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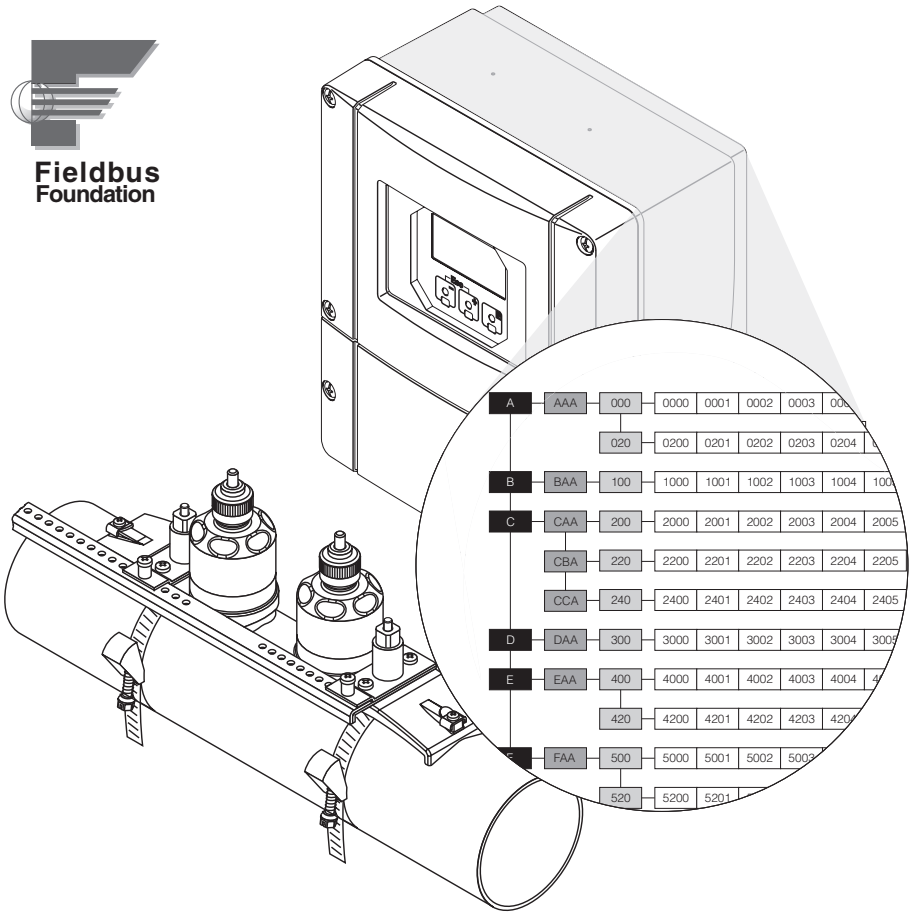
valid from software version:
V 1.01.XX (amplifier)
V 1.01.XX (communication)

PROline Prosonic Flow 93 FOUNDATION Fieldbus Ultrasonic Flow Measuring System

Description of Device Functions



Endress+Hauser
The Power of Know How

Operation
PROline Prosonic Flow 93
FOUNDATION Fieldbus

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Contents (local operation)

1 Notes on using this manual

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

1.1 Using the table of contents to locate a function description

The designations of all the cells in the function matrix are listed in the table of contents. You can use these unambiguous designations, (such as MEASURED VARIABLES, USER INTERFACE, TOTALIZERS, 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 5.

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

This step-by-step, top-down approach starts with the blocks, the highest level of the matrix, 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 10. Select the block (or the group within the block) which you need for your application and use the page reference to locate the information corresponding to the next level.
2. The page in question contains a graphic showing of the block with all its subordinate groups, function groups and functions.
   Select the function which you need for your application and use the page reference to locate the detailed function description.

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

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

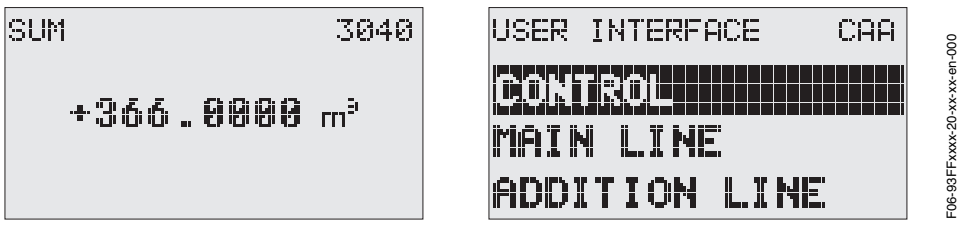


Fig. 1: Codes of the function groups and functions on the local display

The function-matrix index lists the codes for all the available “cells” in alphabetic and consecutive order, complete with the page references for the corresponding functions.

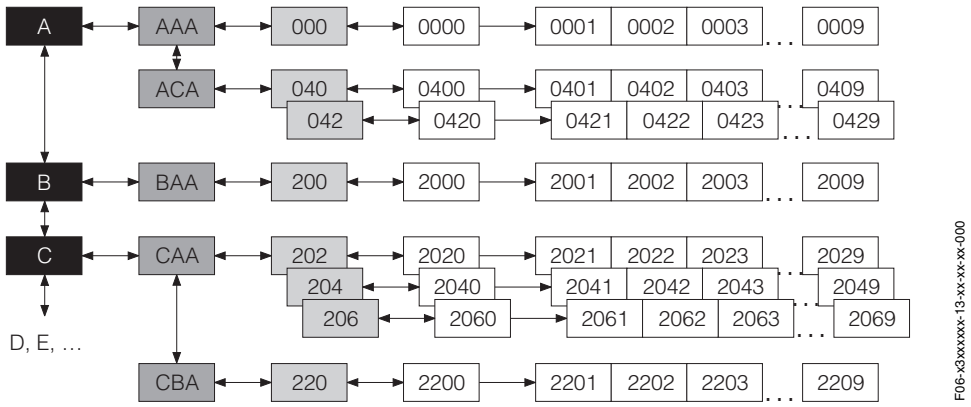
The index to the function matrix is on Page 79.

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 measuring device. Examples of blocks available are MEASURED VARIABLES, 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, ADDITIONAL LINE etc.

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

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

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

Each function group consists of one or more functions. The functions are used to operate and configure the measuring device. Numerical values can be entered or parameters selected and saved.
The functions in the “BASIC CONFIGURATION” function group, for example, include: LANGUAGE, DISPLAY DAMPING, CONTRAST LCD etc.

To change the operating language of the device, for example, you must proceed as follows:
1. Select the “USER INTERFACE” Block.
2. Select the “CONTROL” group.
3. Select the “BASIC CONFIGURATION” function group.
4. Select the “LANGUAGE” function
   (the language required is selected here).

2.1.5 Codes identifying cells

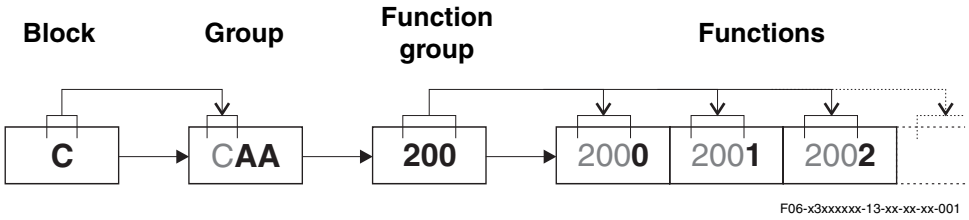
Each cell (block, group, function group and function) in the function matrix has an individual, unique code.

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”, in other words A _ _; the codes of the groups in block B start with a “B”, in other words 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.).

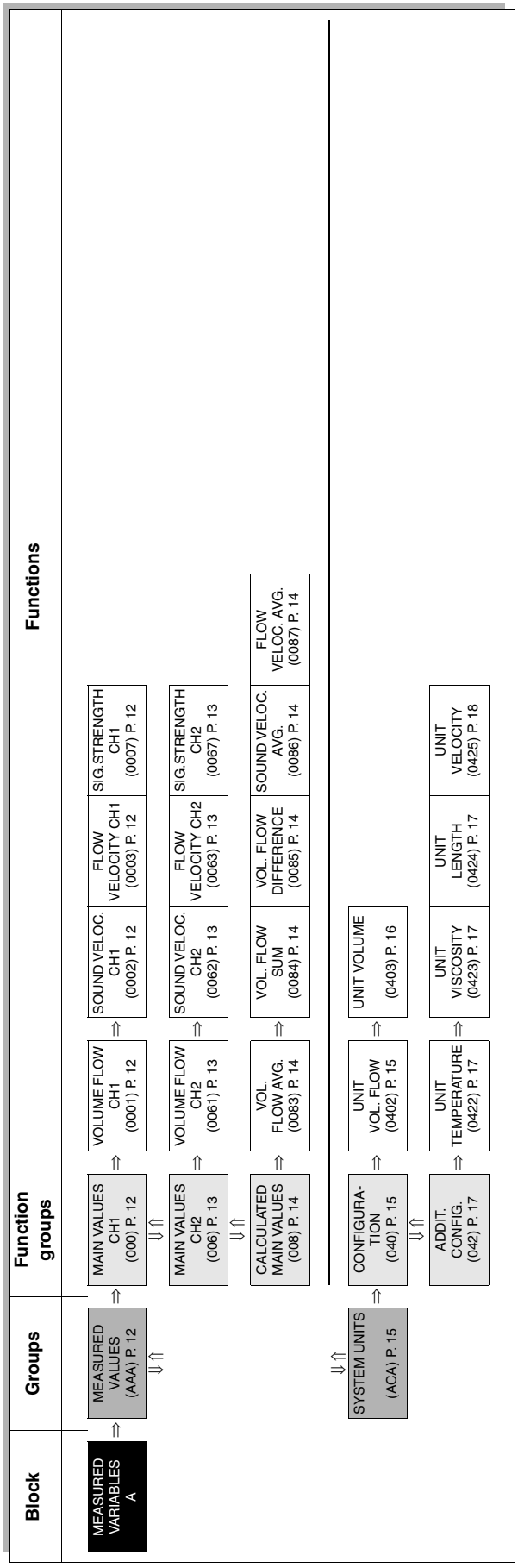
Functions:
The code consists of four digits (0000, 0001, 0201, etc.).
The first three digits are the same as the code for the function group.
The last digit in the code is a counter for the functions in the function group, incrementing from 0 to 9 (e.g. function 0005 is the sixth function in group 000).



2.2 Function matrix Prosonic Flow 93 FOUNDATION Fieldbus

BLOCKS	GROUPS		FUNCTION GROUPS
MEASURED VARIABLES A (see Page 11)	MEASURED VALUES	AAA	see Page 12
	SYSTEM UNITS	ACA	see Page 15
QUICK SETUP B (see Page 19)	Sensor and commissioning setups		see Page 19
USER INTERFACE C (see Page 23)	CONTROL	CAA	see Page 24
	MAIN LINE	CCA	see Page 28
	ADDITIONAL LINE	CEA	see Page 32
	INFORMATION LINE	CGA	see Page 38
TOTALIZERS D (see Page 44)	TOTALIZER 1	DAA	see Page 45
	TOTALIZER 2	DAB	see Page 45
	TOTALIZER 3	DAC	see Page 45
	HANDLING TOTALIZERS	DJA	see Page 48
BASIC FUNCTION G (see Page 49)	FOUNDATION FIELDBUS	GGA	see Page 50
	PROCESS PARAMETER CH1	GIA	see Page 53
	PROCESS PARAMETER CH2	GIB	see Page 53
	SYSTEM PARAMETER CH1	GLA	see Page 62
	SYSTEM PARAMETER CH2	GLB	see Page 62
	SENSOR DATA CH1	GNA	see Page 63
	SENSOR DATA CH2	GNB	see Page 63
SUPERVISION J (see Page 69)	SYSTEM	JAA	see Page 70
	SYSTEM CH2	JAB	see Page 70
	VERSION-INFO	JCA	see Page 74

3 Block MEASURED VARIABLES



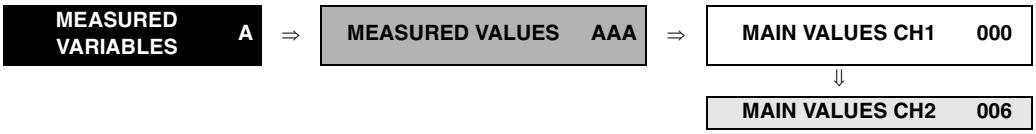
3.1 Group MEASURED VALUES

3.1.1 Function group: MAIN VALUES CH1

MEASURED VARIABLES A ⇒ MEASURED VALUES AAA ⇒ MAIN VALUES CH1 000

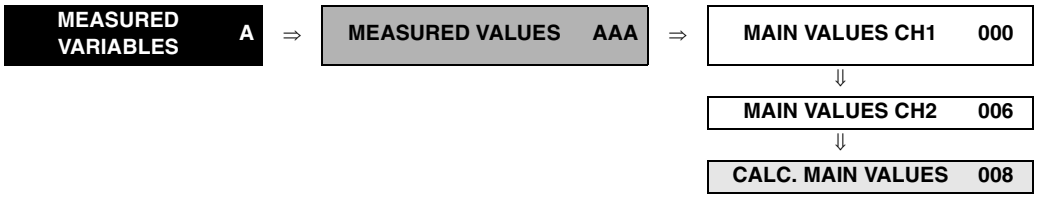
Function description MEASURED VARIABLES → MEASURED VALUES → MAIN VALUES CH1	
Use this function group to display the channel 1 measured values currently measured. ✎ Note! • The engineering units of all the measured variables shown here can be set in the “SYSTEM UNITS” group. • If the fluid in the pipe flows backwards, a negative sign prefixes the flow reading on the display.	
VOLUME FLOW CH1 (0001)	Displays the volume flow currently measured, (channel 1). **Display:** 5-digit floating-point number, including unit and sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; -731.63 gal/d; etc.)
SOUND VELOCITY CH1 (0002)	Displays the sound velocity currently measured in the liquid (channel 1). **Display:** 5-digit fixed-point number, incl. units (e.g. 1400.0 m/s, 5249.3 ft/s)
FLOW VELOCITY CH1 (0003)	Displays the flow velocity currently measured (channel 1). **Display:** 5-digit floating-point number, including unit and sign (e.g. 8.0000 m/s, 26.247 ft/s)
SIGNAL STRENGTH CH1 (0007)	Displays the signal strength (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



Function description MEASURED VARIABLES → MEASURED VALUES → MAIN VALUES CH2	
Use this function group to display the channel 2 measured values currently measured. ✎ Note! • The engineering units of all the measured variables shown here can be set in the "SYSTEM UNITS" group. • If the fluid in the pipe flows backwards, a negative sign prefixes the flow reading on the display.	
VOLUME FLOW CH2 (0061)	Displays the volume flow currently measured, (channel 2). **Display:** 5-digit floating-point number, including unit and sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; -731.63 gal/d; etc.)
SOUND VELOCITY CH2 (0062)	Displays the sound velocity currently measured in the liquid, (channel 2). **Display:** 5-digit fixed-point number, incl. units (e.g. 1400.0 m/s, 5249.3 ft/s)
FLOW VELOCITY CH2 (0063)	Displays the flow velocity currently measured, (channel 2). **Display:** 5-digit floating-point number, including unit and sign (e.g. 8.0000 m/s, 26.247 ft/s)
SIGNAL STRENGTH CH2 (0067)	Displays the signal strength, (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.

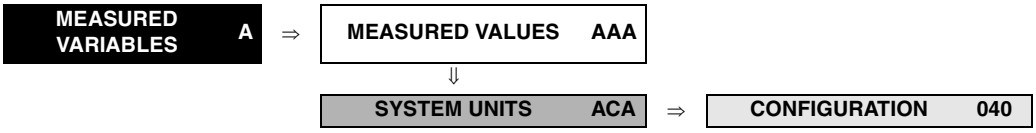
3.1.3 Function group: CALCULATED MAIN VALUES



Function description MEASURED VARIABLES → MEASURED VALUES → CALCULATED MAIN VALUES	
Displays the calculated measured values. 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)	Displays the calculated average volume flow. Calculated from: (VOLUME FLOW CH1 + VOLUME FLOW CH2) / 2 **Display:** 5-digit floating-point number, including unit and sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; -731.63 gal/d; etc.)
VOLUME FLOW SUM (0084)	Displays the calculated total volume flow. Calculated from: VOLUME FLOW CH1 + VOLUME FLOW CH2 **Display:** 5-digit floating-point number, including unit and sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; -731.63 gal/d; etc.)
VOLUME FLOW DIFFERENCE (0085)	Displays the calculated difference between the volume flows. Calculated from: VOLUME FLOW CH1 - VOLUME FLOW CH2 **Display:** 5-digit floating-point number, including unit and sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; -731.63 gal/d; etc.)
SOUND VELOCITY AVERAGE (0086)	Displays the average sound velocity calculated. Calculated from: (SOUND VELOCITY CH1 + SOUND VELOCITY CH2) / 2 **Display:** 5-digit fixed-point number, incl. units (e.g. 1400.0 m/s, 5249.3 ft/s)
FLOW VELOCITY AVERAGE (0087)	Displays the average flow velocity calculated. Calculated from: (FLOW VELOCITY CH1 + FLOW VELOCITY CH2) / 2 **Display:** 5-digit floating-point number, including unit and sign (e.g. 8.0000 m/s, 26.247 ft/s)

3.2 Group SYSTEM UNITS

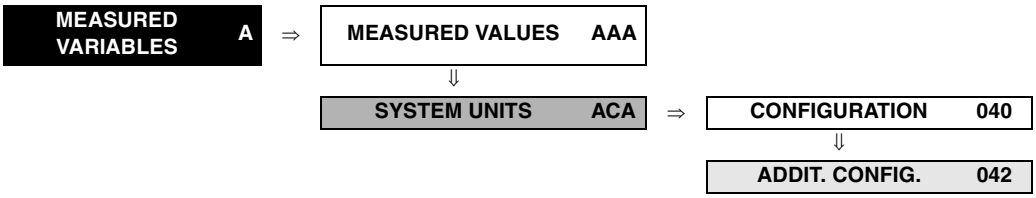
3.2.1 Function group: CONFIGURATION



Function description MEASURED VARIABLES → SYSTEM UNITS → CONFIGURATION	
Use this function group to select the units for the measured variables. ✎ 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 centimetre → cm^3/... Cubic decimetre → dm^3/... Cubic metre → m^3/... Millilitre → ml/... Litre → l/... Hectolitre → hl/... Megalitre → Ml/... MEGA *US:* Cubic centimetre→ 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)

Function description MEASURED VARIABLES → SYSTEM UNITS → CONFIGURATION	
UNIT VOLUME (0403)	Use this function to select the unit for displaying the volume. **Options:** *Metric:* Cubic centimetre → cm^3 Cubic decimetre → dm^3 Cubic metre → m^3 Millilitre → ml Litre → l Hectolitre → hl Megalitre → Ml MEGA *US:* Cubic centimetre → 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), corresponds to the totalizer unit factory setting, (see Page 76 ff.). ✎ Note! The unit of the totalizers is independent of your choice here. The unit for each totalizer is selected separately for the totalizer in question.

3.2.2 Funktion group: ADDITIONAL CONFIGURATION



Function 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 liquid temperature. ✎ Note! The fluid temperature is entered in the TEMPERATURE function, (see Page 60). **Options:** °C (Celsius) K (Kelvin) °F (Fahrenheit) R (Rankine) **Factory setting:** Depends on country (°C or °F), see factory setting Page 76 ff.
UNIT VISCOSITY (0423)	Use this function to select the unit for fluid viscosity. ✎ Note! The viscosity is entered in the VISCOSITY function, (see Page 61). **Options:** mm^2/s cSt St **Factory setting:** mm^2/s
UNIT LENGTH (0424)	Use this function to select the unit for the measure of length. The unit you select here is valid for: • Nominal diameter • Diameter • Wall thickness • Liner thickness • Path length • Wire length • Sensor distance **Options:** MILLIMETER INCH **Factory setting:** Depends on country (MILLIMETER or INCH), see factory setting Page 76 ff.

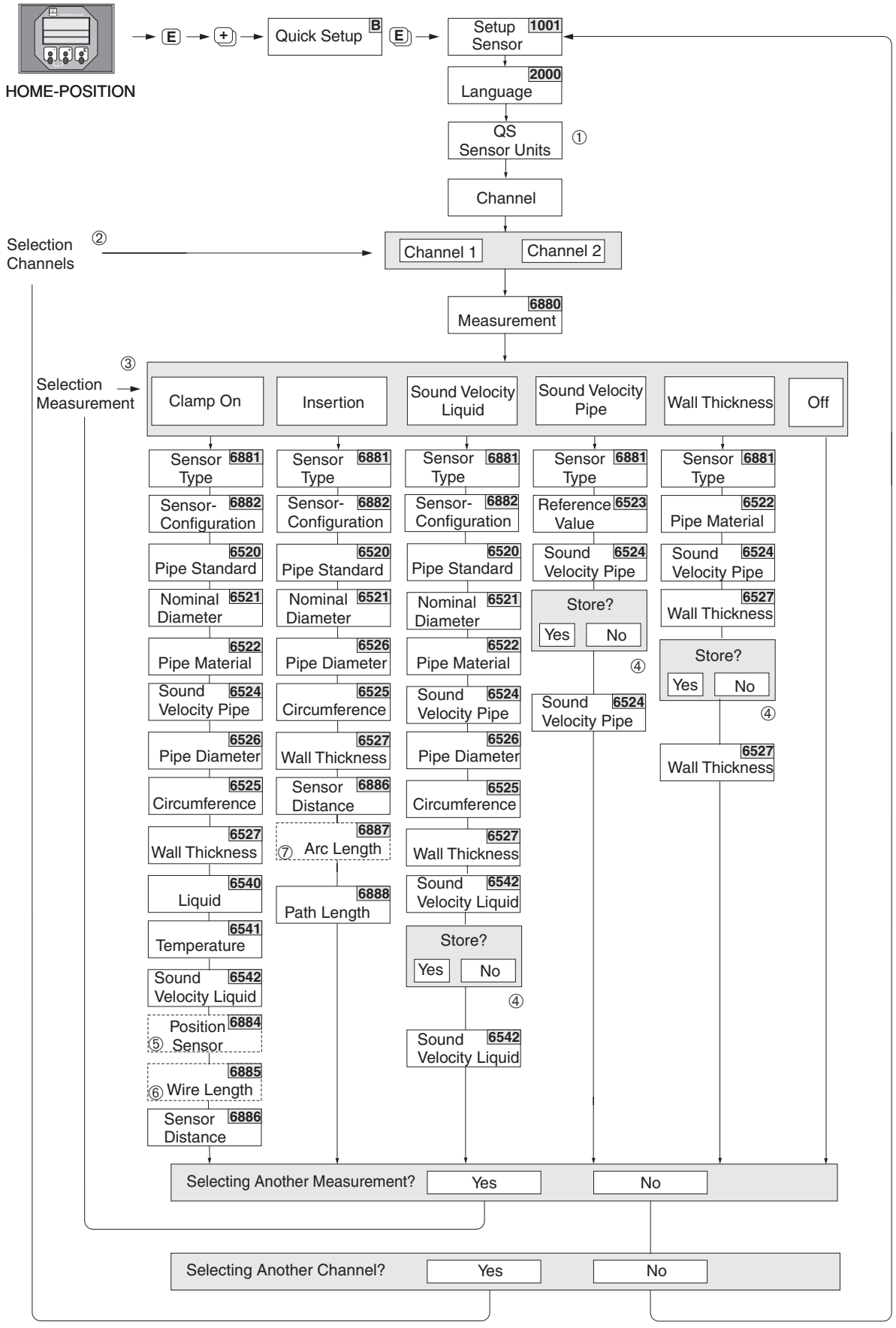
Function description MEASURED VARIABLES → SYSTEM UNITS → ADDITIONAL CONFIGURATION	
UNIT VELOCITY (0425)	Use this function to select the unit for the velocity. The unit selected is valid for the sound and flow velocity. **Options:** m/s ft/s **Factory setting:** m/s

4 Block QUICK SETUP

Block	Group	Function groups	Functions		
QUICK SETUP B	⇒	⇒	SETUP SENSOR (1001) P. 19	⇒ QUICK SETUP COMMISSION. (1002) P. 19	T-DAT SAVE/ LOAD (1009) P. 19

Function description QUICK SETUP	
SETUP SENSOR (1001)	Use this function to start the Quick Setup menu for mounting the ultrasonic sensors. **Options:** YES NO **Factory setting:** NO ✎ Note! You will find a flowchart of the Quick Setup SENSOR menu on Page 20. Further information on Quick Setups is provided in the related Operating Instructions for Prosonic Flow 93 FOUNDATION Fieldbus, (BA078D/06/en/).
QUICK SETUP COMMISSIONING (1002)	Use this function to start the Quick Setup for commissioning. **Options:** YES NO **Factory setting:** NO ✎ Note! You will find a flowchart of the COMMISSIONING Quick Setup menu on Page 22. Further information on Quick Setups is provided in the related Operating Instructions for Prosonic Flow 93 FOUNDATION Fieldbus, (BA078D/06/en/).
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.

4.0.1 Sensor Quick Setup



Note!

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

- See numbers in the illustration of the Quick Setup sensor menu:

  ① The choice of units only affects the UNIT LENGTH (0424) and UNIT VELOCITY (0425) functions.

  ② If a channel is selected for which a Quick Setup has already been carried out beforehand, the previous values are overwritten.

  ③ All options are offered for selection in each cycle. Any settings which may already have been made in a cycle are overwritten.

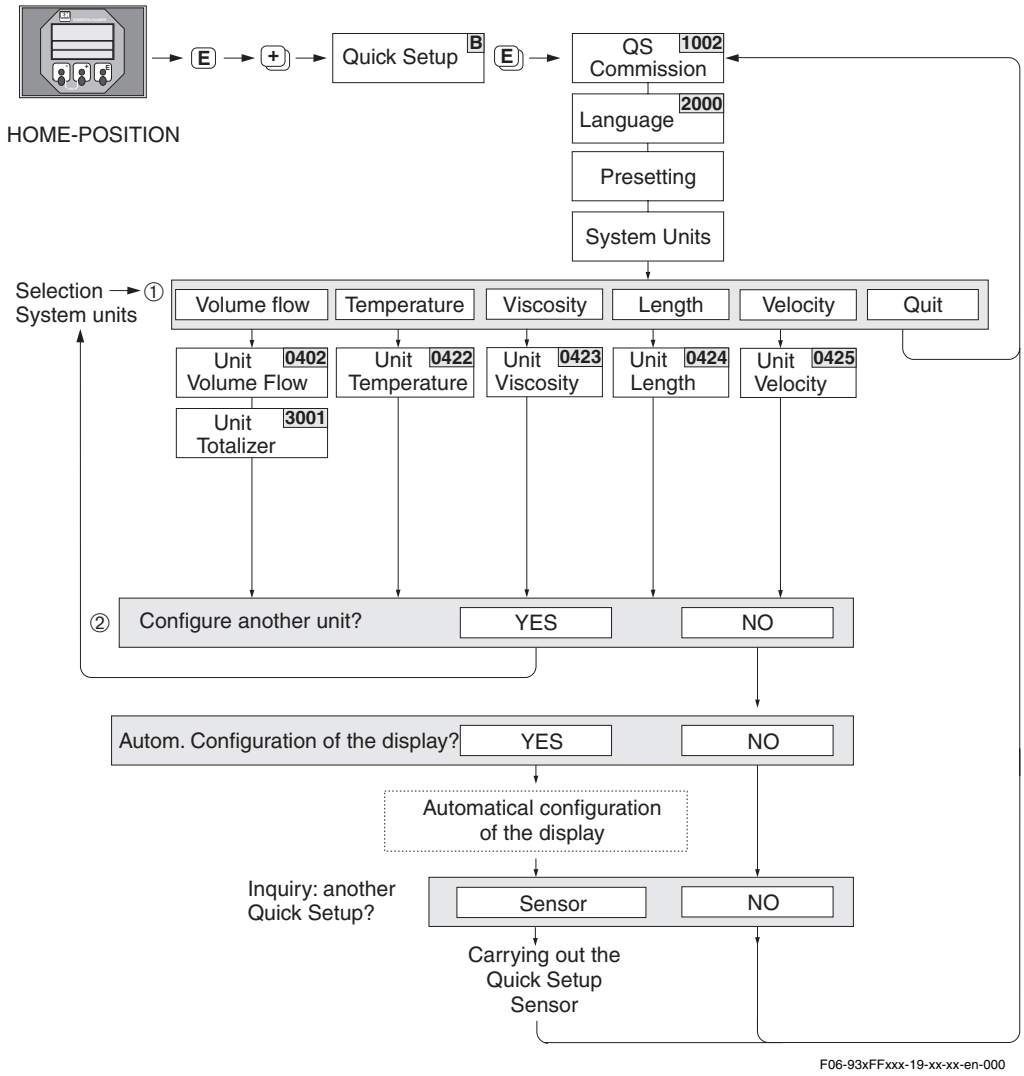
  ④ Option “YES”: The value measured during the Quick Setup is applied to the function in question. Option “NO”: The measurement is rejected and the original value is retained.

  ⑤ The SENSOR POSITION (6884) function does not appear unless CLAMP ON is set in the MEASUREMENT function and the number of traverses in the SENSOR CONFIGURATION (6882) function is 2 or 4.

  ⑥ The WIRE LENGTH (6885) function does not appear unless CLAMP ON is set in the MEASUREMENT function and the number of traverses in the SENSOR CONFIGURATION (6882) function is 1 or 3.

  ⑦ The ARC LENGTH (6887) function does not appear unless “INSERTION” is set in the MEASUREMENT function and “DUAL PATH” was selected in the SENSOR CONFIGURATION (6882) function.

4.0.2 Commissioning Quick Setup



Note!

- The display returns to the QUICK SETUP COMMISSIONING (1002) cell if you press the ESC key combination during parameter interrogation.

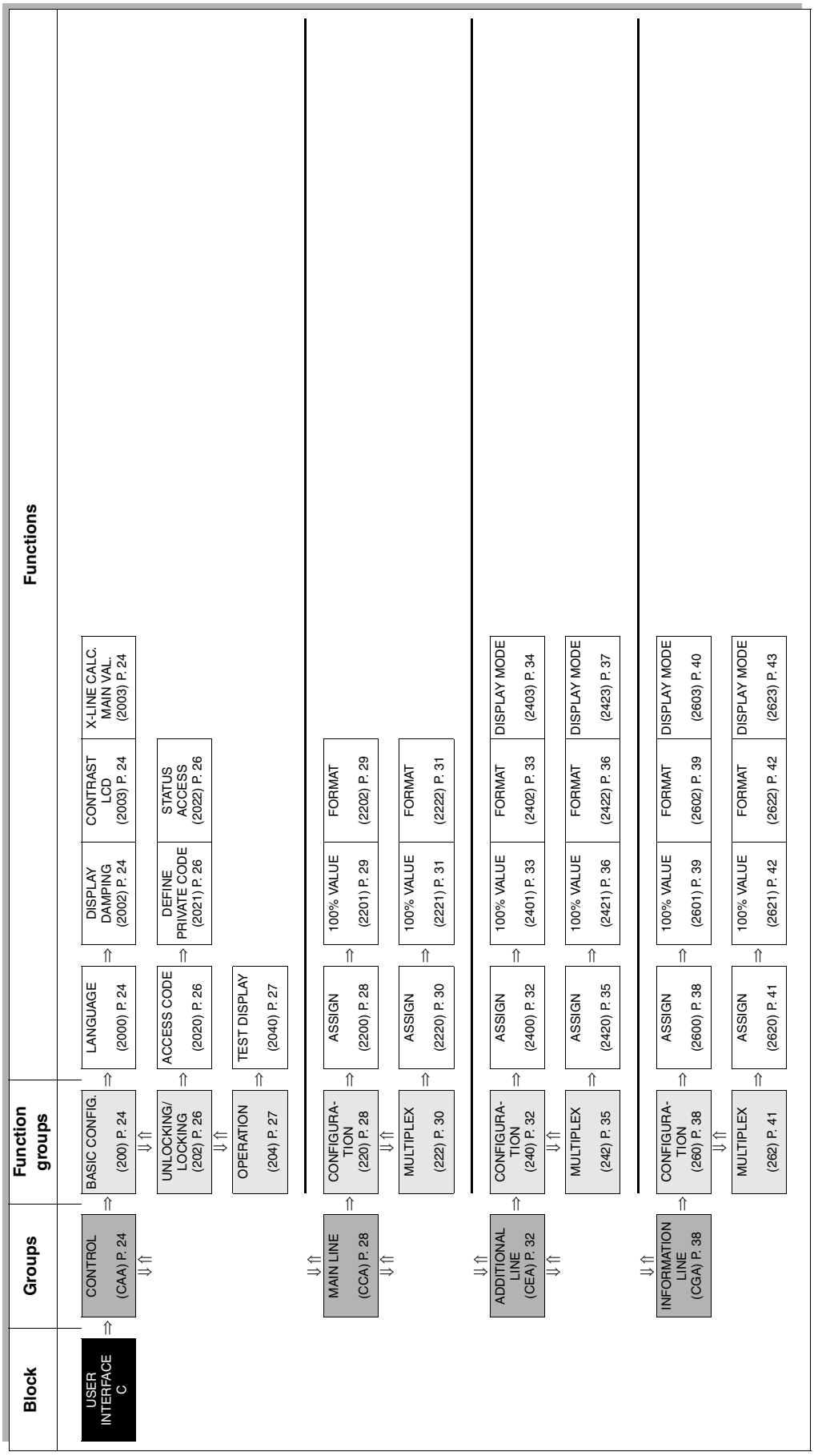
- See numbers in the illustration of the Quick Setup sensor menu:

  ① Only the units not yet configured in the current Quick Setup are offered for selection in each cycle. The unit for volume is derived from the volume flow unit.

  ② The “YES” option remains visible until all the units have been configured. “NO” is the only option displayed when no further units are available.

- The system units selected via the Quick Setup are only valid for display on the local display and for the parameters in the Transducer Blocks.
  They have no effect on the process variables which are transmitted via the FOUNDATION Fieldbus.

5 Block USER INTERFACE



5.1 Group CONTROL

5.1.1 Function group: BASIC CONFIGURATION

USER INTERFACE C ⇒ **CONTROL CAA** ⇒ **BASIC CONFIGURATION 200**

Function description USER INTERFACE → CONTROL → BASIC CONFIGURATION	
LANGUAGE (2000)	Use this function to select the language for all texts, parameters and messages shown on the local display. **Options:** ENGLISH DEUTSCH FRANCAIS ESPANOL ITALIANO NEDERLANDS DANSK NORSK SVENSKA SUOMI BAHASA INDONESIA JAPANESE (syllabary) **Factory setting:** Depends on country, see factory setting Page 76 ff. ✎ Note! If you press the ⊡ keys at startup, the language defaults to “ENGLISH”.
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...100 seconds **Factory setting:** 1 s ✎ Note! Setting the time constant to 0 seconds switches off damping.
CONTRAST LCD (2003)	Use this function to optimise display contrast to suit local operating conditions. **User input:** 10...100% **Factory setting:** 50%

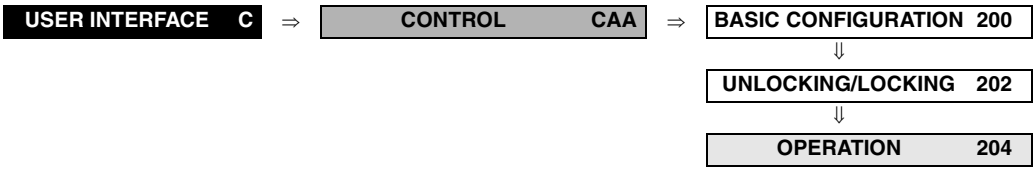
Function description USER INTERFACE → CONTROL → BASIC CONFIGURATION	
X-LINE CALCULATED MAIN VALUES (2004)	Use this function to indicate which “calculated main value” from the measured values of both channels is displayed. “CALCULATED VOLUME FLOW” must be selected in the ASSIGN line function, (function 2200 for the main line, function 2400 for the additional line, function 2600 for the information line), so that the value appears in the line required. ✎ Note! This function does **not** appear if “OFF” was selected on at least one channel in the MEASUREMENT (6880) function. **Options:** (CH1 + CH2) / 2 CH1 + CH2 CH1 - CH2 **Factory setting:** (CH1 + CH2) / 2

5.1.2 Function group: UNLOCKING/LOCKING

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

Function description USER INTERFACE → 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 ⊞ or ⊟ keys in any function, the measuring system automatically goes to this function and the prompt to enter the code appears on the display (when programming is disabled). You can enable programming by entering your private code (**factory setting = 93**, see the DEFINE PRIVATE CODE function). **User input:** Max. 4-digit number: 0...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 organisation can be of assistance if you mislay your personal code. • Access to programming is only valid for local operation in this function. If functions or parameters are to be changed via the FOUNDATION Fieldbus, programming must be enabled separately in the “Un/Locking - Access Code” parameter (Transducer Blocks).
DEFINE PRIVATE CODE (2021)	Use this function to enter a personal code for enabling programming. **User input:** 0...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. • The code entered here is also valid for operation with the FF configuration programme.
STATUS ACCESS (2022)	Use this function to check the access status for the function matrix (local display). **Display:** ACCESS CUSTOMER (parameters can be modified) LOCKED (parameters cannot be modified)

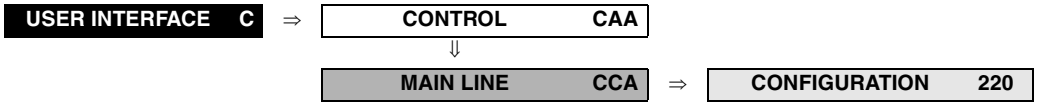
5.1.3 Function group: OPERATION

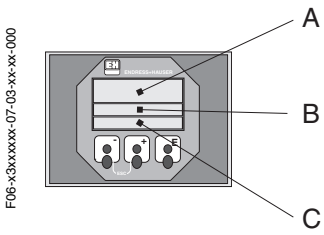


Function description USER INTERFACE → CONTROL → OPERATION	
TEST DISPLAY (2040)	Use this function to test the operability of the local display and its pixels. **Options:** OFF ON **Factory setting:** OFF Test sequence: 1. Start the test by selecting ON. 2. All pixels of the main line, additional line and information line are darkened for minimum 0.75 seconds. 3. Main line, additional line and information line show an “8” in each field for minimum 0.75 seconds. 4. Main line, additional line and information line show a “0” in each field for minimum 0.75 seconds. 5. Main line, additional line and information line show nothing (blank display) for minimum 0.75 seconds. When the test completes the local display returns to its initial state and the setting changes to “OFF.”

5.2 Group MAIN LINE

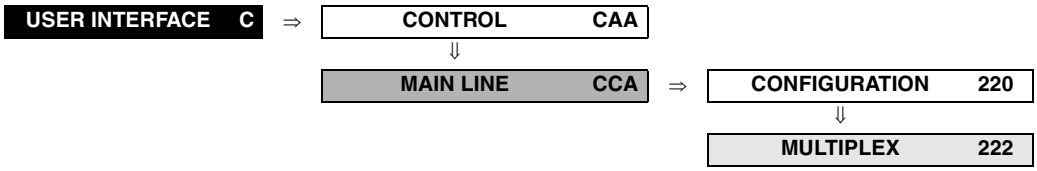
5.2.1 Function group: CONFIGURATION



Function description USER INTERFACE → MAIN LINE → CONFIGURATION	
 A = main line, B = additional line, C = information line	
ASSIGN (2200)	Use this function to define the display value assigned to the main line (the top line of the local display) during normal measuring operation. **Options:** OFF VOLUME FLOW CH1 VOLUME FLOW CH2 CALCULATED VOLUME FLOW VOLUME FLOW % CH1 VOLUME FLOW % CH2 CALCULATED VOLUME FLOW % SOUND VELOCITY CH1 SOUND VELOCITY CH2 SOUND VELOCITY AVERAGE SIGNAL STRENGTH CH1 SIGNAL STRENGTH CH2 FLOW VELOCITY CH1 FLOW VELOCITY CH2 FLOW VELOCITY AVERAGE TOTALIZER 1 TOTALIZER 2 TOTALIZER 3 AI 1 - OUT VALUE AI 2 - OUT VALUE AI 3 - OUT VALUE AI 4 - OUT VALUE AI 5 - OUT VALUE AI 6 - OUT VALUE AI 7 - OUT VALUE AI 8 - OUT VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (remote setpoint value) PID - OUT VALUE (manipulated variable) **Factory setting:** VOLUME FLOW CH1 ✎ Note! If a channel is not visible, it does not appear in the options. The channels can be displayed or hidden by means of the MEASUREMENT (6880) function.

Function description USER INTERFACE → MAIN LINE → CONFIGURATION	
100% VALUE (2201)	✎ Note! This function is not available unless one of the following options was selected in the ASSIGN (2200) function: • VOLUME FLOW % CH1 • VOLUME FLOW % CH2 • CALCULATED VOLUME FLOW % Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on country, [value] / [dm^3...m^3 or US-gal...US-Mgal]
FORMAT (2202)	Use this function to define the maximum number of places after the decimal point displayed for the reading in the main line. **Options:** XXXXX. - XXXX.X - XXX.XX - XX.XXX -X.XXXX **Factory setting:** X.XXXX ✎ Note! • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In these instances an arrow appears on the display between the measured value and the engineering unit, (e.g. 1.2 → 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

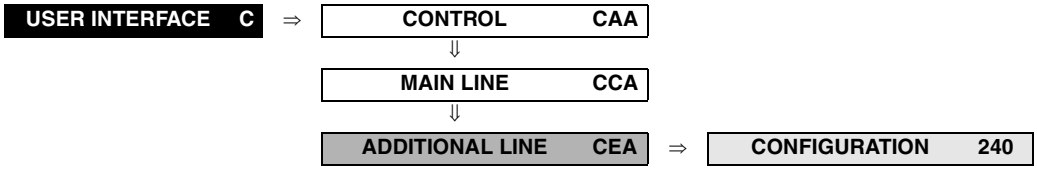


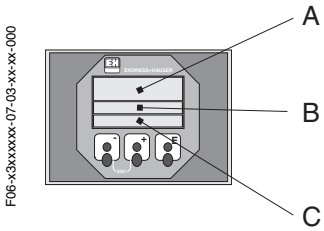
Function description USER INTERFACE → MAIN LINE → MULTIPLEX	
ASSIGN (2220)	Use this function to define the second reading to be displayed in the main line alternately (every 10 seconds) with the value defined in the ASSIGN (2200) function. **Options:** OFF VOLUME FLOW CH1 VOLUME FLOW CH2 CALCULATED VOLUME FLOW VOLUME FLOW % CH1 VOLUME FLOW % CH2 CALCULATED VOLUME FLOW % SOUND VELOCITY CH1 SOUND VELOCITY CH2 SOUND VELOCITY AVERAGE SIGNAL STRENGTH CH1 SIGNAL STRENGTH CH2 FLOW VELOCITY CH1 FLOW VELOCITY CH2 FLOW VELOCITY AVERAGE TOTALIZER 1 TOTALIZER 2 TOTALIZER 3 AI 1 - OUT VALUE AI 2 - OUT VALUE AI 3 - OUT VALUE AI 4 - OUT VALUE AI 5 - OUT VALUE AI 6 - OUT VALUE AI 7 - OUT VALUE AI 8 - OUT VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (remote setpoint value) PID - OUT VALUE (manipulated variable) **Factory setting:** OFF ✎ Note! If a channel is not visible, it does not appear in the options. The channels can be displayed or hidden by means of the MEASUREMENT (6880) function.

Function description USER INTERFACE → MAIN LINE → MULTIPLEX	
100% VALUE (2221)	✎ Note! This function is not available unless one of the following options was selected in the ASSIGN (2220) function: • VOLUME FLOW % CH1 • VOLUME FLOW % CH2 • CALCULATED VOLUME FLOW % Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on country, [value] / [dm^3...m^3 or US-gal...US-Mgal]
FORMAT (2222)	Use this function to define the maximum number of places after the decimal point for the second value displayed in the main line. **Options:** XXXXX. - XXXX.X - XXX.XX - XX.XXX -X.XXXX **Factory setting:** X.XXXX ✎ Note! • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In these instances an arrow appears on the display between the measured value and the engineering unit, (e.g. 1.2 → m^3/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

5.3 Group ADDITIONAL LINE

5.3.1 Function group: CONFIGURATION

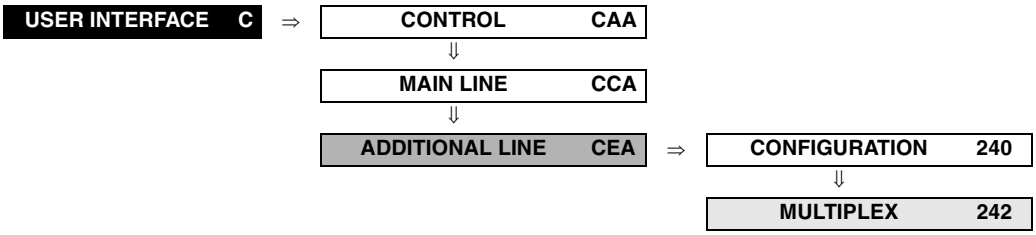


Function description USER INTERFACE → ADDITIONAL LINE → CONFIGURATION	
 A = main line, B = additional line, C = information line	
ASSIGN (2400)	Use this function to define the display value assigned to the additional line (the middle line of the local display) during normal measuring operation. **Options:** OFF VOLUME FLOW CH1 VOLUME FLOW CH2 CALCULATED VOLUME FLOW VOLUME FLOW % CH1 VOLUME FLOW % CH2 CALCULATED VOLUME FLOW % SOUND VELOCITY CH1 SOUND VELOCITY CH2 SOUND VELOCITY AVERAGE SIGNAL STRENGTH CH1 SIGNAL STRENGTH CH2 FLOW VELOCITY CH1 FLOW VELOCITY CH2 FLOW VELOCITY AVERAGE VOLUME FLOW BARGRAPH % CH1 VOLUME FLOW BARGRAPH % CH2 CALCULATED VOLUME FLOW BARGRAPH % SIGNAL STRENGTH BARGRAPH CH1 SIGNAL STRENGTH BARGRAPH CH2 TOTALIZER 1 TOTALIZER 2 TOTALIZER 3 FLOW DIRECTION CH1 FLOW DIRECTION CH2 CALCULATED FLOW DIRECTION AI 1 - OUT VALUE AI 2 - OUT VALUE AI 3 - OUT VALUE AI 4 - OUT VALUE AI 5 - OUT VALUE AI 6 - OUT VALUE AI 7 - OUT VALUE AI 8 - OUT VALUE (Continued on next page)

Function description USER INTERFACE → ADDITIONAL LINE → CONFIGURATION	
Contd: **ASSIGN** **(2400)**	**Options (contd.):** PID - IN VALUE (controlled variable) PID - CAS IN VALUE (remote setpoint value) 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. The channels can be displayed or hidden by means of the MEASUREMENT (6880) function.
100% VALUE **(2401)**	✎ Note! This function is not available unless one of the following options was selected in the ASSIGN (2400) function: • VOLUME FLOW % CH1 • VOLUME FLOW % CH2 • CALCULATED VOLUME FLOW % • VOLUME FLOW BARGRAPH % CH1 • VOLUME FLOW BARGRAPH % CH2 • CALCULATED VOLUME FLOW BARGRAPH % Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on country, [value] / [dm^3...m^3 or US-gal...US-Mgal]
FORMAT **(2402)**	✎ Note! This function is not available unless a numerical option was selected in the ASSIGN (2400) function. Use this function to define the maximum number of places after the decimal point displayed for the reading in the additional line. **Options:** XXXXX. - XXXX.X - XXX.XX - XX.XXX -X.XXXX **Factory setting:** X.XXXX ✎ Note! • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In these instances an arrow appears on the display between the measured value and the engineering unit, (e.g. 1.2 → m^3/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

Function description USER INTERFACE → ADDITIONAL LINE → CONFIGURATION	
DISPLAY MODE (2403)	✎ Note! This function is not available unless one of the following options was selected in the ASSIGN (2400) function: • VOLUME FLOW BARGRAPH % CH1 • VOLUME FLOW BARGRAPH % CH2 • CALCULATED VOLUME FLOW BARGRAPH % • SIGNAL STRENGTH BARGRAPH CH1 • SIGNAL STRENGTH BARGRAPH CH2 Use this function to define the format of the bar graph. **Options:** STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign).  F-x3xxxxx-20-xx-xx-xx-000 SYMMETRY (Symmetrical bar graph for positive and negative directions of flow with –50 / 0 / +50% gradations and integrated sign).  F-x3xxxxx-20-xx-xx-xx-001 **Factory setting:** STANDARD

5.3.2 Function group: MULTIPLEX



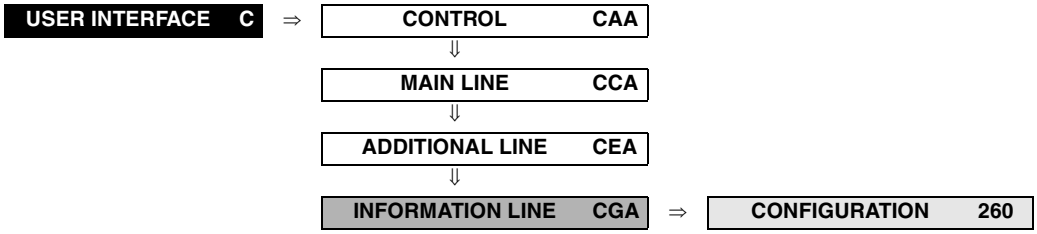
Function description USER INTERFACE → ADDITIONAL LINE → MULTIPLEX	
ASSIGN (2420)	Use this function to define the second reading to be displayed in the additional line alternately (every 10 seconds) with the value defined in the ASSIGN (2400) function. **Options:** OFF VOLUME FLOW CH1 VOLUME FLOW CH2 CALCULATED VOLUME FLOW VOLUME FLOW % CH1 VOLUME FLOW % CH2 CALCULATED VOLUME FLOW % SOUND VELOCITY CH1 SOUND VELOCITY CH2 SOUND VELOCITY AVERAGE SIGNAL STRENGTH CH1 SIGNAL STRENGTH CH2 FLOW VELOCITY CH1 FLOW VELOCITY CH2 FLOW VELOCITY AVERAGE VOLUME FLOW BARGRAPH % CH1 VOLUME FLOW BARGRAPH % CH2 CALCULATED VOLUME FLOW BARGRAPH % SIGNAL STRENGTH BARGRAPH CH1 SIGNAL STRENGTH BARGRAPH CH2 TOTALIZER 1 TOTALIZER 2 TOTALIZER 3 FLOW DIRECTION CH1 FLOW DIRECTION CH2 CALCULATED FLOW DIRECTION AI 1 - OUT VALUE AI 2 - OUT VALUE AI 3 - OUT VALUE AI 4 - OUT VALUE AI 5 - OUT VALUE AI 6 - OUT VALUE AI 7 - OUT VALUE AI 8 - OUT VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (remote setpoint value) PID - OUT VALUE (manipulated variable) DEVICE PD-TAG (tag name) **Factory setting:** OFF (Continued on next page)

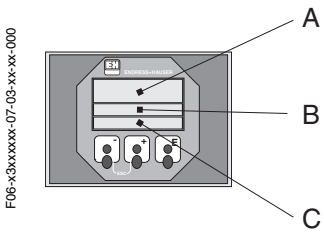
Function description USER INTERFACE → ADDITIONAL LINE → MULTIPLEX	
Contd: **ASSIGN** **(2420)**	✎ Note! Multiplex mode is suspended as soon as a fault/notice message is generated. The appropriate error message appears on the display: • Fault message (identified by a lightning icon): Multiplex mode is 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. If a channel is not visible, it does not appear in the options. The channels can be displayed or hidden by means of the MEASUREMENT (6880) function.
100% VALUE **(2421)**	✎ Note! This function is not available unless one of the following options was selected in the ASSIGN (2420) function: • VOLUME FLOW % CH1 • VOLUME FLOW % CH2 • CALCULATED VOLUME FLOW % • VOLUME FLOW BARGRAPH % CH1 • VOLUME FLOW BARGRAPH % CH2 • CALCULATED VOLUME FLOW BARGRAPH % Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on country, [value] / [dm^3...m^3 or US-gal...US-Mgal]
FORMAT **(2422)**	✎ Note! This function is not available unless a numerical option was selected in the ASSIGN (2420) function. Use this function to define the maximum number of places after the decimal point for the second value displayed in the additional line. **Options:** XXXXX. - XXXX.X - XXX.XX - XX.XXX -X.XXXX **Factory setting:** X.XXXX ✎ Note! • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In these instances an arrow appears on the display between the measured value and the engineering unit, (e.g. 1.2 → m^3/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

Function description USER INTERFACE → ADDITIONAL LINE → MULTIPLEX	
DISPLAY MODE (2423)	✎ Note! This function is not available unless one of the following options was selected in the ASSIGN (2420) function: • VOLUME FLOW BARGRAPH % CH1 • VOLUME FLOW BARGRAPH % CH2 • CALCULATED VOLUME FLOW BARGRAPH % • SIGNAL STRENGTH BARGRAPH CH1 • SIGNAL STRENGTH BARGRAPH CH2 Use this function to define the format of the bar graph. **Options:** STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign).  F-x3xxxx-20-xx-xx-xx-000 SYMMETRY (Symmetrical bar graph for positive and negative directions of flow with –50 / 0 / +50% gradations and integrated sign).  F-x3xxxx-20-xx-xx-xx-001 **Factory setting:** STANDARD

5.4 Group INFORMATION LINE

5.4.1 Function group: CONFIGURATION

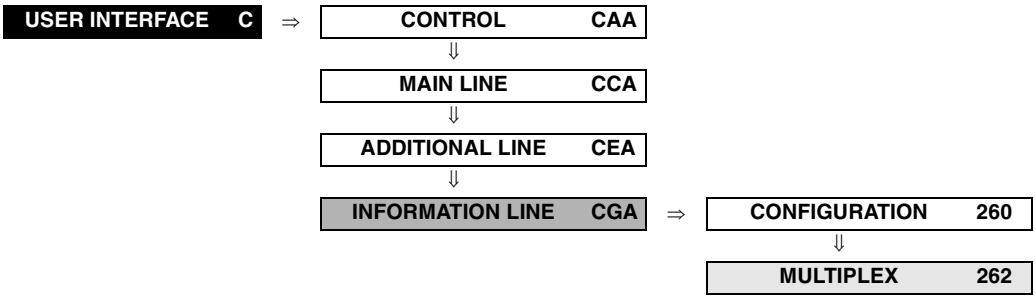


Function description USER INTERFACE → INFORMATION LINE → CONFIGURATION	
 A = main line, B = additional line, C = information line	
ASSIGN (2600)	Use this function to define the display value assigned to the information line (the bottom line of the local display) during normal measuring operation. **Options:** OFF VOLUME FLOW CH1 VOLUME FLOW CH2 CALCULATED VOLUME FLOW VOLUME FLOW % CH1 VOLUME FLOW % CH2 CALCULATED VOLUME FLOW % SOUND VELOCITY CH1 SOUND VELOCITY CH2 SOUND VELOCITY AVERAGE SIGNAL STRENGTH CH1 SIGNAL STRENGTH CH2 FLOW VELOCITY CH1 FLOW VELOCITY CH2 FLOW VELOCITY AVERAGE VOLUME FLOW BARGRAPH % CH1 VOLUME FLOW BARGRAPH % CH2 CALCULATED VOLUME FLOW BARGRAPH % SIGNAL STRENGTH BARGRAPH CH1 SIGNAL STRENGTH BARGRAPH CH2 TOTALIZER 1 TOTALIZER 2 TOTALIZER 3 OPERATING/SYSTEM CONDITIONS FLOW DIRECTION CH1 FLOW DIRECTION CH2 CALCULATED FLOW DIRECTION (Continued on next page)

Function description USER INTERFACE → INFORMATION LINE → CONFIGURATION	
ASSIGN (2600) (contd.)	**Options (contd.):** AI 1 - OUT VALUE AI 2 - OUT VALUE AI 3 - OUT VALUE AI 4 - OUT VALUE AI 5 - OUT VALUE AI 6 - OUT VALUE AI 7 - OUT VALUE AI 8 - OUT VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (remote setpoint value) 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. The channels can be displayed or hidden by means of the MEASUREMENT (6880) function.
100% VALUE (2601)	✎ Note! This function is not available unless one of the following options was selected in the ASSIGN (2600) function: • VOLUME FLOW % CH1 • VOLUME FLOW % CH2 • CALCULATED VOLUME FLOW % • VOLUME FLOW BARGRAPH % CH1 • VOLUME FLOW BARGRAPH % CH2 • CALCULATED VOLUME FLOW BARGRAPH % Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on country, [value] / [dm^3...m^3 or US-gal...US-Mgal]
FORMAT (2602)	✎ Note! This function is not available unless a numerical option was selected in the ASSIGN (2600) function. Use this function to define the maximum number of places after the decimal point displayed for the reading in the information line. **Options:** XXXXX. - XXXX.X - XXX.XX - XX.XXX -X.XXXX **Factory setting:** X.XXXX ✎ Note! • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In these instances an arrow appears on the display between the measured value and the engineering unit, (e.g. 1.2 → m^3/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

Function description USER INTERFACE → INFORMATION LINE → CONFIGURATION	
DISPLAY MODE (2603)	✎ Note! This function is not available unless one of the following options was selected in the ASSIGN (2600) function: • VOLUME FLOW BARGRAPH % CH1 • VOLUME FLOW BARGRAPH % CH2 • CALCULATED VOLUME FLOW BARGRAPH % • SIGNAL STRENGTH BARGRAPH CH1 • SIGNAL STRENGTH BARGRAPH CH2 Use this function to define the format of the bar graph. **Options:** STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign).  F-x3xxxxx-20-xx-xx-xx-000 SYMMETRY (Symmetrical bar graph for positive and negative directions of flow with –50 / 0 / +50% gradations and integrated sign).  F-x3xxxxx-20-xx-xx-xx-001 **Factory setting:** STANDARD

5.4.2 Function group: MULTIPLEX

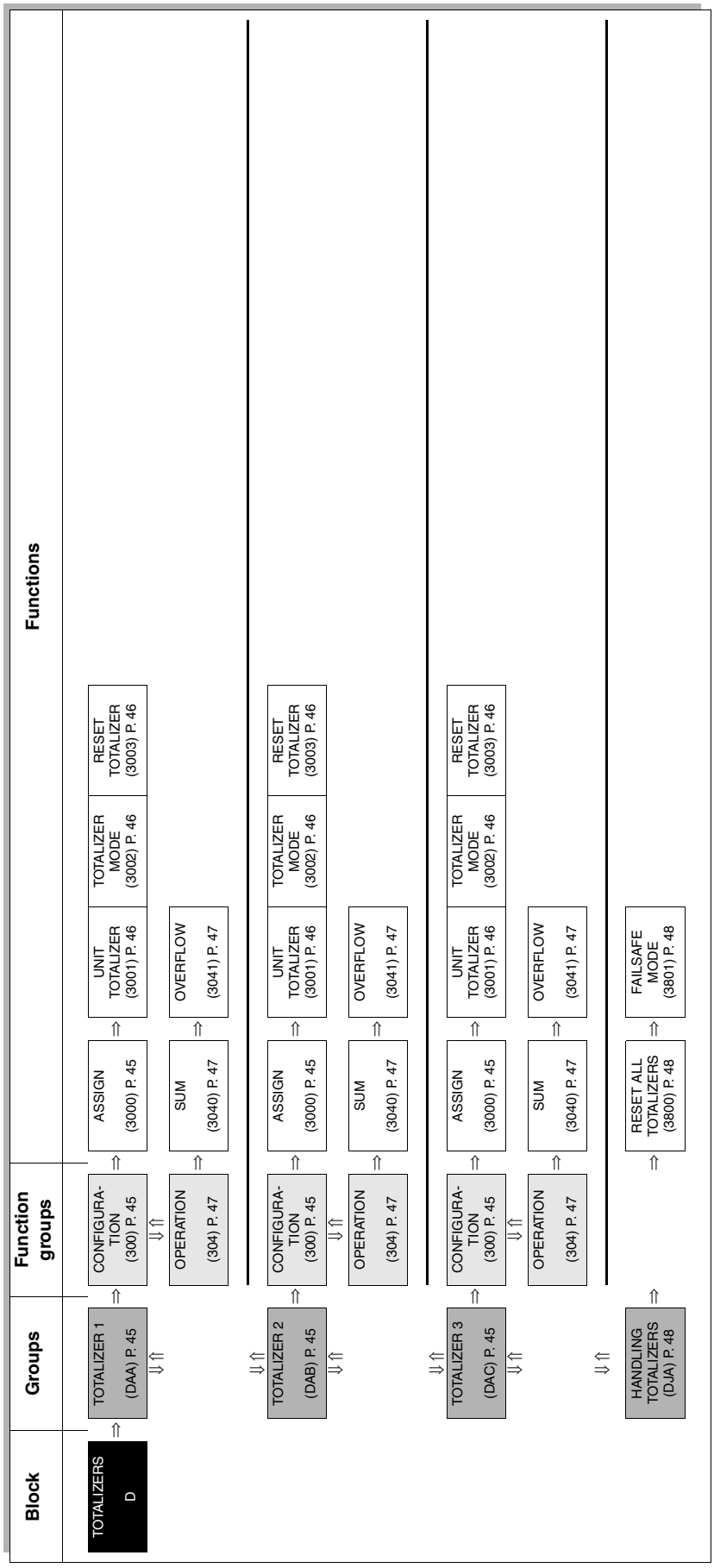


Function description USER INTERFACE → INFORMATION LINE → MULTIPLEX	
ASSIGN (2620)	Use this function to define the second reading to be displayed in the information line alternately (every 10 seconds) with the value defined in the ASSIGN (2600) function. **Options:** OFF VOLUME FLOW CH1 VOLUME FLOW CH2 CALCULATED VOLUME FLOW VOLUME FLOW % CH1 VOLUME FLOW % CH2 CALCULATED VOLUME FLOW % SOUND VELOCITY CH1 SOUND VELOCITY CH2 SOUND VELOCITY AVERAGE SIGNAL STRENGTH CH1 SIGNAL STRENGTH CH2 FLOW VELOCITY CH1 FLOW VELOCITY CH2 FLOW VELOCITY AVERAGE VOLUME FLOW BARGRAPH % CH1 VOLUME FLOW BARGRAPH % CH2 CALCULATED VOLUME FLOW BARGRAPH % SIGNAL STRENGTH BARGRAPH CH1 SIGNAL STRENGTH BARGRAPH CH2 TOTALIZER 1 TOTALIZER 2 TOTALIZER 3 OPERATING/SYSTEM CONDITIONS FLOW DIRECTION CH1 FLOW DIRECTION CH2 CALCULATED FLOW DIRECTION AI 1 - OUT VALUE AI 2 - OUT VALUE AI 3 - OUT VALUE AI 4 - OUT VALUE AI 5 - OUT VALUE AI 6 - OUT VALUE AI 7 - OUT VALUE AI 8 - OUT VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (remote setpoint value) PID - OUT VALUE (manipulated variable) DEVICE PD-TAG (tag name) **Factory setting:** OFF (Continued on next page)

Function description USER INTERFACE → INFORMATION LINE → MULTIPLEX	
Contd: **ASSIGN** **(2620)**	✎ Note! Multiplex mode is suspended as soon as a fault/notice message is generated. The appropriate error message appears on the display: • Fault message (identified by a lightning icon): 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. If a channel is not visible, it does not appear in the options. The channels can be displayed or hidden by means of the MEASUREMENT (6880) function.
100% VALUE **(2621)**	✎ Note! This function is not available unless one of the following options was selected in the ASSIGN (2620) function: • VOLUME FLOW % CH1 • VOLUME FLOW % CH2 • CALCULATED VOLUME FLOW % • VOLUME FLOW BARGRAPH % CH1 • VOLUME FLOW BARGRAPH % CH2 • CALCULATED VOLUME FLOW BARGRAPH % Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on country, [value] / [dm^3...m^3 or US-gal...US-Mgal]
FORMAT **(2622)**	✎ Note! This function is not available unless a numerical option was selected in the ASSIGN (2620) function. Use this function to define the maximum number of places after the decimal point for the second value displayed in the information line. **Options:** XXXXX. - XXXX.X - XXX.XX - XX.XXX -X.XXXX **Factory setting:** X.XXXX ✎ Note! • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In these instances an arrow appears on the display between the measured value and the engineering unit, (e.g. 1.2 → m^3/h), , indicating that the measuring system is computing with more decimal places than can be shown on the display.

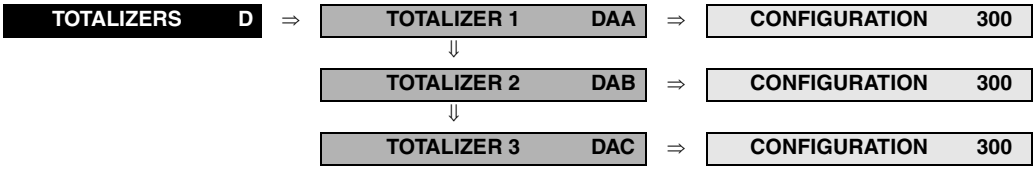
Function description USER INTERFACE → INFORMATION LINE → MULTIPLEX	
DISPLAY MODE (2623)	✎ Note! This function is not available unless one of the following options was selected in the ASSIGN (2620) function: • VOLUME FLOW BARGRAPH % CH1 • VOLUME FLOW BARGRAPH % CH2 • CALCULATED VOLUME FLOW BARGRAPH % • SIGNAL STRENGTH BARGRAPH CH1 • SIGNAL STRENGTH BARGRAPH CH2 Use this function to define the format of the bar graph. **Options:** STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign).  F-x3xxxx-20-xx-xx-xx-000 SYMMETRY (Symmetrical bar graph for positive and negative directions of flow with –50 / 0 / +50% gradations and integrated sign).  F-x3xxxx-20-xx-xx-xx-001 **Factory setting:** STANDARD

6 Block TOTALIZERS



6.1 Group TOTALIZER (1...3)

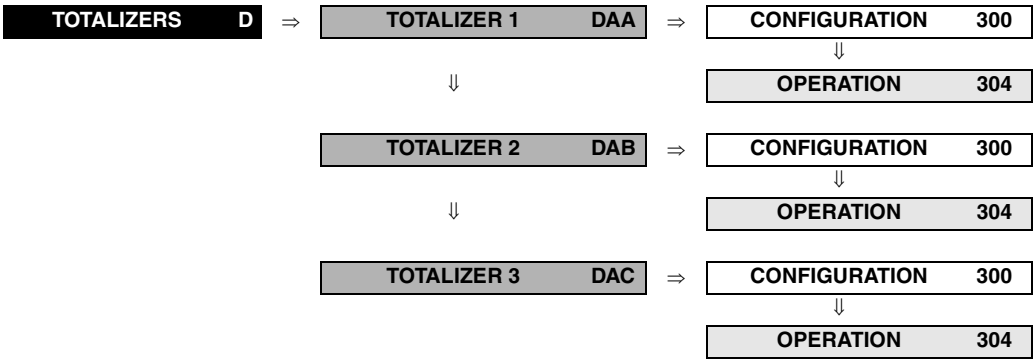
6.1.1 Function group: CONFIGURATION



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

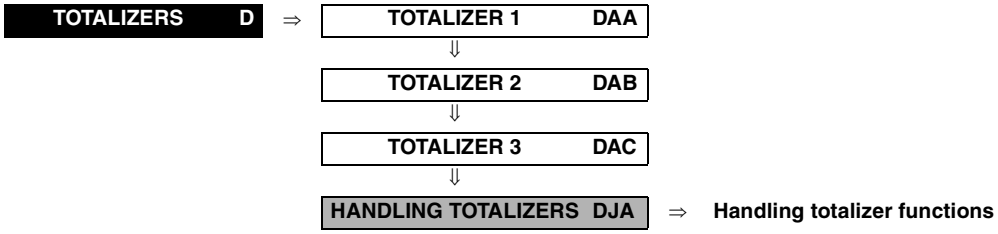
Function description TOTALIZERS → TOTALIZER (1...3) → CONFIGURATION	
UNIT TOTALIZER (3001)	Use this function to define the unit for the totalizer's measured variable, as selected beforehand. **Options:** *Metric:* Cubic centimetre → cm^3 Cubic decimetre → dm^3 Cubic metre → m^3 Millilitre → ml Litre → l Hectolitre → hl Megalitre → Ml MEGA *US:* Cubic centimetre → 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), corresponds to the totalizer unit factory setting (see Page 76 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 totalled by the totalizer. **Options:** BALANCE → Positive and negative flow components. (The positive and negative flow components are balanced. In other words, net flow in the flow direction is registered.) FORWARD → Positive flow components only. REVERSE → Negative flow components only. **Factory setting:** Totalizer 1 = BALANCE Totalizer 2 = FORWARD Totalizer 3 = REVERSE
RESET TOTALIZER (3003)	Use this function to reset the sum and the overflow of the totalizer to “0”. **Options:** NO YES **Factory setting:** NO

6.1.2 Function group: OPERATION



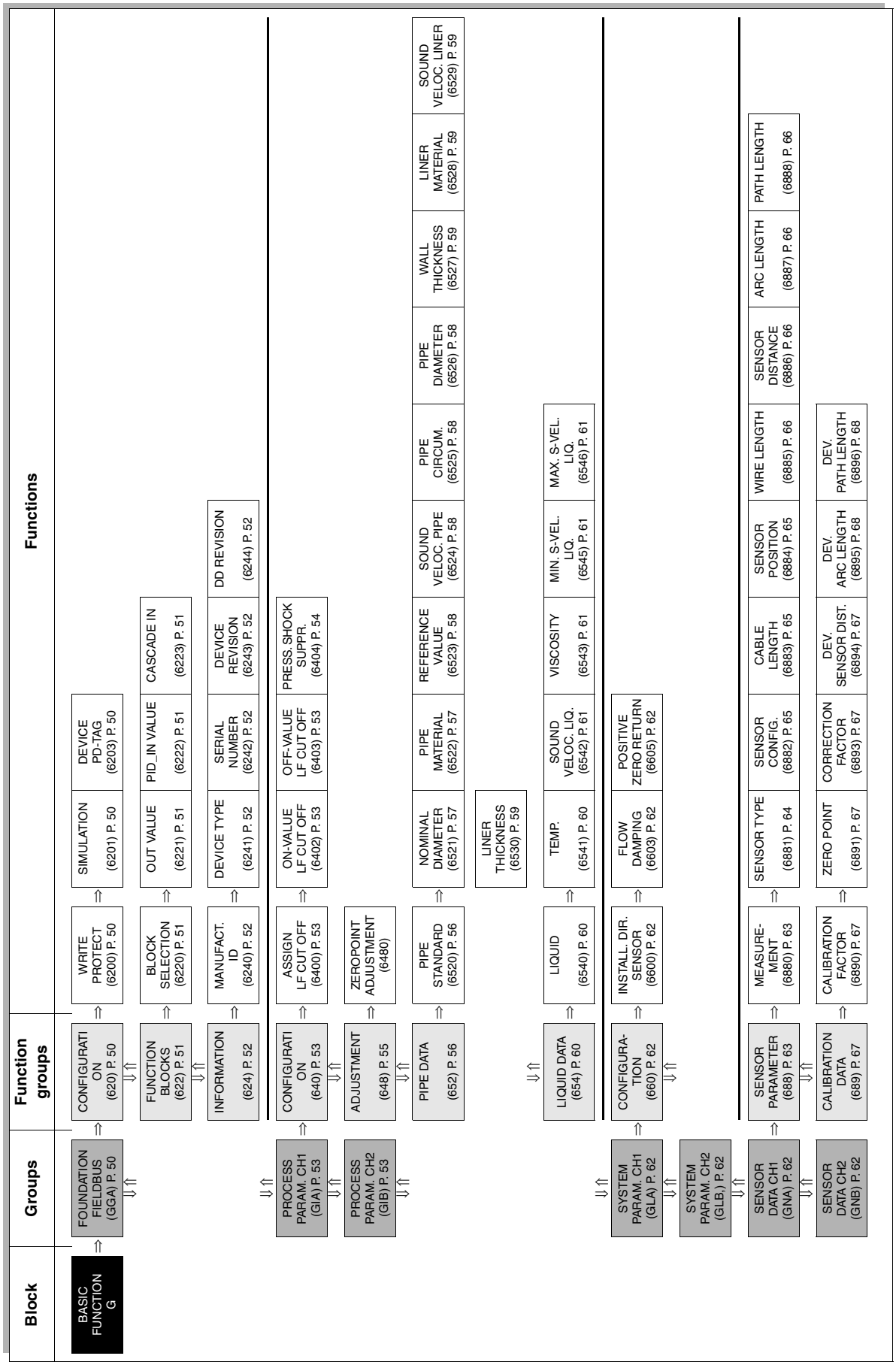
Function description TOTALIZERS → TOTALIZER (1...3) → OPERATION	
The function descriptions below apply to totalizers 1...3; the totalizers are independently configurable.	
SUM (3040)	Use this function to view the total for the totalizer's measured variable aggregated since measuring commenced. This value can be positive or negative, depending on the setting selected in the TOTALIZER MODE (3002) function and the direction of flow. **Display:** Max. 7-digit floating-point number, including sign and unit (e.g. 15467.04 m^3) ✎ Note! • The effect of the setting in the TOTALIZER MODE function (see Page 46) 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 (3801) function, (see Page 48).
OVERFLOW (3041)	Use this function to view the overflow for the totalizer in question, aggregated since measuring commenced. Total flow quantity is represented by a floating-point number consisting of max. 7 digits. You can use this function to view higher numerical values (>9,999,999) as overflows. The effective quantity is thus the total of the OVERFLOW plus the value returned by the SUM function. Example: Reading for 2 overflows: $2 \cdot 10^7$ kg (= 20,000,000 kg). The value returned by the SUM function = 196,845.7 kg Effective total quantity = 20,196,845.7 kg **Display:** Integer with exponent, including sign and unit, e.g. $2 \cdot 10^7$ kg

6.2 Group HANDLING TOTALIZERS



Function description TOTALIZERS → HANDLING TOTALIZERS → Handling totalizer functions	
RESET ALL TOTALIZERS (3800)	Use this function to reset the totals (including all overflows) of the totalizers (1...3) to “0” (= RESET). **Options:** NO YES **Factory setting:** NO
FAILSAFE MODE (3801)	Use this function to define the common response of all totalizers (1...3) to error. **Options:** STOP The totalizer is paused until the fault is rectified. ACTUAL VALUE The totalizers continue to count based on the current measured flow value. The fault is ignored. HOLD VALUE The totalizer continues to count the flow is based on the last valid flow value (before the fault occurred). **Factory setting:** STOP

7 Block BASIC FUNCTION



7.1 Group FOUNDATION FIELDBUS

7.1.1 Function group: CONFIGURATION

BASIC FUNCTION G ⇒ **FOUNDATION FIELDBUS GGA** ⇒ **CONFIGURATION 620**

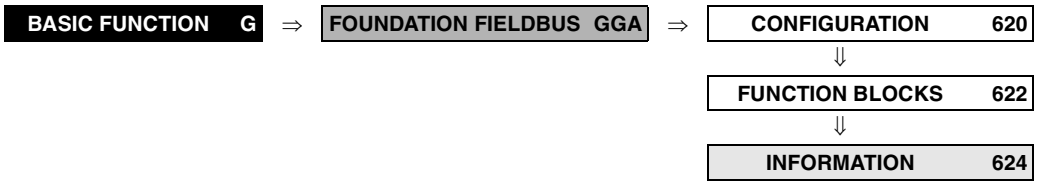
Function description BASIC FUNCTION → FOUNDATION FIELDBUS → CONFIGURATION	
WRITE PROTECT (6200)	Use this function to check whether the device parameters can be accessed via the FOUNDATION Fieldbus. **Display:** OFF Access to device parameters via FOUNDATION Fieldbus possible ON Access to device parameters via FOUNDATION Fieldbus **not** possible **Factory setting:** OFF ✎ Note! Hardware write protection is enabled and disabled by means of a jumper on the I/O board, (see also Operating Instructions for Prosonic Flow 93 FOUNDATION Fieldbus BA078D/06/en/).
SIMULATION (6201)	Use this function to check whether a simulation in the Analog Input or Discrete Output 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! • The simulation mode is activated and deactivated by means of a jumper on the I/O board, (see also Operating Instructions for Prosonic Flow 93 FOUNDATION Fieldbus BA078D/06/en/). • The status of the simulation mode is also shown in the “BLOCK_ERR” parameter of the Resource Block, (see Page 92).
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

Function description BASIC FUNCTION → FOUNDATION FIELDBUS → FUNCTION BLOCKS	
BLOCK SELECTION (6220)	Use this function to select a function block whose value and status is shown in the subsequent functions. **Options:** ANALOG INPUT 1 ANALOG INPUT 2 ANALOG INPUT 3 ANALOG INPUT 4 ANALOG INPUT 5 ANALOG INPUT 6 ANALOG INPUT 7 ANALOG INPUT 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 BLOCK SELECTION (6220) function.
PID_IN VALUE (6222)	✎ Note! This function is not available unless “PID” was selected in the BLOCK SELECTION (6220) function. **Display:** Displays the controlled variable IN, incl. unit and status, of the PID function block.
CASCADE IN (6223)	✎ Note! This function is not available unless “PID” was selected in the BLOCK SELECTION (6220) function. **Display:** Displays the analog setpoint value, incl. unit and status, taken over from an external function block.

7.1.3 Function group: INFORMATION

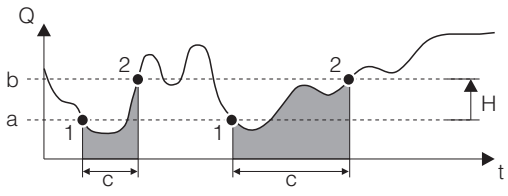


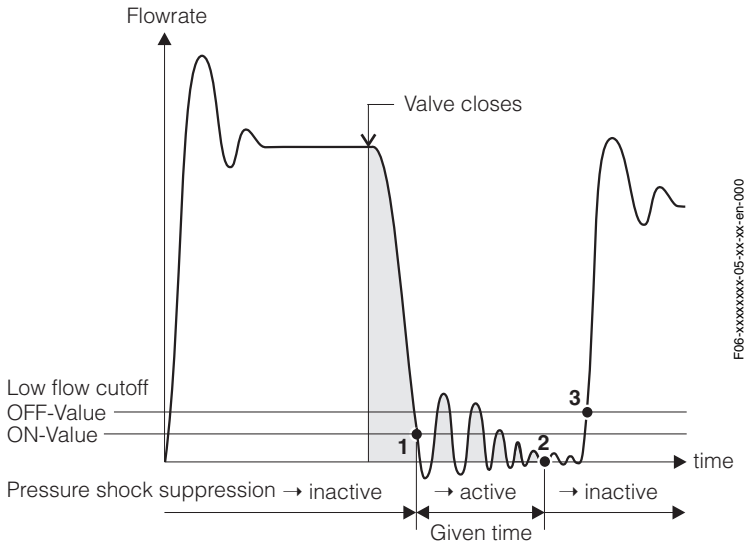
Function description BASIC FUNCTION → FOUNDATION FIELDBUS → OPERATION	
MANUFACTURER ID (6240)	Displays the manufacturer ID. **Display:** 452B48 (hex) for Endress+Hauser
DEVICE TYPE (6241)	Displays the device type. **Display:** 1059 (hex) for Prosonic Flow 93 FOUNDATION Fieldbus
SERIAL NUMBER (6242)	Displays the serial number of the device. **Display:** 11-digit designation (number, letters)
DEVICE REVISION (6243)	Displays the revision number of the device. ✎ Note! This display can be used to check whether the correct system files (DD = Device Description) are being used for linking into the host system. The system files can be downloaded free of charge from the Internet, (www.endress.com). Example: DEVICE REVISION (6243) function displays → 01 DD REVISION (6244) function displays → 01 Device description (DD) files required → 0101.sym and 0101.ffo
DD REVISION (6244)	Displays the revision number of the device description. ✎ Note! This display can be used to check whether the correct system files (DD = Device Description) are being used for linking into the host system. The system files can be downloaded free of charge from the Internet, (www.endress.com). Example: DEVICE REVISION (6243) function displays → 01 DD REVISION (6244) function displays → 01 Device description (DD) files required → 0101.sym and 0101.ffo

7.2 Group PROCESS PARAMETER (CH1...CH2)

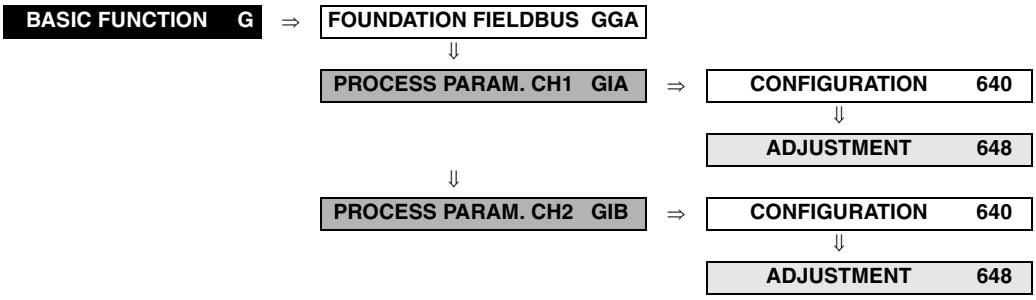
7.2.1 Function group: CONFIGURATION

BASIC FUNCTION G ⇒ **FOUNDATION FIELDBUS GGA**
⇓
PROCESS PARAM. CH1 GIA ⇒ **CONFIGURATION 640**
⇓
PROCESS PARAM. CH2 GIB ⇒ **CONFIGURATION 640**

Function description BASIC FUNCTION → PROCESS PARAMETER (CH1...CH2) → CONFIGURATION	
ASSIGN LOW FLOW CUT OFF (6400)	Use this function to assign the switching point for low flow cut off in a technical engineering unit. **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:** Depends on country, [value] / [dm³...m³ or US-gal...US-Mgal] Corresponds to the factory setting for the low flow cut off, (see Page 76 ff.). ✎ Note! The appropriate unit is taken from the UNIT VOLUME FLOW (0402) function, (see Page 15).
OFF-VALUE LOW FLOW CUT OFF (6403)	Entry of 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...100% **Factory setting:** 50% Example:  Q = Flow [volume/time] t = Time a = ON-VALUE LOW FLOW CUT OFF (6402) = 200 dm³/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 dm³/h 2 = Low flow cut off is switched off at 220 dm³/h

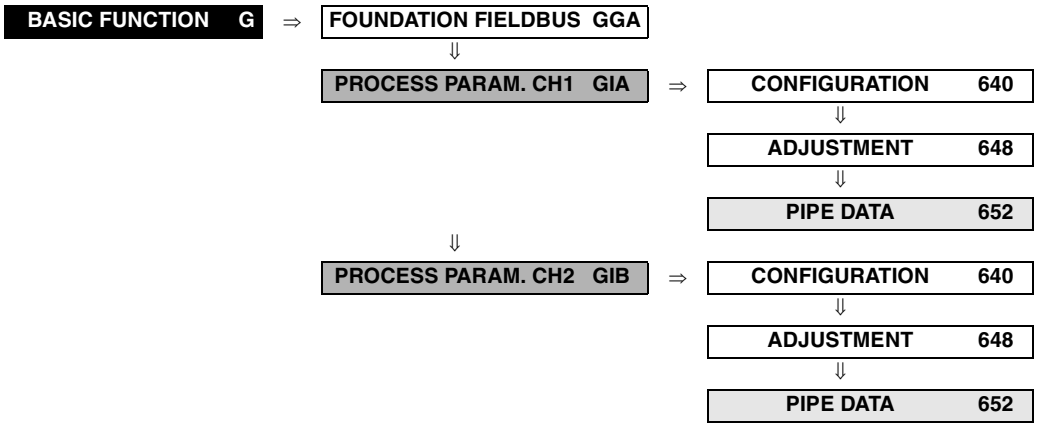
Function description BASIC FUNCTION → PROCESS PARAMETER (CH1...CH2) → CONFIGURATION	
PRESSURE SHOCK SUPPRESSION (6404)	The closure of a valve can cause brief but severe movements of the liquid in the piping system, movements which the measuring system registers. The pulses totalled in this way result 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! Pressure shock suppression cannot be used unless the low flow cut off is active, (see ON-VALUE LOW FLOW CUT OFF function on Page 53). Use this function to define the time span for active pressure shock suppression. Activation of the pressure shock suppression Pressure shock suppression is activated after the flow falls below the switch-on point of the low flow cut off, (see point **1** in graphic). While pressure shock suppression is active, the following conditions apply: • Output value OUT of the AI Blocks → Flow value “0” • Flow reading on display → 0. • Totalizer reading → The totalizers are pegged at the last valid value. Deactivation of the pressure shock suppression The pressure shock suppression is deactivated after the time interval, set in this function, has passed (see point **2** in graphic). ✎ Note! The current flow value is only processed and displayed again once the time interval for the pressure shock suppression has elapsed and the flow exceeds the switch-off point for low flow cut off, (see point **3** in graphic).  **User input:** Max. 4-digit number, incl. unit: 0.00...100.0 s **Factory setting:** 0.00 s

7.2.2 Function group: ADJUSTMENT



Function description BASIC FUNCTION → PROCESS PARAMETER (CH1...CH2) → ADJUSTMENT	
ZEROPOINT ADJUSTMENT (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, (see Page 67). **User input:** CANCEL START **Factory setting:** CANCEL Caution! Before carrying this out, please refer to the Operating Instructions for Prosonic Flow 93 FOUNDATION Fieldbus (BA078D/06/en), for a detailed description of the procedure for zero point adjustment. Note! • Programming is locked during zero point adjustment The message “ZERO ADJUST RUNNING” appears on the display. • If the zero point adjustment is not possible (e.g. if v > 0.1 m/s) or has been cancelled, the alarm “ZERO ADJUST NOT POSSIBLE” appears on the display. This error is relayed to downstream function blocks or higher-level process control systems via the FOUNDATION Fieldbus by means of the status “UNCERTAIN” for the output value OUT (AI Block).

7.2.3 Function group: PIPE DATA



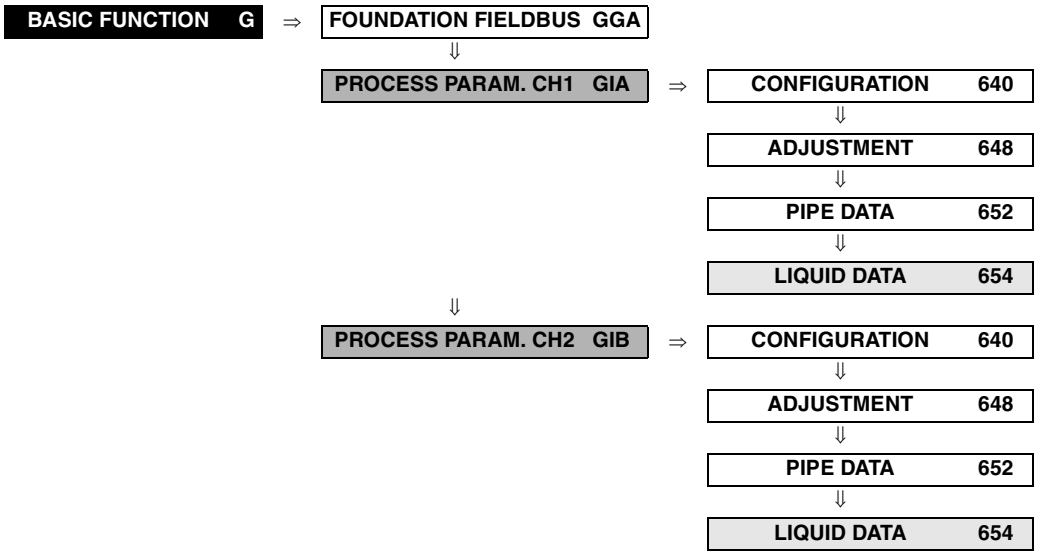
Function description BASIC FUNCTION → PROCESS PARAMETER (CH1...CH2) → PIPE DATA	
PIPE STANDARD (6520)	Use this function to select a standard pipe. **Options:** OTHERS DIN PN10 DIN PN16 DIN 28610 DIN 28614 DIN 28615 DIN 28619 ANSI SCHEDULE 40 ANSI SCHEDULE 80 AWWA CLASS 50 AWWA CLASS 53 AWWA CLASS 55 **Factory setting:** DIN PN10

Function description BASIC FUNCTION → PROCESS PARAMETER (CH1...CH2) → PIPE DATA	
NOMINAL DIAMETER (6521)	Use this function to select the nominal diameter of the pipe. **Options:** OTHERS DN 25/1" DN 40/1½" DN 50/2" DN 80/3" DN 100/4" DN 150/6" DN 200/8" DN 250/10" DN 300/12" DN 400/16" DN 450/18" DN 500/20" DN 600/24" DN 700/28" DN 750/30" DN 800/32" DN 900/36" DN 1000/40" DN 1200/48" DN 1400/54" DN 1500/60" DN 1600/64" DN 1800/72" DN 2000/80" **Factory setting:** DN 80/3"
PIPE MATERIAL (6522)	Use this function to select the pipe material. **Options:** CARBON STEEL CAST IRON STAINLESS STEEL SS ANSI 304 SS ANSI 316 SS ANSI 347 SS ANSI 410 SS ANSI 430 HASTELLOY C PVC PE LDPE HDPE GRP PVDF PA PP PTFE GLASS PYREX ASBESTOS CEMENT OTHERS **Factory setting:** STAINLESS STEEL

Function description BASIC FUNCTION → PROCESS PARAMETER (CH1...CH2) → PIPE DATA	
REFERENCE VALUE (6523)	✎ Note! This function does not appear unless “SOUND VELOCITY PIPE” was selected in the MEASUREMENT function (6880, Page 63). Use this function to enter the thickness of the reference component (e.g. flange) as the basis for measuring the sound velocity of the pipe. **User input:** 5-digit floating-point number, [unit] **Factory setting:** 5 mm
SOUND VELOCITY PIPE (6524)	Use this function to enter the sound velocity in the pipe. **Measuring the sound velocity in the pipe** If the sound velocity in the pipe is not known, it can be measured. To do so, “SOUND VELOCITY PIPE” must be set in the MEASUREMENT function (6880, Page 63). The sound velocity in the pipe is measured by calling up the SOUND VELOCITY PIPE (6524) function. The measured sound velocity, the signal strength and a bar graph appear on the local display. The measurement is valid if 100% is achieved in the bar graph. If you confirm the function with the E key, the SAVE prompt appears. To accept the measured sound velocity, select the option “YES” by means of the + or − key. ✎ Note! A reference value is used as a basis for measuring the sound velocity. This reference value can be edited, (see Page 58). **User input:** Fixed-point number 800...6500 m/s **Factory setting:** 3120 m/s
PIPE CIRCUMFERENCE (6525)	Use this function to enter the circumference of the pipe. **User input:** Fixed-point number 31.4...15708.0 mm **Factory setting:** 279.3 mm
PIPE DIAMETER (6526)	Use this function to enter the diameter of the pipe. **User input:** Fixed-point number 10.0...5000.0 mm **Factory setting:** 88.9 mm

Function description BASIC FUNCTION → PROCESS PARAMETER (CH1...CH2) → PIPE DATA	
WALL THICKNESS (6527)	Use this function to enter the thickness of the pipe walls. **Measuring the wall thickness** If the wall thickness is not known, it can be measured. To do so, "WALL THICKNESS" must be set in the MEASUREMENT function (6880, Page 63). The wall thickness is measured by calling up the WALL THICKNESS (6527) function. The measured wall thickness, the signal strength and a bar graph appear on the local display. The measurement is valid if 100% is achieved in the bar graph. If you confirm the function with the E key, the SAVE prompt appears. To accept the measured wall thickness, select the option "YES" by means of the + or - key. **User input:** Fixed-point number 0.1...100.0 mm **Factory setting:** 3.2 mm
LINER MATERIAL (6528)	Use this function to select the liner material of the pipe. **Options:** NO LINER MORTAR RUBBER TAR EPOXY OTHERS **Factory setting:** NO LINER
SOUND VELOCITY LINER (6529)	✎ Note! This function does not appear unless a liner was selected in the LINER MATERIAL (6528) function. Use this function to enter the sound velocity of the liner. **User input:** Fixed-point number 800...6500 m/s **Factory setting:** Depends on the setting selected in the LINER MATERIAL (6528) function
LINER THICKNESS (6530)	✎ Note! This function does not appear unless a liner was selected in the LINER MATERIAL (6528) function. Use this function to enter the thickness of the liner. **User input:** Fixed-point number 0.1...100.0 mm **Factory setting:** 0 mm

7.2.4 Function group: LIQUID DATA

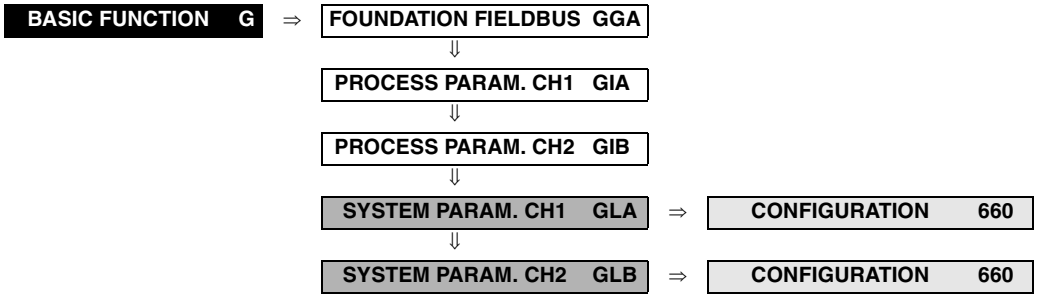


Function description BASIC FUNCTION → PROCESS PARAMETER (CH1...CH2) → LIQUID DATA	
LIQUID **(6540)**	Use this function to select the liquid in the pipe. **Options:** WATER SEA WATER DISTILLED WATER AMMONIA ALCOHOL BENZENE BROMIDE ETHANOL GLYCOL KEROSENE MILK METHANOL TOLUOL LUBE OIL FUEL OIL PETROL OTHERS **Factory setting:** WATER
TEMPERATURE **(6541)**	Use this function to enter the temperature of the liquid. **User input:** Fixed-point number -273.15...726.85 °C (0...1000 K) **Factory setting:** 20 °C

Function description BASIC FUNCTION → PROCESS PARAMETER (CH1...CH2) → LIQUID DATA	
SOUND VELOCITY LIQUID (6542)	Use this function to enter the sound velocity of the liquid. **Measuring the sound velocity of the liquid** If the sound velocity of the liquid is not known, it can be measured. To do so, "SOUND VELOCITY LIQUID" must be set in the MEASUREMENT function (6880, Page 63). The sound velocity of the liquid is measured by calling up the SOUND VELOCITY LIQUID (6542) function. The measured sound velocity appears on the local display. If you confirm the function with the E key, the SAVE prompt appears. To accept the measured sound velocity, select the option "YES" by means of the + or - key. **User input:** Fixed-point number 400...3000 m/s **Factory setting:** 1487 m/s
VISCOSITY (6543)	Use this function to enter the viscosity of the liquid. **User input:** Fixed-point number 0.0...5000.0 mm^2/s **Factory setting:** 1 mm^2/s
MINIMUM SOUND VELOCITY LIQUID (6545)	Use this function to enter the minimum sound velocity of the liquid. **User input:** Fixed-point number 400...3000 m/s **Factory setting:** 800 m/s
MAXIMUM SOUND VELOCITY LIQUID (6546)	Use this function to enter the maximum sound velocity of the liquid. **User input:** Fixed-point number 400...3000 m/s **Factory setting:** 1800 m/s

7.3 Group SYSTEM PARAMETER (CH1...CH2)

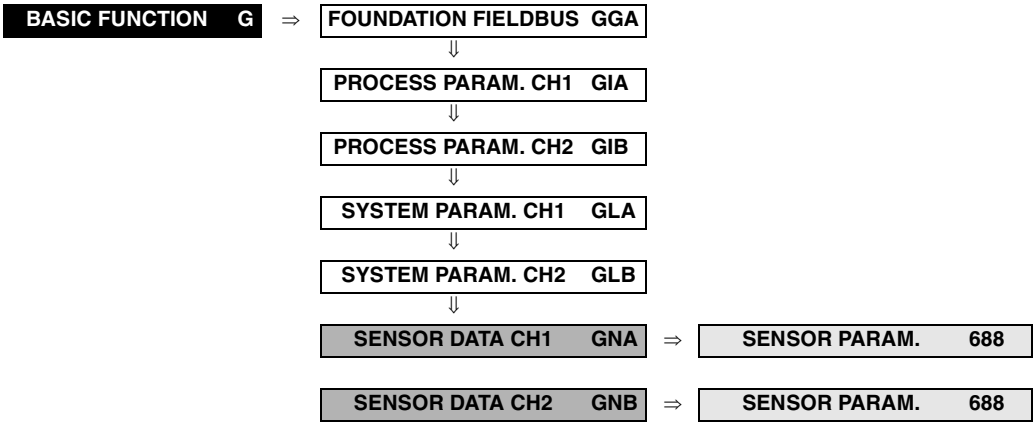
7.3.1 Function group: CONFIGURATION



Function description BASIC FUNCTION → SYSTEM PARAMETER CH1 → CONFIGURATION	
INSTALLATION DIRECTION SENSOR (6600)	Use this function to reverse the sign of the flow rate variable, if necessary. **Options:** NORMAL (flow as indicated by the arrow) INVERSE (flow opposite to direction indicated by the arrow) **Factory setting:** NORMAL
FLOW DAMPING (6603)	✎ Note! The damping acts on all instrument 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 measuring system reaction time increases with the filter setting. **User input:** 0 ...100 s **Factory setting:** 0 s
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. The selection only has an effect on the volume flow and the totalizer as well as the corresponding instrument functions and outputs of the FOUNDATION Fieldbus interface. **Options:** OFF ON → The flow value is set to “0”. **Factory setting:** OFF ✎ Note! An active positive zero return is relayed to downstream function blocks or higher-level process control systems via the FOUNDATION Fieldbus by means of the status “UNCERTAIN” for the output value OUT (AI Block).

7.4 Group SENSOR DATA (CH1...CH2)

7.4.1 Function group: SENSOR PARAMETER



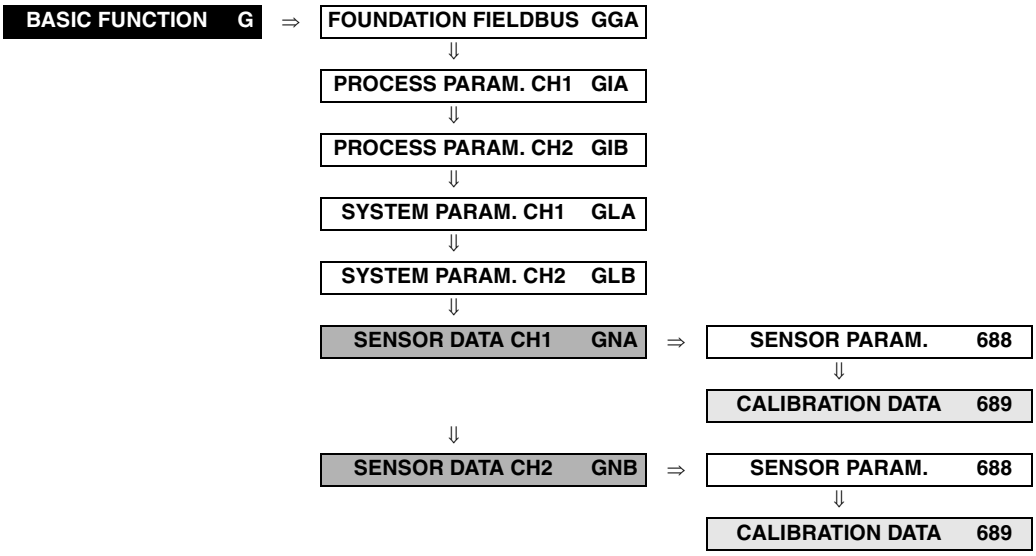
Function description BASIC FUNCTION → SENSOR DATA (CH1...CH2) → SENSOR PARAMETER	
MEASUREMENT (6880)	**Options:** OFF CLAMP ON INSERTION SOUND VELOCITY LIQUID SOUND VELOCITY PIPE WALL THICKNESS **Factory setting for channel 1:** CLAMP ON **Factory setting for channel 2:** OFF

Function description BASIC FUNCTION → SENSOR DATA (CH1...CH2) → SENSOR PARAMETER	
SENSOR TYPE (6881)	✎ Note! This function is only available if “OFF” was not selected in the MEASUREMENT function (6880, see Page 63). Use this function to select a sensor type. The options in this function depend on the measurement method selected in the MEASUREMENT function (6880, see Page 63). **Options:** (if “CLAMP ON” was selected in the MEASUREMENT function) W-CL-05F-L-B W-CL-1F-L-B W-CL-2F-L-B P-CL-05F-L-B P-CL-1F-L-B P-CL-2F-L-B P-CL-05F-M-B P-CL-1F-M-B P-CL-2F-M-B U-CL-2F-L-A **Options:** (if “INSERTION” was selected in the MEASUREMENT function) W-IN-1F-L-B **Options:** (if “SOUND VELOCITY LIQUID” was selected in the MEASUREMENT function) P-CL-1S-L-B P-CL-1S-M-B **Options:** (if “SOUND VELOCITY PIPE” or “WALL THICKNESS” was selected in the MEASUREMENT function) P-CL-4W-L-B **Factory setting:** W-CL-2F-L-B

Function description BASIC FUNCTION → SENSOR DATA (CH1...CH2) → SENSOR PARAMETER	
SENSOR CONFIGURATION (6882)	✎ Note! This function is not available unless one of the following options was selected in the MEASUREMENT function (6880): • CLAMP ON • SOUND VELOCITY LIQUID • INSERTION Use this function to select the configuration for the ultrasonic sensors, e.g. the number of traverses (in the Clamp On version) or whether single-path or dual-path configuration is present (in the Insertion version). The options in this function depend on the measurement method selected in the MEASUREMENT function (6880, see Page 63). **Options:** (if "CLAMP ON" was selected in the MEASUREMENT function) NO. TRAVERSE: 1 NO. TRAVERSE: 2 NO. TRAVERSE: 3 NO. TRAVERSE: 4 **Options:** (if "SOUND VELOCITY LIQUID" was selected in the MEASUREMENT function) NO. TRAVERSE: 1 NO. TRAVERSE: 3 **Options:** (if "INSERTION" was selected in the MEASUREMENT function) SINGLE PATH DUAL PATH **Factory setting:** NO. TRAVERSE: 2
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:** LENGTH 5m/15 feet
SENSOR POSITION (6884)	✎ Note! This function is not available unless "CLAMP ON" is set in the MEASUREMENT function (6880, see Page 63), and the number of traverses selected in the SENSOR CONFIGURATION function (6882) is 2 or 4. Use this function to view the position of both sensors on the rail. **Display:** 5-digit number combination

Function description BASIC FUNCTION → SENSOR DATA (CH1...CH2) → SENSOR PARAMETER	
WIRE LENGTH (6885)	✎ Note! This function is not available unless “CLAMP ON” is set in the MEASUREMENT function (6880, see Page 63), and the number of traverses selected in the SENSOR CONFIGURATION function (6882, see Page 65) is 1 or 3. Displays the wire length for mounting the sensors at the correct distance. **Display:** Max. 5-digit number, including unit (e.g. 200 mm)
SENSOR DISTANCE (6886)	Displays the distance between sensor 1 and sensor 2 as a length measurement. **Display:** Max. 5-digit number, including unit (e.g. 200 mm)
ARC LENGTH (6887)	✎ Note! This function is not available unless “INSERTION” is set in the MEASUREMENT function (6880, see Page 63), and “DUAL PATH” was selected in the SENSOR CONFIGURATION function (6882, see Page 65). Displays the arc length on the pipe. **Display:** Max. 5-digit number, including unit (e.g. 200 mm)
PATH LENGTH (6888)	✎ Note! This function is not available unless “INSERTION” is selected in the MEASUREMENT function (6880, see Page 63). Displays the path length. **Display:** Max. 5-digit number, including unit (e.g. 200 mm)

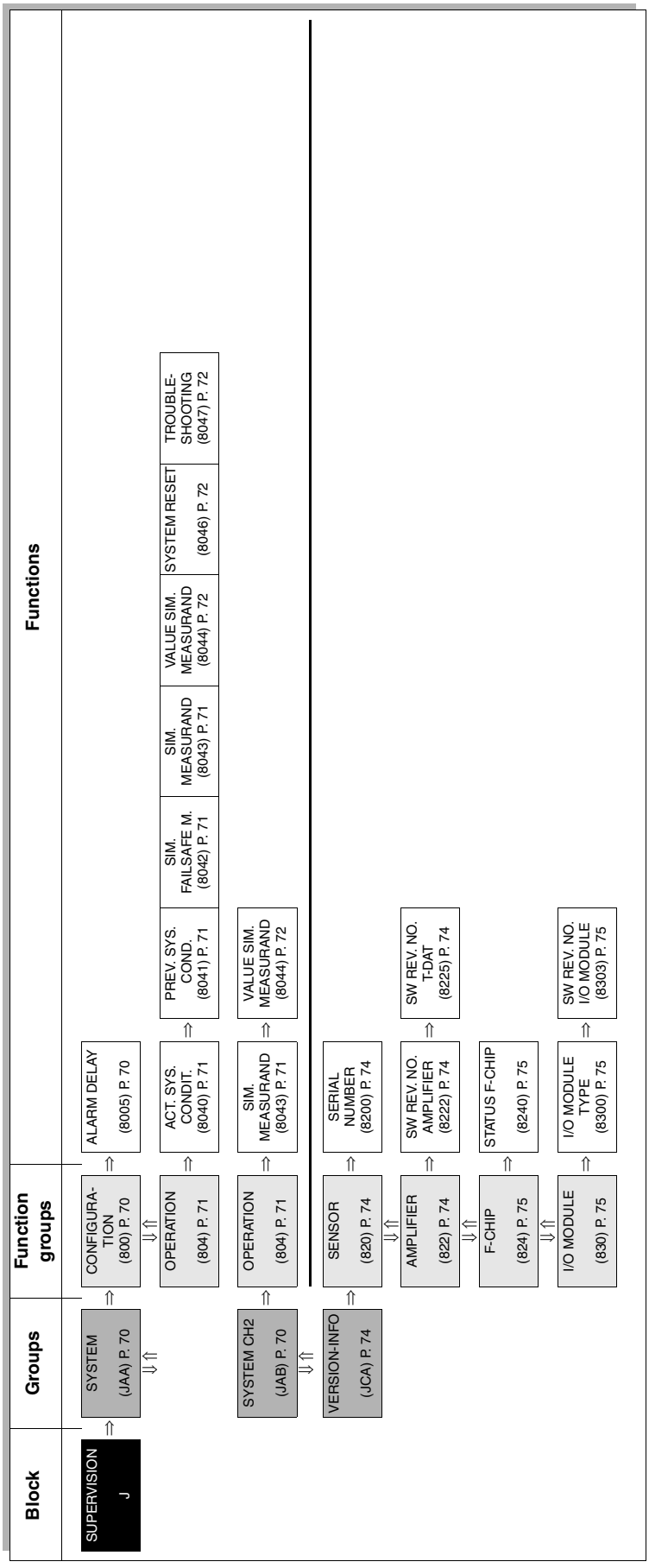
7.4.2 Function group: CALIBRATION DATA



Function description BASIC FUNCTION → SENSOR DATA (CH1...CH2) → CALIBRATION DATA	
CALIBRATION FACTOR (6890)	Displays the current calibration factor for the sensors.
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)
DEVIATION SENSOR DISTANCE (6894)	✎ Note! This function is not available unless “INSERTION” is selected in the MEASUREMENT function (6880, see Page 63). Use this function to enter a deviation value for the sensor distance. **User input:** 5-digit floating-point number, including unit and sign (e.g. +2.0000 mm) **Factory setting:** 0 mm

Function description BASIC FUNCTION → SENSOR DATA (CH1...CH2) → CALIBRATION DATA	
DEVIATION ARC LENGTH (6895)	✎ Note! This function is not available unless “INSERTION” is set in the MEASUREMENT function (6880, see Page 63) and “DUAL PATH” was selected in the SENSOR CONFIGURATION function (6882, see Page 65). Use this function to enter a deviation value for the arc length. **User input:** 5-digit floating-point number, including unit and sign (e.g. +2.0000 mm) **Factory setting:** 0 mm
DEVIATION PATH LENGTH (6896)	✎ Note! This function is not available unless “INSERTION” is selected in the MEASUREMENT function (6880, see Page 63). Use this function to enter a deviation value for the path length. **User input:** 5-digit floating-point number, including unit and sign (e.g. +2.0000 mm) **Factory setting:** 0 mm

8 Block SUPERVISION



8.1 Group SYSTEM

8.1.1 Function group: CONFIGURATION

SUPERVISION J ⇒ SYSTEM JAA ⇒ CONFIGURATION 800

Function description SUPERVISION → SYSTEM → CONFIGURATION	
ALARM DELAY (8005)	Use this function to specify a time period for suppressing the appearance of fault or notice messages. Depending on the setting and the type of fault, this suppression acts on: • Display • Output values (AI Blocks) FF interface **User input:** 0...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-level controller (process controller, etc.). It is therefore imperative to check in advance whether a delay of this nature could affect the safety requirements of the process. If fault and notice messages may not be suppressed, a value of 0 seconds must be entered here.

8.1.2 Function group: OPERATION

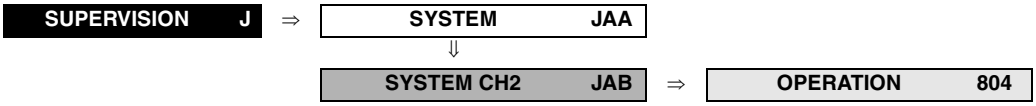
SUPERVISION J ⇒ SYSTEM JAA ⇒ CONFIGURATION 800
⇓
OPERATION 804

Function description SUPERVISION → SYSTEM → OPERATION	
CURRENT SYSTEM CONDITION (8040)	Use this function to check the current system condition. ✎ Note! All error messages are described in detail in the Operating Instructions for PROline Prosonic Flow 93 FOUNDATION Fieldbus, BA 078D/06/en. **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 fault and notice messages since measuring last started. **Display:** The last 15 fault/notice messages appear on the display.
SIMULATION FAILSAFE MODE (8042)	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! Active simulation is relayed to downstream function blocks or higher-level process control systems via the FOUNDATION Fieldbus by means of the status "UNCERTAIN" for the output value OUT (AI Block).
SIMULATION MEASURAND (8043)	Use this function to activate the simulation of a measured variable. The simulation value is determined in the VALUE SIMULATION MEASURAND (8044) function. When simulation is active, the message "SIMULATION MEASURAND" appears on the local display. **Options:** OFF VOLUME FLOW CH1 SOUND VELOCITY CH1 **Factory setting:** OFF ☝ Caution! • The measuring device cannot be used for measuring while this simulation is in progress. • The setting is not saved if the power supply fails. ✎ Note! • Active simulation is relayed to downstream function blocks or higher-level process control systems via the FOUNDATION Fieldbus by means of the status "UNCERTAIN" for the output value OUT (AI Block). • The simulation is **independent** of the position of the jumper for the simulation mode on the I/O board.

Function description SUPERVISION → SYSTEM → OPERATION	
VALUE SIMULATION MEASURAND (8044)	✎ Note! This function is not displayed unless the SIMULATION MEASURAND (8043) function is active. Use this function to specify a selectable value, (e.g. 12 m^3/s). This is used to test the associated functions in the flowmeter 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 if the power supply fails. • The appropriate unit is taken from the SYSTEM UNITS function group, (ACA, see Page 15).
SYSTEM RESET (8046)	Use this function to perform a reset of the measuring system. **Options:** NO RESTART SYSTEM (restart without interrupting power supply) **Factory setting:** NO
TROUBLESHOOTING (8047)	Use this function to rectify errors in the EEPROM. The EEPROM is divided into a number of blocks. Only blocks in which a fault has occurred are shown. For fault elimination, select the block in question and acknowledge by pressing the E key. ☝ Caution! When you clear an error in a block, the parameters of the block you select are reset to their factory settings. **Options:** CANCEL "Faulty block"

8.2 Group SYSTEM CH2

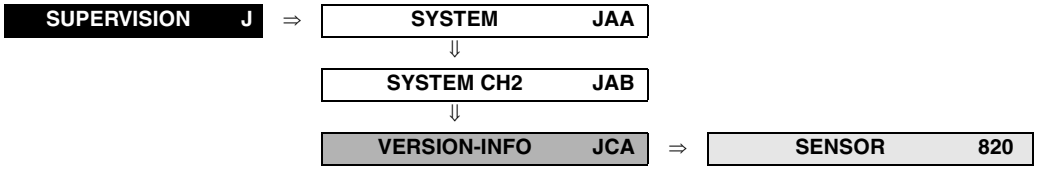
8.2.1 Function group: OPERATION



Function description SUPERVISION → SYSTEM CH2 → OPERATION	
SIMULATION MEASURAND (8043)	Use this function to activate the simulation of a measured variable. The simulation value is determined in the VALUE SIMULATION MEASURAND (8044) function. When simulation is active, the message “SIMULATION MEASURAND” appears on the local display. **Options:** OFF VOLUME FLOW CH2 SOUND VELOCITY CH2 **Factory setting:** OFF Caution! • The measuring device cannot be used for measuring while this simulation is in progress. • The setting is not saved if the power supply fails. Note! • Active simulation is relayed to downstream function blocks or higher-level process control systems via the FOUNDATION Fieldbus by means of the status “UNCERTAIN” for the output value OUT (AI Block). • 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 not displayed unless the SIMULATION MEASURAND (8043) function is active. Use this function to specify a selectable value, (e.g. 12 m^3/s). This is used to test the associated functions in the flowmeter 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 if the power supply fails. • The appropriate unit is taken from the SYSTEM UNITS function group, (ACA, see Page 15).

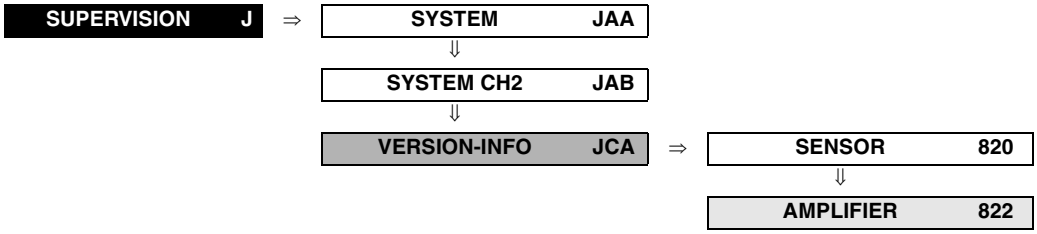
8.3 Group VERSION-INFO

8.3.1 Function group: SENSOR



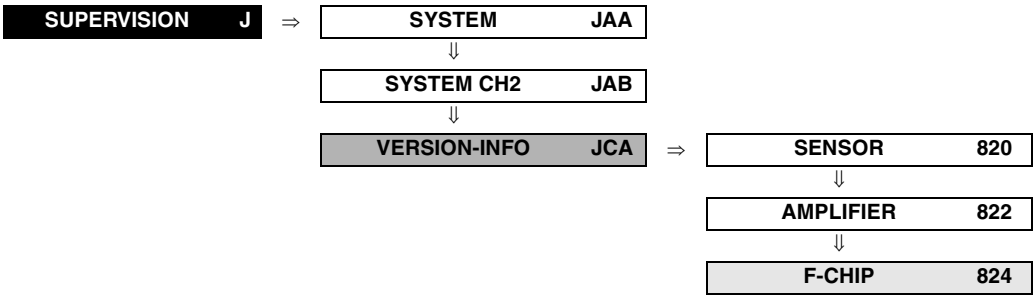
Function description SUPERVISION → VERSION-INFO → SENSOR	
SERIAL NUMBER (8200)	Displays the serial number of the sensor.

8.3.2 Function group: AMPLIFIER



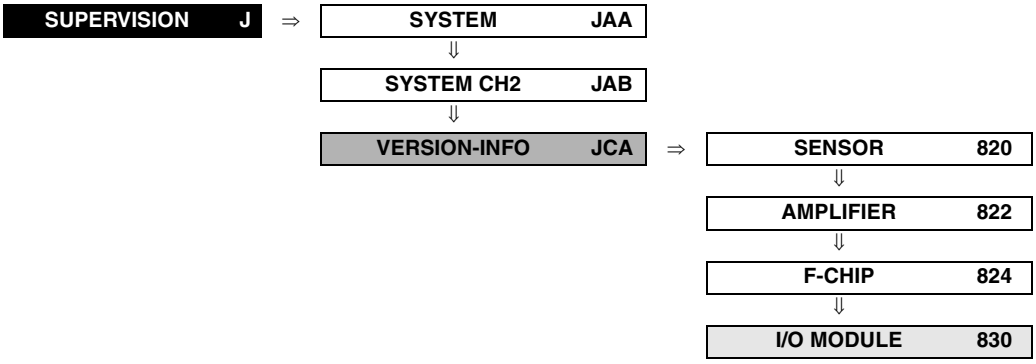
Function description SUPERVISION → VERSION-INFO → AMPLIFIER	
SOFTWARE REVISION NUMBER AMPLIFIER (8222)	Displays the software revision number of the amplifier.
SOFTWARE REVISION NUMBER T-DAT (8225)	Displays the software revision number of the software used to create the content of the T-DAT.

8.3.3 Function group: F-CHIP



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

8.3.4 Function group: I/O MODULE



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

9 Factory settings

9.1 SI units (not for USA and Canada)

9.1.1 Low flow cut off, totalizer

Nominal diameter		Low flow cut off / flow unit		Totalizer unit
[mm]	[inch]	(approx. v = 0.04 m/s)	Volume	Volume
80	3"	12	dm^3/min	dm^3

9.1.2 Language

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

9.1.3 Length, temperature

	Unit
Length	mm
Temperature	°C

9.2 US units (only for USA and Canada)

9.2.1 Low flow cut off, totalizer

Nominal diameter		Low flow cut off / flow unit		Totalizer unit
[inch]	[mm]	(approx. v = 0.04 m/s)	Volume	Volume
3"	80	2.5	gal/min	gal

9.2.2 Language, length, temperature

	Unit
Language	English
Length	Inch
Temperature	°F

10 Index (function matrix)

11 Index (local operation)

Contents (FOUNDATION Fieldbus)

1 Operation via FOUNDATION Fieldbus

1.1 Block model

In the FOUNDATION Fieldbus all the device parameters are categorised 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 (device block)
  The Resource Block contains all the device-specific characteristics of the device.

- One or several Transducer Blocks (transmission block)
  The Transducer Block contains all the measuring and device-specific parameters of the device. The measuring 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 realised depending on the arrangement and connection of the individual function blocks. A field device may comprise further function blocks e.g. several Analog Input function blocks if more than one process variable is available from the field device.

Prosonic Flow 93 FOUNDATION Fieldbus has the following blocks:
- One Resource Block, see Page 89
- Six Transducer Blocks, see Page 100.
- Ten function blocks consisting of:
  – Eight Analog Input function blocks, see Page 167.
  – One Discrete Output, see Page 184.
  – One PID function block (PID controller), see Page 197.

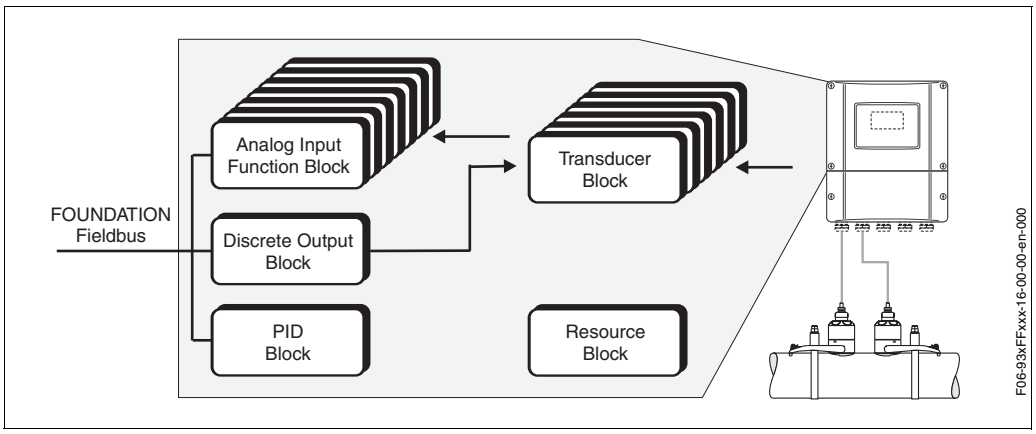


Fig. 1: PROline Prosonic Flow 93 FOUNDATION Fieldbus block model

The sensor signal is first prepared in the measuring block, namely the Transducer Block “TRANSDUCER_ CH1” (base index 1200, flow channel 1) or “TRANSDUCER_ CH2” (base index 1300, flow channel 2).
The process variables are then passed to the Analog Input function blocks for technical processing, (e.g. scaling, limit value processing).

The totalizer values 1 – 3 are derived from the volume flow measured variable in the Transducer Block “TRANSDUCER_ TOT” (base index 1550, totalizer).
These are then also available as process variables at the Transducer Block output.

All the important parameters for configuring the local display, (e.g. UI language, display values etc.), can be configured via the Transducer Block “TRANSDUCER_ DISP” (base index 1500, display).

The Transducer Block “TRANSDUCER_ DIAG” (base index 1600, diagnosis) contains all the important parameters for diagnosis and device maintenance which can be used to call up the device status or reasons for error messages, for example.

The Transducer Block “TRANSDUCER_ SERV” (base index 1650, service) contains all the parameters required for servicing. As these parameters affect the accuracy and functionality of the device, changes may only be made by E+H service technicians.

The process variables go through the complete algorithm of the Analog Input function block and are available to other function blocks, e.g. the PID Block, as an output value for connecting the desired application function.

By means of the Discrete Output function block (DO), various actions and functions in PROline Prosonic Flow 93 FOUNDATION Fieldbus can be initiated or controlled via the FOUNDATION Fieldbus, such as resetting the totalizers, for example.

2 Resource Block

A Resource Block contains all the data which uniquely identify and characterise 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 parameters available from Page 89 onwards.

2.1 Selecting the operating mode

The operating mode is set by means of the MODE_BLK parameter group, (see Page 95). The Resource Block supports the following operating modes:

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

Note!
The OOS operating mode is also displayed via the BLOCK_ERR parameter, (see Page 92). In the OOS operating mode, you can access all the write parameters without restriction if write protection is not enabled, (see Page 90).

2.2 Block status

The current operating status of the Resource Block is displayed in the RS_STATE parameter, (see Page 96).

The Resource Block can take on the following states:

- STANDBY — The Resource Block is in the OOS operating mode. Execution of the remaining blocks is not possible.
- 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 (automatic) operating mode. The configured connections between the function blocks have been made.

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 enabled or disabled via jumpers on the FOUNDATION Fieldbus I/O board, (see Operating Instructions for PROline Prosonic Flow 93 FOUNDATION Fieldbus, BA078D/06/en, Section 5.4).

The WRITE_LOCK parameter (see Page 98) shows the status of the hardware write protection. The following statuses are possible:

– LOCKED = Device data **cannot** be modified via the FOUNDATION Fieldbus.

– NOT LOCKED = Device data can be modified via the FOUNDATION Fieldbus.

The BLOCK_ERR parameter (see Page 92) indicates whether a simulation is possible in the Analog Input and Discrete Output function block.

– SIMULATION ACTVE = Simulation possible via the SIMULATE parameter in the Analog Input function block and via the SIMULATE_D parameter in the Discrete Output function block.

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 BLOCK_ALM parameter, (see Page 91). The ACK_OPTION parameter (see Page 91) 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 BLOCK_ALM parameter, (see Page 91):

– OUT OF SERVICE

– SIMULATION ACTVE

Write protection process alarm
If write protection is disabled on the FOUNDATION Fieldbus I/O board, the alarm priority specified in the WRITE_PRI parameter (see Page 98) is checked prior to communicating the change of status to the fieldbus host system. The alarm priority specifies the action taken in the event of an active write protection alarm WRITE_ALM (see Page 97).

Note!
- If the option of a process alarm has **not** been enabled in the ACK_OPTION parameter (see Page 91) this process alarm must only be acknowledged in the BLOCK_ALM parameter (see Page 91).

- The ALARM_SUM parameter (see Page 91) shows the current status of all the process alarms.

2.5 Resource Block parameters

The following table lists both the FOUNDATION Fieldbus parameters and the Endress+Hauser-specific parameters, (from Page 99), of the Resource Block:

Resource Block / base index 258		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
FOUNDATION Fieldbus parameters		
ACK_OPTION	**AUTO - OOS**	This parameter is used to specify whether a process alarm must be acknowledged at the time of alarm detection by the fieldbus host system. If this option is enabled the process alarm is acknowledged automatically. **Options:** DISC ALM Write protection no longer exists and thus the data can be accessed. BLOCK ALM Block alarm **Factory setting:** The option is not enabled for any alarm, the alarms must be acknowledged.
ALARM_SUM	**AUTO - OOS**	Displays the current status of the process alarms in the Resource Block. **Display:** DISC ALM Write protection no longer exists and thus the data can be accessed. BLOCK ALM Block alarm ✎ Note! In addition, the process alarms can also be disabled in this parameter group.
ALERT_KEY	**AUTO - OOS**	Entry of the identification number of the plant unit. This information can be used by the fieldbus host system for sorting alarms and events. **User input:** 1...255 **Factory setting:** 0
BLOCK_ALM	**AUTO - OOS**	Displays the current block status with information on pending configuration, hardware or system errors, including details of the alarm time (date, time) when the error occurred. The block alarm is triggered in the event of the following block errors: • SIMULATION ACTIVE • OUT OF SERVICE ✎ Note! If the option of the alarm has **not** been enabled in the ACK_OPTION parameter, the alarm can only be acknowledged via this parameter.

Resource Block / base index 258		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
BLOCK_ERR	**read only**	Displays the active block error. **Display:** 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, (see also settings for simulation mode in the Operating Instructions for PROline Prosonic Flow 93 FOUNDATION Fieldbus, BA078D/06/en, Section 5.4). OUT OF SERVICE The block has the status "Out of Service".
CLR_FSTATE	**AUTO - OOS**	This parameter can be used to manually disable the security behaviour of the Discrete Output function block. **Options:** UNINITIALIZED OFF CLEAR (security behaviour disabled) ✎ Note! The security behaviour of the Discrete Output function block can be manually enabled via the SET_FSTATE parameter, (see Page 96).
CONFIRM_ TIME	**AUTO - OOS**	Specifies the confirmation time for the event report. The event report is sent to the fieldbus host system again if the device does not receive confirmation within this time. **Factory setting:** 640000 $^{1}/_{32}$ ms
CYCLE_SEL	**AUTO - OOS**	For selecting and displaying the block execution method used by the fieldbus host system. ✎ Note! The block execution method is selected by the fieldbus host system.
CYCLE_TYPE	**read only**	Displays the block execution methods supported by the device. **Display:** SCHEDULED (timed block execution method) BLOCK EXECUTION (sequential block execution method)
DD_ RESOURCE	**read only**	Displays the reference source for the device description (DD). **Display:** No display ✎ Note! If there is no DD in the device then nothing is displayed.

Resource Block / base index 258		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
DD_REV	**read only**	Displays the revision number of the device description. ✎ Note! This display can be used to check whether the correct system files (DD = Device Description) are being used for linking into the host system. The system files can be downloaded free of charge from the Internet, (www.endress.com). Example: DD_REV parameter displays → 01 DEV_REV parameter displays → 01 Device description (DD) files required → 0101.sym and 0101.ffo
DEV_REV	**read only**	Displays the revision number of the device. ✎ Note! This display can be used to check whether the correct system files (DD = Device Description) are being used for linking into the host system. The system files can be downloaded free of charge from the Internet, (www.endress.com). Example: DD_REV parameter displays → 01 DEV_REV parameter displays → 01 Device description (DD) files required → 0101.sym and 0101.ffo
DEV_TYPE	**read only**	Displays the device type in decimal numerical format. **Display:** 4158 (1059 hex) for Prosonic Flow 93 FOUNDATION Fieldbus
FAULT_STATE	**read only**	Current status display of the security behaviour of the Discrete Output function block. **Display:** UNINITIALIZED CLEAR (security behaviour not active) ACTIVE (security behaviour active)
FEATURES	**read only**	Displays the additional options supported by the device. **Display:** REPORTS Event report is sent. FAULTSTATE The security behaviour of the Discrete Output function block is supported, (see CLR_FSTATE and SET_FSTATE parameters). HARD W LOCK Hardware write protection

Resource Block / base index 258		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
FEATURES_ SEL	**AUTO - OOS**	For selecting the additional options of the device. **Options:** UNICODE (is not supported) REPORTS Event report is sent. The fieldbus host system must acknowledge receipt of the event report. FAULTSTATE (is not supported) The security behaviour of the Discrete Output function block is supported, (see CLR_FSTATE and SET_FSTATE parameters). SOFT W LOCK (is not supported) HARD W LOCK HW write protection, this option has no effect. OUT READ BACK (is not supported) DIRECT WRITE (is not supported)
FREE_TIME	**read only**	Displays the free system time (in percent) available for execution of further function blocks. ✎ Note! Since the function blocks of PROline Prosonic Flow 93 FF are permanently configured, this parameter always displays the value 0%.
FREE_SPACE	**read only**	Displays the free system memory (in percent) available for execution of further function blocks. ✎ Note! Since the function blocks of PROline Prosonic Flow 93 FF are permanently configured, this parameter always displays the value 0%.
GRANT_ DENY	**AUTO - OOS**	Releases or restricts the access authorisation of a fieldbus host system to the field device. ✎ Note! This parameter is not evaluated.
HARD_TYPES	**read only**	Displays the input signal type for the function blocks, (Analog Input and Discrete Output function blocks). **Display:** SCALAR INPUT (scalable analog input value) DISCRETE OUTPUT
ITK_VER	**read only**	Displays the revision state of the Interoperability Test Kits (ITK). **Display:** 4
LIM_NOTIFY	**AUTO - OOS**	This parameter is used to specify the number of event reports that can exist unconfirmed at the same time. **Options:** 0...24 **Factory setting:** 24

Resource Block / base index 258		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
MANUFAC_ID	**read only**	Displays the manufacturer's ID number. **Display:** 452B48 (hex) for Endress+Hauser
MAX_NOTIFY	**read only**	Displays the maximum number of event reports supported by the device that can exist unconfirmed at the same time. **Display:** 24
MEMORY_ SIZE	**read only**	Displays the available configuration memory in Kbytes. ✎ Note! This parameter is not supported.
MIN_ CYCLE_T	**read only**	Displays the shortest block execution time which is supported by PROline Prosonic Flow 93 FOUNDATION Fieldbus. **Display:** 1600 $^{1}/_{32}$ ms (≙ 50 ms)
MODE_BLK	**AUTO - OOS**	Displays the current (Actual) and desired (Target) operating mode of the Resource Block, the permitted modes (Permitted) supported by the Resource Block and the normal operating mode (Normal). **Display:** AUTO (automatic mode) In this operating mode, the execution of the remaining blocks (Transducer Blocks, AI, DO and PID function blocks) is enabled. OOS, Out of Service The block has the status "Out of Service". In this operating mode, the execution of the remaining blocks (Transducer Blocks, AI, DO and PID function blocks) is blocked. These blocks cannot be set to AUTO mode. ✎ Note! The current operating status of the Resource Block is also shown via the RS_STATE parameter, (see Page 96).
NV_CYCLE_T	**read only**	Displays the time interval for which the dynamic device parameters are stored in the non-volatile memory. The time interval displayed relates to storage of the following dynamic device parameters: • OUT • PV • FIELD_VAL ✎ Note! Since PROline Prosonic Flow 93 FF does not store the dynamic device parameter in the non-volatile memory, this parameter always displays the value 0 $^{1}/_{32}$ ms.

Resource Block / base index 258		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
RESTART	**AUTO - OOS**	This parameter is used to reset the field device in various ways. **Options:** UNINITIALIZED RUN Normal operating status. RESOURCE (is not supported) DEFAULTS The FF standard parameters and the connections of the function blocks are reset to the specified default values. PROCESSOR Warm start of device, processor restart.
RS_STATE	**read only**	Displays the current operating status of the Resource Block. **Display:** STANDBY The Resource Block is in the OOS operating mode. Execution of the remaining blocks is not possible. 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 made.
SET_FSTATE	**AUTO - OOS**	This parameter can be used to manually enable the security behaviour of the Discrete Output function block. **Options:** UNINITIALIZED OFF SET (security behaviour enabled) ✎ Note! The security behaviour of the Discrete Output function block can be manually disabled via the CLR_FSTATE parameter, (see Page 92).
SHED_RCAS	**AUTO - OOS**	Specifies the monitoring time for checking the connection between the fieldbus host system and the PID function block in the RCAS operating mode. On expiry of the monitoring time, the PID function block switches from the RCAS operating mode to the operating mode selected in the SHED_OPT parameter, (see Page 214). **Factory setting:** 640000 $^{1}/_{32}$ ms

Resource Block / base index 258		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
SHED_ROUT	**AUTO - OOS**	Specifies the monitoring time for checking the connection between the fieldbus host system and the PID function block in the ROUT operating mode. On expiry of the monitoring time, the PID function block switches from the ROUT operating mode to the operating mode selected in the SHED_OPT parameter, (see Page 214). **Factory setting:** 640000 $^{1}/_{32}$ ms
STRATEGY	**AUTO - OOS**	Parameter for grouping and thus faster evaluation of blocks. Grouping is carried out by entering the same numerical value in the STRATEGY parameter of each individual block. **Factory setting:** 0 ✎ Note! These data are neither checked nor processed by the Resource Block.
ST_REV	**read only**	Displays the revision status of the static data. ✎ Note! The revision status is incremented on each modification of static data.
TAG_DESC	**AUTO - OOS**	Entry of a user-specific text of max. 32 characters for unique identification and assignment of the block. **Factory setting:** "_ _ _ _ _ _ _ _" no text
TEST_RW	**AUTO - OOS**	✎ Note! This parameter is required only for the FF-conformance test and is not significant in normal operation.
UPDATE_EVT	**read only**	Displays whether static block data have been modified, including date and time.
WRITE_ALM	**AUTO - OOS**	Displays the status of the write protection alarm. ✎ Note! • The alarm is triggered if the write protection is disabled. • If the option of the alarm has **not** been enabled in the ACK_OPTION parameter, the alarm can only be acknowledged via this parameter.

Resource Block / base index 258		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
WRITE_LOCK	**read only**	Displays the status of the hardware write protection. **Display:** UNINITIALIZED LOCKED It is **not** possible to write to the device via the FOUNDATION Fieldbus. NOT LOCKED Device data can be modified via the FOUNDATION Fieldbus. ✎ Note! For information on hardware write protection configuration, see the Operating Instructions for PROline Prosonic Flow 93 FOUNDATION Fieldbus, BA078D/06/en, Section 5.4.
WRITE_PRI	**AUTO - OOS**	Specifies the action taken in the event of a write protection alarm, (WRITE_ALM parameter, see Page 97). **User input:** 0 The write protection alarm is not evaluated. 1 No report to the fieldbus host system in the event of a write protection alarm. 2 Reserved for block alarms. 3-7 The write protection alarm is output with the appropriate priority (3 = low priority, 7 = high priority) to the fieldbus host system as a user notice. 8-15 The write protection alarm is output with the appropriate priority (8 = low priority, 15 = high priority) to the fieldbus host system as a critical alarm. **Factory setting:** 0

Resource Block / base index 258		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Endress+Hauser parameters (manufacturer-specific)		
Sensor - Serial Number	**read only**	Displays the sensor serial number.
Amplifier - HW-Revision No.	**read only**	Displays the hardware revision number of the amplifier.
Amplifier - HW-Identification	**read only**	Displays the hardware ID number of the amplifier.
Amplifier - SW-Revision No.	**read only**	Displays the software revision number of the amplifier.
Amplifier - SW-Identification	**read only**	Displays the software ID number of the amplifier.
Amplifier - Production-No.	**read only**	Displays the production number of the amplifier.
Amplifier - SW-Revision No. T-DAT	**read only**	Displays the software revision number of the software used to create the content of the T-DAT.
I/O Module - Type	**read only**	Displays the I/O module type.
I/O Module - HW-Revision No.	**read only**	Displays the hardware revision number of the I/O module.
I/O Module - HW-Identification	**read only**	Displays the hardware ID number of the I/O module.
I/O Module - SW-Revision No.	**read only**	Displays the software revision number of the I/O module.
I/O Module - SW-Identification	**read only**	Displays the software ID number of the I/O module.
I/O Module - Production-No.	**read only**	Displays the production number of the I/O module.

3 Transducer Blocks (transmission blocks)

3.1 Overview

PROline Prosonic Flow 93 FOUNDATION Fieldbus's Transducer Blocks contain all the measuring and device-specific parameters of the flowmeter. The settings directly connected with flow measurement or the application are made here. They form the interface between sensor-specific measured value preprocessing and the Analog Input function blocks required for automation.
The Transducer Blocks allow you to influence the input and output values of the function blocks. The parameters of a Transducer Block include information on the sensor type, sensor configuration, physical units, calibration, damping, diagnosis, etc. as well as the device-specific parameters.

The device-specific parameters and functions of PROline Prosonic Flow 93 FOUNDATION Fieldbus are divided among several Transducer Blocks which cover different tasks. The Figure 2 on Page 101 shows the internal structure of the various Transducer Blocks:

TRANSDUCER_CH1 (flow channel 1) / base index 1200:
All flow-specific parameters and functions, (such as adjustment functions, sensor data etc.), for the first channel are located in this block → Page 109.

TRANSDUCER_CH2 (flow channel 2) / base index 1300:
All flow-specific parameters and functions, (such as adjustment functions, sensor data etc.), for the second channel are located in this block → Page 109.

TRANSDUCER_DISP (display) / base index 1500:
All parameters for configuring the local display are located in this block → Page 129.

TRANSDUCER_TOT (totalizer) / base index 1550:
All parameters for configuring the totalizers are located in this block → Page 148.

TRANSDUCER_DIAG (diagnosis) / base index 1600:
All parameters for system diagnosis, (such as current system status etc.), are located in this block → Page 156.

TRANSDUCER_SERV (service) / base index 1650:
All parameters for servicing are located in this block → Page 159.

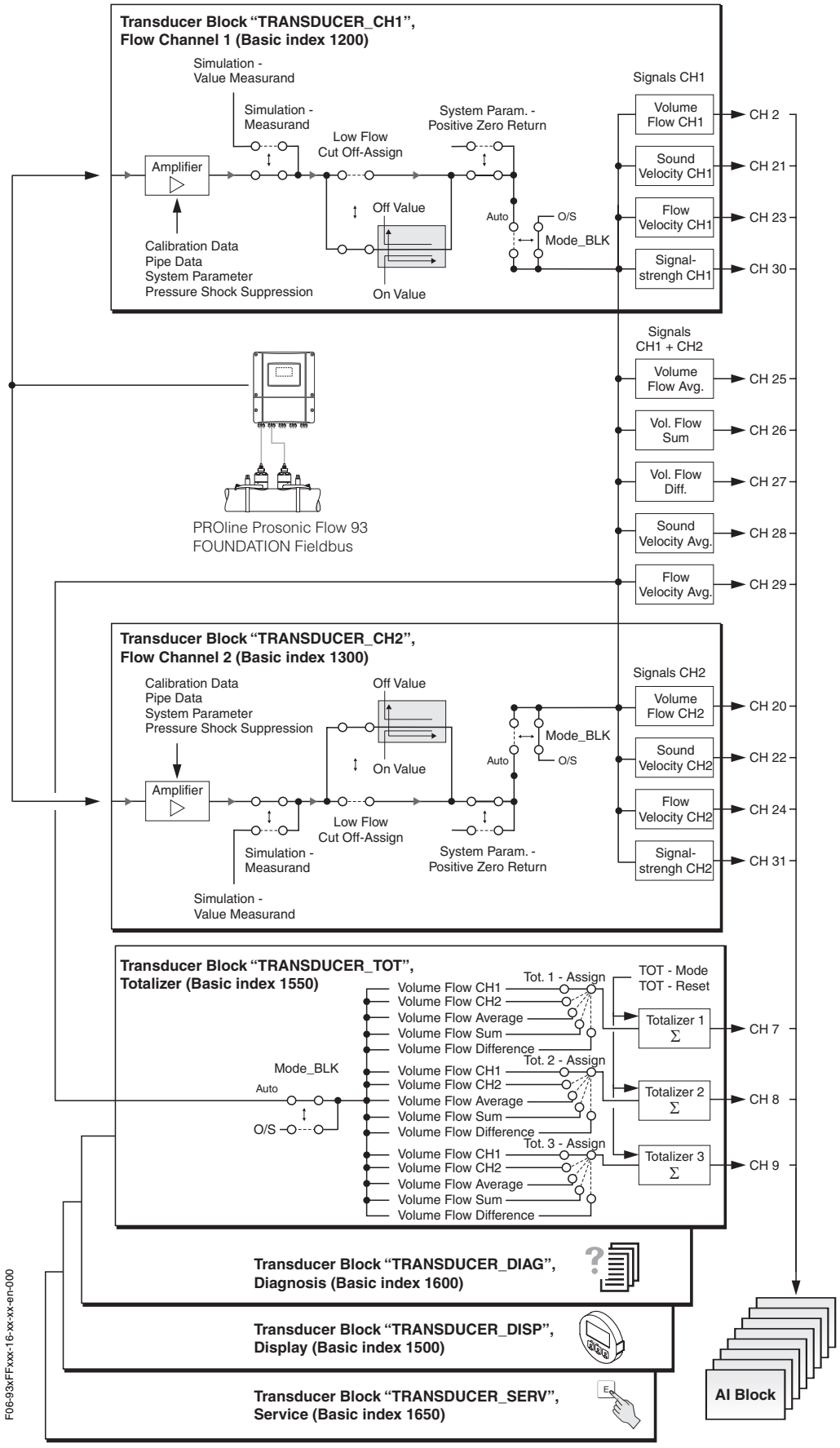


Fig. 2: Structure and function of the individual Transducer Blocks

3.2 Signal processing

The Transducer Blocks TRANSDUCER_CH1 (flow channel 1, base index 1200) and TRANSDUCER_CH2 (flow channel 2, base index 1300) receive several signal variables as input values from the sensor, (sound velocity, flow velocity). Other process variables are derived from these signal variables, (see Section 3.3 Block output values). The input signals are prepared for measuring via the amplifier.
The "Simulation - Value Measurand" parameter (see Page 128) allows you to specify a simulation value for the Transducer Block TRANSDUCER_CH1 (base index 1200) or TRANSDUCER_CH2 (base index 1300) in order to test assigned parameters in the device and subsequent function blocks.

A low flow cut off allows you to hide measurement inaccuracies in the low flow range. The "Low Flow Cut Off - On Value" parameter (see Page 114) allows you to define a limit value.
If the measured flow value undershoots this limit value, the output value of "0" is output. In addition, the "System Param. - Positive Zero Return" parameter (see Page 113) allows you to switch the measured value to “0”. This is necessary when the piping system is being cleaned, for example.

The Transducer Blocks TRANSDUCER_CH1 (flow channel 1, base index 1200) and TRANSDUCER_CH2 (flow channel 2, base index 1300) make the following process variables available to the downstream function blocks.
- Volume flow channel 1 and volume flow channel 2
- Sound velocity channel 1 and sound velocity channel 2
- Flow velocity channel 1 and flow velocity channel 2
- Signal strength channel 1 and signal strength channel 2

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

A process variable (e.g. volume flow channel 1, etc.) can be assigned to each individual totalizer in the Transducer Block TRANSDUCER_TOT (totalizer, base index 1550). The totalizers are also configured here. In this way, for example, all totalizers can be reset simultaneously by means of the “Totalizer Handling - Reset All” parameter.
You will find an overview of all the block output values on Page 103.

The Transducer Block TRANSDUCER_DIAG (diagnosis, base index 1600) contains all the parameters necessary for the diagnosis and maintenance of the device. For example, the “Diagnosis - Actual System Condition” parameter (see Page 156) displays the current system status or detailed information on the cause of an error if an error occurs.
If the device is equipped with a local display, various display parameters, such as the UI language, contrast etc., can be configured via the Transducer Block TRANSDUCER_DISP (display, base index 1500).

Note!
The Transducer Blocks TRANSDUCER_DIAG (diagnosis, base index 1600) and TRANSDUCER_DISP (display, base index 1500) do not have any output values, i.e. they only have an effect on the device itself.

The most important functions and parameters of the Transducer Block are listed below. An overview of all the parameters available is provided from Page 106 onwards.

3.3 Block output values

The Transducer Blocks make the following output values (process variables) available to the downstream Analog Input function blocks:

- Transducer Block TRANSDUCER_CH1 (flow channel 1, base index 1200):
  - Volume flow channel 1
  - Sound velocity channel 1
  - Flow velocity channel 1
  - Signal strength channel 1
- Transducer Block TRANSDUCER_CH2 (flow channel 2, base index 1300):
  - Volume flow channel 2
  - Sound velocity channel 2
  - Flow velocity channel 2
  - Signal strength channel 2
- Transducer Block TRANSDUCER_CH1 and TRANSDUCER_CH2:
  - Average volume flow
  - Volume flow sum
  - Volume flow difference
  - Average sound velocity
  - Average flow velocity
- Transducer Block TRANSDUCER_TOT (flow channel 2, base index 1550):
  - Totalizer 1
  - Totalizer 2
  - Totalizer 3
- The Transducer Blocks TRANSDUCER_DISP (display, base index 1500), TRANSDUCER_DIAG (diagnosis, base index 1600) and TRANSDUCER_SERV (service, base index 1650) do not have any output values.

The CHANNEL parameter in the Analog Input function block, (see Page 171), is used to assign the process variable which is read into and processed in the downstream Analog Input function block.
The Transducer Block(s) in question must be in AUTO (automatic) mode for the process variable to be processed correctly in the downstream Analog Input function block.

Transducer Block:	Base index	Operating mode	Process variable:	Parameter CHANNEL (AI fct. block)
TRANSDUCER_CH1	1200	AUTO	Volume flow channel 1	2
			Sound velocity channel 1	21
			Flow velocity channel 1	23
			Signal strength channel 1	30
TRANSDUCER_CH2	1300	AUTO	Volume flow channel 2	20
			Sound velocity channel 2	22
			Flow velocity channel 2	24
			Signal strength channel 2	31
TRANSDUCER_CH1 + TRANSDUCER CH2	1200 + 1300	AUTO AUTO	Average volume flow	25
			Volume flow sum	26
			Volume flow difference	27
			Average sound velocity	28
			Average flow velocity	29
TRANSDUCER_TOT	1550	AUTO	Totalizer 1	7
			Totalizer 2	8
			Totalizer 3	9

3.4 Selecting the operating mode

The operating mode is set by means of the MODE_BLK parameter group, (see Page 107). The Transducer Blocks support the following operating modes:
- AUTO (automatic mode)
- OOS (out of service).

Note!
- The OOS operating mode is also displayed via the BLOCK_ERR parameter, (see Page 107). In the OOS operating mode, you can access all the write parameters without restriction if write protection is not enabled and the release code is entered, ("Un-/Locking - Access Code" parameter).

- The following applies to the Transducer Blocks TRANSDUCER_CH1 (flow channel 1, base index 1200), TRANSDUCER_CH2 (flow channel 2, base index 1300) and TRANSDUCER_TOT (totalizer, base index 1550):
  – In the "OOS" operating mode, the process variables are updated but the status of the OUT output value of the downstream Analog Input function block changes to "BAD".
  – The Transducer Block(s) in question must be in AUTO (automatic) mode for the process variable to be processed correctly in the downstream Analog Input function block.
- Please refer to the Operating Instructions for PROline Prosonic Flow 93 FOUNDATION Fieldbus, BA078D/06/en, if problems arise when configuring the function blocks.

3.5 Alarm detection and processing

The Transducer Blocks do not generate any process alarms. The status of the process variables is evaluated in the downstream Analog Input function blocks.

A process alarm is generated if the Analog Input function block receives an input value which cannot be evaluated from the Transducer Blocks TRANSDUCER_ CH1 (flow channel 1, base index 1200), TRANSDUCER_CH2 (flow channel 2, base index 1300) or TRANSDUCER_TOT (totalizer, base index 1550). This process alarm is displayed in the BLOCK_ERR parameter of the Analog Input function block, (BLOCK_ERR = Input Failure).

The BLOCK_ERR parameter (see Page 107) of the Transducer Block TRANSDUCER_DIAG (base index 1600) 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.

Detailed information on the current device status and any pending errors is shown in the Transducer Block TRANSDUCER_DIAG (base index 1600) in the "Diagnosis - Actual System Condition" parameter, (see Page 156).

More information on eliminating errors can be found in the Operating Instructions for PROline Prosonic Flow 93 FOUNDATION Fieldbus, BA078D/06/en.

3.6 Diagnosis

The status of the device is displayed via the BLOCK_ERR (see Page 107) and "Transducer Error" (see Page 108) parameters (specified in the FOUNDATION Fieldbus Specification) of the Transducer Block TRANSDUCER_DIAG (diagnosis, base index 1600).

✎ Note!
Although these parameters are available in other Transducer Blocks, the correct values are only displayed in the Transducer Block TRANSDUCER_DIAG (diagnosis, base index 1600).

Detailed information on the current device status and any pending errors is shown in the Transducer Block TRANSDUCER_DIAG (base index 1600) in the "Diagnosis - Actual System Condition" parameter, (see Page 156). More information on eliminating errors can be found in the Operating Instructions for PROline Prosonic Flow 93 FOUNDATION Fieldbus, BA 078D/06/en.

3.7 Access to manufacturer-specific parameters

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

1. Hardware write protection must be disabled (see Operating Instructions for PROline Prosonic Flow 93 FOUNDATION Fieldbus, BA078D/06/en, Section 5.4).

2. The correct code must be entered in the "Un/Locking - Access Code" parameter, (see Page 109).

3.8 FOUNDATION Fieldbus parameters of the Transducer Blocks

The following table provides you with a description of all the specified FOUNDATION Fieldbus parameters of the Transducer Blocks. The E+H-specific parameters are explained from Page 109 onwards.

FOUNDATION Fieldbus parameters (Transducer Blocks, transmission blocks)		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
ST_REV	**read only**	Displays the revision status of the static data. ✎ Note! The revision status parameter is incremented on each modification of static data.
TAG_DESC	**AUTO - OOS**	Entry of a user-specific text of max. 32 characters for unique identification and assignment of the block. **Factory setting:** (_____) no text
STRATEGY	**AUTO - OOS**	Parameter for grouping and thus faster evaluation of blocks. Grouping is carried out by entering the same numerical value in the STRATEGY parameter of each individual block. **Factory setting:** 0 ✎ Note! These data are neither checked nor processed by the Transducer Blocks.
ALERT_KEY	**AUTO - OOS**	Entry of the identification number of the plant unit. This information can be used by the fieldbus host system for sorting alarms and events. **User input:** 1...255 **Factory setting:** 0

FOUNDATION Fieldbus parameters (Transducer Blocks, transmission blocks)		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
MODE_BLK	**AUTO - OOS**	Displays the current (Actual) and desired (Target) operating mode of the relevant Transducer Block, the permitted modes (Permitted) supported by the Transducer Block in question and the normal operating mode (Normal). **Display:** AUTO OOS ✎ Note! The Transducer Blocks support the following operating modes: • AUTO (automatic mode): The block is executed. • OOS (out of service): The block has the status "Out of Service". In the “OOS” operating mode, the process variables are updated but the status of the OUT output value (of the downstream Analog Input function block) changes to “BAD”.
BLOCK_ERR	**read only**	Displays the active block error. ✎ Note! This parameter is available in all Transducer Blocks. However, the block errors (apart from “OUT OF SERVICE”) are only displayed via the BLOCK_ERR parameter of the Transducer Block TRANSDUCER_DIAG (diagnosis, base index 1600). **Display:** OUT OF SERVICE The block is in the “Out of Service” operating mode. SIMULATION ACTIVE Simulation is active via the “Simulation - Measurand” parameter (see Page 128) in the Transducer Block TRANSDUCER_CH1 (flow channel 1, base index 1200) or TRANSDUCER_CH2 (flow channel 2, base index 1300). DEVICE NEEDS MAINTENANCE NOW The device needs to be checked since an active device error is pending. The cause of the error can be viewed in detail via the "Diagnosis - Actual System Condition" parameter in the Transducer Block TRANSDUCER_DIAG (diagnosis, base index 1600), (see Page 156).
UPDATE_ EVT	**AUTO - OOS**	Displays whether static block data have been modified, including date and time.

FOUNDATION Fieldbus parameters (Transducer Blocks, transmission blocks)		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
BLOCK_ALM	**AUTO - OOS**	Displays the current block status with information on pending configuration, hardware or system errors, including details of the alarm time (date, time) when the error occurred. ✎ Note! • In addition, the active block alarm can be acknowledged in this parameter group. • PROline Prosonic Flow 93 FF does not use this parameter to display a process alarm since these are generated in the BLOCK_ALM parameter of the Analog Input function block, (see Page 169).
Transducer Type	**read only**	Displays the Transducer Block type. **Display:** Standard flow with calibration
Transducer Error	**read only**	Displays the active device error. ✎ Note! This parameter is available in all Transducer Blocks. However, the device errors (apart from “No Error”) are only displayed via the BLOCK_ERR parameter of the Transducer Block TRANSDUCER_DIAG (diagnosis, base index 1600). **Possible display:** • No Error (normal state) • Electronis Failure • Data Integrity Error • Mechanical Error • Configuration Error • General Error ✎ Note! • Display of the device error is standardised. Precise information on the pending error is available via the manufacturer-specific error display which can be read in the “Diagnosis - Actual System Condition” parameter in the Transducer Block TRANSDUCER_DIAG (diagnosis, base index 1600). • A precise error description as well as notes on fault elimination can be found in the Operating Instructions for PROline Prosonic Flow 93 FF, BA 078D/06/en.

3.9 Overview of Transducer Blocks with E+H parameters

Here you can find all the E+H-specific parameters of the Transducer Blocks:

- TRANSDUCER_CH1 (flow channel 1) → Page 109
- TRANSDUCER_CH2 (flow channel 2) → Page 109
- TRANSDUCER_DISP (display) → Page 129
- TRANSDUCER_TOT (totalizer) → Page 148
- TRANSDUCER_DIAG (diagnosis) → Page 156
- TRANSDUCER_SERV for servicing purposes only - is not explained here.

3.10 E+H parameters of the Transducer Blocks: "TRANSDUCER_CH1" (flow channel 1) and "TRANSDUCER_CH2" (flow channel 2)

The following table lists all the E+H-specific parameters of the Transducer Blocks "TRANSDUCER_CH1" (flow channel 1) and "TRANSDUCER_CH2" (flow channel 2). The conditions which have to be met before changing these parameters are provided on Page 105.

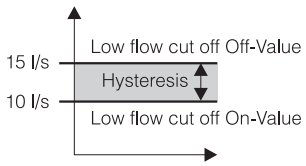
"TRANSDUCER_CH1" and "TRANSDUCER_CH2" (E+H parameters) / Base index 1200 and 1300		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
✎ Note! A description of the FOUNDATION Fieldbus parameters of this block is provided on Page 106.		
Un-/Locking - Access Code	**AUTO - OOS**	All 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 can enable programming by entering: • Code 93 (factory setting) • Personal code (see Page 129) **User input:** Max. 4-digit number (0...9999) ✎ Note! • If write protection is enabled, access to the manufacturer-specific parameters is blocked even if the right code is entered. (More detailed information on write protection is provided in the Operating Instructions for PROline Prosonic Flow 93 FOUNDATION Fieldbus, BA078D/06/en, Section 5.4). • You can disable programming again by entering any number (other than the access code) in this parameter. • The E+H service organisation can be of assistance if you mislay your personal code. • The entry made here does not affect the local display. Therefore programming via the function matrix must 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 (parameters cannot be modified) • ACCESS CUSTOMER (parameters can be modified)

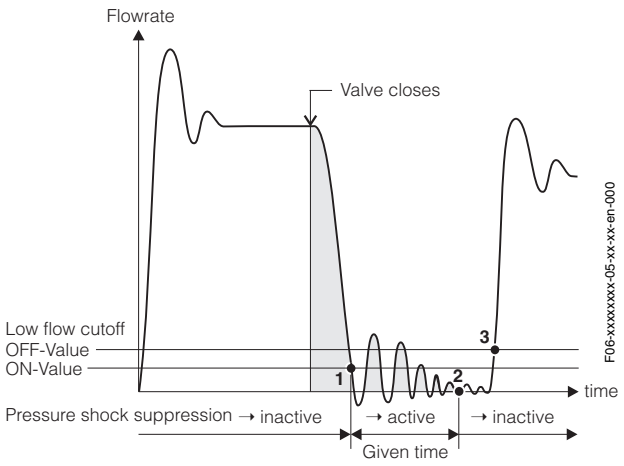
"TRANSDUCER_CH1" and "TRANSDUCER_CH2" (E+H parameters) / Base index 1200 and 1300		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
System Value - Volume Flow	**read only**	Displays the current volume flow. The volume flow is made available to the downstream Analog Input function blocks as a process variable. ✎ Note! The unit is selected and displayed in the "System Unit - Volume Flow" parameter.
System Unit - Volume Flow	**AUTO - OOS**	For selecting the unit required for the volume flow. The unit you select here is also valid for: • Switch 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 centimetre → cm^3/... Cubic decimetre → dm^3/... Cubic metre → m^3/... Millilitre → ml/... Litre → l/... Hectolitre → hl/... Megalitre → Ml/... MEGA *US:* Cubic centimetre → 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 has no effect on the desired volume unit which should be transmitted via the FF interface. This setting is made separately via the appropriate Analog Input function block in the XD_SCALE parameter group, (see Page 180).

"TRANSDUCER_CH1" and "TRANSDUCER_CH2" (E+H parameters) / Base index 1200 and 1300		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
System Value - Sound Velocity	**read only**	Displays the current sound velocity. The sound velocity is made available to the downstream Analog Input function blocks as a process variable. ✎ Note! The unit is selected and displayed in the "System Unit - Sound Velocity" parameter.
System Unit - Sound Velocity	**AUTO - OOS**	For selecting the unit for the sound velocity. **Options:** m/s ft/s **Factory setting:** m/s
System Value - Flow Velocity	**read only**	Displays the current flow velocity. The flow velocity is made available to the downstream Analog Input function blocks as a process variable. ✎ Note! The unit is selected and displayed in the "System Unit - Flow Velocity" parameter.
System Unit - Flow Velocity	**AUTO - OOS**	For selecting the unit for the flow velocity. **Options:** m/s ft/s **Factory setting:** m/s
System Value - Signal Strength	**read only**	Displays the current signal strength. The signal strength is made available to the downstream 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), see factory setting Page 76 ff.

"TRANSDUCER_CH1" and "TRANSDUCER_CH2" (E+H parameters) / Base index 1200 and 1300		
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 measure of length. The unit you select here is valid for: • Nominal diameter • Diameter • Wall thickness • Liner thickness • Path length • Wire length • Sensor distance **Options:** MILLIMETER INCH **Factory setting:** Depends on country (MILLIMETER or INCH), see factory setting Page 76 ff..
System Param. - Installation Direction Sensor	**AUTO - OOS**	This parameter can be used to reverse the sign of the flow rate variable, if necessary. **Options:** NORMAL (FORWARD) INVERSE (REVERSE) **Factory setting:** NORMAL (FORWARD)
System Param. - Flow Damping	**AUTO - OOS**	✎ Note! 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 measuring system reaction time increases with the filter setting. The damping acts on all parameters and all downstream function blocks. **User input:** 0...100 s **Factory setting:** 0 s

"TRANSDUCER_CH1" and "TRANSDUCER_CH2" (E+H parameters) / Base index 1200 and 1300		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
System Param. - Positive Zero Return	**AUTO - OOS**	This parameter can be used to interrupt evaluation of measured variables. This is necessary when a piping system is being cleaned, for example. The setting acts on all parameters and calculations of the measuring device. **Options:** OFF (signal output not interrupted) ON (signal output is set to the value "0") **Factory setting:** OFF ✎ Note! • When positive zero return is active, a flow value of "0" is output via the output value OUT (AI Block). • Active positive zero return is relayed to downstream function blocks or higher-level process control systems by means of the status "UNCERTAIN" for the output value OUT (AI Block). • Positive zero return can be also be controlled using cyclic data transmission via the Discrete Output function block, (see DO function block Page 181).
Adjustment - Adjust Zeropoint	**AUTO - OOS**	This parameter can be used to start zero point adjustment automatically. The new zero point determined by the measuring system is adopted by the "Calibration Data - Zero Point" parameter, (see Page 126). **Options:** CANCEL START **Factory setting:** CANCEL ☝ Caution! Before carrying this out, please refer to the Operating Instructions for *PROline Prosonic Flow 93 FOUNDATION Fieldbus*, (BA078D/06/en), for a detailed description of the procedure for zero point adjustment.

"TRANSDUCER_CH1" and "TRANSDUCER_CH2" (E+H parameters) / Base index 1200 and 1300		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Low Flow Cut Off - Assign	**AUTO - OOS**	Use this function to assign the switch point for the low flow cut off. **Options:** OFF VOLUME FLOW **Factory setting:** OFF
Low Flow Cut Off - On Value	**AUTO - OOS**	Specifies the switch-on point of the low flow cut off. Low flow cut off is active if the setting is a value not equal to "0". **User input:** 5-digit floating-point number **Factory setting:** 0.0000 ✎ Note! • A flow value of "0" is output via the output value OUT (AI Block) when the low flow cut off responds. In addition, the status changes to UNCERTAIN. • The unit used is displayed in the "Low Flow Cut Off - Unit" parameter and determined in the "System Unit - Volume Flow" parameter, (see Page 110).
Low Flow Cut Off - Unit	**read only**	Displays the unit for the low flow cut off. ✎ Note! The unit for the low flow cut off is determined by means of the "System Unit - Volume Flow" parameter, (see Page 110).
Low Flow Cut Off - Off Value	**AUTO - OOS**	Specifies the switch-off point of the low flow cut off. Enter the switch-off point as a positive hysteresis from the switch-on point. **User input:** 0...100% **Factory setting:** 50% Example: Low Flow Cut Off Assign = VOLUME FLOW Low Flow Cut Off Off-Value = 50% Low Flow Cut Off On-Value = 10 Low Flow Cut Off Unit = l/s This results in an off-value of 15 l/s (10 l/s + [10 l/s · 0.5] = 15 l/s).  F06-53xFFxxx-05-xx-xx-en-000

"TRANSDUCER_CH1" and "TRANSDUCER_CH2" (E+H parameters) / Base index 1200 and 1300		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Pressure Shock Suppression	**AUTO - OOS**	The closure of a valve can cause brief but severe movements of the liquid in the piping system, movements which the measuring system registers. The pulses totalled 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! Pressure shock suppression cannot be used unless the low flow cut off is active, (see "Low Flow Cut Off - On Value" parameter, Page 114). Use this parameter to define the time span for active pressure shock suppression. **Activation of the pressure shock suppression** Pressure shock suppression is activated after the flow falls below the switch-on point of the low flow cut off, (see point **1** in graphic). While pressure shock suppression is active, the following conditions apply: • Output value OUT of the AI Blocks → Flow value "0" • Flow reading on display → 0. • Totalizer reading → The totalizers are pegged at the last valid value. **Deactivation of the pressure shock suppression** The pressure shock suppression is deactivated once the time interval set in this parameter has elapsed, (see point **2** in graphic). ✎ Note! The current flow value is only processed and displayed again once the time interval for the pressure shock suppression has elapsed and the flow exceeds the switch-off point for low flow cut off, (see point **3** in graphic).  **User input:** Max. 4-digit number, incl. unit: 0.00...100.0 s **Factory setting:** 0.00 s

"TRANSDUCER_CH1" and "TRANSDUCER_CH2" (E+H parameters) / Base index 1200 and 1300		
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**	For selecting the nominal diameter of the pipe. **Options:** OTHERS 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 "Pipe Data - Nominal Diameter" unit. ✎ Note! The unit is selected in the "System Unit - Length" parameter, see Page 112.

"TRANSDUCER_CH1" and "TRANSDUCER_CH2" (E+H parameters) / Base index 1200 and 1300		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Pipe Data - Pipe Material	**AUTO - OOS**	For selecting the pipe material. **Options:** CARBON STEEL DUCTILE IRON STAINLESS STEEL SS ANSI 304 SS ANSI 316 SS ANSI 347 SS ANSI 410 SS ANSI 430 HASTELLOY C PVC PE LDPE HDPE GRP PVDF PA PP PTFE GLASS PYREX ASBESTOS CEMENT OTHERS **Factory setting:** STAINLESS STEEL
Pipe Data - Reference Value	**AUTO - OOS**	✎ Note! This parameter is not active unless "Sound Vel. Pipe" was selected in the "Sensor Param. - Measurement" parameter, (see Page 122). Entry of the thickness of the reference component (e.g. flange) which serves as the basis for measuring the sound velocity of the pipes, (see Page 118). **User input:** 5-digit floating-point number **Factory setting:** 5 (mm) ✎ Note! The unit used is displayed in the "Pipe Data - Unit Reference Value" parameter.
Pipe Data - Unit Reference Value	**read only**	Displays the unit for the thickness of the reference component. ✎ Note! The unit is selected in the "System Unit - Length" parameter, see Page 112.

"TRANSDUCER_CH1" and "TRANSDUCER_CH2" (E+H parameters) / Base index 1200 and 1300		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Pipe Data - Sound Velocity Pipe	**AUTO - OOS**	Entry of the sound velocity in the pipe. **Measuring the sound velocity in the pipe** Measurement can be carried out via: • The local display ("Sensor" Quick Setup), see Page 19. • The configuration and service software FieldTool. ✎ Note! A reference value is used as a basis for measuring the sound velocity. This reference value can be edited, (see Page 117). **User input:** Fixed-point number 800...6500 (m/s) **Factory setting:** 3120 (m/s) ✎ Note! The unit used is displayed in the "Pipe Data - Unit Sound Velocity Pipe" parameter.
Pipe Data - Unit Sound Velocity Pipe	**read only**	Displays the unit for the sound velocity in the pipe. ✎ Note! The unit is selected in the "System Unit - Sound Velocity" parameter, see Page 111.
Pipe Data - Circumference	**AUTO - OOS**	Entry of the pipe circumference. **User input:** Fixed-point number 31.4...15708.0 (mm) **Factory setting:** 279.3 (mm) ✎ Note! The unit used is displayed in the "Pipe Data - Unit Circumference" parameter.
Pipe Data - Unit Circumference	**read only**	Displays the unit for the pipe circumference. ✎ Note! The unit is selected in the "System Unit - Length" parameter, see Page 112.
Pipe Data - Pipe Diameter	**AUTO - OOS**	Entry of the pipe diameter. **User input:** Fixed-point number 10.0...5000.0 (mm) **Factory setting:** 88.9 (mm) ✎ Note! The unit used is displayed in the "Pipe Data - Unit Pipe Diameter" parameter.

"TRANSDUCER_CH1" and "TRANSDUCER_CH2" (E+H parameters) / Base index 1200 and 1300		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Pipe Data - Unit Pipe Diameter	**read only**	Displays the unit for the pipe circumference. ✎ Note! The unit is selected in the "System Unit - Length" parameter, see Page 112.
Pipe Data - Wall Thickness	**AUTO - OOS**	Entry of the pipe wall thickness. **Measuring the wall thickness** Measurement can be carried out via: • The local display ("Sensor" Quick Setup), see Page 19. • The configuration and service software FieldTool. **User input:** Fixed-point number 0.1...100.0 (mm) **Factory setting:** 3.2 (mm) ✎ Note! The unit used is displayed in the "Pipe Data - Unit Wall Thickness" parameter.
Pipe Data - Unit Wall Thickness	**read only**	Displays the unit for the thickness of the pipe wall. ✎ Note! The unit is selected in the "System Unit - Length" parameter, see Page 112.
Pipe Data - Liner Material	**AUTO - OOS**	For selecting the material with which the pipe is lined. **Options:** LINER NONE MORTAR RUBBER TAR EPOXY OTHERS **Factory setting:** LINER NONE
Pipe Data - Sound Velocity Liner	**AUTO - OOS**	✎ Note! This parameter is not active unless a liner was selected in the "Pipe Data - Liner Material" parameter. Entry of the sound velocity of the liner. **User input:** Fixed-point number 800...6500 **Factory setting:** Depends on the setting selected in the "Pipe Data - Liner Material" parameter. ✎ Note! The unit used is displayed in the "Pipe Data - Unit Sound Velocity Liner" parameter.

"TRANSDUCER_CH1" and "TRANSDUCER_CH2" (E+H parameters) / Base index 1200 and 1300		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Pipe Data - Unit Sound Velocity Liner	**read only**	Displays the unit for the sound velocity of the liner. ✎ Note! The unit is selected in the "System Unit - Sound Velocity" parameter, see Page 111.
Pipe Data - Liner Thickness	**AUTO - OOS**	✎ Note! This parameter is not active unless a liner was selected in the "Pipe Data - Liner Material" parameter. Entry of the thickness of the liner. **User input:** Fixed-point number 0.1...100.0 **Factory setting:** 0 ✎ Note! The unit used is displayed in the "Pipe Data - Unit Liner Thickness" parameter.
Pipe Data - Unit Liner Thickness	**read only**	Displays the unit for the liner thickness selected in the "Pipe Data - Liner Thickness" parameter. ✎ Note! The unit is selected in the "System Unit - Length" parameter, see Page 112.
Liquid Data - Liquid	**AUTO - OOS**	For selecting the liquid in the pipe. **Options:** WATER SEAWATER DEST. WATER (distilled water) AMMONIA ALCOHOL BENZENE BROMIDE ETHANOL GLYCOL KEROSENE MILK METHANOL TOLUOL LUBE OIL FUEL OIL PETROL OTHERS **Factory setting:** WATER

"TRANSDUCER_CH1" and "TRANSDUCER_CH2" (E+H parameters) / Base index 1200 and 1300		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Liquid Data - Temperature	**AUTO - OOS**	Entry of the liquid temperature. **User input:** Fixed-point number -273.15...726.85 °C (0...1000 K) **Factory setting:** 20 ✎ Note! The unit used is displayed in the "Liquid Data - Unit Temperature" parameter.
Liquid Data - Unit Temperature	**read only**	Displays the unit for the liquid temperature selected in the "Liquid Data - Temperature" parameter. ✎ Note! The unit is selected in the "System Unit - Temperature" parameter, see Page 111.
Liquid Data - Sound Velocity Liquid	**AUTO - OOS**	Entry of the sound velocity of the liquid. **Measuring the sound velocity of the liquid** Measurement can be carried out via: • The local display ("Sensor" Quick Setup), see Page 19. • The configuration and service software FieldTool. **User input:** Fixed-point number 400...3000 **Factory setting:** 1487 ✎ Note! The unit used is displayed in the "Liquid Data - Unit Sound Velocity Liquid" parameter.
Liquid Data - Unit Sound Velocity Liquid	**read only**	Displays the unit for the liquid sound velocity selected in the "Liquid Data - Sound Velocity Liquid" parameter. ✎ Note! The unit is selected in the "System Unit - Sound Velocity" parameter, see Page 111.
Liquid Data - Min. Sound Velocity Liquid	**AUTO - OOS**	Entry of the minimum sound velocity of the liquid. **User input:** Fixed-point number 400...3000 **Factory setting:** 800 ✎ Note! The unit used is displayed in the "Liquid Data - Unit Min. Sound Velocity Liquid" parameter.

"TRANSDUCER_CH1" and "TRANSDUCER_CH2" (E+H parameters) / Base index 1200 and 1300		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Liquid Data - Unit Min. Sound Velocity Liquid	**read only**	Displays the unit for the minimum liquid sound velocity selected in the "Liquid Data - Min. Sound Velocity Liquid" parameter. ✎ Note! The unit is selected in the "System Unit - Sound Velocity" parameter, see Page 111.
Liquid Data - Max. Sound Velocity Liquid	**AUTO - OOS**	Entry of the maximum sound velocity of the liquid. **User input:** Fixed-point number 400...3000 **Factory setting:** 1800 ✎ Note! The unit used is displayed in the "Liquid Data - Unit Max. Sound Velocity Liquid" parameter.
Liquid Data - Unit Max. Sound Velocity Liquid	**read only**	Displays the unit for the maximum liquid sound velocity selected in the "Liquid Data - Max. Sound Velocity Liquid" parameter. ✎ Note! The unit is selected in the "System Unit - Sound Velocity" parameter, see Page 111.
Sensor Param. - Measurement	**AUTO - OOS**	For selecting which measurement method should be used. **Options:** OFF CLAMP ON INSERTION **Factory setting for channel 1:** CLAMP ON **Factory setting for channel 2:** OFF ☞ Caution! Although the following options also appear in this parameter, they can only be selected by means of the local display (see Page 63) or the configuration and service software FieldTool: • SOUND VEL. LIQUID (liquid sound velocity) • SOUND VEL. PIPE (pipe sound velocity) • WALL THICKNESS

"TRANSDUCER_CH1" and "TRANSDUCER_CH2" (E+H parameters) / Base index 1200 and 1300		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Sensor Param. - Sensor Type	**AUTO - OOS**	✎ Note! This parameter is only active if "OFF" was not selected in the "Sensor Param. - Measurement" parameter. Sensor type selection. The options in this parameter depend on the measurement method selected in the "Sensor Param. - Measurement" parameter, (see Page 122). **Options:** (if "CLAMP ON" was selected in the "Sensor Param. - Measurement" parameter) W-CL-05F-L-B W-CL-1F-L-B W-CL-2F-L-B P-CL-05F-L-B P-CL-1F-L-B P-CL-2F-L-B P-CL-05F-M-B P-CL-1F-M-B P-CL-2F-M-B U-CL-2F-L-A **Options:** (if "INSERTION" was selected in the "Sensor Param. - Measurement" parameter) W-IN-1F-L-B **Factory setting:** W-CL-2F-L-B ☝ Caution! Although the following options also appear in this parameter, they can only be selected by means of the local display (see Page 64) or the configuration and service software FieldTool: • P-CL-1S-L-B • P-CL-1S-M-B • P-CL-4W-L-B

"TRANSDUCER_CH1" and "TRANSDUCER_CH2" (E+H parameters) / Base index 1200 and 1300		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Sensor Param. - Sensor Configuration	**AUTO - OOS**	✎ Note! This parameter is not active unless one of the following options was selected in the "Sensor Param. - Measurement" parameter. • CLAMP ON • INSERTION Use this parameter to select the configuration for the ultrasonic sensors, e.g. the number of traverses (in the Clamp On version) or whether single-path or dual-path configuration is present (in the Insertion version) The options in this parameter depend on the measurement method selected in the "Sensor Param. - Measurement" parameter, (see Page 122). **Options:** (if "CLAMP ON" was selected in the "Sensor Param. - Measurement" parameter) NO. TRAVERSE: 1 NO. TRAVERSE: 2 NO. TRAVERSE: 3 NO. TRAVERSE: 4 **Options:** (if "INSERTION" was selected in the "Sensor Param. - Measurement" parameter) SINGLE PATH DUAL PATH **Factory setting:** NO. TRAVERSE: 2
Sensor Param. - Cable Length	**AUTO - OOS**	For selecting the length of the sensor cable. **Options:** LEN. 5m/15 feet LEN. 10m/30 feet LEN. 15m/45 feet LEN. 30m/90 feet **Factory setting:** LEN. 5m/15 feet
Sensor Param. - Position Sensor	**read only**	✎ Note! This parameter is not active unless "CLAMP ON" was selected in the "Sensor Param. - Measurement" parameter and the number of traverses in the "Sensor Param. - Sensor Configuration" parameter is 2 or 4. Displays the position of both sensors on the rail. **Display:** 5-digit number combination

"TRANSDUCER_CH1" and "TRANSDUCER_CH2" (E+H parameters) / Base index 1200 and 1300		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Sensor Param. - Wire Length	**read only**	✎ Note! This parameter is not active unless "CLAMP ON" was selected in the "Sensor Param. - Measurement" parameter and the number of traverses in the "Sensor Param. - Sensor Configuration" parameter is 1 or 3. Displays the wire length for mounting the sensors at the correct distance. **Display:** Max. 5-digit number ✎ Note! The unit used is displayed in the "Sensor Param. - Unit Wire Length" parameter.
Sensor Param. - Unit Wire Length	**read only**	Displays the unit used for the display in the "Sensor Param. - Wire Length" parameter. ✎ Note! The unit is selected in the "System Unit - Length" parameter, see Page 112.
Sensor Param. - Sensor Distance	**read only**	Displays the distance between sensor 1 and sensor 2 as a length measurement. **Display:** Max. 5-digit number ✎ Note! The unit used is displayed in the "Sensor Param. - Unit Sensor Distance" parameter.
Sensor Param. - Unit Sensor Distance	**read only**	Displays the unit used for the display in the "Sensor Param. - Sensor Distance" parameter. ✎ Note! The unit is selected in the "System Unit - Length" parameter, see Page 112.
Sensor Param. - ARC Length	**read only**	✎ Note! This parameter is not active unless "INSERTION" was selected in the "Sensor Param. - Measurement" parameter and "DUAL PATH" was selected in the "Sensor Param. - Sensor Configuration" parameter. Displays the arc length on the pipe. **Display:** Max. 5-digit number ✎ Note! The unit used is displayed in the "Sensor Param. - Unit ARC Length" parameter.

"TRANSDUCER_CH1" and "TRANSDUCER_CH2" (E+H parameters) / Base index 1200 and 1300		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Sensor Param. - Unit ARC Length	**read only**	Displays the unit used for the display in the "Sensor Param. - ARC Length" parameter. ✎ Note! The unit is selected in the "System Unit - Length" parameter, see Page 112.
Sensor Param. - Path Length	**read only**	✎ Note! This parameter is not active unless "INSERTION" was selected in the "Sensor Param. - Measurement" parameter. Displays the path length. **Display:** Max. 5-digit number ✎ Note! The unit used is displayed in the "Sensor Param. - Unit Path Length" parameter.
Sensor Param. - Unit Path Length	**read only**	Displays the unit used for the display in the "Sensor Param. - Path Length" parameter. ✎ Note! The unit is selected in the "System Unit - Length" parameter, see Page 112.
Calibration Data - Calibration Factor	**read only**	Displays the current calibration factor for the sensors.
Calibration Data - Zero Point	**AUTO - OOS**	For displaying or manually changing the value for the zero point correction currently used. **User input:** 5-digit floating-point number, including unit and sign (e.g. +10.0 ns)
Calibration Data - Correction Factor	**AUTO - OOS**	Entry of a correction factor defined by the customer. **User input:** 5-digit floating-point number
Calibration Data - Deviation Sensor Distance	**AUTO - OOS**	✎ Note! This parameter is not active unless "INSERTION" was selected in the "Sensor Param. - Measurement" parameter. Entry of the sensor distance deviation. **User input:** 5-digit floating-point number **Factory setting:** 0 ✎ Note! The unit used is displayed in the "Calibration Data - Unit Deviation Sensor Distance" parameter.

"TRANSDUCER_CH1" and "TRANSDUCER_CH2" (E+H parameters) / Base index 1200 and 1300		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Calibration Data - Unit Deviation Sensor Distance	**read only**	Displays the unit used for the entry in the "Calibration Data - Deviation Sensor Distance" parameter. ✎ Note! The unit is selected in the "System Unit - Length" parameter, see Page 112.
Calibration Data - Deviation ARC Length	**AUTO - OOS**	✎ Note! This parameter is not active unless "INSERTION" was selected in the "Sensor Param. - Measurement" parameter and "DUAL PATH" was selected in the "Sensor Param. - Sensor Configuration" parameter. Entry of the arc length deviation. **User input:** 5-digit floating-point number **Factory setting:** 0 ✎ Note! The unit used is displayed in the "Calibration Data - Unit Deviation ARC Length" parameter.
Calibration Data - Unit Deviation ARC Length	**read only**	Displays the unit used for the entry in the "Calibration Data - Deviation ARC Length" parameter. ✎ Note! The unit is selected in the "System Unit - Length" parameter, see Page 112.
Calibration Data - Deviation Path Length	**AUTO - OOS**	✎ Note! This parameter is not active unless "INSERTION" was selected in the "Sensor Param. - Measurement" parameter. Entry of the path length deviation. **User input:** 5-digit floating-point number **Factory setting:** 0 ✎ Note! The unit used is displayed in the "Calibration Data - Unit Deviation Path Length" parameter.
Calibration Data - Unit Deviation Path Length	**read only**	Displays the unit used for the entry in the "Calibration Data - Deviation Path Length" parameter. ✎ Note! The unit is selected in the "System Unit - Length" parameter, see Page 112.

"TRANSDUCER_CH1" and "TRANSDUCER_CH2" (E+H parameters) / Base index 1200 and 1300		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Simulation - Measurand	**AUTO - OOS**	For activating the simulation for the 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 functions **independently** of the position of the relevant jumpers on the I/O board, (see Operating Instructions for PROline Prosonic Flow 93 FOUNDATION Fieldbus, BA078D/06/en, Section 5.4). • The setting is not saved if the power supply fails. Note! Active simulation is relayed to downstream function blocks or higher-level process control systems by means of the status "UNCERTAIN" for the output value OUT (AI Block).
Simulation - Value Measurand	**AUTO - OOS**	This parameter can be used to specify a selectable value (e.g. 12 m^3/s). This is used to test the assigned 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 "Simulation - Unit" parameter. Caution! The setting is not saved if the power supply fails.
Simulation - Unit	**read only**	Displays the unit used in the "Simulation - Value Measurand" parameter. Note! The unit is taken from the "System Unit - Volume Flow" parameter, (see Page 110).
Amp. Device Family	**read only**	This parameter is only used in the event of servicing.

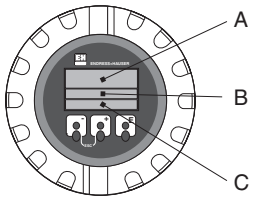
3.11 E+H parameters: Transducer Block "TRANSDUCER_DISP" (display)

The following table lists all the E+H-specific parameters of the Transducer Block "TRANSDUCER_DISP" (display). The conditions which have to be met before changing these parameters are provided on Page 105.

"TRANSDUCER_DISP" (E+H parameters) / base index 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
✎ Note! A description of the FOUNDATION Fieldbus parameters of this block is provided on Page 106.		
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 can enable programming by entering: • Code 93 (factory setting) • Personal code (see Page 129) **User input:** Max. 4-digit number (0...9999) ✎ Note! • If write protection is enabled, access to the manufacturer-specific parameters is blocked even if the right code is entered. (More detailed information on write protection is provided in the Operating Instructions for PROline Prosonic Flow 93 FOUNDATION Fieldbus, BA078D/06/en, Section 5.4). • You can disable programming again by entering any number (other than the access code) in this parameter. • The E+H service organisation can be of assistance if you mislay your personal code. • The entry made here does not affect the local display. Therefore programming via the function matrix must 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 (parameters cannot be modified) • ACCESS CUSTOMER (parameters can be modified)
Un-/Locking - Define Private Code	**AUTO - OOS**	Entry of a personal code with which the configuration can be enabled. This applies both to manufacturer-specific parameters in the Transducer Blocks and also to operation via local display. **User input:** 0...9999 (max. 4-digit number) **Factory setting:** 93 ✎ Note! • Programming is always enabled with the code "0". • Configuration has to be enabled before this code can be changed.

"TRANSDUCER_DISP" (E+H parameters) / base index 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Configuration - Language	**AUTO - OOS**	Use this parameter to select the language for all texts, parameters and messages shown on the local display. **Options:** ENGLISH DEUTSCH FRANCAIS ESPANOL ITALIANO NEDERLANDS DANSK NORSK SVENSKA SUOMI BAHASA INDONESIA JAPANESE (syllabary) **Factory setting:** Depends on country, see factory setting on Page 76 ff.
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 optimise display contrast to suit local operating conditions. **User input:** 10...100% **Factory setting:** 50%

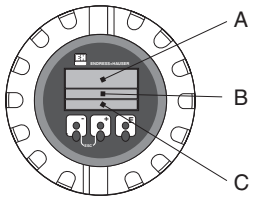
"TRANSDUCER_DISP" (E+H parameters) / base index 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Configuration - Xline Calculated	**AUTO - OOS**	Use this parameter to indicate which "calculated main value" from the measured values of both channels is displayed. "CALC. VOLUME FLOW" must be selected in one of the following parameters so that the value appears in the line desired: • "Main Line - Assign" parameter for display in the main line • "Add. Line - Assign" parameter for display in the additional line • "Info Line - Assign" parameter for display in the information line ✎ Note! This parameter is not active if "OFF" was selected on one channel in the "Sensor Param. - Measurement" parameter, (see Page 122). **Options:** (CH1 + CH2) / 2 CH1 + CH2 CH1 - CH2 **Factory setting:** (CH1 + CH2) / 2
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 a "0" in each field for minimum 0.75 seconds. 5. Main line, additional line and information line show nothing (blank display) for minimum 0.75 seconds. When the test is completed, the display returns to its initial state. Parameter → OFF.

"TRANSDUCER_DISP" (E+H parameters) / base index 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
A = Main line, B = Additional line, C = Information line		 F-x3xxxxx-07-05-xx-xx-000
Main Line - Assign	**AUTO - OOS**	Use this parameter to define the display value assigned to the main line (the top line of the local display) during normal measuring operation. **Options:** OFF VOLUME FLOW CH1 VOLUME FLOW CH2 CALC. VOLUME FLOW VOLUME FLOW % CH1 VOLUME FLOW % CH2 CALC. VOLUME FLOW % SOUND VELOCITY CH1 SOUND VELOCITY CH2 SOUND VELOCITY AVG. SIGNAL STRENGTH CH1 SIGNAL STRENGTH CH2 FLOW VELOCITY CH1 FLOW VELOCITY CH2 FLOW VELOCITY AVG. TOTALIZER 1 TOTALIZER 2 TOTALIZER 3 AI 1 - OUT VALUE AI 2 - OUT VALUE AI 3 - OUT VALUE AI 4 - OUT VALUE AI 5 - OUT VALUE AI 6 - OUT VALUE AI 7 - OUT VALUE AI 8 - OUT VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (remote setpoint value) PID - OUT VALUE (manipulated variable) **Factory setting:** VOLUME FLOW CH1

"TRANSDUCER_DISP" (E+H parameters) / base index 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Main Line - 100%-Value	**AUTO - OOS**	✎ Note! The input is not active unless one of the following was selected in the "Main Line - Assign" parameter: • VOLUME FLOW % CH1 • VOLUME FLOW % CH2 • CALC. VOLUME FLOW % Use this parameter to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on country, [value] / [dm^3...m^3 or US-gal...US-Mgal] ✎ Note! The unit is taken from the "System Unit - Volume Flow" parameter, (see Page 110).
Main Line - Format	**AUTO - OOS**	Use this parameter to define the maximum number of places after the decimal point displayed for the reading in the main line. **Options:** XXXXX. – XXXX.X – XXX.XX – XX.XXX – X.XXXX **Factory setting:** X.XXXX ✎ Note! • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In these instances an arrow appears on the display between the measured value and the engineering unit, (e.g. 1.2 → dm^3/s), indicating that the measuring system is computing with more decimal places than can be shown on the display.

"TRANSDUCER_DISP" (E+H parameters) / base index 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
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 "User Interface Main Line - Assign" parameter. **Options:** OFF VOLUME FLOW CH1 VOLUME FLOW CH2 CALC. VOLUME FLOW VOLUME FLOW % CH1 VOLUME FLOW % CH2 CALC. VOLUME FLOW % SOUND VELOCITY CH1 SOUND VELOCITY CH2 SOUND VELOCITY AVG. SIGNAL STRENGTH CH1 SIGNAL STRENGTH CH2 FLOW VELOCITY CH1 FLOW VELOCITY CH2 FLOW VELOCITY AVG. TOTALIZER 1 TOTALIZER 2 TOTALIZER 3 AI 1 - OUT VALUE AI 2 - OUT VALUE AI 3 - OUT VALUE AI 4 - OUT VALUE AI 5 - OUT VALUE AI 6 - OUT VALUE AI 7 - OUT VALUE AI 8 - OUT VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (remote setpoint value) PID - OUT VALUE (manipulated variable) **Factory setting:** OFF
Main Line Multiplex - 100%-Value	**AUTO - OOS**	✎ Note! The input is not active unless one of the following was selected in the "Main - Multiplex Line Assign" parameter: • VOLUME FLOW % CH1 • VOLUME FLOW % CH2 • CALC. VOLUME FLOW % Use this parameter to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on country, [value] / [dm^3...m^3 or US-gal...US-Mgal] ✎ Note! The unit is taken from the "System Unit - Volume Flow" parameter, (see Page 110).

"TRANSDUCER_DISP" (E+H parameters) / base index 1500		
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 for the second value displayed in the main line. **Options:** XXXXX. – XXXX.X – XXX.XX – XX.XXX – X.XXXX **Factory setting:** X.XXXX ✎ Note! • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In these instances an arrow appears on the display between the measured value and the engineering unit, (e.g. 1.2 → dm^3/s), indicating that the measuring system is computing with more decimal places than can be shown on the display.

"TRANSDUCER_DISP" (E+H parameters) / base index 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
A = Main line, B = Additional line, C = Information line		 F-x3xxxxx-07-05-xx-xx-000
Add. Line - Assign	**AUTO - OOS**	Use this parameter to define the display value assigned to the additional line (the middle line of the local display) during normal measuring operation. **Options:** OFF VOLUME FLOW CH1 VOLUME FLOW CH2 CALC. VOLUME FLOW VOLUME FLOW % CH1 VOLUME FLOW % CH2 CALC. VOLUME FLOW % SOUND VELOCITY CH1 SOUND VELOCITY CH2 SOUND VELOCITY AVG. SIGNAL STRENGTH CH1 SIGNAL STRENGTH CH2 FLOW VELOCITY CH1 FLOW VELOCITY CH2 FLOW VELOCITY AVG. VOLUME FLOW BARGRAPH % CH1 VOLUME FLOW BARGRAPH % CH2 CALC. VOLUME FLOW BARGRAPH % SIGNAL BARGRAPH CH1 SIGNAL BARGRAPH CH2 TOTALIZER 1 TOTALIZER 2 TOTALIZER 3 FLOW DIRECTION CH1 FLOW DIRECTION CH2 CALC. FLOW DIRECTION AI 1 - OUT VALUE AI 2 - OUT VALUE AI 3 - OUT VALUE AI 4 - OUT VALUE AI 5 - OUT VALUE AI 6 - OUT VALUE AI 7 - OUT VALUE AI 8 - OUT VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (remote setpoint value) PID - OUT VALUE (manipulated variable) DEVICE PD-TAG (tag name) **Factory setting:** TOTALIZER 1

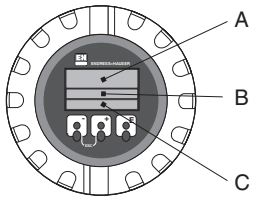
"TRANSDUCER_DISP" (E+H parameters) / base index 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Add. Line - 100%-Value	**AUTO - OOS**	✎ Note! The input is not active unless one of the following was selected in the "Add. Line - Assign" parameter: • VOLUME FLOW % CH1 • VOLUME FLOW % CH2 • CALC. VOLUME FLOW % • VOLUME FLOW BARGRAPH % CH1 • VOLUME FLOW BARGRAPH % CH2 • CALC. VOLUME FLOW BARGRAPH % Use this parameter to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on country, [value] / [dm^3...m^3 or US-gal...US-Mgal] ✎ Note! The unit is taken from the "System Unit - Volume Flow" parameter, (see Page 110).
Add. Line - Format	**AUTO - OOS**	✎ Note! Selection is not active unless a numerical option was selected in the "Add. Line - Assign" parameter. Use this parameter to define the maximum number of places after the decimal point displayed for the reading in the additional line. **Options:** XXXXX. – XXXX.X – XXX.XX – XX.XXX – X.XXXX **Factory setting:** X.XXXX ✎ Note! • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In these instances an arrow appears on the display between the measured value and the engineering unit, (e.g. 1.2 → dm^3/s), indicating that the measuring system is computing with more decimal places than can be shown on the display.

"TRANSDUCER_DISP" (E+H parameters) / base index 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Add. Line - Display Mode	**AUTO - OOS**	✎ Note! Selection is not active unless one of the following was selected in the "Add. Line - Assign" parameter: • VOLUME FLOW BARGRAPH % CH1 • VOLUME FLOW BARGRAPH % CH2 • CALC. VOLUME FLOW BARGRAPH % • SIGNAL BARGRAPH CH1 • SIGNAL BARGRAPH 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.  F-x3xxxxx-20-xx-xx-xx-000 SYMMETRY Symmetrical bar graph for positive and negative directions of flow with –50 / 0 / +50% gradations and integrated sign.  F-x3xxxxx-20-xx-xx-xx-001 **Factory setting:** STANDARD

"TRANSDUCER_DISP" (E+H parameters) / base index 1500		
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 "User Interface Add. Line - Assign" parameter. **Options:** OFF VOLUME FLOW CH1 VOLUME FLOW CH2 CALC. VOLUME FLOW VOLUME FLOW % CH1 VOLUME FLOW % CH2 CALC. VOLUME FLOW % SOUND VELOCITY CH1 SOUND VELOCITY CH2 SOUND VELOCITY AVG. SIGNAL STRENGTH CH1 SIGNAL STRENGTH CH2 FLOW VELOCITY CH1 FLOW VELOCITY CH2 FLOW VELOCITY AVG. VOLUME FLOW BARGRAPH % CH1 VOLUME FLOW BARGRAPH % CH2 CALC. VOLUME FLOW BARGRAPH % SIGNAL BARGRAPH CH1 SIGNAL BARGRAPH CH2 TOTALIZER 1 TOTALIZER 2 TOTALIZER 3 FLOW DIRECTION CH1 FLOW DIRECTION CH2 CALC. FLOW DIRECTION AI 1 - OUT VALUE AI 2 - OUT VALUE AI 3 - OUT VALUE AI 4 - OUT VALUE AI 5 - OUT VALUE AI 6 - OUT VALUE AI 7 - OUT VALUE AI 8 - OUT VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (remote setpoint value) PID - OUT VALUE (manipulated variable) DEVICE PD-TAG (tag name) **Factory setting:** OFF ✎ Note! Multiplex mode is suspended as soon as a fault/notice message is generated. The appropriate error message appears on the display: • Fault message (identified by a lightning icon): 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.

"TRANSDUCER_DISP" (E+H parameters) / base index 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Add. Line Multiplex - 100%-Value	**AUTO - OOS**	✎ Note! The input is not active unless one of the following was selected in the "Add. Line - Multiplex Assign" parameter: • VOLUME FLOW % CH1 • VOLUME FLOW % CH2 • CALC. VOLUME FLOW % • VOLUME FLOW BARGRAPH % CH1 • VOLUME FLOW BARGRAPH % CH2 • CALC. VOLUME FLOW BARGRAPH % Use this parameter to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on country, [value] / [dm^3...m^3 or US-gal...US-Mgal] ✎ Note! The unit is taken from the "System Unit - Volume Flow" parameter, (see Page 110).
Add. Line Multiplex - Format	**AUTO - OOS**	✎ Note! Selection is not active unless a numerical option was selected in the "Add. Line - Multiplex Assign" parameter. Use this parameter to define the maximum number of places after the decimal point displayed for the reading in the additional line. **Options:** XXXXX. – XXXX.X – XXX.XX – XX.XXX – X.XXXX **Factory setting:** X.XXXX ✎ Note! • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In these instances an arrow appears on the display between the measured value and the engineering unit, (e.g. 1.2 → dm^3/s), indicating that the measuring system is computing with more decimal places than can be shown on the display.

"TRANSDUCER_DISP" (E+H parameters) / base index 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Add. Line Multiplex - Display Mode	**AUTO - OOS**	✎ Note! Selection is not active unless one of the following was selected in the "Add. Line - Multiplex Assign" parameter: • VOLUME FLOW BARGRAPH % CH1 • VOLUME FLOW BARGRAPH % CH2 • CALC. VOLUME FLOW BARGRAPH % • SIGNAL BARGRAPH CH1 • SIGNAL BARGRAPH 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.  F-x3xxxxx-20-xx-xx-xx-000 SYMMETRY Symmetrical bar graph for positive and negative directions of flow with –50 / 0 / +50% gradations and integrated sign.  F-x3xxxxx-20-xx-xx-xx-001 **Factory setting:** STANDARD

"TRANSDUCER_DISP" (E+H parameters) / base index 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
A = Main line, B = Additional line, C = Information line		 F-x3xxxxx-07-05-xx-xx-000
Info Line - Assign	**AUTO - OOS**	Use this parameter to define the display value assigned to the information line (the bottom line of the local display) during normal measuring operation. **Options:** OFF VOLUME FLOW CH1 VOLUME FLOW CH2 CALC. VOLUME FLOW VOLUME FLOW % CH1 VOLUME FLOW % CH2 CALC. VOLUME FLOW % SOUND VELOCITY CH1 SOUND VELOCITY CH2 SOUND VELOCITY AVG. SIGNAL STRENGTH CH1 SIGNAL STRENGTH CH2 FLOW VELOCITY CH1 FLOW VELOCITY CH2 FLOW VELOCITY AVG. VOLUME FLOW BARGRAPH % CH1 VOLUME FLOW BARGRAPH % CH2 CALC. VOLUME FLOW BARGRAPH % SIGNAL BARGRAPH CH1 SIGNAL BARGRAPH CH2 TOTALIZER 1 TOTALIZER 2 TOTALIZER 3 OPERATING/SYSTEM CONDITIONS FLOW DIRECTION CH1 FLOW DIRECTION CH2 CALC. FLOW DIRECTION AI 1 - OUT VALUE AI 2 - OUT VALUE AI 3 - OUT VALUE AI 4 - OUT VALUE AI 5 - OUT VALUE AI 6 - OUT VALUE AI 7 - OUT VALUE AI 8 - OUT VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (remote setpoint value) PID - OUT VALUE (manipulated variable) DEVICE PD-TAG (tag name) **Factory setting:** OPERATING/SYSTEM CONDITIONS

"TRANSDUCER_DISP" (E+H parameters) / base index 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Info Line - 100%-Value	**AUTO - OOS**	✎ Note! The input is not active unless one of the following was selected in the "Info Line - Assign" parameter: • VOLUME FLOW % CH1 • VOLUME FLOW % CH2 • CALC. VOLUME FLOW % • VOLUME FLOW BARGRAPH % CH1 • VOLUME FLOW BARGRAPH % CH2 • CALC. VOLUME FLOW BARGRAPH % Use this parameter to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on country, [value] / [dm^3...m^3 or US-gal...US-Mgal] ✎ Note! The unit is taken from the "System Unit - Volume Flow" parameter, (see Page 110).
Info Line - Format	**AUTO - OOS**	✎ Note! Selection is not active unless a numerical option was selected in the "Info Line - Assign" parameter. Use this parameter to define the maximum number of places after the decimal point displayed for the reading in the additional line. **Options:** XXXXX. – XXXX.X – XXX.XX – XX.XXX – X.XXXX **Factory setting:** X.XXXX ✎ Note! • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In these instances an arrow appears on the display between the measured value and the engineering unit, (e.g. 1.2 → dm^3/s), indicating that the measuring system is computing with more decimal places than can be shown on the display.

"TRANSDUCER_DISP" (E+H parameters) / base index 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Info Line - Display Mode	**AUTO - OOS**	✎ Note! Selection is not active unless one of the following was selected in the "Info Line - Assign" parameter: • VOLUME FLOW BARGRAPH % CH1 • VOLUME FLOW BARGRAPH % CH2 • CALC. VOLUME FLOW BARGRAPH % • SIGNAL BARGRAPH CH1 • SIGNAL BARGRAPH 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.  F-x3xxxxx-20-xx-xx-xx-000 SYMMETRY Symmetrical bar graph for positive and negative directions of flow with –50 / 0 / +50% gradations and integrated sign.  F-x3xxxxx-20-xx-xx-xx-001 **Factory setting:** STANDARD

"TRANSDUCER_DISP" (E+H parameters) / base index 1500		
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 "Info. Line - Assign" parameter. **Options:** OFF VOLUME FLOW CH1 VOLUME FLOW CH2 CALC. VOLUME FLOW VOLUME FLOW % CH1 VOLUME FLOW % CH2 CALC. VOLUME FLOW % SOUND VELOCITY CH1 SOUND VELOCITY CH2 SOUND VELOCITY AVG. SIGNAL STRENGTH CH1 SIGNAL STRENGTH CH2 FLOW VELOCITY CH1 FLOW VELOCITY CH2 FLOW VELOCITY AVG. VOLUME FLOW BARGRAPH % CH1 VOLUME FLOW BARGRAPH % CH2 CALC. VOLUME FLOW BARGRAPH % SIGNAL BARGRAPH CH1 SIGNAL BARGRAPH CH2 TOTALIZER 1 TOTALIZER 2 TOTALIZER 3 OPERATING/SYSTEM CONDITIONS FLOW DIRECTION CH1 FLOW DIRECTION CH2 CALC. FLOW DIRECTION AI 1 - OUT VALUE AI 2 - OUT VALUE AI 3 - OUT VALUE AI 4 - OUT VALUE AI 5 - OUT VALUE AI 6 - OUT VALUE AI 7 - OUT VALUE AI 8 - OUT VALUE PID - IN VALUE (controlled variable) PID - CAS IN VALUE (remote setpoint value) PID - OUT VALUE (manipulated variable) DEVICE PD-TAG (tag name) **Factory setting:** OFF ✎ Note! Multiplex mode is suspended as soon as a fault/notice message is generated. The appropriate error message appears on the display: • Fault message (identified by a lightning icon): 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.

"TRANSDUCER_DISP" (E+H parameters) / base index 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Info Line Multiplex - 100%-Value	**AUTO - OOS**	✎ Note! The input is not active unless one of the following was selected in the "Info Line - Multiplex Assign" parameter: • VOLUME FLOW % CH1 • VOLUME FLOW % CH2 • CALC. VOLUME FLOW % • VOLUME FLOW BARGRAPH % CH1 • VOLUME FLOW BARGRAPH % CH2 • CALC. VOLUME FLOW BARGRAPH % Use this parameter to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on country, [value] / [dm^3...m^3 or US-gal...US-Mgal] ✎ Note! The unit is taken from the "System Unit - Volume Flow" parameter, (see Page 110).
Info Line Multiplex - Format	**AUTO - OOS**	✎ Note! Selection is not active unless a numerical option was selected in the "Info Line - Multiplex Assign" parameter. Use this parameter to define the maximum number of places after the decimal point for the second value displayed in the information line. **Options:** XXXXX. — XXXX.X – XXX.XX – XX.XXX – X.XXXX **Factory setting:** X.XXXX ✎ Note! • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In these instances an arrow appears on the display between the measured value and the engineering unit, (e.g. 1.2 → dm^3/s), indicating that the measuring system is computing with more decimal places than can be shown on the display.

"TRANSDUCER_DISP" (E+H parameters) / base index 1500		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Info Line Multiplex - Display Mode	**AUTO - OOS**	✎ Note! Selection is not active unless one of the following was selected in the "Info Line - Multiplex Assign" parameter: • VOLUME FLOW BARGRAPH % CH1 • VOLUME FLOW BARGRAPH % CH2 • CALC. VOLUME FLOW BARGRAPH % • SIGNAL BARGRAPH CH1 • SIGNAL BARGRAPH 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.  F-x3xxxxx-20-xx-xx-xx-000 SYMMETRY Symmetrical bar graph for positive and negative directions of flow with –50 / 0 / +50% gradations and integrated sign.  F-x3xxxxx-20-xx-xx-xx-001 **Factory setting:** STANDARD
Amp. Device Family	**read only**	This parameter is only used in the event of servicing.

3.12 E+H parameters: Transducer Block "TRANSDUCER_TOT" (totalizer)

The following table lists all the E+H-specific parameters of the Transducer Block "TRANSDUCER_TOT" (totalizer). The conditions which have to be met before changing these parameters are provided on Page 105.

"TRANSDUCER_TOT" (E+H parameters) / base index 1550		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
✎ Note! A description of the FOUNDATION Fieldbus parameters of this block is provided on Page 106.		
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 can enable programming by entering: • Code 93 (factory setting) • Personal code (see Page 129) **User input:** Max. 4-digit number (0...9999) ✎ Note! • If write protection is enabled, access to the manufacturer-specific parameters is blocked even if the right code is entered. (More detailed information on write protection is provided in the Operating Instructions for PROline Prosonic Flow 93 FOUNDATION Fieldbus, BA078D/06/en, Section 5.4). • You can disable programming again by entering any number (other than the access code) in this parameter. • The E+H service organisation can be of assistance if you mislay your personal code. • The entry made here does not affect the local display. Therefore programming via the function matrix must 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 (parameters cannot be modified) • ACCESS CUSTOMER (parameters can be modified)

"TRANSDUCER_TOT" (E+H parameters) / base index 1550		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Totalizer 1 - System Value	**AUTO - OOS**	Use this parameter to view the total for the totalizer's measured variable aggregated since measuring commenced. This value can be positive or negative, depending on the setting selected in the "Totalizer 1 - Mode" parameter (see Page 150) and the direction of flow. ✎ Note! • The effect of the setting in the "Totalizer 1 - Mode" parameter (see Page 150) 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 "Totalizer Handling - Failsafe All" parameter, (see Page 155).
Totalizer 1 - System Unit	**AUTO - OOS**	Use this parameter to define the unit for the measured variable selected for the totalizer. **Options:** *Metric:* Cubic centimetre → cm^3 Cubic decimetre → dm^3 Cubic metre → m^3 Millilitre → ml Litre → l Hectolitre → hl Megalitre → Ml MEGA *US:* Cubic centimetre→ 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), corresponds to the totalizer unit factory setting, (see Page 76 ff.). ✎ Note! The unit selected here has no effect on the desired volume unit which should be transmitted via the FF interface. This setting is made separately via the appropriate AI Block in the XD_SCALE parameter group, (see Page 180).

"TRANSDUCER_TOT" (E+H parameters) / base index 1550		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Totalizer 1 - Assign	**AUTO - OOS**	For assigning a measured variable to the totalizer. **Options:** OFF VOLUME FLOW CH1 VOLUME FLOW CH2 VOLUME FLOW AVERAGE VOLUME FLOW SUM VOLUME FLOW DIFF. **Factory setting:** VOLUME FLOW CH1 ✎ Note! The totalizer is reset to "0" as soon as the selection is changed.
Totalizer 1 - Mode	**AUTO - OOS**	Use this parameter to define how the flow components are to be totalled by the totalizer. **Options:** BALANCE Positive and negative flow components. The positive and negative flow components are balanced. In other words, net flow in the flow direction is registered. FORWARD Positive flow components only REVERSE Negative flow components only **Factory setting:** BALANCE
Totalizer 1 - Reset	**AUTO - OOS**	Resets totalizer 1 ("Totalizer 1 - System Value" parameter, see Page 149) to zero. **Options:** NO YES **Factory setting:** NO ✎ Note! Resetting of the totalizer can be also be controlled or initiated using cyclic data transmission via the Discrete Output function block, (see Page 181).

"TRANSDUCER_TOT" (E+H parameters) / base index 1550		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Totalizer 2 - System Value	**AUTO - OOS**	Use this parameter to view the total for the totalizer's measured variable aggregated since measuring commenced. This value can be positive or negative, depending on the setting selected in the "Totalizer 2 - Mode" parameter (see Page 152) and the direction of flow. ✎ Note! • The effect of the setting in the "Totalizer 2 - Mode" parameter (see Page 152) 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 "Totalizer Handling - Failsafe All" parameter, (see Page 155).
Totalizer 2 - System Unit	**AUTO - OOS**	Use this parameter to define the unit for the measured variable selected for the totalizer. **Options:** *Metric:* Cubic centimetre → cm^3 Cubic decimetre → dm^3 Cubic metre → m^3 Millilitre → ml Litre → l Hectolitre → hl Megalitre → Ml MEGA *US:* Cubic centimetre→ 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), corresponds to the totalizer unit factory setting, (see Page 76 ff.). ✎ Note! The unit selected here has no effect on the desired volume unit which should be transmitted via the FF interface. This setting is made separately via the appropriate AI Block in the XD_SCALE parameter group, (see Page 180).

"TRANSDUCER_TOT" (E+H parameters) / base index 1550		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Totalizer 2 - Assign	**AUTO - OOS**	For assigning a measured variable to the totalizer. **Options:** OFF VOLUME FLOW CH1 VOLUME FLOW CH2 VOLUME FLOW AVERAGE VOLUME FLOW SUM VOLUME FLOW DIFF. **Factory setting:** VOLUME FLOW CH1 ✎ Note! The totalizer is reset to "0" as soon as the selection is changed.
Totalizer 2 - Mode	**AUTO - OOS**	Use this parameter to define how the flow components are to be totalled by the totalizer. **Options:** BALANCE Positive and negative flow components. The positive and negative flow components are balanced. In other words, net flow in the flow direction is registered. FORWARD Positive flow components only REVERSE Negative flow components only **Factory setting:** FORWARD
Totalizer 2 - Reset	**AUTO - OOS**	Resets totalizer 2 ("Totalizer 2 - System Value" parameter, see Page 151) to zero. **Options:** NO YES **Factory setting:** NO ✎ Note! Resetting of the totalizer can be also be controlled or initiated using cyclic data transmission via the Discrete Output function block, (see Page 181).

"TRANSDUCER_TOT" (E+H parameters) / base index 1550		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Totalizer 3 - System Value	**AUTO - OOS**	Use this parameter to view the total for the totalizer's measured variable aggregated since measuring commenced. This value can be positive or negative, depending on the setting selected in the "Totalizer 3 - Mode" parameter (see Page 154) and the direction of flow. ✎ Note! • The effect of the setting in the "Totalizer 3 - Mode" parameter (see Page 154) 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 "Totalizer Handling - Failsafe All" parameter, (see Page 155).
Totalizer 3 - System Unit	**AUTO - OOS**	Use this parameter to define the unit for the measured variable selected for the totalizer. **Options:** *Metric:* Cubic centimetre → cm^3 Cubic decimetre → dm^3 Cubic metre → m^3 Millilitre → ml Litre → l Hectolitre → hl Megalitre → Ml MEGA *US:* Cubic centimetre→ 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), corresponds to the totalizer unit factory setting, (see Page 76 ff.). ✎ Note! The unit selected here has no effect on the desired volume unit which should be transmitted via the FF interface. This setting is made separately via the appropriate AI Block in the XD_SCALE parameter group, (see Page 180).

"TRANSDUCER_TOT" (E+H parameters) / base index 1550		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Totalizer 3 - Assign	**AUTO - OOS**	For assigning a measured variable to the totalizer. **Options:** OFF VOLUME FLOW CH1 VOLUME FLOW CH2 VOLUME FLOW AVERAGE VOLUME FLOW SUM VOLUME FLOW DIFF. **Factory setting:** VOLUME FLOW CH1 ✎ Note! The totalizer is reset to "0" as soon as the selection is changed.
Totalizer 3 - Mode	**AUTO - OOS**	Use this parameter to define how the flow components are to be totalled by the totalizer. **Options:** BALANCE Positive and negative flow components. The positive and negative flow components are balanced. In other words, net flow in the flow direction is registered. FORWARD Positive flow components only REVERSE Negative flow components only **Factory setting:** REVERSE
Totalizer 3 - Reset	**AUTO - OOS**	Resets totalizer 3 ("Totalizer 3 - System Value" parameter, see Page 153) to zero. **Options:** NO YES **Factory setting:** NO ✎ Note! Resetting of the totalizer can be also be controlled or initiated using cyclic data transmission via the Discrete Output function block, (see Page 181).

"TRANSDUCER_TOT" (E+H parameters) / base index 1550		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
Totalizer Handling - Reset All	**AUTO - OOS**	Resets totalizers 1–3 ("Totalizer x - System Value" parameter) to zero simultaneously. **Options:** NO YES **Factory setting:** NO ✎ Note! Resetting of the totalizers can be also be controlled or initiated using cyclic data transmission via the Discrete Output function block, (see Page 181).
Totalizers Handling - Failsafe All	**AUTO - OOS**	Use this parameter to define the common response of all totalizers (1...3) to error. **Options:** STOP The totalizer is paused until the fault is rectified. ACTUAL VALUE The totalizers continue to count based on the current measured flow value. The fault is ignored. HOLD VALUE The totalizer continues to count the flow is based on the last valid flow value (before the fault occurred). **Factory setting:** STOP
Amp. Device Family	**read only**	This parameter is only used in the event of servicing.

3.13 E+H parameters: Transducer Block "TRANSDUCER_DIAG" (diagnosis)

The following table lists all the E+H-specific parameters of the Transducer Block "TRANSDUCER_DIAG" (diagnosis). The conditions which have to be met before changing these parameters are provided on Page 105.

"TRANSDUCER_DIAG" (E+H parameters) / base index 1600		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
✎ Note! A description of the FOUNDATION Fieldbus parameters of this block is provided on Page 106.		
Diagnosis - Actual System Condition	**read only**	Displays the current system status. ✎ Note! A precise error description as well as notes on fault elimination can be found in the Operating Instructions for PROline Prosonic Flow 93 FOUNDATION Fieldbus, BA078D/06/en, Section 9.
Diagnosis - Previous System Condition	**read only**	Displays the last error messages 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 can enable programming by entering: • Code 93 (factory setting) • Personal code (see Page 129) **User input:** Max. 4-digit number (0...9999) ✎ Note! • If write protection is enabled, access to the manufacturer-specific parameters is blocked even if the right code is entered. (More detailed information on write protection is provided in the Operating Instructions for PROline Prosonic Flow 93 FOUNDATION Fieldbus, BA078D/06/en, Section 5.4). • You can disable programming again by entering any number (other than the access code) in this parameter. • The E+H service organisation can be of assistance if you mislay your personal code. • The entry made here does not affect the local display. Therefore programming via the function matrix must 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 (parameters cannot be modified) • ACCESS CUSTOMER (parameters can be modified)

"TRANSDUCER_DIAG" (E+H parameters) / base index 1600		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
System - Alarm Delay	**AUTO - OOS**	Use this parameter to define a time span for which the criteria for an error have to be satisfied without interruption before an error or notice message is generated. ✎ Note! Depending on the setting and type of error, this alarm delay acts on both the display and the output values of the FOUNDATION Fieldbus. **User input:** 0...100 s (in steps of one second) **Factory setting:** 0 s ☝ Caution! If this parameter is used, error and notice messages are delayed by the time corresponding to the setting before being forwarded to downstream function blocks or the fieldbus host system. It is therefore imperative to check in advance whether a delay of this nature could affect the safety requirements of the process. If fault and notice messages may not be suppressed, a value of 0 seconds must be entered here.
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 totalizers' response to faults is defined via the "Totalizer Handling - Failsafe All" parameter, (see Page 155). ✎ Note! With regard to the fieldbus, an active simulation is relayed to downstream function blocks or higher-level process control systems by means of the status "UNCERTAIN" for 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

"TRANSDUCER_DIAG" (E+H parameters) / base index 1600		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
System - Trouble-shooting	**AUTO - OOS**	Use this parameter to rectify errors in the EEPROM. The EEPROM is divided into a number of blocks. For fault elimination, select the block in question and acknowledge the error. Caution! When you clear an error in a block, the parameters of the block you select are reset to their factory settings. **Options:** CANCEL MEASURED VALUES SYSTEM UNITS DENSITY PARAMETERS QUICK SETUP USER INTERFACE TOTALIZER COMMUNICATION PROCESS PARAMETER 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**	Displays the entire operation time (in seconds) since the flowmeter was commissioned.
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 T-DAT) LOAD (from T-DAT to EEPROM) **Factory setting:** CANCEL Note! If the power supply fails, the totalizer readings are automatically saved to the EEPROM.
Amp. Device Family	**read only**	This parameter is only used in the event of servicing.

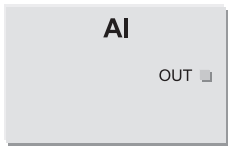
3.14 E+H parameters: Transducer Block "TRANSDUCER_SERV" (service)

The Transducer Block "TRANSDUCER_ SERV" (base index 1650, service) contains all the parameters required for servicing. As these parameters affect the accuracy and functionality of the device, changes may only be made by E+H service technicians. The parameters of the "TRANSDUCER_ SERV" Transducer Block are not explained in these Operating Instructions.

4 Analog Input function block

In the Analog Input function block (AI function block), the process variables from the Transducer Blocks “TRANSDUCER_CH1” (flow channel 1, base index 1200), “TRANSDUCER_ CH2” (flow channel 2, base index 1300) and “TRANSDUCER_ TOT” (totalizer, base index 1550) are prepared for the subsequent automation functions, (e.g. scaling, limit value processing). The automation function is defined by the connections of the outputs.

F06-53xFFxxxx-16-xx-xx-en-001



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:

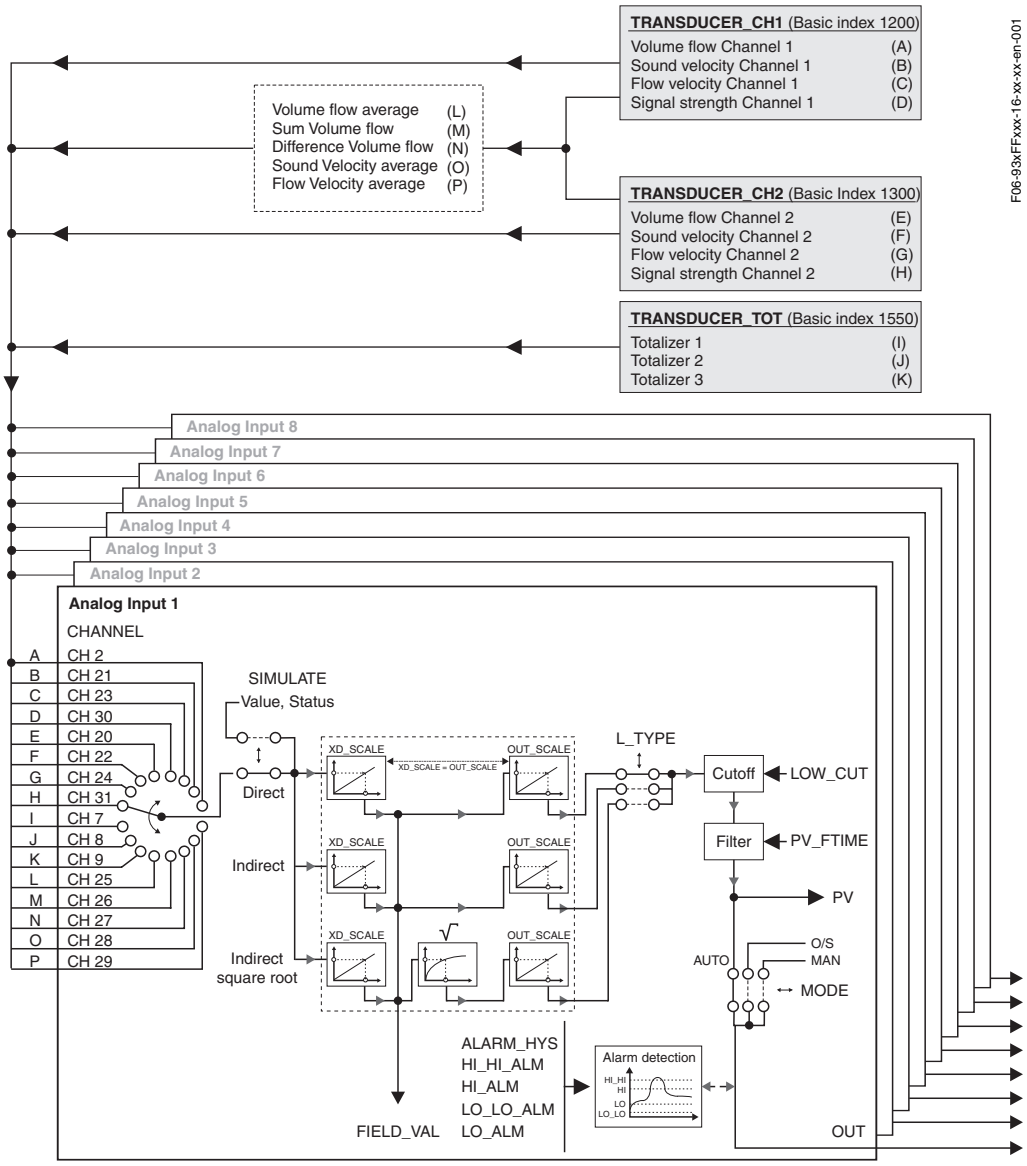


Fig. 3: Signal processing and structure of the Analog Input function blocks

The Analog Input function block receives its input value from the Transducer Blocks TRANSDUCER_CH1 (flow channel 1, base index 1200), TRANSDUCER_ CH2 (flow channel 2, base index 1300) or TRANSDUCER_TOT (flow channel 1, base index 1550). The CHANNEL parameter (see Page 171) is used to select which input value is to be processed by the Analog Input function block.

- CHANNEL = 2 → Volume flow channel 1
- CHANNEL = 21 → Sound velocity channel 1
- CHANNEL = 23 → Flow velocity channel 1
- CHANNEL = 30 → Signal strength channel 1
- CHANNEL = 20 → Volume flow channel 2
- CHANNEL = 22 → Sound velocity channel 2
- CHANNEL = 24 → Flow velocity channel 2
- CHANNEL = 31 → Signal strength channel 2
- CHANNEL = 7 → Totalizer 1
- CHANNEL = 8 → Totalizer 2
- CHANNEL = 9 → Totalizer 3
- CHANNEL = 25 → Average volume flow
- CHANNEL = 26 → Volume flow sum
- CHANNEL = 27 → Volume flow difference
- CHANNEL = 28 → Average sound velocity
- CHANNEL = 29 → Totalizer 1

The SIMULATE parameter group, (see Page 179), allows you to replace the input value with a simulation value and to activate simulation. By specifying the status and the simulation value, the reaction of the complete Analog Input function block can be tested.

Note!
The simulation mode is enabled by means of jumpers on the I/O board, (see Operating Instructions for PROline Prosonic Flow 93 FF, BA078D/06/en, Section 5.4).

The L_TYPE parameter is used to select the linearisation type of the input or simulation value, (see Page 174):
- 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 units you want.
- Indirect signal conversion
  With this setting the input value is re-scaled linearly via the XD_SCALE input scaling to the desired OUT_SCALE output range, (further information on rescaling of the input value can be found on Page 165).
- Indirect signal conversion with root
  With this setting the input value is re-scaled via the XD_SCALE parameter group and recalculated using a root function. It is then rescaled again to the desired output range via the OUT_SCALE parameter group.

The LOW_CUT parameter, (see Page 177), allows a limit value to be specified for the low flow cut off. The low flow cut off is activated via the IO_OPTS parameter, (see Page 173). If the converted primary value (PV) is below the limit value then it is set to a value of "0".

In the PV_FTIME parameter, (see Page 178), a filter time can be specified for filtering the converted input value (PV). If a time of 0 seconds is specified then no filtration takes place.

The MODE_BLK parameter group, (see Page 177), is used to select the operating mode of the Analog Input function block.
If the MAN (manual) operating mode is selected then the output value OUT, (see Page 177), 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.

The most important functions and parameters of the Analog Input function block are listed below. An overview of all the parameters available is provided on Page 167 ff.

4.2 Selecting the operating mode

The operating mode is set by means of the MODE_BLK parameter group, (see Page 177). The Analog Input function block supports the following operating modes:
- AUTO
- MAN
- OOS

Note!
The OOS operating mode is also displayed via the BLOCK_ERR parameter, (see Page 170). In the OOS operating mode, you can access all the write parameters without restriction if write protection is not enabled.

4.3 Selecting the process variable

Prosonic Flow 93 FOUNDATION Fieldbus has eight Analog Input function blocks. The Transducer Block process variables that are to be processed are assigned via the CHANNEL parameter, (see Page 171).

- CHANNEL = 2 → Volume flow channel 1
- CHANNEL = 21 → Sound velocity channel 1
- CHANNEL = 23 → Flow velocity channel 1
- CHANNEL = 30 → Signal strength channel 1
- CHANNEL = 20 → Volume flow channel 2
- CHANNEL = 22 → Sound velocity channel 2
- CHANNEL = 24 → Flow velocity channel 2
- CHANNEL = 31 → Signal strength channel 2
- CHANNEL = 7 → Totalizer 1
- CHANNEL = 8 → Totalizer 2
- CHANNEL = 9 → Totalizer 3
- CHANNEL = 25 → Average volume flow
- CHANNEL = 26 → Volume flow sum
- CHANNEL = 27 → Volume flow difference
- CHANNEL = 28 → Average sound velocity
- CHANNEL = 29 → Totalizer 1

4.4 Linearisation types

In the Analog Input function block, the input value from the Transducer Block can be linearised via the L_TYPE parameter, (see Page 174). The following types of linearisation are available:

- Direct
  With this setting, the input value avoids the linearisation function and is looped unchanged with the same unit through the Analog Input function block.

- Indirect
  With this setting the input value is re-scaled linearly via the XD_SCALE input scaling to the desired OUT_SCALE output range, (further information on rescaling of the input value can be found on Page 165).

- Indirect Square Root
  With this setting, the input value is re-scaled via the XD_SCALE parameter group and recalculated using a root function. It is then rescaled again to the desired output range via the OUT_SCALE parameter group.

4.5 Selecting the units

The XD_SCALE parameter group, (see Page 180), is used to define with which physical unit the input value of the Transducer Block should be read in and processed in the Analog Input function block. Ensure that the unit selected suits the input value selected in the CHANNEL parameter. The unit of the output value OUT is specified via the OUT_SCALE parameter group, (see Page 178). If the "Direct" linearisation mode was selected via the L_TYPE parameter, (see Page 174), the setting of the XD_SCALE and OUT_SCALE parameter groups must be identical as otherwise the function block remains in the OOS operating mode and the “BLOCK CONFIG ERROR” block error is displayed in the BLOCK_ERROR parameter.

Note!
- Example of rescaling the input value → Page 165
- The selection of the system units in the relevant Transducer Blocks does not affect the system unit setting in the Analog Input function block. These settings must be made separately. The unit selected in the Transducer Blocks is only used for the local display, low flow cut off and for simulation.

4.6 Status of the output value OUT

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

- GOOD_NON_CASCADE
  The Analog Input function block is in the AUTO operating mode, i.e. 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 "UNCERTAIN" status tells the downstream function blocks that a "notice message" is present in the device, triggered by an active positive zero return or simulation, for example.

- BAD
  The output value OUT is invalid. The following are possible causes:
  – The Analog Input function block is in the OOS operating mode.
  – The "BLOCK CONFIG ERROR" status is displayed via the BLOCK_ERR parameter, (see Page 170).
  – The Transducer Block TRANSDUCER_CH1 (flow channel 1, base index 1200), TRANSDUCER_ CH2 (flow channel 2, base index 1300) or TRANSDUCER_ TOT (flow channel 1, base index 1550) 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 which is triggered by a serious device error, e.g. a faulty electronic module.

✎ Note!
The reason for the error message in question (notice/fault message) is displayed in the Transducer Block TRANSDUCER_DIAG (diagnosis, base index 1600) via the "Diagnosis - Actual System Condition" parameter.
A list of all the error messages (including troubleshooting measures) is provided in the Operating Instructions for PROline Prosonic Flow 93 FOUNDATION Fieldbus, BA078D/06/en.

4.7 Simulation of input/output

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

1. Simulating the input of the Analog Input function block:
   The SIMULATE parameter group, (see Page 179), can be used to specify the input value (measured value and status). Since the simulation value runs through the entire function block, all the parameter settings of the block can be checked.

   ✎ Note!
   If simulation is disabled by the jumper on the I/O board, the simulation mode cannot be activated in the SIMULATE parameter, (see Page 179). In the Resource Block, the BLOCK_ERROR parameter, (see Page 92), indicates whether simulation of the Analog Input function block is possible.

2. Simulating the output of the Analog Input function block:
   Set the operating mode in the MODE_BLK parameter group (see Page 177) to MAN and specify the desired output value directly in the OUT parameter, (see Page 177).

4.8 Diagnosis

Block errors and diagnosis information are displayed in the Analog Input function block via the BLOCK_ERR parameter, (see Page 170). A description of the block errors supported is provided on Page 170.

Note!
Further information on trouble-shooting and fault elimination while configuring the Analog Input function block is provided in the Operating Instructions for PROline Prosonic Flow 93 FF, BA052D/06/en.

4.9 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 measuring range of the sensor channel 1 is 0...30 m³/h.
- The output range to the automation system should be 0...100%.

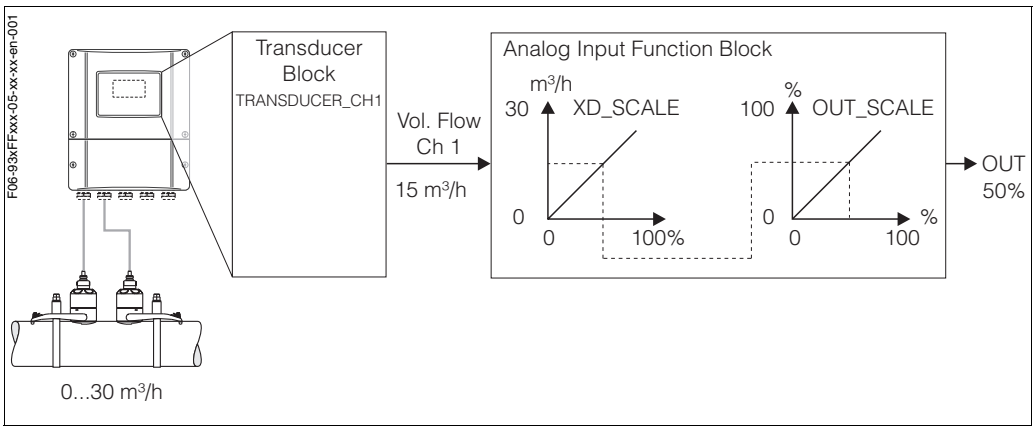
The Analog Input function block must be configured as follows:
- Select the input value in the CHANNEL parameter, (see Page 171)
  Select: Channel = 2 → Volume flow channel 1

- L_TYPE parameter, (see Page 174)
  Select: L_TYPE = Indirect
  The “volume flow channel 1” process variable of the Transducer Block TRANSDUCER_ CH1 (flow channel 1, base index 1200) is rescaled linearly to the desired OUT_SCALE output range via the XD_SCALE input scaling.

- XD_SCALE parameter group, (see Page 180)
  XD_SCALE 0 % = 0
  XD_SCALE 100 % = 30
  XD_SCALE UNIT = m³/h

- OUT_SCALE parameter group, (see Page 178)
  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 OUT parameter.



4.10 Limit values

The limit values are based on the output value OUT. If the output value OUT exceeds or undershoots the defined limit values, 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 (see Page 172)
- HI_LIM (see Page 173)
- LO_LO_LIM (see Page 175)
- LO_LIM (see Page 175)

4.11 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 BLOCK_ALM parameter, (see Page 169). The ACK_OPTION parameter, (see Page 167), 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, (see Page 170) . The BLOCK_ALM parameter (see Page 169) is used to show the block process alarms and communicate them to the fieldbus host system. The following block process alarms can be generated by the Analog Input function block:
  – SIMULATION ACTIVE
  – INPUT FAILURE
  – OUT OF SERVICE
  – BLOCK CONFIG ERROR

  If the option of the process alarm (BLOCK ALM) has **not** been enabled in the ACK_OPTION parameter, (see Page 167), the process alarms must be acknowledged in the BLOCK_ALM parameter, (see Page 169).

- **Limit value process alarms**
  If a limit value is violated then the priority specified for the limit value alarm is 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 (see Page 172)
  - HI_PRI (see Page 173)
  - LO_LO_PRI (see Page 176)
  - LO_PRI (see Page 176)

  The status of the limit value process alarms is communicated to the fieldbus host system via the following parameters:

  - HI_HI_ALM (see Page 172)
  - HI_ALM (see Page 172)
  - LO_LO_ALM (see Page 175)
  - LO_ALM (see Page 175)

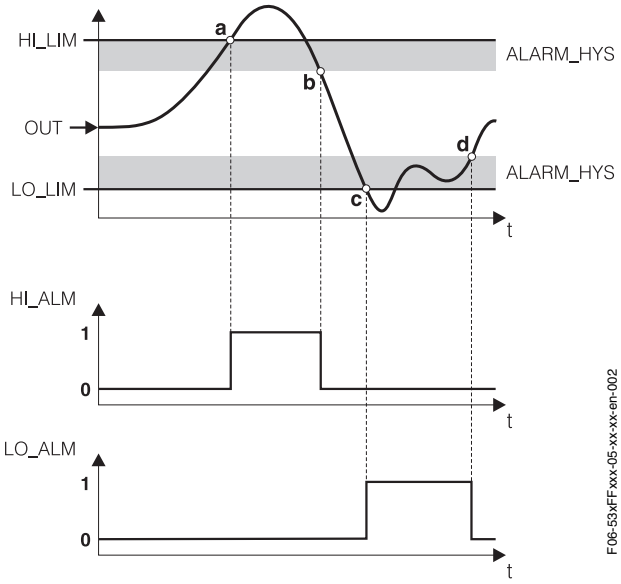
  If the option of a limit value process alarm has **not** been enabled in the ACK_OPTION parameter, (see Page 167), then this must be acknowledged directly in its parameter (see list).

✎ Note!
The ALARM_SUM parameter, (see Page 169), shows the current status of all the process alarms.

4.12 Parameters of the Analog Input function block

The following table shows all the parameters available for the Analog Input function block.

Analog Input function block / **Base index: AI 1 = 350, AI 2 = 390, AI 3 = 430, AI 4 = 470, AI 5 = 510, AI 6 = 550, AI 7 = 590, AI 8 = 630**		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
ACK_OPTION	**AUTO - MAN - OOS**	This parameter is used to specify whether a process alarm must be acknowledged at the time of alarm detection by the fieldbus host system. If this option is enabled the process alarm is acknowledged automatically. **Options:** HI_HI_ALM Upper limit value alarm HI_ALM Upper limit value warning LO_LO_ALM Lower limit value alarm LO_ALM Lower limit value warning BLOCK ALM Block alarm **Factory setting:** The option is not enabled for any alarm, the alarms must be acknowledged.
ALARM_HYS	**AUTO - MAN - OOS**	Entry of the hysteresis value for the upper and lower warning or alarm limit values. The alarm conditions remain active as long as the measured value is within the hysteresis. The hysteresis value affects the following warning and alarm limit values of the Analog Input function block: • HI_HI_ALM (upper limit value alarm) • HI_ALM (lpper limit value warning) • LO_LO_ALM (lower limit value alarm) • LO_ALM (lower limit value warning) **User input:** 0...50% **Factory setting:** 0.5% ✎ Note! The hysteresis value relates to a percentage of the range of the OUT_SCALE parameter group in the Analog Input function block, (see Page 178). (Continued on next page)

Analog Input function block / Base index: AI 1 = 350, AI 2 = 390, AI 3 = 430, AI 4 = 470, AI 5 = 510, AI 6 = 550, AI 7 = 590, AI 8 = 630		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
ALARM_HYS (contd.)	**AUTO - MAN - OOS**	Example: The top diagram shows the limit values defined for the LO_LIM and HI_LIM warnings with their respective hystereses (grey background) and the signal curve of the output value OUT. The bottom two diagrams show the behaviour of the associated HI_ALM and LO_ALM alarms in relation to the changing signal curve (0 = no alarm, 1 = alarm output). **a** = The block output value OUT exceeds the HI_LIM limit value, HI_ALM is activated. **b** = The block output value OUT undershoots the hysteresis value of HI_LIM, HI_ALM is deactivated. **c** = The block output value OUT undershoots the LO_LIM limit value, LO_ALM is activated. **d** = The block output value OUT exceeds the hysteresis value of LO_LIM, LO_ALM is deactivated. 

Analog Input function block / Base index: AI 1 = 350, AI 2 = 390, AI 3 = 430, AI 4 = 470, AI 5 = 510, AI 6 = 550, AI 7 = 590, AI 8 = 630		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
ALARM_SUM	**AUTO - MAN - OOS**	Displays the current status of the process alarms in the Analog Input function block. **Display:** HI_HI_ALM Violation of the upper limit value alarm HI_ALM Violation of the upper limit value warning LO_LO_ALM Violation of the lower limit value alarm LO_ALM Violation of the lower limit value warning BLOCK ALM Block alarm ✎ Note! In addition, the process alarms can also be disabled in this parameter group.
ALERT_KEY	**AUTO - MAN - OOS**	Entry of the identification number of the plant unit. This information can be used by the fieldbus host system for sorting alarms and events. **User input:** 1...255 **Factory setting:** 0
BLOCK_ALM	**AUTO - MAN - OOS**	Displays the current block status with information on pending configuration, hardware or system errors, including details of the alarm time (date, time) when the error occurred. The block alarm is triggered in the event of the following block errors: • SIMULATION ACTIVE • INPUT FAILURE • OUT OF SERVICE • BLOCK CONFIG ERROR ✎ Note! If the option of the alarm has **not** been enabled in the ACK_OPTION parameter, the alarm can only be acknowledged via this parameter.

Analog Input function block / Base index: AI 1 = 350, AI 2 = 390, AI 3 = 430, AI 4 = 470, AI 5 = 510, AI 6 = 550, AI 7 = 590, AI 8 = 630		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
BLOCK_ERR	**read only**	Displays the active block error. **Display:** SIMULATION ACTIVE Simulation in the “Simulate” parameter group of the Analog Input function block is active. OUT OF SERVICE (OOS) The function block is in the "Out of Service" operating mode. INPUT FAILURE This block error indicates that the input value transmitted by the Transducer Block “TRANSDUCER_CH1”, “TRANSDUCER_CH 2” (volume flow channel 1 and 2) or “TRANSDUCER_TOT” (totalizer) is not valid. Possible causes: A serious device error, such as a faulty electronic module, is present. The exact cause of the error is then displayed in the “Diagnosis - Actual System Condition” parameter in the Transducer Block “TRANSDUCER_DIAG” (diagnosis, base index 1600). More information on eliminating errors can be found in the Operating Instructions for PROline Prosonic Flow 93 FOUNDATION Fieldbus,BA078D/06/en. ✎ Note! The “INPUT FAILURE” block error is relayed to downstream function blocks or higher-level process control systems by means of the status “BAD” for the output value OUT (AI Block). BLOCK CONFIG ERROR In the Analog Input function block, a configuration error is present which can be caused by the following: • A unit was selected via the XD_SCALE parameter group which does not suit the input value set in the CHANNEL parameter. For example, if “volume flow channel 1” was defined as the input value, a valid unit for the volume flow, such as m^3/h, must be selected in the XD_SCALE parameter group. • No valid input value was selected in the CHANNEL parameter, (CHANNEL = 0, Uninitialized). • No valid linearisation type was selected in the L_TYPE parameter, (L_TYPE = 0, Uninitialized). • For “Direct” linearisation type, (L_TYPE parameter): The settings (unit, scaling) in the XD_SCALE and OUT_SCALE parameter groups do not match. ✎ Note! • The operating mode of the Analog Input function block cannot be set to "AUTO" in the event of a “BLOCK CONFIG ERROR” block error. • The status of the output value OUT (AI Block) is BAD until the configuration error is eliminated which means that it cannot be used for downstream function blocks.

Analog Input function block / Base index: AI 1 = 350, AI 2 = 390, AI 3 = 430, AI 4 = 470, AI 5 = 510, AI 6 = 550, AI 7 = 590, AI 8 = 630		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
CHANNEL	**OOS**	Assignment of the output values (process variables) of the Transducer Blocks "TRANSDUCER_CH1" (flow channel 1, base index 1200), "TRANSDUCER_CH 2" (flow channel 2, base index 1300) or "TRANSDUCER_TOT" (totalizer, base index 1550) to the input of the Analog Input function block in question. The Transducer Block of makes eight process variables available to the input channels of the Analog Input function blocks: **User input:** 2 = Volume flow channel 1 7 = Totalizer 1 8 = Totalizer 2 9 = Totalizer 3 20 = Volume flow channel 2 21 = Sound velocity channel 1 22 = Sound velocity channel 2 23 = Flow velocity channel 1 24 = Flow velocity channel 2 25 = Average volume flow 26 = Volume flow sum 27 = Volume flow difference 28 = Average sound velocity 29 = Average flow velocity 30 = Signal strength channel 1 31 = Signal strength channel 2 **Factory setting:** 0 = Unitialized ✎ Note! If 0 (= Uninitialized) is selected, the operating mode of the function block does not switch to the AUTO status. In this case, the "BLOCK CONFIG ERROR" block error is displayed in the BLOCK_ERROR parameter.
FIELD_VAL	**read only**	Displays the input value of "TRANSDUCER_CH1" (flow channel 1, base index 1200), "TRANSDUCER_CH 2" (flow channel 2, base index 1300) or "TRANSDUCER_TOT" (totalizer, base index 1550) including the related status. The value relates to a percentage of the XD_SCALE input range and when simulation is active is replaced by the simulation value. $\text{FIELD\_VAL} = \frac{100 \cdot (\text{Process variables PV} - \text{XD\_SCALE\_0\%})}{(\text{XD\_SCALE\_100\%} - \text{XD\_SCALE\_0\%})}$ ✎ Note! The process variables and the input value of the Analog Input function block are assigned via the CHANNEL parameter.
GRANT_ DENY	**AUTO - MAN - OOS**	Releases or restricts the access authorisation of a fieldbus host system to the field device. ✎ Note! This parameter is not evaluated by PROline Prosonic Flow 93 FOUNDATION Fieldbus.

Analog Input function block / Base index: AI 1 = 350, AI 2 = 390, AI 3 = 430, AI 4 = 470, AI 5 = 510, AI 6 = 550, AI 7 = 590, AI 8 = 630		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
HI_ALM	**AUTO - MAN - OOS**	Alarm status display for the upper warning limit value, (HI_LIM), including details of the time of the alarm (date, time) and the value that triggered the alarm. ✎ Note! • In addition, the active alarm can be acknowledged in this parameter group. • If the option of the alarm has **not** been enabled in the ACK_OPTION parameter, the alarm can only be acknowledged via this parameter.
HI_HI_ALM	**AUTO - MAN - OOS**	Alarm status display for the upper alarm limit value, (HI_HI_LIM), including details of the time of the alarm (date, time) and the value that triggered the alarm. ✎ Note! • In addition, the active alarm can be acknowledged in this parameter group. • If the option of the alarm has **not** been enabled in the ACK_OPTION parameter, the alarm can only be acknowledged via this parameter.
HI_HI_LIM	**AUTO - MAN - OOS**	Entry of the alarm limit value for the upper alarm, (HI_HI_ALM). If the output value OUT exceeds this limit value then the alarm status parameter HI_HI_ALM is output. **User input:** Range and unit of OUT_SCALE **Factory setting:** $3402823466 \times 10^{38}$
HI_HI_PRI	**AUTO - MAN - OOS**	Specifies the action taken when the upper alarm limit value (HI_HI_LIM) is exceeded. **User input:** 0 The violation of the upper alarm limit is not evaluated. 1 No notification if the upper alarm limit is violated. 2 Reserved for block alarms. 3-7 The violation of the upper alarm limit is output as a user notice with the appropriate priority (3 = low priority, 7 = high priority). 8-15 The violation of the upper alarm limit is output as a critical alarm with the appropriate priority (8 = low priority, 15 = high priority). **Factory setting:** 0

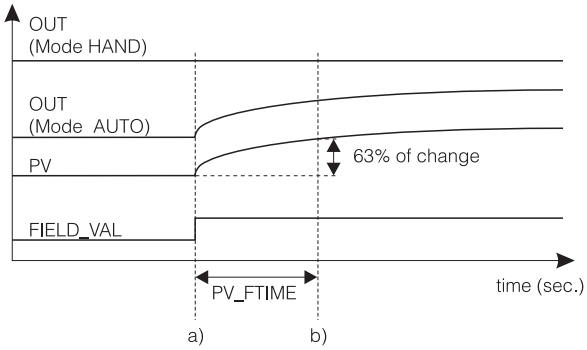
Analog Input function block / Base index: AI 1 = 350, AI 2 = 390, AI 3 = 430, AI 4 = 470, AI 5 = 510, AI 6 = 550, AI 7 = 590, AI 8 = 630		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
HI_LIM	**AUTO - MAN - OOS**	Entry of the alarm limit value for the upper warning (HI_ALM). If the output value OUT exceeds this limit value then the alarm status parameter HI_ALM is output. **User input:** Range and unit of OUT_SCALE **Factory setting:** $3402823466 \times 10^{38}$
HI_PRI	**AUTO - MAN - OOS**	Specifies the action taken when the upper warning limit value (HI_LIM) is exceeded. **User input:** 0 The violation of the upper warning limit is not evaluated. 1 No notification if the upper warning limit is violated. 2 Reserved for block alarms. 3-7 The violation of the upper warning limit is output as a user notice with the appropriate priority (3 = low priority, 7 = high priority). 8-15 The violation of the upper warning limit is output as a critical alarm with the appropriate priority (8 = low priority, 15 = high priority). **Factory setting:** 0
IO_OPTS	**OOS**	Activates the options for processing the input and output values of the function block (I/O options). The following options are supported: **Options:** Low Cutoff **Factory setting:** Not enabled ✎ Note! The switch-on point of the low flow cut off can be entered via the "LOW_CUT" parameter, (see Page 177).

Analog Input function block / Base index: AI 1 = 350, AI 2 = 390, AI 3 = 430, AI 4 = 470, AI 5 = 510, AI 6 = 550, AI 7 = 590, AI 8 = 630		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
L_TYPE	**MAN**	Selects the type of linearisation for the input value. **Options:** Uninitialized Direct With this setting, the input value avoids the linearisation function and is looped unchanged with the same unit through the Analog Input function block. With this option the scaling and unit of the XD_SCALE and OUT_SCALE parameter groups must be identical. If this is not the case, the function block changes to the OOS operating mode and the “BLOCK CONFIG ERROR” block error is displayed in the BLOCK_ERROR parameter. PV = Input value Indirect With this setting, the input value is re-scaled linearly via the XD_SCALE input scaling to the desired OUT_SCALE output range. $$PV = \frac{X}{100} \cdot (Y - Z) - Z$$ X = FIELD_VAL Y = OUT_SCALE_100% Z = OUT_SCALE_0% ✎ Note! Further information in rescaling the input value is provided on Page 165. Indirect Square Root With this setting, the input value is re-scaled via the XD_SCALE parameter group and recalculated using a root function. It is then rescaled again to the desired output range via the OUT_SCALE parameter group. $$PV = \sqrt{\frac{X}{100}} \cdot (Y - Z) - Z$$ X = FIELD_VAL Y = OUT_SCALE_100% Z = OUT_SCALE_0% **Factory setting:** Uninitialized ✎ Note! If "Uninitialized" is selected, the operating mode of the function block does not switch to the AUTO status. In this case, the “BLOCK CONFIG ERROR” block error is displayed via the BLOCK_ERROR parameter.

Analog Input function block / Base index: AI 1 = 350, AI 2 = 390, AI 3 = 430, AI 4 = 470, AI 5 = 510, AI 6 = 550, AI 7 = 590, AI 8 = 630		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
LO_ALM	**AUTO - MAN - OOS**	Alarm status display for the lower warning limit value, (LO_LIM), including details of the time of the alarm (date, time) and the value that triggered the alarm. ✎ Note! • In addition, the active alarm can be acknowledged in this parameter group. • If the option of the alarm has **not** been enabled in the ACK_OPTION parameter, the alarm can only be acknowledged via this parameter.
LO_LIM	**AUTO - MAN - OOS**	Entry of the alarm limit value for the lower warning, (LO_ALM). If the output value OUT undershoots this limit value then the alarm status parameter LO_ALM is output. **User input:** Range and unit of OUT_SCALE **Factory setting:** –3402823466 x 10^{38}
LO_LO_ALM	**read only**	Alarm status display for the lower alarm limit value, (LO_LO_LIM), including details of the time of the alarm (date, time) and the value that triggered the alarm. ✎ Note! • In addition, the active alarm can be acknowledged in this parameter group. • If the option of the alarm has **not** been enabled in the ACK_OPTION parameter, the alarm can only be acknowledged via this parameter.
LO_LO_LIM	**AUTO - MAN - OOS**	Entry of the alarm limit value for the lower alarm, (LO_LO_ALM). If the output value OUT undershoots this limit value then the alarm status parameter LO_LO_ALM is output. **User input:** Range and unit of OUT_SCALE **Factory setting:** –3402823466 x 10^{38}

Analog Input function block / Base index: AI 1 = 350, AI 2 = 390, AI 3 = 430, AI 4 = 470, AI 5 = 510, AI 6 = 550, AI 7 = 590, AI 8 = 630		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
LO_LO_PRI	**AUTO - MAN - OOS**	Specifies the action taken when the lower alarm limit value (LO_LO_LIM) is undershot. **User input:** 0 The violation of the lower alarm limit is not evaluated. 1 No notification to master if the lower alarm limit is violated. 2 Reserved for block alarms. 3-7 The violation of the lower alarm limit is output as a user notice with the appropriate priority (3 = low priority, 7 = high priority). 8-15 The violation of the lower alarm limit is output as a critical alarm with the appropriate priority (8 = low priority, 15 = high priority). **Factory setting:** 0
LO_PRI	**AUTO - MAN - OOS**	Specifies the action taken when the lower warning limit value (LO_LIM) is exceeded. **User input:** 0 The violation of the lower warning limit is not evaluated. 1 No notification to master if the lower warning limit is violated. 2 Reserved for block alarms. 3-7 The violation of the lower warning limit is output as a user notice with the appropriate priority (3 = low priority, 7 = high priority). 8-15 The violation of the lower warning limit is output as a critical alarm with the appropriate priority (8 = low priority, 15 = high priority). **Factory setting:** 0

Analog Input function block / Base index: AI 1 = 350, AI 2 = 390, AI 3 = 430, AI 4 = 470, AI 5 = 510, AI 6 = 550, AI 7 = 590, AI 8 = 630		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
LOW_CUT	**AUTO - MAN - OOS**	Entry of a limit value for the low flow cut off. If the converted measured value is below this limit value then PV is shown as zero. **User input:** Range and unit of OUT_SCALE **Factory setting:** 0 ✎ Note! • This parameter is not active unless the I/O option "low flow cut off" has been selected in the IO_OPTS parameter, (see Page 173). • The unit used is copied from the OUT_SCALE parameter group.
MODE_BLK	**AUTO - MAN - OOS**	Displays the current (Actual) and desired (Target) operating mode of the Analog Input function block, the permitted modes (Permitted) supported by the Resource Block and the normal operating mode (Normal). **Display:** AUTO MAN OOS ✎ Note! The Analog Input function block supports the following operating modes: • AUTO (automatic mode): The block is executed. • MAN (manual intervention by the operator): The output value OUT can be specified manually. • OOS (out of service): The block is in the "Out of Service" mode. With the output value OUT the last valid value is output. The status of the output value OUT switches to BAD.
OUT	**MAN - OOS**	Displays the output value with alarm evaluation and the status of the Analog Input function block. ✎ Note! • If MAN (manual) is selected for the operating mode in the MODE_BLK parameter then the output value OUT can be specified manually here. • The unit used is copied from the OUT_SCALE parameter group.

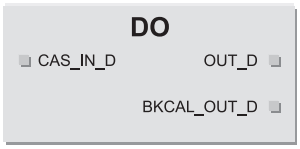
Analog Input function block / Base index: AI 1 = 350, AI 2 = 390, AI 3 = 430, AI 4 = 470, AI 5 = 510, AI 6 = 550, AI 7 = 590, AI 8 = 630		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
OUT_SCALE	**MAN - OOS**	Definition of the measuring range (lower and upper limit), the physical unit and the number of decimal places for the output value OUT. **Factory setting:** 0...100 % ✎ Note! • The measuring range definition in this parameter group does not limit the output value OUT. If the output value OUT is outside the measuring range, the value is still transmitted. • If "Direct" was selected in the L_TYPE parameter, the settings for the measuring range and unit must be identical to those in the XD_SCALE parameter group. If this is not the case, the function block does not switch to the AUTO operating mode. The "BLOCK CONFIG ERROR" block error is then displayed in the BLOCK_ERR parameter.
PV	**read only**	Displays the process variable used for the block execution, including the status of the process variable. ✎ Note! The unit used is copied from the OUT_SCALE parameter group.
PV_FTIME	**AUTO - MAN - OOS**	Entry of the filter time constant (in seconds) of the digital filter of the 1st order. This time is required in order for 63% of a change in the FIELD_VAL parameter to have an effect on the value of PV. The diagram shows the signal curves of the Analog Input function block over time:  a) The FIELD_VAL parameter changes. b) The PV parameter has reacted 63% to the change in the FIELD_VAL parameter. **Factory setting:** 0 s

Analog Input function block / Base index: AI 1 = 350, AI 2 = 390, AI 3 = 430, AI 4 = 470, AI 5 = 510, AI 6 = 550, AI 7 = 590, AI 8 = 630		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
SIMULATE	**AUTO - MAN - OOS**	Simulation of the input value and input status. Since this value runs through the entire algorithm, the behaviour of the Analog Input function block can be checked. **Factory setting:** Simulation Disabled (simulation not active) ✎ Note! • The BLOCK_ERR parameter of the Resource Block indicates whether simulation is possible, (see Page 92). • The BLOCK_ERR parameter of the Analog Input function block indicates whether simulation is active, (see Page 170). • The simulation mode is enabled by means of jumpers on the I/O board, (see Operating Instructions for PROline Prosonic Flow 93 FOUNDATION Fieldbus, BA078D/06/en).
ST_REV	**read only**	Displays the revision status of the static data. ✎ Note! The revision status parameter is incremented on each modification of static data.
STATUS_ OPTS	**OOS**	Specifies the options for status processing and processing of the output value OUT. The following options are supported by the Analog Input function block: **Options:** Uncertain if MAN mode: The status of the output value OUT changes to UNCERTAIN if the operating mode is set to "MAN". Propagate Fault Forward: Fault is forwarded on. The status of the corresponding Transducer Block is relayed to the downstream function blocks via the BKCAL_OUT parameter. **Factory setting:** No options active
STRATEGY	**AUTO - MAN - OOS**	Parameter for grouping and thus faster evaluation of blocks. Grouping is carried out by entering the same numerical value in the STRATEGY parameter of each individual block. **Factory setting:** 0 ✎ Note! These data are neither checked nor processed by the Analog Input function block.

Analog Input function block / Base index: AI 1 = 350, AI 2 = 390, AI 3 = 430, AI 4 = 470, AI 5 = 510, AI 6 = 550, AI 7 = 590, AI 8 = 630		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
TAG_DESC	**AUTO - MAN - OOS**	Entry of a user-specific text of max. 32 characters for unique identification and assignment of the block. **Factory setting:** "_ _ _ _ _ _ _ _" no text
UPDATE_EVT	**read only**	Displays whether static block data have been modified, including date and time.
XD_SCALE	**MAN - OOS**	In this parameter group, the input value from the Transducer Block "TRANSDUCER_CH1" (flow channel 1, base index 1200), "TRANSDUCER_CH 2" (flow channel 2, base index 1300) or "TRANSDUCER_TOT" (totalizer, base index 1550) is scaled and the unit is defined. **User input:** Measuring range of the process variable (input value) **Factory setting:** 0...100 % ✎ Note! • Defining the measuring range in this parameter group does not represent a restriction. If the value is outside the measuring range, it is transferred nonetheless. • The selection of units depends on the setting in the CHANNEL parameter, (see Page 171): Channel = 2: only units for the volume flow are valid Channel = 7: only units for totalizer 1 are valid Channel = 8: only units for totalizer 2 are valid Channel = 9: only units for totalizer 3 are valid Channel = 20: only units for the volume flow are valid Channel = 21: only units for the sound velocity are valid Channel = 22: only units for the sound velocity are valid Channel = 23: only units for the flow velocity are valid Channel = 24: only units for the flow velocity are valid Channel = 25: only units for the volume flow are valid Channel = 26: only units for the volume flow are valid Channel = 27: only units for the volume flow are valid Channel = 28: only units for the sound velocity are valid Channel = 29: only units for the flow velocity are valid Channel = 30: only units for the signal strength are valid Channel = 31: only units for the signal strength are valid • The function block remains in the OOS (out of service) mode if the unit selected does not suit the input value selected in the CHANNEL parameter. In this case, the "BLOCK CONFIG ERROR" block error is displayed via the BLOCK_ERROR parameter. • An example of rescaling the input value is provided on Page 165.

5 Discrete Output function block

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



CAS_IN_D = Remote input value and status from an upstream block
OUT_D = Discrete output value and status
BKCAL_OUT_D = Output value and status for the BKCAL_IN_D input of another block.

5.1 Signal processing

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

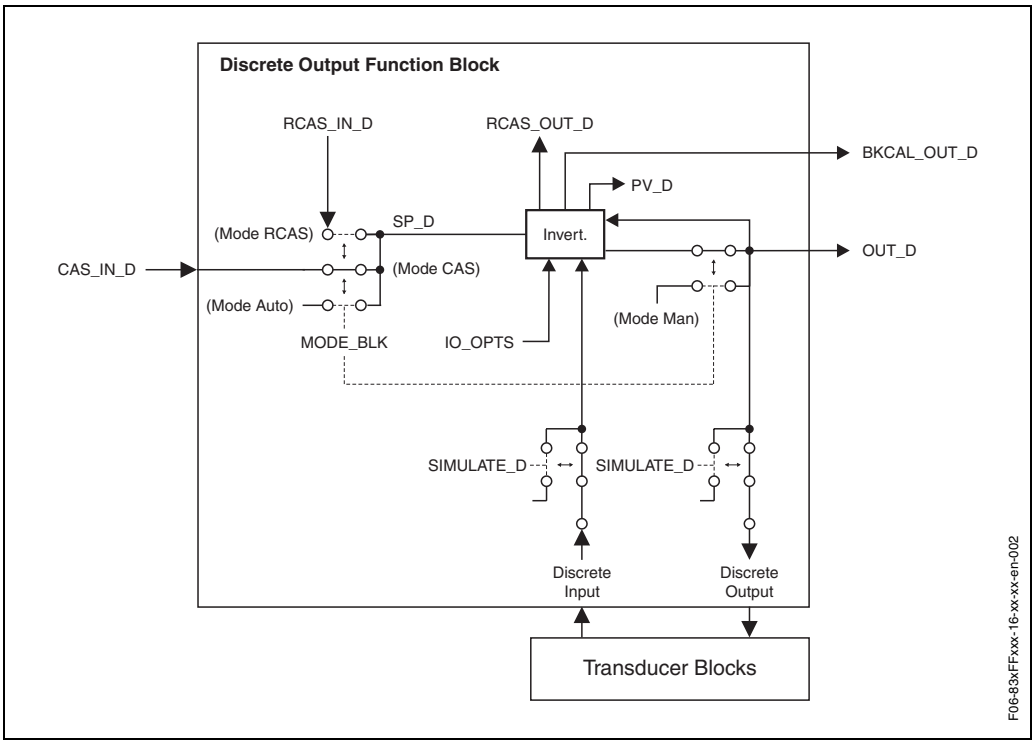


Fig. 4: Signal processing in the Discrete Output function block

In the CAS (cascade operation) operating mode, the Discrete Output function block receives, via the CAS_IN_D function block input, a discrete signal from an upstream function block. This signal controls the setpoint value (SP_D parameter) of the function block and, after internal calculation, is sent as an output signal (OUT_D parameter) to the Transducer Blocks 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 BKCAL_OUT_D output.

Signal processing in the RCAS (remote cascade operation) operating mode is largely identical to the CAS operating mode. However, in this operating mode, control of the SP_D parameter does not take place via an upstream function block but rather via a fieldbus host system. The output value and status of the Discrete Output function block is communicated to the fieldbus host system as a feedback message via the RCAS_OUT_D parameter.
In the AUTO (automatic) operating mode, the setpoint value (SP_D parameter) is prescribed directly in the Discrete Output function block. In this case, the CAS_IN_D parameter is not taken into consideration in the internal calculation.

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

The most important functions and parameters of the Discrete Output function block are listed below; you will find an overview of all the parameters available on Page 184 ff.

5.2 Selecting the operating mode

The operating mode is set by means of the MODE_BLK parameter group,
(see Page 187). The Discrete Output function block supports the following operating modes:
- AUTO
- MAN
- CAS
- RCAS
- OOS

5.3 Security behaviour

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 setpoint value) exists longer than defined in the FSTATE_TIME parameter, or when the SET_FSTATE parameter in the Resource Block is activated. The security behaviour is determined via the FSTATE_TIME, FSTATE_VAL_D, and IO_OPTS parameters.

5.4 Assignment: DO function block/Transducer Blocks

The Discrete Output function block and the Transducer Blocks are assigned/connected via the CHANNEL parameter,
(option “16” → Discrete Output function block).

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

Via the Discrete Output function block, different instrument functions in the appropriate Transducer Blocks can be initiated via manufacturer-specific, fixed setpoint 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 takes place (see Table). The value 0 always serves as the starting point for the corresponding control of instrument functions. A status change from a value not equal to zero to another value has no effect.

Input allocation of the 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

Example for the control of positive zero return via the Discrete Output function block.
The following example shows how the positive zero return for channel 1 can be activated or deactivated by an upstream function block 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 Blocks must be established. For this, the value "16" (= Discrete Output) must be assigned to the CHANNEL parameter.

2. In the CAS operating mode, the Discrete Output function block processes the setpoint value prescribed at the CAS_IN_D input from an upstream function block and transfers it to the Transducer Blocks.

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

   Deactivating the positive zero return, channel 1
   The positive zero return for channel 1 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 the positive zero return be deactivated again through a status change from 0 → 3 at the CAS_IN_D input.

5.6 Parameters of the Discrete Output function block

Discrete Output function block / base index 780		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
ALERT_KEY	**AUTO - MAN - OOS - CAS - RCAS**	Entry of the identification number of the plant unit. This information can be used by the fieldbus host system for sorting alarms and events. **User input:** 1...255 **Factory setting:** 0
BLOCK_ALM	**AUTO - MAN - OOS - CAS - RCAS**	Displays the current block status with information on pending configuration, hardware or system errors, including details of the alarm time (date, time) when the error occurred. The block alarm is triggered in the event of the following block errors: • SIMULATION ACTIVE • INPUT FAILURE • OUTPUT FAILURE • READBACK FAILURE • OUT OF SERVICE • BLOCK CONFIG ERROR
BKCAL_ OUT_D	**read only**	Displays the discrete output value and output status transferred in the case of cascade control to the BKCAL_IN_D input of the upstream function block.
BLOCK_ERR	**read only**	Displays the active block error. **Display:** SIMULATION ACTIVE Simulation in the "SIMULATE_D" parameter group of the Discrete Output Block is active. INPUT FAILURE Input fault. The input value of the upstream function block has a status of BAD. OUTPUT FAILURE Fault in Transducer Block. READBACK FAILURE A fault in the hardware used by the READBACK_D parameter. OUT OF SERVICE The block has the status "Out of Service". BLOCK CONFIG ERROR • An operating switchover is not possible, since the value of the Period of Execution time = 0. • A switchover to the RCAS operating mode is not possible since "Uninitialized" was selected in the SHED_OPT parameter.

Discrete Output function block / base index 780		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
CAS_IN_D	**AUTO - MAN - OOS - CAS - RCAS**	Displays the discrete input value and status copied from an external function block in the CAS operating mode. Discrete state 0 = Starting point, no effect Discrete state 1 = Reserved Discrete state 2 = Positive zero return channel 1 "ON" Discrete state 3 = Positive zero return channel 1 "OFF" Discrete state 4 = Zero point adjustment channel 1 Discrete state 5 = Reserved Discrete state 6 = Reserved Discrete state 7 = Reset totalizers 1, 2, 3 Discrete state 8 = Reset totalizer 1 Discrete state 9 = Reset totalizer 2 Discrete state 10 = Reset totalizer 3 Discrete state 11 = Reserved Discrete state 12 = Reserved Discrete state 13 = Reserved Discrete state 14 = Reserved Discrete state 15 = Reserved Discrete state 16 = Positive zero return channel 2 "ON" Discrete state 17 = Positive zero return channel 2 "OFF" Discrete state 18 = Zero point adjustment channel 2 ✎ Note! • The desired function will only then be executed when a status change from 0 (Discrete state 0) to the corresponding function value, (e.g. Discrete state 2 = positive zero return ON), takes place. • The remote setpoint value read in via the CAS_IN_D parameter is only used if the Discrete Output function block is in the CAS operating mode. In the AUTO operating mode, the value of the SP_D parameter is used as a setpoint value.
CHANNEL	**OOS**	✎ Note! With PROline Prosonic Flow 93 FOUNDATION Fieldbus, this parameter is fixed at 16. Assignment of the logical hardware channels of the Transducer Blocks “TRANSDUCER_CH1” (flow channel 1, base index 1200), “TRANSDUCER_CH 2” (flow channel 2, base index 1300) or “TRANSDUCER_TOT” (totalizer, base index 1550) to the input of the Discrete Output function block in question. **Options:** 0 = Uninitialized 16 = Discrete Output **Factory setting:** 0 = Uninitialized

Discrete Output function block / base index 780		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
FSTATE_TIME	**AUTO - MAN - OOS - CAS - RCAS**	Entry of the delay time which must expire with a fault of the external reference value (RCAS_IN_D parameter), before the defined fault operation is initiated. **Factory setting:** 0 s ✎ Note! After expiry of the delay time and a still active fault, the following values are used for further processing: • If the option "Fault State to value" was selected in the IO_OPTS parameter, the value of the FSTATE_VAL_D (fault replacement value) parameter will be used. • If the option "Fault State to value" was not selected in the IO_OPTS parameter, the value of the RCAS_IN_D parameter will continue to be used.
FSTATE_ VAL_D	**AUTO - MAN - OOS - CAS - RCAS**	Entry of a fault condition replacement value for the RCAS_IN_D parameter. This value is used for further processing instead of the RCAS_IN_D parameter when the following conditions are met:: • An active fault of the RCAS_IN_D parameter exists. • The delay time FSTATE_TIME has elapsed. • The "Fault state to value" option has been selected in the IO_OPTS parameter. **Options:** 0 = Starting point, no effect 1 = Reserved 2 = Positive zero return channel 1 "ON" 3 = Positive zero return channel 1 "OFF" 4 = Zero point adjustment channel 1 5 = Reserved 6 = Reserved 7 = Reset totalizers 1, 2, 3 8 = Reset totalizer 1 9 = Reset totalizer 2 10 = Reset totalizer 3 11 = Reserved 12 = Reserved 13 = Reserved 14 = Reserved 15 = Reserved 16 = Positive zero return channel 2 "ON" 17 = Positive zero return channel 2 "OFF" 18 = Zero point adjustment channel 2 **Factory setting:** 0
GRANT_ DENY	**AUTO - MAN - OOS - CAS - RCAS**	Releases or restricts the access authorisation of a fieldbus host system to the field device. ✎ Note! This parameter is not evaluated by PROline Prosonic Flow 93 FOUNDATION Fieldbus.

Discrete Output function block / base index 780		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
IO_OPTS	**OOS**	Activates the options for processing the input and output values of the function block (I/O options). **Options:** • PV for BKCAL_OUT For BKCAL_OUT_D, the value of PV_D parameter is used instead of the SP_D parameter. • SP-PV Track in MAN SP_D follows PV_D in the MAN operating mode. • SP-PV Track in LO SP_D follows PV_D in the LO operating mode. • Invert Inverting of the output value OUT_D to the Transducer Block. • Fault State to value When security behaviour is initiated, FSTATE_VAL_D is used as a setpoint value. • Use Fault State Value on restart During instrument startup, FSTATE_VAL_D is used as setpoint value until a valid value is available. • Target to MAN if Fault State activated When security behaviour is initiated, the requested (Target) operating mode of the MODE_BLK parameter group is set to MAN, and the original target operating mode is lost. After leaving the security behaviour, the block remains in MAN and must be set to the desired operating mode by the user. **Factory setting:** Not enabled
MODE_BLK	**AUTO - MAN - OOS - CAS - RCAS**	Displays the current (Actual) and desired (Target) operating mode of the Discrete Output function block, the permitted modes (Permitted) supported by the Resource Block and the normal operating mode (Normal). **Display:** AUTO - MAN - OOS - CAS - RCAS The Discrete Output function block supports the following operating modes: • AUTO (automatic mode): The setpoint value specified by the user via the SP_D parameter is used in the execution of the internal Discrete Output algorithm. • MAN (manual intervention by the operator): The OUT_D parameter can be specified directly by the user. • OOS (out of service): The block has the status "Out of Service". The Discrete Output algorithm of the block is not executed. The last valid value is output at the OUT_D parameter and the status changes to BAD. • CAS (cascade mode): Via the input or CAS_IN_D parameter, the Discrete Output function block receives the setpoint value (for internal calculation) directly from another function block. The internal Discrete Output algorithm is executed. • RCAS (remote cascade): Via the RCAS_IN_D parameter, the Discrete Output function block receives the setpoint value (for internal calculation) directly from the fieldbus host system. The internal Discrete Output algorithm is executed.

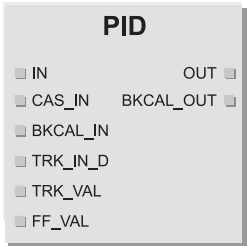
Discrete Output function block / base index 780		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
OUT_D	**MAN - OOS**	Displays the discrete output value and the status of the Discrete Output function block. ✎ Note! If MAN (manual) is selected for the operating mode in the MODE_BLK parameter then the output value OUT_D can be specified manually here.
PV_D	**read only**	Displays the discrete process variable value and status determined in the READBACK_D parameter.
PV_STATE	**AUTO - MAN - OOS - CAS - RCAS**	In this parameter, the fieldbus host system can store a reference to a description of the possible states of the PV_D parameter. ✎ Note! This parameter is not evaluated by PROline Prosonic Flow 93 FOUNDATION Fieldbus.
RCAS_IN_D	**AUTO - MAN - OOS - CAS - RCAS**	In this parameter, the discrete setpoint value (value and status) provided externally, (fieldbus host system, other function block etc.), is read in for internal calculation and displayed. ✎ Note! This parameter is only active in the RCAS operating mode.
RCAS_ OUT_D	**read only**	Displays the discrete output value and status of the specified setpoint value transferred to the fieldbus host system in the course of cascade control. ✎ Note! This parameter is only active in the RCAS operating mode.
READ-BACK_D	**read only**	Displays the input signal condition and status of the feedback message input.
SHED_OPT	**AUTO - MAN - OOS - CAS - RCAS**	Selects the action taken if the monitoring time is exceeded, (see SHED_RCAS parameter, Page 96) in the RCAS operating mode. During the monitoring time, parameter updating between the fieldbus host system and the Discrete Output function block is checked. If the parameters are not being updated then on expiry of the monitoring time the Discrete Output function block switches from the RCAS operating mode to the mode selected here. **Options:** Uninitialized NormalShed_NormalReturn NormalShed_NoReturn ShedToAuto_NormalReturn ShedToAuto_NoReturn ShedToManual_NormalReturn ShedToManual_NoReturn ShedToRetainedTarget_NormalReturn ShedToRetainedTarget_NoReturn **Factory setting:** Uninitialized

Discrete Output function block / base index 780		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
SIMULATE_D	**AUTO - MAN - OOS - CAS - RCAS**	Simulation of the value and status of the process variable PV_D. **Factory setting:** Simulation Disabled (simulation not active) ✎ Note! • During the simulation, the value of OUT_D is not passed on to the Transducer Block. The Transducer Block keeps the last valid value from before the simulation was activated. • The BLOCK_ERROR parameter of the Resource Block indicates whether simulation is possible.
SP_D	**AUTO - MAN - OOS**	Entry of the discrete setpoint value. **Options:** 0 = Starting point, no effect 1 = Reserved 2 = Positive zero return channel 1 "ON" 3 = Positive zero return channel 1 "OFF" 4 = Zero point adjustment channel 1 5 = Reserved 6 = Reserved 7 = Reset totalizers 1, 2, 3 8 = Reset totalizer 1 9 = Reset totalizer 2 10 = Reset totalizer 3 11 = Reserved 12 = Reserved 13 = Reserved 14 = Reserved 15 = Reserved 16 = Positive zero return channel 2 "ON" 17 = Positive zero return channel 2 "OFF" 18 = Zero point adjustment channel 2
ST_REV	**read only**	Displays the revision status of the static data. ✎ Note! The revision status parameter is incremented on each modification of static data.
STATUS_ OPTS	**OOS**	Selects the available status options for specifying the status processing and processing of the output value OUT_D. The following options are supported: **Options:** Propagate Fault Backward Pass on fault operation to upstream blocks. **Factory setting:** No option active

Discrete Output function block / base index 780		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
STRATEGY	**AUTO - MAN - OOS - CAS - RCAS**	Parameter for grouping and thus faster evaluation of blocks. Grouping is carried out by entering the same numerical value in the STRATEGY parameter of each individual block. **Factory setting:** 0 ✎ Note! These data are neither checked nor processed by the Discrete Output function block.
TAG_DESC	**AUTO - MAN - OOS - CAS - RCAS**	Entry of a user-specific text of max. 32 characters for unique identification and assignment of the block. **Factory setting:** "_ _ _ _ _ _ _ _" no text
UPDATE_EVT	**read only**	Displays whether static block data have been modified, including date and time.
XD_STATE	**AUTO - MAN - OOS - CAS - RCAS**	In this parameter, the fieldbus host system can store a reference to a description of the possible states of the PV_D parameter. ✎ Note! This parameter is not evaluated by PROline Prosonic Flow 93 FOUNDATION Fieldbus.

6 PID function block (PID controller)

A PID function block contains the input channel processing, the proportional integral-differential control (PID) and the analog output channel processing. The configuration of the PID function block depends on the automation task. The following can be realised: basic closed-control loops, feedforward control, cascade control, cascade control with limiting.
The possibilities available for data processing within the PID function block include: signal scaling and limiting, operating mode control, feedforward control, limiting control, alarm detection, signal status propagation.



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- IN = Input of the controlled variable from another function block.
- CAS_IN = Input of the remote setpoint value from another function block.
- BKCAL_IN = Input of the feedback value and status from the BKCAL_OUT output of the downstream function block which ensures bumpless switching of the operating mode.
- TRK_IN_D = Discrete input for activating the external output tracking function.
- TRK_VAL = Input for the external value for tracking from another function block.
- FF_VAL = Input for the disturbance variable from another function block.
- OUT = Output value and status (manipulated variable) of the PID function block.
- BKCAL_OUT = Output for the feedback value and status transferred to the BKCAL_IN input of the upstream function block to ensure bumpless switching of the operating mode.

6.1 Signal processing

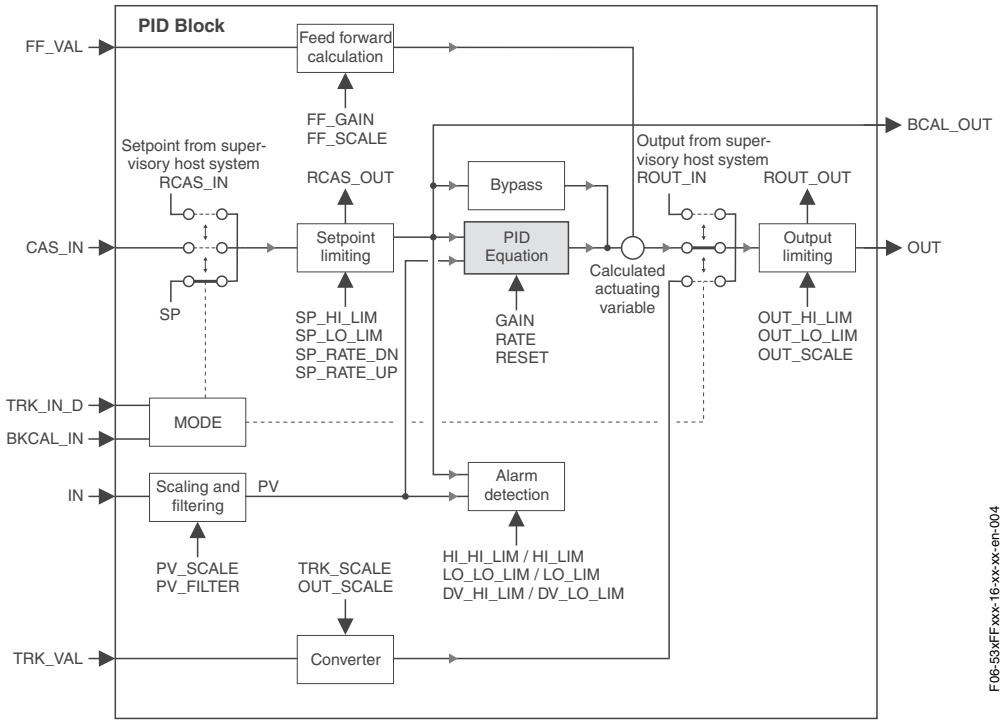

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Fig. 5: Internal structure of the PID function block

6.2 PID function block equation

The PID function block (PID controller) can be used for various automation strategies. The function block has a flexible control algorithm that can be configured differently depending on the application.

$$y = GAIN \cdot \left(e + \frac{1}{RESET} \cdot \int e \cdot \Delta t + RATE \cdot \frac{\Delta e}{\Delta t} \right) + F$$

y = Manipulated variable calculated from the PID algorithm.
GAIN = Proportional gain factor (P-term)
RESET = Time constant for the integral function (I-term)
RATE = Time constant for the derivative action (D-term)
e = Control deviation (e = setpoint value - PV)
F = Disturbance variable (F = FF_VAL · FF_GAIN)

The OUT output value results following checking of the OUT_HI_LIM and OUT_LO_LIM range limits, (see Page 211).
The PID function block consists of a proportional term, an integral term and a derivative term. The manipulated variable is calculated on the basis of the control deviation between the setpoint value SP and the process variable PV (controlled variable).

The individual PID terms are used in the calculation of the manipulated variable as follows:

- Proportional term:
  The proportional term reacts directly and immediately to a change in the setpoint value SP or the process variable PV (controlled variable). The manipulated variable is modified by the proportional factor GAIN. This corresponds to the control deviation multiplied by the gain factor. If a controller works only with the proportional term, then the control has a lasting control deviation.

- Integral term:
  The control deviation arising from the calculation of the manipulated variable using the proportional term is integrated via the integral term of the controller until this control deviation is negligible. The integral function RESET corrects the manipulated variable depending on the size and duration of the control deviation. If the value for the integral function RESET is set to zero then the controller works with pure I-control. The influence of the integral term on the control is greater if the value of the integral function RESET is reduced.

- Derivative term:
  In the case of control sections with long delays, e.g. temperature controls, it is useful to use the derivative term RATE of the controller. Using the derivative term RATE the manipulated variable is calculated as a function of the change in the control deviation.

6.3 Selecting the operating mode

The operating mode is set by means of the MODE_BLK parameter group, (see Page 210). The PID function block supports the following operating modes:
- AUTO
- MAN
- OOS
- CAS
- RCAS
- ROUT

✎ Note!
The OOS block status is also displayed via the BLOCK_ERR parameter, (see Page 201). In the OOS operating mode, you can access all the write parameters without restriction if write protection is not enabled.

6.4 Setpoint value specification

The PID function block works with different setpoint values (reference values) depending on the active operating mode:

- The PID function block is in the AUTO operating mode:
  The setpoint value of the SP parameter, (see Page 214), is used to calculate the manipulated variable. This setpoint value is specified manually by the operator in the SP parameter.

- The PID function block is in the CAS operating mode:
  The setpoint value of the CAS_IN parameter, (see Page 202), is used to calculate the manipulated variable. This setpoint value is copied from an external function block and read in via the CAS_IN parameter in the PID function block.

- The PID function block is in the RCAS operating mode:
  The setpoint value of the RCAS_IN parameter, (see Page 213), is used to calculate the manipulated variable. This setpoint value is copied from the fieldbus host system and read in via the RCAS_IN parameter in the PID function block.

✎ Note!
The range of the setpoint value entry can be restricted via the SP_HI_LIM and SP_LO_LIM parameters, (see Page 215).

6.5 Damping

Specifying a time in the PV_FTIME parameter, (see Page 212), slows down the reaction of the internal process variables to changes in the input value IN, (controlled variable). This output filter is useful where the input value fluctuates greatly. Where a time of 0 seconds is specified, the output value is not filtered.

6.6 Limit values

The limit values are based on the value of the process variable PV, (see Page 212). If the process variable PV exceeds or undershoots the defined limit values, 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 (see Page 205)
- HI_LIM (see Page 206)
- LO_LO_LIM (see Page 208)
- LO_LIM (see Page 207)
- DV_HI_ALM (see Page 202)
- DV_LO_ALM (see Page 204)

6.7 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 BLOCK_ALM parameter, (see Page 201). The ACK_OPTION parameter, (see Page 197), specifies whether an alarm must be acknowledged via the fieldbus host system.

The following process alarms are generated by the PID function block:

- Block process alarms
  A block process alarm is triggered via the BLOCK_ERR parameter, (see Page 201). The BLOCK_ALM parameter (see Page 197) is used to show the block process alarms and communicate them to the fieldbus host system. The following block process alarm can be generated by the PID function block:

  - OUT OF SERVICE

- If the option of the process alarm (BLOCK ALM) has **not** been enabled in the ACK_OPTION parameter, (see Page 197), the process alarm can only be acknowledged in the BLOCK_ALM parameter, (see Page 197).

- Limit value process alarms
  If a limit value is violated then the priority specified for the limit value alarm is 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 (see Page 206)
  - HI_PRI (see Page 207)
  - LO_LO_PRI (see Page 207)
  - LO_PRI (see Page 209)
  - DV_HI_PRI (see Page 203)
  - DV_LO_PRI (see Page 204)

  The status of the limit value process alarms is communicated to the fieldbus host system via the following parameters:

  - HI_HI_ALM (see Page 205)
  - HI_ALM (see Page 205)
  - LO_LO_ALM (see Page 208)
  - LO_ALM (see Page 207)
  - DV_HI_ALM (see Page 202)
  - DV_LO_ALM (see Page 203)

  If the option of a limit value process alarm has **not** been enabled in the ACK_OPTION parameter, (see Page 197), then this must be acknowledged directly in its parameter (see list).

Note!
The ALARM_SUM parameter, (see Page 199), shows the current status of all the process alarms.

6.8 Example: Basic PID control

The continual flow into a container is to be controlled.
The volume flow of the fluid is captured via a flow transmitter (FT) and made available to the PID function block via an Analog Input function block. The PID function block may be either in the flowmeter or in the control valve. The manipulated variable that is forwarded to the control valve (FV) is calculated in the PID function block using the deviation between the measured volume flow and the specified setpoint value (desired volume flow).

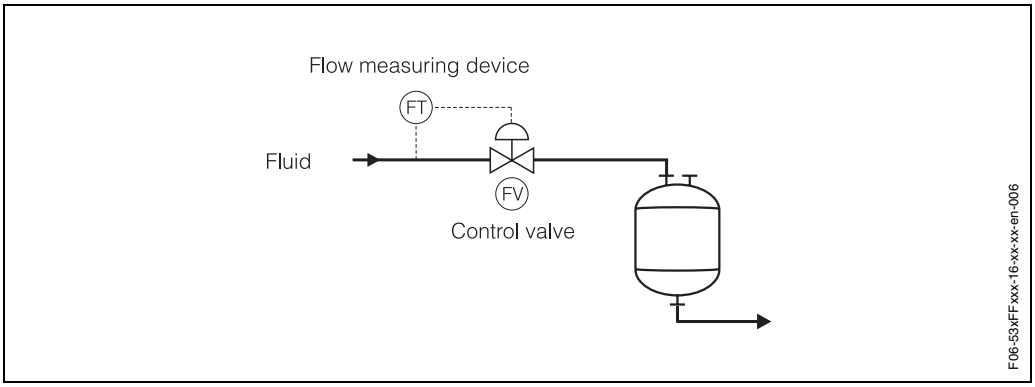


Fig. 6: PID control for continual flow into a container

Connecting the function blocks
The PID function block receives its input value (controlled variable) from an Analog Input function block (OUT output value). This input value, which corresponds to the measured volume flow of the flowmeter, is read into the PID function block via the IN parameter, (see Page 207).

In the AUTO operating mode, the setpoint value is specified manually via the SP parameter, (see Page 214).

The manipulated variable calculated in the PID function block is connected to the CAS_IN input parameter of the Analog Output function block via the output value OUT, (see Page 211). The Analog Output function block forwards this manipulated variable to the control valve.

In addition, the BKCAL_OUT output parameter of the Analog Output function block is read in via the BKCAL_IN input parameter, (see Page 201), of the PID function block to ensure bumpless switching of the operating mode.

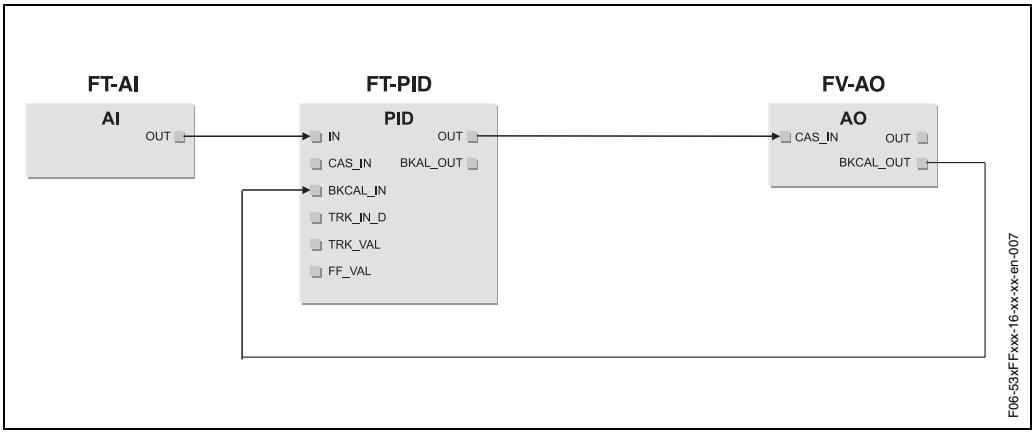


Fig. 7: Connecting the function blocks

6.9 Example of configuration

The measuring range of the flowmeter (controlled variable) is 0...30 m^3/h.
The desired flow value (setpoint value) is specified manually by means of the SP parameter and should be 15 m^3/h. The Analog Output function block is actuated over an output range of 0 ... 100%.

Configuration:

- Setting the input range and input unit of the controlled variable at input IN:

  PV_SCALE 0 % = 0

  PV_SCALE 100% = 30

  PV_SCALE UNIT = m^3/h

- Setting the output range and output unit of the manipulated variable at output OUT:

  OUT_SCALE 0 % = 0

  OUT_SCALE 100 % = 100

  OUT_SCALE UNIT = %

- Defining the input limits for the setpoint value range:

  SP_LO_LIM = 0

  SP_HI_LIM = 30

- Defining the output limits for the manipulated variable at output OUT:

  OUT_LO_LIM = 0

  OUT_HI_LIM = 100

- Setting the bypass function:
  In order to be able to deactivate the bypass function via the BYPASS parameter, the Bypass Enable option must first be activated via the CONTROL_OPTS parameter.

- Setting the control parameter (depending on the controlled system):
  GAIN - proportional gain factor (P-term)
  RESET- time constant for the integral function (I-term)
  RATE- time constant for the derivative action (D-term)

- Specifying the setpoint value via SP parameter:
  SP = 15

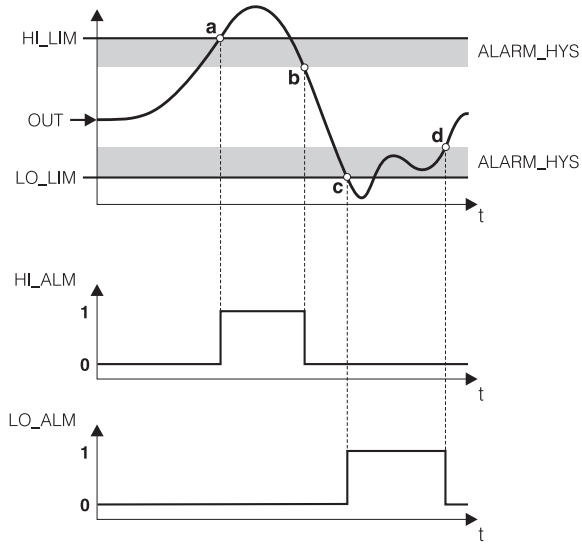
- Configuration of the limit value and control deviation alarms and associated priorities, if required.

- In order for the PID function block to be executed the operating mode must be set to AUTO.

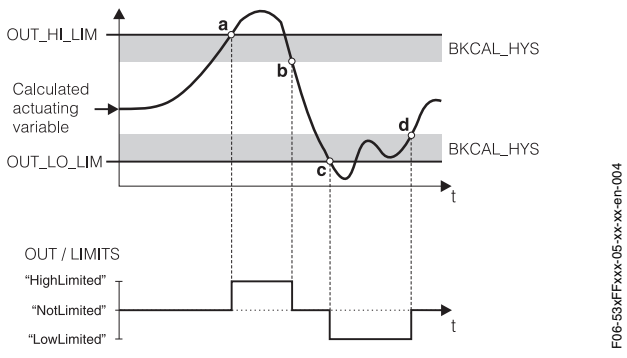
6.10 Parameters of the PID function block

The following table shows all the parameters available for the PID function block:

PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
ACK_OPTION	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	This parameter is used to specify whether a process alarm must be acknowledged at the time of alarm detection by the fieldbus host system. If this option is enabled the process alarm is acknowledged automatically. **Options:** HI_HI_ALM Upper limit value alarm HI_ALM Upper limit value warning LO_LO_ALM Lower limit value alarm LO_ALM Lower limit value warning DV_HI_ALM Limit value alarm for upper control deviation (SP-PV) DV_LO_ALM Limit value alarm for lower control deviation (SP-PV) BLOCK ALM Block alarm **Factory setting:** The option is not enabled for any alarm, the alarms must be acknowledged

PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
ALARM_HYS	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Entry of the hysteresis value for the upper and lower warning or alarm limit values. The alarm conditions remain active as long as the measured value is within the hysteresis. The hysteresis value affects the following warning and alarm limit values of the PID function block: • HI_HI_ALM (upper limit value alarm) • HI_ALM (upper limit value warning) • LO_LO_ALM (lower limit value alarm) • LO_ALM (lower limit value warning) • DV_HI_ALM (limit value for upper control deviation) • DV_LO_ALM (limit value for lower control deviation) **User input:** 0...50% **Factory setting:** 0.5% ✎ Note! The hysteresis value relates to a percentage of the range of the PV_SCALE parameter in the PID function block, (see Page 213). Example: The top diagram shows the defined LO_LIM and HI_LIM alarm limit values with their respective hystereses (grey background) and the signal curve of the process variable PV. The bottom two diagrams show the behaviour of the associated HI_ALM and LO_ALM alarms in relation to the changing signal curve (0 = no alarm, 1 = alarm output). **a** = Process variable PV exceeds the limit value HI_LIM, HI_ALM is activated. **b** = Process variable PV undershoots the hysteresis value of HI_LIM, HI_ALM is deactivated. **c** = Process variable PV undershoots the limit value LO_LIM, LO_ALM is activated. **d** = Process variable PV exceeds the hysteresis value of LO_LIM, LO_ALM is deactivated. 

PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
ALARM_SUM	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Displays the current status of the process alarms. **Display:** HI_HI_ALM Violation of the upper limit value alarm HI_ALM Violation of the upper limit value warning LO_LO_ALM Violation of the lower limit value alarm LO_ALM Violation of the lower limit value warning DV_HI_ALM Violation of the limit value alarm for the upper control deviation DV_LO_ALM Violation of the limit value alarm for the lower control deviation BLOCK_ALM Block alarm ✎ Note! In addition, the process alarms can also be disabled in this parameter group.
ALERT_KEY	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Entry of the identification number of the plant unit. This information can be used by the fieldbus host system for sorting alarms and events. **User input:** 1...255 **Factory setting:** 0
BAL_TIME	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	This parameter is used to enter the time for which the weighting factor counteracts the integral term of the saturation, (calculated manipulated variable > OUT_HI_LIM). **Factory setting:** 0 s

PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
BKCAL_HYS	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Entry of the hysteresis value for the upper and lower manipulated variable range limit value OUT_HI_LIM and OUT_LO_LIM. The hysteresis value relates to a percentage of the value in the OUT_SCALE parameter group, (see Page 212). If the calculated manipulated variable exceeds or undershoots the range defined by the range limit values then this range violation is shown in the LIMITS monitoring parameter in the OUT parameter group and communicated to the downstream blocks. The range violation remains active as long as the value of the calculated manipulated variable does not undershoot or overshoot the hysteresis value again. **User input:** 0...50% **Factory setting:** 0.5% Example: The top diagram shows the defined manipulated variable range limit values OUT_HI_LIM and OUT_LO_LIM with the BKCAL_HYS hysteresis (grey background) and the signal curve of the calculated manipulated variable. The bottom diagram shows the behaviour of the LIMITS range limit value monitor, of the OUT parameter group, to the changing signal curve of the calculated manipulated variable. "NotLimited" = No range limit value violation "HighLimited" = Range limit value violation is output "LowLimited" = Range limit value violation is output **a** = The calculated manipulated variable exceeds the upper manipulated variable range limit value OUT_HI_LIM. In the OUT parameter group the status "HighLimited" is output via LIMITS. **b** = The calculated manipulated variable undershoots the BKCAL_HYS hysteresis value of the upper manipulated variable range limit value OUT_HI_LIM. In the OUT parameter group the status "NotLimited" is output via LIMITS. **c** = The calculated manipulated variable undershoots the lower manipulated variable range limit value OUT_LO_LIM. In the OUT parameter group the status "LowLimited" is output via LIMITS. **d** = The calculated manipulated variable exceeds the BKCAL_HYS hysteresis value of the lower manipulated variable range limit value OUT_LO_LIM. In the OUT parameter group the status "NotLimited" is output via LIMITS. 

PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
BKCAL_IN	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Displays the analog input value and status copied in the case of cascade control from the BKCAL_OUT output of the downstream function block. The cascade control is initialised with this value to ensure bumpless switching of the operating mode.
BKCAL_OUT	**read only**	Displays the analog output value and output status transferred in the case of cascade control to the BKCAL_IN input of the upstream function block. The cascade control is initialised with this value to ensure bumpless switching of the operating mode.
BLOCK_ALM	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Displays the current block status with information on pending configuration, hardware or system errors, including details of the alarm time (date, time) when the error occurred. ✎ Note! If the option of the alarm has **not** been enabled in the ACK_OPTION parameter, the alarm can only be acknowledged via this parameter.
BLOCK_ERR	**read only**	Displays the active block error. **Display:** OUT OF SERVICE The block has the status "Out of Service".
BYPASS	**MAN - OOS**	This parameter can be used to activate and deactivate calculation of the manipulated variable by the PID control algorithm. **Options:** Unitialized OFF Bypass deactivated: the manipulated variable determined by the PID control algorithm is output via the OUT parameter. ON BYPASS activated: the value of the setpoint value SP is output directly via the OUT parameter. ☝ Caution! The BYPASS parameter is enabled in the controller options (CONTROL_OPTS parameter). This must be set before commissioning.

PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
CAS_IN	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Displays the analog setpoint value and status copied from an external function block in the CAS operating mode. This value is shown in the unit of the PV_SCALE parameter group. ✎ Note! The remote setpoint value read in via the CAS_IN parameter is only used if the PID function block is in the CAS operating mode. In the AUTO operating mode, the value of the SP parameter is used as a setpoint value.
CONTROL_ OPTS	**OOS**	Selects the available controller options for specifying the automation strategy. **Options:** Bypass Enable Enables the BYPASS parameter Direct Acting Direct effect Track Enable Enables tracking Track in Manual Operating mode MAN with active tracking PV for BKCAL_OUT Use value and status of the PV parameter for the BKCAL_OUT parameter No OUT Limits in Manual No output restriction in the MAN operating mode. If the range limit value OUT_HI_LIM or OUT_LO_LIM is exceeded or undershot, this has no effect on the OUT parameter. **Factory setting:** No option activated
DV_HI_ALM	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Alarm status display for the upper control deviation, including details of the time of the alarm (date, time) and the value that triggered the alarm. The controlled variable exceeds the setpoint value by more than the value specified in the DV_HI_LIM parameter. ✎ Note! In addition, the active alarm can be acknowledged in this parameter group.

PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
DV_HI_LIM	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Entry of the limit value for the upper control deviation. If the controlled variable exceeds the setpoint value by this value, then the warning DV_HI_ALM is output. **User input:** Range and unit of PV_SCALE **Factory setting:** $3402823466 \times 10^{38}$ ✎ Note! If the setting for the end of the scale is changed in the PV_SCALE parameter this value should be modified accordingly.
DV_HI_PRI	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Specifies the action taken when the upper control deviation (DV_HI_LIM) is exceeded. **User input:** 0 The violation of the limit value for the upper control deviation is not evaluated. 1 No notification if the limit value for the upper control deviation is violated. 2 Reserved for block alarms. 3-7 The violation of the limit value for the upper control deviation is output as a user notice with the appropriate priority (3 = low priority, 7 = high priority). 8-15 The violation of the limit value for the upper control deviation is output as a critical alarm with the appropriate priority (8 = low priority, 15 = high priority). **Factory setting:** 0
DV_LO_ALM	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Alarm status display for the lower control deviation, including details of the time of the alarm (date, time) and the value that triggered the alarm. The controlled variable undershoots the setpoint value by more than the value specified in the DV_LO_LIM parameter. ✎ Note! In addition, the active alarm can be acknowledged in this parameter group.

PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
DV_LO_LIM	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Entry of the limit value for the lower control deviation. If the controlled variable undershoots the setpoint value by this value, then the warning DV_LO_ALM is output. **User input:** Range and unit of PV_SCALE **Factory setting:** $-3402823466 \times 10^{38}$ ✎ Note! If the setting for the end of the scale is changed in the PV_SCALE parameter this value should be modified accordingly.
DV_LO_PRI	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Specifies the action taken when the lower control deviation (DV_LO_LIM) is undershot. **User input:** 0 The violation of the limit value for the lower control deviation is not evaluated. 1 No notification if the limit value for the lower control deviation is violated. 2 Reserved for block alarms. 3-7 The violation of the limit value for the lower control deviation is output as a user notice with the appropriate priority (3 = low priority, 7 = high priority). 8-15 The violation of the limit value for the lower control deviation is output as a critical alarm with the appropriate priority (8 = low priority, 15 = high priority). **Factory setting:** 0
FF_GAIN	**MAN - OOS**	Entry of the disturbance gain for the feedforward control. **Factory setting:** 0 ✎ Note! The disturbance gain is multiplied by the disturbance variable (FF_VAL) and the result is added to the calculated manipulated variable.
FF_SCALE	**MAN - OOS**	Definition of the measuring range (lower and upper limit), the physical unit and the number of decimal places for the disturbance variable (FF_VAL). **Factory setting:** 0...100%

PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
FF_VAL	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	For displaying and entering the value and status of the disturbance variable. **User input:** Range and unit of FF_SCALE
GAIN	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Entry of the proportional gain factor. **Factory setting:** 0 ✎ Note! If the value 0 is specified for this parameter then the status of the OUT parameter changes to BAD.
GRANT_ DENY	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Releases or restricts the access authorisation of a fieldbus host system to the field device. ✎ Note! This parameter is not evaluated by PROline Prosonic Flow 93 FF.
HI_ALM	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Alarm status display for the upper warning limit value, (HI_LIM), including details of the time of the alarm (date, time) and the value that triggered the alarm. ✎ Note! In addition, the active alarm can be acknowledged in this parameter group.
HI_HI_ALM	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Alarm status display for the upper alarm limit value, (HI_HI_LIM), including details of the time of the alarm (date, time) and the value that triggered the alarm. ✎ Note! In addition, the active alarm can be acknowledged in this parameter group.
HI_HI_LIM	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Entry of the alarm limit value for the upper alarm, (HI_HI_ALM). If the value PV exceeds this limit value then the alarm status parameter HI_HI_ALM is output. **User input:** Range and unit of PV_SCALE **Factory setting:** $3402823466 \times 10^{38}$ ✎ Note! If the setting for the end of the scale is changed in the PV_SCALE parameter this value should be modified accordingly.

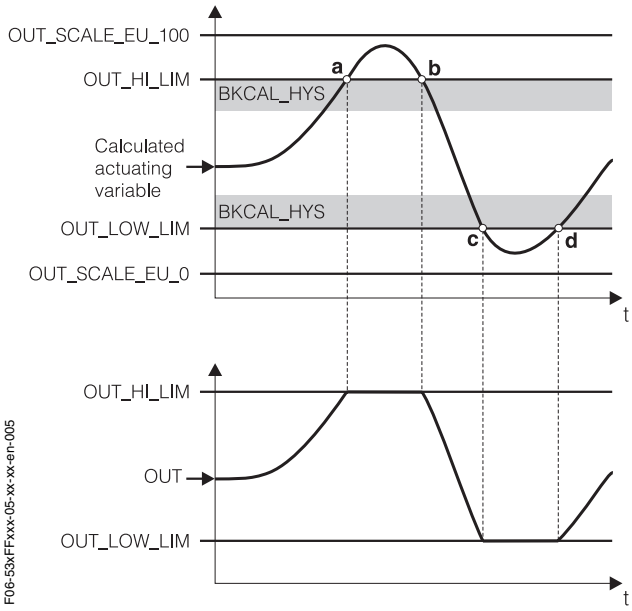
PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
HI_HI_PRI	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Specifies the action taken when the upper alarm limit value (HI_HI_LIM) is exceeded. **User input:** 0 The violation of the upper alarm limit value is not evaluated. 1 No notification if the upper alarm limit value is violated. 2 Reserved for block alarms. 3-7 The violation of the upper alarm limit value is output as a user notice with the appropriate priority (3 = low priority, 7 = high priority). 8-15 The violation of the upper alarm limit value is output as a critical alarm with the appropriate priority (8 = low priority, 15 = high priority). **Factory setting:** 0
HI_LIM	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Entry of the alarm limit value for the upper warning (HI_ALM). If the value PV exceeds this limit value then the alarm status parameter HI_ALM is output. **User input:** Range and unit of PV_SCALE **Factory setting:** $3402823466 \times 10^{38}$ ✎ Note! If the setting for the end of the scale is changed in the PV_SCALE parameter this value should be modified accordingly.

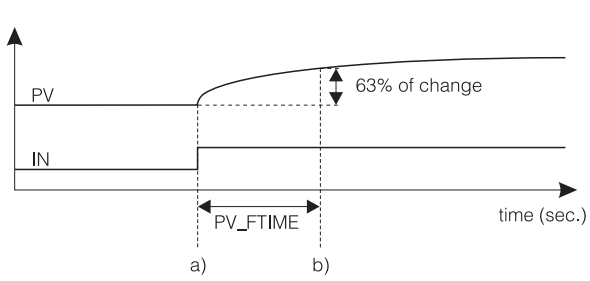
PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
HI_PRI	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Specifies the action taken when the upper warning limit value (HI_LIM) is exceeded. **User input:** 0 The violation of the upper warning limit value is not evaluated. 1 No notification if the upper warning limit value is violated. 2 Reserved for block alarms. 3-7 The violation of the upper warning limit value is output as a user notice with the appropriate priority (3 = low priority, 7 = high priority). 8-15 The violation of the upper warning limit value is output as a critical alarm with the appropriate priority (8 = low priority, 15 = high priority). **Factory setting:** 0
IN	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Displays the analog controlled variable with information on the status and value. ✎ Note! Scaling of the input range and selection of the unit of the controlled variable are carried out via the PV_SCALE parameter group.
LO_ALM	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Alarm status display for the lower warning limit value, (LO_LIM), including details of the time of the alarm (date, time) and the value that triggered the alarm. ✎ Note! In addition, the active alarm can be acknowledged in this parameter group.
LO_LIM	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Entry of the alarm limit value for the lower warning, (LO_ALM). If the value PV exceeds this limit value then the alarm status parameter LO_ALM is output. **User input:** Range and unit of PV_SCALE **Factory setting:** $-3402823466 \times 10^{38}$ ✎ Note! If the setting for the end of the scale is changed in the PV_SCALE parameter this value should be modified accordingly.

PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
LO_LO_ALM	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Alarm status display for the lower alarm limit value, (LO_LO_LIM), including details of the time of the alarm (date, time) and the value that triggered the alarm. ✎ Note! In addition, the active alarm can be acknowledged in this parameter group.
LO_LO_LIM	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Entry of the alarm limit value for the lower alarm, (LO_LO_ALM). If the value PV undershoots this limit value then the alarm status parameter LO_LO_ALM is output. **User input:** Range and unit of PV_SCALE **Factory setting:** $-3402823466 \times 10^{38}$ ✎ Note! If the setting for the end of the scale is changed in the PV_SCALE parameter this value should be modified accordingly.
LO_LO_PRI	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Specifies the action taken when the lower alarm limit value (LO_LO_LIM) is undershot. **User input:** 0 The violation of the lower alarm limit value is not evaluated. 1 No notification if the lower alarm limit value is violated. 2 Reserved for block alarms. 3-7 The violation of the lower alarm limit value is output as a user notice with the appropriate priority (3 = low priority, 7 = high priority). 8-15 The violation of the lower alarm limit value is output as a critical alarm with the appropriate priority (8 = low priority, 15 = high priority). **Factory setting:** 0

PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
LO_PRI	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Specifies the action taken when the lower warning limit value (LO_LIM) is undershot. **User input:** 0 The violation of the lower warning limit value is not evaluated. 1 No notification if the lower warning limit value is violated. 2 Reserved for block alarms. 3-7 The violation of the lower warning limit value is output as a user notice with the appropriate priority (3 = low priority, 7 = high priority). 8-15 The violation of the lower warning limit value is output as a critical alarm with the appropriate priority (8 = low priority, 15 = high priority). **Factory setting:** 0

PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
MODE_BLK	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Displays the current (Actual) and desired (Target) operating mode of the PID function block, the permitted modes (Permitted) supported by the Resource Block and the normal operating mode (Normal). **Display:** AUTO MAN OOS CAS RCAS ROUT The PID function block supports the following operating modes: • AUTO (automatic mode): The setpoint value specified by the user via the SP parameter is used in the execution of the internal PID algorithm. • MAN (manual intervention by the operator): The OUT parameter can be specified directly by the user. • OOS (out of service): The block has the status "Out of Service". The PID algorithm of the block is not executed. The last valid value is output at the OUT parameter and the status changes to BAD. • CAS (cascade mode): Via the input or CAS_IN parameter, the PID function block receives the setpoint value for internal calculation of the manipulated variable directly from another function block. The internal PID algorithm is executed. • RCAS (remote cascade): Via the RCAS_IN parameter, the PID function block receives the setpoint value for internal calculation of the manipulated variable directly from the fieldbus host system. The internal PID algorithm is executed. • ROUT (remote output): Via the ROUT_IN parameter, the PID function block receives the actuating value directly from the fieldbus host system. The manipulated variable is output again via the OUT parameter without the internal PID algorithm being executed.

PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
OUT	**MAN - OOS**	Displays the output value (manipulated variable) of the PID function block. The output value contains the value, the limit value status, the status and the alarm evaluation. The output value OUT is a function of the OUT_HI_LIM and OUT_LO_LIM range limit values. If the calculated manipulated variable exceeds or undershoots the range limit values then the value of the range limit value in question is output as the output value OUT, (see diagram).  ✎ Note! If MAN (manual intervention by the operator) is selected for the operating mode in the MODE_BLK parameter then the output value OUT can be specified manually here. The unit used is copied from the OUT_SCALE parameter group, the input area corresponds to OUT_SCALE ±10%.
OUT_HI_LIM	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Entry of the maximum permissible analog manipulated variable that can be output from the PID function block. **User input:** Range and unit of OUT_SCALE ±10% **Factory setting:** 100
OUT_LO_LIM	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Entry of the minimum permissible analog manipulated variable that can be output from the PID function block. **User input:** Range and unit of OUT_SCALE ±10% **Factory setting:** 0

PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
OUT_SCALE	**OOS**	Definition of the measuring range (lower and upper limit), the physical unit and the number of decimal places for the manipulated variable (OUT). **Factory setting:** 0...100% ✎ Note! The range limits are defined via the OUT_HI_LIM and OU_LO_LIM parameters .
PV	**read only**	Displays the process variable used for the block execution, including the status. ✎ Note! The unit used is copied from the PV_SCALE parameter group.
PV_FTIME	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Entry of the filter time constant (in seconds) of the digital filter of the 1st order. This time is required in order for 63% of a change in the controlled variable at input IN to have an effect on the value of PV. The diagram shows the signal curves between the parameters IN and PV over time:  a) The IN parameter changes. b) The PV parameter has reacted 63% to the change in the IN parameter. **Factory setting:** 0 s

PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
PV_SCALE	**OOS**	Definition of the measuring range (lower and upper limit), the physical unit and the number of decimal places for the process variable (PV). **Factory setting:** 0...100% ✎ Note! If this parameter group is modified then the following parameters should be checked and modified if necessary: • DV_HI_LIM • DV_LO_LIM • HI_LIM • HI_HI_LIM • LO_LIM • LO_LO_LIM • RCAS_IN • RCAS_OUT • SP_LO_LIM • SP_HI_LIM • SP
RATE	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Entry of the time constant for the derivative action (D-term) **Factory setting:** 0 s
RCAS_IN	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	In this parameter, the analog setpoint value (value and status) provided by the fieldbus host system is read in for internal calculation of the manipulated variable and displayed. ✎ Note! • Value statement and unit of PV_SCALE. • If the setting for the end of the scale is changed in the PV_SCALE parameter this value should be modified accordingly. • This parameter is only active in the RCAS operating mode.
RCAS_OUT	**read only**	Displays the analog output value and status of the specified setpoint value transferred to the fieldbus host system in the course of cascade control. The cascade control is initialised with this value to ensure bumpless switching of the operating mode. ✎ Note! • Value statement and unit of PV_SCALE. • If the setting for the end of the scale is changed in the PV_SCALE parameter this value should be modified accordingly. • This parameter is only active in the RCAS operating mode.
RESET	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Entry of the time constant for the integral function (I-term). **Factory setting:** 3402823466 x 10^{38} s ✎ Note! The integral function is disabled by entering 0 seconds.

PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
ROUT_IN	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	In this parameter, the manipulated variable (value and status) provided by the fieldbus host system is read in and displayed. ✎ Note! • Value statement and unit of OUT_SCALE • This parameter is only active in the ROUT operating mode. • The PID algorithm is no longer executed.
ROUT_OUT	**read only**	Displays the analog output value and status of the manipulated variable transferred to the fieldbus host system in the course of cascade control. The cascade control is initialised with this value to ensure bumpless switching of the operating mode. ✎ Note! • Value statement and unit of OUT_SCALE • This parameter is only active in the ROUT operating mode.
SHED_OPT		Selects the action taken if the monitoring time is exceeded (see SHED_RCAS, SHED_ROUT parameters on Page 96) in the RCAS or ROUT operating mode. During the monitoring time, parameter updating between the fieldbus host system and the PID function block is checked. If the parameters are not being updated then on expiry of the monitoring time the PID function block switches from the RCAS or ROUT operating mode to the mode selected here. **Options:** Uninitialized NormalShed_NormalReturn NormalShed_NoReturn ShedToAuto_NormalReturn ShedToAuto_NoReturn ShedToManual_NormalReturn ShedToManual_NoReturn ShedToRetainedTarget_NormalReturn ShedToRetainedTarget_NoReturn **Factory setting:** Uninitialized
SP	**AUTO - MAN - OOS**	Entry of the setpoint value (reference value). **User input:** Range and unit of PV_SCALE ±10% ✎ Note! If the setting for the end of the scale is changed in the PV_SCALE parameter this value should be modified accordingly.

PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
SP_HI_LIM	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Entry of the upper limit of the setpoint value (reference value). **User input:** Range and unit of PV_SCALE ±10% **Factory setting:** 100 ✎ Note! If the setting for the end of the scale is changed in the PV_SCALE parameter this value should be modified accordingly.
SP_LO_LIM	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Entry of the lower limit of the setpoint value (reference value). **User input:** Value and range of PV_SCALE ±10% **Factory setting:** 100 ✎ Note! If the setting for the end of the scale is changed in the PV_SCALE parameter this value should be modified accordingly.
SP_RATE_DN	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Entry of the ramping rate of a diminishing setpoint value in the AUTO operating mode. **Factory setting:** 3402823466 x 10^{38} PV per second ✎ Note! • If the value "0" is entered then this parameter is deactivated and the setpoint value is used directly. • The speed restriction is only active in the AUTO operating mode.
SP_RATE_UP	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Entry of the ramping rate of an increasing setpoint value in the AUTO operating mode. **Factory setting:** 3402823466 x 10^{38} PV per second ✎ Note! • If the value "0" is entered then this parameter is deactivated and the setpoint value is used directly. • The speed restriction is only active in the AUTO operating mode.
ST_REV	**read only**	Displays the revision status of the static data. ✎ Note! The revision status parameter is incremented on each modification of static data.

PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
STATUS_ OPTS	**OOS**	Selects the available status options for specifying the status processing and processing of the output value OUT. The following options are supported: **Options:** IFS if Bad IN Trigger disturbance status of downstream Analog Output function block if the controlled variable (IN) changes the status to BAD. IFS if Bad CAS_IN Trigger disturbance status of downstream Analog Output function block if the remote setpoint value (CAS_IN) changes the status to BAD. Use Uncertain as Good The status UNCERTAIN is used as GOOD. Target In Manual if Bad IN Switch to the MAN operating mode if the controlled variable switches the status to BAD. **Factory setting:** No option active
STRATEGY	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Parameter for grouping and thus faster evaluation of blocks. Grouping is carried out by entering the same numerical value in the STRATEGY parameter of each individual block. **Factory setting:** 0 ✎ Note! These data are neither checked nor processed by the PID function block.
TAG_DESC	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Entry of a user-specific text of max. 32 characters for unique identification and assignment of the block. **Factory setting:** "_ _ _ _ _ _ _ _" no text
TRK_IN_D	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Displays the discrete input (value and status) that initiates the external or output tracking function. On activation of tracking the operating mode switches to LO (Local Compulsory Tracking). In so doing the manipulated variable at the output OUT adopts the value specified at input TRK_VAL.
TRK_SCALE	**MAN - OOS**	Definition of the measuring range (lower and upper limit), the physical unit and the number of decimal places for the external tracking variable (TRK_VAL). **Factory setting:** 0...100%

PID function block (PID controller) / base index 810		
Parameter	**Write access with operating mode (MODE_BLK)**	**Description**
TRK_VAL	**ROUT - RCAS - CAS - AUTO - MAN - OOS**	Displays the analog input value and input status read in from another function block for the external tracking function in the unit of the TRK_SCALE parameter group.
UPDATE_EVT	**read only**	Displays whether static block data have been modified, including date and time.

7 Index (FOUNDATION Fieldbus)

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S

S (continued)

T

U

W

X

Z

Europe

Austria
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Belgium / Luxembourg
❑ Endress+Hauser N.V.
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Bulgaria
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Croatia
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