display to indicate that low flow cut off is active. **User input:** 5-digit floating-point number **Factory setting:** 0 l/s ✎ Note! The appropriate unit is taken from the UNIT VOLUME FLOW (0402) function→ Page 13.
OFF-VALUE LOW FLOW CUT OFF (6403)	Use this function to enter the switch-off (**b**) point 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% Example:  A0001245 Q = Flow [volume/time] t = Time a = ON-VALUE LOW FLOW CUT OFF (6402) = 200 dm^3/h b = OFF-VALUE LOW FLOW CUT OFF (6403) = 10% c = Low flow cut off active 1 = Low flow cut off is switched on at 200 dm^3/h 2 = Low flow cut off is switched off at 220 dm^3/h

Functional description

BASIC FUNCTION → PROCESS PARAMETER (CH1 to CH2)→ 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 function ON-VALUE LOW FLOW CUT OFF on Page 49).

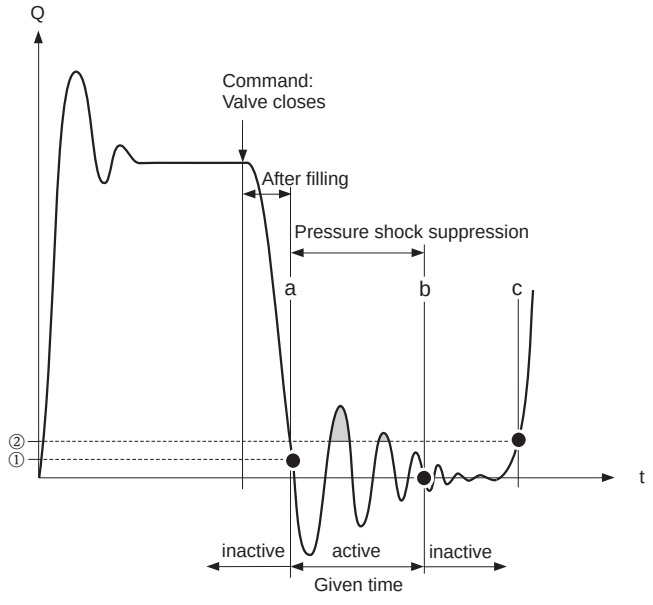
Use this function to define the time span for active pressure shock suppression.

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

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

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

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



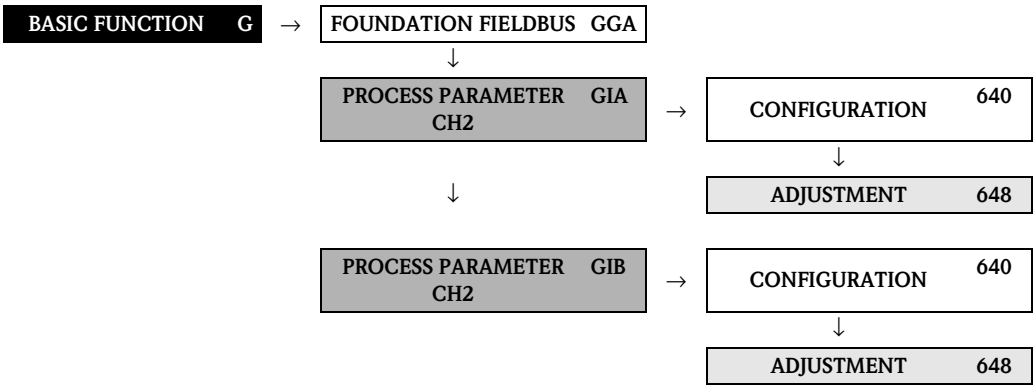
A0001285-EN

① = off-value (low flow cut off), ② = on-value (low flow cut off)
a Activated when the on-value for low flow cut off is undershot
b Deactivated once the time specified passes
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

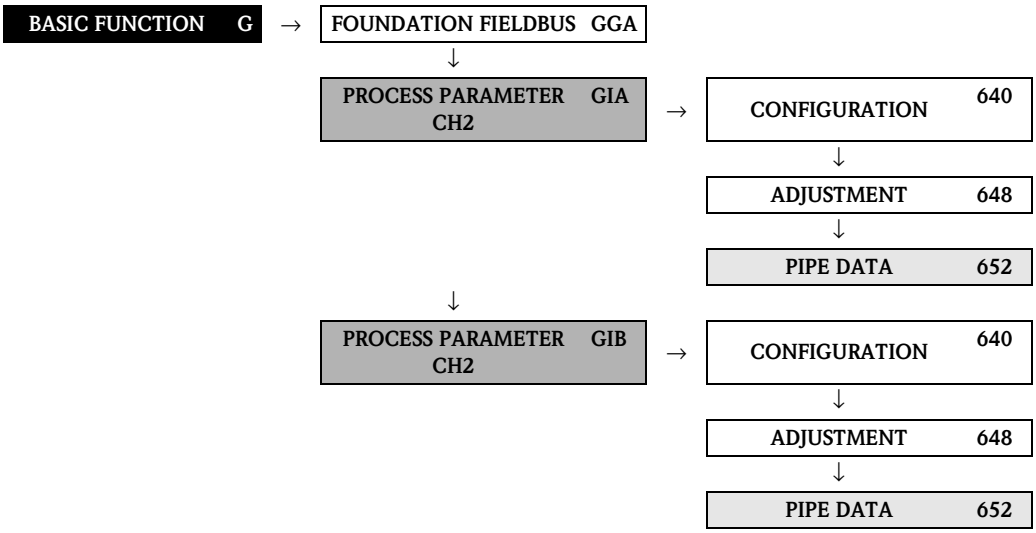
Factory setting:
0.00 s

7.2.2 Function group ADJUSTMENT



Functional description BASIC FUNCTION → PROCESS PARAMETER (CH1 to CH2) → ADJUSTMENT	
ZERO POINT (6480)	This function enables a zero point adjustment to be automatically carried out. The new zero point determined by the measuring system is adopted by the ZERO POINT function (→ Page 67). **User input:** CANCEL START **Factory setting:** CANCEL Caution! Before carrying out an adjustment, please refer to the Operating Instructions for Prosonic Flow 93 FOUNDATION Fieldbus, BA0078D, where a detailed description of zero point adjustment is given. Note! ■ Programming is locked during zero point adjustment. The message "ZERO ADJUST RUNNING" appears on the display. ■ If the zero point adjustment is not possible, e.g. with a flow velocity > 0.1 m/s, or has been canceled, then the alarm message "ZERO ADJUST NOT POSSIBLE" is shown on the display. This error is communicated to the subsequent function blocks via the status "UNCERTAIN" for the process variables.

7.2.3 Function group PIPE DATA



Functional description BASIC FUNCTION → PROCESS PARAMETER (CH1 to CH2) → PIPE DATA	
PIPE STANDARD (6520)	Use this function to select a pipe standard. **Options:** OTHERS DIN: PN10, PN16, 28610, 28614, 28615, 28619 ANSI: SS SCH 40S SS SCH 80S SS SCH 5S SS SCH 10S CS SCH 20 CS SCH 40 CS SCH 80 CS SCH 120 AWWA: CLASS 50, CLASS 53, CLASS 55 ✎ Note! The selection specifies the values for the following functions: ■ PIPE MATERIAL (6522) ■ SOUND VELOCITY PIPE (6524) ■ LINER MATERIAL (6528) If you edit these functions the pipe standard will be reset to the option OTHERS. **Factory setting:** DIN PN10

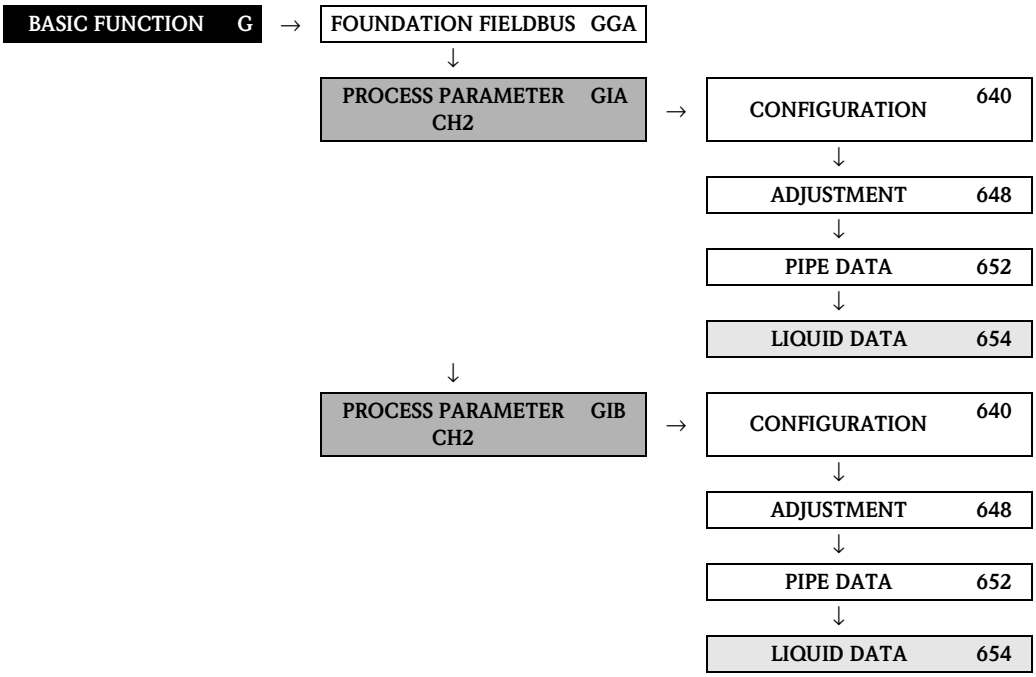
Functional description BASIC FUNCTION → PROCESS PARAMETER (CH1 to CH2) → PIPE DATA	
NOMINAL DIAMETER (6521)	✎ Note! This function does **not** appear if the option OTHERS was selected in the PIPE STANDARD function (6520). Use this function to select the nominal diameter of the pipe. **Options:** OTHERS DN: 15/½", 25/1", 40/1½", 50/2", 80/3", 100/4", 150/6", 200/8", 250/10", 300/12", 400/16", 450/18", 500/20", 600/24", 700/28", 750/30", 800/32", 900/36", 1000/40", 1200/48", 1400/54", 1500/60", 1600/64", 1800/72", 2000/80" ✎ Note! The selection specifies the values for the following functions: ■ CIRCUMFERENCE (6525) ■ PIPE DIAMETER (6526) ■ WALL THICKNESS (6527) If you edit these functions the pipe standard will be reset to the option OTHERS and the NOMINAL DIAMETER function (6521) does not appear. **Factory setting:** 80/3"
PIPE MATERIAL (6522)	This function displays the pipe material determined via the option selected in the PIPE STANDARD function (6520). If you edit the predetermined value the pipe standard will be reset to the option OTHERS and the NOMINAL DIAMETER function (6521) does not appear. The pipe material must be selected if the OTHERS option was selected in the PIPE STANDARD function (6520), and thus no pipe standard is defined. **Options:** CARBON STEEL, DUCTILE IRON, STAINLESS STEEL, SS ANSI 304, SS ANSI 316, SS ANSI 347, SS ANSI 410, SS ANSI 430, HASTELLOY C, PVC, PE, LDPE, HDPE, GRP, PVDF, PA, PP, PTFE, GLASS PYREX, COPPER, ASBESTOS CEMENT, OTHERS **Factory setting:** STAINLESS STEEL
REFERENCE VALUE (6523)	Use this function to enter the thickness of the reference component (e.g. flange) as the basis for measuring the sound velocity of the pipe. ✎ Note! This function does not appear unless the option SOUND VELOCITY PIPE was selected in the MEASUREMENT function (6880, → Page 63). **User input:** 5-digit floating-point number, [unit] **Factory setting:** 5 mm

Functional description BASIC FUNCTION → PROCESS PARAMETER (CH1 to CH2) → PIPE DATA	
SOUND VELOCITY PIPE (6524)	This function displays the sound velocity in the pipe determined via the option selected in the PIPE STANDARD function (6520). If you edit the predetermined value the pipe standard will be reset to the option OTHERS and the NOMINAL DIAMETER function (6521) does not appear. The sound velocity in the pipe must be entered if the OTHERS option was selected in the PIPE STANDARD function (6520), and thus no pipe standard is defined. **Measuring the sound velocity in the pipe** If the sound velocity in the pipe is unknown, it can be measured. For this purpose, the option SOUND VELOCITY PIPE must be selected in the MEASUREMENT function (6880, → Page 63). The sound velocity in the pipe is measured by calling up the SOUND VELOCITY PIPE function (6524). The measured sound velocity, the signal strength and a bar graph appear on the local display. The measurement is valid if 100% is achieved in the bar graph. If you confirm the function by pressing the E key, the SAVE prompt appears. To accept the measured sound velocity, select the option YES by means of the + or − key. ✎ Note! ■ To measure the sound velocity, you require the ultrasonic sensors "DDU18" which you can order as an accessory from Endress+Hauser. ■ A reference value is used as a basis for measuring the sound velocity. This reference value can be edited (→ Page 53). **User input:** Fixed-point number 800 to 6500 m/s **Factory setting:** 3120 m/s
CIRCUMFERENCE (6525)	This function displays the outer circumference of the pipe determined via the option selected in the NOMINAL DIAMETER function (6521). If you edit the predetermined value the pipe standard will be reset to the option OTHERS and the NOMINAL DIAMETER function (6521) does not appear. The pipe outer circumference must be entered here if the OTHERS option was selected in the NOMINAL DIAMETER function (6521), and thus no pipe standard is defined. **User input:** Fixed-point number 31.4 to 15708.0 mm **Factory setting:** 279.3 mm
PIPE DIAMETER (6526)	This function displays the outer diameter of the pipe determined via the option selected in the NOMINAL DIAMETER function (6521). If you edit the predetermined value the pipe standard will be reset to the option OTHERS and the NOMINAL DIAMETER function (6521) does not appear. The pipe outer diameter must be entered here if the OTHERS option was selected in the NOMINAL DIAMETER function (6521), and thus no pipe standard is defined. **User input:** Fixed-point number 10.0 to 5000.0 mm **Factory setting:** 88.9 mm

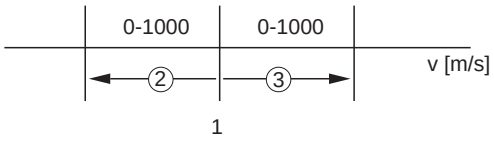
Functional description BASIC FUNCTION → PROCESS PARAMETER (CH1 to CH2) → PIPE DATA	
WALL THICKNESS (6527)	This function displays the thickness of the pipe walls determined via the option selected in the NOMINAL DIAMETER function (6521). If you edit the predetermined value the pipe standard will be reset to the option OTHERS and the NOMINAL DIAMETER function (6521) does not appear. The wall thickness must be entered here if the OTHERS option was selected in the NOMINAL DIAMETER function (6521), and thus no pipe standard is defined. **Measuring the wall thickness** If the wall thickness is unknown, it can be measured. For this purpose, the option WALL THICKNESS must be selected in the MEASUREMENT function, (6880, → Page 63). The wall thickness is measured by calling up the WALL THICKNESS function (6527). The measured wall thickness, the signal strength and a bar graph appear on the local display. The measurement is valid if 100% is achieved in the bar graph. If you confirm the function by pressing the E key, the SAVE prompt appears. To accept the measured wall thickness, select the option YES by means of the + or − key. ✎ Note! To measure the wall thickness, you require the ultrasonic sensors "DDU19" which you can order as an accessory from Endress+Hauser. **User input:** Fixed-point number 0.1 to 100.0 mm **Factory setting:** 3.2 mm
LINER MATERIAL (6528)	This function displays the liner material of the pipe determined via the option selected in the PIPE STANDARD function (6520). If you edit the predetermined value the pipe standard will be reset to the option OTHERS and the NOMINAL DIAMETER function (6521) does not appear. The liner material must be specified if the OTHERS option was selected in the PIPE STANDARD function (6520), and thus no pipe standard is defined. **Options:** LINER NONE MORTAR RUBBER TAR EPOXY OTHERS **Factory setting:** LINER NONE

Functional description BASIC FUNCTION → PROCESS PARAMETER (CH1 to CH2) → PIPE DATA	
SOUND VELOCITY LINER (6529)	✎ Note! This function does **not** appear if the option LINER NONE was selected in the LINER MATERIAL function (6528). This function displays the sound velocity of the liner This is defined by the selection in the function LINER MATERIAL (6528). If you change the default value, the liner material is reset to the value OTHER. The sound velocity of the liner must be entered if the OTHERS option was selected in the LINER MATERIAL function (6528). **User input:** Fixed-point number 800 to 6500 m/s **Factory setting:** Depending on the selection in the LINER MATERIAL function (6528)
LINER THICKNESS (6530)	✎ Note! This function does **not** appear if the option LINER NONE was selected in the LINER MATERIAL function (6528). Use this function to enter the thickness of the liner. **User input:** Fixed-point number 0.1 to 100.0 mm **Factory setting:** 0 mm

7.2.4 Function group LIQUID DATA



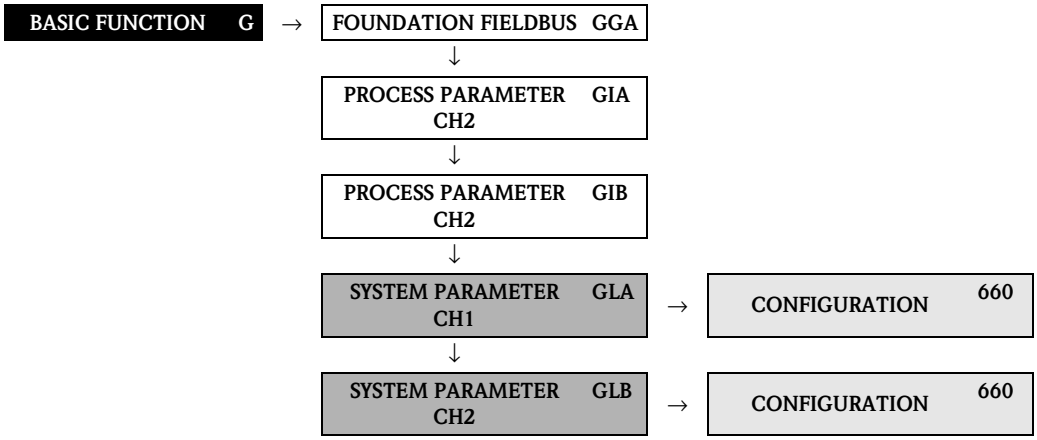
Functional description BASIC FUNCTION → PROCESS PARAMETER (CH1 to CH2) → LIQUID DATA	
LIQUID (6540)	Use this function to select the liquid in the pipe. **Options:** WATER, SEA WATER, DISTILLED WATER, AMMONIA, ALCOHOL, BENZENE, BROMIDE, ETHANOL, GLYCOL, KEROSENE, MILK, METHANOL, TOLUENE, LUBE OIL, DIESEL, PETROL, OTHERS ✎ Note! The selection specifies the values for the sound velocity and viscosity. If OTHERS is selected, these values must be entered via the SOUND VELOCITY LIQUID (6542) and VISCOSITY (6543) functions. **Factory setting:** WATER
TEMPERATURE (6541)	Use this function to enter the process temperature of the liquid. Via the sound velocity, the value influences the determination of the sensor distance. Enter the process temperature at normal operating conditions to achieve an optimum configuration of the measuring system. **User input:** Fixed-point number –273.15 to 726.85 °C (0 to 1000 K) **Factory setting:** 20 °C

Functional description BASIC FUNCTION → PROCESS PARAMETER (CH1 to CH2) → LIQUID DATA	
SOUND VELOCITY LIQUID (6542)	This function displays the sound velocity of the liquid. This is determined via the values entered in the LIQUID (6540) and TEMPERATURE (6541) functions. If you edit the predetermined value the LIQUID function (6540) will be reset to the option OTHERS. The sound velocity of the liquid must be entered if the liquid is not listed in the LIQUID function (6540) and the OTHERS option was selected. **Measuring the sound velocity of the liquid** If the sound velocity of the liquid is unknown, it can be measured. For this purpose, the option SOUND VELOCITY LIQUID must be selected in the MEASUREMENT function (6880, → Page 63). The sound velocity in the liquid is measured by calling up the SOUND VELOCITY LIQUID function (6542). The result of the measurement appears on the local display. If you confirm the function by pressing the E key, the SAVE prompt appears. To accept the measured sound velocity, select the option YES by means of the + or − key. ✎ Note! To measure the sound velocity, you require the ultrasonic sensors "DDU18" which you can order as an accessory from Endress+Hauser. **Transmitter search range:** The measuring device searches for the measuring signal within a defined sound velocity range. You specify the search range in the SOUND VELOCITY NEGATIVE (6545) or SOUND VELOCITY POSITIVE (6546) functions. An error message is displayed if the sound velocity of the liquid exceeds the search range. ✎ Note! We recommend you select a smaller search range for unfavorable signal conditions (signal strength < 50%).  A0001246 1 = Sound velocity of the liquid ② = Lower search range: is specified in the SOUND VEL. NEGATIVE function (6545) ③ = Upper search range: is specified in the SOUND VEL. POSITIVE function (6546) **User input:** Fixed-point number 400 to 3000 m/s **Factory setting:** 1485 m/s
VISCOSITY (6543)	This function displays the viscosity of the liquid. This is determined via the values entered in the LIQUID (6540) and TEMPERATURE (6541) functions. If you edit the predetermined value the LIQUID function (6540) will be reset to the option OTHERS. The viscosity must be entered if the liquid is not listed in the LIQUID function (6540) and the OTHERS option was selected. **User input:** Fixed-point number 0.0 to 5000.0 mm^2/s (cSt) **Factory setting:** 1 mm^2/s

Functional description BASIC FUNCTION → PROCESS PARAMETER (CH1 to CH2) → LIQUID DATA	
SOUND VELOCITY NEGATIVE (6545)	Use this function to specify the lower search range for the sound velocity of the liquid. **User input:** Fixed-point number 400 to 3000 m/s **Factory setting:** 500 m/s ✎ Note! See the explanations in the SOUND VELOCITY LIQUID function (6542).
SOUND VELOCITY POSITIVE (6546)	Use this function to specify the upper search range for the sound velocity of the liquid. **User input:** Fixed-point number 400 to 3000 m/s **Factory setting:** 300 m/s ✎ Note! See the explanations in the SOUND VELOCITY LIQUID function (6542).

7.3 Group SYSTEM PARAMETER (CH1 to CH2)

7.3.1 Function group CONFIGURATION

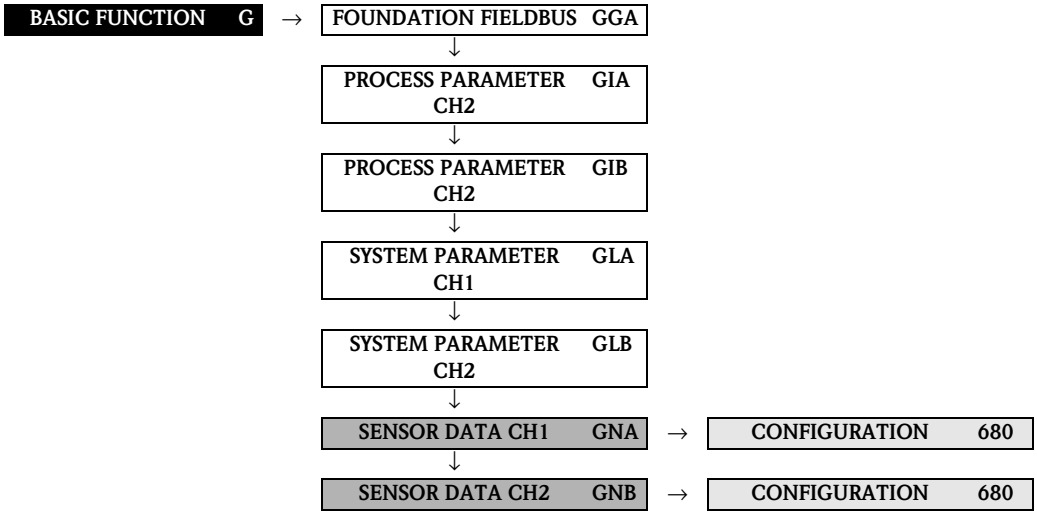


Functional description BASIC FUNCTION→ SYSTEM PARAMETER CH1 → CONFIGURATION	
INSTALLATION DIRECTION SENSOR (6600)	Use this function to reverse the sign of the flow quantity, if necessary. **Options:** NORMAL INVERSE (REVERSE) **Factory setting:** NORMAL
MEASURING MODE (6601)	Use this function to specify the flow direction for outputting the signal: Unidirectional: Signal is only output if the flow direction is positive (forward flow). Flow in the negative flow direction (reverse flow) is not taken into account or totalized by the measuring system. Bidirectional: Signal is output with flow in both directions (forward and reverse flow). **Options:** UNIDIRECTIONAL BIDIRECTIONAL **Factory setting:** UNIDIRECTIONAL
FLOW DAMPING (6603)	✎ Note! The system damping acts on all functions and FOUNDATION Fieldbus outputs of the measuring device. 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 system reaction time increases with the filter setting. **User input:** 0 to 100 s **Factory setting:** 0 s

Functional description BASIC FUNCTION→ SYSTEM PARAMETER CH1 → CONFIGURATION	
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. The selection has an effect on the volume flow and the totalizer and the corresponding device functions and outputs of the FOUNDATION Fieldbus interface. **Options:** OFF ON (signal output is set to the "zero flow" value) **Factory setting:** OFF ✎ Note! An active positive zero return is communicated to the subsequent function blocks via the status "UNCERTAIN" for the process variables.

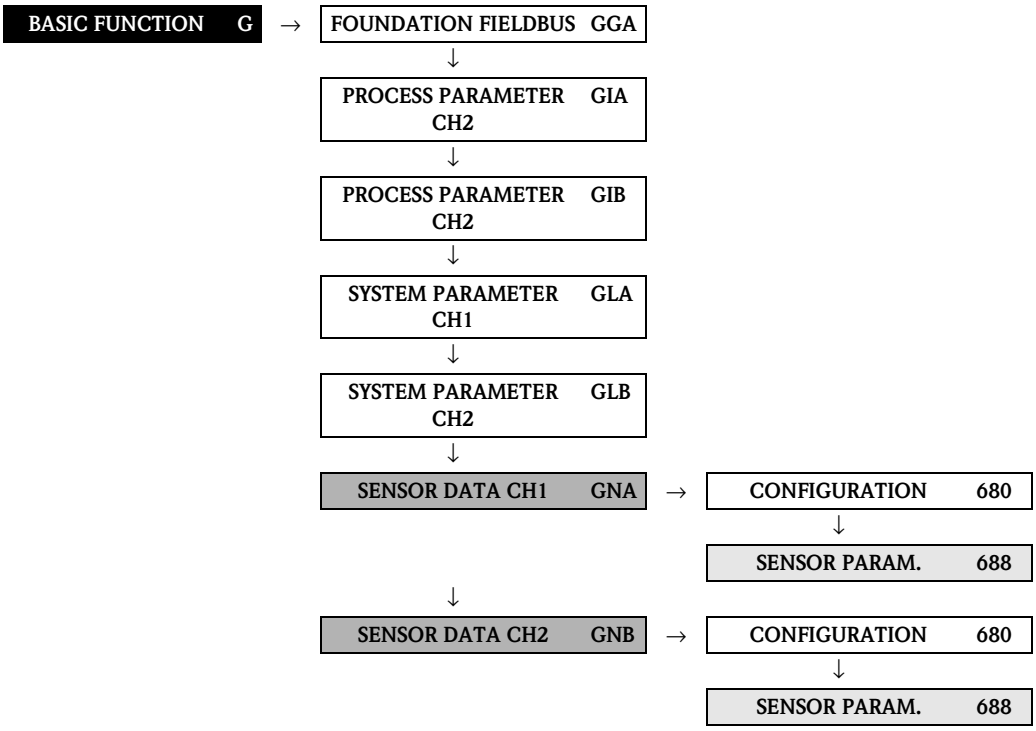
7.4 Group SENSOR DATA (CH1 to CH2)

7.4.1 Function group CONFIGURATION



Functional description BASIC FUNCTION → SENSOR DATA (CH1 to CH2) → CONFIGURATION	
✎ Note! The function group is only available for measuring devices in "Clamp on" version..	
CALIBRATION DATE (6808)	Use this function to view the calibration date (last calibration). ✎ Note! ■ If the measuring device is delivered without calibration, the display shows the value 1.0. ■ If the calibration is reset via the function CALIBRATION DATE (6910), the date is overwritten. **Display:** Format depends on the selection in function FORMAT DATE/TIME (0429)
K-FACTOR (6800)	Use this function to view the current calibration factor for the measuring tube and the measuring sensors. **Display:** 5-digit floating-point number, (including sign) **Factory setting:** depends on the nominal diameter and the calibration
ZERO POINT (6803)	Use this function to view the zero-point correction value for the measuring tube and the measuring sensors The calibration at the factory determines the zero-point correction value. ✎ Note! If the measuring device is delivered without calibration, the display shows the value 0 **Display:** 5-digit floating-point number, (including sign) **Factory setting:** depends on the nominal diameter and the calibration

7.4.2 Function group SENSOR PARAMETER



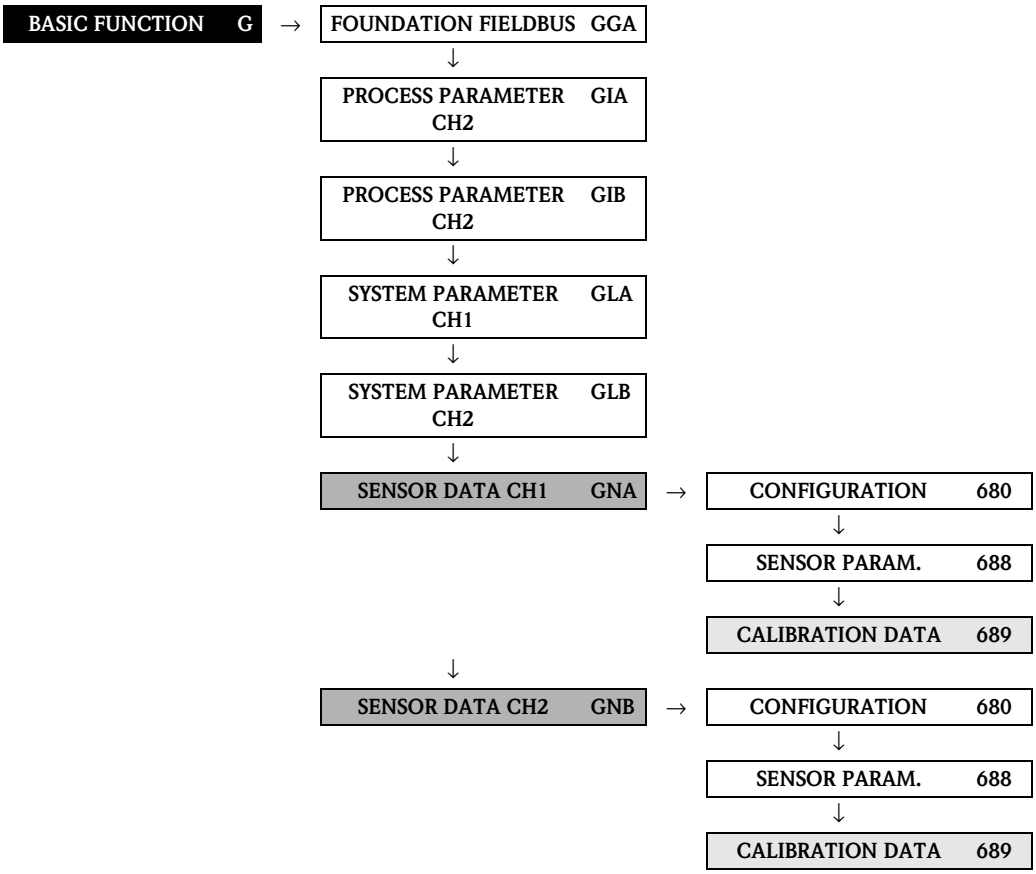
Functional description BASIC FUNCTION → SENSOR DATA (CH1 to CH2) → SENSOR PARAMETER	
MEASUREMENT (6880)	**Options:** OFF CLAMP ON INSERTION SOUND VELOCITY LIQUID SOUND VELOCITY PIPE WALL THICKNESS **Factory setting:** CLAMP ON (for channel 1) OFF (for channel 2)

Functional description BASIC FUNCTION → SENSOR DATA (CH1 to CH2) → SENSOR PARAMETER	
SENSOR TYPE (6881)	✎ Note! This function is only available if the OFF setting was **not** selected in the MEASUREMENT function. Select the appropriate type of measuring sensor. As a rule, a selection is not necessary as the type of measuring sensor has already been set according to the order data (order code). **Options:** (CLAMP ON in the MEASUREMENT function) W-CL-05F-L-B W-CL-1F-L-B W-CL-1F-L-C W-CL-2F-L-B P-CL-05F-L-B P-CL-05F-M-B P-CL-1F-L-B P-CL-1F-M-B P-CL-2F-L-B P-CL-2F-M-B P-CL-6F-L-C P-CL-6F-M-C U-CL-2F-L-A **Options:** (INSERTION in the MEASUREMENT function) W-IN-1F-L-B **Options:** (SOUND VELOCITY LIQUID in the MEASUREMENT function) P-CL-1S-L-B P-CL-1S-M-B **Options:** (SOUND VELOCITY PIPE or WALL THICKNESS in the MEASUREMENT function) P-CL-4W-L-B **Factory setting:** depends on the order code

Functional description BASIC FUNCTION → SENSOR DATA (CH1 to CH2) → SENSOR PARAMETER	
SENSOR CONFIGURATION (6882)	Use this function to select the configuration for the ultrasonic sensors, e.g. the number of traverses (in the clamp-on design) or whether single-path or dual-path configuration is present (in the insertion design). ✎ Note! This function is not available unless one of the following options was selected in the MEASUREMENT function (6880): ■ CLAMP ON ■ SOUND VELOCITY LIQUID ■ INSERTION **Options:** NO. TRAVERSE: 1 [1] NO. TRAVERSE: 2 [2] NO. TRAVERSE: 3 [1] NO. TRAVERSE: 4 [2] SINGLE PATH [3] DUAL PATH [3] **Factory setting:** NO. TRAVERSE: 2 ✎ Note! ■ In principle, setting "NO. TRAVERSE: 2" is for the P-sensor DN15 ... DN 65 necessary. ■ For sound velocity measurement it is always required to set this function to "NO. TRAVERSE: 1" or "NO. TRAVERSE: 3". ■ For flow measurement it is basically not recommended to set this function to "NO. TRAVERSE: 3". [1] This option is not available unless CLAMP ON or SOUND VELOCITY LIQUID was selected in the MEASUREMENT function. [2] This option is not available unless CLAMP ON was selected in the MEASUREMENT function. [3] This option is not available unless INSERTION was selected in the MEASUREMENT function.
CABLE LENGTH (6883)	Use this function to select the length of the sensor cable. **Options:** LENGTH 5m/15 feet LENGTH 10m/30 feet LENGTH 15m/45 feet LENGTH 30m/90 feet **Factory setting:** Depends on the order code
POSITION SENSOR (6884)	Use this function to view the position of both sensors on the rail. ✎ Note! This option is not available unless CLAMP ON is set in the MEASUREMENT function and the number of traverses is 2 or 4 (see the SENSOR CONFIGURATION function (6882)). **Display:** 5-digit number combination

Functional description BASIC FUNCTION → SENSOR DATA (CH1 to CH2) → SENSOR PARAMETER	
WIRE LENGTH (6885)	The wire length for assembling the sensors at the correct distance apart appears on the display. ✎ Note! This option is not available unless CLAMP ON is set in the MEASUREMENT function and the number of traverses is 1 or 3 (see the SENSOR CONFIGURATION function (6882)). **Display:** max. 5-digit number, including unit (e.g. 200 mm)
SENSOR DISTANCE (6886)	The distance between sensor 1 and sensor 2 as a length measurement appears on the display. **Display:** max. 5-digit number, including unit (e.g. 200 mm)
ARC LENGTH (6887)	The arc length on the pipe appears on the display. ✎ Note! This function is not available unless INSERTION was set in the MEASUREMENT function (6880) and the DUAL PATH option was selected in the SENSOR CONFIGURATION function (6882). **Display:** max. 5-digit number, including unit (e.g. 200 mm)
PATH LENGTH (6888)	The path length appears on the display. ✎ Note! This function is not available unless INSERTION was selected in the MEASUREMENT function. **Display:** max. 5-digit number, including unit (e.g. 200 mm)

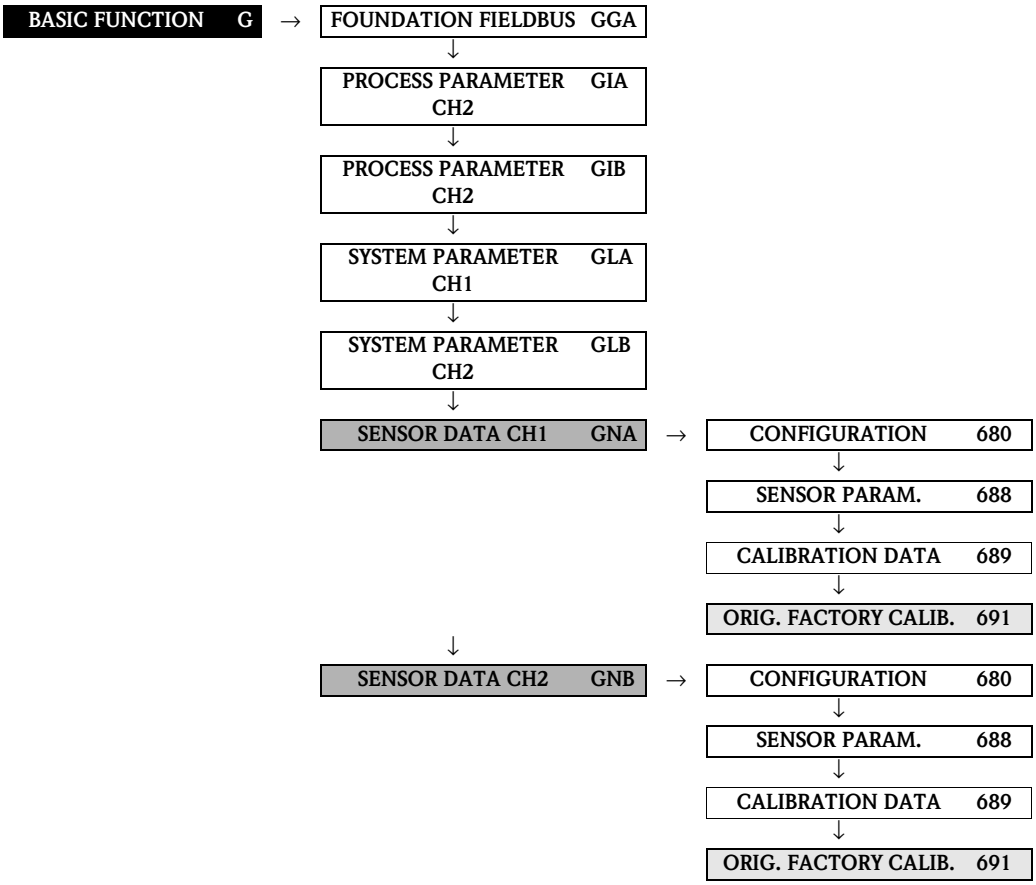
7.4.3 Function group CALIBRATION DATA



Functional description BASIC FUNCTION → SENSOR DATA (CH1 to CH2) → CALIBRATION DATA	
P-FACTOR (6890)	Use this function to display the P-factor. The P-factor describes the effect of the speed distribution of the flow profile in the pipe and depends on the Reynolds number. The P-factor varies in the range from 0.75 to 0.95. If the displayed value is in the range between 0.75 and 0.94, the measurement must be expected to have less linearity.
ZERO POINT (6891)	Use this function to call up or manually change the zero point correction currently being used. **User input:** 5-digit floating-point number, including unit and sign (e.g. +10.0 ns)
CORRECTION FACTOR (6893)	Use this function to enter a correction factor at the client's site. **User input:** 5-digit floating-point number **Factory setting:** 1.0000 (no correction)
DEV. SENSOR DISTANCE (6894)	Use this function to enter a deviation value for the sensor distance. ✎ Note! This option is not available unless INSERTION was selected in the MEASUREMENT function (6880). **User input:** 5-digit floating-point number, including unit and sign (e.g. +2.0000 mm) **Factory setting:** 0 mm

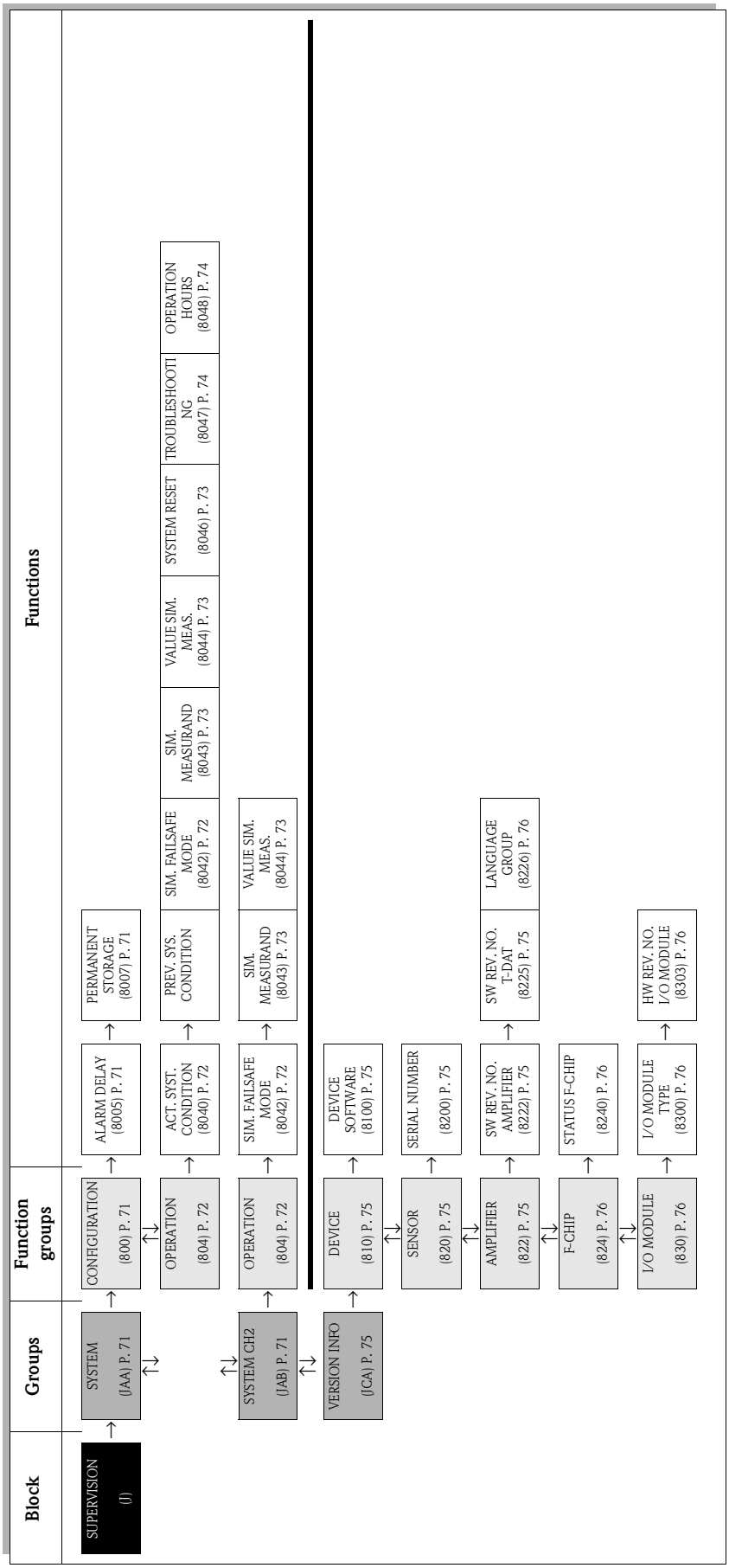
Functional description BASIC FUNCTION → SENSOR DATA (CH1 to CH2) → CALIBRATION DATA	
DEV. ARC LENGTH (6895)	Use this function to enter a deviation value for the arc length. ✎ Note! This function is not available unless INSERTION was set in the MEASUREMENT function (6880) and the DUAL PATH option was selected in the SENSOR CONFIGURATION function (6882). **User input:** 5-digit floating-point number, including unit and sign (e.g. +2.0000 mm) **Factory setting:** 0 mm
DEV. PATH LENGTH (6896)	Use this function to enter a deviation value for the path length. ✎ Note! This option is not available unless INSERTION was selected in the MEASUREMENT function (6880). **User input:** 5-digit floating-point number, including unit and sign (e.g. +2.0000 mm) **Factory setting:** 0 mm

7.4.4 Function group ORIG. FACT. CALIBR.



Functional description BASIC FUNCTION → SENSOR DATA (CH1 to CH2) → ORIG. FACT. CALIBR.	
CALIBRATION DATE (6910)	This function resets the calibration data of the measuring device to the factory settings. Procedure: 1. Enter current date. 2. Store it. The measuring device resets the calibration data to the factory settings and restarts automatically. ✎ Note! ■ The calibration data reset is recorded in the calibration history. ■ The date of the function CALIBRATION DATE (6808) is overwritten. **User input:** Format depends on the selection in function FORMAT DATE/TIME (0429)

8 Block SUPERVISION



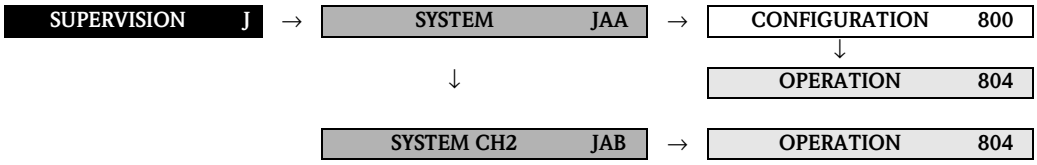
8.1 Group SYSTEM (SYSTEM CH2)

8.1.1 Function group CONFIGURATION

SUPERVISION J → SYSTEM JAA → CONFIGURATION 800

Functional description SUPERVISION→ SYSTEM → CONFIGURATION	
ALARM DELAY (8005)	Use this function to specify a time period for suppressing the appearance of fault or notice messages . This suppression acts on: ■ Display ■ Output values (AI blocks) FF interface **User input:** 0 to 100 s (in steps of one second) **Factory setting:** 0 s Caution! If this function is activated, error and notice messages are delayed by the time corresponding to the setting before being forwarded 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 error and notice messages cannot be suppressed, a value of 0 seconds must be entered here.
PERMANENT STORAGE (8007)	This function displays whether permanent storage of all parameters in the EEPROM is switched on or off. **Options:** OFF ON **Factory setting:** ON

8.1.2 Function group OPERATION



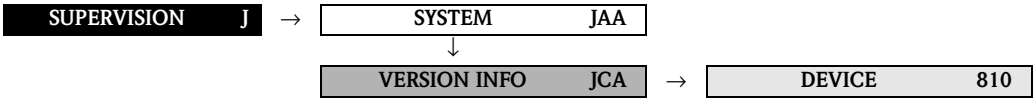
Functional description SUPERVISION→ SYSTEM [CH2] → OPERATION	
ACTUAL SYSTEM CONDITION (8040)	Use this function to check the present system condition. **Display:** SYSTEM OK or the fault/notice message with the highest priority.
PREVIOUS SYSTEM CONDITIONS (8041)	Use this function to view the fifteen most recent error and notice messages since measuring last started. **Display:** The last 15 fault/notice messages appear on the display.
SIMULATION FAILSAFE MODE (8042)	✎ Note! This function is available in groups SYSTEM+SYSTEM CH2. Use this function to set all totalizers to their defined failsafe modes, in order to check whether they respond correctly. During this time, the words "SIMULATION FAILSAFE MODE" appear on the display. **Options:** ON OFF FAILURE (CH1 to CH2) **Factory setting:** OFF ✎ Note! With the fieldbus, an active simulation is relayed to downstream function blocks or higher-level process control systems by means of the status UNCERTAIN of the output value OUT (AI Block).

Functional description SUPERVISION→ SYSTEM [CH2] → OPERATION	
SIMULATION MEASURAND (8043)	✎ Note! This function is available in groups SYSTEM+SYSTEM CH2. Use this function to set all 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 VOLUME FLOW (CH1 to CH2) SOUND VELOCITY (CH1 to CH2) SIGNAL STRENGTH (CH1 to CH2) **Factory setting:** OFF ☝ Caution! ■ The measuring device cannot be used for measuring while this simulation is in progress. ■ The setting is not saved in the event of a power failure. ✎ Note! ■ An active simulation of the measurand is communicated to the subsequent function blocks via the status "UNCERTAIN" for the process variables. ■ The simulation is independent of the position of the jumper for the simulation mode on the I/O board.
VALUE SIMULATION MEASURAND (8044)	✎ Note! This function is available in groups SYSTEM+SYSTEM CH2. ✎ Note! The function is not visible unless the function SIMULATION MEASURAND (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 FOUNDATION Fieldbus function blocks. **User input:** 5-digit floating-point number, [unit] **Factory setting:** 0 [unit] ☝ Caution! ■ The setting is not saved in the event of a power failure. ■ The appropriate unit is taken from the SYSTEM UNITS (ACA) function group, → 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

Functional description SUPERVISION→ SYSTEM [CH2] → OPERATION	
TROUBLESHOOTING (8047)	This function allows you to remedy errors that occur in the EEPROM. The EEPROM is divided into various blocks. Only blocks in which an error has occurred are displayed. Troubleshooting takes place by selecting the respective block and acknowledging using the E key. Caution! When troubleshooting a block, the parameters of the selected block are reset to the values according to the factory setting. **Options:** CANCEL "Faulty block"
OPERATION HOURS (8048)	The hours of operation of the device appear on the display. **Display:** Depends on the number of hours of operation elapsed: Hours of operation < 10 hours → display format = 00:00:00 (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)

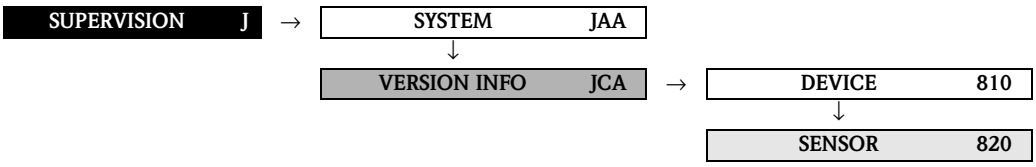
8.2 Group VERSION INFO

8.2.1 Function group DEVICE



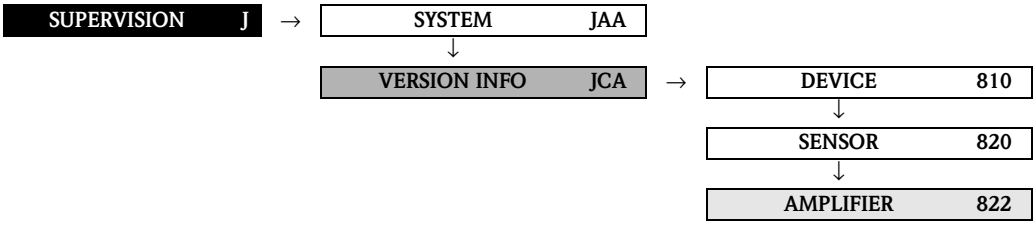
Functional description SUPERVISION → VERSION INFO → DEVICE	
DEVICE SOFTWARE (8100)	Displays the current device software version.

8.2.2 Function group SENSOR



Functional description SUPERVISION → VERSION INFO → SENSOR	
SERIAL NUMBER (8200)	Use this function to view the serial number of the sensor.

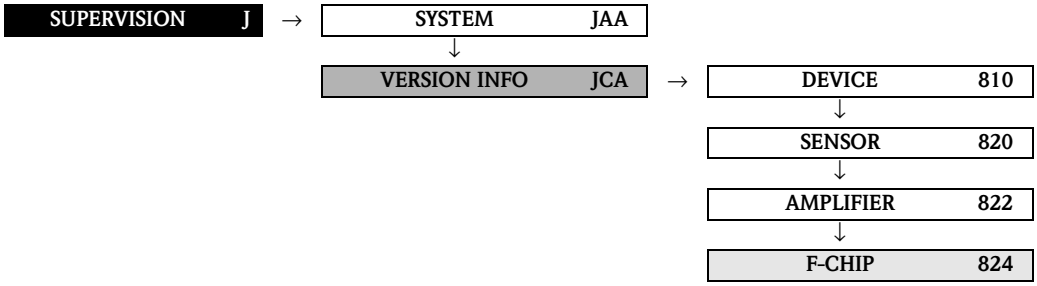
8.2.3 Function group AMPLIFIER



Functional 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 function to view the software revision number of the software used to create the content of the T-DAT.

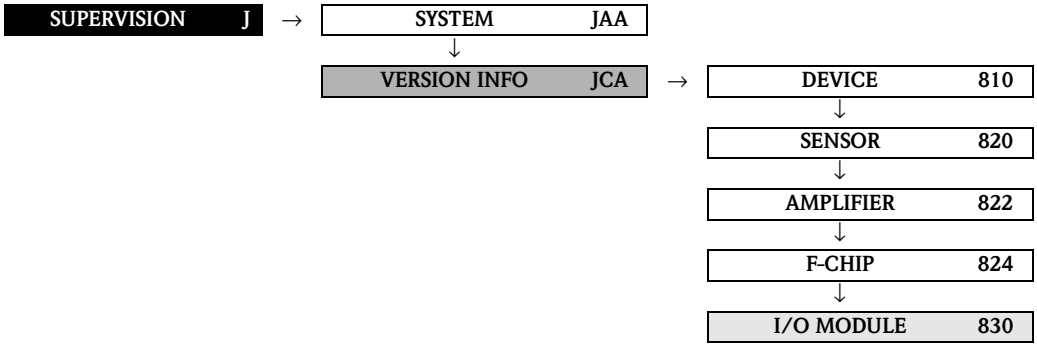
Functional description SUPERVISION → VERSION INFO → AMPLIFIER	
LANGUAGE GROUP (8226)	Use this function to view the language group. The following language groups can be ordered: WEST EU / USA, EAST EU / SCAND., ASIA, CHINESE. **Display:** available language group ✎ Note! ■ The language options of the available language group are displayed in the LANGUAGE function (2000). ■ You can change the language group via the configuration software FieldCare. Please do not hesitate to contact your Endress+Hauser sales office if you have any questions.

8.2.4 Function group F-CHIP



Functional description SUPERVISION→ VERSION INFO → F-CHIP	
STATUS F-CHIP (8240)	Use this function to check whether an F-CHIP is installed.

8.2.5 Function group I/O MODULE



Functional description SUPERVISION → VERSION INFO → I/O-MODUL	
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 Factory settings

9.1 SI units

Parameter	Factory setting
Nominal diameter	80 [mm]
Low flow cut off (v ≈ 0.04 m/s)	12 [dm^3/min]
Unit totalizer	dm^3
Unit length	mm
Unit temperature	°C

9.2 US units (for USA and Canada only)

Parameter	Factory setting
Nominal diameter	3"
Low flow cut off (v ≈ 0.04 m/s)	2.5 [gal/min]
Unit totalizer	gal
Unit length	inch
Unit temperature	F

9.3 Language

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

10 Index Function matrix

Blocks

A = MEASURED VARIABLES 9
B = QUICK SETUP 17
C = USER INTERFACE 22
D = TOTALIZER 39
G = BASIC FUNCTION 45
J = SUPERVISION 70

Groups

AAA = MEASURING VALUES 10
ACA = SYSTEM UNITS 13
CAA = CONTROL 23
CCA = MAIN LINE 27
CEA = ADDITIONAL LINE 31
CGA = INFORMATION LINE 35
DAA = TOTALIZER 1 40
DAB = TOTALIZER 2 40
DAC = TOTALIZER 3 40
DJA = HANDLING TOTALIZER 44
GGA = FOUNDATION FIELDBUS 46
GIA, GIB = PROCESS PARAMETER (CH1 to CH2) 49
GLA, GLB = SYSTEM PARAMETER (CH1 to CH2) 60
GNA, GNB = SENSOR DATA (CH1 to CH2) 62
JAA = SYSTEM 71
JAB = SYSTEM CH2 72
JCA = VERSION INFO 75

Function Groups

000 = MAIN VALUES CH1 10
006 = MAIN VALUES CH2 11
008 = CALCULATED MAIN VALUES 12
040 = CONFIGURATION 13
042 = ADDITIONAL CONFIGURATION 15
200 = BASIC CONFIGURATION 23
202 = UNLOCKING/LOCKING 25
204 = OPERATION 26
220 = CONFIGURATION 27
222 = MULTIPLEX 29
240 = CONFIGURATION 31
242 = MULTIPLEX 33
260 = CONFIGURATION 35
262 = MULTIPLEX 37
300 = CONFIGURATION 40
304 = OPERATION 43
620 = CONFIGURATION 46
622 = FUNCTION BLOCKS 47
624 = INFORMATION 48
640 = CONFIGURATION 49
648 = ADJUSTMENT 51
652 = PIPE DATA 52
654 = LIQUID DATA 57
660 = CONFIGURATION 60
680 = CONFIGURATION 62
688 = SENSOR PARAMETER 63
689 = CALIBRATION DATA 67
691 = ORIG. FACT. CALIBRATION 69
800 = CONFIGURATION 71
804 = OPERATION 72
810 = DEVICE 75
820 = SENSOR 75
822 = AMPLIFIER 75
824 = F-CHIP 76
830 = I/O MODULE 76

Functions 0...

0001 = VOLUME FLOW CH1 10
0002 = SOUND VELOCITY CH1 10
0003 = FLOW VELOCITY CH1 10
0007 = SIGNAL STRENGTH CH1 10
0061 = VOLUME FLOW CH2 11
0062 = SOUND VELOCITY CH2 11
0063 = FLOW VELOCITY CH2 11
0067 = SIGNAL STRENGTH CH2 11
0083 = AVERAGE VOLUME FLOW 12
0084 = VOLUME FLOW SUM 12
0085 = VOLUME FLOW DIFFERENCE 12
0086 = AVERAGE SOUND VELOCITY 12
0087 = AVERAGE FLOW VELOCITY 12
0402 = UNIT VOLUME FLOW 13
0403 = UNIT VOLUME 14
0422 = UNIT TEMPERATURE 15
0423 = UNIT VISCOSITY 15
0424 = UNIT LENGTH 15
0425 = UNIT VELOCITY 16
0429 = FORMAT DATE/TIME 16

1...

1001 = QUICK SETUP SENSOR 17
1002 = QUICK SETUP COMMISSIONING 17
1009 = T-DAT SAVE/LOAD 17

2...

2000 = LANGUAGE 23
2002 = DISPLAY DAMPING 23
2003 = CONTRAST LCD 24
2004 = BACKLIGHT 24
2009 = X-LINE CALCULATED MAIN VALUES 24
2020 = ACCESS CODE 25
2021 = DEFINE PRIVATE CODE 25
2022 = STATUS ACCESS 25
2023 = ACCESS CODE COUNTER 25
2040 = TEST DISPLAY 26
2200 = ASSIGN 27
2201 = 100% VALUE 27
2202 = FORMAT 28
2220 = ASSIGN 29
2221 = 100% VALUE 29
2222 = FORMAT 30
2400 = ASSIGN 31
2401 = 100% VALUE 32

2402 = FORMAT 32
2403 = DISPLAY MODE 32
2420 = ASSIGN 33
2421 = 100% VALUE 33
2422 = FORMAT 34
2423 = DISPLAY MODE 34
2600 = ASSIGN 35
2601 = 100% VALUE 36
2602 = FORMAT 36
2603 = DISPLAY MODE 36
2620 = ASSIGN 37
2621 = 100% VALUE 38
2622 = FORMAT 38
2623 = DISPLAY MODE 38

3...

3000 = ASSIGN 40
3001 = UNIT TOTALIZER 41
3002 = TOTALIZER MODE 41
3003 = RESET TOTALIZER 42
3040 = SUM 43
3041 = OVERFLOW 43
3800 = RESET ALL TOTALIZERS 44
3801 = FAILSAFE MODE 44

6...

6200 = WRITE PROTECTION 46
6201 = SIMULATION 46
6203 = DEVICE PD-TAG 46
6220 = BLOCK SELECTION 47
6221 = OUT VALUE 47
6222 = IN VALUE 47
6223 = CASCADE IN VALUE 47
6224 = SETPOINT VALUE 47
6240 = MANUFACTURER ID 48
6241 = DEVICE TYPE 48
6242 = SERIAL NUMBER 48
6243 = DEVICE REVISION 48
6244 = DD REVISION 48
6400 = ASSIGN LOW FLOW CUT OFF 49
6402 = ON-VALUE LOW FLOW CUT OFF 49
6403 = OFF-VALUE LOW FLOW CUT OFF 49
6404 = PRESSURE SHOCK SUPPRESSION 50
6480 = ZEROPOINT ADJUSTMENT 51
6520 = PIPE STANDARD 52
6521 = NOMINAL DIAMETER 53
6522 = PIPE MATERIAL 53
6523 = REFERENCE VALUE 53
6524 = SOUND VELOCITY PIPE 54
6525 = CIRCUMFERENCE 54
6526 = PIPE DIAMETER 54
6527 = WALL THICKNESS 55
6528 = LINER MATERIAL 55
6529 = SOUND VELOCITY LINER 56
6530 = LINER THICKNESS 56
6540 = LIQUID 57
6541 = TEMPERATURE 57
6542 = SOUND VELOCITY LIQUID 58
6543 = VISCOSITY 58
6545 = SOUND VELOCITY NEGATIVE 59
6546 = SOUND VELOCITY POSITIVE 59
6600 = INSTALLATION DIRECTION SENSOR 60
6601 = MEASURING MODE 60
6603 = FLOW DAMPING 60
6605 = POSITIVE ZERO RETURN 61
6800 = K-FACTOR 62
6803 = ZERO POINT 62
6808 = CALIBRATION DATE 62
6880 = MEASUREMENT 63
6881 = SENSOR TYPE 64
6882 = SENSOR CONFIGURATION 65
6883 = CABLE LENGTH 65
6884 = POSITION SENSOR 65
6885 = WIRE LENGTH 66
6886 = SENSOR DISTANCE 66
6887 = ARC LENGTH 66
6888 = PATH LENGTH 66
6890 = P-FACTOR 67
6891 = ZERO POINT 67
6893 = CORRECTION FACTOR 67
6894 = DEVIATION SENSOR SPACING 67
6895 = DEVIATION ARC LENGTH 68
6896 = DEVIATION PATH LENGTH 68
6910 = CALIBRATION DATE 69

8...

8005 = ALARM DELAY 71
8007 = PERMANENT STORAGE 71
8040 = ACTUAL SYSTEM CONDITION 72
8041 = PREVIOUS SYSTEM CONDITIONS 72
8042 = SIMULATION FAILSAFE MODE 72
8043 = SIMULATION MEASURAND 73
8044 = VALUE SIMULATION MEASURAND 73
8046 = SYSTEM RESET 73
8047 = TROUBLESHOOTING 74
8048 = OPERATION HOURS 74
8100 = DEVICE SOFTWARE 75
8200 = SERIAL NUMBER 75
8222 = SOFTWARE REVISION NUMBER AMPLIFIER . . . 75
8225 = SOFTWARE REVISION NUMBER T-DAT 75
8226 = LANGUAGE GROUP 76
8240 = STATUS F-CHIP 76
8300 = I/O MODULE TYPE 76
8303 = SOFTWARE REVISION NUMBER I/O MODULE . 76

11 Index Local operation

A

Actual system condition 72
Additional configuration 15
Additional line
  Configuration 31
  Multiplex 33
Adjustment
  Function group 51
  Zero point 51
Alarm delay 71
Amplifier (version info) 75
Assign
  Additional line 31
  Additional line (Multiplex) 33
  Information line 35
  Information line (Multiplex) 37
  Low flow cut off 49
  Main line 27
  Main line (Multiplex) 29
  Totalizer 40
Available functions 8
Average flow velocity 12
Average sound velocity 12
Average volume flow 12

B

Basic configuration (user interface) 23
Basic functions
  FOUNDATION Fieldbus
    Function blocks 47
    Information 48
Basic functions (Block) 45
Block
  Basic function 45
  Display 22
  Measured variables 9
  Quick Setup 17
  Supervision 70
  Totalizer 39
Block Selection 47

C

Cable length 65
Calculated main values (displaying) 24
Calibration
  Factory calibration 69
Calibration data
  Correction factor 67
  Deviation arc length 68
  Deviation path length 68
  Deviation sensor distance 67
  P-factor 67
  Sensor data 63, 67
  Zero point 67
Calibration date 62, 69
Cascade IN Value 47
Code
  Access 25
  Access counter 25
  Customer 25
Configuration
  Additional line 31
  FOUNDATION Fieldbus 46
  Information line 35
  Main line 27
  Process parameter 49
  Sensor data (CH1 to CH2) 62
  System 71
  System parameter (CH1 to CH2) 60
  System units 13
  Totalizer 40
Contrast LCD 24
Control
  Operation 26
  Unlocking/locking 25
Control (group CAA)
  Basic configuration 23
Correction factor 67

D

Damping
  Display 23
  Flow 60
DD Revision 48
Define private code 25
Deviation
  Arc length 68
  Path length 68
  Sensor spacing 67
  Volume flow 12
Device PD-Tag 46
Device revision 48
Device software 75
Device type 48
Device (version info) 75
Display
  Calculated main values 24
  Damping 23
  Language selection 23
  Lighting (back lighting) 24
  See Display
  Test 26
  User interface (Block C) 22
Display lines of local operation 8
Display mode
  Additional line 32
  Additional line (Multiplex) 34
  Information line 36
  Information line (Multiplex) 38

F

Factory calibration 69

Factory settings 77
Failsafe mode
All totalizers 44
F-CHIP (version info) 76
Flow damping 60
Flow velocity
Average 12
Channel 1 10
Channel 2 11
Format
Additional line 32
Additional line (Multiplex) 34
Date/Time 16
Information line 36
Information line (Multiplex) 38
Main line 28
Main line (Multiplex) 30
FOUNDATION Fieldbus
Configuration 46
Function blocks 47
Information 48
Function group
Additional configuration 15
Adjustment 51
Amplifier 75
Basic configuration (user interface) 23
Calculated main values 12
Configuration
Additional line 31
Calibration data 63, 67
FOUNDATION Fieldbus 46
Information line 35
Main line 27
Process parameter 49
Sensor data (CH1 to CH2) 62
Sensor parameter 63
System 71
System parameter (CH1 to CH2) 60
System units 13
Totalizer 40
F-CHIP 76
Function blocks (FOUNDATION Fieldbus) 47
Information (FOUNDATION Fieldbus) 48
I/O Module 76
Liquid data 57
Main values 10
Measuring values
Main values CH2 11
Multiplex
Additional line 33
Information line 37
Main line 29
Operation
Display 26
System 72
Totalizer 43
Original factory calibration 69
Pipe data 52
Sensor 75
Unlocking/locking (user interface) 25
Function matrix
General layout 6
Identification code 7
Overview 8

G

Group
Additional line 31
Control (User interface) 23
FOUNDATION Fieldbus 46
Handling Totalizer 44
Information line 35
Main line 27
Measuring values 10
PROCESS PARAMETER (CH1 to CH2) 49
Sensor data (CH1 to CH2) 62
System 71
System parameter (CH1 to CH2) 60
System units 13
Totalizer (1 to 3) 40
Version info 75

H

Handling Totalizer 44

I

Illustration of function description 7
IN Value 47
Information line
Configuration 35
Multiplex 37
Information (FOUNDATION Fieldbus) 48
Installation direction sensor 60
I/O Module 76

K

K-Factor 62

L

Language
Factory settings (country) 77
Language groups (display) 76
Options
. 23
Liner
Material 55
Sound velocity 56
Thickness 56
Liquid
Measurement of the sound velocity 58
Liquid data (function group) 57
Local operation (display lines) 8
Low flow cut off
Assign 49
Off-value 49
On-value 49

M

Main line

Configuration 27
Multiplex 29
Main values 10
Manufacturer ID 48
Measured variables (block A) 9
Measurement 63
Measurement of the ...
sound velocity liquid 58
Measuring mode 60
Measuring values 10
Calculated main values 12
Main values 10
Main values CH2 11
Multiplex
Additional line 33
Information line 37
Main line 29

N
Nominal diameter 53

O
Off-value, low-flow cutoff 49
On-value, low-flow cutoff 49
Operation
Display 26
System 72
Totalizer 43
Operation hours 74
OUT Value 47
Overflow
Totalizer 43

P
Permanent storage 71
P-factor 67
Pipe circumference 54
Pipe data 52
Circumference 54
Diameter 54
Liner material 55
Liner thickness 56
Nominal diameter 53
Pipe material 53
Sound velocity liner 56
Sound velocity pipe 53, 54
Standard pipe 52
Wall thickness 55
Pipe diameter 54
Pipe material 53
Position sensor 65
Positive zero return 61
Pressure shock suppression 50
Previous system conditions 72
Process parameter
Configuration 49
Process parameter (CH1 to CH2), (Group GIA, GIB)
Adjustment 51
Liquid 57
Liquid data 57
Pipe data 52
Temperature 57

Q
Quick Setup (Block B)
Commission 17
Overview 17
Sensor installation 17

R
Reset
All totalizers 44
System 73
Totalizer 42

S
Sensor
Distance 66
Position 65
Type 64
Sensor data (group GNA, GNB)
Configuration 62
Original factory calibration 69
Sensor settings 65
Sensor type 64
Sensor parameter 63
Sensor settings 65
Sensor (version info) 75
Serial number 48
Serial number sensor 75
Setpoint value 47
Signal strength
Channel 1 10
Channel 2 11
Simulation 46
Failsafe mode 72
Measured variable 73
Value measured variable 73
Software revision number
Amplifier 75
I/O Module 76
T-DAT 75
Sound velocity
Average 12
Channel 1 10
Channel 2 11
Liner 56
Liquid 58
Negative 59
Pipe 53, 54
Positive 59
Standard pipe 52
Status access 25
Status F-CHIP 76
Sum
Totalizer 43
Supervision (Block J) 70
System condition
Actual 72
Previous 72

System parameter (Group GLA, GLB)
Configuration 60
System units
Additional configuration 15
Configuration 13
System (group JAA)
Configuration 71
Operation 72
Reset 73

T

T-DAT Save/Load 17, 21
Temperature (liquid) 57
Test display 26
Totalizer
Assign 40
Configuration 40
Failsafe mode 44
Handling Totalizer 44
Operation 43
Overflow 43
Reset 42
Sum 43
Totalizer Mode 41
Unit 41
Totalizer Mode 41
Troubleshooting 74
Type
Device 48
I/O Module 76
Sensor 64

U

Unit
Length 15
Temperature 15
Totalizer 41
Velocity 16
Viscosity 15
Volume 14
Volume flow 13
Unlocking/locking (user interface) 25

V

Value simulation
Measured variable 73
Version info (group JCA)
Amplifier 75
F-CHIP 76
I/O Module 76
Sensor 75
Viscosity 58
Volume flow
Average 12
Channel 1 10
Channel 2 11
Deviation 12
Sum 12
Unit 13
Volume flow Sum 12

W

Wall thickness 55
Wire length 66
Write protection 46

X

Xline calculated main values 24

Z

Zero point 62, 67
Zero point adjustment 51

Numbers

100% value flow
Additional line 32
Additional line (Multiplex) 33
Information line 36
Information line (Multiplex) 38
Main line 27
Main line (Multiplex) 29

Content FOUNDATION Fieldbus

1 Operation via FOUNDATION Fieldbus 86

1.1 Block model 86

2 Resource Block 88

2.1 Selecting the operating mode 88
2.2 Block status 88
2.3 Write protection and simulation 89
2.4 Alarm detection and processing 89
2.5 Resource Block parameters 90

3 Transducer Blocks 91

3.1 Signal processing 92
3.2 Important functions and parameters of the Transducer Blocks 94
3.2.1 Block output values 94
3.2.2 Selecting the operating mode 94
3.2.3 Alarm detection and processing 95
3.2.4 Diagnosis 95
3.2.5 Accessing the device-specific parameters 95
3.3 Parameters for Transducer Blocks "Flow Channel 1" and "Channel 2" 96
3.4 "Diagnosis" Transducer Block parameters 115
3.5 "Service" Transducer Block parameters 118
3.6 "Display" Transducer Block parameters 118
3.7 "Totalizer" Transducer Block parameters 133

4 Function blocks 137

4.1 Signal processing 138
4.2 Important functions and parameters of the Analog Input function blocks 140
4.2.1 Selecting the operating mode 140
4.2.2 Assignment of the process variable 140
4.2.3 Linearization types 140
4.2.4 Selection of units 141
4.2.5 Status of the output value OUT 141
4.2.6 Simulation of input/output 142
4.2.7 Diagnosis 142
4.2.8 Rescaling the input value 142
4.2.9 Limit values 143
4.2.10 Alarm detection and processing 143

5 Discrete Output function block 145

5.1 Signal processing 145
5.2 Important functions and parameters of the Discrete Output function block 146
5.2.1 Selecting the operating mode 146
5.2.2 Safety behavior 146
5.2.3 Assignment between the Discrete Output function block and Transducer Block 146
5.2.4 Values for the parameters CAS_IN_D, RCAS_IN_D, OUT_D, and SP_D 146

6 Additional function blocks 148

7 Index FOUNDATION Fieldbus 150

1 Operation via FOUNDATION Fieldbus

1.1 Block model

In the 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:
- One Resource Block
  The Resource Block contains all the device-specific characteristics of the device.

- One or more Transducer Blocks
  The Transducer Block contains all the metrology-specific and device-specific parameters of the device. The measurement principles (e.g. flow, temperature etc.) 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 Function Blocks. In addition to these blocks, a field device may have any number of further Function Blocks e.g. several Analog Input Function Blocks, if more than one process variable is available from the field device.

The Prosonic Flow 93 FOUNDATION Fieldbus has the following blocks:
- One Resource Block
- Six Transducer Blocks
- Ten function blocks consisting of:
  – Eight Analog Input function blocks
  – One Discrete Output
  – One PID function block

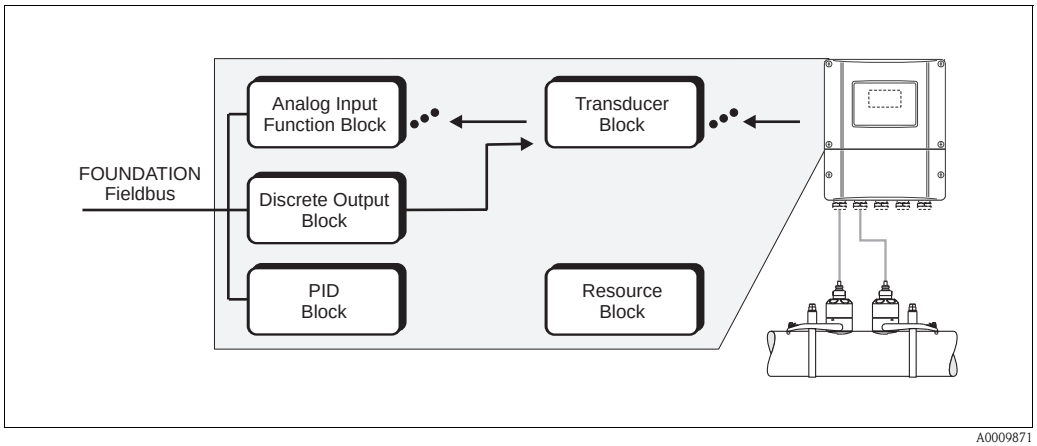


Fig. 1: Prosonic Flow 93 FOUNDATION Fieldbus block model

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 technical 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 in the device functions of the Proline Prosonic Flow 93 FOUNDATION Fieldbus can be triggered and controlled.

✎ Note!
Additional 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.de → 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 Block 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 most important functions and parameters of the Resource Block are listed below; you will find an overview of all the available parameters starting on Page 88.

2.1 Selecting the operating mode

The operating mode is configured via the MODE_BLK parameter group. The Resource Block supports the following operating modes:

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

Note!
The operating mode 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 the OOS mode. It is not possible to execute the remaining blocks.
- ONLINE LINKING — The connections configured between the Function Blocks have not yet been linked.
- ONLINE — Normal operating status, the Resource Block is in the AUTO operating mode. 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 jumper settings on the FOUNDATION Fieldbus I/O board (see Operating Instructions Proline Prosonic Flow 93 FOUNDATION Fieldbus, BA00078D).

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

- LOCKED — Device data cannot be modified via the FOUNDATION Fieldbus interface.
- NOT LOCKED — Device data can be modified via 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 protection 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 Resource Block parameters

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

Note!
FOUNDATION Fieldbus parameters are described in the Operating Instructions "FOUNDATION Fieldbus Overview" (BA013S) (acquired at: → www.endress.de → 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 function 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 function 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 function 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 function 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 function to view the production number of the I/O module.
Device Software	read only	Display of the device software number.

3 Transducer Blocks

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, each covering different task areas.

"Flow Channel 1" Transducer Block/base index 1400:
This block contains all the flow-specific parameters and functions, e.g. calibration functions, sensor data etc. for the first channel → Page 96

"Flow Channel 2" Transducer Block/base index 1500:
This block contains all the flow-specific parameters and functions, e.g. calibration functions, sensor data, etc. for the second channel → Page 96

"Diagnosis" Transducer Block/base index 1600:
This block contains all the parameters for system diagnosis, e.g. current system status etc.
→ Page 115

"Service" Transducer Block/base index 1700:
This block contains all the parameters for service
→ Page 118

"Display" Transducer Block/base index 1800:
This Block contains all the parameters for the configuration of the local display
→ Page 118

"Totalizer" Transducer Block/base index 1900:
This Block contains all the parameters for the configuration of the totalizers
→ Page 133

3.1 Signal processing

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

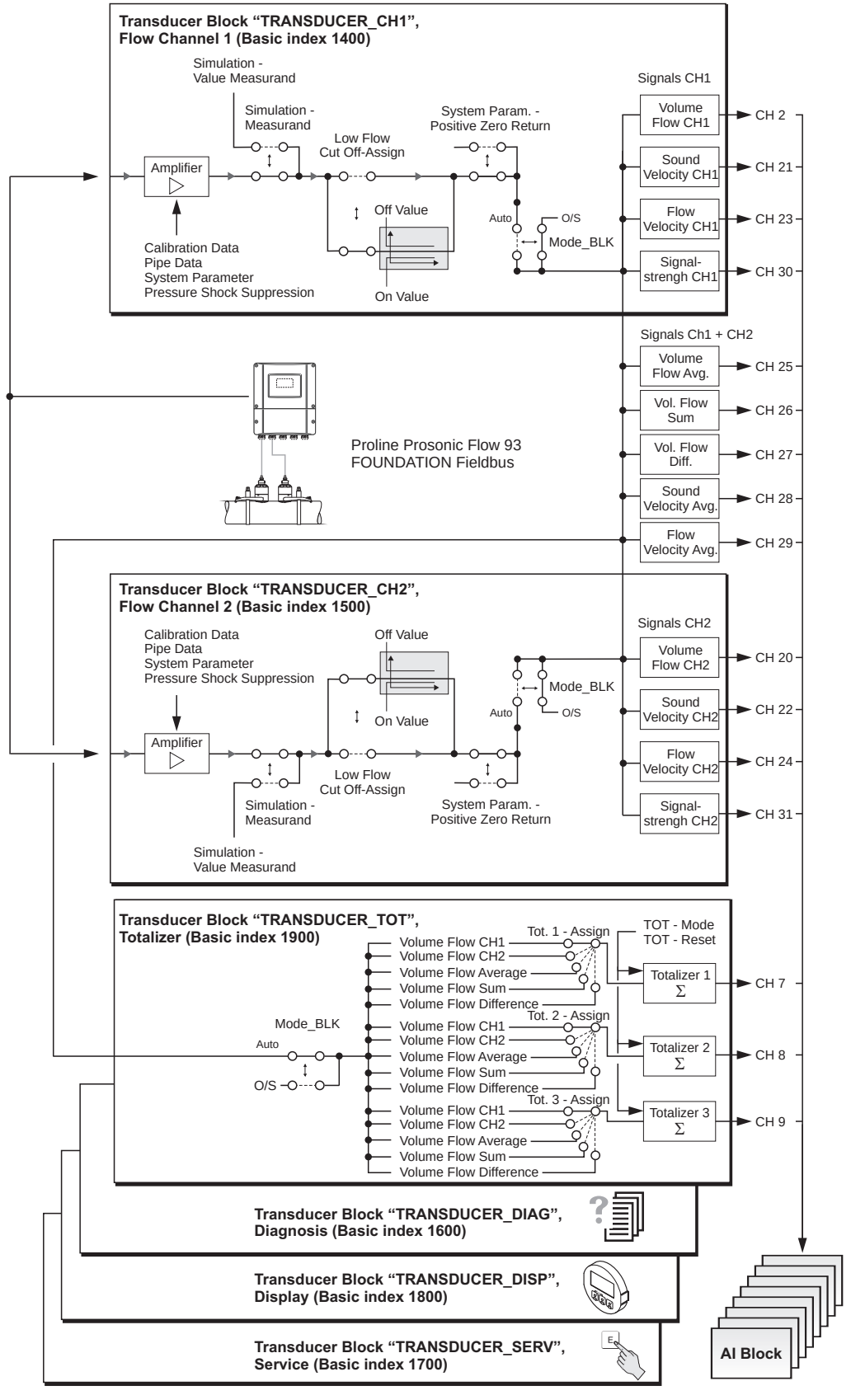


Fig. 2: Internal structure of the individual Transducer Blocks

The Transducer Blocks "Flow Channel 1" and "Flow Channel 2" receive several signals from the sensor as input values (sound velocity, flow velocity). Other process variables are derived from these signals. The input signals are further processed via an amplifier.

The parameter "Simulation - Value Measurand" (see Page 114) allows you to specify a simulation value for the Transducer Block "Flow Channel 1" or "Flow Channel 2" in order to test assigned parameters in the device and subsequent function blocks.

The parameter "Low Flow Cut Off - On Value" (Page 100) allows you to define a limit value for the 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 "System Param. - Positive Zero Return" (see Page 99) allows you switch the measured value to "zero flow". This is necessary when a piping system is being cleaned, for example.

The Transducer Blocks "Flow Channel 1" and "Flow Channel 2" provide the following process variables for the subsequent Function Blocks:
- Volume flow channel 1 and Volume flow channel 2
- Sound velocity channel 1 and Sound velocity channel 2
- Flow velocity channel 1 and Flow velocity channel 2
- Signal strength channel 1 and Signal strength channel 2

If the measuring device is working in two-channel mode, the following calculated process variables are also made available:
- Average volume flow
- Volume flow Sum
- Volume flow difference
- Average sound velocity
- Average flow velocity

In the Transducer Block "Totalizer", a process variable can be assigned to each individual totalizer (e.g. Volume flow channel 1 etc.). The totalizers are also configured here; for example, the parameter "Totalizer Handling - Reset All" can be used to reset all totalizers simultaneously. For an overview of all block output variables, refer to → Page 94.

The "Diagnosis" Transducer Block comprises all the parameters and functions necessary for the diagnosis and maintenance of the device. For example, the parameter "Diag. - Act.Sys.Condition" indicates the actual system condition and, in case of error, a detailed cause of the error (see → Page 115).

If the measuring device is equipped with a local display, the Transducer Block "Display" can be used to configure various display parameters such as display language, contrast etc.

Note!
The Transducer Blocks "Diagnosis" and "Diagnosis" do not have any output variables, i.e. these have an effect on the measuring device itself only.

The most important functions and parameters of the Transducer Block are listed below. You will find an overview of all the available parameters starting on → Page 96 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. 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.

✎ Note!
The "Diagnosis" and "Display" Transducer Blocks do not have any output variables.

Block	Process variable	Channel parameter (AI Block)
Transducer Block "CH1"	Volume flow channel 1	2
	Sound velocity channel 1	21
	Flow velocity channel 1	23
	Average volume flow	25
	Volume flow sum	26
	Volume flow difference	27
	Average sound velocity	28
	Average flow velocity	29
	Signal strength channel 1	30
Transducer Block "CH2"	Volume flow channel 2	20
	Sound velocity channel 2	22
	Flow velocity channel 2	24
	Signal strength channel 2	31
"Totalizer" Transducer Block	Totalizer 1	7
	Totalizer 2	8
	Totalizer 3	9

3.2.2 Selecting the operating mode

The operating mode is configured via the MODE_BLK parameter group. The Transducer Blocks support 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 and the release code is entered, you can access all the write parameters without restriction.
- The following applies for the "Flow Channel 1", "Flow Channel 2" and "Totalizer" Transducer Blocks: In 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 Prosonic Flow 93 FOUNDATION Fieldbus (BA00078D), "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 subsequent Analog Input function blocks. If the Analog Input function block does not receive an input value that can be evaluated from the Transducer Blocks "Flow Channel 1", "Flow Channel 2" or "Totalizer", 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 "Diagnosis" Transducer Block 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 "Diag. - Act.Sys.Condition" parameter (→ Page 115).

For more information on rectifying errors → See Operating Instructions for Prosonic Flow 93 FOUNDATION Fieldbus (BA00078D), "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

Detailed information on the current device status is displayed via the "Diagnosis" Transducer Block in the manufacturer-specific parameter "Diag. - Act.Sys.Condition"
(→ Page 115).

For more information on rectifying errors →See Operating Instructions for Prosonic Flow 93 FOUNDATION Fieldbus (BA00078D), "Troubleshooting" section.

3.2.5 Accessing the device-specific parameters

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

1. The hardware write protection must be disabled → see Operating Instructions for Prosonic Flow 93 FOUNDATION Fieldbus (BA00078D).
2. The correct code must be entered in the parameter "Access - Code" via the corresponding Transducer Block.

3.3 Parameters for Transducer Blocks "Flow Channel 1" and "Channel 2"

The following table shows the Endress+Hauser-specific parameters of the "Flow Channel 1" and "Flow Channel 2" Transducer Blocks. These can only be changed after entering a release code in the "Access - Code"
parameter.

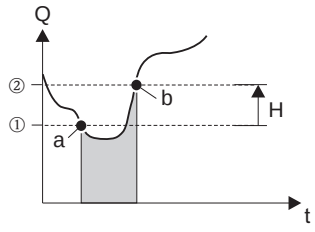
✎ Note!
FOUNDATION Fieldbus parameters are described in the Operating Instructions "FOUNDATION Fieldbus Overview" (BA013S) (acquired at: → www.endress.de → Download).

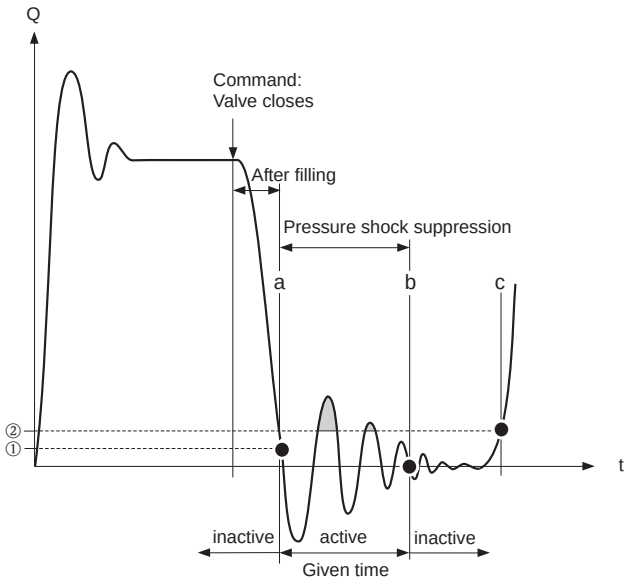
Transducer Blocks "Flow Channel 1" and "Flow Channel 2" / base indexes 1400 and 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Un-/Locking - Access Code	AUTO - OOS	All data of the measuring system are protected against inadvertent change. Only when the code has been entered in this parameter can the manufacturer-specific parameters be programmed and the device configuration modified. You can enable programming by entering: ■ Code 93 (factory setting) ■ Personal code ("Access - Def.Private Code" parameter → Page 119) **Access** max. 4-digit number: 0 to 9999 ✎ Note! ■ If the hardware write protection is enabled then access to the manufacturer-specific parameters is blocked even if the right code is entered. ■ You can disable programming again by entering any number (other than the release 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.
Un-/Locking - Access Status	read only	Displays the current status of access to the manufacturer-specific parameters of the device. **Display:** LOCKED (parameterization disabled) ACCESS CUSTOMER (parameterization enabled) ACCESS SERVICE (parameterization enabled)
System Value Volume Flow	read only	Use this parameter to view the current volume flow. The volume flow is provided to the subsequent Analog Input function blocks as a process variable. **Display:** 5-digit floating-point number, including unit and sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; –731.63 gal/d; etc.) ✎ Note! The unit is selected in the parameter "System Unit - Volume Flow".

Transducer Blocks "Flow Channel 1" and "Flow Channel 2" / base indexes 1400 and 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
System Unit - Volume Flow	AUTO - OOS	For displaying the desired unit for the volume flow (volume/time). The unit you select here is also valid for: ■ Switching points (limit value, flow direction) ■ Low flow cut off **Options:** ✎ Note! The following units of time can be selected: s = second, m = minute, h = hour, d = day *Metric:* Cubic centimeter → cm^3/... Cubic decimeter → dm^3/... Cubic meter → m^3/... Milliliter → ml/... Liter → l/... Hectoliter → hl/... Megaliter → Ml/... MEGA *US:* Cubic centimeter → cc/... Acre foot → af/... Cubic foot → ft^3/... Fluid ounce → oz f/... Gallon → US gal/... Million gallon → US Mgal/... Barrel (normal fluids: 31.5 gal/bbl) → US bbl/... NORM. Barrel (beer: 31.0 gal/bbl) → US bbl/... BEER Barrel (petrochemicals: 42.0 gal/bbl) → US bbl/... PETR. Barrel (filling tanks: 55.0 gal/bbl) → US bbl/... TANK *Imperial:* Gallon → imp. gal/... Mega gallon → imp. Mgal/... Barrel (beer: 36.0 gal/bbl) → imp. bbl/... BEER Barrel (petrochemicals: 34.97 gal/bbl) → imp. bbl/... PETR. **Factory setting:** Depends on country (dm^3/m...m^3/h or US gal/m...US Mgal/d) ✎ Note! The unit selected here does not have any effect on the desired volume unit which should be transmitted by means of the FF interface. This setting is made separately by means of the corresponding Analog Input Function Block in the XD_SCALE parameter group.
System Value - Sound Velocity	read only	Displays the current sound velocity. The sound velocity is provided to the subsequent Analog Input function blocks as a process variable. ✎ Note! The unit is displayed and selected in the parameter "System Unit - Sound Velocity".
System Unit - Sound Velocity	AUTO - OOS	For selecting the unit for the sound velocity. **Options:** m/s ft/s **Factory setting:** m/s

Transducer Blocks "Flow Channel 1" and "Flow Channel 2" / base indexes 1400 and 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
System Value - Flow Velocity	read only	Displays the current flow velocity. The flow velocity is provided to the subsequent Analog Input function blocks as a process variable. ✎ Note! The unit is displayed and selected in the parameter "System Unit - Flow Velocity".
System Unit - Flow Velocity	AUTO - OOS	For selecting the unit for the flow velocity. **Options:** m/s ft/s **Factory setting:** m/s
System Value - Signal Strength	read only	Displays the current signal strength. The signal strength is provided to the subsequent Analog Input function blocks as a process variable.
System Unit Temperature	AUTO - OOS	For selecting the unit for the fluid temperature. **Options:** °C (Celsius) K (Kelvin) °F (Fahrenheit) R (Rankine) **Factory setting:** Depends on country (°C or °F) → Page 77 ff.
System Unit - Viscosity	AUTO - OOS	For selecting the unit for the viscosity of the fluid. **Options:** mm²/s cSt St **Factory setting:** mm²/s
System Unit - Length	AUTO - OOS	For selecting the unit for the length measurement. The unit you select here is valid for: ■ Nominal diameter ■ Diameter ■ Wall thickness ■ Liner thickness ■ Path length ■ Wire length ■ Sensor distance **Options:** MILLIMETER INCH **Factory setting:** Depends on country (MILLIMETER or INCH) → Page 77 ff.
System Param. - Installation Direction Sensor	AUTO - OOS	Use this parameter to reverse the sign of the flow measured variable, if necessary. **Options:** NORMAL (FORWARD) INVERSE (REVERSE) **Factory setting:** NORMAL (FORWARD)

Transducer Blocks "Flow Channel 1" and "Flow Channel 2" / base indexes 1400 and 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
System Param. - Flow Damping	AUTO - OOS	✎ Note! The system damping acts on all functions of the measuring device. Specifies 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 system reaction time increases with the filter setting. The damping acts on all parameters and on all downstream function blocks. **User input:** 0 to 100 s **Factory setting:** 0 s
System Param. - 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 ZERO FLOW value) **Factory setting:** OFF ✎ Note! ▪ An active positive zero return is relayed to downstream function blocks or higher-level 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.
Adjustment - Adjust Zeropoint	AUTO - OOS	This parameter enables a zero point adjustment to be automatically carried out. The new zero point determined by the measuring system is adopted by the "Calibration Data - Zero Point" parameter (→ Page 112). **Options:** CANCEL START **Factory setting:** CANCEL ☝ Caution! Before carrying out an adjustment, please refer to the Operating Instructions for Proline Prosonic Flow 93 FOUNDATION Fieldbus (BA00078D), where a detailed description of zero point adjustment is given.
Low Flow Cut Off - Assign	AUTO - OOS	Use this parameter to assign the switch point for the low flow cutoff. **Options:** OFF VOLUME FLOW **Factory setting:** OFF

Transducer Blocks "Flow Channel 1" and "Flow Channel 2" / base indexes 1400 and 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
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 **Factory setting:** 0.0000 ✎ 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. ■ The unit used is displayed in the parameter "Low Flow Cut Off - Unit" and determined in the "System Unit - Volume Flow" parameter (→ Page 96).
Low Flow Cut Off - Unit	read only	Use this parameter to view the unit for the low flow cut off. ✎ Note! The unit for the low flow cut off is defined using the parameter "System Unit - Volume Flow" (→ Page 96).
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 = *on-value,* ② = *off-value* *a* *Low flow cut off is switched on* *b* *Low flow cut off is switched off (a + a · H)* *H* *Hysteresis value: 0 to 100%* ■ *Low flow cut off active* *Q* *Flow*
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 parameter "Low Flow Cut Off - On-Value" → Page 100). (Continued on next page)

Transducer Blocks "Flow Channel 1" and "Flow Channel 2" / base indexes 1400 and 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Process - Pressure Shock Suppression (Continued)	AUTO - OOS	Use this parameter to define the time span for active pressure shock suppression. **Activation of the 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 the pressure shock suppression** The pressure shock suppression is deactivated after the time interval, set in this function, has passed (see point **b** in graphic). ✎ Note! The actual flow value is displayed and output when the time interval for the pressure shock suppression has passed and the flow exceeds the switch-off point of the low flow cut off (see point **c** in graphic).  *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 passes* *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

Transducer Blocks "Flow Channel 1" and "Flow Channel 2" / base indexes 1400 and 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Pipe Data - Pipe Standard	AUTO - OOS	For selecting the standard pipe. **Options:** OTHERS DIN PN10 DIN PN16 DIN 28610 DIN 28614 DIN 28615 DIN 28619 ANSI SCHEDULE 40 ANSI SCHEDULE 80 AWWA CLASS 50 AWWA CLASS 53 AWWA CLASS 55 **Factory setting:** DIN PN10
Pipe Data - Nominal Diameter	AUTO - OOS	Use this function to select the nominal diameter of the pipe. **Options:** OTHERS 15/½ IN DN 25/1IN DN 40/1½IN DN 50/2IN DN 80/3IN DN 100/4IN DN 150/6IN DN 200/8IN DN 250/10IN DN 300/12IN DN 400/16IN DN 450/18IN DN 500/20IN DN 600/24IN DN 700/28IN DN 750/30IN DN 800/32IN DN 900/36IN DN 1000/40IN DN 1200/48IN DN 1400/54IN DN 1500/60IN DN 1600/64IN DN 1800/72IN DN 2000/80IN **Factory setting:** DN 80/3IN
Pipe Data - Unit Nominal Diameter	read only	Displays the unit used in the parameter "Pipe Data - Nominal Diameter". ✎ Note! The unit is selected in the parameter "System Unit - Length" → Page 98.

Transducer Blocks "Flow Channel 1" and "Flow Channel 2" / base indexes 1400 and 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Pipe Data - Pipe Material	AUTO - OOS	For selecting the pipe material. **Options:** CARBON STEEL DUCTILE IRON STAINLESS STEEL SS ANSI 304 SS ANSI 316 SS ANSI 347 SS ANSI 410 SS ANSI 430 HASTELLOY C PVC PE LDPE HDPE GRP PVDF PA PP PTFE GLASS PYREX ASBESTOS CEMENT OTHERS **Factory setting:** STAINLESS STEEL
Pipe Data - Reference Value	AUTO - OOS	✎ Note! This parameter is active only if the option "Sound Vel. Pipe" has been selected in the parameter "Sensor Param. - Measurement" (→ Page 108). For entering the thickness of the reference piece (e.g. flange), this serves as the basis for measuring the sound velocity of the pipes (see Page 104). **User input:** 5-digit floating-point number **Factory setting:** 5 (mm) ✎ Note! The unit used is displayed in the parameter "Pipe Data - Unit Reference Value".
Pipe Data - Unit Reference Value	read only	Displays the unit for the thickness of the reference piece. ✎ Note! The unit is selected in the parameter "System Unit - Length" → Page 98.

Transducer Blocks "Flow Channel 1" and "Flow Channel 2" / base indexes 1400 and 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Pipe Data - Sound Velocity Pipe	AUTO - OOS	For entering the sound velocity in the pipe. **Measuring the sound velocity in the pipe** The measurement can be carried out via: ■ Local display (Quick Setup "Sensor") → Page 17. ■ The FieldTool configuration and service software. ✎ Note! A reference value is used as a basis for measuring the sound velocity. This reference value can be edited (→ Page 103). **User input:** Fixed-point number 800 to 6500 (m/s) **Factory setting:** 3120 (m/s) ✎ Note! The unit used is displayed in the parameter "Pipe Data - Unit Sound Velocity Pipe".
Pipe Data - Unit Sound Velocity Pipe	read only	For displaying the unit for the sound velocity in the pipe. ✎ Note! The unit is selected in the parameter "System Unit - Sound Velocity" → Page 97.
Pipe Data - Circumference	AUTO - OOS	For entering the pipe circumference. **User input:** Fixed-point number 31.4 to 15708.0 (mm) **Factory setting:** 279.3 (mm) ✎ Note! The unit used is displayed in the parameter "Pipe Data - Unit Circumference".
Pipe Data - Unit Circumference	read only	Use this parameter to view the unit for the pipe circumference. ✎ Note! The unit is selected in the parameter "System Unit - Length" → Page 98.
Pipe Data - Pipe Diameter	AUTO - OOS	For entering the pipe diameter. **User input:** Fixed-point number 10.0 to 5000.0 (mm) **Factory setting:** 88.9 (mm) ✎ Note! The unit used is displayed in the parameter "Pipe Data - Unit Pipe Diameter".
Pipe Data - Unit Pipe Diameter	read only	Use this parameter to view the unit for the pipe circumference. ✎ Note! The unit is selected in the parameter "System Unit - Length" → Page 98.

Transducer Blocks "Flow Channel 1" and "Flow Channel 2" / base indexes 1400 and 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Pipe Data - Wall Thickness	AUTO - OOS	For entering the wall thickness of the pipe. **Measuring the wall thickness** The measurement can be carried out via: ■ Local display (Quick Setup "Sensor") → Page 17. ■ The FieldTool configuration and service software. **User input:** Fixed-point number 0.1 to 100.0 (mm) **Factory setting:** 3.2 (mm) ✎ Note! The unit used is displayed in the parameter "Pipe Data - Unit Wall Thickness".
Pipe Data - Unit Wall Thickness	read only	Displays the unit for the wall thickness of the pipe. ✎ Note! The unit is selected in the parameter "System Unit - Length" → Page 98.
Pipe Data - Liner Material	AUTO - OOS	Use this parameter to select the material with which the pipe is lined. **Options:** LINER NONE MORTAR RUBBER TAR EPOXY OTHERS **Factory setting:** LINER NONE
Pipe Data - Sound Velocity Liner	AUTO - OOS	✎ Note! The entry is not active unless a liner was selected in the "Pipe Data - Liner Material" parameter. For entering the sound velocity in the liner. **User input:** Fixed-point number 800 to 6500 **Factory setting:** Depends on the selection in the parameter "Pipe Data - Liner Material". ✎ Note! The unit used is displayed in the parameter "Pipe Data - Unit Sound Velocity Liner".
Pipe Data - Unit Sound Velocity Liner	read only	For displaying the unit for the sound velocity in the liner. ✎ Note! The unit is selected in the parameter "System Unit - Sound Velocity" → Page 97.

Transducer Blocks "Flow Channel 1" and "Flow Channel 2" / base indexes 1400 and 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Pipe Data - Liner Thickness	AUTO - OOS	✎ Note! The entry is not active unless a measured variable was selected in the "Pipe Data - Liner Material" parameter. For entering the thickness of the liner. **User input:** Fixed-point number 0.1 to 100.0 **Factory setting:** 0 ✎ Note! The unit used is displayed in the parameter "Pipe Data - Unit Liner Thickness".
Pipe Data - Unit Liner Thickness	read only	Use this parameter to display the unit for selecting the thickness of the liner in the parameter "Pipe Data - Liner Thickness". ✎ Note! The unit is selected in the parameter "System Unit - Length" → Page 98.
Liquid Data - Liquid	AUTO - OOS	Use this function to select the fluid in the pipe. **Options:** WATER SEAWATER DEST. WATER AMMONIA ALCOHOL BENZENE BROMIDE ETHANOL GLYCOL KEROSENE MILK METHANOL TOLUOL (toluene) LUBE OIL FUEL OIL (diesel) PETROL (gasoline) OTHERS **Factory setting:** WATER
Liquid Data - Temperature	AUTO - OOS	For entering the temperature of the liquid. **User input:** Fixed-point number -273.15 to 726.85 °C (0 to 1000 K) **Factory setting:** 20 ✎ Note! The unit used is displayed in the parameter "Liquid Data - Unit-Temperature".

Transducer Blocks "Flow Channel 1" and "Flow Channel 2" / base indexes 1400 and 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Liquid Data - Unit Temperature	read only	Use this parameter to display the unit for selecting the temperature of the liquid in the parameter "Liquid Data - Temperature". ✎ Note! The unit is selected in the parameter "System Unit - -Temperature" → Page 98.
Liquid Data - Sound Velocity Liquid	AUTO - OOS	For entering the sound velocity of the liquid. **Measuring the sound velocity of the liquid** The measurement can be carried out via: ■ Local display (Quick Setup "Sensor"). ■ The FieldTool configuration and service software. **User input:** Fixed-point number 400 to 3000 **Factory setting:** 1487 ✎ Note! The unit used is displayed in the parameter "Liquid Data - Unit Sound Velocity Liquid".
Liquid Data - Unit Sound Velocity Liquid	read only	Use this parameter to display the unit for selecting the sound velocity of the liquid in the parameter "Liquid Data - Sound Velocity Liquid". ✎ Note! The unit is selected in the parameter "System Unit - Sound Velocity" → Page 97.
Liquid Data - Min. Sound Velocity Liquid	AUTO - OOS	For entering the minimum sound velocity of the liquid. **User input:** Fixed-point number 400 to 3000 **Factory setting:** 500 ✎ Note! The unit used is displayed in the parameter "Liquid Data - Unit Min. Sound Velocity Liquid".
Liquid Data - Unit Min. Sound Velocity Liquid	read only	Use this parameter to display the unit for selecting the minimum sound velocity of the liquid in the parameter "Liquid Data - Min. Sound Velocity Liquid". ✎ Note! The unit is selected in the parameter "System Unit - Sound Velocity" → Page 97.
Liquid Data - Max. Sound Velocity Liquid	AUTO - OOS	For entering the maximum sound velocity of the liquid. **User input:** Fixed-point number 400 to 3000 **Factory setting:** 300 ✎ Note! The unit used is displayed in the parameter "Liquid Data - Unit Max. Sound Velocity Liquid".

Transducer Blocks "Flow Channel 1" and "Flow Channel 2" / base indexes 1400 and 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Liquid Data - Unit Max. Sound Velocity Liquid	read only	Use this parameter to display the unit for selecting the maximum sound velocity of the liquid in the parameter "Liquid Data - Max. Sound Velocity Liquid". ✎ Note! The unit is selected in the parameter "System Unit - Sound Velocity" → Page 97.
Sensor Param. - Measurement	AUTO - OOS	Use this parameter to select which measurement method is to be carried out. **Options:** OFF CLAMP ON INSERTION **Factory setting for channel 1:** CLAMP ON **Factory setting for channel 2:** OFF ☝ Caution! The following options likewise appear as a selection in this parameter, but may be selected via the local display ( ) or the FieldTool configuration and service software only: ■ SOUND VEL. LIQUID ■ SOUND VEL. PIPE ■ WALL THICKNESS

Transducer Blocks "Flow Channel 1" and "Flow Channel 2" / base indexes 1400 and 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Sensor Param. - Sensor Type	AUTO - OOS	✎ Note! This parameter is active only if the option "OFF" has not been selected in the parameter "Sensor Param. - Measurement". For selecting the sensor type. The selection in this parameter depends on the measurement method selected in the parameter "Sensor Param. - Measurement", (→ Page 108). **Options:** (if "CLAMP ON" has been selected in the "Sensor Param. - Measurement" parameter) W-CL-05F-L-B W-CL-1F-L-B W-CL-1F-L-C W-CL-2F-L-B P-CL-05F-L-B P-CL-05F-M-B P-CL-1F-L-B P-CL-1F-M-B P-CL-2F-L-B P-CL-2F-M-B P-CL-6F-L-C P-CL-6F-M-C U-CL-2F-L-A **Options:** (if "INSERTION" has been selected in the "Sensor Param. - Measurement" parameter) W-IN-1F-L-B **Factory setting:** W-CL-2F-L-B ☝ Caution! The following options likewise appear as a selection in this parameter, but may be selected via the local display (→ Page 64) or the FieldTool configuration and service software only: ■ P-CL-1S-L-B ■ P-CL-1S-M-B ■ P-CL-4W-L-B

Transducer Blocks "Flow Channel 1" and "Flow Channel 2" / base indexes 1400 and 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Sensor Param. - Sensor Configuration	AUTO - OOS	✎ Note! This parameter is active only if one of the following options has been selected in the parameter "Sensor Param. - Measurement". ▪ CLAMP ON ▪ INSERTION Use this parameter to select the configuration for the ultrasonic sensors, e.g. the number of traverses (in the clamp-on design) or whether single-path or dual-path configuration is present (in the insertion design). The selection in this parameter depends on the measurement method selected in the parameter "Sensor Param. - Measurement", (→ Page 108). **Options:** (if "CLAMP ON" has been selected in the "Sensor Param. - Measurement" parameter) NO. TRAVERSE: 1 NO. TRAVERSE: 2 NO. TRAVERSE: 3 NO. TRAVERSE: 4 **Options:** (if "INSERTION" has been selected in the "Sensor Param. - Measurement" parameter) SINGLE PATH DUAL PATH **Factory setting:** NO. TRAVERSE: 2
Sensor Param. - Cable Length	AUTO - OOS	Use this function to select the length of the sensor cable. **Options:** LEN. 5m/15 feet LEN. 10m/30 feet LEN. 15m/45 feet LEN. 30m/90 feet **Factory setting:** LEN. 5m/15 feet
Sensor Param. - Position Sensor	read only	✎ Note! This parameter is active only if the option "CLAMP ON" has been selected in the parameter "Sensor Param. - Measurement" and the number of traverses has been selected as 2 or 4 in the parameter "Sensor Param. - Sensor Configuration". Displays the position of both sensors on the rail. **Display:** 5-digit number combination

Transducer Blocks "Flow Channel 1" and "Flow Channel 2" / base indexes 1400 and 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Sensor Param. - Wire Length	read only	✎ Note! This parameter is active only if the option "CLAMP ON" has been selected in the parameter "Sensor Param. - Measurement" and the number of traverses has been selected as 1 or 3 in the parameter "Sensor Param. - Sensor Configuration". The wire length for assembling the sensors at the correct distance apart appears on the display. **Display:** Max. 5-digit number ✎ Note! The unit used is displayed in the parameter "Sensor Data - Unit Wire Length".
Sensor Param. - Unit Wire Length	read only	Displays the unit used for the selection in the parameter "Sensor Data - Wire Length". ✎ Note! The unit is selected in the parameter "System Unit - Length" → Page 98.
Sensor Param. - Sensor Distance	read only	The distance between sensor 1 and sensor 2 as a length measurement appears on the display. **Display:** Max. 5-digit number ✎ Note! The unit used is displayed in the parameter "Sensor Param. - Unit Sensor Distance".
Sensor Param. - Unit Sensor Distance	read only	Displays the unit used for the selection in the parameter "Sensor Param. - Sensor Distance". ✎ Note! The unit is selected in the parameter "System Unit - Length" → Page 98.
Sensor Param. - ARC Length	read only	✎ Note! This parameter is active only if the option "INSERTION" has been selected in the parameter "Sensor Param. - Measurement" and the option "DUAL PATH" has been selected in the parameter "Sensor Param. - Sensor Configuration". The arc length on the pipe appears on the display. **Display:** Max. 5-digit number ✎ Note! The unit used is displayed in the parameter "Sensor Param. - Unit ARC Length".

Transducer Blocks "Flow Channel 1" and "Flow Channel 2" / base indexes 1400 and 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Sensor Param. - Unit ARC Length	read only	Displays the unit used for the selection in the parameter "Sensor Param. - ARC Length". ✎ Note! The unit is selected in the parameter "System Unit - Length" → Page 98.
Sensor Param. - Path Length	read only	✎ Note! This parameter is active only if the option "INSERTION" has been selected in the parameter "Sensor Param. - Measurement". The path length appears on the display. **Display:** Max. 5-digit number ✎ Note! The unit used is displayed in the parameter "Sensor Param. - Unit Path Length".
Sensor Param. - Unit Path Length	read only	Displays the unit used for the selection in the parameter "Sensor Param. - Path Length". ✎ Note! The unit is selected in the parameter "System Unit - Length" → Page 98.
Calibration Data - Calibration Factor	read only	Use this function to view the current calibration factor for the measuring sensors.
Calibration Data - Zero Point	AUTO - OOS	Display or manual change of the value for the currently used zero point correction. **User input:** 5-digit floating-point number, including unit and sign (e.g. +10.0 ns)
Calibration Data - Correction Factor	AUTO - OOS	For entering a correction factor defined by the customer. **User input:** 5-digit floating-point number
Calibration Data - Deviation Sensor Distance	AUTO - OOS	✎ Note! This parameter is active only if the option "INSERTION" has not been selected in the parameter "Sensor Param. - Measurement". Use this function to enter the deviation of the sensor distance. **User input:** 5-digit floating-point number **Factory setting:** 0 ✎ Note! The unit used is displayed in the parameter "Calibration Data - Unit Deviation Sensor Distance".

Transducer Blocks "Flow Channel 1" and "Flow Channel 2" / base indexes 1400 and 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Calibration Data - Unit Deviation Sensor Distance	read only	Displays the unit used for the selection in the parameter "Calibration Data - Deviation Sensor Distance". ✎ Note! The unit is selected in the parameter "System Unit - Length" → Page 98.
Calibration Data - Deviation ARC Length	AUTO - OOS	✎ Note! This parameter is active only if the option "INSERTION" has been selected in the parameter "Sensor Param. - Measurement" and the option "DUAL PATH" has been selected in the parameter "Sensor Param. - Sensor Configuration". Use this function to enter the deviation of the arc length. **User input:** 5-digit floating-point number **Factory setting:** 0 ✎ Note! The unit used is displayed in the parameter "Calibration Data - Unit Deviation ARC Length".
Calibration Data - Unit Deviation ARC Length	read only	Displays the unit used for the selection in the parameter "Calibration Data - Deviation ARC Length". ✎ Note! The unit is selected in the parameter "System Unit - Length" → Page 98.
Calibration Data - Deviation Path Length	AUTO - OOS	✎ Note! This parameter is active only if the option "INSERTION" has not been selected in the parameter "Sensor Param. - Measurement". Use this function to enter the deviation of the path length. **User input:** 5-digit floating-point number **Factory setting:** 0 ✎ Note! The unit used is displayed in the parameter "Calibration Data - Unit Deviation Path Length".
Calibration Data - Unit Deviation Path Length	read only	Displays the unit used for the selection in the parameter "Calibration Data - Deviation Path Length". ✎ Note! The unit is selected in the parameter "System Unit - Length" → Page 98.

Transducer Blocks "Flow Channel 1" and "Flow Channel 2" / base indexes 1400 and 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Simulation - Measurand	AUTO - OOS	Activation of simulation for volume flow. **Options:** OFF VOLUME FLOW **Factory setting:** OFF ☞ Caution! ■ The measuring device cannot be used for measuring while this simulation is in progress. ■ The simulation is active **independently** of the position of the corresponding jumpers of the I/O board (see Operating Instructions for Proline Prosonic Flow 93 FOUNDATION Fieldbus, BA00078D, Chapter 5.4). ■ The setting is not saved in the event of a power failure. ✎ Note! An active simulation mode is relayed to downstream function blocks or higher-level 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 flowmeter itself and downstream function blocks. **User input:** 5-digit floating-point number **Factory setting:** 0 ✎ Note! The unit used is displayed in the parameter "Simulation - Unit". ☞ Caution! The setting is not saved in the event of a power failure.
Simulation - Unit	read only	Displays the unit used in the parameter "Simulation - Value Measurand". ✎ Note! The unit is taken from the parameter "System Unit - Volume Flow" (→ Page 97).
Amp. Device Family	read only	This parameter is only used for service purposes.

3.4 "Diagnosis" Transducer Block parameters

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

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

"Diagnosis" Transducer Block/base index 1600		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Diagnosis - Actual System Condition	read only	Displays the current system status. ✎ Note! A precise error description as well as notes on remedying errors can be found in the Operating Instructions for the Proline Prosonic Flow 93 FOUNDATION Fieldbus, BA00078D.
Diagnosis - Previous System Condition	read only	Displays the last error message that occurred.
Un-/Locking - 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 (E+H parameters) be programmed and the device configuration modified. You enable programming by entering: ■ Code 93 (factory setting) ■ Personal code (→ Page 119) **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 Prosonic Flow 93 FOUNDATION Fieldbus, BA00078). ■ You can disable programming again by entering any number (other than the access code) in this parameter. ■ The E+H service organization can be of assistance if you mislay your personal code. ■ The entry made here does not affect the local display. Programming via the function matrix thus has to be enabled separately.
Un-/Locking - Access Status	read only	Displays the current status of access to the manufacturer-specific parameters of the device. **Display:** ■ 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**
System - Alarm Delay	AUTO - OOS	Use this function to define a time span for which the criteria for an error have to be satisfied without interruption before a fault or notice message is generated. ✎ Note! This alarm delay has an effect – depending on the configuration and type of error – both on the display and the output values of the FOUNDATION Fieldbus. **User input:** 0 s to 100 s (in one-second increments) **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 error and notice messages cannot be suppressed, a value of 0 seconds must be entered here.
System - Simulation Failsafe Mode	AUTO - OOS	Use this function to set the totalizers to their defined failsafe modes, in order to check whether they respond correctly. The failsafe mode of the totalizers is defined via the "Totalizer Handling - Failsafe All" parameter (→ Page 136). ✎ Note! With the fieldbus, an active simulation is relayed to downstream function blocks or higher-level process control systems by means of the status UNCERTAIN of the output value OUT (AI Block). **Options:** OFF ON **Factory setting:** OFF
System - Reset	AUTO - OOS	Use this parameter to perform a reset of the measuring system. **Options:** NO RESTART SYSTEM (new startup without network interruption) **Factory setting:** NO

"Diagnosis" Transducer Block/base index 1600		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
System - Troubleshooting	AUTO - OOS	Use this parameter to rectify errors occurring in the EEPROM. The EEPROM is divided into various blocks. The error is rectified by selecting the block in question and acknowledging. ☝ Caution! When troubleshooting a block, the parameters of the selected block are reset to the values according 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
System - Operation Time	read-only	The total operating time since the flowmeter was commissioned appears on the display (in seconds).
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. Application examples: ■ After commissioning, the current measuring point parameters can be saved to the T-DAT as a backup. ■ If the transmitter is replaced for some reason, the data from the T-DAT can be loaded into the new transmitter (EEPROM). **Options:** CANCEL SAVE (from EEPROM to the T-DAT) LOAD (from the T-DAT to the EEPROM) **Factory setting:** CANCEL ✎ Note! ■ If the power supply fails, the totalizer readings are automatically saved to the EEPROM. ■ The option "LOAD" cannot be executed if the T-DAT is empty or faulty. ■ The option "LOAD" and "SAVE" cannot be executed if no T-DAT is present.
Amp. Device Family	read only	This parameter is only used for service purposes.

3.5 "Service" Transducer Block parameters

The Transducer Block "Service" (base index 1700) contains all the parameters necessary for service purposes. Because these parameters affect the accuracy and function of the measuring device, they may be modified by E+H service technicians only. The parameters of the Transducer Block "TRANSDUCER_ SERV" are not described in these Operating Instructions.

3.6 "Display" Transducer Block parameters

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

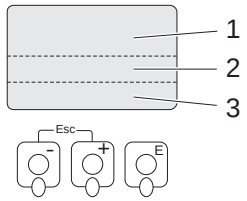
✎ Note!
FOUNDATION Fieldbus parameters are described in the Operating Instructions "FOUNDATION Fieldbus Overview" (BA013S) (acquired at: → www.endress.de → Download).

"Display" Transducer Block/base index 1800		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Un-/Locking - 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 (E+H parameters) be programmed and the device configuration modified. You enable programming by entering: ■ Code 93 (factory setting) ■ Personal code (→ Page 119) **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 Prosonic Flow 93 FOUNDATION Fieldbus). ■ You can disable programming again by entering any number (other than the access code) in this parameter. ■ The E+H service organization can be of assistance if you mislay your personal code. ■ The entry made here does not affect the local display. Programming via the function matrix thus has to be enabled separately.
Un-/Locking - Access Status	read only	Displays the current status of access to the manufacturer-specific parameters of the device. **Display:** ■ 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 measuring device. **Display:** 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**
Un-/Locking - Define Private Code	AUTO - OOS	Use this function to enter a personal code to enable configuration. This applies both to manufacturer-specific parameters in the Transducer Blocks and to operating via the local display. **User input:** 0...9999 (max. 4-digit number) **Factory setting:** 93 ✎ Note! ■ Programming is always enabled with the code "0". ■ Parameter configuration has to be enabled before this code can be changed.
Configuration - 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 language group available which is 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 77 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.

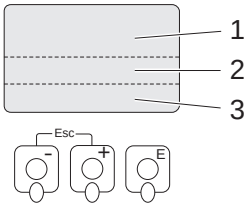
"Display" Transducer Block/base index 1800		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Configuration- Display Damping	AUTO - OOS	Use this parameter to enter a time constant defining how the display reacts to severely fluctuating flow variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). **User input:** 0...100 seconds **Factory setting:** 1 s ✎ Note! Setting the time constant to "0" seconds switches off damping.
Configuration - Contrast LCD	AUTO - OOS	Use this function 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%
Configuration - Xline Calculated	AUTO - OOS	Use this parameter to indicate which "calculated main value" from the measured values of both channels is displayed. For the value to be displayed in the desired line, the option "CALC. VOLUME FLOW" must be selected in one of the following parameters: ■ For the display in the main line, parameter "Main Line - Assign" ■ For the display in the addition line, parameter "Add. Line - Assign" ■ For the display in the information line, parameter "Info Line - Assign" ✎ Note! This parameter is **not** active if on one channel, "OFF" has been selected in the parameter "Sensor Param. - Measurement" (→ Page 108). **Options:** (CH1 + CH2)/2 CH1 + CH2 CH1 - CH2 **Factory setting:** (CH1 + CH2)/2

"Display" Transducer Block/base index 1800		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Operation - Test Display	AUTO - OOS	Use this parameter 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 an "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 display returns to its initial state. Parameter → OFF.

"Display" Transducer Block/base index 1800		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
1 = Main line 2 = Additional line 3 = Info line		 A0001253
Main Line - Assign	AUTO - OOS	Use this parameter to define the display value assigned to the main line (the top line of the local display) during normal measuring operation. **Options:** OFF VOLUME FLOW (CH1 to CH2) CALC. VOLUME FLOW VOLUME FLOW % (CH1 to CH2) CALC. VOLUME FLOW % SOUND VELOCITY (CH1 to CH2) SOUND VELOCITY AVG. SIGNAL STRENGTH (CH1 to CH2) FLOW VELOCITY (CH1 to CH2) FLOW VELOCITY AVG. TOTALIZER (1 to 3) AI (1 to 8) - OUT VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (external set point) PID - OUT VALUE (manipulated variable) **Factory setting:** VOLUME FLOW CH1
Main Line - 100%-Value	AUTO - OOS	✎ Note! The entry is not active unless one of the following was selected in the parameter "Main - Line - Assign": ▪ VOLUME FLOW % CH1 ▪ VOLUME FLOW % CH2 ▪ CALC. VOLUME FLOW % 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 country (10 l/s or 200 us.gal/min) Note! The unit is taken from the parameter "System Unit - Volume Flow" (→ Page 97).

"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 such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → dm^3/s), indicating that the measuring system is computing with more decimal places than can be shown on the display.
Main Line Multiplex - 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 "User Interface Main - Line Assign". **Options:** OFF VOLUME FLOW (CH1 to CH2) CALC. VOLUME FLOW VOLUME FLOW % (CH1 to CH2) CALC. VOLUME FLOW % SOUND VELOCITY (CH1 to CH2) SOUND VELOCITY AVG. SIGNAL STRENGTH (CH1 to CH2) FLOW VELOCITY (CH1 to CH2) FLOW VELOCITY AVG. TOTALIZER (1 to 3) AI (1 to 8) - OUT VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (external set point) PID - OUT VALUE (manipulated variable) **Factory setting:** OFF
Main Line Multiplex - 100%-Value	AUTO - OOS	✎ Note! The entry is not active unless one of the following was selected in the parameter "Main - Multiplex Line Assign": ■ VOLUME FLOW % CH1 ■ VOLUME FLOW % CH2 ■ CALC. VOLUME FLOW % 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 country [10 l/s or 200 us.gal/min] ✎ Note! The unit is taken from the parameter "System Unit - Volume Flow" (Page 97).

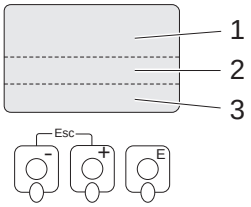
"Display" Transducer Block/base index 1800		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Main Line Multiplex - Format	AUTO - OOS	Use this parameter to define the maximum number of places after the decimal point of the second value displayed for the reading in the main line. **Options:** XXXXX. – XXXX.X – XXX.XX – XX.XXX – X.XXXX **Factory setting:** X.XXXX ✎ Note! ■ Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. ■ The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → dm^3/s), 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**
1 = Main line **2 = Additional line** 3 = Info 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 (CH1 to CH2) CALC. VOLUME FLOW VOLUME FLOW % (CH1 to CH2) CALC. VOLUME FLOW % SOUND VELOCITY (CH1 to CH2) SOUND VELOCITY AVG. SIGNAL STRENGTH (CH1 to CH2) FLOW VELOCITY (CH1 to CH2) FLOW VELOCITY AVG. VOLUME FLOW BARGRAPH % (CH1 to CH2) CALC. VOLUME FLOW BARGRAPH % SIGNAL BARGRAPH (CH1 to CH2) TOTALIZER (1 to 3) FLOW DIRECTION (CH1 to CH2) CALC. FLOW DIRECTION AI (1 to 8) - 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:** TOTALIZER 1
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": ▪ VOLUME FLOW % (CH1 to CH2) ▪ CALC. VOLUME FLOW % ▪ VOLUME FLOW BARGRAPH % (CH1 to CH2) ▪ CALC. VOLUME FLOW BARGRAPH % 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 country (10 l/s or 200 us.gal/min) ✎ Note! The unit is taken from the parameter "System Unit - Volume Flow" (→ Page 97).

"Display" Transducer Block/base index 1800		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
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 such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → dm^3/s), indicating that the measuring system is computing with more decimal places than can be shown on the display.
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": ▪ VOLUME FLOW BARGRAPH % (CH1 to CH2) ▪ CALC. VOLUME FLOW BARGRAPH % ▪ SIGNAL BARGRAPH (CH1 to CH2) 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

"Display" Transducer Block/base index 1800		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Add. Line Multiplex - 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 "User Interface Add. Line - Assign". **Options:** OFF VOLUME FLOW (CH1 to CH2) CALC. VOLUME FLOW VOLUME FLOW % (CH1 to CH2) CALC. VOLUME FLOW % SOUND VELOCITY (CH1 to CH2) SOUND VELOCITY AVG. SIGNAL STRENGTH (CH1 to CH2) FLOW VELOCITY (CH1 to CH2) FLOW VELOCITY AVG. VOLUME FLOW BARGRAPH % (CH1 to CH2) CALC. VOLUME FLOW BARGRAPH % SIGNAL BARGRAPH (CH1 to CH2) TOTALIZER (1 to 3) FLOW DIRECTION (CH1 to CH2) CALC. FLOW DIRECTION AI (1 to 8) - 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 or notice message is generated. The message in question appears on the display. ■ Fault message (identified by a lightning flash symbol): Multiplex mode is resumed as soon as the fault is no longer active. ■ Notice message (identified by an exclamation mark): Multiplex mode is resumed as soon as the notice message is no longer active.
Add. Line Multiplex - 100%-Value	AUTO - OOS	✎ Note! The entry is not active unless one of the following was selected in the parameter "Add. Line - Multiplex Assign": ■ VOLUME FLOW % (CH1 to CH2) ■ CALC. VOLUME FLOW % ■ VOLUME FLOW BARGRAPH % (CH1 to CH2) ■ CALC. VOLUME FLOW BARGRAPH % 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 country (10 l/s or 200 us.gal/min) ✎ Note! The unit is taken from the parameter "System Unit - Volume Flow" (→ Page 97).

"Display" Transducer Block/base index 1800		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Add. Line Multiplex - Format	AUTO - OOS	✎ Note! The option is not active unless a number was selected in the parameter "Add. Line - Multiplex 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 such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → dm³/s), indicating that the measuring system is computing with more decimal places than can be shown on the display.
Add. Line Multiplex - Display Mode	AUTO - OOS	✎ Note! The option is not active unless one of the following was selected in the parameter "Add. Line - Multiplex Assign": ■ VOLUME FLOW BARGRAPH % (CH1 to CH2) ■ CALC. VOLUME FLOW BARGRAPH % ■ SIGNAL BARGRAPH (CH1 to CH2) 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

"Display" Transducer Block/base index 1800		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
1 = Main line 2 = Additional line **3 = Info 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 (CH1 to CH2) CALC. VOLUME FLOW VOLUME FLOW % (CH1 to CH2) CALC. VOLUME FLOW % SOUND VELOCITY (CH1 to CH2) SOUND VELOCITY AVG. SIGNAL STRENGTH (CH1 to CH2) FLOW VELOCITY (CH1 to CH2) FLOW VELOCITY AVG. VOLUME FLOW BARGRAPH % (CH1 to CH2) CALC. VOLUME FLOW BARGRAPH % SIGNAL BARGRAPH (CH1 to CH2) TOTALIZER (1 to 3) OPERATING/SYSTEM CONDITIONS FLOW DIRECTION (CH1 to CH2) CALC. FLOW DIRECTION AI (1 to 8) - 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
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": ■ VOLUME FLOW % (CH1 to CH2) ■ CALC. VOLUME FLOW % ■ VOLUME FLOW BARGRAPH % (CH1 to CH2) ■ CALC. VOLUME FLOW BARGRAPH % 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 country (10 l/s or 200 us.gal/min) ✎ Note! The unit is taken from the parameter "System Unit - Volume Flow" (→ Page 97).

"Display" Transducer Block/base index 1800		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Info Line - Format	AUTO - OOS	✎ Note! The option is not active unless a number was selected in the parameter "Info 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 such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → dm^3/s), indicating that the measuring system is computing with more decimal places than can be shown on the display.
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": ■ VOLUME FLOW BARGRAPH % (CH1 to CH2) ■ CALC. VOLUME FLOW BARGRAPH % ■ SIGNAL BARGRAPH (CH1 to CH2) 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

"Display" Transducer Block/base index 1800		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Info Line Multiplex - 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". **Options:** OFF VOLUME FLOW (CH1 to CH2) CALC. VOLUME FLOW VOLUME FLOW % (CH1 to CH2) CALC. VOLUME FLOW % SOUND VELOCITY (CH1 to CH2) SOUND VELOCITY AVG. SIGNAL STRENGTH (CH1 to CH2) FLOW VELOCITY (CH1 to CH2) FLOW VELOCITY AVG. VOLUME FLOW BARGRAPH % (CH1 to CH2) CALC. VOLUME FLOW BARGRAPH % SIGNAL BARGRAPH (CH1 to CH2) TOTALIZER (1 to 3) OPERATING/SYSTEM CONDITIONS FLOW DIRECTION (CH1 to CH2) CALC. FLOW DIRECTION AI (1 to 8) - 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 or notice message is generated. The message in question appears on the display. ■ Fault message (identified by a lightning flash symbol): Multiplex mode is resumed as soon as the fault is no longer active. ■ Notice message (identified by an exclamation mark): Multiplex mode is resumed as soon as the notice message is no longer active.
Info Line Multiplex - 100%-Value	AUTO - OOS	✎ Note! The entry is not active unless one of the following was selected in the parameter "Info Line - - Multiplex Assign": ■ VOLUME FLOW % (CH1 to CH2) ■ CALC. VOLUME FLOW % ■ VOLUME FLOW BARGRAPH % (CH1 to CH2) ■ CALC. VOLUME FLOW BARGRAPH % 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 country (10 l/s or 200 us.gal/min) ✎ Note! The unit is taken from the parameter "System Unit - Volume Flow" (→ Page 97).

"Display" Transducer Block/base index 1800		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Info Line Multiplex - Format	AUTO - OOS	✎ Note! The option is not active unless a number was selected in the parameter "Info Line - Multiplex Assign". 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 such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → dm³/s), indicating that the measuring system is computing with more decimal places than can be shown on the display.
Info Line Multiplex - Display Mode	AUTO - OOS	✎ Note! The option is not active unless one of the following was selected in the parameter "Info Line - Multiplex Assign": ■ VOLUME FLOW BARGRAPH % (CH1 to CH2) ■ CALC. VOLUME FLOW BARGRAPH % ■ SIGNAL BARGRAPH (CH1 to CH2) 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
Amp. Device Family	read only	This parameter is only used for service purposes.

3.7 "Totalizer" Transducer Block parameters

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

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

"Totalizer" Transducer Block/base index 1900		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Un-/Locking - 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 (E+H parameters) be programmed and the device configuration modified. You enable programming by entering: ■ Code 93 (factory setting) ■ Personal code (→ Page 119) **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 Prosonic Flow 93 FOUNDATION Fieldbus, BA00078). ■ You can disable programming again by entering any number (other than the access code) in this parameter. ■ The E+H service organization can be of assistance if you mislay your personal code. ■ The entry made here does not affect the local display. Programming via the function matrix thus has to be enabled separately.
Un-/Locking - Access Status	read only	Displays the current status of access to the manufacturer-specific parameters of the device. **Display:** ■ 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**
Totalizer 1 to 3 - System Value	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 "Totalizer 1 to 3 - Mode" (→ Page 135) and the direction of flow. **Display:** Max. 7-digit floating-point number, including unit and sign (e.g. 15467.04m^3; –4925.631 kg) ✎ Note! ■ The effect of the setting in the parameter "Totalizer 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 totalizers' response to faults is defined in the parameter "Totalizer - Failsafe All".
Totalizer 1 to 3 - System Unit	AUTO - OOS	Use this parameter to define the unit for the totalizer's measured variable as selected. **Options:** *Metric:* Cubic centimeter →cm^3 Cubic decimeter → dm^3 Cubic meter → m^3 Milliliter →ml Liter → l Hectoliter → hl Megaliter → Ml MEGA *US:* Cubic centimeter → cc Acre foot → af Cubic foot → ft^3 Fluid ounce → oz f Gallon → US gal Million gallon → US Mgal Barrel (normal fluids: 31.5 gal/bbl) →US bbl NORM.FL. Barrel (beer: 31.0 gal/bbl) →US bbl BEER Barrel (petrochemicals: 42.0 gal/bbl) →US bbl PETROCH. Barrel (filling tanks: 55.0 gal/bbl) →US bbl TANK *Imperial:* Gallon → imp. gal Mega gallon → imp. Mgal Barrel (beer: 36.0 gal/bbl) → imp. bbl BEER Barrel (petrochemicals: 34.97 gal/bbl) → imp. bbl PETROCH. **Factory setting:** Depends on country (m^3 or us.gal) → Page 77 ✎ Note! The unit selected here does not have any effect on the desired volume unit which should be transmitted by means of the FF interface. This setting is made separately by means of the corresponding AI Block in the XD_SCALE parameter group.

"Totalizer" Transducer Block/base index 1900		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Totalizer 1 to 3 - Assign	AUTO - OOS	Assign a measured variable to the totalizer. **Options:** OFF VOLUME FLOW CH1 VOLUME FLOW CH2 VOLUME FLOW AVERAGE VOLUME FLOW SUM VOLUME FLOW DIFF. **Factory setting:** VOLUME FLOW CH1 ✎ Note! The totalizer is reset to "0" as soon as the selection is changed.
Totalizer 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 Only positive flow components REVERSE Negative flow components only **Factory setting:** Totalizer 1 = BALANCE Totalizer 2 = FORWARD Totalizer 3 = REVERSE
Totalizer 1 to 3 - Reset	AUTO - OOS	Reset the totalizer ("Totalizer 1 to 3 - System Value" parameter) to zero. **Options:** NO YES **Factory setting:** NO ✎ Note! Totalizer resetting can also be controlled or initiated using cyclic data transmission via the Discrete Output function block (→ Page 145).

"Totalizer" Transducer Block/base index 1900		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Totalizer Handling - Reset All	AUTO - OOS	Simultaneously reset all totalizers ("Totalizer 1 to 3 - System Value" parameter) to zero. **Options:** NO YES **Factory setting:** NO ✎ Note! Totalizer resetting can also be controlled or initiated using cyclic data transmission via the Discrete Output function block (→ Page 145).
Totalizers Handling - Failsafe All	AUTO - OOS	Use this parameter to define the common response of all totalizers 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 current 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
Amp. Device Family	read only	This parameter is only used for service purposes.

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.

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

4.1 Signal processing

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

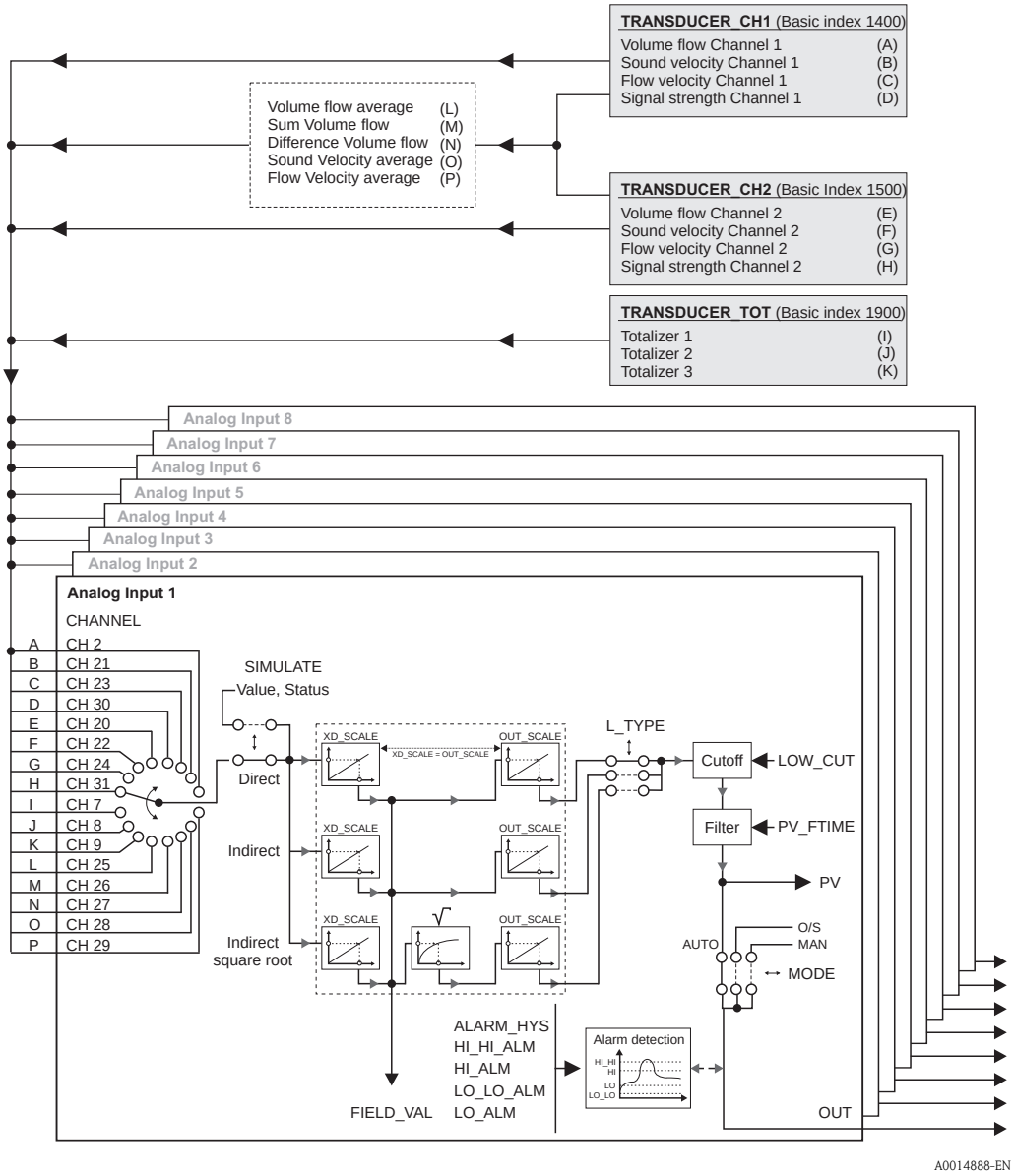


Fig. 3: Internal structure of the individual Analog Input function blocks

The Analog Input function blocks "Flow Channel 1", "Flow Channel 2" and "Totalizer" receive their input values from the **Transducer Blocks**. The parameter CHANNEL is used to select which input value is to be processed in an **Analog Input function block**.

Factory-based configuration of the Transducer Blocks → Page 94 ff.

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 activated by means of jumpers on the I/O board (→ Operating Instructions for Prosonic Flow 93 FOUNDATION Fieldbus, BA00078D).

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

- Direct signal conversion
  The input 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 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 142).

- Indirect signal conversion with square root
  With this setting the 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 "0".

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.

4.2 Important functions and parameters of the Analog Input function blocks

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

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

4.2.1 Selecting the operating mode

The operating mode is configured via the MODE_
BLK parameter group. The Analog Input function block supports the following operating 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.

4.2.2 Assignment of the process variable

The Prosonic Flow 93 FOUNDATION Fieldbus has eight Analog Input function blocks. The process variables of the Transducer Block that are to be processed are assigned via the parameter CHANNEL.

Factory-based configuration of the Transducer Blocks → Page 94 ff.

4.2.3 Linearization types

In an Analog Input function block, the input value of a Transducer Block can be linearized 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) bypasses 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.

4.2.4 Selection of units

A change in the unit for a process variable is defined in the relevant Analog Input function block, in the parameter group XD_SCALE via the element UNIT.

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

Note!
- If the "Direct" type of linearization was selected via the L_TYPE parameter, the setting of the XD_SCALE and OUT_SCALE parameter groups must be identical; otherwise, the function block remains in the OOS operating 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, low flow cut off and for simulation.

4.2.5 Status of the output value OUT

The status of the parameter group OUT transmits to the subsequent 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 during this process:

- 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 UNCERTAIN tells 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 "Flow Channel 1", "Flow Channel 2" 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!
- The status of the device (block error) is displayed by means of the BLOCK_ERR parameter.
- Detailed information on the current device status is displayed via the "Diagnosis" Transducer Block in the parameter "Diag. - Act.Sys.Condition". A list of all the error messages, including remedial measures, can be found in the Operating Instructions for Prosonic Flow 93 FOUNDATION Fieldbus (BA00078D).

4.2.6 Simulation of input/output

Certain 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.

4.2.7 Diagnosis

The status of the device is displayed via the BLOCK_ERR parameter specified in the FOUNDATION Fieldbus specification.

Detailed information on the current device status is displayed via the "Diagnosis" Transducer Block in the manufacturer-specific parameter "Diag. - Act.Sys.Condition"
(→ Page 115).

For more information on rectifying errors →See Operating Instructions for Prosonic Flow 93 FOUNDATION Fieldbus (BA00078D), "Troubleshooting" section.

4.2.8 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 measurement range of the channel 1 sensor is 0 to 30 m³/h.
- The output range to the process control system should be 0 to 100%.

The Analog Input function block must be configured as follows:
- Select the input value in the parameter CHANNEL
  Selection: Channel = 2 → Volume flow channel 1

- Parameter L_TYPE
  Select: L_TYPE = Indirect
  The process variable "Volume flow channel 1" from the "Flow Channel 1" Transducer Block is rescaled linearly via input scaling XD_SCALE to the desired output range OUT_SCALE.

- Parameter group XD_SCALE

XD_SCALE 0 %	= 0
XD_SCALE 100 %	= 30
XD_SCALE UNIT	= m³/h

- Parameter group OUT_SCALE

  OUT_SCALE 0 % = 0

  OUT_SCALE 100 % = 100

  OUT_SCALE UNIT = %

The result is that with an input value of, for example, 15 m³/h, a value of 50% is output via the parameter OUT.

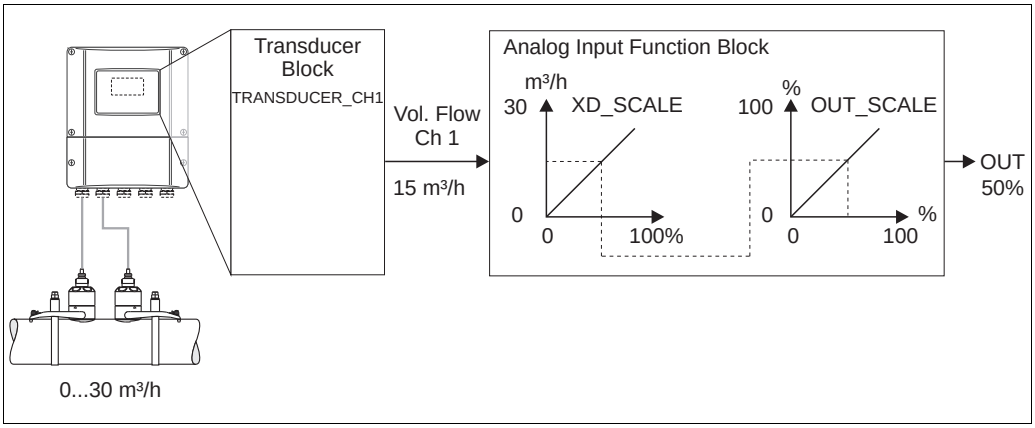


Fig. 4: Rescaling the input value (example)

4.2.9 Limit values

The full scale 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 pre-warning limit)
- LO_LO_LIM (lower alarm limit)
- LO_LIM (lower pre-warning limit)

4.2.10 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 (upper alarm limit)
- HI_PRI (upper pre-warning limit)
- LO_LO_PRI (lower alarm limit)
- LO_PRI (lower pre-warning limit)

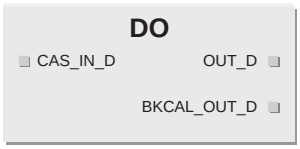
The status of the limit value process alarms is communicated to the fieldbus host system via the following parameters:
- HI_HI_ALM (upper alarm limit)
- HI_ALM (upper pre-warning limit)
- LO_LO_ALMI (lower alarm limit)
- LO_ALM (lower pre-warning limit)

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.

5 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 subsequent 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

5.1 Signal processing

The figure shows the internal structure of the Discrete Output function blocks Prosonic Flow 93 FOUNDATION Fieldbus:

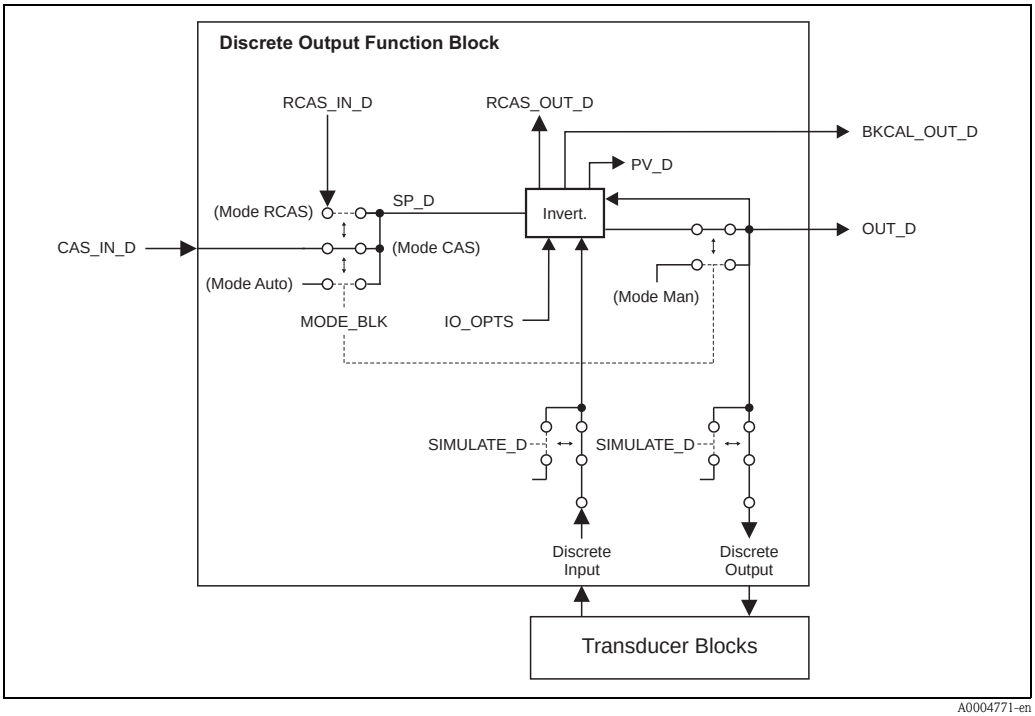

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Fig. 5: Signal processing in the Discrete Output function block

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 fieldbus host 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.

5.2 Important functions and parameters of the Discrete Output function block

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

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

5.2.1 Selecting the operating mode

The operating mode is configured via the MODE_BLK parameter group. The Discrete Output function block supports the following operating modes:
- AUTO
- MAN
- CAS
- RCAS
- OOS

5.2.2 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.

5.2.3 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)

5.2.4 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 assignment of the CAS_IN_D, RCAS_IN_D, OUT_D, SP_D parameters

Status changes			Action
Discrete state 0	→	Discrete state 1	Reserved
Discrete state 0	→	Discrete state 2	Positive zero return channel 1: On
Discrete state 0	→	Discrete state 3	Positive zero return channel 1: Off
Discrete state 0	→	Discrete state 4	Zero point adjustment channel 1
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
Discrete state 0	→	Discrete state 11	Reserved
Discrete state 0	→	Discrete state 12	Reserved
Discrete state 0	→	Discrete state 13	Reserved
Discrete state 0	→	Discrete state 14	Reserved
Discrete state 0	→	Discrete state 15	Reserved
Discrete state 0	→	Discrete state 16	Positive zero return channel 2: On
Discrete state 0	→	Discrete state 17	Positive zero return channel 2: Off
Discrete state 0	→	Discrete state 18	Zero point adjustment channel 2
Discrete state 0	→	Discrete state 27	Permanent storage: Off
Discrete state 0	→	Discrete state 28	Permanent storage: On

Example for controlling positive zero return via the Discrete Output function block.
The following example shows how positive zero return can be activated or deactivated via the Discrete Output function block during a cleaning procedure.

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.

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

   Activating the positive zero return channel 1
   With a starting value of 0 (Discrete state 0), positive zero return is activated by a status change from 0 → 2 at input CAS_IN_D.

   Deactivating the positive zero return channel 1
   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 → 3 at input CAS_IN_D.

6 Additional function blocks

Note!
Additional 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.de → download).

7 Index FOUNDATION Fieldbus

A

Access - Code
Transducer Blocks "Channel 1" and "Channel 2" 96
Access - Code Counter
"Display" Transducer Block 118
Access counter 25
Add. Line - 100%-Value
"Display" Transducer Block 125
Add. Line - Assign
"Display" Transducer Block 125
Add. Line - Display Mode
"Display" Transducer Block 126
Add. Line - Format
"Display" Transducer Block 126
Add. Line Multiplex - 100%-Value
"Display" Transducer Block 127
Add. Line Multiplex - Assign
"Display" Transducer Block 127
Add. Line Multiplex - Display Mode
"Display" Transducer Block 128
Add. Line Multiplex - Format
"Display" Transducer Block 128
Additional line
100% Value 125
100% value (multiplex) 127
Assign 125
Assign (multiplex) 127
Display mode 126
Display mode (multiplex) 128
Format 126
Format (multiplex) 128
Alarm delay 116
Alarm detection
AI function block 143
Resource Block 89
Transducer Block 95
Alarm processing
AI function block 143
Resource Block 89
Transducer Blocks 95
Amp. - HW Identification
Resource Block 90
Amp. - HW Rev.Number
Resource Block 90
Amp. - Language Group
Resource Block 90
Amp. - Prod.Number
Resource Block 90
Amp. - SW Identification
Resource Block 90
Amp. - SW Rev.No. T-DAT
Resource Block 90
Amp. - SW Rev.Number
Resource Block 90
Amp. Device Family
"Display" Transducer Block 132
"Totalizer" Transducer Block 136
Transducer Blocks "Channel 1" and "Channel 2" 114
Amp. Device Family - Transducer Block "Diagnosis" 117
Amplifier
Hardware identification number 90
Hardware revision number 90
Language Group 90
Production number 90
Software identification number 90
Software revision number 90
Analog Input function block
Alarm detection, processing 143
Diagnosis 142
General description 137
Limit values 143
Rescaling 142
Signal processing 138
Simulation of input/output 142
Status, output value OUT 141
Arc length 111
Assign
DO function block 146
Totalizer 1 to 3 135

B

Backlight
Display 120
Base index
1700 Transducer Block "Service" 118
Block model 86
Block output values
Transducer Block 94

C

Cable length 110
Calibration Data - Calibration Factor
Transducer Blocks "Channel 1" and "Channel 2" 112
Calibration Data - Correction Factor
Transducer Blocks "Channel 1" and "Channel 2" 112
Calibration Data - Deviation ARC Length
Transducer Blocks "Channel 1" and "Channel 2" 113
Calibration Data - Deviation Path Length
Transducer Blocks "Channel 1" and "Channel 2" 113
Calibration Data - Deviation Sensor Distance
Transducer Blocks "Channel 1" and "Channel 2" 112
Calibration Data - Unit Deviation ARC Length
Transducer Blocks "Channel 1" and "Channel 2" 113
Calibration Data - Unit Deviation Path Length
Transducer Blocks "Channel 1" and "Channel 2" 113
Calibration Data - Unit Deviation Sensor Distance
Transducer Blocks "Channel 1" and "Channel 2" 113
Calibration Data - Zero Point
Transducer Blocks "Channel 1" and "Channel 2" 112
Calibration factor 112
Code
Access counter 25

Code entry
See Access - Code
Config. - Backlight
"Display" Transducer Block 120
Configuration - Contrast LCD
"Display" Transducer Block 120
Configuration - Display Damping
"Display" Transducer Block 120
Configuration - Language
"Display" Transducer Block 119
Configuration - Xline Calculated
"Display" Transducer Block 120
Contrast LCD 120
Correction factor 112

D

Damping
Display 120
Flow 99
Data backup 21
Define failsafe mode (totalizer) 136
Deviation
Arc length 113
Path length 113
Sensor distance 112
Device Software
Resource Block 90
Diagnosis
AI function block 142
Transducer Block 95
Diagnosis - Actual System Condition
"Diagnosis" Transducer Block 115
Diagnosis - Previous System Condition
"Diagnosis" Transducer Block 115
Discrete Output function block 145
Safety behavior 146
Values for CAS_IN_D, RCAS_IN_D, OUT_D and SP_D .. 146
Display
Backlight 120
Signal strength 98
Sound velocity 97
Test 121
Volume flow 96

F

Function blocks 137

I

I/O - HW Identification
Resource Block 90
I/O - HW Rev. Number
Resource Block 90
I/O - Prod.Number
Resource Block 90
I/O - SW Identification
Resource Block 90
I/O - SW Rev. Number
Resource Block 90
I/O - Type
Resource Block 90
I/O Module
Device Software 90
Hardware identification number 90
Hardware revision number 90
Production number 90
Software identification number 90
Software revision number 90
Identification number
Amplifier hardware 90
Amplifier software 90
I/O module hardware 90
I/O module software 90
Info Line - 100%-Value
"Display" Transducer Block 129
Info Line - Display Mode
"Display" Transducer Block 130
Info Line - Format
"Display" Transducer Block 130
Info Line Assign
"Display" Transducer Block 129
Info Line Multiplex
- Assign
"Display" Transducer Block 131
Info Line Multiplex - 100%-Value
"Display" Transducer Block 131
Info Line Multiplex - Display Mode
"Display" Transducer Block 132
Info Line Multiplex - Format
"Display" Transducer Block 132
Information line
100% Value 129
100% value (multiplex) 131
Assign 129
Assign (multiplex) 131
Display mode 130
Display mode (multiplex) 132
Format 130
Format (multiplex) 132

L

Language 119
Language group amplifier 90
Limit values
AI function block 143
Lining (pipe)
Material 105
Sound velocity 105
Thickness 106
Liquid
Max. sound velocity 107
Min. sound velocity 107
Options
..... 106
Sound velocity 107
Temperature 106
Liquid Data - Liquid
Transducer Blocks "Channel 1" and "Channel 2" 106
Liquid Data - Max. Sound Velocity

Transducer Blocks "Channel 1" and "Channel 2" 107
Liquid Data - Min. Sound Velocity
Transducer Blocks "Channel 1" and "Channel 2" 107
Liquid Data - Sound Velocity
Transducer Blocks "Channel 1" and "Channel 2" 107
Liquid Data - Temperature
Transducer Blocks "Channel 1" and "Channel 2" 106
Liquid Data - Unit Max. Sound Velocity
Transducer Blocks "Channel 1" and "Channel 2" 108
Liquid Data - Unit Min. Sound Velocity
Transducer Blocks "Channel 1" and "Channel 2" 107
Liquid Data - Unit Sound Velocity
Transducer Blocks "Channel 1" and "Channel 2" 107
Liquid Data - Unit Temperature
Transducer Blocks "Channel 1" and "Channel 2" 107
Low flow cut off
Assign 99
Off-value 100
On-value 100
Unit 100
Low Flow Cut Off - Assign
Transducer Blocks "Channel 1" and "Channel 2" 99
Low Flow Cut Off - Unit
Transducer Blocks "Channel 1" and "Channel 2" 100
Low Flow Cut Off - Off-Value
Transducer Blocks "Channel 1" and "Channel 2" 100
Low Flow Cut Off - On-Value
Transducer Blocks "Channel 1" and "Channel 2" 100

M

Main line
100% Value 122
100% value (multiplex) 123
Assign 122
Assign (multiplex) 123
Format 123
Format (multiplex) 124
Main Line - 100%-Value
"Display" Transducer Block 122
Main Line - Assign
"Display" Transducer Block 122
Main Line - Format
"Display" Transducer Block 123
Main Line Multiplex - 100%-Value
"Display" Transducer Block 123
Main Line Multiplex - Assign
"Display" Transducer Block 123
Main Line Multiplex - Format
"Display" Transducer Block 124
Main values (calculated) 120
Measurement method 108
Mode
Totalizer 1 to 3 135

O

Operating hours 117
Operation - Test Display
"Display" Transducer Block 121
Operation mode
AI function block 140
DO function block 146
Resource Block 88
Transducer Block 94

P

Parameter
Discrete Output function block 148
Resource Block 90
Path length 112
Pipe
Circumference 104
Diameter 104
Liner material 105
Material 103
Nominal diameter 102
Sound velocity 104
Standard 102
Wall thickness 105
Pipe Data - Circumference
Transducer Blocks "Channel 1" and "Channel 2" 104
Pipe Data - Liner Material
Transducer Blocks "Channel 1" and "Channel 2" 105
Pipe Data - Liner Thickness
Transducer Blocks "Channel 1" and "Channel 2" 106
Pipe Data - Nominal Diameter
Transducer Blocks "Channel 1" and "Channel 2" 102
Pipe Data - Pipe Diameter
Transducer Blocks "Channel 1" and "Channel 2" 104
Pipe Data - Pipe Material
Transducer Blocks "Channel 1" and "Channel 2" 103
Pipe Data - Pipe Standard
Transducer Blocks "Channel 1" and "Channel 2" 102
Pipe Data - Reference Value
Transducer Blocks "Channel 1" and "Channel 2" 103
Pipe Data - Sound Velocity Liner
Transducer Blocks "Channel 1" and "Channel 2" 105
Pipe Data - Sound Velocity Pipe
Transducer Blocks "Channel 1" and "Channel 2" 104
Pipe Data - Unit Circumference
Transducer Blocks "Channel 1" and "Channel 2" 104
Pipe Data - Unit Liner Thickness
Transducer Blocks "Channel 1" and "Channel 2" 106
Pipe Data - Unit Nominal Diameter
Transducer Blocks "Channel 1" and "Channel 2" 102
Pipe Data - Unit Pipe Diameter
Transducer Blocks "Channel 1" and "Channel 2" 104
Pipe Data - Unit Reference Value
Transducer Blocks "Channel 1" and "Channel 2" 103
Pipe Data - Unit Sound Velocity Pipe
Transducer Blocks "Channel 1" and "Channel 2" 104
Pipe Data - Unit Wall Thickness
Transducer Blocks "Channel 1" and "Channel 2" 105
Pipe Data - Wall Thickness
Transducer Blocks "Channel 1" and "Channel 2" 105
Positive zero return 99
Pressure shock suppression 100, 101
Process - Pressure Shock Suppression
Transducer Blocks "Channel 1" and "Channel 2" 100, 101

Process variable assignment
AI function block ... 140
Production number
Amplifier ... 90
I/O Module ... 90

R

Reference value ... 103
Rescaling the input value (AI funct. block) ... 142
Reset
All totalizers ... 136
System ... 116
Totalizer 1 to 3 ... 135
Resource Block ... 88
Resource block block status ... 88
Revision number
Amplifier hardware ... 90
Amplifier software ... 90

S

Selecting units
Volume flow ... 97
Sensor
Arc length ... 111
Cable length ... 110
Configuration ... 110
Distance ... 111
Path length ... 112
Position ... 110
Serial number ... 90
Type (selection) ... 109
Wire length ... 111
Sensor - Serial Number
Resource Block ... 90
Sensor installation direction ... 98
Sensor Param. - ARC Length
Transducer Blocks "Channel 1" and "Channel 2" ... 111
Sensor Param. - Cable Length
Transducer Blocks "Channel 1" and "Channel 2" ... 110
Sensor Param. - Measurement
Transducer Blocks "Channel 1" and "Channel 2" ... 108
Sensor Param. - Path Length
Transducer Blocks "Channel 1" and "Channel 2" ... 112
Sensor Param. - Position Sensor
Transducer Blocks "Channel 1" and "Channel 2" ... 110
Sensor Param. - Sensor Configuration
Transducer Blocks "Channel 1" and "Channel 2" ... 110
Sensor Param. - Sensor Distance
Transducer Blocks "Channel 1" and "Channel 2" ... 111
Sensor Param. - Sensor Type
Transducer Blocks "Channel 1" and "Channel 2" ... 109
Sensor Param. - Unit ARC Length
Transducer Blocks "Channel 1" and "Channel 2" ... 112
Sensor Param. - Unit Path Length
Transducer Blocks "Channel 1" and "Channel 2" ... 112
Sensor Param. - Unit Sensor Distance
Transducer Blocks "Channel 1" and "Channel 2" ... 111
Sensor Param. - Unit Wire Length
Transducer Blocks "Channel 1" and "Channel 2" ... 111
Sensor Param. - Wire Length
Transducer Blocks "Channel 1" and "Channel 2" ... 111
Sensor, installation direction ... 98
Serial number sensor ... 90
Signal processing
AI function block ... 138
DO function block ... 145
Transducer Block ... 92
Simulation
AI function block ... 142
Error ... 116
Measured variable ... 114
Resource Block ... 89
Value measured variable ... 114
Simulation - Measurand
Transducer Blocks "Channel 1" and "Channel 2" ... 114
Simulation - Unit
Transducer Blocks "Channel 1" and "Channel 2" ... 114
Simulation - Value Measurand
Transducer Blocks "Channel 1" and "Channel 2" ... 114
System - Alarm Delay
"Diagnosis" Transducer Block ... 116
System - Operation Time
"Diagnosis" Transducer Block ... 117
System - Reset
"Diagnosis" Transducer Block ... 116
System - Simulation Failsafe Mode
"Diagnosis" Transducer Block ... 116
System - Troubleshooting
"Diagnosis" Transducer Block ... 117
System condition
Actual ... 115
Previous ... 115
System Param. - Adjust Zeropoint
Transducer Blocks "Channel 1" and "Channel 2" ... 99
System Param. - Flow Damping
Transducer Blocks "Channel 1" and "Channel 2" ... 99
System Param. - Installation Direction Sensor
Transducer Blocks "Channel 1" and "Channel 2" ... 98
System Param. -Positive Zero Return
Transducer Blocks "Channel 1" and "Channel 2" ... 99
System Unit - Flow Velocity
Transducer Blocks "Channel 1" and "Channel 2" ... 98
System Unit - Length
Transducer Blocks "Channel 1" and "Channel 2" ... 98
System Unit - Sound Velocity
Transducer Blocks "Channel 1" and "Channel 2" ... 97
System Unit - Viscosity
Transducer Blocks "Channel 1" and "Channel 2" ... 98
System Unit Temperature
Transducer Blocks "Channel 1" and "Channel 2" ... 98
System Unit Volume Flow
Transducer Blocks "Channel 1" and "Channel 2" ... 97
System Value - Flow Velocity
Transducer Blocks "Channel 1" and "Channel 2" ... 98
System Value - Signal Strength
Transducer Blocks "Channel 1" and "Channel 2" ... 98
System Value - Sound Velocity
Transducer Blocks "Channel 1" and "Channel 2" ... 97

System Value Volume Flow
Transducer Blocks "Channel 1" and "Channel 2" 96

T

T-DAT
Amplifier software revision number 90
Loading/saving data 117
Save/load (data back-up, e.g. for replacing devices) ... 21
T-DAT - Save/Load
"Diagnosis" Transducer Block 117
Test display 121
Tot. 1 to 3 - Assign
"Totalizer" Transducer Block 135
Tot. 1 to 3 - Mode
"Totalizer" Transducer Block 135
Tot. 1 to 3 - Sum
"Totalizer" Transducer Block 134, 135
Totalizer 1 to 3
Assign 135
Display value 134
Mode 135
Reset 135
Unit 134
Totalizer Handling
Reset All 136
Totalizer Handling - Failsafe All
"Totalizer" Transducer Block 136
Transducer
Block 91
Transducer Block
"Diagnosis" Transducer Block 115
Transducer Blocks 91
Alarm detection, processing 95
Diagnostics (error messages) 95
E+H parameters 96
FOUNDATION Fieldbus parameters 96
Transducer Blocks "Channel 1" and "Channel 2" 96
Troubleshooting (EEPROM) 117
Type of linearization
AI function block 140

U

Un-/Locking - Access Code
"Diagnosis" Transducer Block 115
"Display" Transducer Block 118
"Totalizer" Transducer Block 133
Un-/Locking - Access Status
"Diagnosis" Transducer Block 115
"Display" Transducer Block 118
"Totalizer" Transducer Block 133
Un-/Locking - Define Private Code
"Display" Transducer Block 119
Unit (display)
Arc length 112
Deviation arc length 113
Deviation path length 113
Deviation sensor distance 113
Liner material thickness 106
Max. sound velocity (liquid) 108
Min. sound velocity (liquid) 107
Nominal diameter 102
Path length 112
Pipe circumference 104
Pipe diameter 104
Reference value 103
Sensor distance 111
Simulation measurand 114
Sound velocity (liquid) 107
Sound velocity (pipe) 104
Temperature (liquid) 107
Wall thickness (pipe) 105
Wire length 111
Unit (selection)
Flow velocity 98
Length 98
Sound velocity 97
Temperature 98
Totalizer 1 to 3 134
Viscosity 98
Units
AI function block 141

W

Wire length 111
Write protection and simulation 89

Z

Zero point 112
Zero point adjustment 99

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