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FM+SGML 6.0

valid as of software version:
V 1.06.XX (amplifier)
V 1.03.XX (communication)

PROline prosonic flow 93 C
Ultrasonic
Flow Measuring System

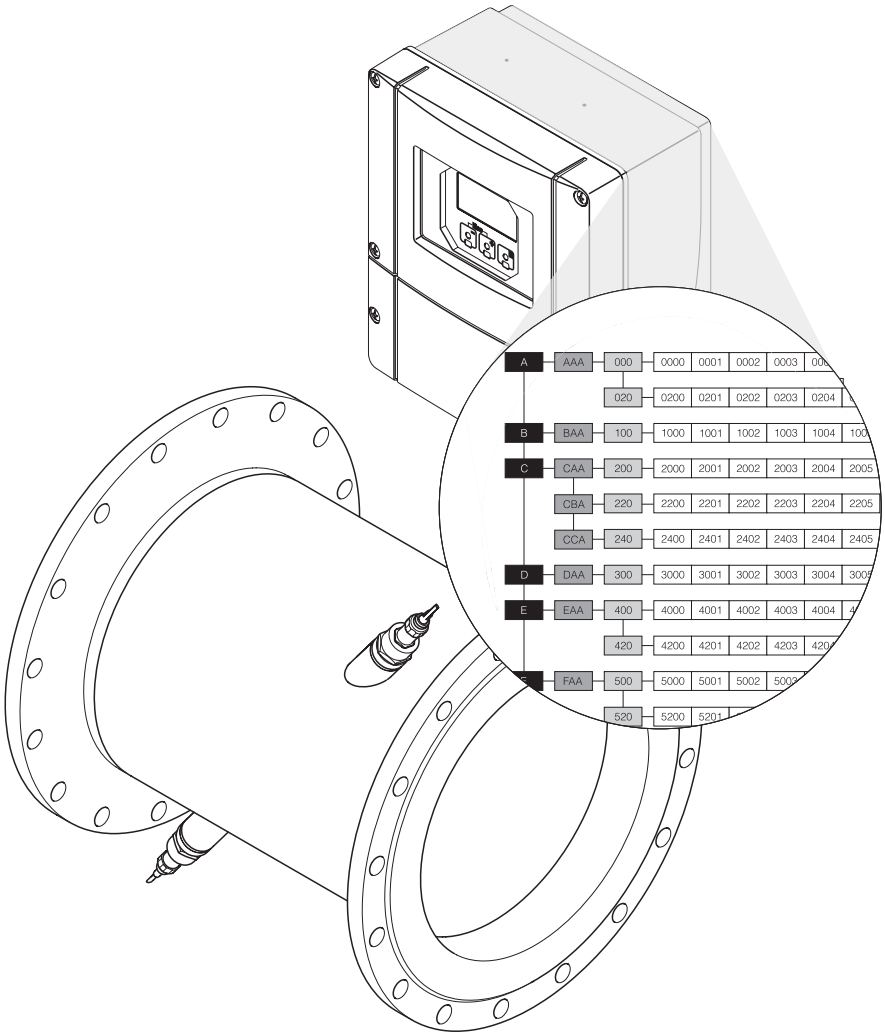








Description of Device Functions



Endress+Hauser
The Power of Know How

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1 Notes on using this manual

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

1.1 Using the table of contents to locate a function description

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

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

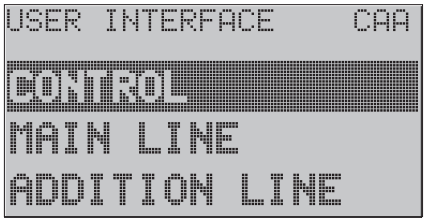
This step-by-step, top-down approach starts with the blocks, the highest level, and works down through the matrix to the description of the function you need:

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

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

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

Example:



F-x3xxxxx-20-xx-xx-en-000

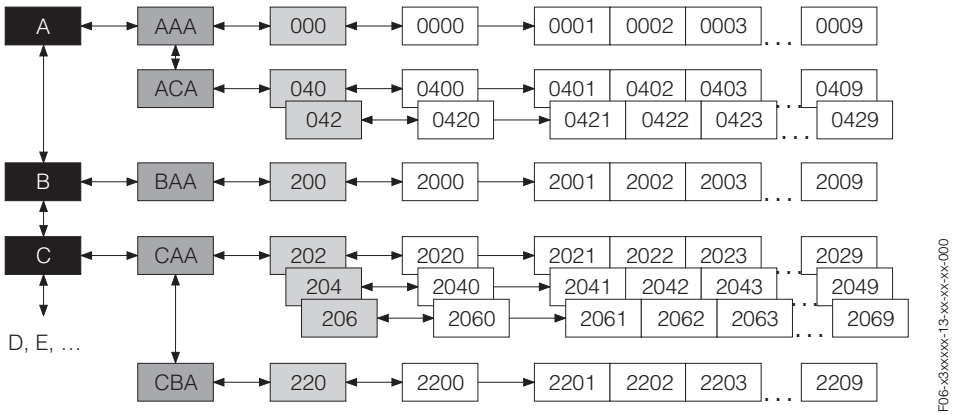
The function-matrix index lists the codes for all the available “cells” in alphabetic and consecutive order, complete with the page references for the corresponding functions. The index to the function matrix is on page 133.

2 Function matrix

2.1 General layout of the function matrix

The function matrix consists of four levels:

Blocks -> Groups -> Function groups -> Functions



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

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

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

A block consists of one or more groups. Each group represents a more detailed selection of the operation options in the higher-order block. Examples of groups available in the “USER INTERFACE” block are 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. Function groups available of group “CONTROL” are for example: BASIC CONFIGURATION, UNLOCKING/LOCKING, OPERATION, etc.

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

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

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

2.1.5 Codes identifying cells

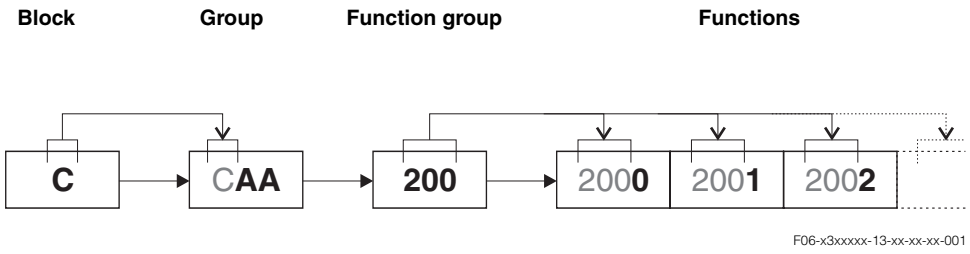
Each cell (block, group, function group and function) in the function matrix has an individual, unique code.

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

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

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

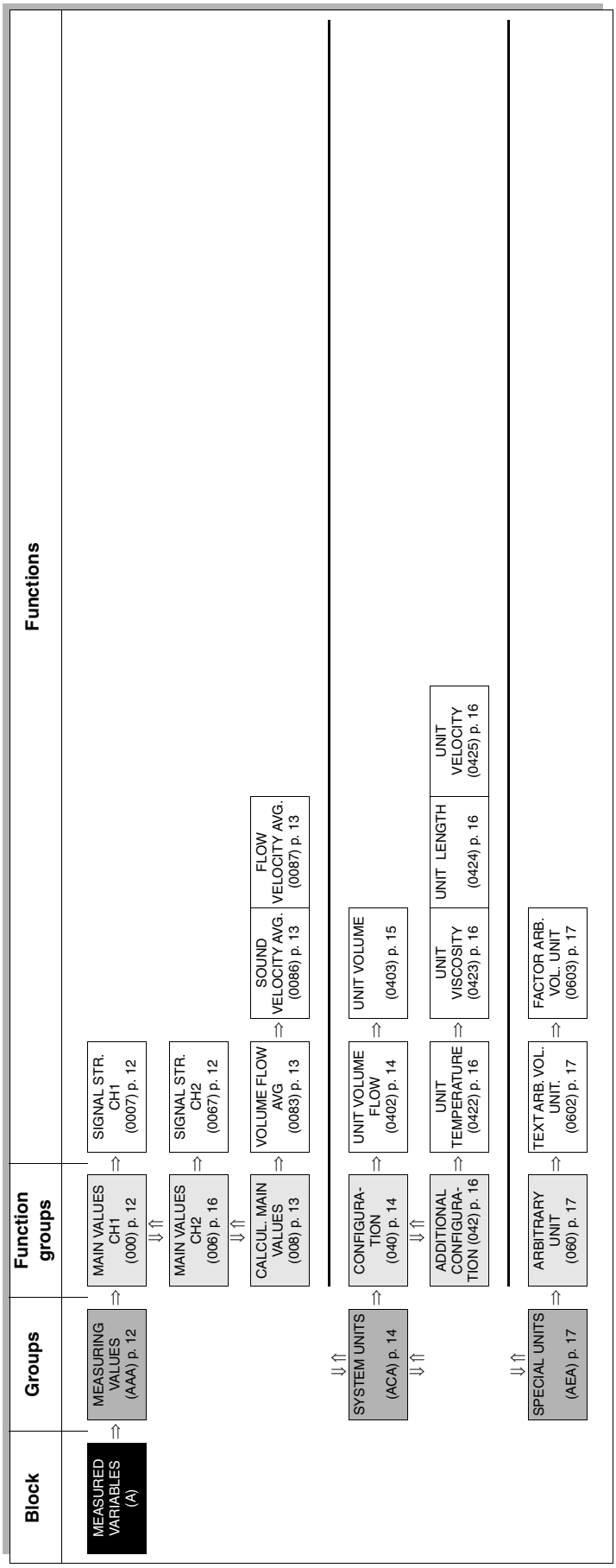
Functions:
The code consists of four digits (0000, 0001, 0201, etc.).
The first three digits are the same as the code for the function group.
The last digit in the code is a counter for the functions in the function group, incrementing from 0 to 9 (e.g. function 0005 is the sixth function in group 000).



2.2 Function matrix PROline Prosonic Flow 93 C

BLOCKS		GROUPS			FUNCTION GROUPS
MEASURED VARIABLES (see p. 11)	**A**	MEASURING VALUES	AAA	→	see p. 12
		SYSTEM UNITS	ACA	→	see p. 14
		SPECIAL UNITS	AEA	→	see p. 17
QUICK SETUP (see p. 18)	**B**	Commissioning setups		→	see p. 18
USER INTERFACE (see p. 24)	**C**	CONTROL	CAA	→	see p. 25
		MAIN LINE	CCA	→	see p. 29
		ADDITIONAL LINE	CEA	→	see p. 32
		INFORMATION LINE	CGA	→	see p. 36
TOTALIZER (see p. 40)	**D**	TOTALIZER (1...3)	DAA, DAB, DAC	→	see p. 41
		HANDLING TOTALIZER	DJA	→	see p. 44
OUTPUTS (see p. 45)	**E**	CURRENT OUTPUT (1...3)	EAA, EAB, EAC	→	see p. 46
		PULSE/FREQUENCY OUTPUT (1...2)	ECA, ECB	→	see p. 57
		RELAY OUTPUT (1...2)	EGA, EGB	→	see p. 78
INPUTS (see p. 88)	**F**	STATUS INPUT	FAA	→	see p. 89
BASIC FUNCTION (see p. 92)	**G**	HART	GAA	→	see p. 93
		PROCESS PARAMETER (CH1...CH2)	GIA, GIB	→	see p. 95
		SYSTEM PARAMETER (CH1...CH2)	GLA, GLB	→	see p. 101
		SENSOR DATA (CH1...CH2)	GNA, GNB	→	see p. 102
SPEC. FUNCTION (see p. 106)	**H**	ADVANCED DIAGNOSTICS CH1	HEA	→	see p. 107
SUPERVISION (see p. 123)	**J**	SYSTEM	JAA	→	see p. 124
		SYSTEM CH2	JAB	→	see p. 124
		VERSION INFO	JCA	→	see p. 128

3 Block MEASURED VARIABLES



3.1 Group MEASURING VALUES

3.1.1 Function group MAIN VALUES CH1

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

Functional description MEASURED VARIABLES → MEASURING VALUES → MAIN VALUES CH1	
SIGNAL STRENGTH CH1 **(0007)**	The signal strength appears on the display (channel 1). **User interface:** 4-digit fixed-point number (e.g. 80.0) ✎ Note! To ensure reliable measurement takes place, Prosonic Flow requires a signal strength of > 30.

3.1.2 Function group MAIN VALUES CH2

MEASURED VARIABLES A ⇒ **MEASURING VALUES AAA** ⇒ **MAIN VALUES CH2 006**

Functional description MEASURED VARIABLES → MEASURING VALUES → MAIN VALUES CH2	
SIGNAL STRENGTH CH2 **(0067)**	The signal strength appears on the display (channel 2). **User interface:** 4-digit fixed-point number (e.g. 80.0) ✎ Note! To ensure reliable measurement takes place, Prosonic Flow requires a signal strength of > 30

3.1.3 Function group CALCULATED MAIN VALUES

MEASURED VARIABLES A ⇒ **MEASURING VALUES AAA** ⇒ **CALCUL. MAIN VALUES 008**

Functional description MEASURED VARIABLES → MEASURING VALUES → CALCULATED MAIN VALUES	
The calculated measured values appear on the display. The measured values of both channels are used when calculating the values. ✎ Note! • The units of measure of all the measured variables shown here can be set in the "SYSTEM UNITS" group. • If the fluid in the pipe flows backwards, a negative sign prefixes the flow reading on the display.	
VOLUME FLOW AVERAGE (0083)	The average volume flow appears on the display. Calculated from the measured values: (VOLUME FLOW CH1 + VOLUME FLOW CH2)/2 **User interface:** 5-digit floating-point number, including unit and sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; –731.63 gal/d; etc.)
SOUND VELOCITY AVERAGE (0086)	The average sound velocity appears on the display. Calculated from the measured values: (SOUND VELOCITY CH1 + SOUND VELOCITY CH2)/2 **User interface:** 5-digit fixed-point number, incl. units (e.g. 1400.0 m/s, 5249.3 ft/s)
FLOW VELOCITY AVERAGE (0087)	The average flow velocity appears on the display. Calculated from the measured values: (FLOW VELOCITY CH1 + FLOW VELOCITY CH2)/2 **User interface:** 5-digit floating-point number, including unit and sign (e.g. 8.0000 m/s, 26.247 ft/s)

3.2 Group SYSTEM UNITS

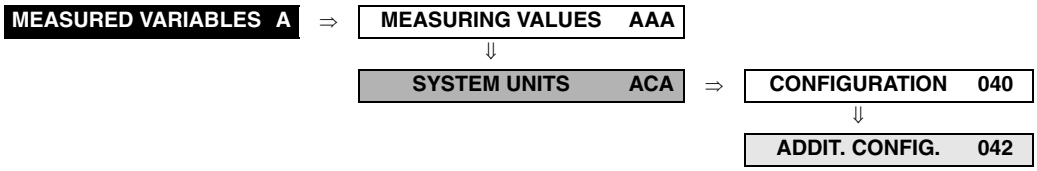
3.2.1 Function group CONFIGURATION

MEASURED VARIABLES A ⇒ **MEASURING VALUES AAA**
⇓
SYSTEM UNITS ACA ⇒ **CONFIGURATION 040**

Functional description MEASURED VARIABLES ➞ SYSTEM UNITS ➞ CONFIGURATION	
You can select the units for measured variables in this function group.	
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: • Current output • Frequency output • Relay switch points (limit value, flow direction) • Creepage **Options:** Metric: Cubic centimeter → cm^3/s; cm^3/min; cm^3/h; cm^3/day Cubic decimeter → dm^3/s; dm^3/min; dm^3/h; dm^3/day Cubic meter → m^3/s; m^3/min; m^3/h; m^3/day Milliliter → ml/s; ml/min; ml/h; ml/day Liter → l/s; l/min; l/h; l/day Hectoliter → hl/s; hl/min; hl/h; hl/day Megaliter → Ml/s; Ml/min; Ml/h; Ml/day US: Cubic centimeter → cc/s; cc/min; cc/h; cc/day Acre foot → af/s; af/min; af/h; af/day Cubic foot → ft^3/s; ft^3/min; ft^3/h; ft^3/day Fluid ounce → oz f/s; oz f/min; oz f/h; oz f/day Gallon → gal/s; gal/min; gal/h; gal/day Million gallon → Mgal/s; Mgal/min; Mgal/h; Mgal/day Barrel (normal fluids: 31.5 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (beer: 31.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (petrochemicals: 42.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (filling tanks: 55.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Imperial Gallon → gal/s; gal/min; gal/h; gal/day Mega gallon → Mgal/s; Mgal/min; Mgal/h; Mgal/day Barrel (beer: 36.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (petrochemicals: 34.97 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Arbitrary unit, (see function group ARBITRARY UNIT on page 17) _ _ _ _ → _ _ _ _/s; _ _ _ _/min; _ _ _ _/h; _ _ _ _/day **Factory setting:** m^3/h ✎ Note! If you defined a unit of volume in the ARBITRARY UNIT (060) function group (see page 17) the unit in question is shown here.

Functional description MEASURED VARIABLES → SYSTEM UNITS → CONFIGURATION	
UNIT VOLUME **(0403)**	Use this function to select the unit for displaying the volume. The unit you select here is also valid for: • Pulse weighting (e.g. m^3/p) **Options:** Metric → cm^3; dm^3; m^3; ml; l; hl; Ml MEGA US → cc; af; ft ^{3}; oz f; gal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals); bbl (filling tanks) Imperial → gal; Mgal; bbl (BEER); bbl (PETROCHEMICALS) Arbitrary unit → _ _ _ _ (see function group ARBITRARY UNIT on page 17) **Factory setting:** m^3 ✎ Note! • If you defined a unit of volume in the ARBITRARY UNIT (060) function group (see page 17) the unit in question is shown here. • The unit of the totalizers is independent of your choice here. The unit for each totalizer is selected separately for the totalizer in question.

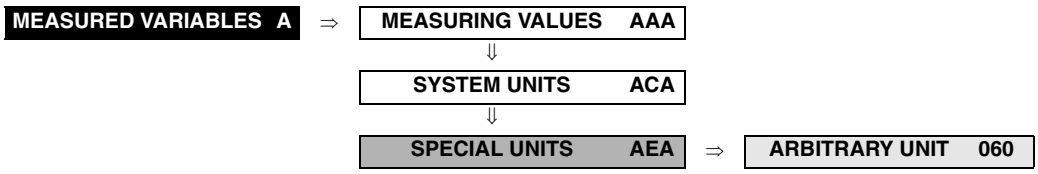
3.2.2 Function group ADDITIONAL CONFIGURATION



Functional description MEASURED VARIABLES → SYSTEM UNITS → ADDITIONAL CONFIGURATION	
UNIT TEMPERATURE (0422)	Use this function to select the unit for displaying the liquid temperature. ✎ Note! The liquid temperature is entered in the function TEMPERATURE (see p. 98). **Options:** °C (Celsius) K (Kelvin) °F (Fahrenheit) R (Rankine) **Factory setting:** °C
UNIT VISCOSITY (0423)	Use this function to select the unit for liquid viscosity. **Options:** mm2/s cSt St **Factory setting:** mm2/s
UNIT LENGTH (0424)	Use this function to select the unit for the measure of length. The unit you select here is valid for: • Nominal diameter • Diameter • Wall thickness • Liner thickness • Path length • Wire length • Sensor spacing **Options:** MILLIMETER INCH **Factory setting:** MILLIMETER
UNIT VELOCITY (0425)	Use this function to select the unit for displaying the velocity. The unit you select here is valid for: • Sound velocity • Flow velocity **Options:** m/s ft/s **Factory setting:** m/s

3.3 Group SPECIAL UNITS

3.3.1 Function group ARBITRARY UNIT



Functional description MEASURED VARIABLES → SPECIAL UNITS → ARBITRARY UNIT	
Use this function group to define an arbitrary unit for the flow rate variable.	
TEXT ARBITRARY VOLUME (0602)	Use this function to enter a text for the selectable volume (flow) unit. You define only the text, the unit of time is provided from a choice of options (s, min, h, day). **User input:** xxxxxxx (max. 4 characters) Valid characters are A-Z, 0-9, +, -, decimal point, white space or underscore **Factory setting:** _ _ _ _ (No text) Example: If your text entry is “GLAS”, this text string appears on the display complete with the unit of time, e.g. “GLAS/min”: GLAS = Volume (text input) GLAS / min = Volume flow as shown (on the display)
FACTOR ARBITRARY VOLUME (0603)	Use this function to define a quantity factor (without time) for the free selectable unit. The volume unit on which this factor is based is one liter. **User input:** 7-digit floating-point number **Factory setting:** 1 **Reference quantity:** Liter Example: The volume of a glass is 0.5 l → 2 glasses = 1 liter User input: 2

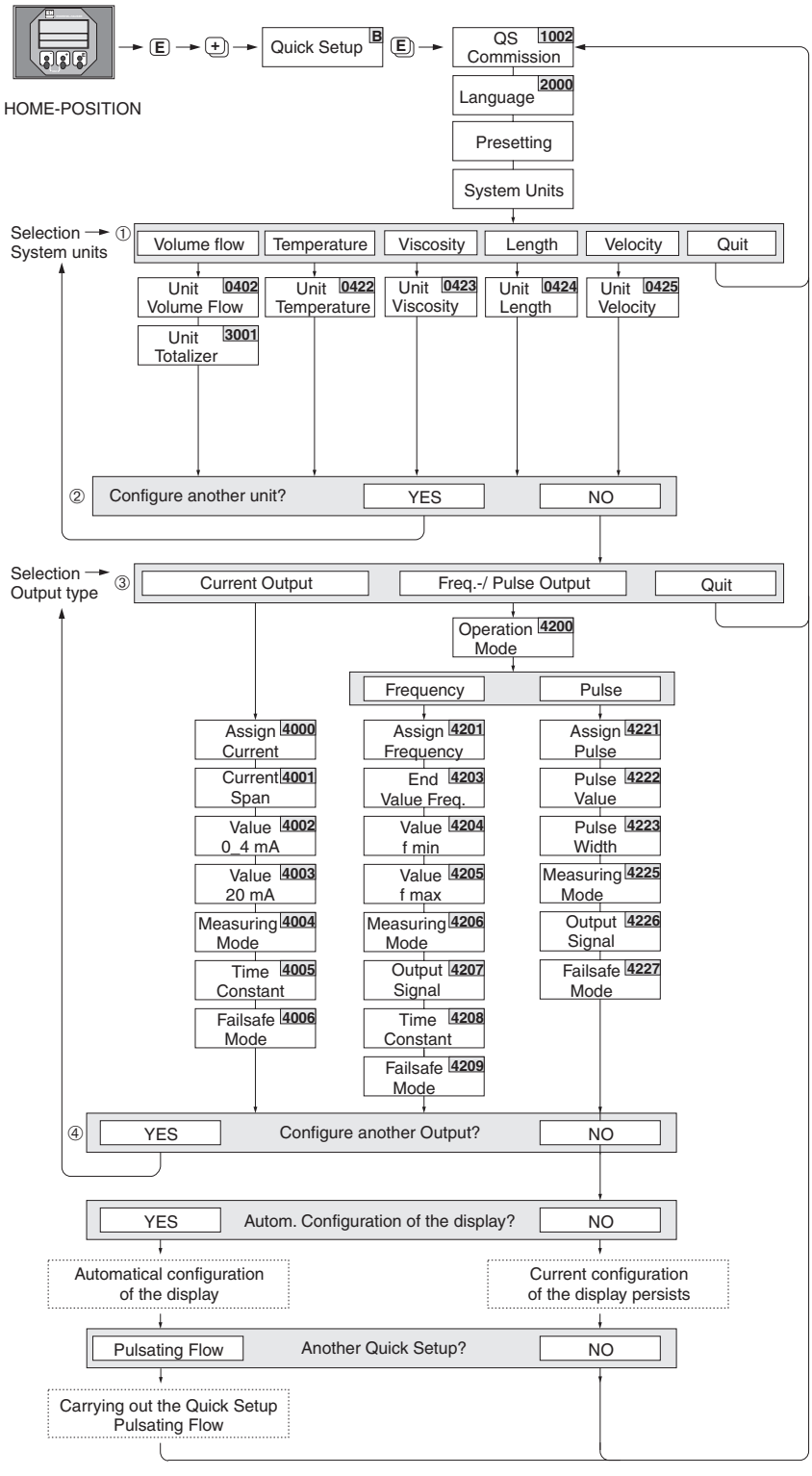
4 Block QUICK SETUP

Block	Group	Function groups	Functions
QUICK SETUP (B)	⇒	⇒	QS COMMISSION. (1002) p. 18 ⇒ QS PULSATING FLOW (1003) p. 18 | T-DAT SAVE/ LOAD (1009) p. 18

Functional description QUICK SETUP	
QUICK SETUP COMMISSIONING (1002)	Use this function to start the Quick Setup menu for commissioning. **Options:** YES NO **Factory setting:** NO ✎ Note! You will find a flowchart of the COMMISSIONING Quick Setup menu on page 20. Please refer to the Operating Instructions *Prosonic Flow 93 C* (BA 087D/06/en/....) for more information on Quick Setup menus.
QUICK SETUP PULSATING FLOW (1003)	Use this function to start the application-specific Quick Setup menu for pulsating flow. **Options:** YES NO **Factory setting:** NO ✎ Note! You will find a flowchart of the PULSATING FLOW Quick Setup menu on page 22. Please refer to the Operating Instructions *Prosonic Flow 93 C* (BA 087D/06/en/....) for more information on Quick Setup menus.
T-DAT SAVE/LOAD (1009)	Use this function to save the parameter settings / configuration of the **transmitter** in a transmitter DAT (T-DAT), or to load the parameter settings from the T-DAT into the EEPROM (**manual** security function). Application examples: • After commissioning, the current measuring point parameters can be saved to the T-DAT as a backup. • If the transmitter is replaced for some reason, the data from the T-DAT can be loaded into the new transmitter (EEPROM). **Options:** CANCEL SAVE (from EEPROM to T-DAT) LOAD (from the T-DAT into EEPROM) **Factory setting:** SAVE ✎ Note! If the power supply fails, the totalizer readings are automatically saved to the EEPROM.

4.1 Quick Setup "Commissioning"

If the measuring device is equipped with a local operation, all the device parameters important for standard measuring mode can be configured easily and quickly using the "Commissioning" Quick Setup menu.
If a measuring device does not have a local operation, the individual parameters and functions must be configured via the configuration program FieldTool.



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Note!

- The display returns to the cell QUICK SETUP COMMISSIONING (1002) if you press the ESC key combination (□+□) during interrogation.
- If you confirm the inquiry “Automatic configuration of the display?” as YES, the configuration of the display will be carried out as follows: main line = volume flow, additional line = totalizer 1, information line = operational/system condition.

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 thevolume flow unit.

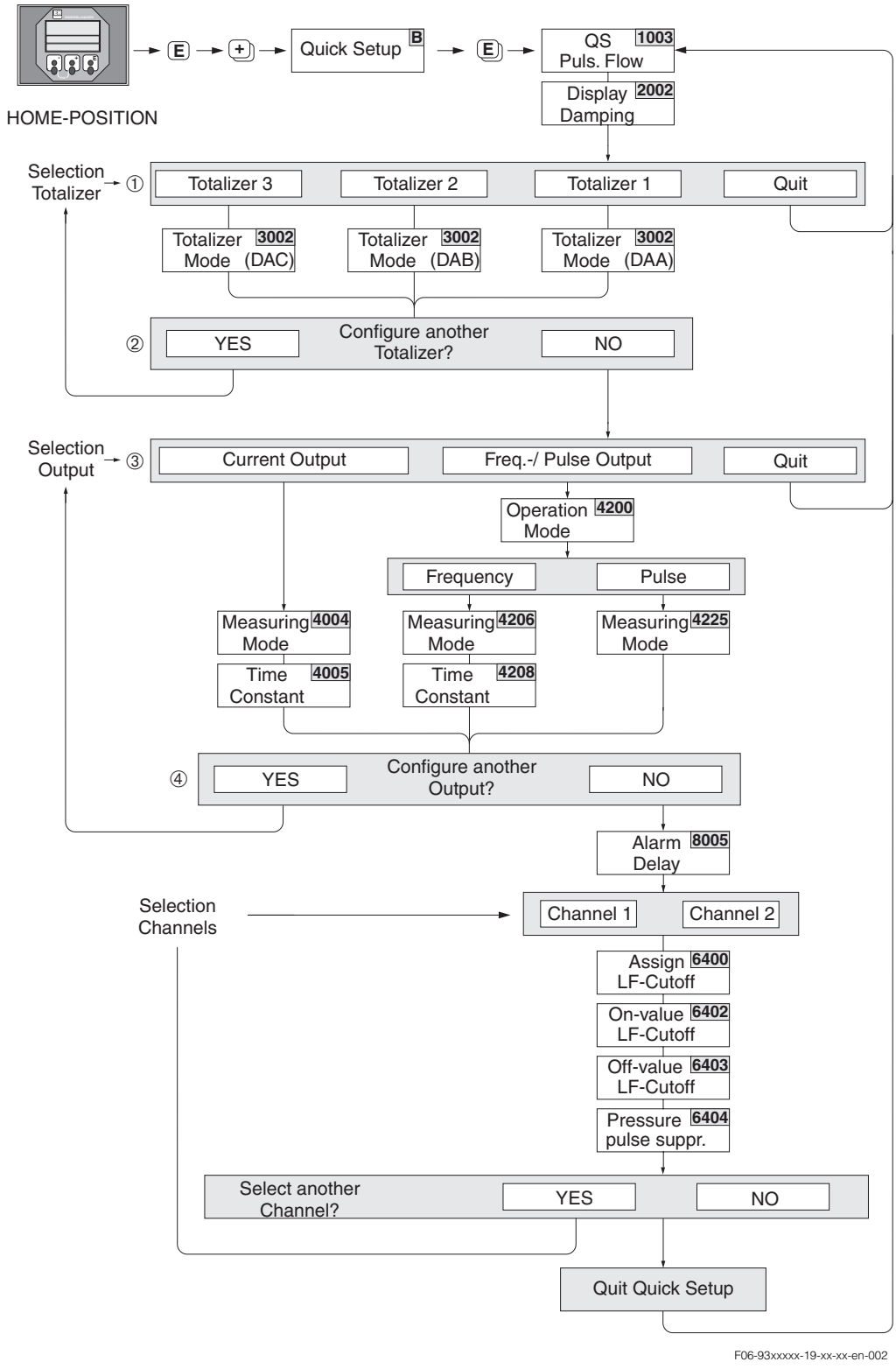
②
The “YES” option remains visible until all the units have been configured. “NO” is the only option displayed when no further units are available.

③
Only the outputs not yet configured in the current Quick Setup are offered for selection in each cycle.

④
The “YES” option remains visible until all the outputs have been configured. “NO” is the only option displayed when no further outputs are available.

4.2 Quick Setup “Pulsating flow”

If the measuring device is equipped with a local operation, all the device parameters important for standard measuring mode can be configured easily and quickly using the “Pulsating Flow” Quick Setup menu.
If a measuring device does not have a local operation, the individual parameters and functions must be configured via the configuration program FieldTool.



Note!

- The display returns to the cell QUICK SETUP PULSATING FLOW (1003) if you press the ESC key combination (□+□) during interrogation.
- You can call this Quick Setup menu either directly from the "COMMISSIONING" Quick Setup menu or manually by means of the QUICK SETUP PULSATING FLOW function (1003).
- If you confirm the inquiry "Automatic configuration of the display?" as YES, the configuration of the display will be carried out as follows: main line = volume flow, additional line = totalizer 1, information line = operational/system condition.

①
Only the totalizers not yet configured in the current Quick Setup are offered for selection in each cycle.

②
The "YES" option remains visible until all the totalizers have been parameterized. "NO" is the only option displayed when no further totalizers are available.

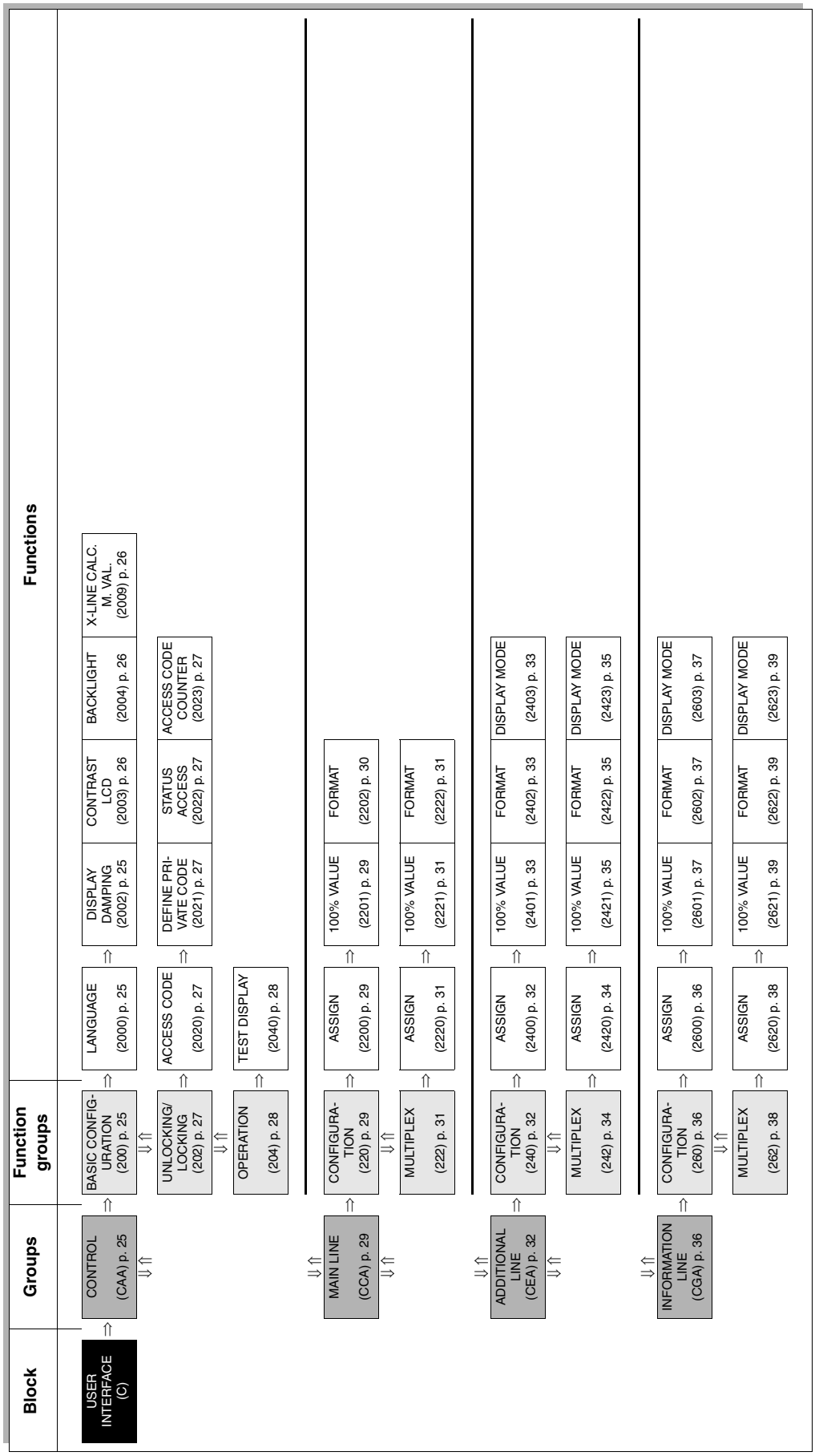
③
Only the outputs not yet configured in the current Quick Setup are offered for selection in each cycle.

④
The "YES" option remains visible until all the outputs have been parameterized. "NO" is the only option displayed when no further outputs are available.

Settings for the Pulsating Flow menu in Quick Setup:

Fctn. des.	Function name	Suggested settings	Description
Call up through the function matrix:			
B	QUICK SETUP	QS PULSATING FLOW	see p. 18
1003	QS PULSATING FLOW	YES	see p. 18
Basic configuration:			
2002	DISPLAY DAMPING	1 s	see p. 25
3002	TOTALIZER MODE (DAA)	BALANCE	see p. 41
3002	TOTALIZER MODE (DAB)	BALANCE	see p. 41
3002	TOTALIZER MODE (DAC)	BALANCE	see p. 41
Select the signal type: CURRENT OUTPUT (1...2)			
4004	MEASURING MODE	PULSATING FLOW	see p. 51
4005	TIME CONSTANT	1 s	see p. 53
Select the signal type: FREQ.-/PULSE OUTPUT (1...n) / operation mode: FREQUENCY			
4206	MEASURING MODE	PULSATING FLOW	see p. 61
4208	TIME CONSTANT	0 s	see p. 63
Select the signal type: FREQ.-/PULSE OUTPUT (1...n) / operation mode: PULSE			
4225	MEASURING MODE	PULSATING FLOW	see p. 66
Other settings:			
8005	ALARM DELAY	0 s	see p. 125
6400	ASSIGN LOW FLOW CUT OFF	VOLUME FLOW	see p. 95
6402	ON-VALUE LOW FLOW CUT OFF	3.0 dm^3/min resp. 0.8 US-gal/min	see p. 95
6403	OFF-VALUE LOW FLOW CUT OFF	50%	see p. 95
6404	PRESSURE SHOCK SUPPRESSION	0 s	see p. 96

5 Block USER INTERFACE



5.1 Group CONTROL

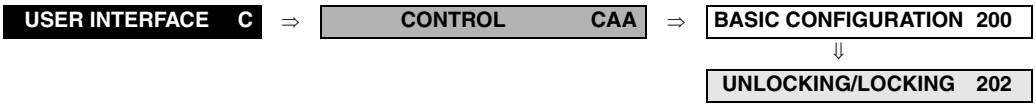
5.1.1 Function group BASIC CONFIGURATION

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

Functional description USER INTERFACE → CONTROL → BASIC CONFIGURATION	
LANGUAGE (2000)	Use this function to select the language for all texts, parameters and messages shown on the local display. ✎ Note! The displayed options depend on the available language group shown in the LANGUAGE GROUP (8226) function. **Options:** Language group WEST EU / USA: ENGLISH, DEUTSCH, FRANCAIS, ESPANOL, ITALIANO, NEDERLANDS, PORTUGUESE Language group EAST EU / SCAND.: ENGLISH, NORSK, SVENSKA, SUOMI, POLISH, CZECH, RUSSIAN Language group ASIA: ENGLISH, BAHASA INDONESIA, JAPANESE (syllabary) **Factory setting:** Country-dependent, see Page 131 ✎ Note! If you press the ± ↵ keys simultaneously during 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 zero seconds switches off damping.

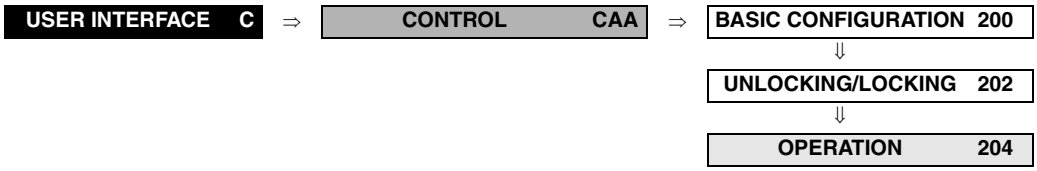
Functional description USER INTERFACE → CONTROL → BASIC CONFIGURATION	
CONTRAST LCD (2003)	Use this function to optimize display contrast to suit local operating conditions. **User input:** 10...100% **Factory setting:** 50%
BACKLIGHT (2004)	Use this function to optimize the backlight to suit local operating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

5.1.2 Function group UNLOCKING/LOCKING



Functional 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 ⊡ keys in any function, the measuring system automatically goes to this function and the prompt to enter the code appears on the display (when programming is disabled). You can enable programming by entering your personal code (**factory setting = 93**, see function DEFINE PRIVATE CODE (2021)). **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 organization can be of assistance if you mislay your personal code.
DEFINE PRIVATE CODE (2021)	Use this function to enter a personal code number 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.
STATUS ACCESS (2022)	Use this function to check the access status for the function matrix. **User interface:** ACCESS CUSTOMER (parameterization possible) LOCKED (parameterization disabled)
ACCESS CODE COUNTER (2023)	The number of times the private or service code was entered to access the device appears on the display. **Display:** Integer (delivery status: 0)

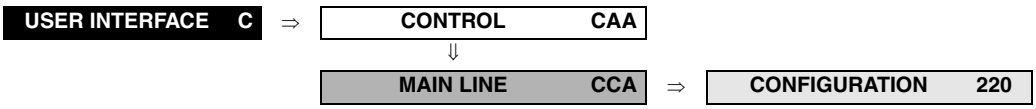
5.1.3 Function group OPERATION

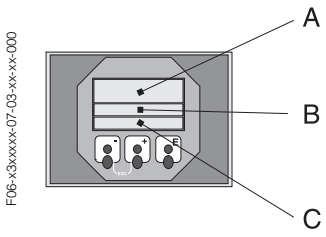


Functional description USER INTERFACE ➞ CONTROL ➞ OPERATION	
TEST DISPLAY (2040)	Use this function to test the operability of the local display and its pixels. **Options:** OFF ON **Factory setting:** OFF Test sequence: 1. Start the test by selecting ON. 2. All pixels of the main line, additional line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

5.2 Group MAIN LINE

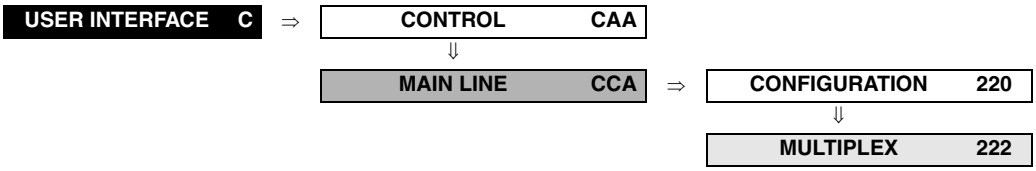
5.2.1 Function group CONFIGURATION



Functional description 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 CALCULATED VOLUME FLOW CALCULATED VOLUME FLOW % SOUND VELOCITY AVERAGE SIGNAL STRENGTH (CH1...CH2) FLOW VELOCITY AVERAGE ACTUAL CURRENT (1...3) ACTUAL FREQUENCY (1...2) TOTALIZER (1...3) **Factory setting:** CALCULATED VOLUME FLOW **Advanced options with optional software package ADVANCED DIAGNOSTICS:** DEVIATION VOLUME FLOW AVERAGE DEVIATION FLOW VELOCITY AVERAGE DEVIATION SIGNAL STRENGTH (CH1...CH2) DEVIATION SOUND VELOCITY AVERAGE DEVIATION ACTUAL TRANSIT TIME (CH1...CH2) DEVIATION ACCEPTANCE RATE (CH1...CH2)
100% VALUE (2201)	✎ Note! This function is only available if CALCULATED VOLUME FLOW IN % is selected in the function ASSIGN (2200). Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** 10l/s

Functional description USER INTERFACE → MAIN LINE → CONFIGURATION	
FORMAT **(2202)**	Use this function to define the maximum number of places after the decimal point displayed for the reading in the main line. **Options:** XXXXX. - XXXX.X - XXX.XX - XX.XXX -X.XXXX **Factory setting:** X.XXXX ✎ Note! • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → m^3/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

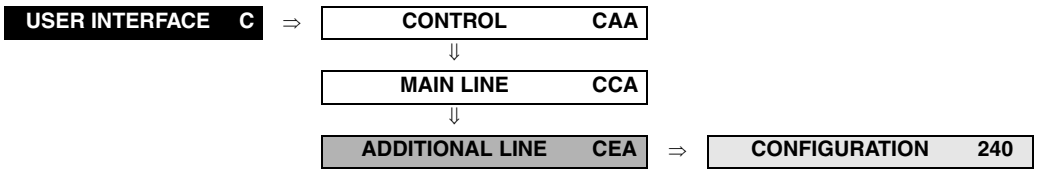
5.2.2 Function group MULTIPLEX

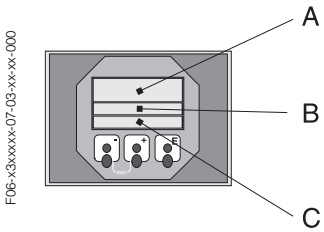


Functional description USER INTERFACE → MAIN LINE → MULTIPLEX	
ASSIGN (2220)	Use this function to define a second reading to be displayed in the main line alternatively (every 10 seconds) with the reading defined in the function ASSIGN (2200). **Options:** OFF CALCULATED VOLUME FLOW CALCULATED VOLUME FLOW % SOUND VELOCITY AVERAGE SIGNAL STRENGTH (CH1...CH2) FLOW VELOCITY AVERAGE ACTUAL CURRENT (1...3) ACTUAL FREQUENCY (1...2) TOTALIZER (1...3) **Factory setting:** OFF **Advanced options with optional software package ADVANCED DIAGNOSTICS:** DEVIATION VOLUME FLOW AVERAGE DEVIATION FLOW VELOCITY AVERAGE DEVIATION SIGNAL STRENGTH (CH1...CH2) DEVIATION SOUND VELOCITY AVERAGE DEVIATION ACTUAL TRANSIT TIME (CH1...CH2) DEVIATION ACCEPTANCE RATE (CH1...CH2)
100% VALUE (2221)	✎ Note! This function is only available if CALCULATED VOLUME FLOW % is selected in the function ASSIGN (2200). Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter and country, [value] / [dm^3...m^3 or US-gal...US-Mgal] Corresponds to the factory setting for the full scale value (see page 131 ff.)
FORMAT (2222)	Use this function to define the maximum number of places after the decimal point for the second value displayed in the main line. **Options:** XXXXX. - XXXX.X - XXX.XX - XX.XXX -X.XXXX **Factory setting:** X.XXXX ✎ Note! • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → m^3/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

5.3 Group ADDITIONAL LINE

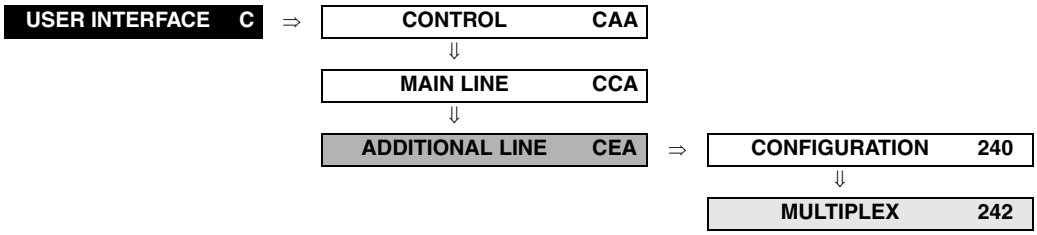
5.3.1 Function group CONFIGURATION



Functional 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 CALCULATED VOLUME FLOW CALCULATED VOLUME FLOW % SOUND VELOCITY AVERAGE SIGNAL STRENGTH (CH1...CH2) FLOW VELOCITY AVERAGE CALCULATED VOLUME FLOW BARGRAPH % (CH1...CH2) SIGNAL STRENGTH BARGRAPH % (CH1...CH2) ACTUAL CURRENT (1...3) ACTUAL FREQUENCY (1...2) TOTALIZER (1...3) TAG NAME CALCULATED FLOW DIRECTION **Factory setting:** TOTALIZER 1 **Advanced options with optional software package ADVANCED DIAGNOSTICS:** DEVIATION VOLUME FLOW AVERAGE DEVIATION FLOW VELOCITY AVERAGE DEVIATION SIGNAL STRENGTH (CH1...CH2) DEVIATION SOUND VELOCITY AVERAGE DEVIATION ACTUAL TRANSIT TIME (CH1...CH2) DEVIATION ACCEPTANCE RATE (CH1...CH2)

Functional description USER INTERFACE → ADDITIONAL LINE → CONFIGURATION	
100% VALUE (2401)	✎ Note! This function is not available unless one of the following was selected in the function ASSIGN (2400): • CALCULATED VOLUME FLOW % • CALCULATED VOLUME FLOW BARGRAPH % Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter and country, [value] / [dm^3...m^3 or US-gal...US-Mgal] Corresponds to the factory setting for the full scale value (see page 131 ff.).
FORMAT (2402)	✎ Note! This function is not available unless a number was selected in the function ASSIGN (2400). Use this function to define the maximum number of places after the decimal point displayed for the reading in the additional line. **Options:** XXXXX. - XXXX.X - XXX.XX - XX.XXX -X.XXXX **Factory setting:** X.XXXX ✎ Note! • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → m^3/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.
DISPLAY MODE (2403)	✎ Note! This function is only available if CALCULATED VOLUME FLOW BARGRAPH IN % was selected in the function ASSIGN (2420). Use this function to define the format of the bar graph. **Options:** STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign).  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

5.3.2 Function group MULTIPLEX

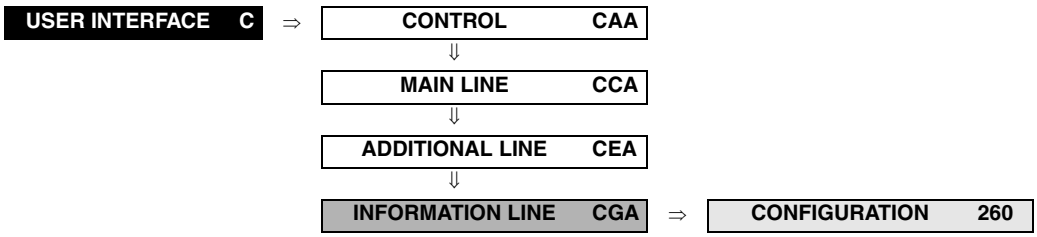


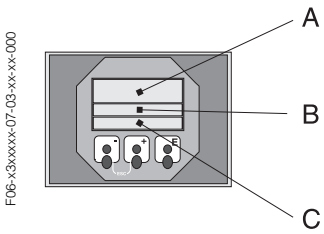
Functional description USER INTERFACE → ADDITIONAL LINE → MULTIPLEX	
ASSIGN (2420)	Use this function to define the second reading to be displayed in the additional line alternately (every 10 seconds) with the value defined in the function ASSIGN (2400). **Options:** OFF CALCULATED VOLUME FLOW CALCULATED VOLUME FLOW % SOUND VELOCITY AVERAGE SIGNAL STRENGTH (CH1...CH2) FLOW VELOCITY AVERAGE CALCULATED VOLUME FLOW BARGRAPH % SIGNAL STRENGTH BARGRAPH % (CH1...CH2) ACTUAL CURRENT (1...3) ACTUAL FREQUENCY (1...2) TOTALIZER (1...3) TAG NAME CALCULATED FLOW DIRECTION **Factory setting:** OFF ✎ Note! Multiplex mode is suspended as soon as a fault / notice message is generated. The message in question appears on the display. • Fault message (identified by a lightning icon): – If ON was selected in the function ACKNOWLEDGE FAULTS (8004), multiplex mode is resumed as soon as the fault has been acknowledged and is no longer active. – If OFF was selected in the function ACKNOWLEDGE FAULTS (8004), 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. **Advanced options with optional software package ADVANCED DIAGNOSTICS:** DEVIATION VOLUME FLOW AVERAGE DEVIATION FLOW VELOCITY AVERAGE DEVIATION SIGNAL STRENGTH (CH1...CH2) DEVIATION SOUND VELOCITY AVERAGE DEVIATION ACTUAL TRANSIT TIME (CH1...CH2) DEVIATION ACCEPTANCE RATE (CH1...CH2

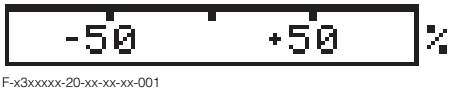
Functional description USER INTERFACE → ADDITIONAL LINE → MULTIPLEX	
100% VALUE (2421)	✎ Note! This function is not available unless one of the following was selected in the function ASSIGN (2420): • CALCULATED VOLUME FLOW % • CALCULATED VOLUME FLOW BARGRAPH % Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter and country, [value] / [dm^3...m^3 or US-gal...US-Mgal] Corresponds to the factory setting for the full scale value (see page 131 ff.).
FORMAT (2422)	✎ Note! This function is not available unless a number was selected in the function ASSIGN (2420). Use this function to define the maximum number of places after the decimal point for the second value displayed in the additional line. **Options:** XXXXX. - XXXX.X - XXX.XX - XX.XXX -X.XXXX **Factory setting:** X.XXXX ✎ Note! • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → m^3/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.
DISPLAY MODE (2423)	✎ Note! This function is only available if CALCULATED VOLUME FLOW BARGRAPH IN % was selected in the function ASSIGN (2420). Use this function to define the format of the bar graph. **Options:** STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign).  F-x3xxxxx-20-xx-xx-xx-000 SYMMETRY (Symmetrical bar graph for positive and negative directions of flow, with –50 / 0 / +50% gradations and integrated sign).  F-x3xxxxx-20-xx-xx-xx-001 **Factory setting:** STANDARD

5.4 Group INFORMATION LINE

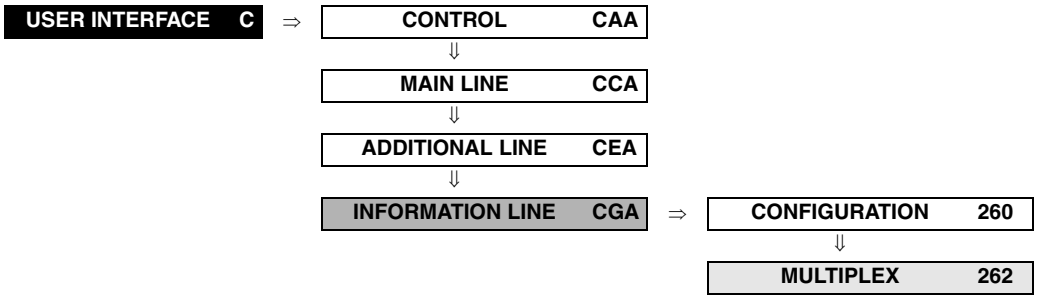
5.4.1 Function group CONFIGURATION



Functional 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 CALCULATED VOLUME FLOW CALCULATED VOLUME FLOW IN % SOUND VELOCITY AVERAGE SIGNAL STRENGTH (CH1...CH2) FLOW VELOCITY AVERAGE CALCULATED VOLUME FLOW BARGRAPH % (CH1...CH2) SIGNAL STRENGTH BARGRAPH % (CH1...CH2) ACTUAL CURRENT (1...3) ACTUAL FREQUENCY (1...2) TOTALIZER (1...3) TAG NAME OPERATING/SYSTEM CONDITIONS CALCULATED FLOW DIRECTION **Factory setting:** OPERATING/SYSTEM CONDITIONS **Advanced options with optional software package ADVANCED DIAGNOSTICS:** DEVIATION VOLUME FLOW AVERAGE DEVIATION FLOW VELOCITY AVERAGE DEVIATION SIGNAL STRENGTH (CH1...CH2) DEVIATION SOUND VELOCITY AVERAGE DEVIATION ACTUAL TRANSIT TIME (CH1...CH2) DEVIATION ACCEPTANCE RATE (CH1...CH2)

Functional description USER INTERFACE → INFORMATION LINE → CONFIGURATION	
100% VALUE (2601)	✎ Note! This function is not available unless one of the following was selected in the function ASSIGN (2400): • VOLUME FLOW % • VOLUME FLOW BARGRAPH % • CALCULATED VOLUME FLOW % • CALCULATED VOLUME FLOW BARGRAPH % Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter and country, [value] / [dm^3...m^3 or US-gal...US-Mgal] Corresponds to the factory setting for the full scale value (see page 131 ff.).
FORMAT (2602)	✎ Note! This function is not available unless a number was selected in the function ASSIGN (2600). Use this function to define the maximum number of places after the decimal point displayed for the reading in the information line. **Options:** XXXXX. - XXXX.X - XXX.XX - XX.XXX -X.XXXX **Factory setting:** X.XXXX ✎ Note! • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → m^3/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.
DISPLAY MODE (2603)	✎ Note! This function is only available if CALCULATED VOLUME FLOW BARGRAPH IN % was selected in the function ASSIGN (2600). Use this function to define the format of the bar graph. **Options:** STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign).  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

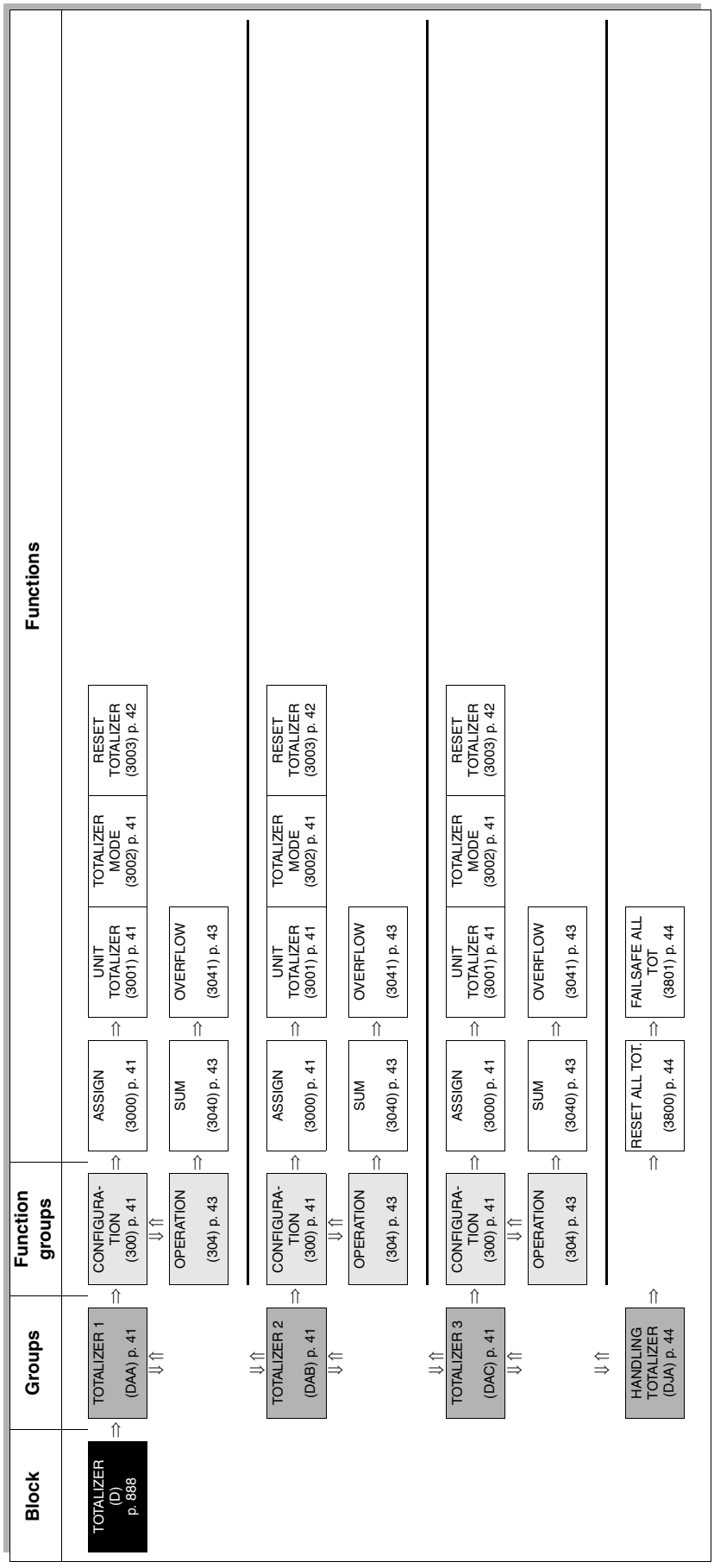
5.4.2 Function group MULTIPLEX



Functional 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 function ASSIGN (2600). **Options:** OFF CALCULATED VOLUME FLOW CALCULATED VOLUME FLOW IN % SOUND VELOCITY AVERAGE SIGNAL STRENGTH (CH1...CH2) FLOW VELOCITY AVERAGE CALCULATED VOLUME FLOW BARGRAPH % (CH1...CH2) SIGNAL STRENGTH BARGRAPH % (CH1...CH2) ACTUAL CURRENT (1...3) ACTUAL FREQUENCY (1...2) TOTALIZER (1...3) TAG NAME OPERATING/SYSTEM CONDITIONS CALCULATED FLOW DIRECTION **Factory setting:** OFF ✎ Note! Multiplex mode is suspended as soon as a fault / notice message is generated. The message in question appears on the display. • Fault message (identified by a lightning icon): – If ON was selected in the function ACKNOWLEDGE FAULTS (8004), multiplex mode is resumed as soon as the fault has been acknowledged and is no longer active. – If OFF was selected in the function ACKNOWLEDGE FAULTS (8004), 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. **Advanced options with optional software package ADVANCED DIAGNOSTICS:** DEVIATION VOLUME FLOW AVERAGE DEVIATION FLOW VELOCITY AVERAGE DEVIATION SIGNAL STRENGTH (CH1...CH2) DEVIATION SOUND VELOCITY AVERAGE DEVIATION ACTUAL TRANSIT TIME (CH1...CH2) DEVIATION ACCEPTANCE RATE (CH1...CH2)

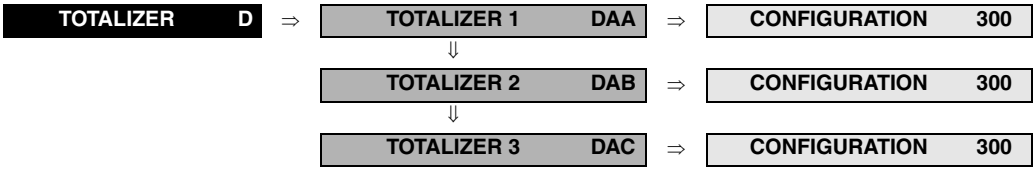
Functional description USER INTERFACE → INFORMATION LINE → MULTIPLEX	
100% VALUE **(2621)**	✎ Note! This function is not available unless one of the following was selected in the function ASSIGN (2400): • VOLUME FLOW % • VOLUME FLOW BARGRAPH % • CALCULATED VOLUME FLOW % • CALCULATED VOLUME FLOW BARGRAPH % Use this function to define the flow value to be shown on the display as the 100% value. **User input:** 5-digit floating-point number **Factory setting:** Depends on nominal diameter and country, [value] / [dm^3...m^3 or US-gal...US-Mgal] Corresponds to the factory setting for the full scale value (see page 131 ff.).
FORMAT **(2622)**	✎ Note! This function is not available unless a number was selected in the function ASSIGN (2600). Use this function to define the maximum number of places after the decimal point for the second value displayed in the information line. **Options:** XXXXX. - XXXX.X - XXX.XX - XX.XXX -X.XXXX **Factory setting:** X.XXXX ✎ Note! • Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations. • The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → m^3/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.
DISPLAY MODE **(2623)**	✎ Note! This function is only available if VOLUME FLOW BARGRAPH IN % or CALCULATED VOLUME FLOW BARGRAPH IN % was selected in the function ASSIGN (2620). Use this function to define the format of the bar graph. **Options:** STANDARD (Simple bar graph with 25 / 50 / 75% gradations and integrated sign).  F-x3xxxxx-20-xx-xx-xx-000 SYMMETRY (Symmetrical bar graph for positive and negative directions of flow, with –50 / 0 / +50% gradations and integrated sign).  F-x3xxxxx-20-xx-xx-xx-001 **Factory setting:** STANDARD

6 Block TOTALIZER



6.1 Group TOTALIZER (1...3)

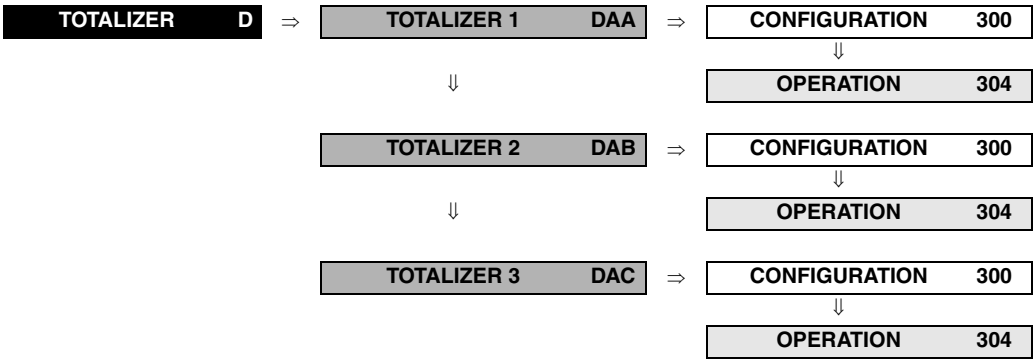
6.1.1 Function group CONFIGURATION



Functional description TOTALIZER ➞ 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 in question. **Options:** OFF VOLUME FLOW AVERAGE **Factory setting:** VOLUME FLOW AVERAGE ✎ Note! • The totalizer is reset to "0" as soon as the selection is changed. • If you select OFF in the function group CONFIGURATION of the totalizer in question, only the ASSIGN (3000) function remains visible.
UNIT TOTALIZER (3001)	Use this function to define the unit for the totalizer's measured variable, as selected beforehand. **Options:** Metric cm⟶^{3}; dm^3; m^3; ml; l; hl; Ml US cc⟶; af; ft ^{3}; oz f; gal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals); bbl (filling tanks) Imperial gal⟶; Mgal; bbl (beer); bbl (petrochemicals) Arbitrary unit ⟶ _ _ _ _ (see function group ARBITRARY UNIT on page 17) **Factory setting:** m^3
TOTALIZER MODE (3002)	Use this function to define how the flow components are to be totaled by the totalizer in question. **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

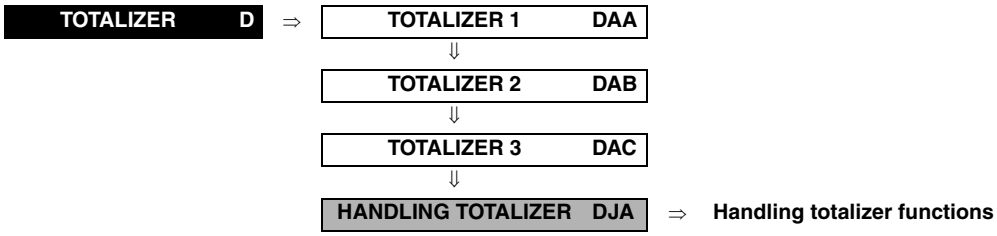
Functional description TOTALIZER → TOTALIZER (1...3) → CONFIGURATION	
RESET TOTALIZER (3003)	Use this function to reset the sum and the overflow of the totalizer in question (1...3) to zero. **Options:** NO YES **Factory setting:** NO ✎ Note! If the device is equipped with a status input, with the appropriate configuration a reset for each individual totalizer can also be triggered by a pulse (see function ASSIGN STATUS INPUT (5000) on page 89).

6.1.2 Function group OPERATION



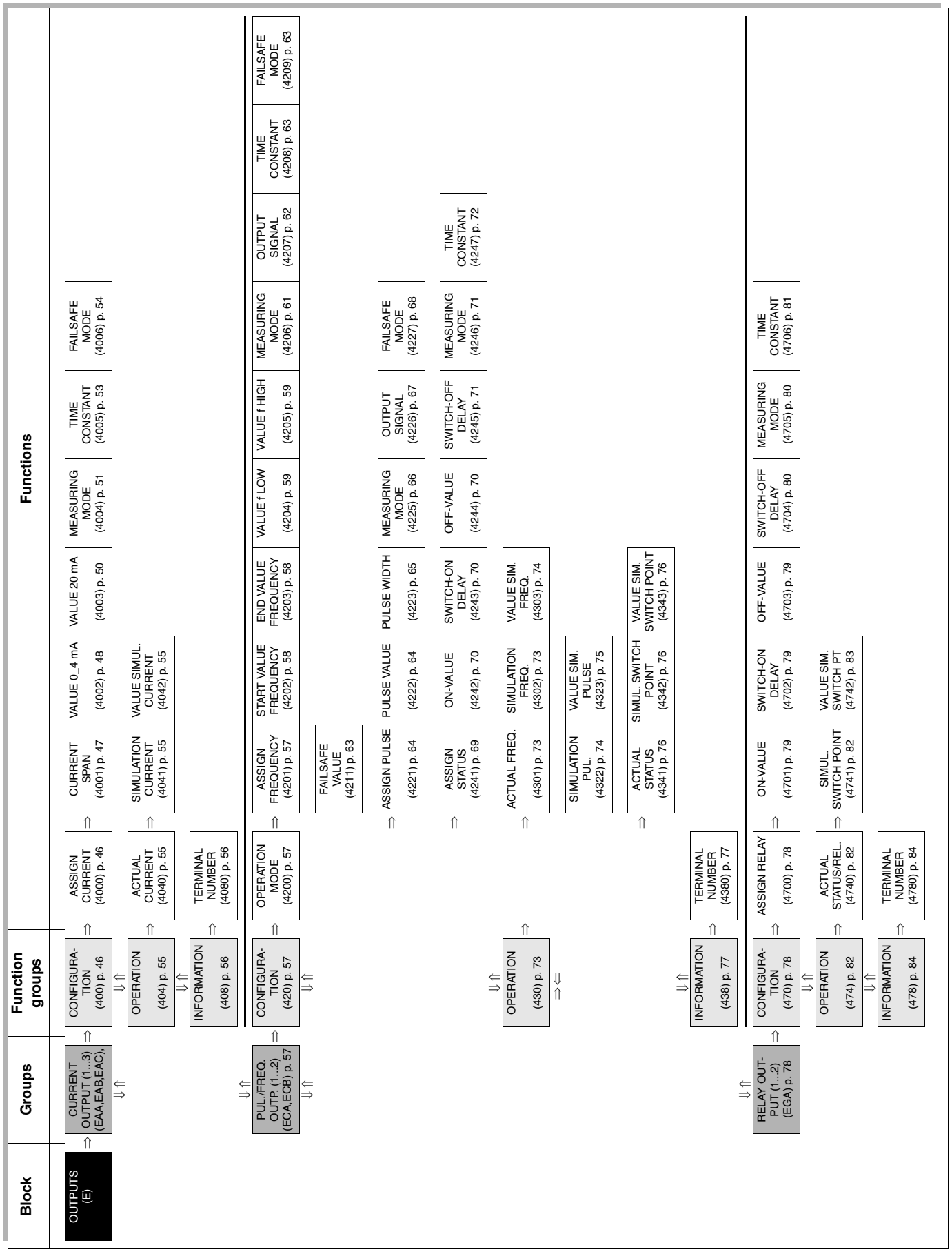
Functional description TOTALIZER → TOTALIZER (1...3) → OPERATION	
The function descriptions below apply to totalizers 1...3; the totalizers are independently configurable.	
SUM (3040)	Use this function to view the total for the particular totalizer's measured variable aggregated since measuring commenced. The value can be positive or negative, depending on the setting selected in the "TOTALIZER MODE" function (3002), and the direction of flow. **User interface:** max. 7-digit floating-point number, including sign and unit (e.g. 15467.04 m^3; ✎ Note! • The effect of the setting in the "TOTALIZER MODE" function (see page 41) is as follows: – If the setting is "BALANCE", the totalizer balances flow in the positive and negative directions. – If the setting is "POSITIVE", the totalizer registers only flow in the positive direction. – If the setting is "NEGATIVE", the totalizer registers only flow in the negative direction. • The totalizer's response to faults is defined in the "FAILSAFE ALL TOTALIZERS" function (3801) (see page 44).
OVERFLOW (3041)	Use this function to view the totaled overflow for the particular totalizer aggregated since measuring commenced. Total flow quantity is represented by a floating-point number consisting of max. 7 digits. You can use this function to view higher numerical values (>9,999,999) as overflows. The effective quantity is thus the total of OVERFLOW plus the value returned by the SUM function. Example: Reading for 2 overflows: 2 10^7 dm^3 (= 20,000,000 dm^3) The value displayed in the function SUM = 196 dm^3 Effective total quantity = 20,196,845.7 dm^3 **User interface:** Integer with exponent, including sign and unit, e.g. 2 10^7 dm^3

6.2 Group HANDLING TOTALIZER



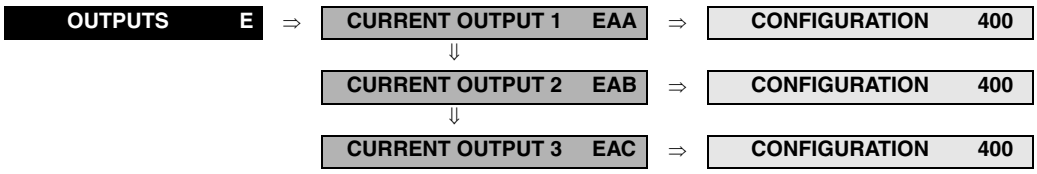
Functional description TOTALIZER → HANDLING TOTALIZER → Handling totalizer functions	
RESET ALL TOTALIZERS (3800)	Use this function to reset the totals (including all overflows) of the totalizers (1...3) to "zero" (= RESET). **Options:** NO YES **Factory setting:** NO ✎ Note! If the device is equipped with a status input and if it is appropriately configured, a reset for the totalizer (1...3) can also be triggered by a pulse (see function ASSIGN STATUS INPUT (5000) on page 89).
FAILSAFE ALL TOTALIZERS (3801)	Use this function to define the common response of all totalizers (1...3) in case of error. **Options:** STOP The totalizer is paused until the fault is rectified. ACTUAL VALUE The totalizer continues to count based on the current flow measuring 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 OUTPUTS

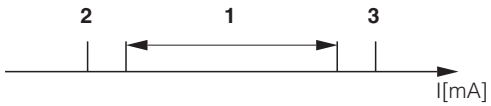


7.1 Group CURRENT OUTPUT (1...3)

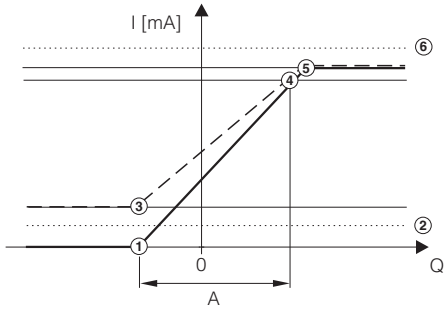
7.1.1 Function group CONFIGURATION



Functional description OUTPUTS → CURRENT OUTPUT (1...3) → CONFIGURATION	
ASSIGN CURRENT OUTPUT (4000)	Use this function to assign a measured variable to the current output. **Options:** OFF VOLUME FLOW AVERAGE SOUND VELOCITY AVERAGE FLOW VELOCITY AVERAGE **Factory setting:** VOLUME FLOW AVERAGE ✎ Note! If you select OFF, the only function shown in the function group CONFIGURATION (400) is this function, in other words, ASSIGN CURRENT OUTPUT (4000). **Advanced options with optional software package ADVANCED DIAGNOSTICS:** SIGNAL STRENGTH (CH1...CH2) DEVIATION VOLUME FLOW AVERAGE DEVIATION FLOW VELOCITY AVERAGE DEVIATION SIGNAL STRENGTH (CH1...CH2) DEVIATION SOUND VELOCITY AVERAGE DEVIATION ACTUAL TRANSIT TIME (CH1...CH2) DEVIATION ACCEPTANCE RATE (CH1...CH2)

Functional description OUTPUTS → CURRENT OUTPUT (1...3) → CONFIGURATION	
CURRENT SPAN (4001)	Use this function to define the current span. The selection specifies the operational range and the lower and upper signal on alarm. For the current output 1 the option HART can be defined additionally. **Options:** 0-20 mA 4-20 mA 4-20 mA HART (only current output1) 4-20 mA NAMUR 4-20 mA HART NAMUR (only current output1) 4-20 mA US 4-20 mA HART US (only current output1) 0-20 mA (25 mA) 4-20 mA (25 mA) 4-20 mA (25 mA) HART (only current output1) **Factory setting:** 4-20 mA HART NAMUR (für current output 1) 4-20 mA NAMUR (für current output 2) ✎ Note! • The option HART is only supported by the current output designated as current output 1 in the device software, (terminals 26 and 27, see function TERMINAL NUMBER (4080) on page 56). • When switching the hardware from an active (factory setting) to a passive output signal select a current span of 4-20 mA, (see *Operating Instructions Prosonic Flow 93 C*, BA 087D/06/en/.) **Current span, operational range and signal on alarm level**  F06-x3xxxxxx-05-xx-xx-xx-017 *A = Current span* *1 = Operational range (measuring information)* *2 = Lower signal on alarm level* *3 = Upper signal on alarm level* ✎ Note! • If the measured value exceeds the measuring range (as defined in the functions VALUE 0_4 mA (4002) and VALUE 20 mA (4003)) a notice message is generated (#351–354, current span). • In case of a fault the behaviour of the current output is according to the selected option in the function FAILSAFE MODE (4006.) Change the error category in the function ASSIGN SYSTEM ERROR (8000) to generate a fault message instead of a notice message.

A	1	2	3
0-20 mA	0 - 20,5 mA	0	22
4-20 mA	4 - 20,5 mA	2	22
4-20 mA HART	4 - 20,5 mA	2	22
4-20 mA NAMUR	3,8 - 20,5 mA	3,5	22,6
4-20 mA HART NAMUR	3,8 - 20,5 mA	3,5	22,6
4-20 mA US	3,9 - 20,8 mA	3,75	22,6
4-20 mA HART US	3,9 - 20,8 mA	3,75	22,6
0-20 mA (25 mA)	0 - 24 mA	0	25
4-20 mA (25 mA)	4 - 24 mA	2	25
4-20 mA (25 mA) HART	4 - 24 mA	2	25

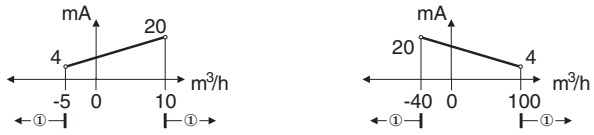
Functional description OUTPUTS → CURRENT OUTPUT (1...3) → CONFIGURATION	
VALUE 0_4 mA (4002)	Use this function to assign the 0/4 mA current a value. The value can be greater or less than the value assigned to 20 mA (function VALUE 20 mA (4003)). Positive and negative values are permissible, depending on the measured variable in question (e.g. CH1 volume flow). Example: 4 mA assigned value = - 250 l/h 20 mA assigned value = +750 l/h Calculated current value = 8 mA (at zero flow) Note that values with different signs cannot be entered for 0/4 mA and 20 mA (function 4003) if SYMMETRY is the setting selected for the MEASURING MODE function (4004). In this case the message “INPUT RANGE EXCEEDED” appears on the display. Example for STANDARD measuring mode:  F06-93xxxxxx-05-xx-xx-xx-000 ① *= Initial value (0...20 mA)* ② *= Lower signal on alarm level:: depends on the setting in the function CURRENT SPAN* ③ *= Initial value (4...20 mA): depends on the setting in the function CURRENT SPAN* ④ *= Full scale value (0/4...20 mA): depends on the setting in the function CURRENT SPAN* ⑤ *= Maximum current value: depends on the setting in the function CURRENT SPAN* ⑥ *= Failsafe mode (upper signal on alarm level): depends on the setting in the functions CURRENT SPAN (see Page 47) and FAILSAFE MODE, (see Page 54)* *A = Measuring range (the minimum measuring range has to exceed the value that correlates with a flow velocity of 0.3 m/s)* **User input:** 5-digit floating-point number, with sign **Factory setting:** 0 [unit] ✎ Note! • The appropriate unit is taken from the function UNIT VOLUME FLOW (0402) (see page 14). • For details on current span, operational range and signal on alarm level see Page 47. ☞ Caution! The current output responds differently, depending on the parameters set in the various functions. Some examples of parameter settings and their effect on the current output are given in the following section. (Continued on next page)

Functional description
OUTPUTS → CURRENT OUTPUT (1...3) → CONFIGURATION

VALUE 0_4 mA
(Continued)

Parameter setting, example 1:
VALUE 0_4 mA (4002) = not equal to zero flow (e.g. –5 m^3/h, 10m^3/h)
VALUE 20 mA (4003) = not equal to zero flow (e.g. 100 m^3/h, –40 m^3/h)
MEASURING MODE () = STANDARD4004

When you enter the values for 0/4 mA and 20 mA, the working range of the measuring device is defined. If the effective flow drops below or exceeds this working range (see ①), a fault or notice message is generated (#351-354, current range) and the current output responds in accordance with the parameter settings in the function FAILSAFE MODE (4002).



F06-xxxxxxxx-05-xx-xx-xx-007

Parameter setting, example 2:
VALUE 0_4 mA (4002) = equal to zero flow (e.g. 0 m^3/h)
VALUE 20 mA (4003) = not equal to zero flow (e.g. 10 m^3/h)
or
VALUE 0_4 mA (4002) = not equal to zero flow (e.g. 100 m^3/h)
VALUE 20 mA (4003) = equal to zero flow (e.g. 0 m^3/h)
and
MEASURING MODE (4004) = STANDARD

When you enter the values for 0/4 mA and 20 mA, the working range of the measuring device is defined. In doing so, one of the two values is parameterised as zero flow (e.g. 0 m^3/h).
If the effective flow drops below or exceeds the value parameterised as the zero flow, no fault/notice message is generated and the current output retains its value.
If the effective flow drops below or exceeds the other value, a fault/notice message is generated (#351-354, current range) and the current output responds in accordance with the parameter settings in the function FAILSAFE MODE (4002).

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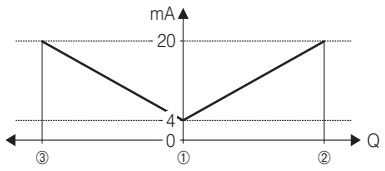
Deliberately only one flow direction is output with this setting and flow values in the other flow direction are suppressed.

Parameter setting, example 3:
MEASURING MODE (4004) = SYMMETRY
The current output signal is independent of the direction of flow (absolute amount of the measured variable). The 0_4 mA value and the ①20 ②mA value must have the same sign (+ or -). The "20 mA value" ③ (e.g. backflow) corresponds to the mirrored 20 mA value ② (e.g. flow).

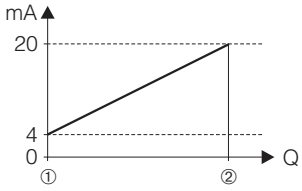
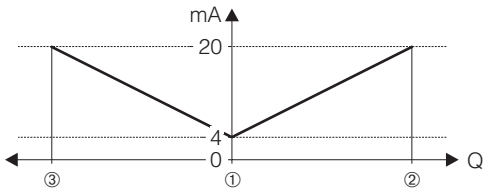


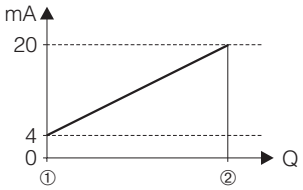
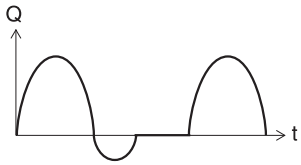
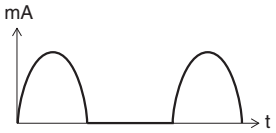
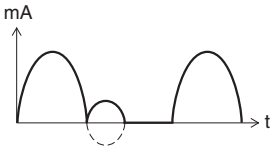
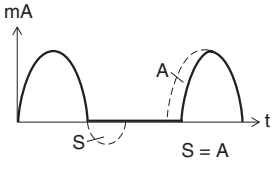
F-xxxxxxx-05-xx-xx-xx-007

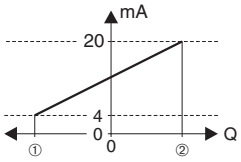
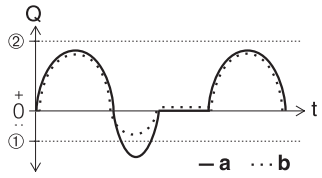
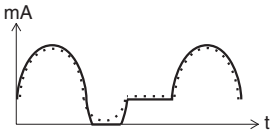
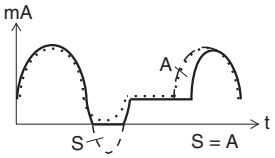
ASSIGN RELAY (4700) = FLOW DIRECTION
Flow direction output via a switching contact.

(Continued on next page)

Functional description OUTPUTS → CURRENT OUTPUT (1...3) → CONFIGURATION	
VALUE 0_4 mA (Continued)	**Parameter setting example 4:** MEASURING MODE (4004) = PULSATING FLOW If flow is characterized by severe fluctuations as is the case, for example, with reciprocating pumps, flow components outside the measuring range are buffered, balanced and output after a delay. If the effective flow drops below or exceeds the defined working range, normally no fault/notice message is generated.
VALUE 20 mA **(4003)**	Use this function to assign the 20 mA current a value. The value can be greater or less than the value assigned to 0/4 mA, (function VALUE 0_4 mA (4002)). Positive and negative values are permissible, depending on the measured variable in question (e.g. volume flow). Example: 4 mA assigned value = - 250 l/h 20 mA assigned value = +750 l/h Calculated current value = 8 mA (at zero flow) Note that values with different signs cannot be entered for 0/4 mA (function 4002) and 20 mA if SYMMETRY is the setting selected in the function MEASURING MODE (4004). In this case the message “INPUT AREA EXCEEDED” appears. **User input:** 5-digit floating-point number, with sign **Factory setting:** depends on the seting in the function assign current input: volume flow: 20 l/s sound velocity: 1800 m/s flow velocity: 10 m/s corresponds to the factory setting for the final value. ✎ Note! • The appropriate unit is taken from the function UNIT VOLUME FLOW (0402) (see page 14). • For an example for STANDARD measuring mode see Page 48. • If a channel is not visible, it does not appear in the options. Channels can be displayed or hidden by means of the function MEASUREMENT (6880). ☝ Caution! It is very important to read and comply with the information in the function VALUE 0_4 mA (under “☝ Caution”; Examples of parameterization) on page 48.

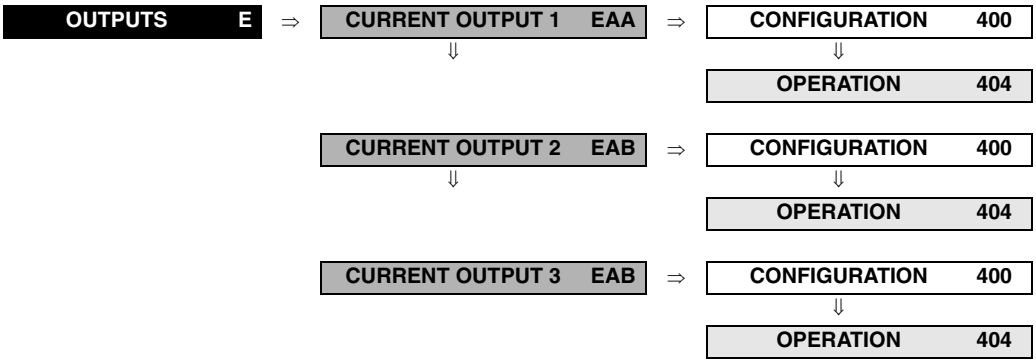
Functional description OUTPUTS → CURRENT OUTPUT (1...3) → CONFIGURATION	
MEASURING MODE (4004)	Use this function to define the measuring mode for the current output. **Options:** STANDARD SYMMETRY PULSATING FLOW The current output signal is proportional to the measured variable. The flow components outside the scaled measuring range (defined by the 0_4 mA VALUE ① and the 20 mA VALUE ②) are taken into account as follows for signal output: • If one of the values is defined as equal to the zero flow (e.g. VALUE 0_4 mA = 0 m^3/h), no message is given if this value is exceeded or not achieved and the current output retains its value (4 mA in the example). If the other value is exceeded or not achieved, the message “CURRENT OUTPUT AT FULL SCALE VALUE” appears and the current output responds in accordance with the parameter setting in the function FAILSAFE MODE (4002). • If both values are defined as not equal to the zero flow (e.g. VALUE 0_4 mA = –5 m^3/h, VALUE 20 mA = 10m^3/h) the message “CURRENT OUTPUT AT FULL SCALE VALUE” appears if the measuring range is exceeded or not achieved and the current output responds in accordance with the parameter setting in the function FAILSAFE MODE (4002).  F-xxxxxxx-05-xx-xx-xx-003 SYMMETRY The current output signal is independent of the direction of flow (absolute amount of the measured variable). The 0_4 mA value and the ①20 ②mA value must have the same sign (+ or -). The “20 mA value” ③ (e.g. backflow) corresponds to the mirrored 20 mA value ② (e.g. flow).  F-xxxxxxx-05-xx-xx-xx-007 ✎ Note! • The direction of flow can be output via the configurable relay or status outputs. • SYMMETRY cannot be selected unless the values in the VALUE 0_4 mA (4002) and VALUE 20 mA (4003) functions have the same sign or one of the values is zero. If the signs of the two values differ, SYMMETRY cannot be selected and an “ASSIGNMENT NOT POSSIBLE” message is issued. (Continued on next page)

Functional description OUTPUTS → CURRENT OUTPUT (1...3) → CONFIGURATION	
MEASURING MODE (Contd)	PULSATING FLOW If flow is characterized by severe fluctuations as is the case, for example, with reciprocating pumps, flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 seconds. If the data cannot be buffered within approx. 60 seconds, a fault or notice message appears. Under certain plant conditions, flow values can aggregate in the buffer, for example in the case of prolonged and unwanted fluid backflow. However, this buffer is reset in all relevant programming adjustments which affect the current output. **Factory setting:** STANDARD
Detailed explanations and information	**How the current output responds under the following postulated conditions:** 1. Defined measuring range (①-②): ①② and have the **same** sign  F-xxxxxxx-05-xx-xx-xx-003 and the following flow behaviour:  F-x3xxxxx-05-xx-xx-xx-008 • STANDARD The current output signal is proportional to the measured variable. The flow components outside the scaled measuring range are not taken into account for signal output.  F-x3xxxxx-05-xx-xx-xx-009 • SYMMETRY The current output signal is independent of the direction of flow.  F-x3xxxxx-05-xx-xx-xx-010 • PULSATING FLOW Flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 seconds.  F-x3xxxxx-05-xx-xx-xx-011 (Continued on next page)

Functional description OUTPUTS → CURRENT OUTPUT (1...3) → CONFIGURATION	
Detailed explanations and information (Contd)	2. Defined measuring range (①-②): ①② and do **not** have the **same** sign.  F-x3xxxxx-05-xx-xx-xx-002 Flow a (—) outside, b (- -) within the measuring range.  F-x3xxxxx-05-xx-xx-xx-012 • STANDARD a (—): The flow components outside the scaled measuring range cannot be taken into account for signal output. A fault message is generated (# 351...354, current range) and the current output responds in accordance with the parameter settings in the function FAILSAFE MODE (4006). b (- -): The current output signal is proportional to the measured variable assigned.  F-x3xxxxx-05-xx-xx-xx-013 • SYMMETRY This option is not available under these circumstances, because the 0_4 mA value and the 20 mA value have different signs. • PULSATING FLOW Flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 seconds.  F-x3xxxxx-05-xx-xx-xx-014
TIME CONSTANT (4005)	Use this function to enter a time constant defining how the current output signal reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). **User input:** fixed-point number 0.01...100.00 s **Factory setting:** 1.00 s

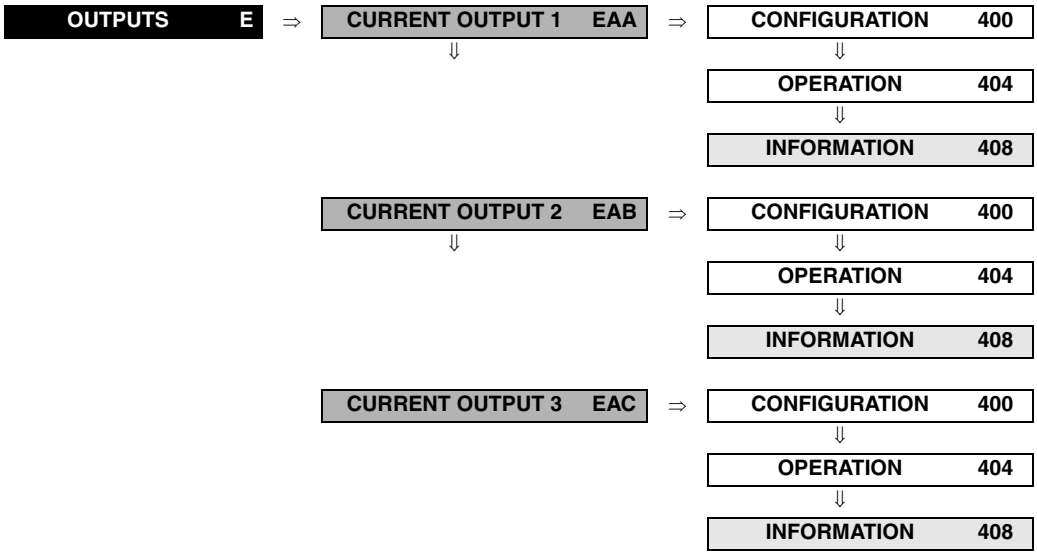
Functional description OUTPUTS → CURRENT OUTPUT (1...3) → CONFIGURATION	
FAILSAFE MODE (4006)	For safety reasons it is advisable to ensure that the current output assumes a predefined state in the event of a fault. The setting you select here affects only the current output. It has no effect on other outputs and the display (e.g. totalizers). **Options:** MIN. CURRENT The current output adopts the value of the lower signal on alarm level (as defined in the function CURRENT SPAN (4001) MAX. CURRENT The current output adopts the value of the upper signal on alarm level (as defined in the function CURRENT SPAN (4001) HOLD VALUE (**not recommended**) Measuring value output is based on the last measuring value saved before the error occurred . ACTUAL VALUE Measured value output is based on the current flow measurement. The fault is ignored . **Factory setting:** MIN. CURRENT

7.1.2 Function group OPERATION



Functional description OUTPUTS → CURRENT OUTPUT (1...3) → OPERATION	
ACTUAL CURRENT (4040)	Use this function to view the computed actual value of the output current. **User interface:** 0.00...25.00 mA
SIMULATION CURRENT (4041)	Use this function to activate simulation of the current output. **Options:** OFF ON **Factory setting:** OFF ✎ Note! • The "SIMULATION CURRENT OUTPUT" message indicates that simulation is active. • The measuring device continues to measure while simulation is in progress, i.e. the current measuring values are output correctly via the other outputs. ☝ Caution! The setting is not saved if the power supply fails.
VALUE SIMULATION CURRENT (4042)	✎ Note! The function is not visible unless the function SIMULATION CURRENT (4041) is active (= ON). Use this function to define a freely selectable value (e.g. 12 mA) to be output at the current output. This value is used to test downstream devices and the measuring device itself. **User input:** Floating-point number: 0.00...25.00 mA **Factory setting:** 0.00 mA ☝ Caution! The setting is not saved if the power supply fails.

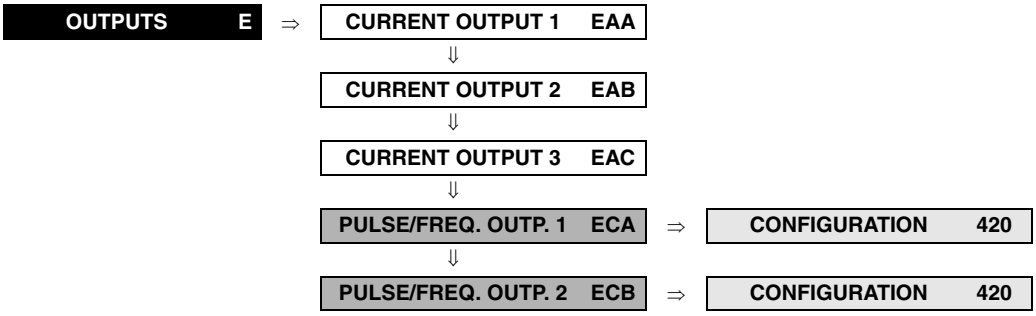
7.1.3 Function group INFORMATION



Functional description OUTPUTS → CURRENT OUTPUT (1...3) → INFORMATION	
TERMINAL NUMBER (4080)	Use this function to display the numbers of the terminals (in the connection compartment) which are used by the current output.

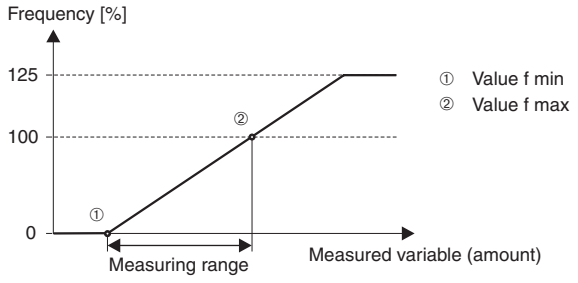
7.2 Group PULSE/FREQUENCY OUTPUT (1...2)

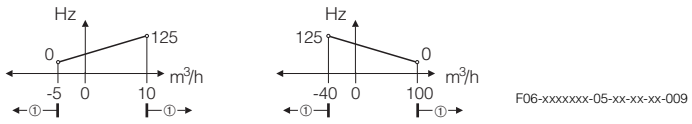
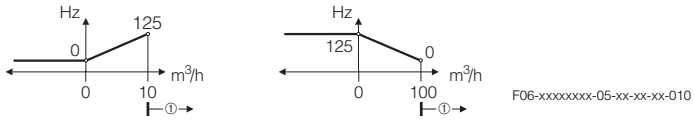
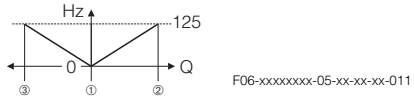
7.2.1 Function group CONFIGURATION



Functional description OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → CONFIGURATION (GENERAL/FREQUENCY)	
OPERATION MODE (4200)	Use this function to configure the output as a pulse output, frequency output or status output. The functions available in this function group vary, depending on which option you select here. **Options:** PULSE FREQUENCY STATUS **Factory setting:** PULSE
ASSIGN FREQUENCY (4201)	✎ Note! This function is not available unless the FREQUENCY setting was selected in the function OPERATION MODE (4200). Use this function to assign a measured variable to the frequency output. **Options:** VOLUME FLOW AVERAGE SOUND VELOCITY AVERAGE FLOW VELOCITY AVERAGE **Factory setting:** VOLUME FLOW AVERAGE ✎ Note! If you select OFF, the only function shown in the CONFIGURATION function group is this function, in other words ASSIGN FREQUENCY (4201). **Advanced options with optional software package ADVANCED DIAGNOSTICS:** SIGNAL STRENGTH (CH1...CH2) DEVIATION VOLUME FLOW AVERAGE DEVIATION FLOW VELOCITY AVERAGE DEVIATION SIGNAL STRENGTH (CH1...CH2) DEVIATION SOUND VELOCITY AVERAGE DEVIATION ACTUAL TRANSIT TIME (CH1...CH2) DEVIATION ACCEPTANCE RATE (CH1...CH2)

Functional description OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → CONFIGURATION (GENERAL/FREQUENCY)	
START VALUE FREQUENCY (4202)	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to define an initial frequency for the frequency output. You define the associated measuring value of the measuring range in the function-VALUE f LOW (4204) described on page 59. **User input:** 5-digit fixed-point number 0...10000 Hz **Factory setting:** 0 Hz Example: • VALUE f LOW. = 0 l/h, initial frequency = 0 Hz: i.e. for a flow of 0 l/h, the frequency output is 0 Hz. • VALUE f LOW = 1 l/h, initial frequency = 10 Hz: i.e. for a flow of 1 l/h, the frequency output is 10 Hz.
END VALUE FREQUENCY (4203)	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to define an end frequency for the frequency output. You define the associated measuring value of the measuring range in the function-VALUE f HIGH (4205) described on page 59. **User input:** 5-digit fixed-point number 2...10000 Hz **Factory setting:** 10000 Hz Example: • VALUE f HIGH = 1000 l/h, full scale frequency = 1000 Hz: i.e. at a flow of 1000 l/h, a frequency of 1000 Hz is output. • VALUE f HIGH = 3600 l/h, full scale frequency = 1000 Hz: i.e. at a flow of 3600 l/h, a frequency of 1000 Hz is output. ✎ Note! In the FREQUENCY operating mode the output signal is symmetrical (on/off ratio = 1:1). At low frequencies the pulse duration is limited to a maximum of 2 seconds, i.e. the on/off ratio is no longer symmetrical.

Functional description OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → CONFIGURATION (GENERAL/FREQUENCY)	
VALUE f LOW (4204)	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to assign a variable to the start value frequency (4202). The value can be greater or less than the value assigned to the VALUE f HIGH. Positive and negative values are permissible, depending on the measured variable in question (e.g. volume flow). You define a measuring range by defining the VALUE f LOW and VALUE f HIGH values. **User input:** 5-digit floating-point number **Factory setting:** 0 [unit] ✎ Note! • Graphic illustration of VALUE f LOW see function VALUE f HIGH (4205) on page 59. • The appropriate unit is taken from the group SYSTEM UNITS (ACA) (see page 14).
VALUE f HIGH (4205)	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to assign a variable to the end value frequency (4203). The value can be greater or less than the value assigned to the VALUE f LOW. Positive and negative values are permissible, depending on the measured variable in question (e.g. volume flow). You define a measuring range by defining the VALUE f LOW and VALUE f HIGH values. **User input:** 5-digit floating-point number **Factory setting:** depends on the seting in the function assign frequency: volume flow: 20 l/s sound velocity: 1800 m/s flow velocity: 10 m/s corresponds to the factory setting for the final value.  Caution! The frequency output responds differently, depending on the parameters set in the various functions. Some examples of parameter settings and their effect on the frequency output are given in the following section. ✎ Note! The appropriate unit is taken from the group SYSTEM UNITS (ACA) (see page 14). (Continued on next page)

Functional description OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → CONFIGURATION (GENERAL/FREQUENCY)	
VALUE f HIGH (Contd)	**Parameter setting, example 1:** VALUE f LOW (4204) = not equal to zero flow (e.g. –5 m^3/h, 10m^3/h) VALUE f HIGH (4205) = not equal to zero flow (e.g. 100 m^3/h, –40 m^3/h) MEASURING MODE (4206) = STANDARD When you enter the values for VALUE f LOW and VALUE f HIGH, the working range of the measuring device is defined. If the effective flow drops below or exceeds this working range (see Fig. ①), a fault or notice message is generated (#351-354, frequency range) and the frequency output responds in accordance with the parameter settings in the function FAILSAFE MODE (4209).  F06-xxxxxxx-05-xx-xx-xx-009 **Parameter setting, example 2:** VALUE f LOW (4204) = equal to zero flow (e.g. 0 m^3/h) VALUE f HIGH (4205) = not equal to zero flow (e.g. 10 m^3/h) or VALUE f LOW (4204) = not equal to zero flow (e.g. 100 m^3/h) VALUE f HIGH (4205) = equal to zero flow (e.g. 0 m^3/h) and MEASURING MODE (4206) = STANDARD When you enter the values for VALUE f LOW and VALUE f HIGH, the working range of the measuring device is defined. In doing so, one of the two values is parameterised as zero flow (e.g. 0 m^3/h). If the effective flow drops below or exceeds the value parameterised as the zero flow, no fault/notice message is generated and the frequency output retains its value. If the effective flow drops below or exceeds the other value, a fault/notice message is generated (#351-354, frequency area) and the frequency output responds in accordance with the parameters set in the function FAILSAFE MODE (4209).  F06-xxxxxxxx-05-xx-xx-xx-010 Deliberately only one flow direction is output with this setting and flow values in the other flow direction are suppressed. **Parameter setting, example 3:** MEASURING MODE (4206) = SYMMETRY The frequency output signal is independent of the direction of flow (absolute amount of the measured variable). The VALUE f LOW ① and VALUE f HIGH ② must have the same sign (+ or -). The “VALUE f HIGH” ③ (e.g. backflow) corresponds to the mirrored VALUE f HIGH ② (e.g. flow).  F06-xxxxxxxx-05-xx-xx-xx-011 ASSIGN RELAY (4700) = FLOW DIRECTION Flow direction output via a switching contact. **Parameter setting example 4:** MEASURING MODE (4206) = PULSATING FLOW If flow is characterized by severe fluctuations as is the case, for example, with reciprocating pumps, flow components outside the measuring range are buffered, balanced and output after a delay. If the effective flow drops below or exceeds the defined working range, normally no fault/notice message is generated.

Functional description
OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → CONFIGURATION (GENERAL/FREQUENCY)

MEASURING MODE (4206)

✎ Note!
This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200).

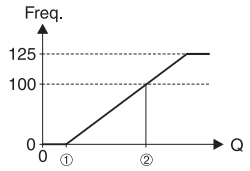
Use this function to define the measuring mode for the frequency output.

Options:
STANDARD
SYMMETRY
PULSATING FLOW
Factory setting
STANDARD

Description of the individual options:
• STANDARD
The frequency output signal is proportional to the measured variable. The flow components outside the scaled measuring range (defined by the VALUE f LOW. ① and VALUE f HIGH. ②) are not taken into account for signal output.

– If one of the values is defined as equal to the zero flow (e.g. = VALUE f LOW 0 m^3/h), no message is given if this value is exceeded or not achieved and the frequency output retains its value (0 Hz in the example). If the other value is exceeded or not achieved, the message "FREQUENCY OUTPUT AT FULL SCALE VALUE" appears and the frequency output responds in accordance with the parameter setting in the function FAILSAFE MODE (4209).

– If both values are defined as not equal to the zero flow (e.g. VALUE f LOW = –5 m^3/h; VALUE f HIGH = 10m^3/h), the message "FREQUENCY OUTPUT AT FULL SCALE VALUE" appears if the measuring range is exceeded or not achieved and the frequency output responds in accordance with the parameter setting in the function FAILSAFE MODE (4209).



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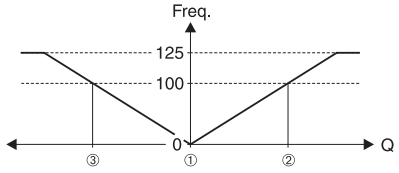
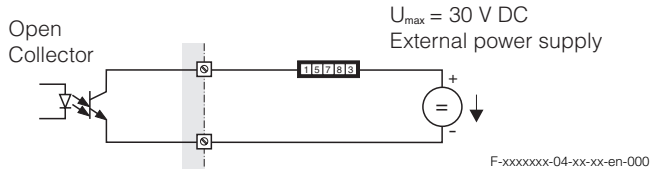
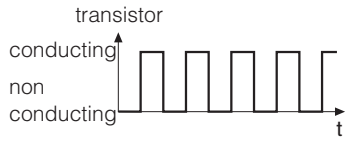
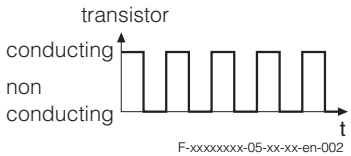
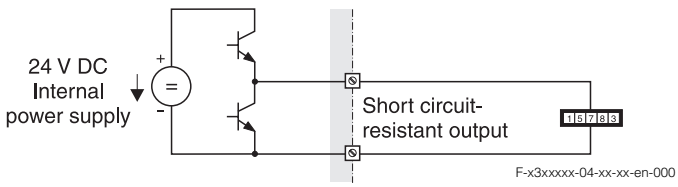
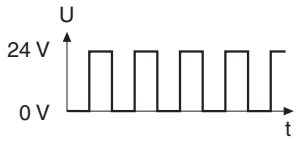
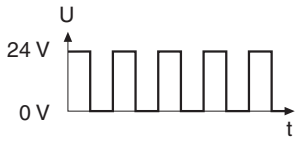
SYMMETRY
The frequency output signal is independent of the direction of flow (absolute amount of the measured variable). The VALUE f LOW ① and VALUE f HIGH ② must have the same sign (+ or -). The VALUE f HIGH ③ (e.g. backflow) corresponds to the mirrored VALUE f HIGH ② (e.g. forward flow).



F-x3xxxxx-05-xx-xx-xx-004

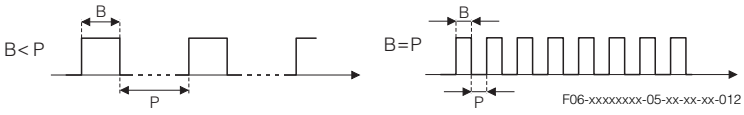
✎ Note!
• The direction of flow can be output via the configurable relay or status outputs.
• SYMMETRY cannot be selected unless the values in the VALUE f LOW (4204) and VALUE f HIGH (4205) functions have the same sign or one of the values is zero. If the values have different signs, SYMMETRY cannot be selected and an "ASSIGNMENT NOT POSSIBLE" message is displayed.

(Continued on next page)

Functional description OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → CONFIGURATION (GENERAL/FREQUENCY)	
MEASURING MODE (Contd)	• PULSATING FLOW If flow is characterized by severe fluctuations as is the case, for example, with reciprocating pumps, flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 seconds. If the buffered data cannot be processed within approx. 60 seconds, a fault/ notice message appears. Hinweismeldung. Under certain plant conditions, flow values can aggregate in the buffer, for example in the case of prolonged and unwanted fluid backflow. However, this buffer is reset in all relevant programming adjustments which affect the frequency output.
OUTPUT SIGNAL **(4207)**	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to select whether to use the device's internal power supply (ACTIVE) or an external power supply (PASSIVE), along with the polarity of the frequency. **Options:** PASSIVE - POSITIVE PASSIVE - NEGATIVE ACTIVE-POSITIVE ACTIVE-NEGATIVE **Factory setting:** PASSIVE - POSITIVE **PASSIVE:**  ✎ Note! For continuous currents up to 25 mA (I_{max} = 250 mA / 20 ms) **PASSIVE-POSITIVE**  **PASSIVE-NEGATIVE**  F-xxxxxxxx-05-xx-xx-en-002 **ACTIVE:**  **ACTIVE-POSITIVE**  **ACTIVE-NEGATIVE**  F06-xxxxxxx-05-xx-xx-en-003

Functional description OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → CONFIGURATION (GENERAL/FREQUENCY)	
TIME CONSTANT (4208)	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to enter a time constant defining how the frequency output signal reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). **User input:** fixed-point number 0.00...100.00 s **Factory setting:** 1.00 s
FAILSAFE MODE (4209)	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). For safety reasons it is advisable to ensure that the frequency output assumes a predefined state in the event of a fault. The setting you select here affects only the frequency output. It has no effect on other outputs and the display (e.g. totalizers). **Options:** FALLBACK VALUE Output is 0 Hz. FAILSAFE LEVEL Output is the frequency specified in the FAILSAFE VALUE function (4211). HOLD VALUE Measuring value output is based on the last measuring value saved before the error occurred. ACTUAL VALUE Measuring value output is based on the current flow measurement (fault is ignored). **Factory setting:** FALLBACK VALUE
FAILSAFE VALUE (4211)	✎ Note! This function is not available unless FREQUENCY was selected in the function OPERATION MODE (4200) and FAILSAFE LEVEL was selected in the function FAILSAFE MODE (4209). Use this function to define the frequency that the measuring device outputs in the event of an error. **User input:** max. 5-digit number: 0...12500 Hz **Factory setting:** 12500 Hz

Functional description OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → CONFIGURATION (PULSE)	
ASSIGN PULSE (4221)	✎ Note! This function is not available unless the PULSE setting was selected in the function OPERATION MODE (4200). Use this function to assign a measured variable to the pulse output. **Options:** OFF VOLUME FLOW AVERAGE **Factory setting:** VOLUME FLOW AVERAGE ✎ Note! If you select OFF, the only function shown in the CONFIGURATION function group is this function, in other words ASSIGN PULSE (4221).
PULSE VALUE (4222)	✎ Note! This function is not available unless the PULSE setting was selected in the function OPERATION MODE (4200). Use this function to define the flow at which a pulse is triggered. These pulses can be totalled by an external totalizer and in this way the total flow since measuring commenced can be registered. **User input:** 5-digit floating-point number, [unit] **Factory setting:** 1 l/pulse ✎ Note! The appropriate unit is taken from the function UNIT VOLUME (0403), (see page 15)

Functional description OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → CONFIGURATION (PULSE)	
PULSE WIDTH (4223)	✎ Note! This function is not available unless the PULSE setting was selected in the function OPERATION MODE (4200). Use this function to enter the pulse width of the output pulse. **User input:** 0.05...2000 ms **Factory setting:** 100 ms Pulse output is **always** with the pulse width (B) entered in this function. The pauses (P) between the individual pulses are automatically configured. However, they must at least correspond to the pulse width (B = P).  B = Pulse width entered (the illustration applies to positive pulses) P= Intervals between the individual pulses ✎ Note! When entering the pulse width, select a value that can still be processed by an external totalizer (e.g. mechanical totalizer, PLC, etc.) . ☞ Caution! If the pulse number or frequency resulting from the pulse value entered, (see function PULSE VALUE (4222) onpage 64) and from the current flow is too large to maintain the pulse width selected (the interval P is smaller than the pulse width B entered), a system error message (# 359...362, pulse memory) is generated after buffering/balancing has occurred.

Functional description OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → CONFIGURATION (PULSE)	
MEASURING MODE (4225)	✎ Note! This function is not available unless the PULSE setting was selected in the function OPERATION MODE (4200). Use this function to define the measuring mode for the pulse output. **Options:** STANDARD Only positive flow components are totaled. Negative components are not taken into account. STANDARD REVERSE Only negative flow components are totaled. Positive components are not taken into account. SYMMETRY Positive and negative flow components are taken into account. ✎ Note! The direction of flow can be output via the relay output. PULSATING FLOW If flow is characterized by severe fluctuations as is the case, for example, with reciprocating pumps, the positive and negative flow components are totalled, with the signs taken into account (e.g. –10 l and +25 l = 15 l). Flow components outside the maximum pulse number per second (value/ width) are buffered, balanced and output after a maximum delay of 60 seconds. If the buffered data cannot be processed within approx. 60 seconds, a fault/notice message appears. Under certain plant conditions, flow values can aggregate in the buffer, for example in the case of prolonged and unwanted fluid backflow. However, this buffer is reset in all relevant programming adjustments which affect the pulse output. **Factory setting:** STANDARD

Functional description
OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → CONFIGURATION (PULSE)

OUTPUT SIGNAL (4226)

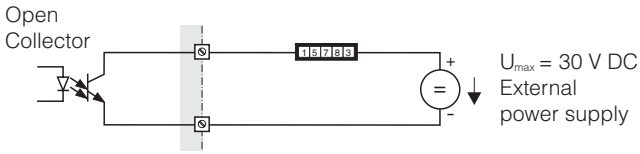
✎ Note!
This function is not available unless the PULSE setting was selected in the function OPERATION MODE (4200).

Use this function to configure the output in such a way that it matches an external counter, for example. Depending on the application you can select whether to use the device's internal power supply (ACTIVE) or an external power supply (PASSIVE), along with the direction of the polarity of the pulses.

Options:
PASSIVE-POSITIVE
PASSIVE-NEGATIVE
ACTIVE-POSITIVE
ACTIVE-NEGATIVE

Factory setting:
PASSIVE-POSITIVE

PASSIVE:



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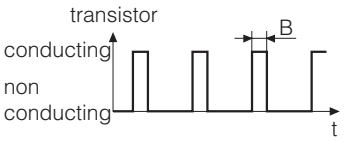
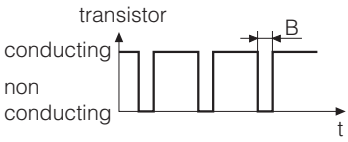
✎ Note!
For continuous currents up to 25 mA (I_{max} = 250 mA / 20 ms)

PASSIVE-NEGATIVE
pulses



PASSIVE-POSITIVE
pulses



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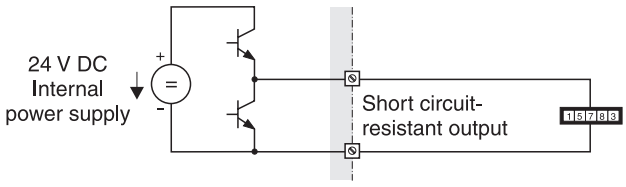
B = Pulse width

ACTIVE:



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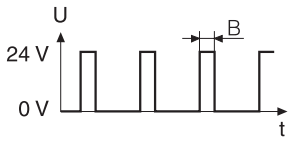
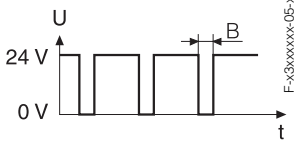
ACTIVE-POSITIVE
pulses



ACTIVE-NEGATIVE
pulses



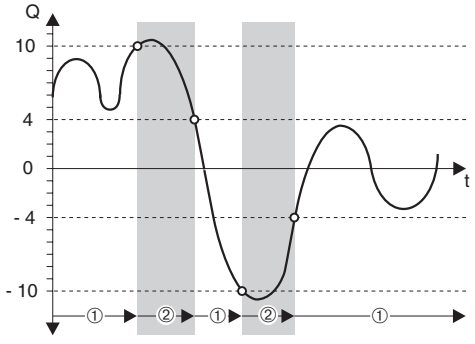
F-x3xxxxx-05-xx-xx-en-006

B = Pulse width

Functional description OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → CONFIGURATION (PULSE)	
FAILSAFE MODE (4227)	✎ Note! This function is not available unless the PULSE setting was selected in the function OPERATION MODE (4200). For safety reasons it is advisable to ensure that the pulse output assumes a predefined state in the event of a fault. The setting you select here affects only the pulse output. It has no effect on other outputs and the display (e.g. totalizers). **Options:** FALLBACK VALUE Output is 0 pulse. HOLD VALUE Measuring value output is based on the last measuring value saved before the error occurred. ACTUAL VALUE Measuring value output is based on the current flow measurement The fault is ignored. **Factory setting:** FALL BACK VALUE

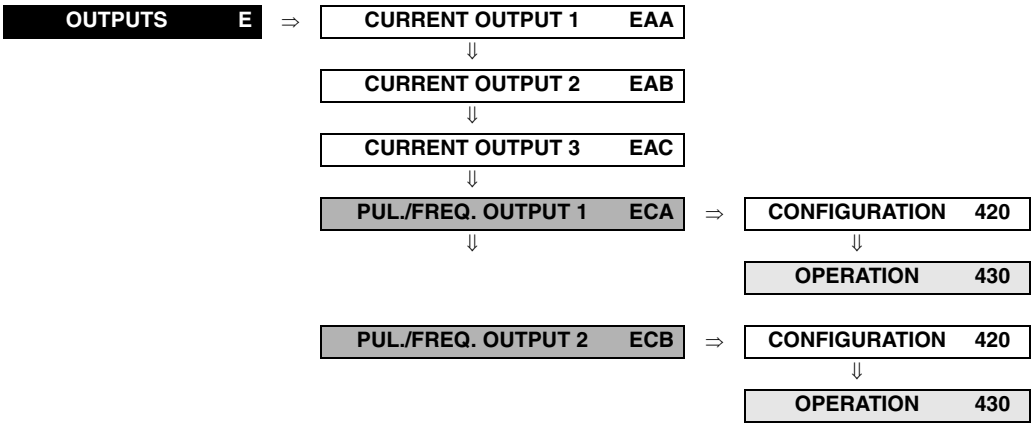
Functional description OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → CONFIGURATION (STATUS)	
ASSIGN STATUS (4241)	✎ Note! This function is not available unless the STATUS setting was selected in the function OPERATION MODE (4200). Use this function to assign a switching function to the status output. **Options:** OFF ON (operation) FAULT MESSAGE NOTICE MESSAGE FAULT MESSAGE & NOTICE MESSAGE LIMIT TOTALIZER (1...3) AVERAGE FLOW DIRECTION LIMIT AVERAGE VOLUME FLOW LIMIT SOUND VELOCITY AVERAGE LIMIT AVERAGE FLOW VELOCITY ✎ Note! • The following settings/entries must be made to ensure correct and immediate signal output: – Function SWITCH-ON DELAY (4243) = 0 ms, (see page 70) – Function SWITCH-OFF DELAY (4245) = 0 ms, (see page 71) – Function TIME CONSTANT (4247) = 0 ms, (see page 72) **Factory setting:** FAULT MESSAGE ✎ Note! • The behaviour of the status output is a normally closed behaviour, in other words the output is closed (transistor conductive) when normal, error-free measuring is in progress. If you select OFF, the only function shown in the CONFIGURATION function group is the function (4241 ASSIGN STATUS). **Advanced options with optional software package ADVANCED DIAGNOSTICS:** LIMIT SIGNAL STRENGTH (CH1...CH2) DEVIATION VOLUME FLOW AVERAGE DEVIATION FLOW VELOCITY AVERAGE DEVIATION SIGNAL STRENGTH (CH1...CH2) DEVIATION SOUND VELOCITY AVERAGE DEVIATION ACTUAL TRANSIT TIME (CH1...CH2) DEVIATION ACCEPTANCE RATE (CH1...CH2)

Functional description OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → CONFIGURATION (STATUS)	
ON-VALUE (4242)	✎ Note! This function is not available unless STATUS was selected in the function OPERATION MODE (4200) and LIMIT VALUE or FLOW DIRECTION was selected in the function ASSIGN STATUS (4241). Use this function to assign a value to the switch-on point (activation of the status output). The value can be equal to, greater than or less than the switch-off point. Positive or negative values are permissible, depending on the measured variable in question (e.g. volume flow, totalizer reading). **User input:** 5-digit floating-point number, [unit] **Factory setting:** 0 [unit] ✎ Note! • The appropriate unit is taken from the function UNIT VOLUME FLOW (0402). • Only the switch-on point is available for flow direction output (no switch-off point). If you enter a value not equal to the zero flow (e.g. 5), the difference between the zero flow and the value entered corresponds to half the switch-over hysteresis.
SWITCH-ON DELAY (4243)	✎ Note! This function is not available unless STATUS was selected in the function OPERATION MODE (4200) and LIMIT VALUE or FLOW DIRECTION was selected in the function ASSIGN STATUS (4241). Use this function to specify a delay (0...100 seconds) for switching on the status output (i.e. signal changes from 0 to 1). The delay starts when the limit value is reached. The status output does switch when the delay has timed out and the switch condition has been valid over the delay time. **User input:** fixed-point number 0.0...100.0 s **Factory setting:** 0.0 s
OFF-VALUE (4244)	✎ Note! This function is not available unless STATUS was selected in the function OPERATION MODE (4200) and a LIMIT VALUE was selected in the function ASSIGN STATUS (4241). Use this function to assign a value to the switch-off point (deactivation of the status output). The value can be equal to, greater than or less than the switch-on point. Positive and negative values are permissible, depending on the measured variable in question (e.g. volume flow, totalizer reading). **User input:** 5-digit floating-point number, [unit] **Factory setting:** 0 [unit] ✎ Note! • The appropriate unit is taken from the function UNIT VOLUME FLOW (0402). • If SYMMETRY is the setting selected in the MEASURING MODE function (4246) and values with different signs are entered for the switch-on and switch-off points, an “INPUT RANGE EXCEEDED” message is issued.

Functional description OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → CONFIGURATION (STATUS)	
SWITCH-OFF DELAY (4245)	✎ Note! This function is not available unless the STATUS setting was selected in the function OPERATION MODE (4200). Use this function to define a delay (0...100 seconds) for switching off the status output (i.e. signal changes from 1 to 0). The delay starts when the limit value is reached. The status output does switch when the delay has timed out and the switch condition has been valid over the delay time. **User input:** fixed-point number 0.0...100.0 s **Factory setting:** 0.0 s
MEASURING MODE (4246)	✎ Note! • This function is not available unless the STATUS setting was selected in the function OPERATION MODE (4200). • This function is not visible unless a limit value was assigned to the status output. Use this function to define the measuring mode for the status output. **Options:** STANDARD The status output signal switches at the defined switch points. SYMMETRY The status output signal switches at the defined switch points, irrespective of the sign. If you define a switch point with a positive sign, the status output signal switches as soon as the value is reached in the negative direction (negative sign), see illustration. **Factory setting:** STANDARD Example for the SYMMETRY measuring mode: Switch-on point: Q = 4 Switch-off point: Q = 10 ① = Status output switched on (conductive) ② = Status output switched off (not conductive)  ✎ Note! • SYMMETRY cannot be selected unless the values in the ON-VALUE (4242) and OFF-VALUE (4244) functions have the same sign or one of the values is zero. • If the signs of the two values differ, SYMMETRY cannot be selected and an “ASSIGNMENT NOT POSSIBLE” message is issued.

Functional description OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → CONFIGURATION (STATUS)	
TIME CONSTANT (4247)	✎ Note! This function is not available unless the STATUS setting was selected in the function OPERATION MODE (4200). Use this function to enter a time constant defining how the measuring signal reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). Damping acts on the measuring signal before the switch status changes, and consequently before switch-on or switch-off delay is activated. The purpose of damping, therefore, is to prevent the status output changing state continuously in response to fluctuations in flow. **User input:** fixed-point number 0.00...100.00 s **Factory setting:** 0.00 s

7.2.2 Function group OPERATION



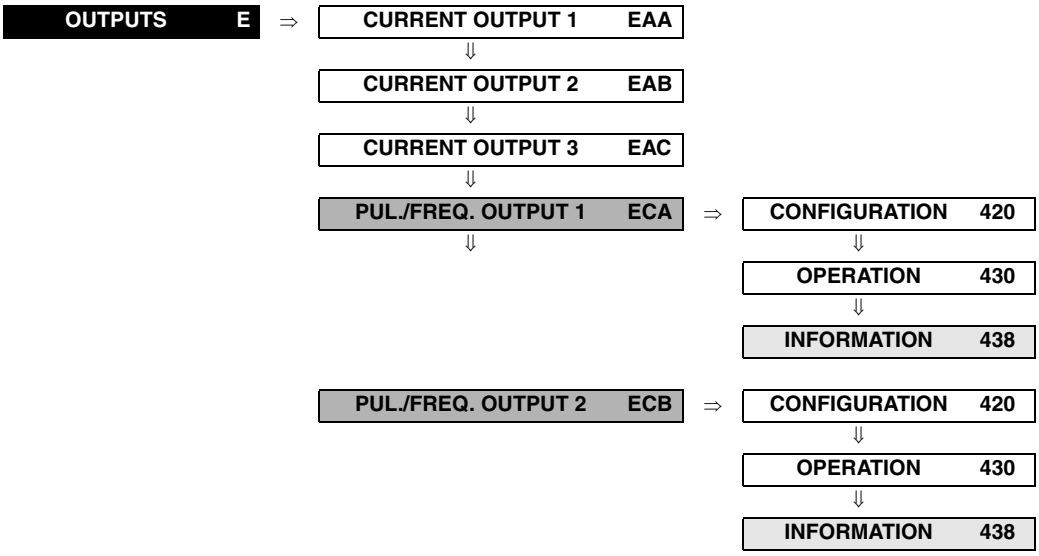
Functional description OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → OPERATION (FREQUENCY)	
ACTUAL FREQUENCY (4301)	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to view the computed value of the output frequency. **User interface:** 0...12500 Hz
SIMULATION FREQUENCY (4302)	✎ Note! This function is not available unless the FREQUENCY setting was selected in the OPERATION MODE function (4200). Use this function to activate simulation of the frequency output. **Options:** OFF ON **Factory setting:** OFF ✎ Note! • The "SIMULATION FREQUENCY OUTPUT" message indicates that simulation is active. • The measuring device continues to measure while simulation is in progress, i.e. the current measuring values are output correctly via the other outputs. ☝ Caution! The setting is not saved if the power supply fails.

Functional description OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → OPERATION (FREQUENCY)	
VALUE SIMULATION FREQUENCY (4303)	✎ Note! This function is not available unless FREQUENCY was selected in the function OPERATION MODE (4200) and the function SIMULATION FREQUENCY (4302) is active (= ON). Use this function to define a selectable frequency value (e.g. 500 Hz) to be output at the frequency output. This value is used to test downstream devices and the measuring device itself. **User input:** 0...12500 Hz **Factory setting:** 0 Hz ☝ Caution! The setting is not saved if the power supply fails.
SIMULATION PULSE (4322)	✎ Note! This function is not available unless the PULSE option was selected in the OPERATING MODE function. Use this function to activate simulation of the pulse output. **Options:** OFF COUNTDOWN The pulses specified in the VALUE SIMULATION PULSE function are output. CONTINUOUSLY Pulses are continuously output with the pulse width specified in the PULSE WIDTH function. Simulation is started once the CONTINUOUSLY option is confirmed with the E key. ✎ Note! Simulation is started by confirming the CONTINUOUSLY option with the E key. The simulation can be switched off again via the SIMULATION PULSE function. **Factory setting:** OFF ✎ Note! • The notice message #631 “SIM. PULSE” indicates that simulation is active. • The on/off ratio is 1:1 for both types of simulation. • The measuring device continues to measure while simulation is in progress, i.e. the current measured values are output correctly via the other outputs. ☝ Caution! The setting is not saved if the power supply fails.

Functional description OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → OPERATION (FREQUENCY)	
VALUE SIMULATION PULSE (4323)	✎ Note! This function is not available unless the COUNTDOWN option was selected in the SIMULATION PULSE function. Use this function to specify the number of pulses (e.g. 50) which are output during the simulation. This value is used to test downstream devices and the measuring device itself. The pulses are output with the pulse width specified in the PULSE WIDTH function. The on/off ratio is 1:1. Simulation is started once the specified value is confirmed with the E key. The display remains at 0 if the specified pulses have been output. **User input:** 0...10,000 **Factory setting:** 0 ✎ Note! Simulation is started by confirming the simulation value with the E key. The simulation can be switched off again via the SIMULATION PULSE function. ☝ Caution! The setting is not saved if the power supply fails.

Functional description OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → OPERATION (STATUS)	
ACTUAL STATUS (4341)	✎ Note! This function is not available unless the STATUS setting was selected in the function OPERATION MODE (4200). Use this function to check the current status of the status output. **User interface:** NOT CONDUCTIVE CONDUCTIVE
SIMULATION SWITCH POINT (4342)	✎ Note! This function is not available unless the STATUS setting was selected in the function OPERATION MODE (4200). Use this function to activate simulation of the status output. **Options:** OFF ON **Factory setting:** OFF ✎ Note! • The “SIMULATION SWITCH POINT” message indicates that simulation is active. • The measuring device continues to measure while simulation is in progress, i.e. the current measuring values are output correctly via the other outputs. ☝ Caution! The setting is not saved if the power supply fails
VALUE SIMULATION SWITCH POINT (4343)	✎ Note! This function is not available unless STATUS was selected in the function OPERATION MODE (4200) and the function SIMULATION SWITCH POINT (4342) is active (= ON). Use this function to define the switching response of the status output during the simulation. This value is used to test downstream devices and the measuring device itself. **Options:** NOT CONDUCTIVE CONDUCTIVE **Factory setting:** NOT CONDUCTIVE ☝ Caution! The setting is not saved if the power supply fails.

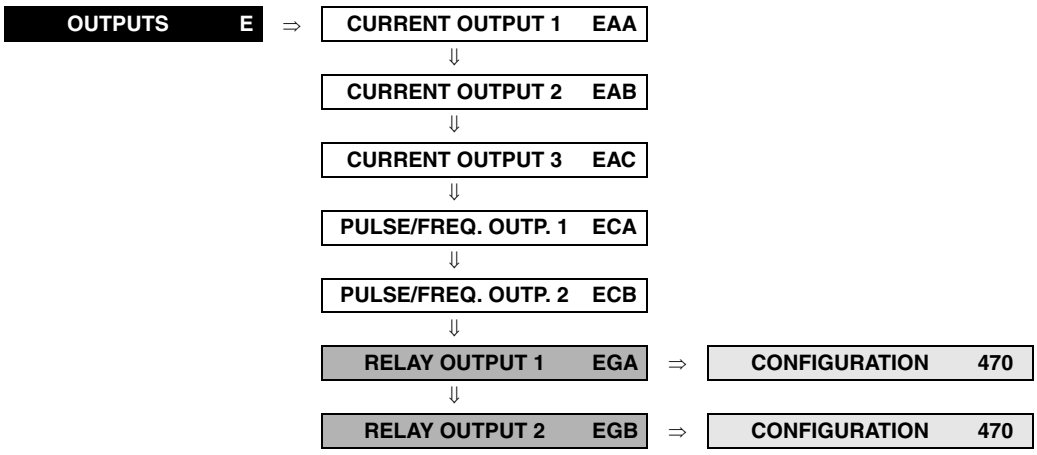
7.2.3 Function group INFORMATION



Functional description OUTPUTS → PULSE/FREQUENCY OUTPUT (1...2) → INFORMATION	
TERMINAL NUMBER (4380)	Use this function to display the numbers of the terminals (in the connection compartment) which are used by the pulse/frequency output.

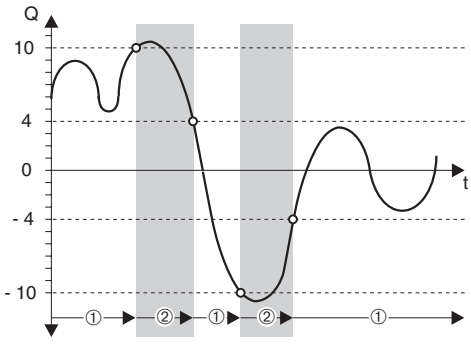
7.3 Group RELAY OUTPUT (1...2)

7.3.1 Function group CONFIGURATION



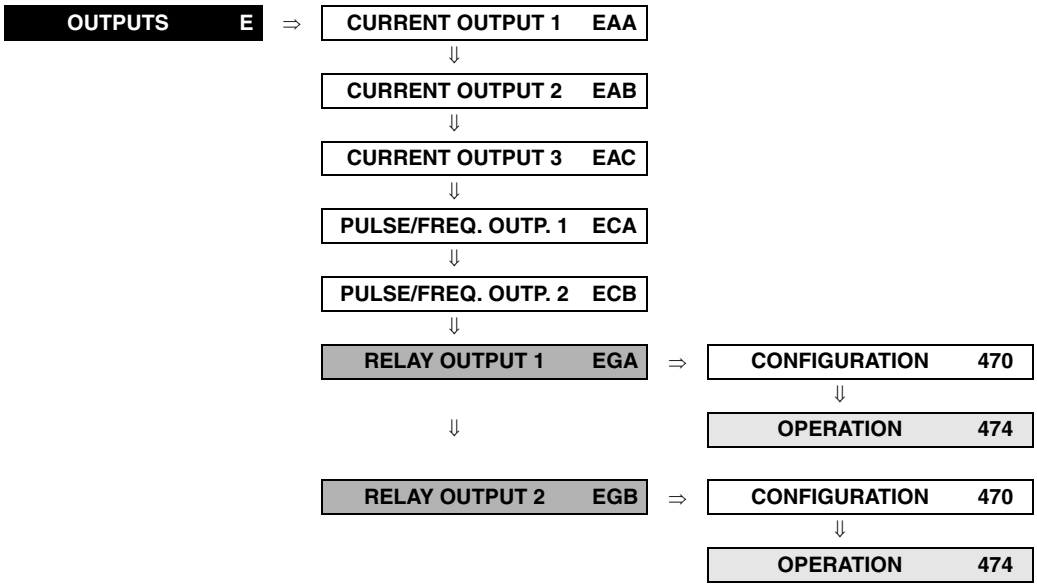
Functional description OUTPUTS ➞ RELAY OUTPUT (1...2) ➞ CONFIGURATION	
ASSIGN RELAY (4700)	Use this function to assign a switching function to the relay output. **Options:** OFF ON (operation) FAULT MESSAGE NOTICE MESSAGE FAULT MESSAGE & NOTICE MESSAGE LIMIT TOTALIZER (1...3) FLOW DIRECTION AVERAGE LIMIT VOLUME FLOW AVERAGE LIMIT SOUND VELOCITY AVERAGE LIMIT AVERAGE FLOW VELOCITY **Factory setting:** FAULT MESSAGE ✎ Note! • It is very important to read and comply with the information on the switching characteristics of the relay output (see page 85). • It is advisable to configure at least one relay output as a fault output and define the outputs' response to error. • The relay output is configured as a normally open (NO or make) contact by default. It can be reconfigured as a normally closed (NC or break) contact by means of a jumper on the relay module, (see *Operating Instructions Prosonic Flow 93 C*, BA 087D/06/en/.). • If you select OFF, the only function shown in the CONFIGURATION function group is this function, ASSIGN RELAY (4700). **Advanced options with optional software package ADVANCED DIAGNOSTICS:** LIMIT SIGNAL STRENGTH (CH1..CH2) DEVIATION VOLUME FLOW AVERAGE DEVIATION FLOW VELOCITY AVERAGE DEVIATION SIGNAL STRENGTH (CH1...CH2) DEVIATION SOUND VELOCITY AVERAGE DEVIATION ACTUAL TRANSIT TIME (CH1...CH2) DEVIATION ACCEPTANCE RATE (CH1...CH2)

Functional description OUTPUTS → RELAY OUTPUT (1...2) → CONFIGURATION	
ON-VALUE **(4701)**	✎ Note! This function is not available unless LIMIT VALUE or FLOW DIRECTION was selected in the function ASSIGN RELAY (4700). Use this function to assign a value to the switch-on point (relay output pulls up). The value can be equal to, greater than or less than the switch-off point. Positive or negative values are permissible, depending on the measured variable in question (e.g. volume flow, totalizer reading). **User input:** 5-digit floating-point number, [unit] **Factory setting:** 0 [unit] ✎ Note! • The appropriate unit is taken from the function UNIT VOLUME FLOW (0402). • Only the switch-on point is available for flow direction output (no switch-off point). If you enter a value not equal to the zero flow (e.g. 5), the difference between the zero flow and the value entered corresponds to half the switching hysteresis.
SWITCH-ON DELAY **(4702)**	✎ Note! This function is not available unless LIMIT VALUE or FLOW DIRECTION was selected in the function ASSIGN RELAY (4700). Use this function to define a delay (0 ... 100 seconds) for pull-up (i.e. signal changes from 0 to 1) of the relay output. The delay starts when the limit value is reached. The relay output does switch when the delay has timed out and the switch condition has been valid throughout the delay time. **User input:** fixed-point number 0.0...100.0 s **Factory setting:** 0.0 s
OFF-VALUE **(4703)**	✎ Note! This function is not available unless LIMIT VALUE was selected in the function ASSIGN RELAY (4700). Use this function to assign a value to the switch-off point (relay drops out). The value can be equal to, greater than or less than the switch-on point. Positive or negative values are permissible, depending on the measured variable in question (e.g. volume flow, totalizer reading). **User input:** 5-digit floating-point number, [unit] **Factory setting:** 0 [unit] ✎ Note! • The appropriate unit is taken from the function UNIT VOLUME FLOW (0402). • If SYMMETRY is the setting selected in the MEASURING MODE function (4705) and values with different signs are entered for the switch-on and switch-off points, an “INPUT RANGE EXCEEDED” message is issued.

Functional description OUTPUTS → RELAY OUTPUT (1...2) → CONFIGURATION	
SWITCH-OFF DELAY (4704)	✎ Note! This function is not available unless LIMIT VALUE was selected in the function ASSIGN RELAY (4700). Use this function to define a delay (0 ... 100 seconds) for drop-out (i.e. signal changes from 1 to 0) of the relay output. The delay starts when the limit value is reached. The relay output does switch when the delay has timed out and the switch condition has been valid throughout the delay time. **User input:** fixed-point number 0.0...100.0 s **Factory setting:** 0.0 s
MEASURING MODE (4705)	✎ Note! This function is not visible unless a limit value was assigned to the relay output. Use this function to define the measuring mode for the relay output. **Options:** STANDARD The relay output signal switches at the defined switch points. SYMMETRY The relay output signal switches at the defined switching points, irrespective of the sign. If you define a switch point with a positive sign, the relay output switches as soon as the value is reached in the negative direction (negative sign), (see illustration). **Factory setting:** STANDARD Example for the SYMMETRY measuring mode: Switch-on point Q = 4 Switch-off point Q = 10 ① = Relay energised ② = Relay de-energised  ✎ Note! • SYMMETRY cannot be selected unless the values in the ON-VALUE (4701) and OFF-VALUE (4703) functions have the same sign or one of the values is zero. • If the signs of the two values differ, SYMMETRY cannot be selected and an “ASSIGNMENT NOT POSSIBLE” message is issued.

Functional description OUTPUTS → RELAY OUTPUT (1...2) → CONFIGURATION	
TIME CONSTANT (4706)	Use this function to enter a time constant defining how the measuring signal reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant). Damping acts on the measuring signal before the switch status changes, and consequently before switch-on or switch-off delay is activated. The purpose of damping, therefore, is to prevent the relay output changing state continuously in response to fluctuations in flow. **User input:** fixed-point number 0.00...100.00 s **Factory setting:** 0.00 s

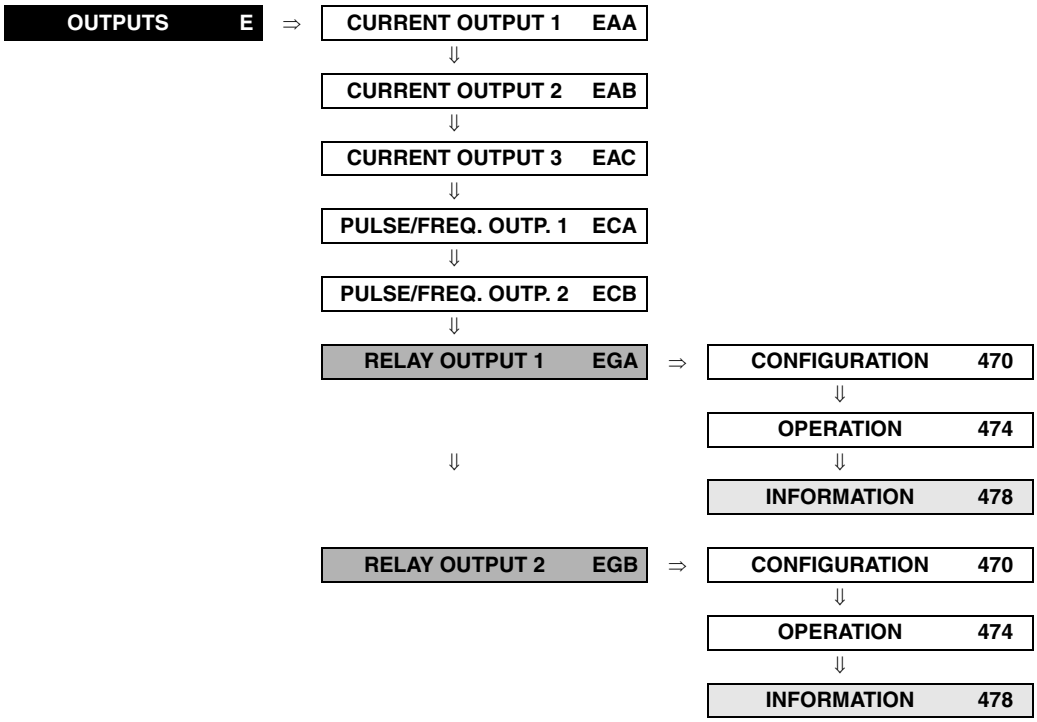
7.3.2 Function group OPERATION



Functional description OUTPUTS → RELAY OUTPUT (1...2) → OPERATION	
ACTUAL STATUS RELAY (4740)	Use this function to check the current status of the relay output. A jumper on the contact side defines the relay output as a normally open (NO or make) or normally closed (NC or break) contact see *Operating Instructions Prosonic Flow 93 C*, BA 087D/06/en/.. **User interface:** BREAK CONTACT OPEN BREAK CONTACT CLOSED MAKE CONTACT OPEN MAKE CONTACT CLOSED
SIMULATION SWITCH POINT (4741)	Use this function to activate simulation of the relay output. **Options:** OFF ON **Factory setting:** OFF ✎ Note! • The “SIMULATION RELAY” message indicates that simulation is active. • The measuring device continues to measure while simulation is in progress, i.e. the current measuring values are output correctly via the other outputs. ☝ Caution! The setting is not saved if the power supply fails.

Functional description OUTPUTS → RELAY OUTPUT (1...2) → OPERATION	
VALUE SIMULATION SWITCH POINT (4742)	✎ Note! The function is not visible unless the function SIMULATION SWITCH POINT (4741) is active (= ON). Use this function to define the status of the relay output during the simulation. This value is used to test downstream devices and the measuring device itself. Depending on the relay configuration (as make or break contact) the following selections are available. **Options:** Relay output configured as normally open (make) contact: MAKE CONTACT OPEN MAKE CONTACT CLOSED Relay output configured as normally closed (break) contact: BREAK CONTACT OPEN BREAK CONTACT ☝ Caution! The setting is not saved if the power supply fails.

7.3.3 Function group INFORMATION

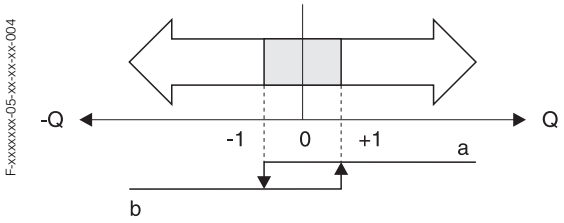


Functional description OUTPUTS → RELAY OUTPUT (1...2) → INFORMATION	
TERMINAL NUMBER (4780)	Use this function to display the numbers of the terminals (in the connection compartment) which are used by the relay output.

7.3.4 Information on the response of the relay output

General
If you have configured the relay output signal for “LIMIT-VALUE” or “FLOW DIRECTION”, you can define the requisite switching points in the ON-VALUE and OFF-VALUE functions. When the measured variable in question reaches one of these predefined values, the relay output switches as shown in the illustrations below.

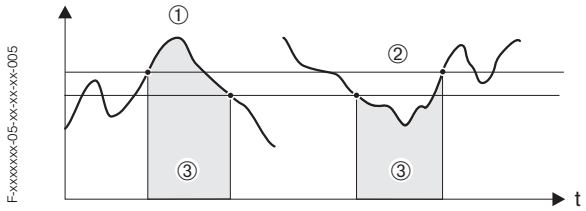
Relay output configured for “flow direction”
The value you entered in the function ON-VALUE defines the switching point for the positive and negative directions of flow.
If, for example, the switch point you define is = 1 m^3/h, the relay drops out at –1 m^3/h and pulls up at +1 m^3/h. Set the switch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



a Relay energized
b Relay de-energized

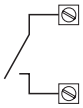
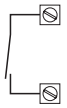
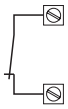
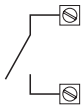
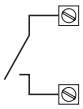
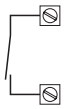
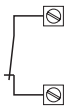
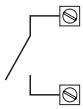
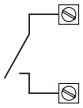
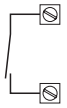
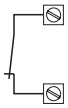
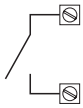
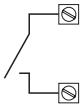
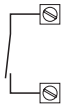
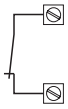
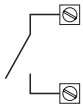
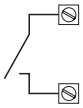
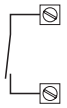
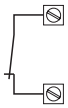
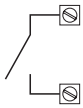
Relay output configured for limit value
The relay output signal switches as soon as the measured variable undershoots or overshoots a defined switch point.
Application: Monitoring flow or process-related boundary conditions.

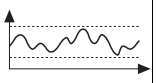
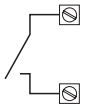
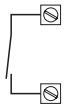
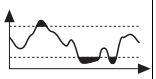
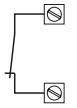
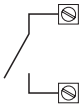
Measured variable



① = ON > SWITCH-OFF POINT (maximum safety)
② = ON > SWITCH-OFF POINT (minimum safety)
③ = Relay de-energised

7.3.5 Switching action of the relay output

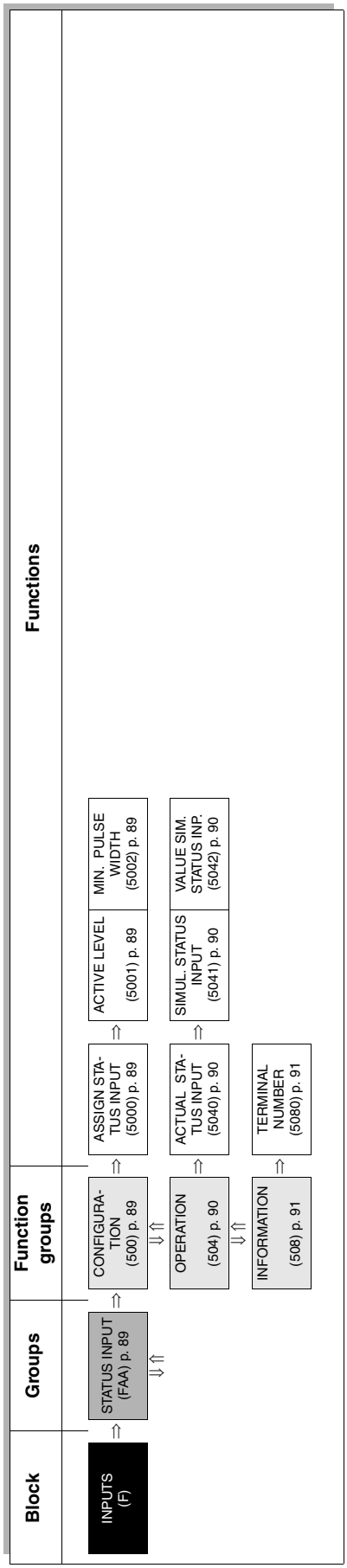
Function	Status	Relais coil	Contact*	
			NC	NO
ON (operation)	System in measuring mode	energized		
	System not in measuring mode (power supply failed)	de-energized		
Fault message	System OK	energized		
	(System or process error) Fault Response to error Outputs /Inputs and totalizers	de-energized		
Notice message	System OK	energized		
	(System or process error) Fault Continuation of measuring	de-energized		
Fault message or notice message	System OK	energized		
	(System or process error) Fault Response to error or NoteContinuation of measuring	de-energized		
Flow direction (CH1, CH2 AVG. SUM DIFFERENCE)	forward 	energized		
	reverse 	de-energized		

Function	Status	Relais coil	Contact*	
			NC	NO
Limit value – Volume flow – Totalizer – Sound velocity – Flow velocity (CH1, CH2 AVG. SUM DIFFERENCE)	Limit value **not** overshot or undershot 	energized		
	Limit value overshot or undershot 	de-energized		

* Terminal numbers in accordance with the TERMINAL NUMBER function (4780) on page 84.

✎ Note!
If the measuring device has two relays, the factory setting is:
- Relay 1 → normally open contact
- Relay 2 → normally closed contact

8 Block INPUTS



8.1 Group STATUS INPUT

8.1.1 Function group CONFIGURATION

INPUTS F ⇒ STATUS INPUT FAA ⇒ CONFIGURATION 500

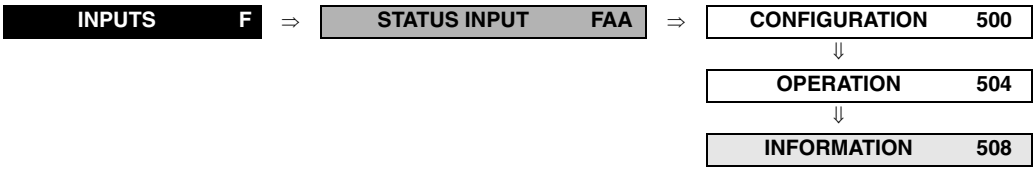
Functional description INPUTS → STATUS INPUT → CONFIGURATION	
ASSIGN STATUS INPUT (5000)	Use this function to assign a switching function to the status input. **Options:** OFF RESET TOTALIZER (1...3) RESET ALL TOTALIZERS POSITIVE ZERO RETURN CH1&CH2 RESET FAULT MESSAGE ZERO ADJUST (CH1...CH2) ACQUISITION (CH1...CH2) ACQUISITION AVG **Factory setting:** OFF Caution! Positive zero return is active as long as the level is available at the status input (continuous signal). All other assignments react to a change in level (pulse) at the status input. You can configure the status input for the record of process and device parameters in the “Advanced Diagnostics” group via the options ACQUISITION CH1, ACQUISITION CH2 and ACQUISITION AVG. With each change of the level state, an additional value for each diagnosis parameter will be recorded. • ACQUISITION CH1: record of process and device parameters for channel 1 • ACQUISITION CH2: record of process and device parameters for channel 2 • AKQUISITION AVG: record of the average process and device parameters of channel 1 and channel 2 Note! The options ACQUISITION CH1, ACQUISITION CH2 and ACQUISITION AVG are not available unless the SINGLE SHOT setting was selected in the ACQUISITION MODE function.
ACTIVE LEVEL (5001)	Use this function to define whether the assigned switch function is released or sustained when the signal level is present (HIGH) or not present (LOW). **Options:** HIGH LOW **Factory setting:** HIGH
MINIMUM PULSE WIDTH (5002)	Use this function to define a minimum pulse width which the input pulse must achieve in order to trigger the selected switching function (see function ASSIGN STATUS INPUT (5000) on page 89). **User input:** 20...100 ms **Factory setting:** 50 ms

8.1.2 Function group OPERATION

INPUTS F ⇒ STATUS INPUT FAA ⇒ CONFIGURATION 500
⇓
OPERATION 504

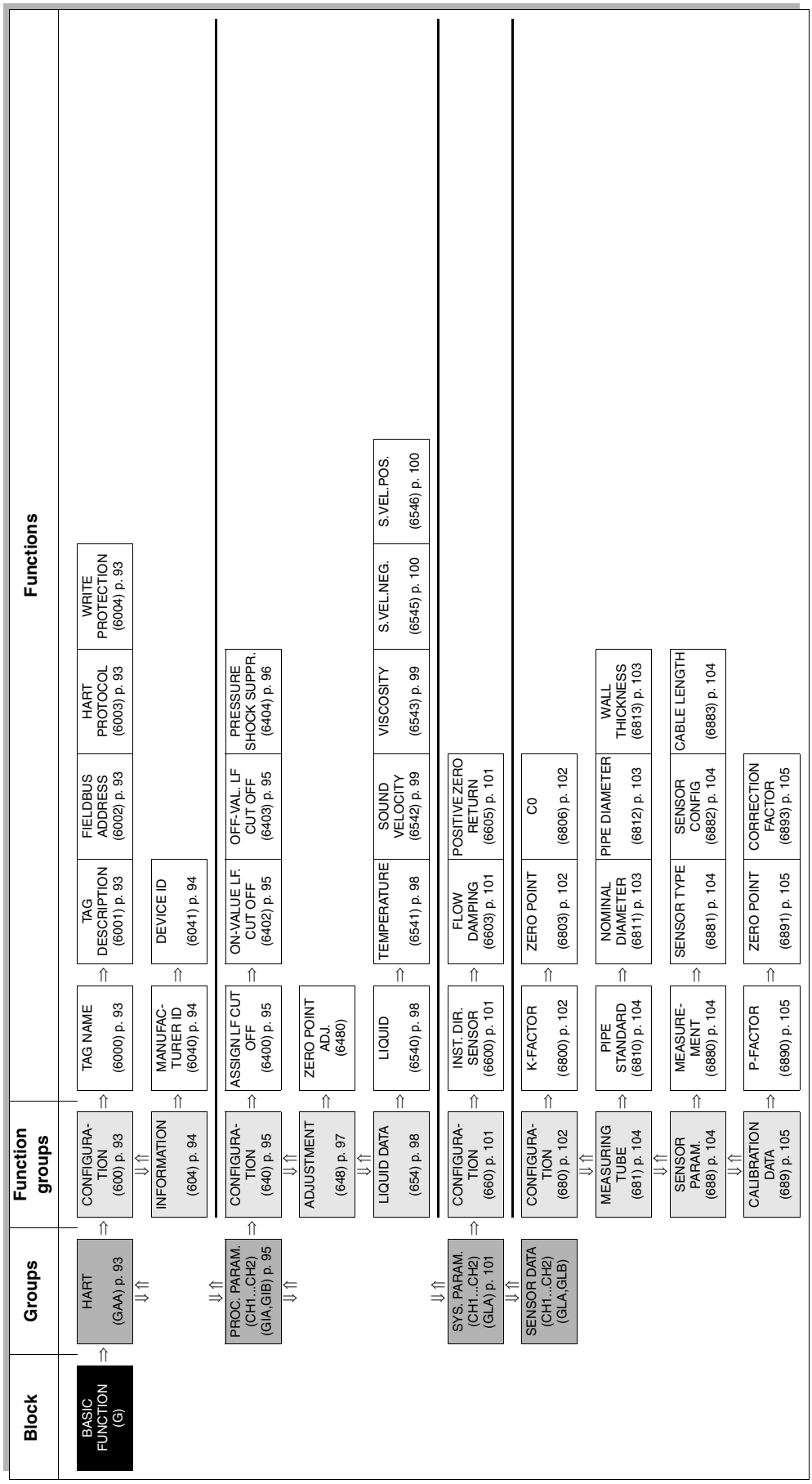
Functional description INPUTS → STATUS INPUT → OPERATION	
ACTUAL STATUS INPUT (5040)	Use this function to view the current level of the status input. **User interface:** HIGH LOW
SIMULATION STATUS INPUT (5041)	Use this function to simulate the status input, i.e. to trigger the function (see function ASSIGN STATUS INPUT (5000) on page 89) assigned to the status input. **Options:** OFF ON **Factory setting:** OFF ✎ Note! • The “SIMULATION STATUS INPUT” message indicates that simulation is active. • The measuring device continues to measure while simulation is in progress, i.e. the current measuring values are output correctly via the other outputs. ☝ Caution! The setting is not saved if the power supply fails.
VALUE SIMULATION STATUS INPUT (5042)	✎ Note! The function is not visible unless the function SIMULATION STATUS INPUT (5041) is active (= ON). Use this function to define the level to be assumed at the status output during the simulation. This value is used to test downstream devices and the measuring device itself. **Options:** HIGH LOW **Factory setting:** LOW ☝ Caution! The setting is not saved if the power supply fails.

8.1.3 Function group INFORMATION



Functional description INPUTS → STATUS INPUT → INFORMATION	
TERMINAL NUMBER (5080)	Use this function to display the numbers of the terminals (in the connection compartment) which are used by the status input.

9 Block BASIC FUNCTION



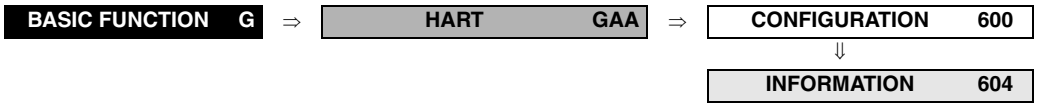
9.1 Group HART

9.1.1 Function group CONFIGURATION

BASIC FUNCTION G ⇒ **HART GAA** ⇒ **CONFIGURATION 600**

Functional description BASIC FUNCTION → HART → CONFIGURATION	
TAG NAME **(6000)**	Use this function to enter a tag name for the measuring device. You can edit and read this tag name at the local display or via the HART protocol. **User input:** max. 8-character text, permitted characters are: A-Z, 0-9, +,-, punctuation marks **Factory setting:** "_ _ _ _ _ _ _ _" (without text)
TAG DESCRIPTION **(6001)**	Use this function to enter a tag description for the measuring device. You can edit and read this tag description at the local display or via the HART protocol. **User input:** max. 16-character text, permitted characters are: A-Z, 0-9, +,-, punctuation marks **Factory setting:** "_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _" (without text)
FIELDBUS ADDRESS **(6002)**	Use this function to define the address for the exchange of data with the HART protocol. **User input:** 0...15 **Factory setting:** 0 ✎ Note! Addresses 1...15: a constant 4 mA current is applied.
HART PROTOCOL **(6003)**	Use this function to display if the HART protocol is active. **User interface:** OFF = HART protocol not active ON = HART protocol active ✎ Note! The HART protocol is activated by selecting 4-20 mA HART or 4-20 mA (25 mA) HART in the function CURRENT SPAN, (see page 47).
WRITE PROTECTION **(6004)**	Use this function to check whether the measuring device can be write-accessed. **User interface:** OFF (Data exchange is possible) ON (Data exchange is disabled) **Factory setting:** OFF ✎ Note! Write protection is activated and deactivated by means of a jumper on the I/O module see *Operating Instructions Prosonic Flow 93 C*, BA 087D/06/en/..

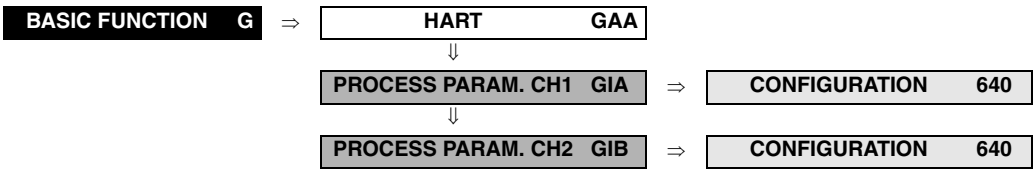
9.1.2 Function group INFORMATION

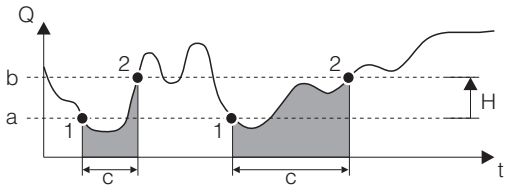


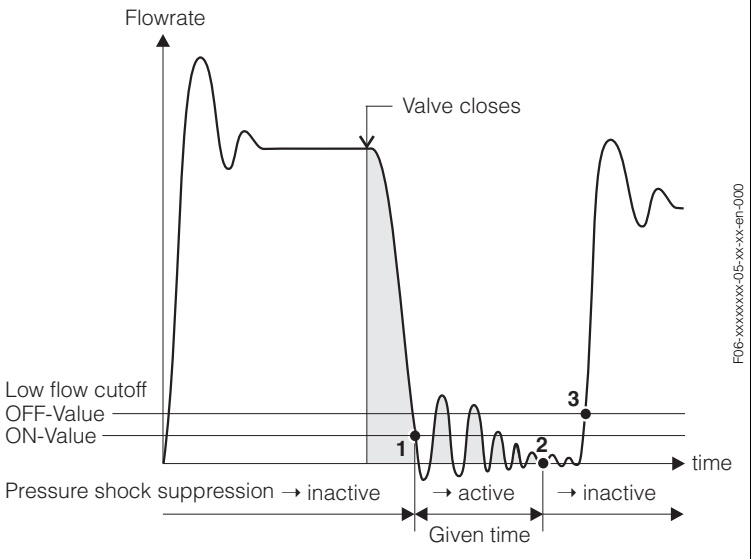
Functional description BASIC FUNCTION → HART → INFORMATION	
MANUFACTURER ID (6040)	Use this function to view the manufacturer number in decimal numerical format. **User interface:** 17 (≙ 11 hex) for Endress+Hauser
DEVICE ID (6041)	Use this function to view the device ID in hexadecimal numerical format. **User interface:** 59 (≙ 89dez) for Prosonic Flow 93 C

9.2 Group PROCESS PARAMETER (CH1...CH2)

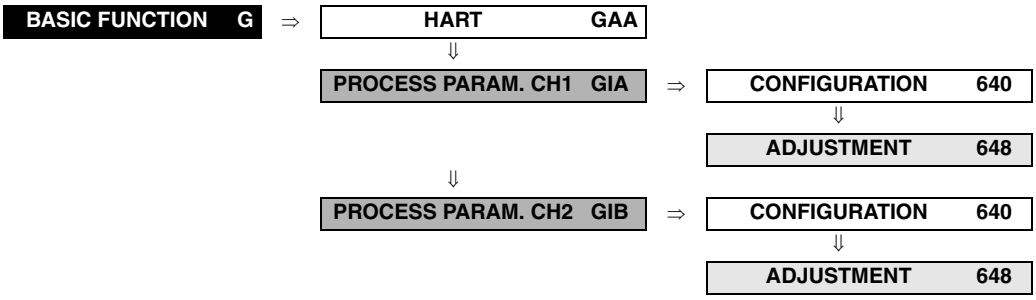
9.2.1 Function group CONFIGURATION



Functional description BASIC FUNCTION → PROCESS PARAMETER (CH1...CH2) → CONFIGURATION	
ASSIGN LOW FLOW CUT OFF (6400)	Use this function to assign the switch point for low flow cut off rate suppression. **Options:** OFF VOLUME FLOW **Factory setting:** VOLUME FLOW
ON-VALUE LOW FLOW CUT OFF (6402)	Use this function to assign a value to the switch-on point for low flow cut off. Low flow cut off is active if the value entered is not equal to 0. The sign of the flow value is highlighted on the display to indicate that low flow cut off is active. **User input:** 5-digit floating-point number **Factory setting:** 0 l/s ✎ Note! The appropriate unit is taken from the function UNIT VOLUME FLOW (0402), (see page 14)
OFF-VALUE LOW FLOW CUT OFF (6403)	Use this function to enter the switch-off (b) point for low flow cut off. Enter the switch-off point as a positive hysteresis (H) from the switch-on point (a). **User input:** Integer 0...100% **Factory setting:** 50% Example:  Q = Flow [volume/time] t = Time a = ON-VALUE LOW FLOW CUT OFF (6402) = 200 dm^3/h b = OFF-VALUE LOW FLOW CUT OFF (6403) = 10% c = Low flow cut off active 1 = Low flow cut off is switched on at 200 dm^3/h 2 = Low flow cut off is switched off at 220 dm^3/h

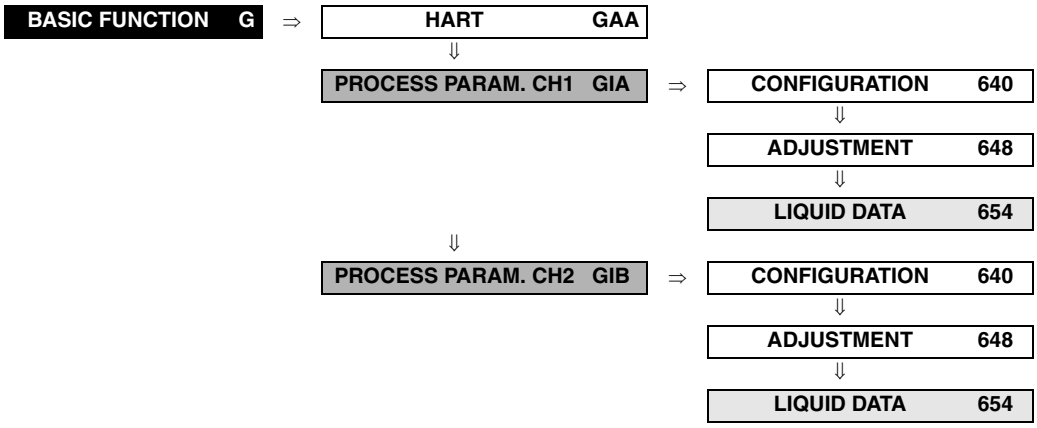
Functional description BASIC FUNCTION → PROCESS PARAMETER (CH1...CH2) → CONFIGURATION	
PRESSURE SHOCK SUPPRESSION (6404)	The closure of a valve can cause brief but severe movements of the fluid in the piping system, movements which the measuring system registers. The pulses totalled in this way result 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! Note that pressure shock suppression cannot be used unless the low flow cut off is active, (see function ON-VALUE LOW FLOW CUT OFF on page 95). 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: • Current output → outputs the current corresponding to zero flow. • Pulse/Freq.-output → outputs the frequency corresponding to zero flow. • Flow reading on display = → 0 • Totalizer reading → the totalizers are pegged at the last correct value. Deactivation of the pressure shock suppression The pressure shock suppression is deactivated after the time interval, set in this function, has passed (see point **2** in graphic). ✎ Note! The actual flow value is displayed and output, when the time interval for the pressure shock suppression has passed and the flow exceeds the switch-off point of the low flow cut off (see point **3** in graphic).  **User input:** max. 4-digit number, incl. unit: 0.00...100.0 s **Factory setting:** 0.00 s

9.2.2 Function group ADJUSTMENT

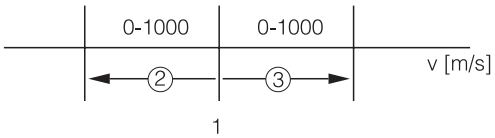


Functional description BASIC FUNCTION → PROCESS PARAMETER (CH1...CH2) → ADJUSTMENT	
ZERO POINT ADJUSTMENT (6480)	This function enables a zero point adjustment to be automatically carried out. The new zero point determined by the measuring system is adopted by the ZERO POINT function (see page 105). **Options:** CANCEL START **Factory setting:** CANCEL Caution! Before this carrying out, please refer to the Operating Instructions *Prosonic Flow 93 C* (BA 087D/06/en/....), for a detailed description of the procedure for zero point adjustment. Note! • A zero point adjustment has to be carried out only if sensors or sensor elements have been replaced. The determined value should not exceed 3 ns. In case of exceedance check if zero flow is existent. E.G. solar radiation can cause a partial warm-up of the pipe. The resulting motion of the liquid is detected as flow signal. • Programming is locked during zero point adjustment The message “ZERO ADJUST RUNNING” appears on the display. • If the zero point adjustment is not possible, e.g. with a flow velocity > 0.1 m/s, or has been canceled, then the alarm message “ZERO ADJUST NOT POSSIBLE” is shown on the display. • If the Prosonic Flow 93 C measuring electronics are fitted with a status input, then the zero point can also be activated by using this input.

9.2.3 Function group LIQUID DATA



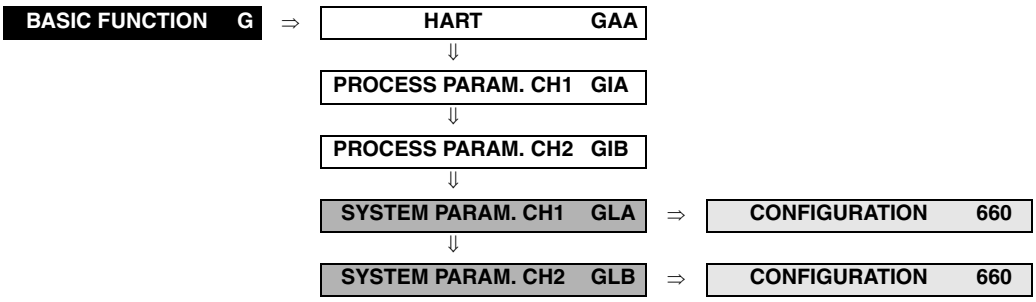
Functional description BASIC FUNCTION → PROCESS PARAMETER (CH1...CH2) → LIQUID DATA	
LIQUID **(6540)**	Use this function to select the liquid in the pipe. ✎ Note! The selection specifies the values for the sound velocity and viscosity. If OTHER is selected, these must be entered via the SOUND VELOCITY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

Functional description BASIC FUNCTION → PROCESS PARAMETER (CH1...CH2) → LIQUID DATA	
SOUND VELOCITY LIQUID (6542)	This function displays the sound velocity of the liquid determined via the values entered in the functions LIQUID (6540) and TEMPERATURE (6541). If you edit the predetermined value the function LIQUID (6540) will be reset to the option OTHERS. If a liquid was not available for selection and the selection OTHER was made in the function LIQUID (6540) the sound velocity must be entered here. **Transmitter search range:** The measuring device searches for the measuring signal within a defined sound velocity range. You specify the search range in the SOUND VELOCITY NEGATIVE (6545) and SOUND VELOCITY POSITIVE (6546) functions. An error message is displayed if the sound velocity of the liquid exceeds the search range. ✎ Note! We recommend you select a smaller search range by unfavourable signal conditions (signal strength < 50%).  1 1 = Sound velocity of the liquid 2 = Lower search range: is specified in the SOUND VELOCITY NEGATIVE (6545) function 3 = Upper search range: is specified in the SOUND VELOCITY POSITIVE (6546) function **User input:** Fixed-point number 400...3000 m/s **Factory setting:** 1485 m/s
VISCOSITY (6543)	This function displays the viscosity of the liquid. This is determined via the values entered in the LIQUID (6540) and TEMPERATURE (6541) functions. If you edit the predetermined value the function LIQUID (6540) will be reset to the option OTHERS. If the liquid is not available for selection in the LIQUID (6540) function and the OTHER option was selected the viscosity must be entered here. **User input:** Fixed-point number 0.0...5000.0 cSt **Factory setting:** 1 mm2/s

Functional description BASIC FUNCTION → PROCESS PARAMETER (CH1...CH2) → LIQUID DATA	
SOUND VELOCITY NEGATIVE (6545)	Use this function to specify the lower search range for the sound velocity of the liquid. **User input:** Fixed-point number 0...1000 m/s **Factory setting:** 500 m/s ✎ Note! Pay particular attention to the information in the SOUND VELOCITY LIQUID (6542) function.
SOUND VELOCITY POSITIVE (6546)	Use this function to specify the upper search range for the sound velocity of the liquid. **User input:** Fixed-point number 0...1000 m/s **Factory setting:** 300 m/s ✎ Note! Pay particular attention to the information in the SOUND VELOCITY LIQUID (6542) function.

9.3 Group SYSTEM PARAMETER (CH1...CH2)

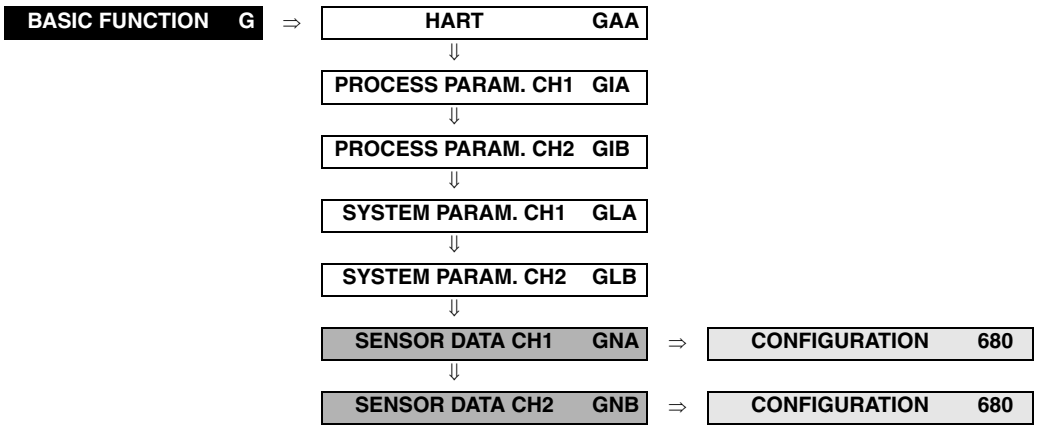
9.3.1 Function group CONFIGURATION



Functional description BASIC FUNCTION → SYSTEM PARAMETER CH1 → CONFIGURATION	
INSTALLATION DIRECTION SENSOR (6600)	Use this function to reverse the sign of the flow quantity, if necessary. **Options:** NORMAL INVERSE **Factory setting:** NORMAL
FLOW DAMPING (6603)	✎ Note! The system damping acts on all functions and outputs of the measuring device. Use this function to set the filter depth of the digital filter. This reduces the sensitivity of the measuring signal to interference peaks (e.g. high solids content, gas bubbles in the fluid, etc.). The system reaction time increases with the filter setting. **User input:** 0 ...15 **Factory setting:** 0
POSITIVE ZERO RETURN (6605)	Use this function to interrupt evaluation of measured variables. This is necessary when a piping system is being cleaned, for example. This setting acts on all function and outputs of the measuring device. **Options:** OFF ON Signal output is set to the “ZERO FLOW” value. **Factory setting:** OFF

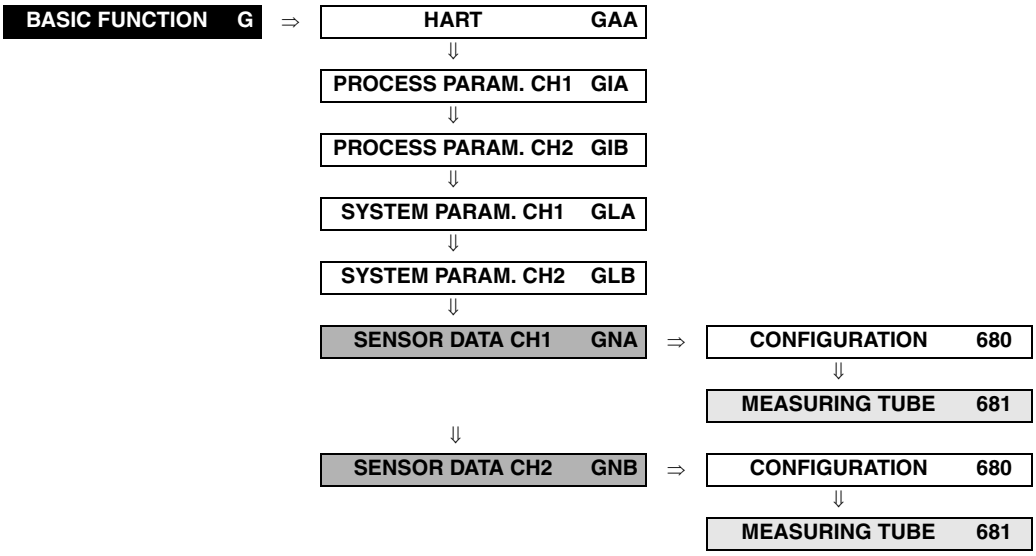
9.4 Group SENSOR DATA (CH1...CH2)

9.4.1 Function group CONFIGURATION



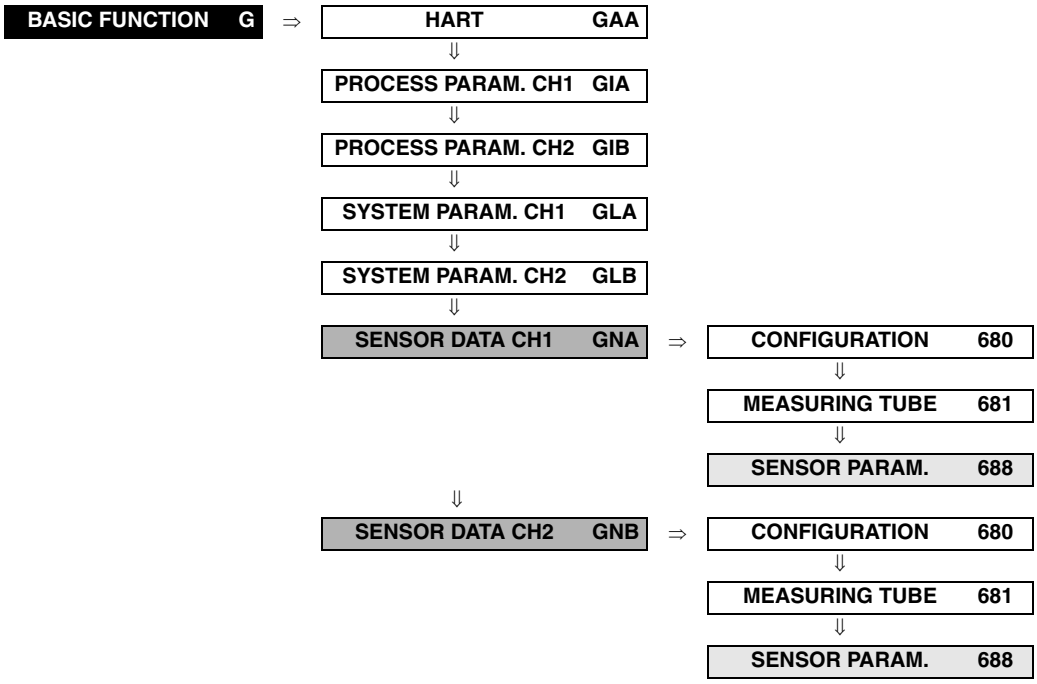
Funktionsbeschreibung BASIC FUNCTION → SENSOR DATA (CH1..CH2) → CONFIGURATION	
K-FACTOR **(6800)**	This function displays the actual calibration factor for the measuring tube and the meausuring sensors. **Display:** 5-digit floating-point-number (including unit) **Factory setting:** Depends on the measuring tube and calibration.
ZERO POINT **(6803)**	This function displays the zero point correction value for the measurring tube and the measuring sensors determined through the calibration. **Display:** max. 5-digit number **Factory setting:** Depends on the measuring tube and calibration
C0 **(6806)**	This function displays the actual corection factor of the sound velocity of the measuring tube and the measuring sensors. **Display:** 5-digit number (including unit) **Factory setting:** 1.0000 (= no correctionr)

9.4.2 Funktionsgruppe MEASURING TUBE



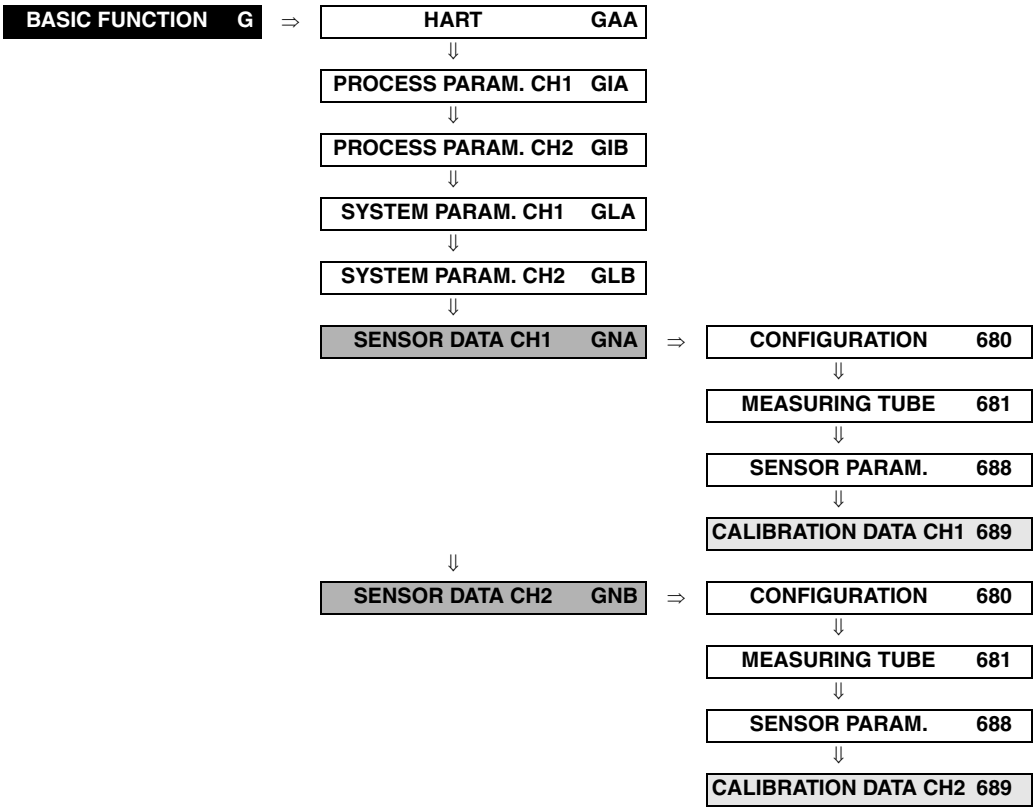
Funktionsbeschreibung BASIC FUNCTION → SENSOR DATA (CH1..CH2) → MEASURING TUBE	
PIPE STANDARD (6810)	This function displays the pipe standard of the measuring tube. **Factory setting:** Depends on the measuring tube
NOMINAL DIAMETER (6811)	This function displays the nominal diameter of the measuring tube. **Factory setting:** Depends on the measuring tube
PIPE DIAMETER (6812)	This function displays the outer diameter of the measuring tube. **Display:** 5-digit floating-point-number (including unit) **Factory setting:** Depends on the measuring tube
WALL THICKNESS (6813)	This function displays the outer diameter of the measuring tube. **Display:** 4-digit floating-point-number (including unit) **Factory setting:** Depends on the measuring tube

9.4.3 Function group SENSOR PARAMETER



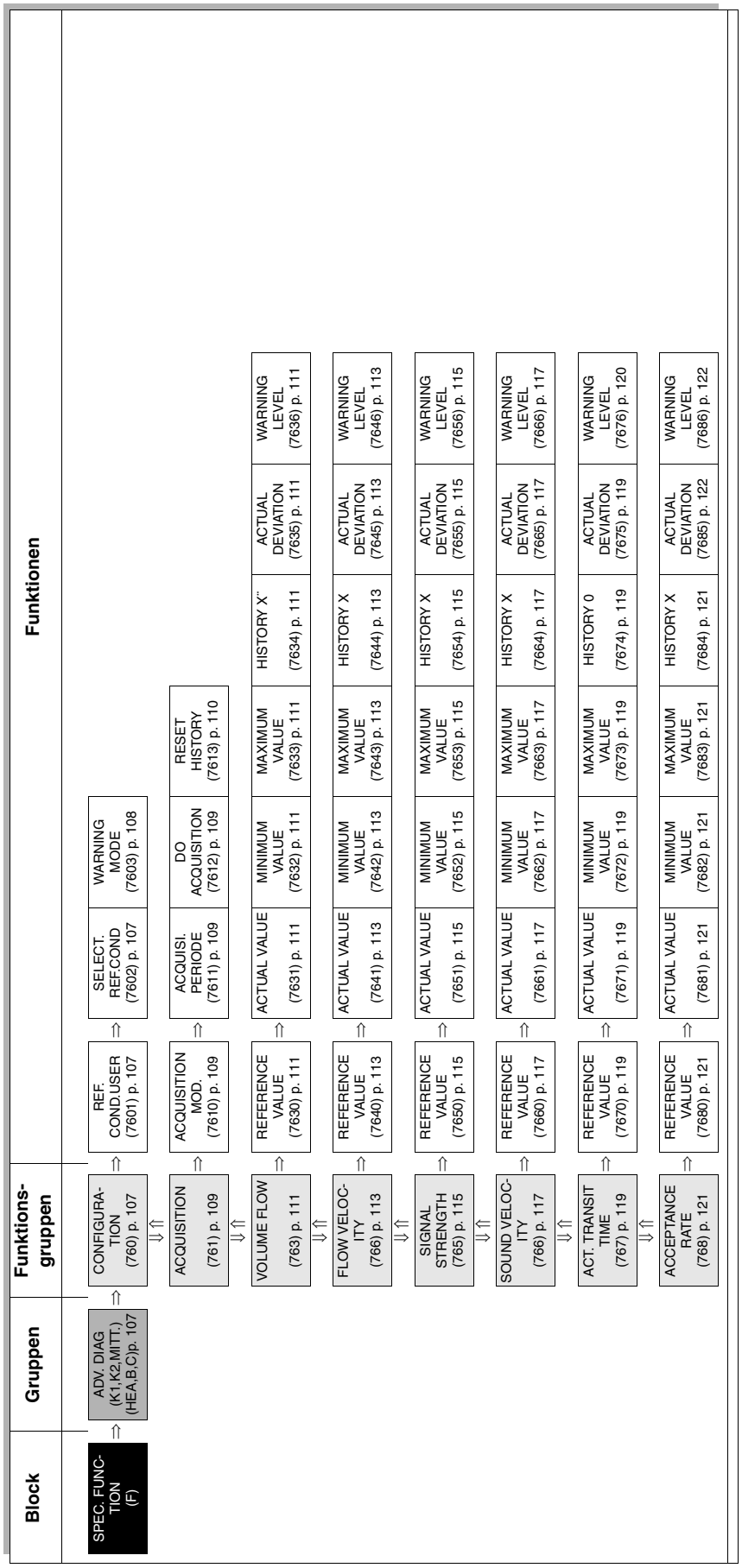
Functional description BASIC FUNCTION → SENSOR DATA (CH1...CH2) → SENSOR PARAMETER	
MEASUREMENT (6880)	**Options:** INLINE **Factory setting:** INLINE
SENSOR TYPE (6881)	✎ Note! For Prosonic Flow 93 C Inline only the option W-IN-1F-L-C is available. **Options:** W-IN-1F-L-C **Factory setting:** W-IN-1F-L-C
SENSOR CONFIGURATION (6882)	Use this function to select the configuration for the ultrasonic sensors. ✎ Note! For Prosonic Flow 93 C Inline only the option DUAL PATH is available. **Options:** DUAL PATH **Factory setting:** DUAL PATH
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

9.4.4 Function group CALIBRATION DATA



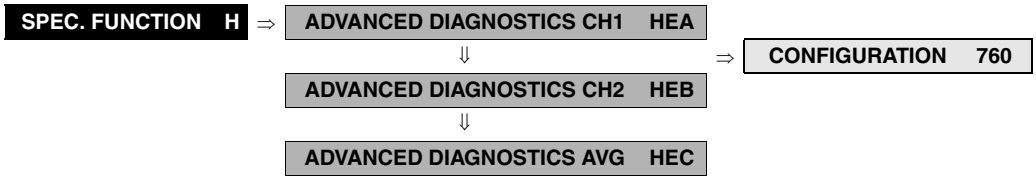
Functional description BASIC FUNCTION → SENSOR DATA (CH1...CH2) → CALIBRATION DATA	
P-FACTOR **(6890)**	This function displays the p-factor. The p-factor indicates the influence of the velocity distribution of the flow profile inside the pipe; it is dependent on the reynolds number. The p-factor varies in the range 0.98...1.02.
ZERO POINT **(6891)**	Use this function to call up or manually change the zero point correction currently being used. **User input:** 5-digit floating-point number, including unit and sign (e.g. +1.0 ns) **Factory setting:** 0.0 ns (no correction)
CORRECTION FACTOR **(6893)**	Use this function to enter a correction factor at the client's site. It is recommended to enter values only between the range 0.5...2. **User input:** 5-digit floating-point number **Factory setting:** 1.0000 (no correction)

10 Block SPECIAL FUNCTION



10.1 Group ADVANCED DIAGNOSTICS (CH1,CH2,AVG)

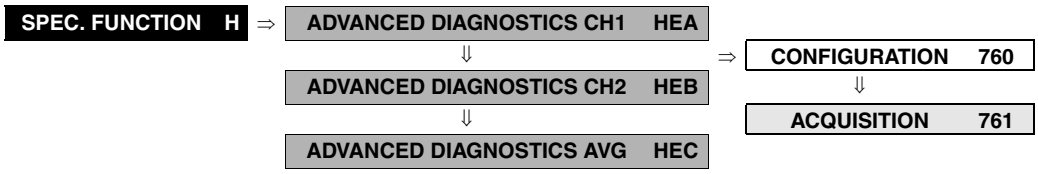
10.1.1 Function group CONFIGURATION



Functional description SPEC. FUNCTION → ADVANCED DIAGNOSTICS (CH1,CH2,AVG) → CONFIGURATION	
In this function group you define the settings for the additional software functionality “Advanced Diagnostics”. The functionality is available for channel 1 (ADVANCED DIAGNOSTICS CH1) and channel 2 (ADVANCED DIAGNOSTICS CH2) as well as for the average values of the parameters volume flow, flow velocity and sound velocity (ADVANCED DIAGNOSTICS AVG). ✎ Note! For further information on the functional concept of the “Advanced Diagnostics” menu please refer to the Operating Instructions *PROline Prosonic Flow 93 C*, BA 087D/06/en/, chapter “Commissioning”	
REFERENCE CONDITION USER (7601)	Use this function to start determining the user reference status. The following values are determined: • VOLUME FLOW • FLOW VELOCITY • SIGNAL STRENGTH • SOUND VELOCITY • ACTUAL TRANSIT TIME • ACCEPTANCE RATE **Option:** CANCEL START **Factory setting:** CANCEL ✎ Note! • The values of the user reference status can each be entered manually. These are entered in the REFERENCE VALUE function in the appropriate function group (→ page 111 ff.) • We recommend to determine the user reference status in the REFERENCE CONDITION USER (7601) function. If entering the reference values manually, you should have good knowledge of the “Advanced Diagnostics” functionality. • If you have entered reference values manually via the REFERENCE VALUE function, these are overwritten if START is selected.
SELECT REFERENCE CONDITION (7602)	Use this function to select the reference status which should be used to compare the advanced diagnostics parameters (see function ACQUISITION MODE (7610) on page 109). **Option:** USER **Factory setting:** USER

Functional description SPEC. FUNCTION → ADVANCED DIAGNOSTICS (CH1,CH2,AVG) → CONFIGURATION	
WARNING MODE (7603)	Use this function to determine whether a warning should be generated when there is a deviation between the reference status (USER, see function SELECT REFERENCE CONDITION (7602)) and the current measuring values. The values of the following functions are compared to the reference status : • ACTUAL VALUE (Volume flow) (7631) • ACTUAL VALUE (Flow velocity) (7641) • ACTUAL VALUE (Signal strength) (7651) • ACTUAL VALUE (Sound velocity) (7661) • ACTUAL VALUE (Actual transit time) (7671) • ACTUAL VALUE (Acceptance rate) (7681) **Option:** OFF ON **Factory setting:** OFF

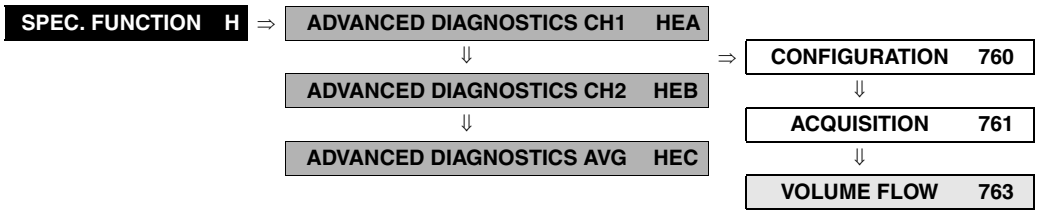
10.1.2 Function group ACQUISITION



Functional description SPEC. FUNCTION → ADVANCED DIAGNOSTICS (CH1,CH2,AVG) → ACQUISITION	
ACQUISITION MODE (7610)	Use this function to specify whether the advanced diagnostics parameters should be determined on a periodical or single-shot basis.. **Option:** OFF PERIODICAL SINGLE SHOT **Factory setting:** OFF ✎ Note! • The option SINGLE SHOT permits the record of process and device parameters either via the DO ACQUISITION (7612) function or via the status input (see function ASSIGN STATUS INPUT (5000) on page 89). • See the Chapter on "Commissioning" in the Operating Instructions *PROline Prosonic Flow 93*, BA 070D/06/en/ for more information on advanced diagnostics.
ACQUISITION PERIODE (7611)	✎ Note! This function is not available unless PERIODICAL was selected in the ACQUISITION MODE function (7610). Use this function to specify the time interval after which the advanced diagnostics parameters should be taken. The time intervall starts with the confirmation of the input. **User input:** 0...99999 s **Factory setting:** 3600 s ✎ Note! A reference status must be defined prior to determining the diagnostics parameters, see function SELECT REFERENCE CONDITION (7602).
DO ACQUISITION (7612)	✎ Note! This function is not available unless SINGLE SHOT was selected in the ACQUISITION MODE (7610) function Use this function to start determining the advanced diagnostics parameters on a single-shot basis. **Option:** START – CANCEL **Factory setting:** CANCEL ✎ Note! A reference status must be defined prior to determining the diagnostics parameters, see function SELECT REFERENCE CONDITION (7602).

Functional description SPEC. FUNCTION → ADVANCED DIAGNOSTICS (CH1,CH2,AVG) → ACQUISITION	
RESET HISTORY (7613)	Use this function to delete all history values. **Option:** NO - YES **Factory setting:** NO

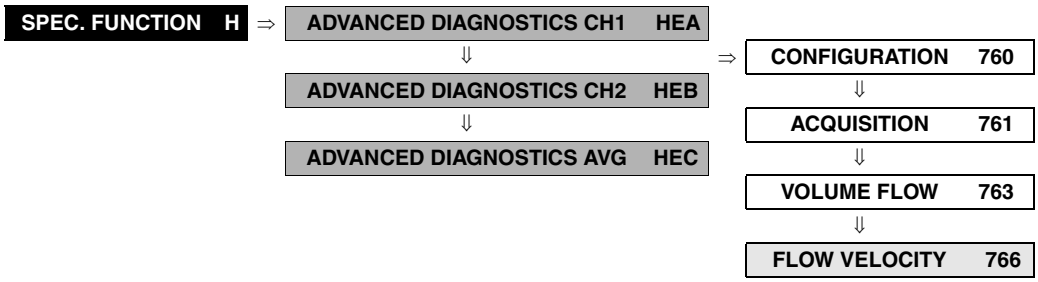
10.1.3 Function group VOLUME FLOW



Functional description SPECIAL FUNCTION → ADVANCED DIAGNOSTICS (CH1,CH2,AVG) → VOLUME FLOW	
The volume flow can be monitored in this function group and compared with a reference value. ✎ Note! The appropriate unit is taken from the function UNIT VOLUME FLOW (0402) (see page 14).	
REFERENCE VALUE (7630)	The reference value for the volume flow appears on the display. **User Interface:** 5-digit floating-point number, including unit and sign ✎ Note! The reference value is taken from the REFERENCE CONDITION USER (7601) function. It can also be entered manually here. The reference value entered is overwritten if you select the START option in the REFERENCE CONDITION USER (7601) function.
ACTUAL VALUE (7631)	The measured volume flow appears on the display **User Interface:** 5-digit floating-point number, including unit and sign
MINIMUM VALUE (7632)	The lowest volume flow value since the saved values were last reset appears on the display. **User Interface:** 5-digit floating-point number, including unit and sign
MAXIMUM VALUE (7633)	The lowest volume flow value since the saved values were last reset appears on the display **User Interface:** 5-digit floating-point number, including unit and sign
HISTORY X (7634)	Three of the last ten stored volume flow values appear on the display. Please use the ☟-keys to scroll through the list. 'X' indicates the position. E.g. HISTORY 0 shows the latest value at the first position in the display. To reset the list use the function RESET HISTORY (7613). **User Interface:** 5-digit floating-point number, including unit and sign
ACTUAL DEVIATION (7635)	This function displays deviation between the measured volume flow and the reference values (USER), see page 107, selected in the function SELECT REFERENCE CONDITION (7602). **User Interface:** 5-digit floating-point number, including unit and sign

Functional description SPECIAL FUNCTION → ADVANCED DIAGNOSTICS (CH1,CH2,AVG) → VOLUME FLOW	
WARNING LEVEL (7636)	✎ Note! This function is not available unless ON was selected in the WARNING MODE (7603) function. Use this function to specify a limit value for the volume flow. A notice message is generated if the limit value is exceeded.. **User input:** 0...99999 % **Factory setting:** 100 %

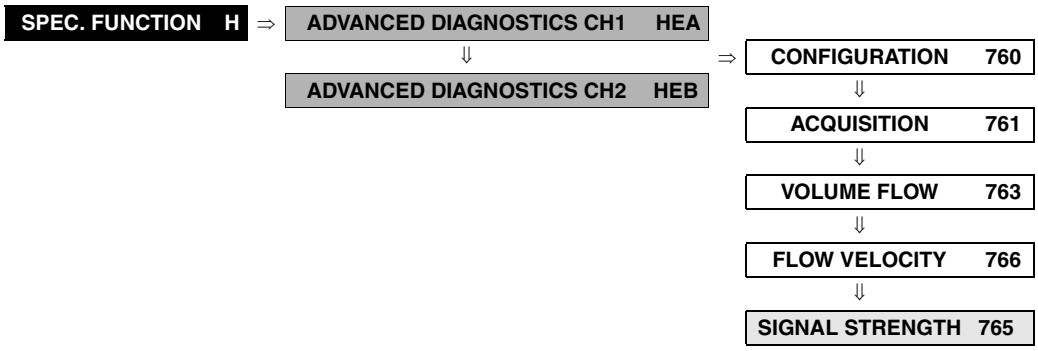
10.1.4 Function group FLOW VELOCITY



Functional description SPEC. FUNCTION → ADVANCED DIAGNOSTICS (CH1,CH2,AVG) → FLOW VELOCITY	
The flow velocity can be monitored in this function group and compared with a reference value. ✎ Note! The appropriate unit is taken from the function UNIT VELOCITY (0425) (see page 16).	
REFERENCE VALUE (7640)	The reference value for the flow velocity appears on the display. **User Interface:** 5-digit floating-point number, including unit and sign ✎ Note! The reference value is taken from the REFERENCE CONDITION USER (7601) function. It can also be entered manually here. The reference value entered is overwritten if you select the START option in the REFERENCE CONDITION USER (7601) function.
ACTUAL VALUE (7641)	The measured flow velocity appears on the display **User Interface:** 5-digit floating-point number, including unit and sign
MINIMUM VALUE (7642)	The lowest flow velocity value since the saved values were last reset appears on the display. **User Interface:** 5-digit floating-point number, including unit and sign
MAXIMUM VALUE (7643)	The lowest flow velocity value since the saved values were last reset appears on the display **User Interface:** 5-digit floating-point number, including unit and sign
HISTORY X (7644)	Three of the last ten stored flow velocity values appear on the display. Please use the ⊟-keys to scroll through the list. 'X' indicates the position. E.g. HISTORY 0 shows the latest value at the first position in the display. To reset the list use the function RESET HISTORY (7613). **User Interface:** 5-digit floating-point number, including unit and sign
ACTUAL DEVIATION (7645)	This function displays deviation between the measured flow velocity and the reference values (USER), see page 107, selected in the function SELECT REFERENCE CONDITION (7602). **User Interface:** 5-digit floating-point number, including unit and sign

Functional description SPEC. FUNCTION → ADVANCED DIAGNOSTICS (CH1,CH2,AVG) → FLOW VELOCITY	
WARNING LEVEL (7646)	✎ Note! This function is not available unless ON was selected in the WARNING MODE (7603) function. Use this function to specify a limit value for the volume flow. A notice message is generated if the limit value is exceeded.. **User input:** 0...99999 % **Factory setting:** 100 %

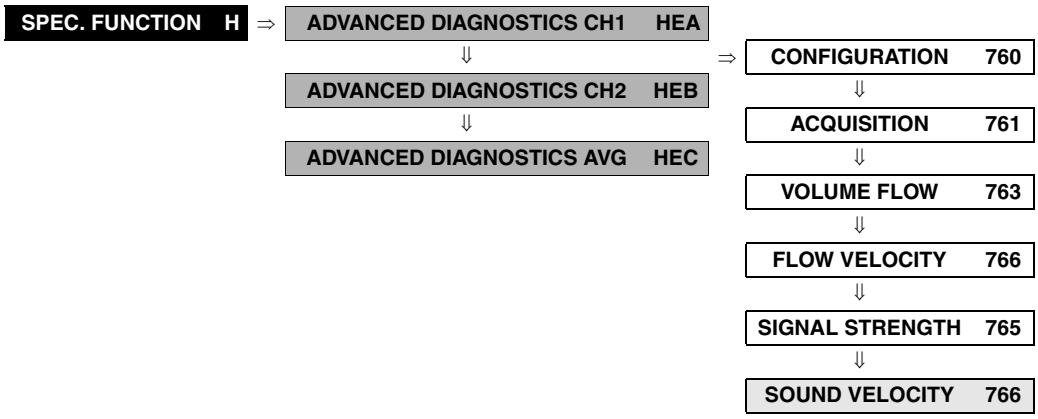
10.1.5 Function group SIGNAL STRENGTH



Functional description SPEC. FUNCTION → ADVANCED DIAGNOSTICS (CH1,CH2,AVG) → SIGNAL STRENGTH	
The signal strength can be monitored in this function group and compared with a reference value.	
REFERENCE VALUE (7650)	The reference value for the signal strength appears on the display. **User Interface:** 5-digit floating-point number ✎ Note! The reference value is taken from the REFERENCE CONDITION USER (7601) function. It can also be entered manually here. The reference value entered is overwritten if you select the START option in the REFERENCE CONDITION USER (7601) function.
ACTUAL VALUE (7651)	The measured signal strength appears on the display **User Interface:** 5-digit floating-point number
MINIMUM VALUE (7652)	The lowest signal strength value since the saved values were last reset appears on the display. **User Interface:** 5-digit floating-point number
MAXIMUM VALUE (7653)	The lowest signal strength value since the saved values were last reset appears on the display **User Interface:** 5-digit floating-point number
HISTORY X (7654)	Three of the last ten stored signal strength values appear on the display. Please use the ⍈-keys to scroll through the list. 'X' indicates the position. E.g. HISTORY 0 shows the latest value at the first position in the display. To reset the list use the function RESET HISTORY (7613). **User Interface:** 5-digit floating-point number
ACTUAL DEVIATION (7655)	This function displays deviation between the measured signal strength and the reference values (USER), see page 107, selected in the function SELECT REFERENCE CONDITION (7602). **User Interface:** 5-digit floating-point number, including unit and sign

Functional description SPEC. FUNCTION → ADVANCED DIAGNOSTICS (CH1,CH2,AVG) → SIGNAL STRENGTH	
WARNING LEVEL (7656)	✎ Note! This function is not available unless ON was selected in the WARNING MODE (7603) function. Use this function to specify a limit value for the volume flow. A notice message is generated if the limit value is exceeded.. **User input:** 0...99999 % **Factory setting:** 100 %

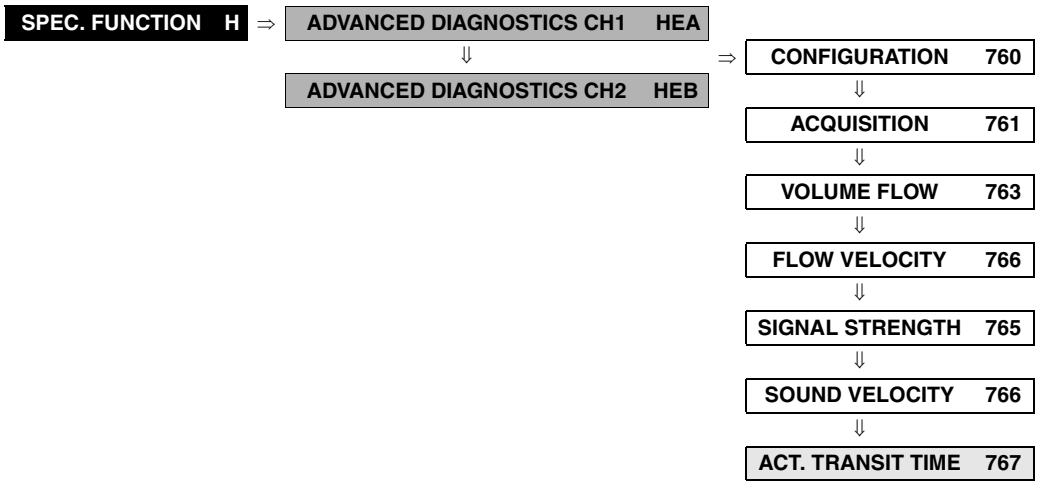
10.1.6 Function group SOUND VELOCITY



Functional description SPEC. FUNCTION → ADVANCED DIAGNOSTICS (CH1,CH2,AVG) → SOUND VELOCITY	
The sound velocity can be monitored in this function group and compared with a reference value. ✎ Note! The appropriate unit is taken from the function UNIT VELOCITY (0425) (see page 16).	
REFERENCE VALUE (7660)	The reference value for the sound velocity appears on the display. **User Interface:** 5-digit floating-point number, including unit ✎ Note! The reference value is taken from the REFERENCE CONDITION USER (7601) function. It can also be entered manually here. The reference value entered is overwritten if you select the START option in the REFERENCE CONDITION USER (7601) function.
ACTUAL VALUE (7661)	The measured sound velocity appears on the display **User Interface:** 5-digit floating-point number, including unit
MINIMUM VALUE (7662)	The lowest sound velocity value since the saved values were last reset appears on the display. **User Interface:** 5-digit floating-point number, including unit
MAXIMUM VALUE (7663)	The lowest sound velocity value since the saved values were last reset appears on the display **User Interface:** 5-digit floating-point number, including unit
HISTORY X (7664)	Three of the last ten stored sound velocity values appear on the display. Please use the ⊡-keys to scroll through the list. 'X' indicates the position. E.g. HISTORY 0 shows the latest value at the first position in the display. To reset the list use the function RESET HISTORY (7613). **User Interface:** 5-digit floating-point number, including unit
ACTUAL DEVIATION (7665)	This function displays deviation between the measured sound velocity and the reference values (USER), see page 107, selected in the function SELECT REFERENCE CONDITION (7602). **User Interface:** 5-digit floating-point number, including unit

Functional description SPEC. FUNCTION → ADVANCED DIAGNOSTICS (CH1,CH2,AVG) → SOUND VELOCITY	
WARNING LEVEL (7666)	✎ Note! This function is not available unless ON was selected in the WARNING MODE (7603) function. Use this function to specify a limit value for the volume flow. A notice message is generated if the limit value is exceeded.. **User input:** 0...99999 % **Factory setting:** 100 %

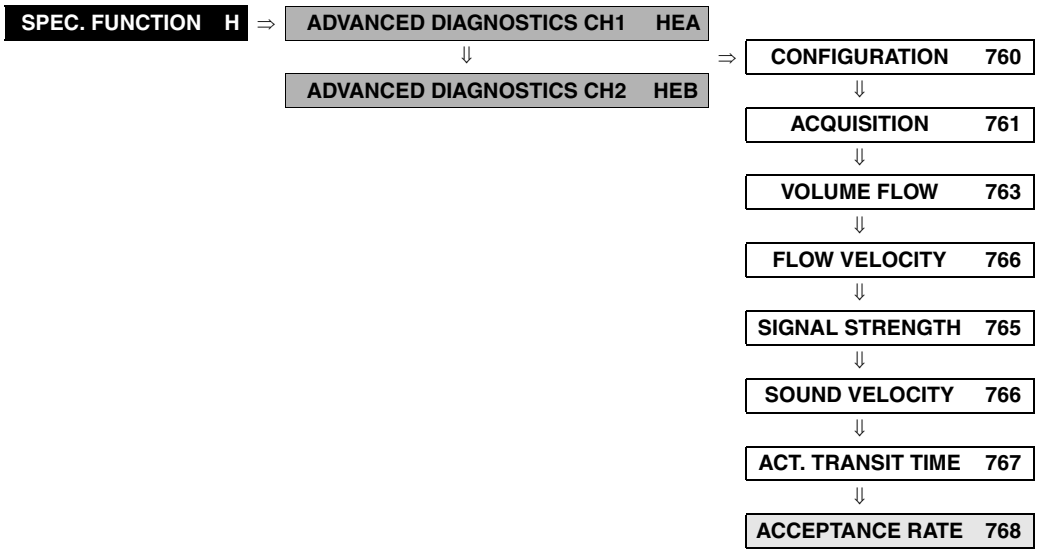
10.1.7 Function group ACTUAL TRANSIT TIME



Functional description SPEC. FUNCTION → ADVANCED DIAGNOSTICS CH1 → ACTUAL TRANSIT TIME	
The actual transit time can be monitored in this function group and compared with a reference value.	
REFERENCE VALUE (7670)	The reference value for the actual transition time appears on the display. **User Interface:** 5-digit floating-point number, including unit ✎ Note! The reference value is taken from the REFERENCE CONDITION USER (7601) function. It can also be entered manually here. The reference value entered is overwritten if you select the START option in the REFERENCE CONDITION USER (7601) function.
ACTUAL VALUE (7671)	The measured actual transition time appears on the display **User Interface:** 5-digit floating-point number, including unit
MINIMUM VALUE (7672)	The lowest actual transition time value since the saved values were last reset appears on the display. **User Interface:** 5-digit floating-point number, including
MAXIMUM VALUE (7673)	The lowest actual transition time value since the saved values were last reset appears on the display **User Interface:** 5-digit floating-point number, including
HISTORY X (7674)	Three of the last ten stored actual transition time values appear on the display. Please use the ⊡-keys to scroll through the list. 'X' indicates the position. E.g. HISTORY 0 shows the latest value at the first position in the display. To reset the list use the function RESET HISTORY (7613). **User Interface:** 5-digit floating-point number, including unit
ACTUAL DEVIATION (7675)	This function displays deviation between the measured actual transition time and the reference values (USER), see page 107, selected in the function SELECT REFERENCE CONDITION (7602). **User Interface:** 5-digit floating-point number, including unit and sign

Functional description SPEC. FUNCTION → ADVANCED DIAGNOSTICS CH1 → ACTUAL TRANSIT TIME	
WARNING LEVEL (7676)	✎ Note! This function is not available unless ON was selected in the WARNING MODE (7603) function. Use this function to specify a limit value for the volume flow. A notice message is generated if the limit value is exceeded.. **User input:** 0...99999 % **Factory setting:** 100 %

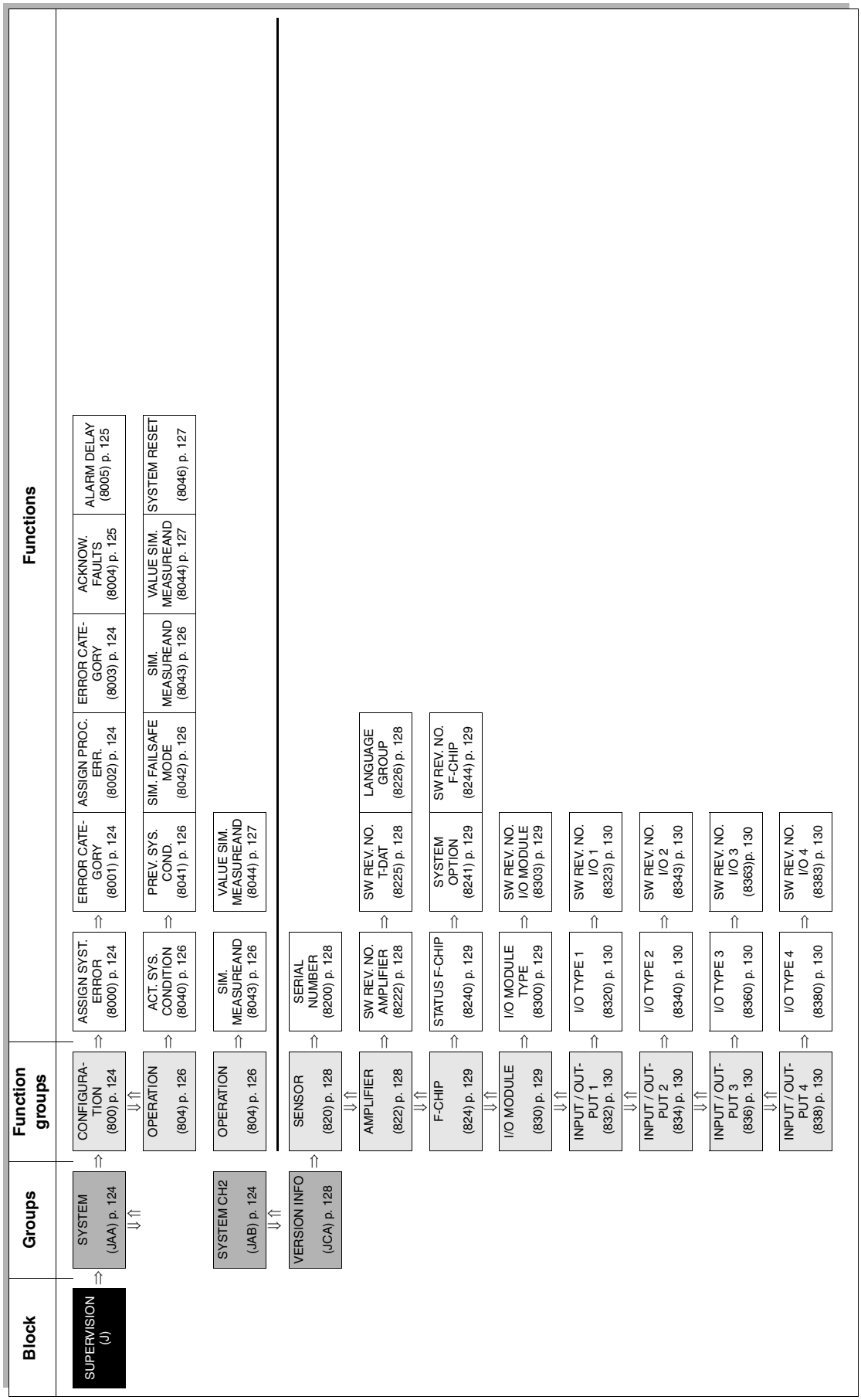
10.1.8 Function group ACCEPTANCE RATE



Functional description SPEC. FUNCTION → ADVANCED DIAGNOSTICS CH1 → ACCEPTANCE RATE	
The acceptance rate can be monitored in this function group and compared with a reference value. The acceptance rate indicates the proportion of measurements which are used in flow calculation.	
REFERENCE VALUE (7680)	The reference value for the acceptance rate appears on the display. **User Interface:** 5-digit floating-point number ✎ Note! The reference value is taken from the REFERENCE CONDITION USER (7601) function. It can also be entered manually here. The reference value entered is overwritten if you select the START option in the REFERENCE CONDITION USER (7601) function.
ACTUAL VALUE (7681)	The measured acceptance rate appears on the display **User Interface:** 5-digit floating-point number
MINIMUM VALUE (7682)	The lowest acceptance rate value since the saved values were last reset appears on the display. **User Interface:** 5-digit floating-point number
MAXIMUM VALUE (7683)	The lowest acceptance rate value since the saved values were last reset appears on the display **User Interface:** 5-digit floating-point number
HISTORY X (7684)	Three of the last ten stored acceptance rate values appear on the display. Please use the ⊡-keys to scroll through the list. 'X' indicates the position. HISTORY 0 shows the latest value at the first position in the display. To reset the list use the function RESET HISTORY (7613). **User Interface:** 5-digit floating-point number

Functional description SPEC. FUNCTION → ADVANCED DIAGNOSTICS CH1 → ACCEPTANCE RATE	
ACTUAL DEVIATION (7685)	This function displays deviation between the measured acceptance rate and the reference values (USER), see page 107, selected in the function SELECT REFERENCE CONDITION (7602). **User Interface:** 5-digit floating-point number, including unit and sign
WARNING LEVEL (7686)	✎ Note! This function is not available unless ON was selected in the WARNING MODE (7603) function. Use this function to specify a limit value for the volume flow. A notice message is generated if the limit value is exceeded.. **User input:** 0...99999 % **Factory setting:** 100 %

11 Block SUPERVISION



11.1 Group SYSTEM (SYSTEM CH2)

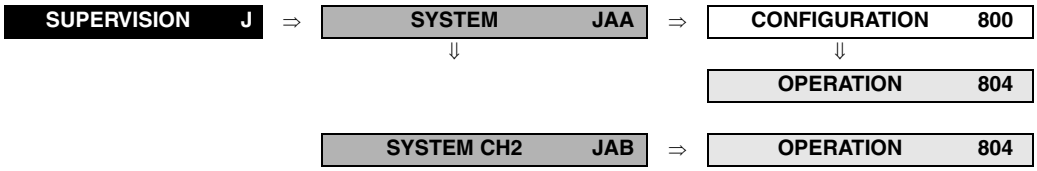
11.1.1 Function group CONFIGURATION

SUPERVISION J ⇒ **SYSTEM JAA** ⇒ **CONFIGURATION 800**

Functional description SUPERVISION → SYSTEM → CONFIGURATION	
ASSIGN SYSTEM ERROR (8000)	Use this function to view all system errors and the associated error categories (fault message or notice message). If you select a single system error you can change its error category. **User interface:** CANCEL List of system errors with an icon preceding each entry. ✎ Note! • Press the E key twice to call up the function ERROR CATEGORY (8001). • Use the ⊡+⊡ key combination or select “CANCEL” in the system error list to exit the function. • A list of possible system errors is provided in the Operating Instructions *PROline Prosonic Flow 93 C*, BA 087D/06/en/
ERROR CATEGORY (8001)	Use this function to define whether a system error triggers a notice message or a fault message. If you select “FAULT MESSAGES”, all outputs respond to an error in accordance with their defined error response patterns. **Options:** NOTICE MESSAGES (display only) FAULT MESSAGES (outputs and display) ✎ Note! Press the E key twice to call up the function ASSIGN SYSTEM ERROR (8000).
ASSIGN PROCESS ERROR (8002)	Use this function to view all process errors and the associated error categories (fault message or notice message). If you select a single process error you can change its error category. **User interface:** CANCEL List of process errors with an icon preceding each entry. ✎ Note! • Press the E key twice to call up the function ERROR CATEGORY (8003). • Use the ⊡+⊡ key combination or select “CANCEL” in the process error list to exit the function. • A list of possible process errors is provided in theOperating Instructions *PROline Prosonic Flow 93 C*, BA 087D/06/en/
ERROR CATEGORY (8003)	Use this function to define whether a process error triggers a notice message or a fault message. If you select “FAULT MESSAGES”, all outputs respond to an error in accordance with their defined error response patterns. **Options:** NOTICE MESSAGES (display only) FAULT MESSAGES (outputs and display) ✎ Note! Press the E key twice to call up the function ASSIGN PROCESS ERROR (8002).

Functional description SUPERVISION → SYSTEM → CONFIGURATION	
ACKNOWLEDGE FAULTS (8004)	Use this function to define the measuring device's response to fault messages. **Options:** OFF The measuring device resumes normal operation when the fault is rectified. The fault message disappears automatically. ON The measuring device resumes normal operation when the fault is rectified. The fault message has to be acknowledged by pressing the E key on the local display. **Factory setting:** OFF
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 error, this suppression acts on: • Display • Relay output • Current output • Frequency output **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-order controller (process controller, etc.). It is therefore imperative to check in advance in order to make sure whether a delay of this nature could affect the safety requirements of the process. If error and notice messages cannot be suppressed, a value of 0 seconds must be entered here.

11.1.2 Function group OPERATION

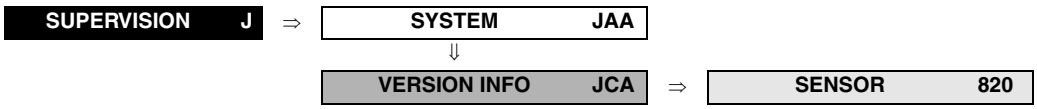


Functional description SUPERVISION → [CH2] SYSTEM → OPERATION	
ACTUAL SYSTEM CONDITION (8040)	Use this function to check the present system condition. **User interface:** "SYSTEM OK" or the fault / notice message with the highest priority.
PREVIOUS SYSTEM CONDITIONS (8041)	Use this function to view the fifteen most recent error and notice messages since measuring last started. **User interface:** The last 15 fault/notice messages appear on the display.
SIMULATION FAILSAFE MODE (8042)	Use this function to set all inputs, outputs and 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
SIMULATION MEASURAND (8043)	Use this function to set all inputs, outputs and totalizers to their defined flow-response modes, in order to check whether they respond correctly. During this time, the words "SIMULATION MEASURAND" appear on the display. **Options:** OFF VOLUME FLOW (CH1...CH2) SOUND VELOCITY (CH1...CH2) SIGNAL STRENGTH (CH1...CH2) ✎ Note! The option SIGNAL STRENGTH (CH1...CH2) is only available with the optional software package ADVANCED DIAGNOSTICS. **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.

Functional description SUPERVISION → [CH2] SYSTEM → OPERATION	
VALUE SIMULATION MEASURAND (8044)	✎ Note! The function is not visible unless the function SIMULATION MEASURAND (8043) is active. Use this function to specify a selectable value (e.g. 12 m^3/s). This is used to test the associated functions in the device itself and downstream signal loops. **User input:** 5-digit floating-point number, [unit] **Factory setting:** 0 [unit] ☝ Caution! • The setting is not saved if the power supply fails. • The appropriate unit is taken from the function group SYSTEM UNITS (ACA), (see page 14).
SYSTEM RESET (8046)	Use this function to perform a reset of the measuring system. **Options:** NO RESTART SYSTEM (restart without interrupting power supply) MEASURING TUBE DATA (restorage of the original calibration data) ✎ Note! To restore the original calibration data with the option MEASURING TUBE DATA the T-DAT has to be available. If the T-DAT is not available a fault message K-CAL T-DAT (#043) is generated. For further information please refer to the Operating Instructions *PROline Prosonic Flow 93 C*, BA 087D/06/en/ **Factory setting:** MEASURING TUBE DATA
OPERATION HOURS (8048)	The hours of operation of the device appear on the display. **Display:** Depends on the number of hours of operation elapsed: Hours of operation < 10 hours → display format = 00:00:00 (hr:min:sec) Hours of operation 10...10,000 hours → display format = 0000:00 (hr:min) Hours of operation > 10,000 hours → display format = 000000 (hr)

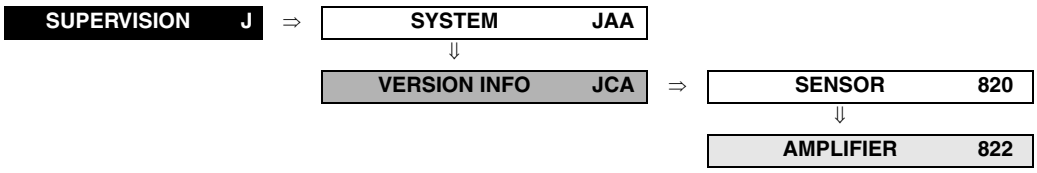
11.2 Group VERSION INFO

11.2.1 Function group SENSOR



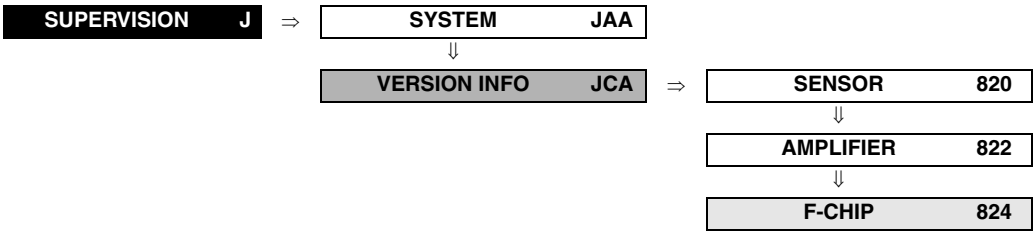
Functional description SUPERVISION → VERSION INFO → SENSOR	
SERIAL NUMBER (8200)	Use this function to view the serial number of the sensor.

11.2.2 Function group AMPLIFIER



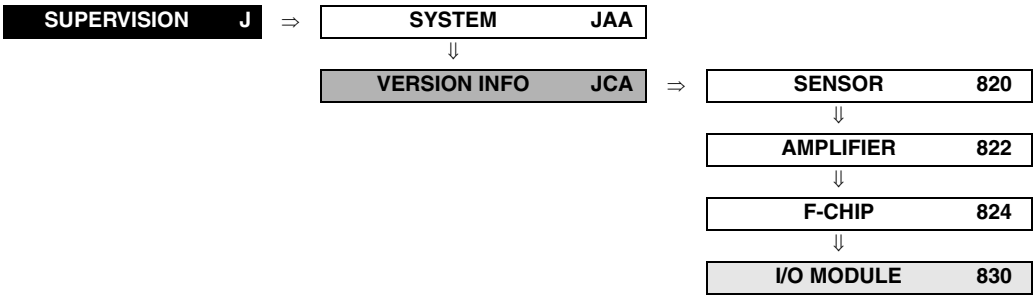
Functional description SUPERVISION → VERSION INFO → AMPLIFIER	
SOFTWARE REVISION NUMBER AMPLIFIER (8222)	Use this function to view the software revision number of the amplifier.
SOFTWARE REVISION NUMBER T-DAT (8225)	Use this function to view the software revision number of the software used to create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

11.2.3 Function group F-CHIP



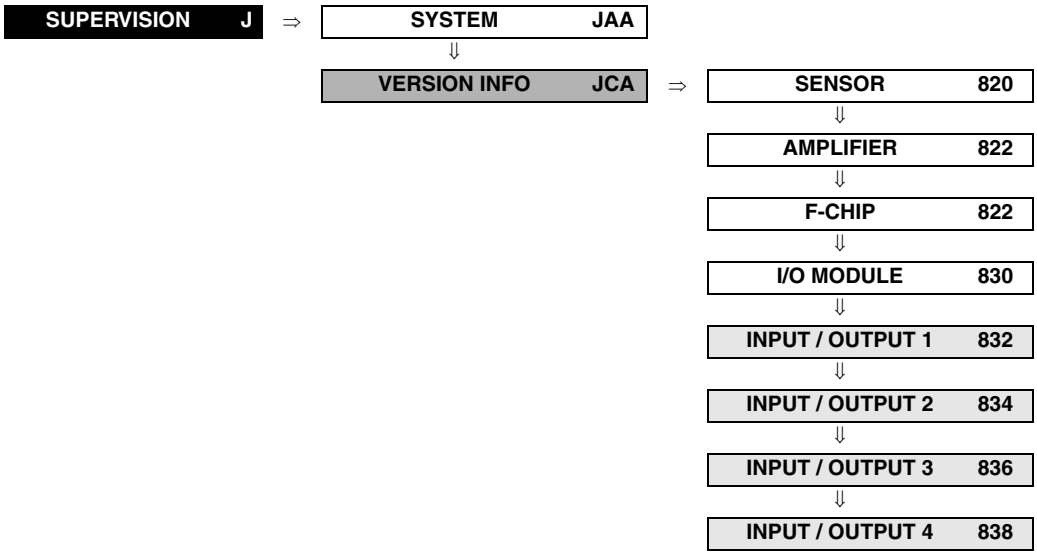
Functional description SUPERVISION → VERSION INFO → F-CHIP	
STATUS F-CHIP (8240)	Use this function to check whether an F-CHIP is installed.
SYSTEM OPTION (8241)	✎ Note! This function is not available unless the measuring device is equipped an F-CHIP. Use this function to view the system option.
SOFTWARE REVISION NUMBER F-CHIP (8244)	✎ Note! This function is not available unless the measuring device is equipped an F-CHIP. Use this function to view the software revision number of the F-CHIP.

11.2.4 Function group I/O MODULE



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

11.2.5 Function groups INPUT /OUTPUT 1...4



Functional description SUPERVISION → VERSION INFO → INPUT / OUTPUT 1...4	
TYPE IN-/OUTPUT: **1 = (8320),** **2 = (8340),** **3 = (8360),** **4 = (8380)**	Use this function to view the assembly of the I/O sub-module.
SOFTWARE REVISION NUMBER I/O SUB-MODULE 1 **1 = (8323),** **2 = (8343),** **3 = (8363),** **4 = (8383)**	Use this function to view the software revision number of the I/O sub-module.

12 Factory settings

12.1 SI units

Nominal diameter [mm]	Low flow cut off (v ≈ 0.04 m/s) [m^3/h]	Full scale value (v ≈ 2.5 m/s) [m^3/h]	Pulse value (approx. 2 pulses/s at 2.5 m/s) [m^3]	Unit totalizer	Unit length	Unit temperature
300	10	700	0.10	m^3	mm	° C
350	15	900	0.10			
400	20	1100	0.15			
450	20	1400	0.25			
500	30	1700	0.25			
600	40	2500	0.30			
700	55	3400	0.50			
800	75	4500	0.75			
900	90	5600	0.75			
1000	115	7000	1.00			
1200	160	10100	1.50			
1400	220	13800	2.00			
1600	285	17900	2.50			
1800	360	22600	3.00			
2000	450	27800	3.50			

12.2 US units (for USA and Canada only)

Nominal diameter	Low flow cut off (v ≈ 0.04 m/s)	Full scale value (v ≈ 2.5 m/s)	Pulse value (approx. 2 pulses/s at 2.5 m/s)	Unit totalizer	Unit length	Unit temperature
12"	45 [gal/min]	3100 [gal/min]	25 [gal]	gal	mm	° C
14"	65 [gal/min]	4000 [gal/min]	25 [gal]			
16"	90 [gal/min]	4800 [gal/min]	40 [gal]			
18"	90 [gal/min]	6200 [gal/min]	65 [gal]			
20"	130 [gal/min]	7500 [gal/min]	65 [gal]			
24"	175 [gal/min]	11000 [gal/min]	80 [gal]			
28"	240 [gal/min]	15000 [gal/min]	125 [gal]			
30"	275 [gal/min]	17600 [gal/min]	125 [gal]			
32"	325 [gal/min]	19800 [gal/min]	200 [gal]			
36"	400 [gal/min]	24700 [gal/min]	200 [gal]			
40"	500 [gal/min]	30800 [gal/min]	275 [gal]			
42"	550 [gal/min]	34300 [gal/min]	275 [gal]			
48"	700 [gal/min]	44500 [gal/min]	400 [gal]			
54"	1.3 [Mgal/d]	81 [Mgal/d]	0.0005 [Mgal]	Mgal		
60"	1.6 [Mgal/d]	101 [Mgal/d]	0.0005 [Mgal]			
66"	1.9 [Mgal/d]	122 [Mgal/d]	0.00075 [Mgal]			
72"	2.3 [Mgal/d]	143 [Mgal/d]	0.00075 [Mgal]			
78"	2.9 [Mgal/d]	176 [Mgal/d]	0.001 [Mgal]			

12.3 Language

Land	Sprache
Austria	Deutsch
Belgium	English
Canada	English
Denmark	English
England	English
Finland	English
France	Francais
Germany	Deutsch
Holland	English
Hong Kong	English
Instruments International	English
Italy	Italiano
Japan	Japanese
Malaysia	English
Norway	English
Singapore	English
Spain	Espanol
South Africa	English
Sweden	English
Switzerland	Deutsch
Thailand	English
USA	English

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