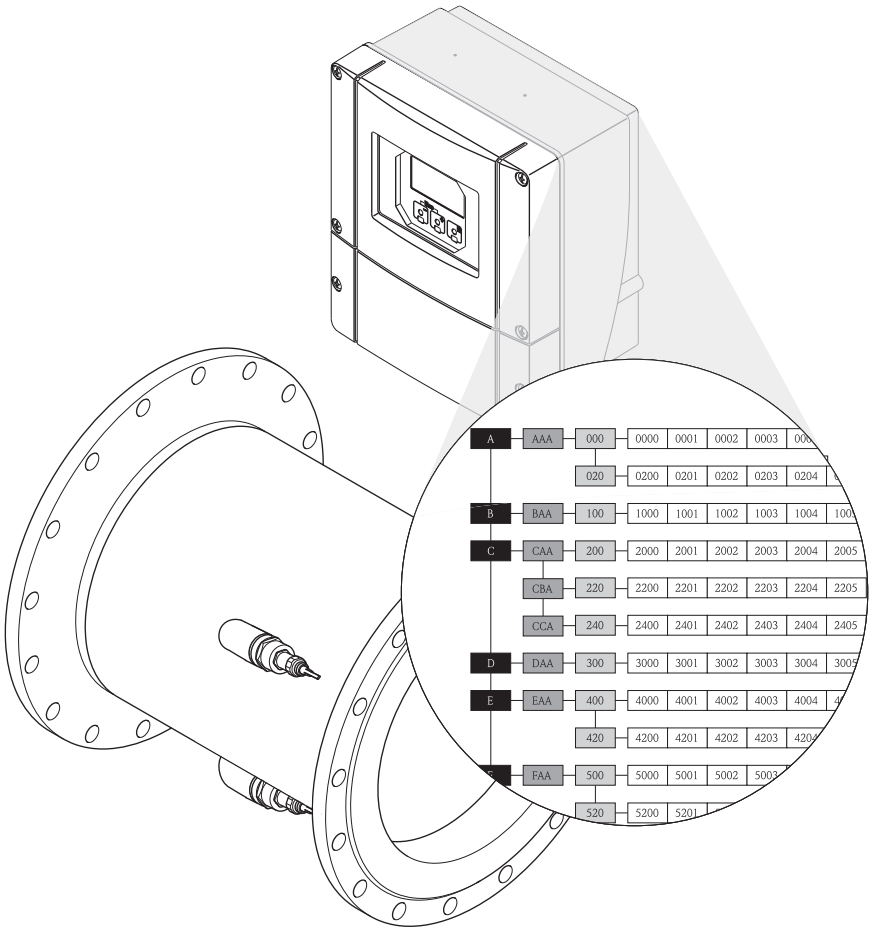
Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Description of Device Functions

Proline Prosonic Flow 93C FOUNDATION Fieldbus

Ultrasonic flow measuring system

Fieldbus™ Foundation



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Valid as of version:
V 3.00.XX

Endress+Hauser

People for Process Automation

Operation of Proline Prosonic Flow 93C FOUNDATION Fieldbus

Content for Local operation

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

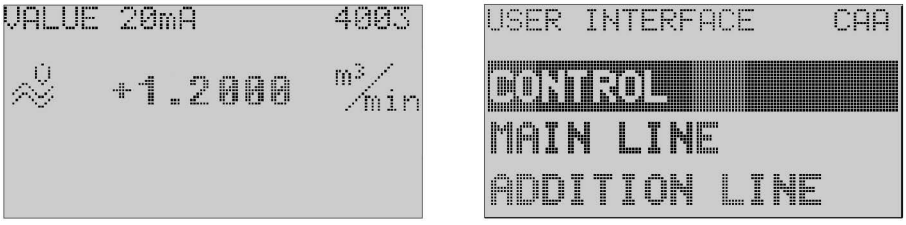
This step-by-step, top-down approach starts with the blocks, the highest level, and works down through the matrix to the description of the function you need:

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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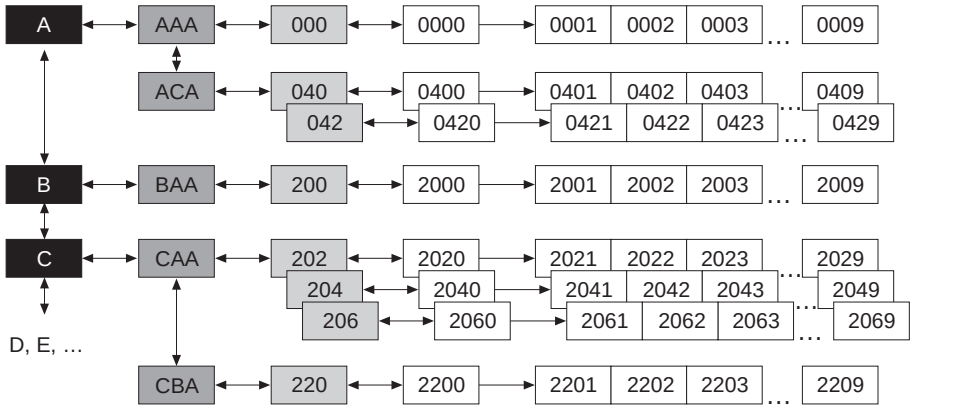
The function matrix index lists the codes for all the available "cells" in alphabetic and consecutive order, complete with the page references for the corresponding functions.
The index to the function matrix is on Page 6.

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

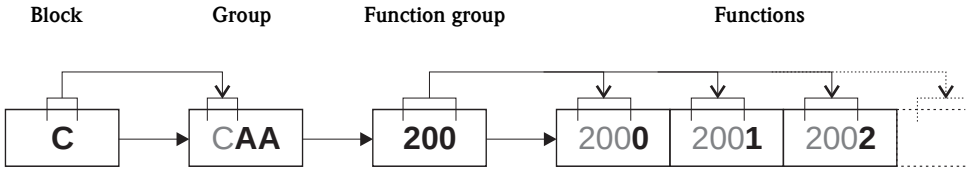
Each cell (block, group, function group and function) in the function matrix has an individual, unique code.

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

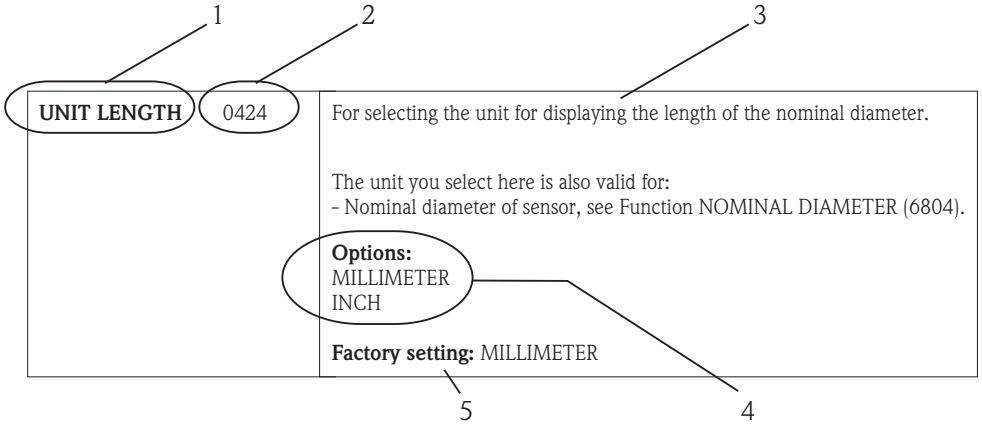


Fig. 1: Example for the description of a function

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.

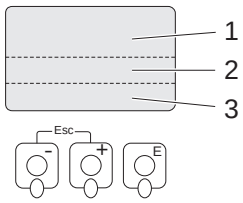


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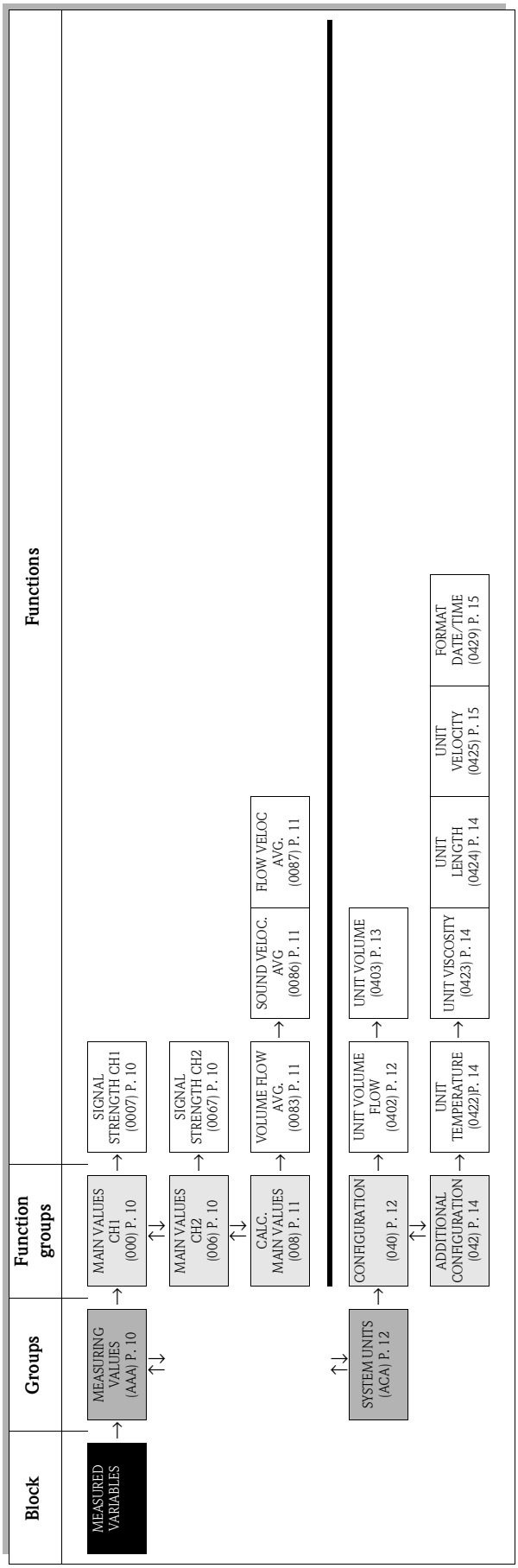
Fig. 2: Local display
1 Main line
2 Additional line
3 Information line

The values are assigned to the individual lines in the USER INTERFACE block, → Page 19.

2.4 Function matrix of the Prosonic Flow 93C FOUNDATION Fieldbus

BLOCKS		GROUPS			FUNCTION GROUPS
MEASURED VARIABLES (→ Page 9)	**A**	MEASURING VALUES	AAA	→	Page 10
		SYSTEM UNITS	ACA	→	Page 12
QUICK-SETUP (→ Page 16)	**B**	Commissioning and application setups		→	Page 16
USER INTERFACE (→ Page 19)	**C**	CONTROL	CAA	→	Page 20
		MAIN LINE	CCA	→	Page 24
		ADDITION LINE	CEA	→	Page 27
		INFORMATION LINE	CGA	→	Page 31
TOTALIZER (→ Page 35)	**D**	TOTALIZER 1	DAA	→	Page 36
		TOTALIZER 2	DAB	→	Page 36
		TOTALIZER 3	DAC	→	Page 36
		HANDLING TOTALIZER	DJA	→	Page 39
BASIC FUNCTION (→ Page 40)	**G**	FOUNDATION FIELDBUS	GGA	→	Page 41
		PROCESS PARAMETER (CH1 to CH2)	GIA, GIB	→	Page 44
		SYSTEM PARAMETER (CH1 to CH2)	GLA, GLB	→	Page 50
		SENSOR DATA (CH1 to CH2)	GNA, GNB	→	Page 52
SUPERVISION (→ Page 58)	**J**	SYSTEM	JAA	→	Page 59
		SYSTEM CH2	JAB	→	Page 59
		VERSION INFO	JCA	→	Page 63

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	
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	
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.

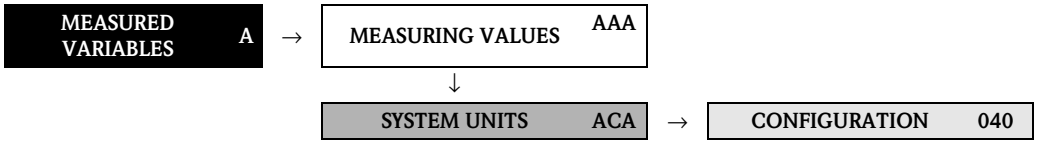
3.1.3 Function group CALCULATED MAIN VALUES

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 AVERAGE (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.)
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

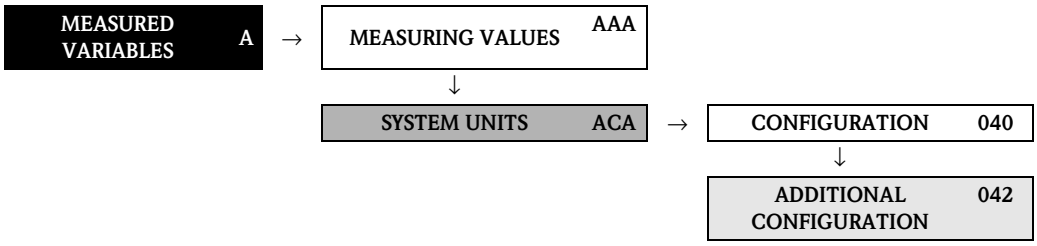
3.2.1 Function group CONFIGURATION



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^3 or US gal...US Mgal) → Page 65 ff. ✎ Note! ■ The unit of the totalizers is independent of your choice here. The unit for each totalizer is selected separately for the totalizer in question. ■ 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 47). **Options:** °C (Celsius) K (Kelvin) °F (Fahrenheit) R (Rankine) **Factory setting:** Depends on country (°C or °F) → Page 65 ff.
UNIT VISCOSITY (0423)	Use this function to select the unit for fluid viscosity. ✎ Note! The viscosity is entered in the function (→ Page 48). **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 **Options:** MILLIMETER INCH **Factory setting:** Depends on country (MILLIMETER or INCH)

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

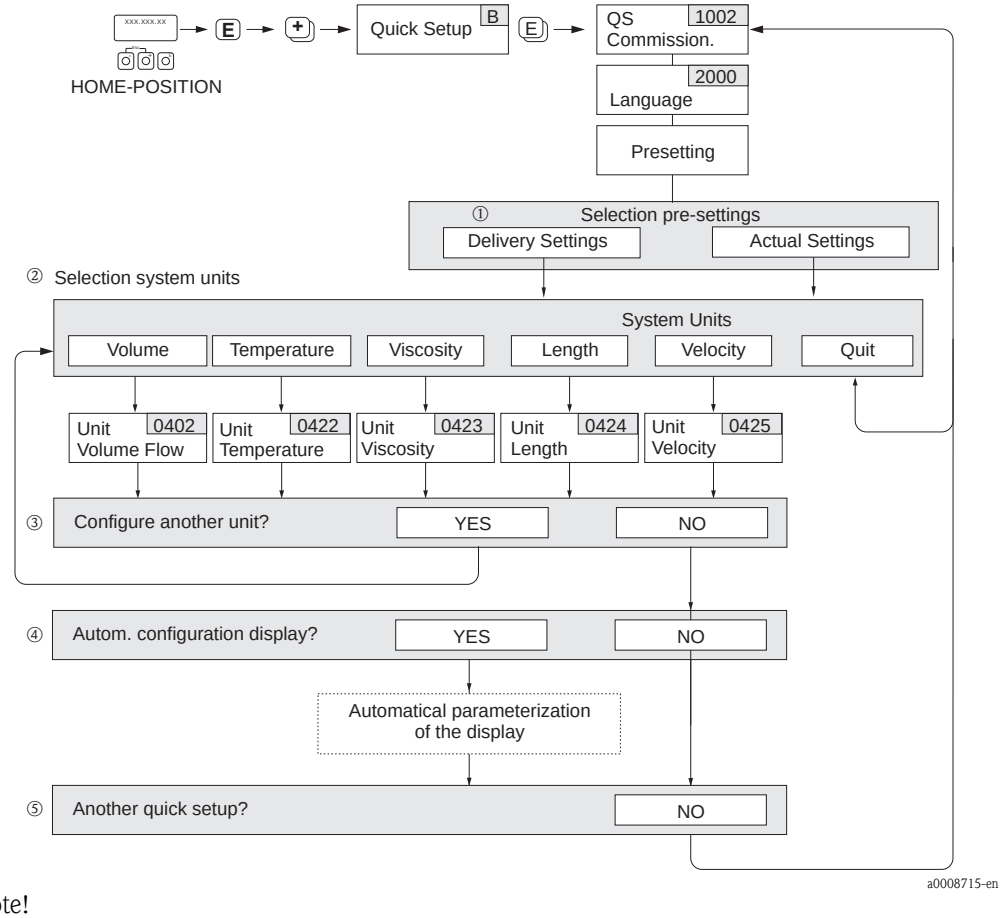
Block	Group	Function groups	Functions		
QUICK-SETUP (B)	→	→	QS-COMMISSION. (1002) P. 16	→	T-DAT SAVE/LOAD (1009) P. 16

Functional description QUICK-SETUP	
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 "COMMISSIONING" Quick Setup menu on Page 17. Please refer to the Operating Instructions for Prosonic Flow 93C FOUNDATION Fieldbus, BA00154D, 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 "Commissioning"



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.

4.1.2 Data backup/transmission

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

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

Note!
For information on installing and removing the T-DAT, see Operating Instructions for Prosonic Flow 93C FOUNDATION Fieldbus, BA00145D.

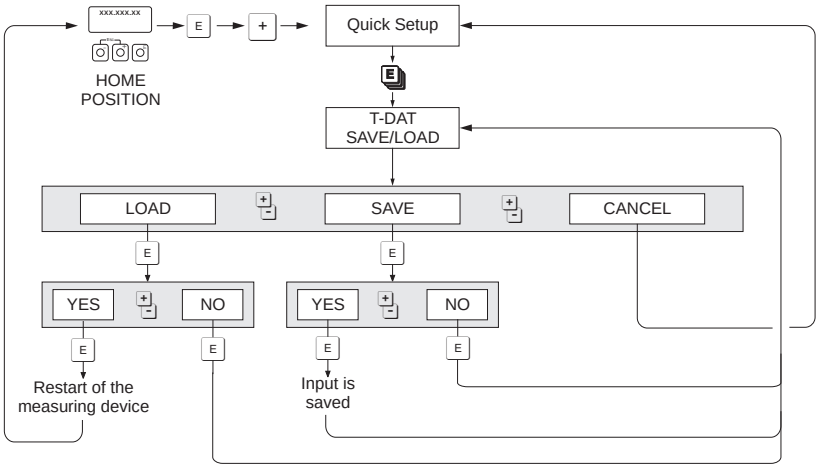


Fig. 3: Data backup/transmission with T-DAT SAVE/LOAD function

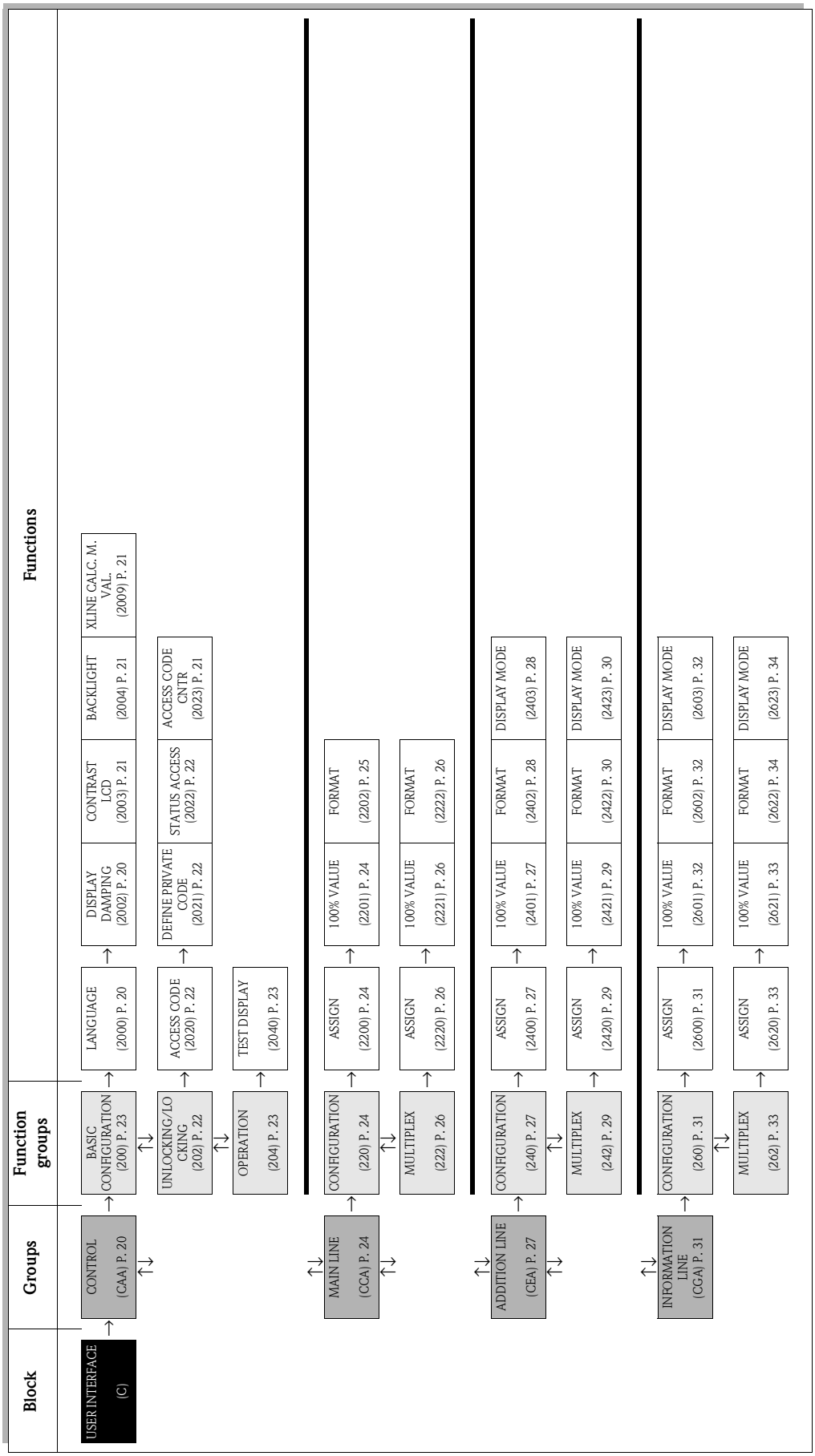
Information on the LOAD and SAVE options available:

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 65 ✎ 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.

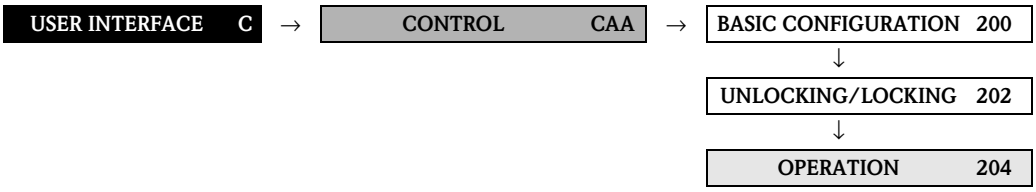
Functional description USER INTERFACE → CONTROL → BASIC CONFIGURATION	
CONTRAST LCD **(2003)**	Use this function to optimize display contrast to suit local operating conditions. **User input:** 10…100% **Factory setting:** 50%
BACKLIGHT **(2004)**	Use this function to optimize the backlight to suit local operating conditions. **User input:** 10…100% **Factory setting:** 50%
X-LINE CALCULATED MAIN VALUES **(2009)**	This function defines 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. **Options:** (CH1 + CH2)/2 **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 enabled) 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)

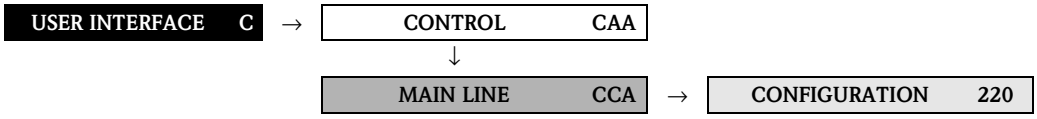
5.1.3 Function group OPERATION

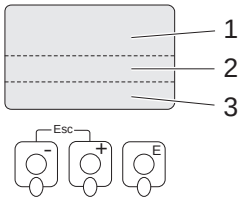


Functional description USER INTERFACE → CONTROL → OPERATION	
TEST DISPLAY (2040)	Use this function to test the operability of the local display and its pixels. **Options:** OFF ON **Factory setting:** OFF Test sequence: 1. Start the test by selecting ON. 2. All pixels of the main line, additional line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

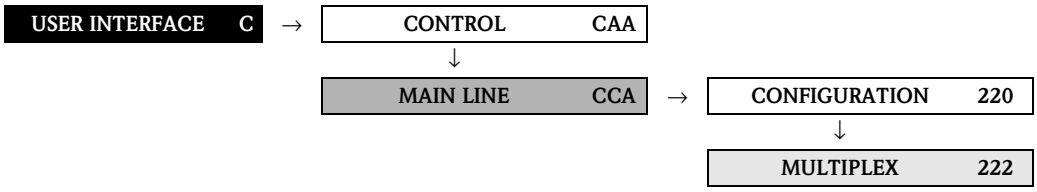
5.2.1 Function group CONFIGURATION



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 CALCULATED VOLUME FLOW CALCULATED VOLUME FLOW IN % SOUND VELOCITY AVERAGE SIGNAL STRENGTH (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:** CALCULATED VOLUME FLOW
100% VALUE **(2201)**	✎ Note! This function is not available unless the CALCULATED VOLUME FLOW IN % setting was 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 nominal diameter and country [700 to 27800 m^3/hr or 3100 to 44500 imp.gal/min. or 81 to 176 imp.Mgal/day] → Page 65.

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.

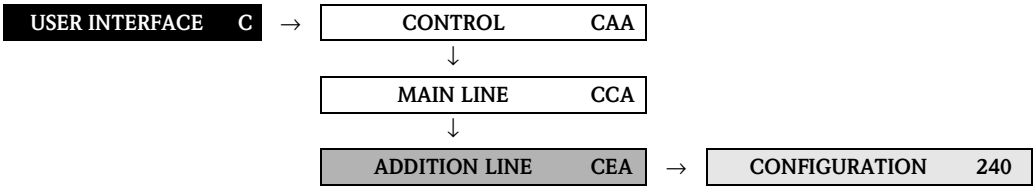
5.2.2 Function group MULTIPLEX

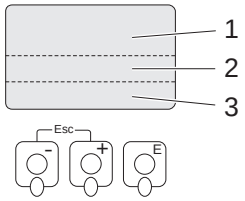


Functional description USER INTERFACE → MAIN LINE → MULTIPLEX	
ASSIGN (2220)	Use this function to define a second reading to be displayed in the main line alternatively (every 10 seconds) with the reading defined in the ASSIGN function (2200). **Options:** OFF CALCULATED VOLUME FLOW CALCULATED VOLUME FLOW IN % SOUND VELOCITY AVERAGE SIGNAL STRENGTH (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 not available unless the CALCULATED VOLUME FLOW IN % setting was 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 nominal diameter and country [700 to 27800 m^3/hr or 3100 to 44500 imp.gal/min. or 81 to 176 imp.Mgal/day] → Page 65.
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

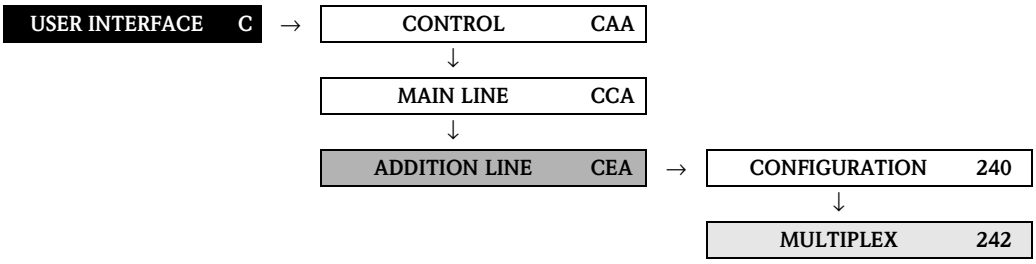
5.3.1 Function group CONFIGURATION



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 CALCULATED VOLUME FLOW CALCULATED VOLUME FLOW IN % SOUND VELOCITY AVERAGE SIGNAL STRENGTH (CH1 to CH2) FLOW VELOCITY AVERAGE 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).
100% VALUE **(2401)**	✎ Note! This function is not available unless one of the following was selected in the ASSIGN function (2400): ▪ 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 nominal diameter and country [700 to 27800 m^3/hr or 3100 to 44500 imp.gal/min. or 81 to 176 imp.Mgal/day] → Page 65.

Functional description DISPLAY→ ADDITIONAL LINE→ CONFIGURATION	
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 not available unless the CALCULATED VOLUME FLOW BARGRAPH IN % or SIGNAL STRENGTH BAR GRAPH setting 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

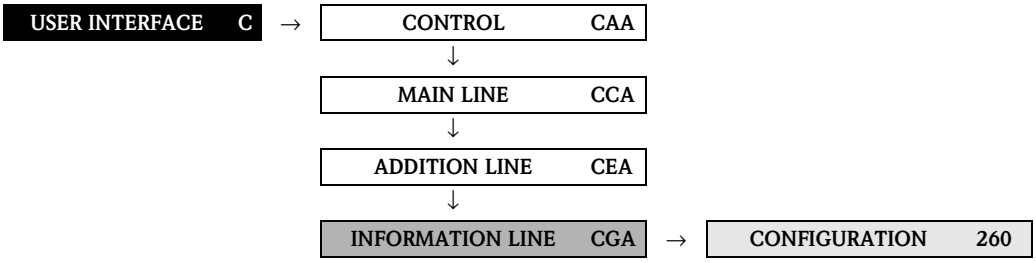


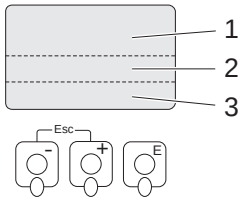
Functional description USER INTERFACE → ADDITION LINE → MULTIPLEX	
ASSIGN **(2420)**	Use this function to define a second reading to be displayed in the additional line alternatively (every 10 seconds) with the reading defined in the ASSIGN function (2400). **Options:** OFF CALCULATED VOLUME FLOW CALCULATED VOLUME FLOW IN % SOUND VELOCITY AVERAGE SIGNAL STRENGTH (CH1 to CH2) FLOW VELOCITY AVERAGE CALCULATED VOLUME FLOW BARGRAPH % SIGNAL STRENGTH BARGRAPH % (CH1 to CH2) TOTALIZER (1 to 3) 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): ■ 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 nominal diameter and country [700 to 27800 m^3/hr or 3100 to 44500 imp.gal/min. or 81 to 176 imp.Mgal/day] → Page 65.

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 not available unless the CALCULATED VOLUME FLOW BARGRAPH IN % or SIGNAL STRENGTH BAR GRAPH setting 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

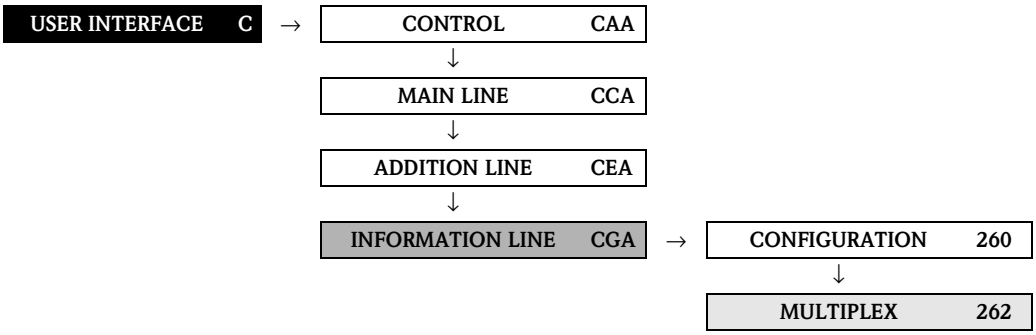
5.4.1 Function group CONFIGURATION



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 CALCULATED VOLUME FLOW CALCULATED VOLUME FLOW IN % SOUND VELOCITY AVERAGE SIGNAL STRENGTH (CH1 to CH2) FLOW VELOCITY AVERAGE CALCULATED VOLUME FLOW BARGRAPH % SIGNAL STRENGTH BARGRAPH % (CH1 to CH2) TOTALIZER (1 to 3) OPERATING/SYSTEM CONDITIONS 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): ■ 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 nominal diameter and country [700 to 27800 m^3/hr or 3100 to 44500 imp.gal/min. or 81 to 176 imp.Mgal/day] → Page 65.
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 not available unless the CALCULATED VOLUME FLOW BARGRAPH IN % or SIGNAL STRENGTH BAR GRAPH setting 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

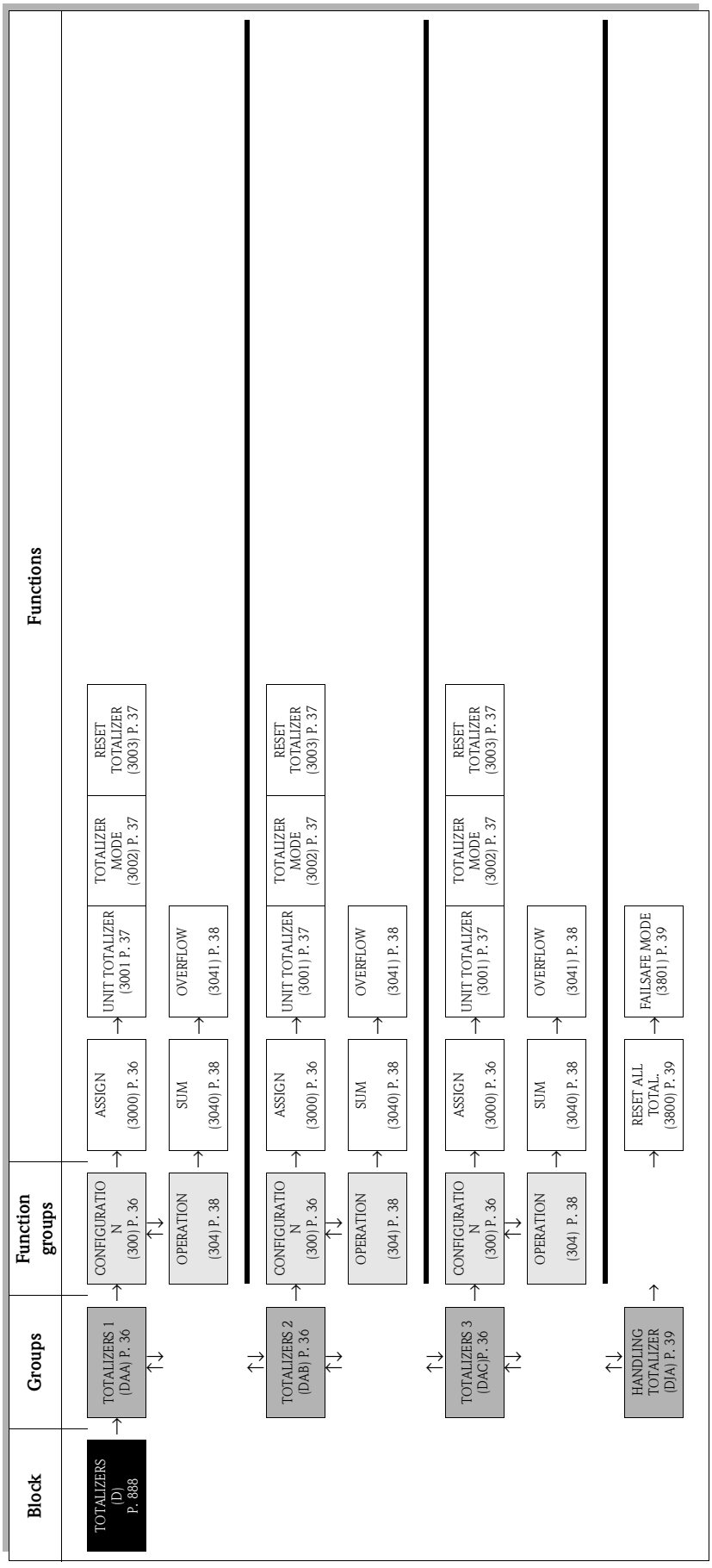
5.4.2 Function group MULTIPLEX



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 CALCULATED VOLUME FLOW CALCULATED VOLUME FLOW IN % SOUND VELOCITY AVERAGE FLOW VELOCITY AVERAGE 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).
100% VALUE **(2621)**	✎ Note! This function is not available unless one of the following was selected in the ASSIGN function (2400): ■ 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 nominal diameter and country [700 to 27800 m^3/hr or 3100 to 44500 imp.gal/min. or 81 to 176 imp.Mgal/day] → Page 65.

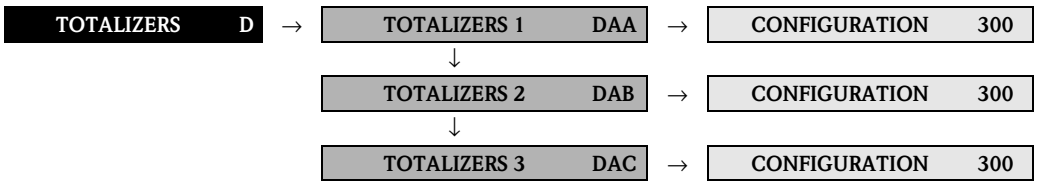
Functional description USER INTERFACE → INFORMATION LINE → MULTIPLEX	
FORMAT **(2622)**	✎ Note! This function is not available unless a number was selected in the ASSIGN function (2600). Use this function to define the maximum number of places after the decimal point for the second value displayed in the information line. **Options:** XXXXX. – XXXX.X – XXX.XX – XX.XXX – X.XXXX **Factory setting:** X.XXXX ✎ Note! ▪ Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. ▪ The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In 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 not available unless the CALCULATED VOLUME FLOW BARGRAPH IN % or SIGNAL STRENGTH BAR GRAPH setting 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)

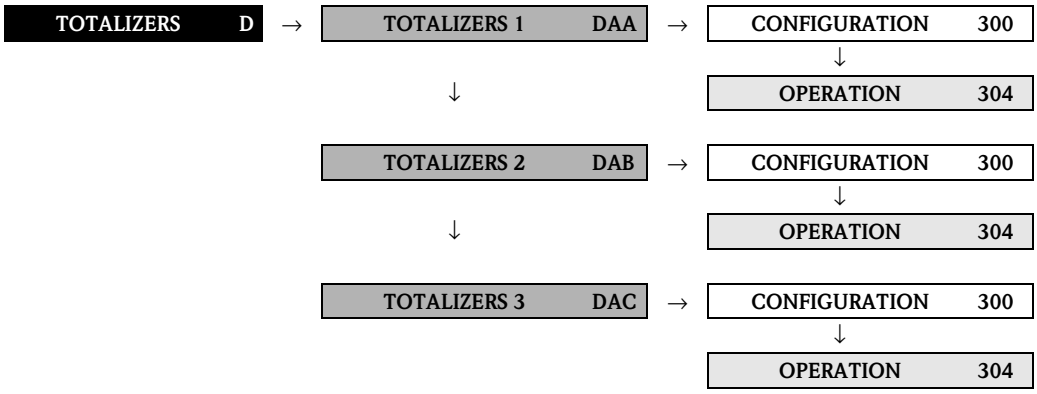
6.1.1 Function group CONFIGURATION



Functional description TOTALIZERS → TOTALIZERS (1 to 3) → CONFIGURATION	
The function descriptions below apply to totalizers 1 to 3; the totalizers are independently configurable.	
ASSIGN (3000)	Use this function to assign a measured variable to the totalizer. **Options (standard):** OFF VOLUME FLOW AVERAGE **Factory setting:** VOLUME FLOW AVERAGE ✎ 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).

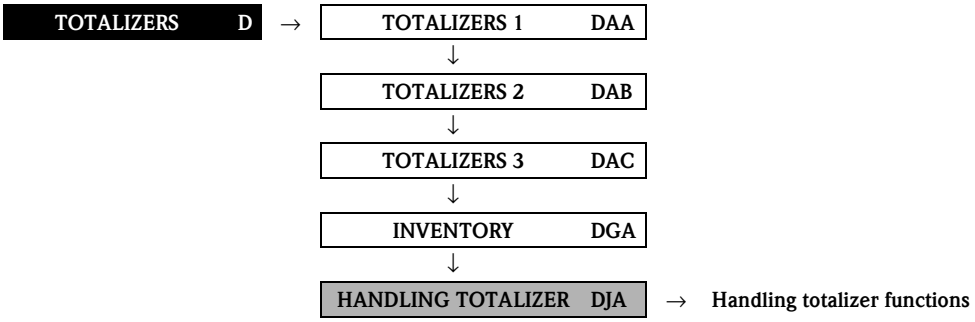
Functional description TOTALIZERS → TOTALIZERS (1 to 3) → CONFIGURATION	
UNIT TOTALIZER (3001)	Use this function to define the unit for the totalizer's measured variable, as selected beforehand. **Options:** *Metric:* Cubic centimeter →cm^3 Cubic decimeter → dm^3 Cubic meter → m^3 Milliliter →ml Liter → 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 nominal diameter and country (m^3 or imp.gal...imp.Mgal) → Page 65 ff. ✎ 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
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



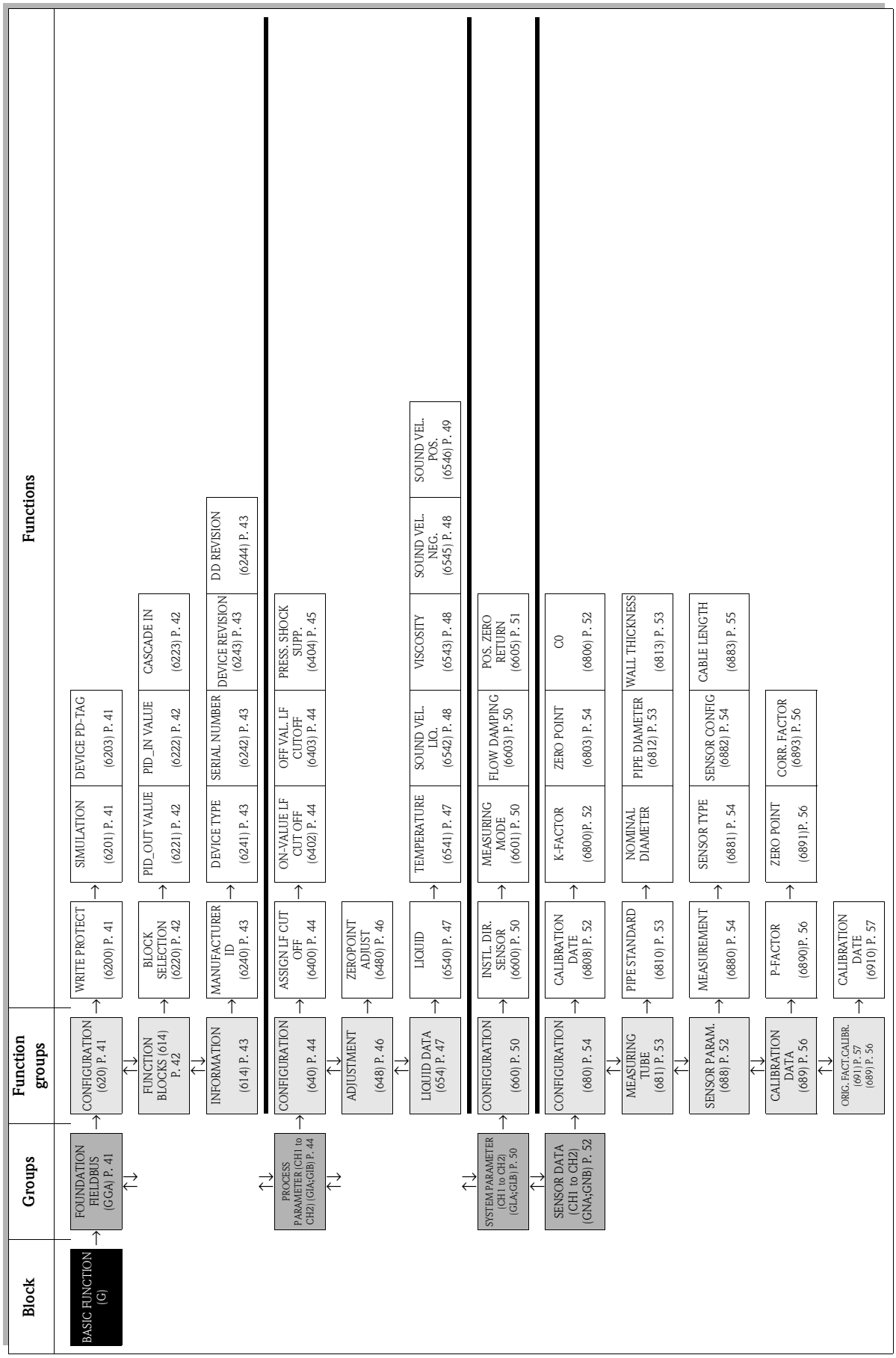
Functional description TOTALIZERS → TOTALIZERS (1 to 3) → OPERATION	
The function descriptions below apply to totalizers 1 to 3; the totalizers are independently configurable.	
SUM **(3040)**	Use this function to view the total for the totalizer's measured variable aggregated since measuring commenced. The value can be positive or negative, depending on the setting selected in the function TOTALIZER MODE (3002) and the flow direction. **Display:** Max. 7-digit floating-point number, including unit and sign (e.g. 15467.04 m^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 for Prosonic Flow 93C FOUNDATION Fieldbus, BA00145D).
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 for Prosonic Flow 93C FOUNDATION Fieldbus, BA00145D). ■ 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

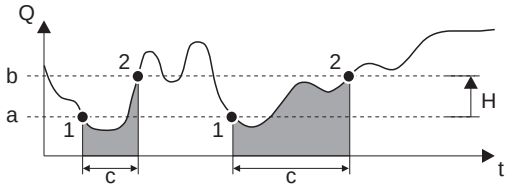
BASIC FUNCTION G → FOUNDATION FIELDBUS GGA → CONFIGURATION 620
↓
FUNCTION BLOCKS 622
↓
INFORMATION 624

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

BASIC FUNCTION G → FOUNDATION FIELDBUS GGA
↓
PROCESS PARA. (CH1 to CH2) GIA → CONFIGURATION 640

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 12.
OFF-VALUE LOW FLOW CUT OFF (6403)	Use this function to enter the switch-off point (**b**) for low flow cut off. Enter the switch-off point as a positive hysteresis (**H**) from the switch-on point (**a**). **User input:** Integer 0 to 100% **Factory setting:** 50% 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 44).

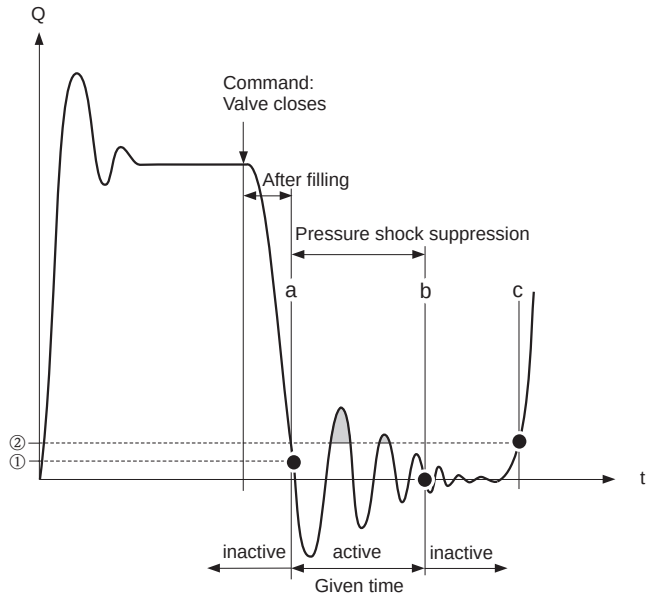
Use this function to define the time span for active pressure shock suppression.

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).

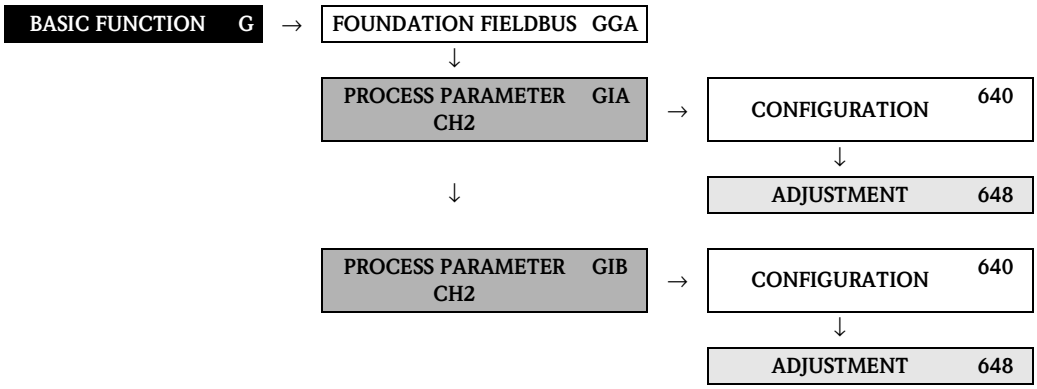


① = off-value (low flow cut off), ② = on-value (low flow cut off)
a Activated when the on-value for low flow cut off is undershot
b Deactivated once the time specified passes
c Flow values are taken into account again for calculating the pulses
Suppressed values
Q Flow

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

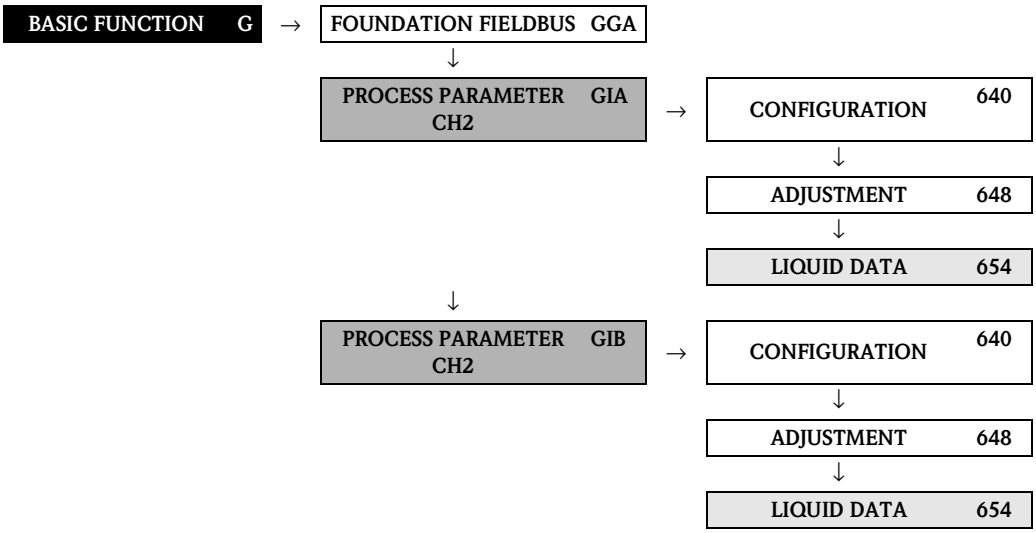
Factory setting:
0.00 s

7.2.2 Function group ADJUSTMENT

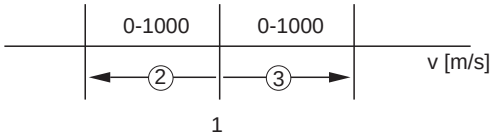


Functional description BASIC FUNCTION → PROCESS PARAMETER (CH1 to CH2) → ADJUSTMENT	
ZERO POINT (6480)	This function enables a zero point adjustment to be automatically carried out. The new zero point determined by the measuring system is adopted by the ZERO POINT function (→ Page 56). **User input:** CANCEL START **Factory setting:** CANCEL Caution! Before carrying out an adjustment, please refer to the Operating Instructions for Prosonic Flow 93C FOUNDATION Fieldbus, BA00145D, 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 LIQUID DATA



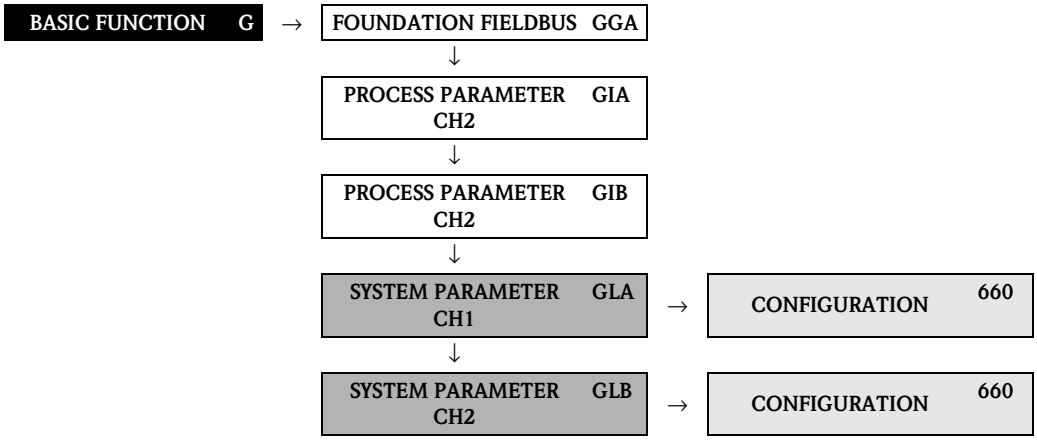
Functional description BASIC FUNCTION → PROCESS PARAMETER (CH1 to CH2) → LIQUID DATA	
LIQUID (6540)	Use this function to select the liquid in the pipe. **Options:** WATER, SEA WATER, DISTILLED WATER, AMMONIA, ALCOHOL, BENZENE, BROMIDE, ETHANOL, GLYCOL, KEROSENE, MILK, METHANOL, TOLUENE, LUBE OIL, DIESEL, 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. **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
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 0 to 1000 m/s **Factory setting:** 500 m/s ✎ Note! See the explanations in the SOUND VELOCITY LIQUID function (6542).

Functional description BASIC FUNCTION → PROCESS PARAMETER (CH1 to CH2) → LIQUID DATA	
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 0 to 1000 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

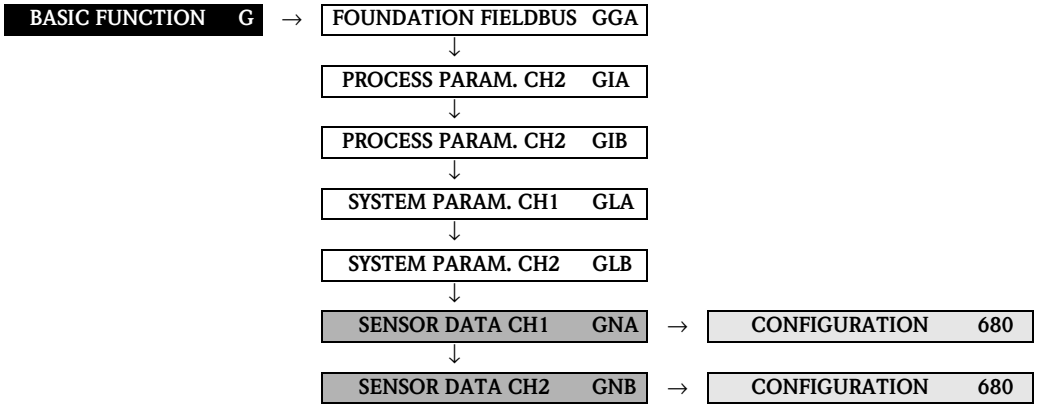


Functional description BASIC FUNCTION→ SYSTEM PARAMETER CH1 → CONFIGURATION	
INSTALLATION DIRECTION SENSOR (6600)	Use this function to reverse the sign of the flow quantity, if necessary. **Options:** NORMAL INVERSE (REVERSE) **Factory setting:** NORMAL
MEASURING MODE (6601)	Use this function to specify 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.

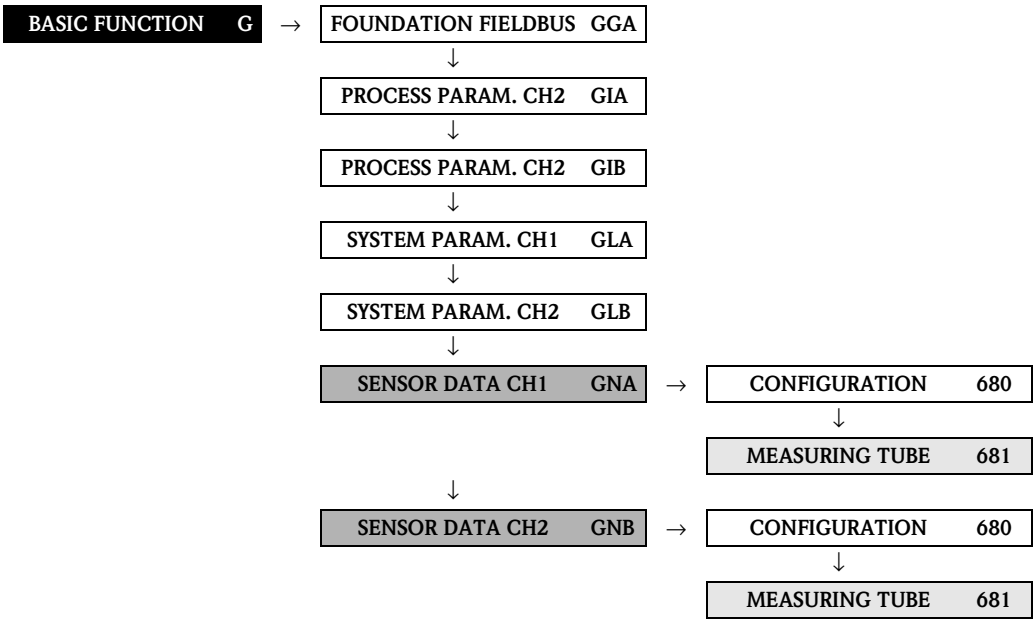
7.4 Group SENSOR DATA (CH1 to CH2)

7.4.1 Function group CONFIGURATION



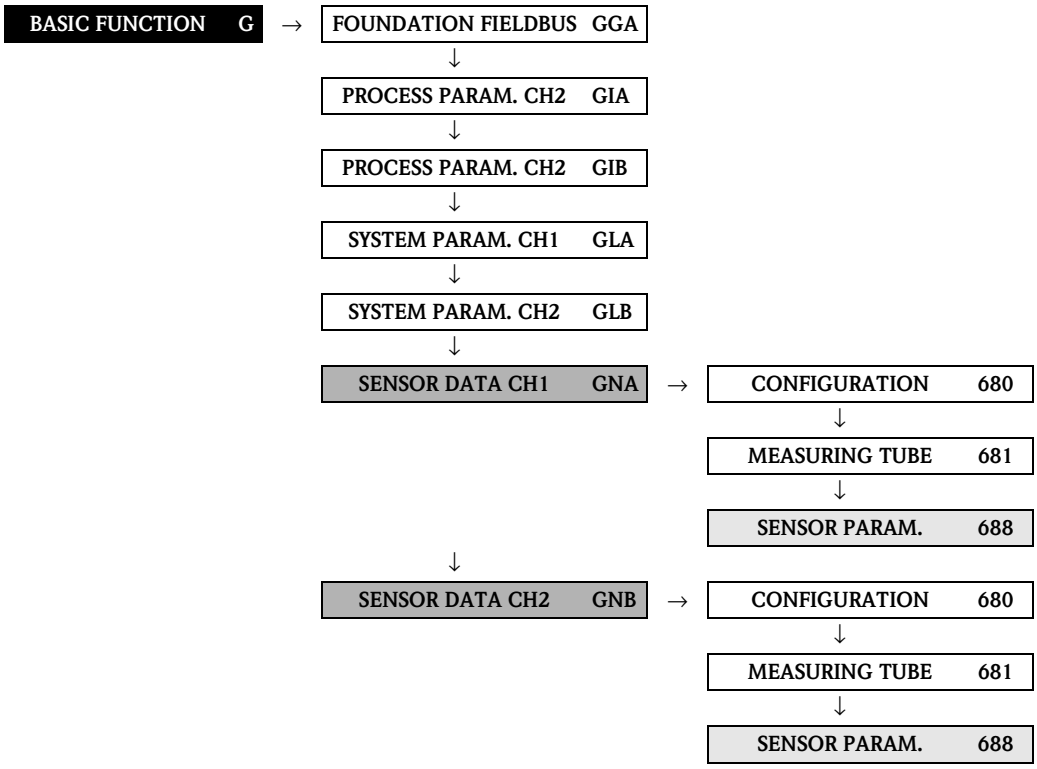
Functional description BASIC FUNCTION → SENSOR DATA (CH1 to CH2) → CONFIGURATION	
✎ Note! The function group is only available for measuring devices in "Clamp on" version..	
CALIBRATION DATE (6808)	Use this function to view the calibration date (last calibration). ✎ Note! ■ If the measuring device is 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
C0 (6806)	Use this function to view the current correction factor of the sound velocity for the measuring tube and the measuring sensors. The correction factor is determined during factory calibration. **Display:** Max. 5-digit number **Factory setting:** 1.0000 (= no correction)

7.4.2 Function group MEASURING TUBE



Functional description BASIC FUNCTION → SENSOR DATA (CH1 to CH2) → MEASURING TUBE	
PIPE STANDARD (6810)	Use this function to view the pipe standard for the measuring pipe. **Factory setting:** Depends on the measuring pipe
NOMINAL DIAMETER (6811)	Use this function to view the nominal diameter of the measuring pipe. **Factory setting:** Depends on the measuring pipe
PIPE DIAMETER (6812)	Use this function to view the pipe outer diameter of the measuring pipe. **Display:** 5-digit floating-point number (incl. unit) **Factory setting:** Depends on the measuring pipe
WALL THICKNESS (6813)	Use this function to view the wall thickness of the measuring pipe. **Display:** 4-digit floating-point number (incl. unit) **Factory setting:** Depends on the measuring pipe

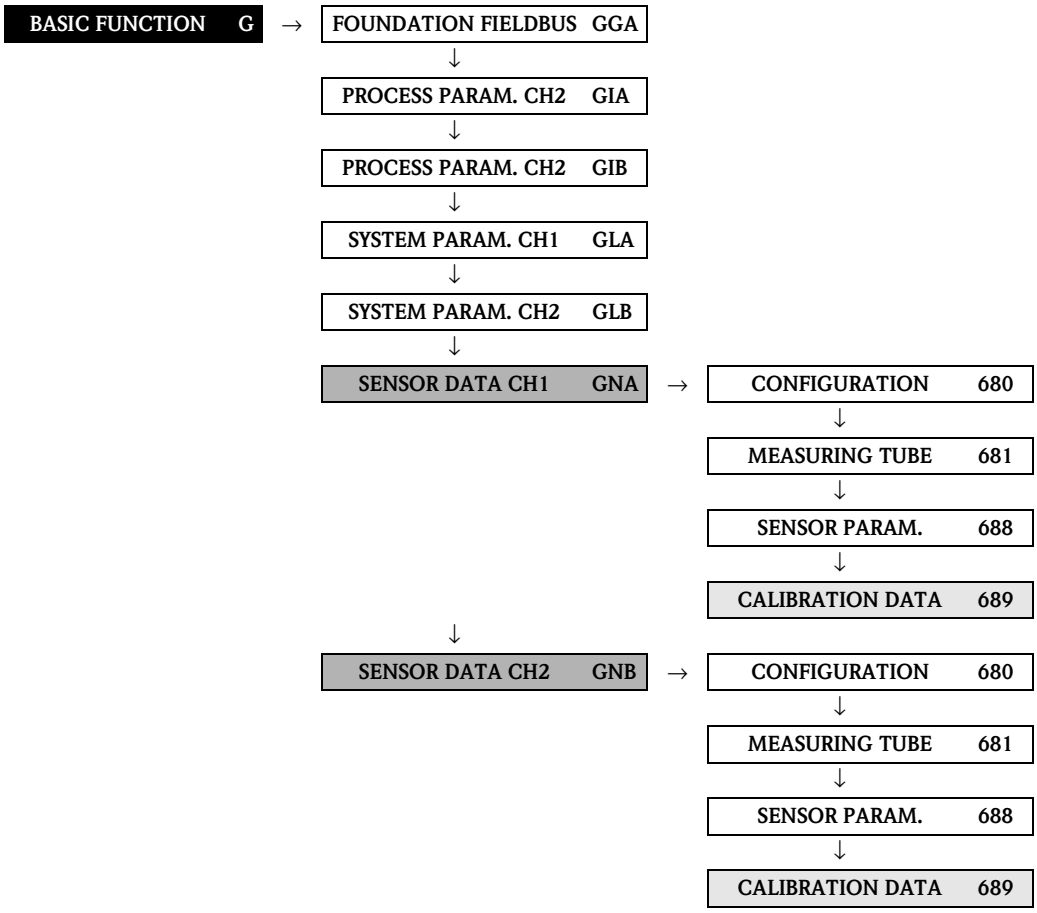
7.4.3 Function group SENSOR PARAMETER



Functional description BASIC FUNCTION → SENSOR DATA (CH1 to CH2) → SENSOR PARAMETER	
MEASUREMENT (6880)	**Options:** INLINE **Factory setting:** INLINE
SENSOR TYPE (6881)	✎ Note! This function is only available if the OFF setting was **not** selected in the MEASUREMENT function. **Options:** W-IN-1F-L-C **Factory setting:** W-IN-1F-L-C
SENSOR CONFIGURATION (6882)	Use this function to select the configuration for the ultrasonic sensors. ✎ Note! Only the DUAL PATH option can be selected for Prosonic Flow 93C. **Options:** DUAL PATH **Factory setting:** DUAL PATH

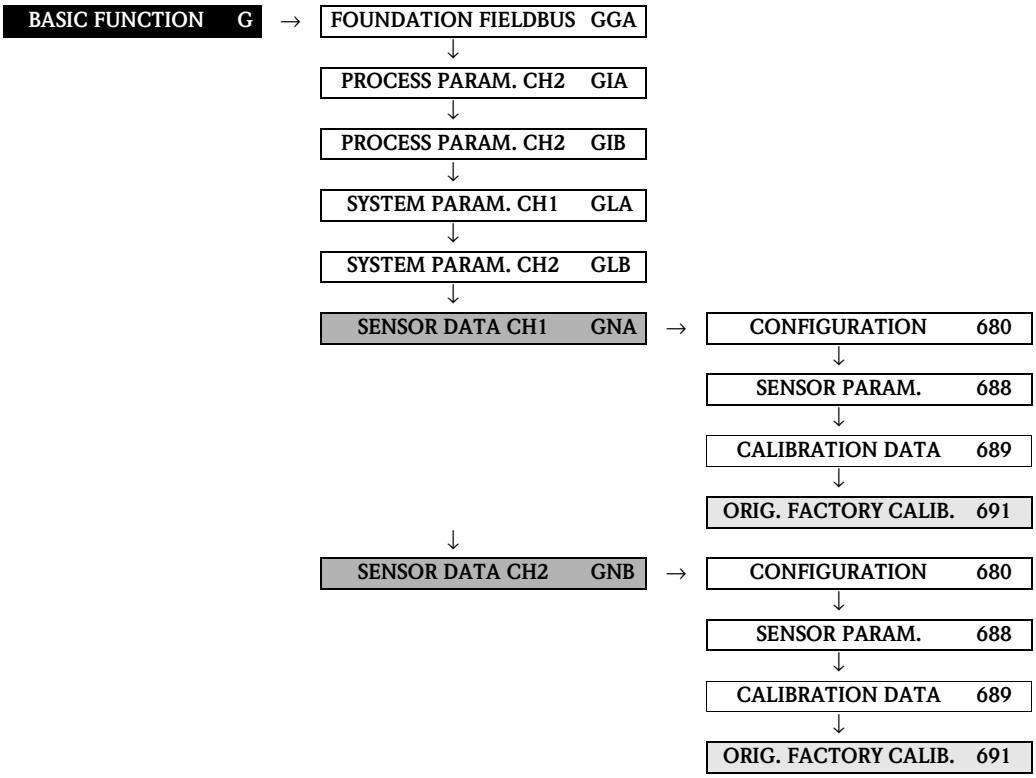
Functional description BASIC FUNCTION → SENSOR DATA (CH1 to CH2) → SENSOR PARAMETER	
CABLE LENGTH (6883)	Use this function to select the length of the sensor cable. **Options:** LENGTH 5m/15 feet LENGTH 10m/30 feet LENGTH 15m/45 feet LENGTH 30m/90 feet **Factory setting:** Depends on the order code

7.4.4 Function group CALIBRATION DATA



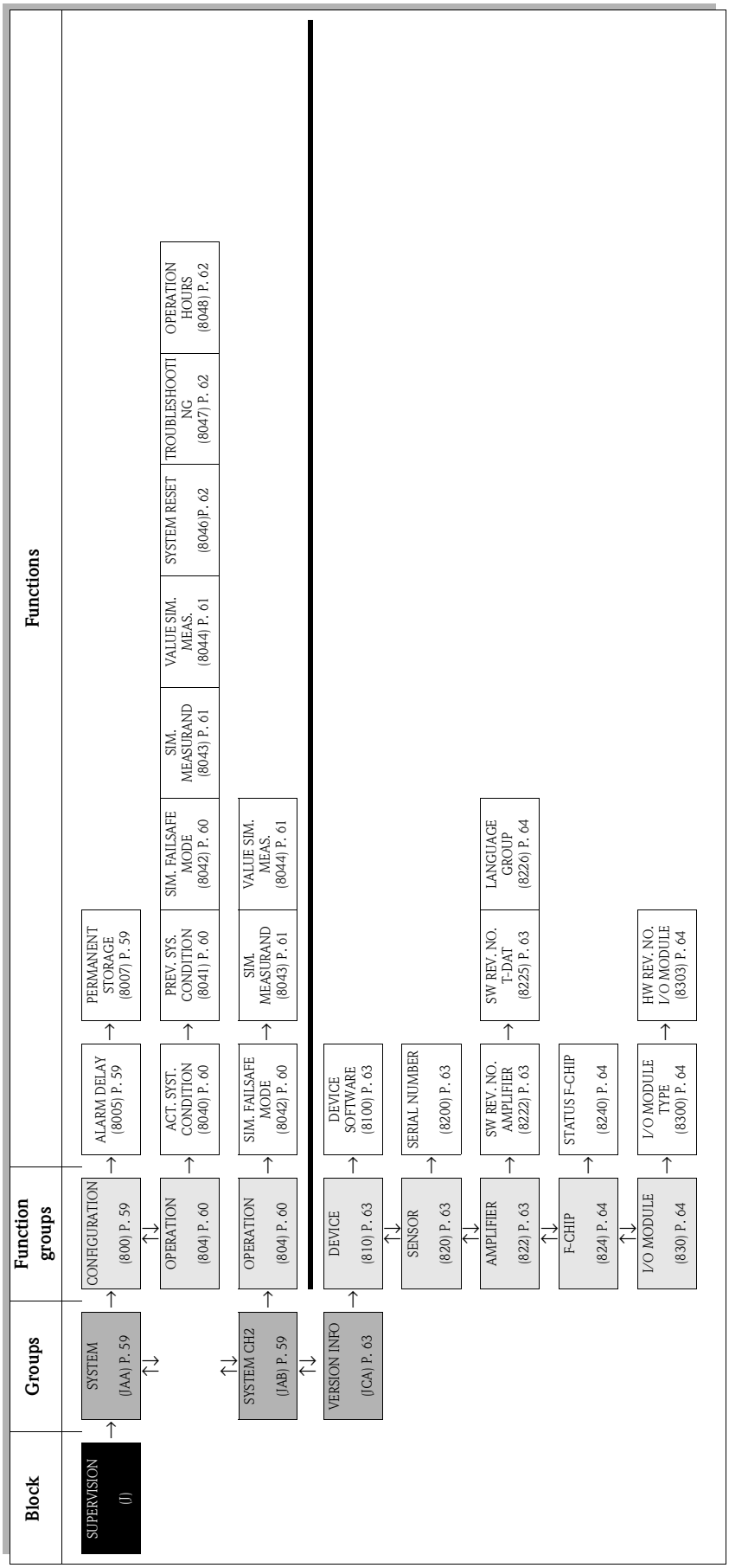
Functional description BASIC FUNCTION → SENSOR DATA (CH1 to CH2) → CALIBRATION DATA	
P-FACTOR (6890)	Use this function to display the P-factor. The P-factor describes the effect of the speed distribution of the flow profile in the pipe and depends on the Reynolds number. The P-factor is in the range from to 0.98 to 1.02.
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)

7.4.5 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



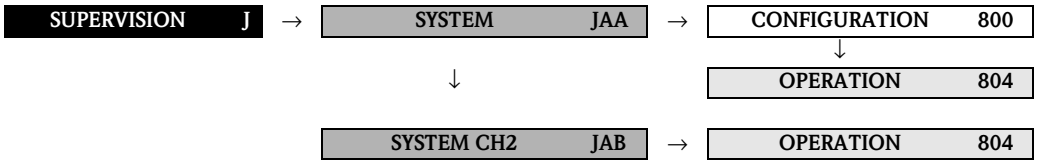
8.1 Group SYSTEM (SYSTEM CH2)

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



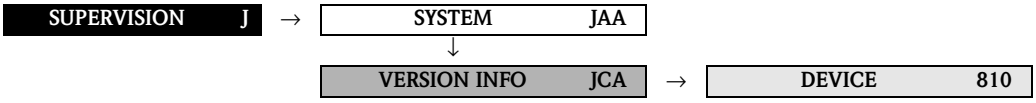
Functional description SUPERVISION→ SYSTEM [CH2] → OPERATION	
ACTUAL SYSTEM CONDITION (8040)	Use this function to check the present system condition. **Display:** SYSTEM OK or the fault/notice message with the highest priority.
PREVIOUS SYSTEM CONDITIONS (8041)	Use this function to view the fifteen most 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 **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) **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 12.

Functional description SUPERVISION→ SYSTEM [CH2] → OPERATION	
SYSTEM RESET (8046)	Use this function to perform a reset of the measuring system. **Options:** NO RESTART SYSTEM (restart without interrupting power supply) MEASURING TUBE DATA (restore the original calibration data) ✎ Note! The T-DAT must be present in order to successfully restore the original calibration data when the MEASURING TUBE DATA option is selected. If it is not, the error message K-CAL T-DAT (# 043) appears on the display. For more information, please refer to the Operating Instructions for Proline Prosonic Flow 93C FOUNDATION Fieldbus, BA00145D. **Factory setting:** NO
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)

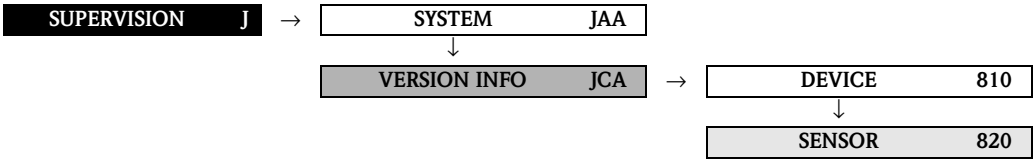
8.2 Group VERSION INFO

8.2.1 Function group DEVICE



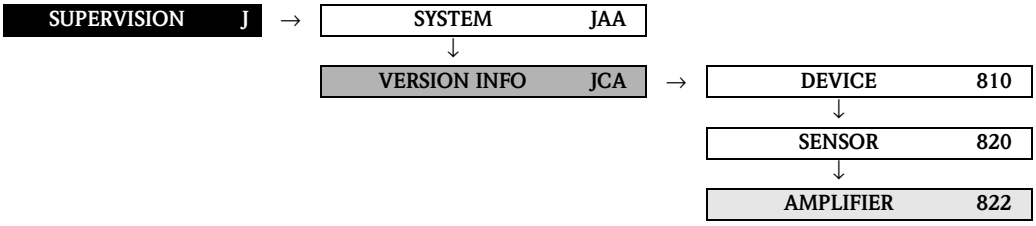
Functional description SUPERVISION → VERSION INFO → DEVICE	
DEVICE SOFTWARE (8100)	Displays the current device software version.

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.

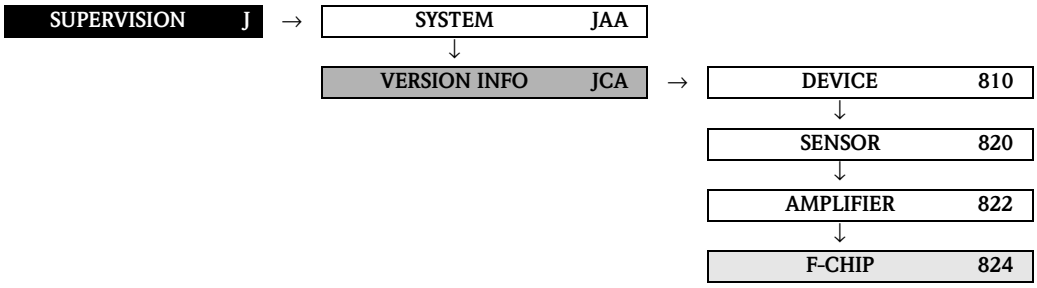
8.2.3 Function group AMPLIFIER



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.

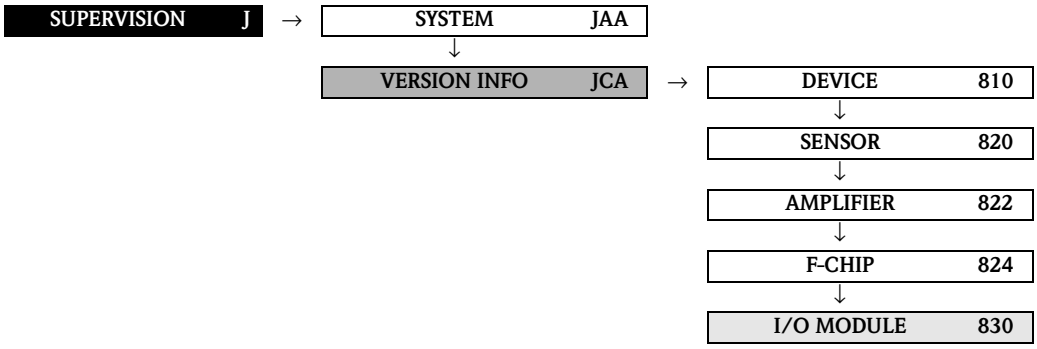
Functional description SUPERVISION → VERSION INFO → AMPLIFIER	
LANGUAGE GROUP (8226)	Use this function to view the language group. The following language groups can be ordered: WEST EU / USA, EAST EU / SCAND., ASIA, CHINESE. **Display:** available language group ✎ Note! ■ The language options of the 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

9.1.1 Low flow cutoff, totalizer

Nominal diameter		Low flow cut off (approx. v = 0.04 m/s)		Totalizer
[mm]	[inch]		Volume	Vol.
300	12"	10	m^3/h	m^3
350	14"	15	m^3/h	m^3
400	16"	20	m^3/h	m^3
450	18"	20	m^3/h	m^3
500	20"	30	m^3/h	m^3
600	24"	40	m^3/h	m^3
700	28"	55	m^3/h	m^3
–	30"	65	m^3/h	m^3
800	32"	75	m^3/h	m^3
900	36"	90	m^3/h	m^3
1000	40"	115	m^3/h	m^3
–	42"	125	m^3/h	m^3
1200	48"	160	m^3/h	m^3
–	54"	205	m^3/h	m^3
1400	–	220	m^3/h	m^3
–	60"	255	m^3/h	m^3
1600	–	285	m^3/h	m^3
–	66"	305	m^3/h	m^3
1800	72"	360	m^3/h	m^3
–	78"	450	m^3/h	m^3
2000	–	450	m^3/h	m^3

9.1.2 Language

Country	Language	Country	Language
Australia	English	Japan	Japanese
Belgium	Francais	Malaysia	English
Canada	English	Norway	Norsk
Denmark	Dansk	Austria	Deutsch
Germany	Deutsch	Sweden	Svenska
England	English	Switzerland	Deutsch
Finland	Suomi	Singapore	English
France	Francais	Spain	Espanol
Netherlands	Nederlands	South Africa	English
Hong Kong	English	Thailand	English
India	English	Hungary	English
Instruments International	English	USA	English
Italy	Italiano		

9.1.3 Length, temperature

	Unit
Length	mm
Temperature	°C

9.2 US units (for USA and Canada only)

9.2.1 Low flow cutoff, totalizer

Nominal diameter		Low flow cut off (approx. v = 0.04 m/s)		Totalizer
[inch]	[mm]		Volume	Vol.
12"	300	45	gal/min	gal
14"	350	65	gal/min	gal
16"	400	90	gal/min	gal
18"	450	90	gal/min	gal
20"	500	130	gal/min	gal
24"	600	175	gal/min	gal
28"	700	240	gal/min	gal
30"	–	275	gal/min	gal
32"	800	325	gal/min	gal
36"	900	400	gal/min	gal
40"	1000	500	gal/min	gal
42"	–	550	gal/min	gal
48"	1200	700	gal/min	gal
54"	–	1.3	Mgal/d	Mgal
–	1400	1.4	Mgal/d	Mgal
60"	–	1.6	Mgal/d	Mgal
–	1600	1.8	Mgal/d	Mgal
66"	–	1.9	Mgal/d	Mgal
72"	1800	2.3	Mgal/d	Mgal
78"	–	2.9	Mgal/d	Mgal
–	2000	2.9	Mgal/d	Mgal

9.2.2 Language, length, temperature

	Unit
Language	English
Length	mm
Temperature	°C

10 Index Function matrix

Blocks

Groups

Function groups

Functions 0...

1...

2...

3...

6...

8...

11 Index

G

H

I

K

L

M

U

V

W

X

Z

Numbers

Content FOUNDATION Fieldbus

1 Operation via FOUNDATION Fieldbus

1.1 Block model

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

A FOUNDATION Fieldbus device has the following block types:
- A Resource Block
  The Resource Block contains all the device-specific characteristics of the device.

- One or more Transducer Blocks
  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 93C FOUNDATION Fieldbus has the following blocks:
- A Resource Block
- Five Transducer Blocks
- Ten function blocks consisting of:
  – Eight Analog Input function blocks
  – One Discrete Output
  – One PID function block

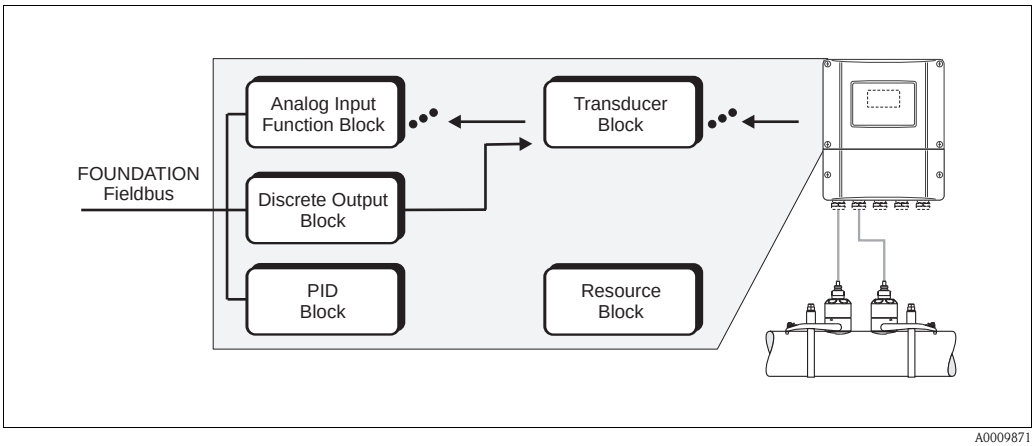


Fig. 1: Prosonic Flow 93 FOUNDATION Fieldbus block model

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 93C FOUNDATION Fieldbus can be initiated and controlled via FOUNDATION Fieldbus.

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 79.

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 for Prosonic Flow 93C FOUNDATION Fieldbus, BA00145D).

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 enables you to influence the input and output variables of a function block. Parameters of a Transducer Block include information about the sensor type, the sensor configuration, physical units, the calibration, damping, diagnostics 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" Transducer Block/base index 2600:
This block contains all the flow-specific parameters and functions, e.g. calibration functions, sensor data, etc. → Page 87

"Diagnosis" Transducer Block/base index 1600:
This block contains all the parameters for system diagnosis, e.g. current system status etc.
→ Page 98

"Service" Transducer Block/base index 1700:
This block contains all the parameters for service
→ Page 101

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

"Totalizer" Transducer Block/base index 1900:
This Block contains all the parameters for the configuration of the totalizers
→ Page 116

3.1 Signal processing

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

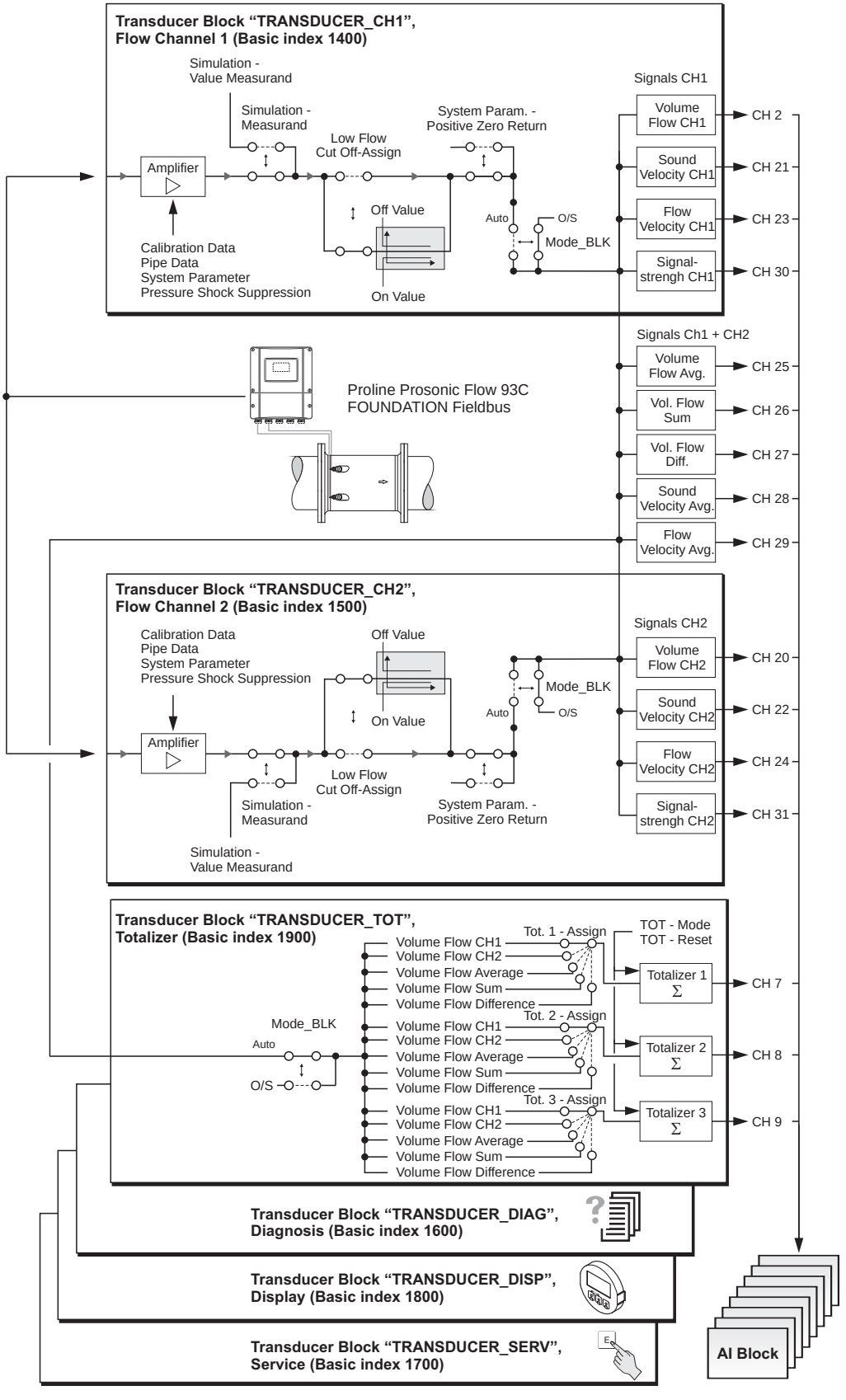


Fig. 2: Internal structure of the individual Transducer Blocks

The Transducer Block "Flow" receives several signals from the sensor as input values (signal strength CH1 to CH2). Other process variables are derived from these signals. The input signals are further processed via an amplifier.

The parameter "Simulation – Value Measurand" (see Page 97) allows you to specify a simulation value for the Transducer Block "Flow" in order to test assigned parameters in the device and subsequent function blocks.

The parameter "Low Flow Cut Off – On Value" (Page 90) 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 90) allows you switch the measured value to "zero flow". This is necessary when a piping system is being cleaned, for example.

The Transducer Block "Flow" provides the following process variables for the subsequent function blocks:
- Average volume flow
- Average sound velocity
- Average flow velocity
- Signal strength channel 1
- Signal strength channel 2

In the Transducer Block "Totalizer", a process variable can be assigned to each individual totalizer (e.g. Average volume flow 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 85.

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 98).

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 87 ff..

3.2 Important functions, 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)
"Flow" Transducer Block	Average volume flow	25
	Average sound velocity	28
	Average flow velocity	29
	Signal strength channel 1	30
	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" 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 for Proline Prosonic Flow 93C, BA00145D, "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" 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 98).

For more information on rectifying errors → See Operating Instructions for Prosonic Flow 93C FOUNDATION Fieldbus (BA065D), "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 98).

For more information on rectifying errors →See Operating Instructions for Prosonic Flow 93C FOUNDATION Fieldbus (BA00145D), "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 93C FOUNDATION Fieldbus (BA00145D).
2. The correct code must be entered in the parameter "Access - Code" via the corresponding Transducer Block.

3.3 "Flow" Transducer Block parameters

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

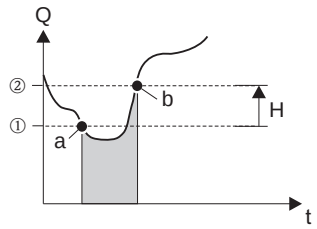
✎ Note!
FOUNDATION Fieldbus parameters are described in the Operating Instructions "FOUNDATION Fieldbus Overview" (BA013S) (acquired at: → www.endress.de → Download).

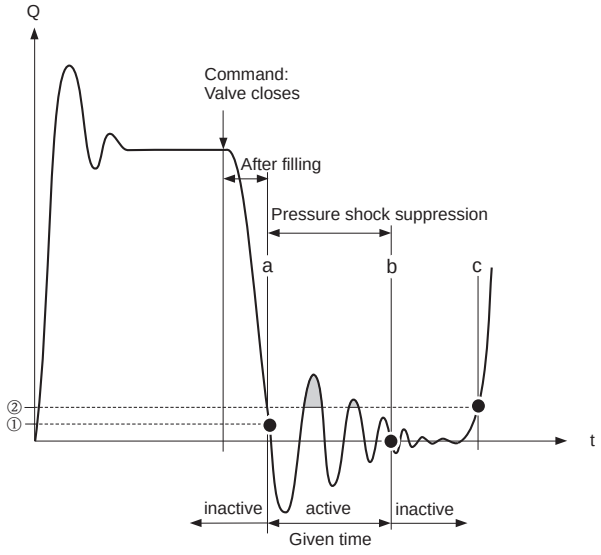
"Flow" Transducer Block /base index 2600		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Un-/Locking - Access Code	AUTO - OOS	All data of the measuring system are protected against inadvertent change. Only when the code has been entered in this parameter can the manufacturer-specific 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 102) **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)

"Flow" Transducer Block /base index 2600		
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 - 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 65 ff.

"Flow" Transducer Block /base index 2600		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
System Unit - Viscosity	AUTO - OOS	For selecting the unit for the viscosity of the fluid. **Options:** mm^2/s cSt St **Factory setting:** mm^2/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 **Options:** MILLIMETER INCH **Factory setting:** Depends on country (MILLIMETER or INCH) → Page 65 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)
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

"Flow" Transducer Block /base index 2600		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
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 97). **Options:** CANCEL START **Factory setting:** CANCEL ☝ Caution! Before carrying this out, please refer to the Operating Instructions for Prosonic Flow 93C FOUNDATION Fieldbus (BA00145D) for a detailed description of the procedure for zero point adjustment.
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
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 88).

"Flow" Transducer Block /base index 2600		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
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 88).
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 90). Use this parameter to define the time span for active pressure shock suppression. (Continued on next page)

"Flow" Transducer Block /base index 2600		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Process - Pressure Shock Suppression (Continued)	AUTO - OOS	**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).  A0001285-EN *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

"Flow" Transducer Block /base index 2600		
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:** OTHER 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 89.

"Flow" Transducer Block /base index 2600		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
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 89.
Pipe Data - Pipe Diameter	AUTO - OOS	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 89.
Pipe Data - Wall Thickness	AUTO - OOS	Entering the wall thickness of the pipe. **Measuring the wall thickness** The measurement can be carried out via: ■ Local display (Quick Setup "Sensor"). ■ 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 89.

"Flow" Transducer Block /base index 2600		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
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	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".
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 88.
Liquid Data - Sound Velocity Liquid	AUTO - OOS	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".

"Flow" Transducer Block /base index 2600		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
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".
Liquid Data - Min. Sound Velocity Liquid	AUTO - OOS	Entering the minimum sound velocity of the liquid. **User input:** Fixed-point number 0 to 1000 **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".
Liquid Data - Max. Sound Velocity Liquid	AUTO - OOS	Entering the maximum sound velocity of the liquid. **User input:** Fixed-point number 0 to 1000 **Factory setting:** 300 ✎ Note! The unit used is displayed in the parameter "Liquid Data - Unit Max. Sound Velocity Liquid".
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".
Sensor Param. - Measurement	AUTO - OOS	Use this parameter to select which measurement method is to be carried out. **Options:** INLINE **Factory setting** INLINE
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". **Options:** W-IN-1F-L-C **Factory setting:** W-IN-1F-L-C
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

"Flow" Transducer Block /base index 2600		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
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	Entering a correction factor defined by the customer. **User input:** 5-digit floating-point number
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 Prosonic Flow 93C FOUNDATION Fieldbus, BA00145D, Section 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 88).
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 Prosonic Flow 93C FOUNDATION Fieldbus BA00145D.
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 102) **User input:** max. 4-digit number (0 to 9999) ✎ Note! ■ If the write protection is enabled then access to the manufacturer-specific parameters is blocked even if the right code is entered. Write protection can be activated and deactivated by means of jumpers on the I/O board (→ See Operating Instructions for Prosonic Flow 93C FOUNDATION Fieldbus, BA00145D). ■ 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 119). ✎ 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 (restart without interrupting power supply) ORIGINAL TRANSMITTER DATA **Factory setting:** NO

"Diagnosis" Transducer Block/base index 1600		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
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.

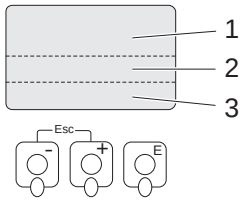
✎ Note!
FOUNDATION Fieldbus parameters are described in the Operating Instructions "FOUNDATION Fieldbus Overview" (BA013S) (acquired at: → www.endress.de → Download).

"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 102) **User input:** max. 4-digit number (0 to 9999) ✎ Note! ■ If the write protection is enabled then access to the manufacturer-specific parameters is blocked even if the right code is entered. Write protection can be activated and deactivated by means of jumpers on the I/O board (→ See Operating Instructions for Prosonic Flow 93C 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 65 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.

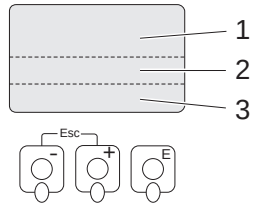
"Display" Transducer Block/base index 1800		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Configuration- Display Damping	AUTO - OOS	Use this parameter to enter a time constant defining how the display reacts to severely fluctuating flow variables, either very quickly (enter 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	This function defines 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" **Options:** (CH1 + CH2)/2 **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 CALC. VOLUME FLOW CALC. VOLUME FLOW % SOUND VELOCITY AVG. SIGNAL STRENGTH (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:** CALC. VOLUME FLOW
Main Line - 100%-Value	AUTO - OOS	✎ Note! The option is not active unless CALC. VOLUME FLOW % was selected in the parameter "Main - Line Assign". Use this parameter to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter and country [700 to 27800 m^3/hr or 3100 to 44500 imp.gal/min. or 81 to 176 imp.Mgal/day] → Page 65. ✎ Note! The unit is taken from the parameter "System Unit - Volume Flow" (→ Page 88).

"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 CALC. VOLUME FLOW CALC. VOLUME FLOW % SOUND VELOCITY AVG. SIGNAL STRENGTH (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 option is not active unless CALC. VOLUME FLOW % was selected in the parameter "Main - Multiplex Line Assign". Use this parameter to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter and country [700 to 27800 m^3/hr or 3100 to 44500 imp.gal/min. or 81 to 176 imp.Mgal/day] → Page 65. ✎ Note! The unit is taken from the parameter "System Unit - Volume Flow" (→ Page 88).

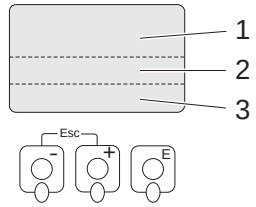
"Display" Transducer Block/base index 1800		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Main Line Multiplex - Format	AUTO - OOS	Use this parameter to define the maximum number of places after the decimal point of the second value displayed for the reading in the main line. **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.

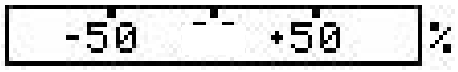
"Display" Transducer Block/base index 1800		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
1 = Main line **2 = Additional line** 3 = Info line		 A0001253
Add. Line - Assign	AUTO - OOS	Use this parameter to define the display value assigned to the additional line (the middle line of the local display) during normal measuring operation. **Options:** OFF CALC. VOLUME FLOW CALC. VOLUME FLOW % SOUND VELOCITY AVG. SIGNAL STRENGTH (CH1 to CH2) FLOW VELOCITY AVG. 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": ■ CALC. VOLUME FLOW % ■ 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 nominal diameter and country [700 to 27800 m^3/hr or 3100 to 44500 imp.gal/min. or 81 to 176 imp.Mgal/day] → Page 65. ✎ Note! The unit is taken from the parameter "System Unit - Volume Flow" (→ Page 88).

"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": ■ 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 CALC. VOLUME FLOW CALC. VOLUME FLOW % SOUND VELOCITY AVG. SIGNAL STRENGTH (CH1 to CH2) FLOW VELOCITY AVG. CALC. VOLUME FLOW BARGRAPH % SIGNAL BARGRAPH (CH1 to CH2) TOTALIZER (1 to 3) 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": ■ CALC. VOLUME FLOW % ■ 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 nominal diameter and country [700 to 27800 m^3/hr or 3100 to 44500 imp.gal/min. or 81 to 176 imp.Mgal/day] → Page 65. ✎ Note! The unit is taken from the parameter "System Unit - Volume Flow" (→ Page 88).

"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 → dm^3/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": ■ 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 CALC. VOLUME FLOW CALC. VOLUME FLOW % SOUND VELOCITY AVG. SIGNAL STRENGTH (CH1 to CH2) FLOW VELOCITY AVG. CALC. VOLUME FLOW BARGRAPH % SIGNAL BARGRAPH (CH1 to CH2) TOTALIZER (1 to 3) OPERATING/SYSTEM CONDITIONS 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": ▪ CALC. VOLUME FLOW % ▪ 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 nominal diameter and country [700 to 27800 m^3/hr or 3100 to 44500 imp.gal/min. or 81 to 176 imp.Mgal/day] → Page 65. ✎ Note! The unit is taken from the parameter "System Unit - Volume Flow" (→ Page 88).

"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": ■ 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 CALC. VOLUME FLOW CALC. VOLUME FLOW % SOUND VELOCITY AVG. SIGNAL STRENGTH (CH1 to CH2) FLOW VELOCITY AVG. CALC. VOLUME FLOW BARGRAPH % SIGNAL BARGRAPH (CH1 to CH2) TOTALIZER (1 to 3) OPERATING/SYSTEM CONDITIONS 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": ■ CALC. VOLUME FLOW % ■ 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 nominal diameter and country [700 to 27800 m^3/hr or 3100 to 44500 imp.gal/min. or 81 to 176 imp.Mgal/day] → Page 65. ✎ Note! The unit is taken from the parameter "System Unit - Volume Flow" (→ Page 88).

"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 → dm^3/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": ■ 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 102) **User input:** max. 4-digit number (0 to 9999) ✎ Note! ■ If the write protection is enabled then access to the manufacturer-specific parameters is blocked even if the right code is entered. Write protection can be activated and deactivated by means of jumpers on the I/O board (→ See Operating Instructions for Prosonic Flow 93C FOUNDATION Fieldbus, BA00145D). ■ 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 118) and the direction of flow. **Display:** Max. 7-digit floating-point number, including unit and sign (e.g. 15467.04 m^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 nominal diameter and country (dm^3 or imp.gal...imp.Mgal) → Page 65 ff. ✎ 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 AVERAGE **Factory setting:** VOLUME FLOW AVERAGE ✎ 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 128).
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 128).

"Totalizer" Transducer Block/base index 1900		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
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.

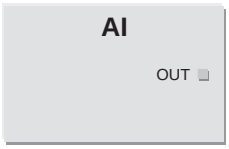
4 Function blocks

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.Analog Input function block

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



A0003800

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:

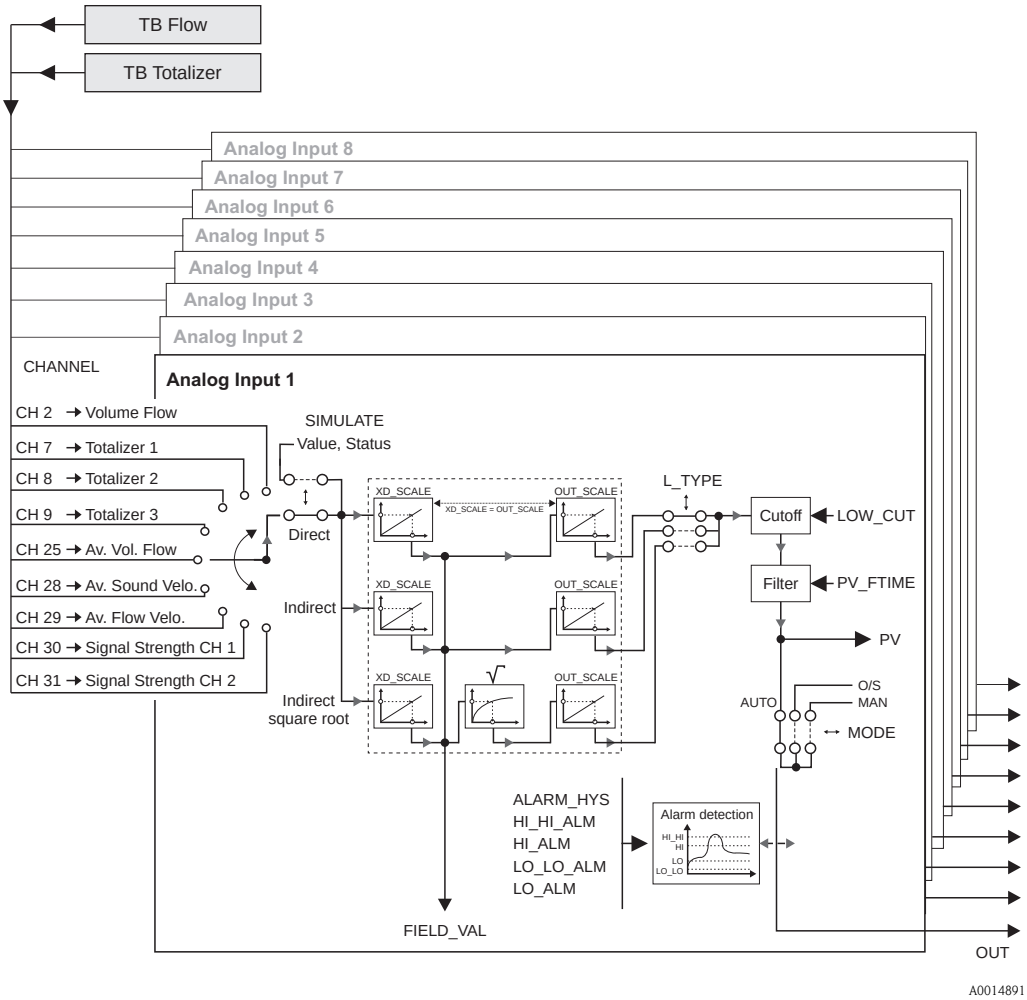


Fig. 3: Internal structure of the individual Analog Input function blocks

The Analog Input function blocks "Flow" 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 85 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 93C FOUNDATION Fieldbus, BA00145D).

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 125).

- 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 93C 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 85 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" 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 93C FOUNDATION Fieldbus (BA00145D).

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.

   ✎ Hinweis!
   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 98).

For more information on rectifying errors →See Operating Instructions for Prosonic Flow 93C FOUNDATION Fieldbus (BA00145D), "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 sensor is 0 to 30 m^3/h.
- The output range to the process control system should be 0 to 100%.

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

- Parameter L_TYPE
  Selection: L_TYPE = Indirect
  The process variable "Average volume flow" from the "Channel 25" 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	= m^3/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.

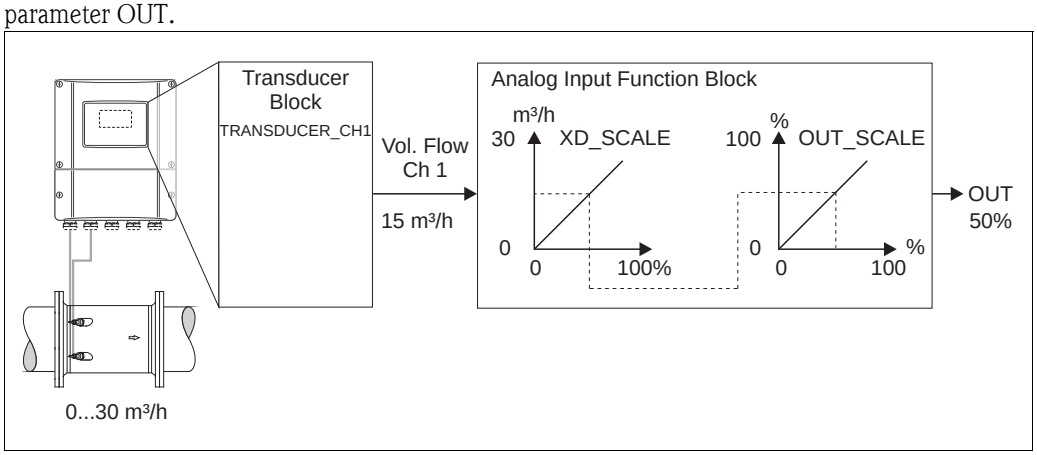


Fig. 4: Rescaling the input value (example)

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)

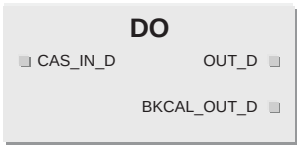
The status of the limit value process alarms is communicated to the fieldbus host system via the following parameters:
- HI_HI_ALM (upper alarm limit)
- HI_ALM (upper pre-warning limit)
- LO_LO_ALMI (lower alarm limit)
- LO_ALM (lower pre-warning limit)

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 93C FOUNDATION Fieldbus:

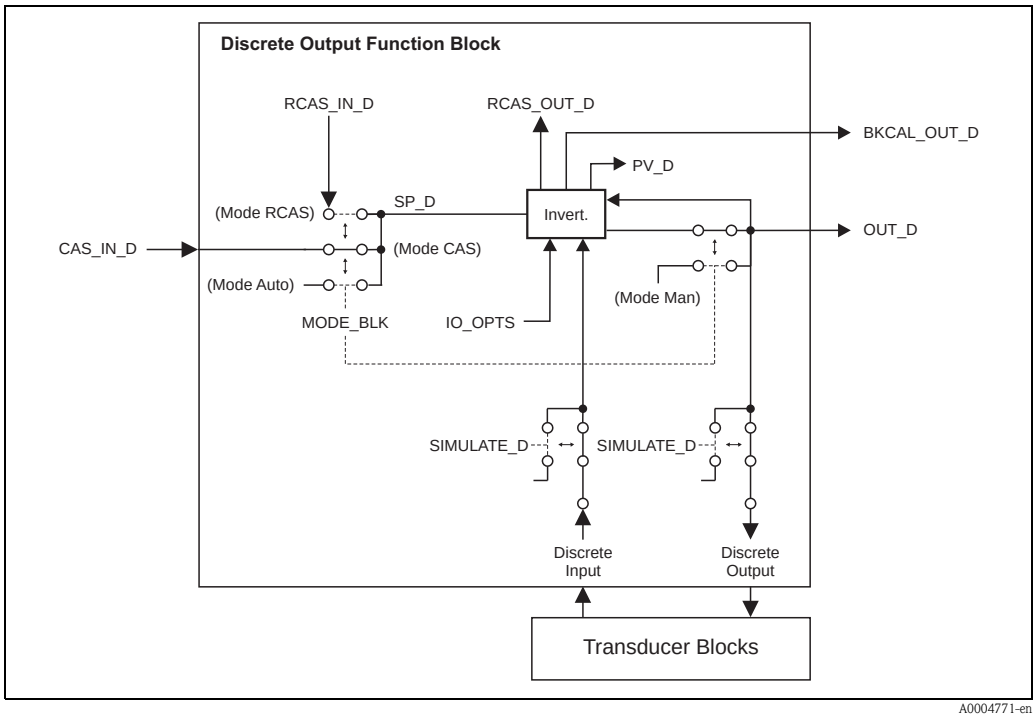

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Fig. 5: Signal processing in the Discrete Output function block

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

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F

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L

T

U

W

Z

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