



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services

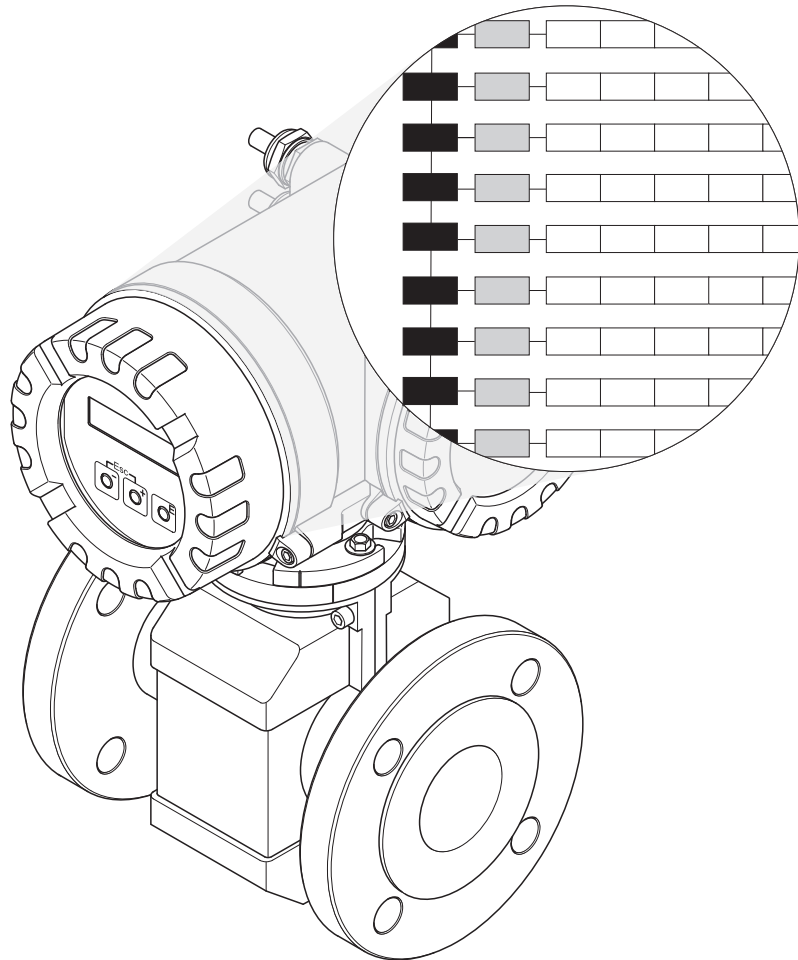


Solutions

Description of Device Functions

Proline Promag 50 PROFIBUS DP/PA

Electromagnetic Flow Measuring System



BA056D/06/en/06.10
71116498

Valid as of version
PROFIBUS DP: V 3.06.XX (Device software)
PROFIBUS PA: V 3.06.XX (Device software)

Endress+Hauser 

People for Process Automation

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1 Function matrix

1.1 Layout and operation of the function matrix

The function matrix consists of two levels – the groups and the groups' functions. The groups are the highest-level grouping of the operation options for the device. A number of functions are assigned to every group.

By selecting the group, you can access the functions in which the operation or configuration of the device takes place.

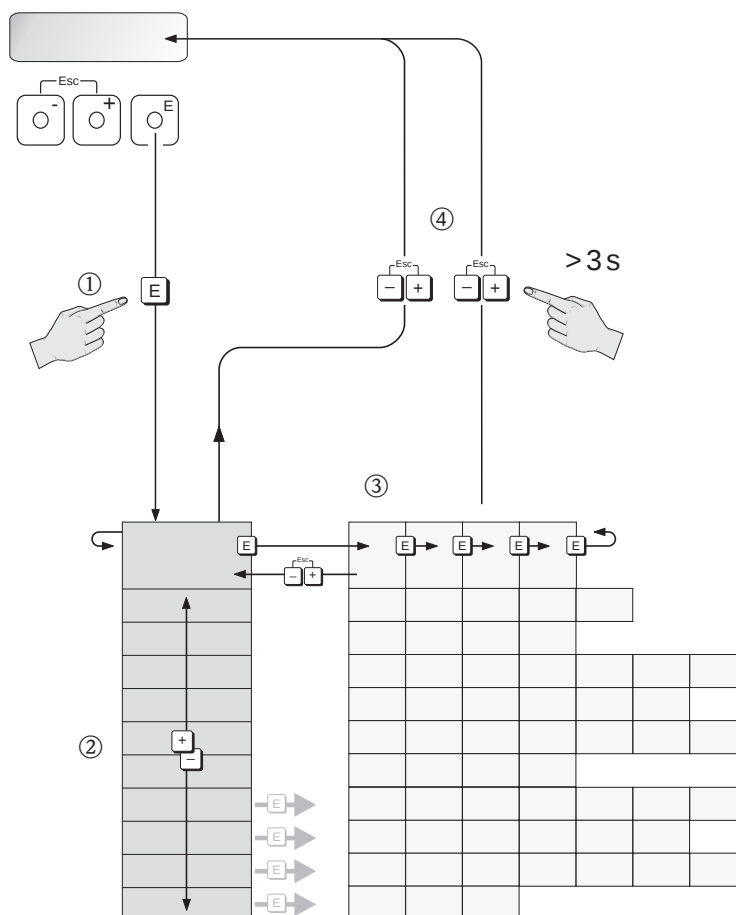
An overview of all the groups available is provided in the Table of Contents on Page 3 and in the graphic illustration of the function matrix on Page 6.

Page 6 also provides you with an overview of all the functions available with cross-references to the exact function description.

The individual functions are described as of Page 7.

Example for configuring a function (changing the display language from German to English):

1. Enter the function matrix (E key).
2. Select the OPERATION group.
3. Select the LANGUAGE function, then change the option from DEUTSCH to ENGLISH (+/-) and save (E) (the display text now appears in English).
4. Exit the function matrix (ESC > 3 seconds).



1.2 Illustration of the function matrix

Function groups	Functions →	
	▲	▲
MEASURING VALUES (P. 7)	VOLUME FLOW (P. 7)	
SYSTEM UNITS (P. 8)	UNIT VOL. FLOW (P. 8)	UNIT VOLUME (P. 8)
QUICK SETUP (P. 10)	SETUP COMMISSIONING	SETUP COMMUNICATION
OPERATION (P. 13)	LANGUAGE (P. 13)	ACCESS CODE (P. 14)
USER INTERFACE (P. 15)	ASSIGN LINE 1 (P. 15)	ASSIGN LINE 2 (P. 15)
TOTALIZER (P. 17)	SELECT TOTALIZER (P. 17)	TOTALIZER 1 OUT VALUE (P. 17)
COMMUNICATION (P. 20)	TAG NAME (P. 20)	FIELD BUS ADDRESS (P. 20)
	OUT VALUE (P. 21)	DISPLAY VALUE (P. 21)
PROCESSPARAMETER (P. 22)	ASSIGN LF CUTOFF (P. 22)	LF CUTOFF ON- VALUE (P. 22)
SYSTEM PARAMETER (P. 27)	INST. DIR. SENSOR (P. 27)	MEASURING MODE (P. 27)
SENSOR DATA (P. 28)	CALIBRATION DATE (P. 28)	K-FACTOR (P. 28)
SUPERVISION (P. 30)	ACT. SYSTEM COND. (P. 30)	PREV. SYSTEM COND. (P. 30)
SIMULAT. SYSTEM (P. 31)	SIM. FAILSAFE (P. 31)	SIM. MEASURAND (P. 31)
SENSOR VERSION (P. 32)	SERIAL NUMBER (P. 32)	SENSOR TYPE (P. 32)
AMPLIFIER VERSION (P. 33)	DEVICE SOFTWARE (P. 33)	SW REVISION NO. AMPL. (P. 33)
		SW REVISION NO. I/O-MOD. (P. 33)
		LANGUAGE GROUP (P. 33)
		I/O MODULE TYPE (P. 33)
		SW REVISION NO. S-DAT (P. 32)
		HW REVISION NO. SENS. (P. 32)
		SYSTEM RESET (P. 30)
		ALARM DELAY (P. 30)
		OPERATION HOURS (P. 30)
		PERMANENT STORAGE (P. 30)
		OVERVOLT. TIME (P. 29)
		EPD ELECTRODE (P. 29)
		POLARITY ECC (P. 29)
		EPD/OED ADJUSTMENT (P. 24)
		EMPTY PIPE DETECT. (P. 23)
		INTEGRATION TIME (P. 27)
		SYSTEM DAMPING (P. 27)
		POS. ZERO RETURN (P. 27)
		ZEROPOINT (P. 28)
		NOMINAL DIAMETER (P. 28)
		MEASURING PERIOD (P. 29)
		EPD RESPONSE TIME (P. 25)
		ECC (P. 25)
		ECC DURATION (P. 26)
		ECC RECOVERY TIME (P. 26)
		ECC CLEAN. CYCLE (P. 26)
		DEVICE ID (P. 21)
		CHECK CONFIG. (P. 21)
		BLOCK SELECTION (P. 21)
		PRESET TOTALIZER (P. 18)
		BACKLIGHT (P. 16)
		TEST DISPLAY (P. 16)
		DISPL. DAMPING (P. 16)
		ACCESS CODE COUNT. (P. 14)
		STATUS ACCESS (P. 14)
		DEFINE PRIVATE CODE (P. 14)
		FORMAT (P. 15)
		100% VALUE (P. 15)
		CHANNEL (P. 17)
		UNIT TOTALIZER (P. 17)
		SET TOTALIZER (P. 18)
		CONTRAST LCD (P. 16)
		TOTALIZER MODE (P. 18)
		CYCL. CALC. TOT. (P. 19)
		UNIT TO BUS (P. 20)
		PROFILE VERSION (P. 21)
		ACTUAL BAUDRATE (P. 21)
		DEVICE ID (P. 21)
		CHECK CONFIG. (P. 21)
		BLOCK SELECTION (P. 21)

2

Group MEASURING VALUES

MEASURING VALUES function description	
 Note! The engineering unit of the measured variable displayed here can be set in the SYSTEM UNITS group (see Page 8). If the fluid in the pipe flows backwards, a negative sign prefixes the flow reading on the display.	
VOLUME FLOW	The volume flow currently measured appears on the display. Display: 5-digit floating-point number, including unit and sign (e.g. 5.5445 dm³/min; 1.4359 m³/h; -731.63 gal/d; etc.)

3 Group SYSTEM UNITS

SYSTEM UNITS function description	
You can select the unit for the measured variable in this function group.  Note! The factory settings of the system units described here apply to the local display and can differ from the units that are used to transfer the measured variables to the automation system. The UNIT TO BUS function (→ Page 20), however, allows you to set these units to the currently selected units of the local display.	
UNIT VOLUME FLOW	Use this function to select the desired unit to be displayed for the volume flow. The unit you select here is also valid for: ■ Low flow cut off Options: Metric: Cubic centimeter → cm³/s; cm³/min; cm³/h; cm³/day Cubic decimeter → dm³/s; dm³/min; dm³/h; dm³/day Cubic meter → m³/s; m³/min; m³/h; m³/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 → ft³/s; ft³/min; ft³/h; ft³/day Fluid ounce → oz f/s; oz f/min; oz f/h; oz f/day Gallon → gal/s; gal/min; gal/h; gal/day Kilo gallon → Kgal/s; Kgal/min; Kgal/h; Kgal/day Million gallon → Mgal/s; Mgal/min; Mgal/h; Mgal/day Barrel (normal fluids: 31.5 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (beer: 31.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (petrochemicals: 42.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (filling tanks: 55.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Imperial: Gallon → gal/s; gal/min; gal/h; gal/day Mega gallon → Mgal/s; Mgal/min; Mgal/h; Mgal/day Barrel (beer: 36.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Barrel (petrochemicals: 34.97 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day Factory setting: Depends on nominal diameter and country (see Page 34 ff.).
UNIT VOLUME	 Note! This function is only shown on the local display and is not processed further by the measuring system.
UNIT LENGTH	Use this function to select the desired unit to be displayed for the length of the nominal diameter. The unit you select here is also valid for: ■ Nominal diameter of sensor (see NOMINAL DIAMETER function on Page 28) Options: MILLIMETER INCH Factory setting: MILLIMETER (SI units) INCH (US units)

SYSTEM UNITS function description	
FORMAT DATE/TIME	Use this function to select the format for the date and the time. The unit you select here is also valid for: Displaying the current calibration date (function CALIBRATION DATE on Page 28) Options: DD.MM.YY 24H MM/DD/YY 12H A/P DD.MM.YY 12H A/P MM/DD/YY 24H Factory setting: DD.MM.YY 24H (SI units) MM/DD/YY 12H A/P (US units)

4 Group QUICK SETUP

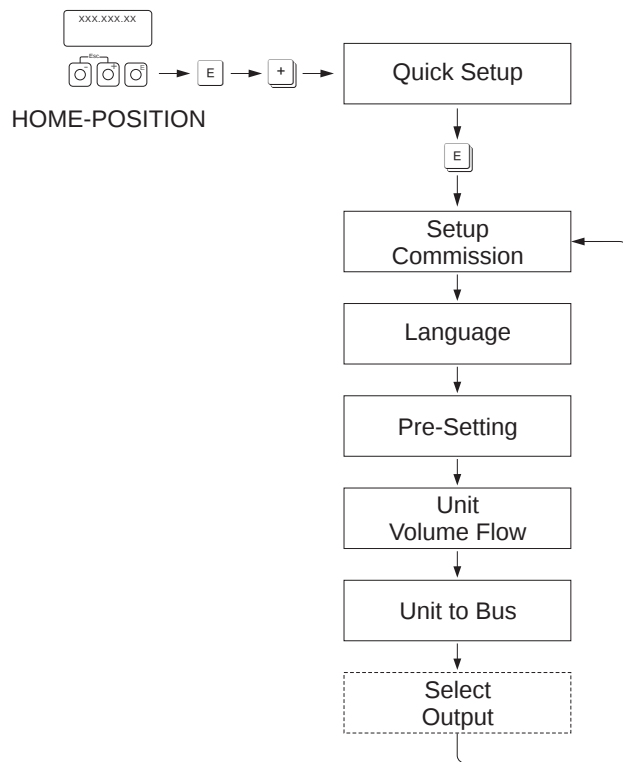
QUICK SETUP function description	
 Note! ■ The Quick Setups are only available via the local display. ■ Flowcharts of the various Quick Setups can be found on the following pages. ■ Further information on the Setups can be found in Operating Instructions BA107D.	
QUICK SETUP COMMISSIONING	Starts the Setup. Options: YES NO Factory setting: NO
QUICK SETUP COMMUNICATION	Starts the Setup. Options: YES NO Factory setting: NO

4.1 Flowchart

4.1.1 Setup Commissioning

If the device is equipped with a local display, the “Commissioning” QuickSetup menu can be used to configure all the important device parameters for standard measuring quickly and easily.

In the case of measuring devices without a local display, the individual parameters and functions must be configured by means of a configuration program, such as FieldCare.



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For Quick Setup “Commissioning”, only settings have to be made in the functions shown in the graphic above.



Note!

When you run through the Quick Setup another function or option is displayed ("Select Output" option) but this should not be taken into account. Settings in this function are not processed further by the measuring system.

4.1.2 Quick Setup “Communication”

To establish cyclic data transfer, various arrangements between the PROFIBUS master and the slave are required which have to be taken into consideration when configuring various functions. These functions can be configured quickly and easily by means of the “Communication” Quick Setup.

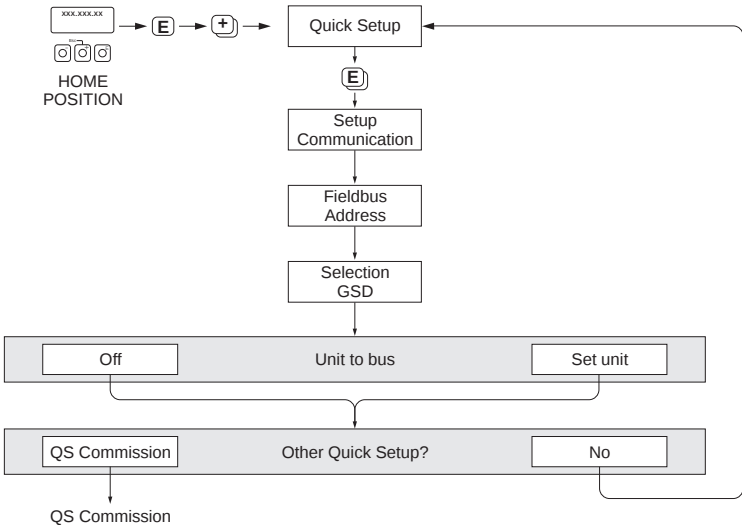


Fig. 1: Quick Setup Communication

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5 Group OPERATION

OPERATION function description	
LANGUAGE	Use this function to select the desired language for all texts, parameters and messages shown on the local display.  Note! The displayed options depend on the available language group which is indicated in the LANGUAGE GROUP function→ Page 33). OPTIONS: Language group WEST EU / USA: ENGLISH DEUTSCH FRANCAIS ESPANOL ITALIANO NEDERLANDS PORTUGUESE Language group EAST EU / SCAND. ENGLISH NORSK SVENSKA SUOMI POLISH RUSSIAN CZECH Language group ASIA: ENGLISH BAHASA INDONESIA JAPANESE (syllabary) Factory setting: Country-dependent (see Page 34 ff.)  Note! ■ If you press the  keys at startup, the language defaults to “ENGLISH”. ■ You can change the language group via the configuration software FieldCare. Please do not hesitate to contact your Endress+Hauser sales office if you have any questions.

OPERATION function description	
ACCESS CODE	 Note! This function is only relevant for onsite operation and access via an operating program (e.g. FieldCare) and does not affect cyclic data transmission via the PROFIBUS master (Class 1). 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  operating elements 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 = 50, see DEFINE PRIVATE CODE function on Page 14) User input: max. 4-digit number: 0...9999  Note! ■ Programming is 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	Use this function to specify a personal code with which programming is enabled. User input: 0...9999 (max. 4-digit number) Factory setting: 50  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	Use this function to display the status of access to the function matrix. Display: ACCESS CUSTOMER (parameterization possible) LOCKED (parameterization disabled)
ACCESS CODE COUNTER	Displays how often the customer code, service code or the digit "0" (code-free) has been entered to gain access to the function matrix. Display: max. 7-digit number: 0...9999999 Factory setting: 0

6 Group USER INTERFACE

USER INTERFACE function description	
ASSIGN LINE 1	Use this function to select the display value for the main line (top line of the local display). Options: OFF VOLUME FLOW VOLUME FLOW IN % AI 1 - OUT VALUE AO - DISPLAY VALUE TOT. 1 OUT VALUE (totalizer 1) TOT. 2 OUT VALUE (totalizer 2) Factory setting: VOLUME FLOW
ASSIGN LINE 2	Use this function to select the display value for the additional line (bottom line of the local display). Options: OFF VOLUME FLOW VOLUME FLOW IN % TAG NAME OPERATING/SYSTEM CONDITIONS FLOW DIRECTION VOLUME FLOW BARGRAPH IN % AI 1 - OUT VALUE AO - DISPLAY VALUE TOT. 1 OUT VALUE (totalizer 1) TOT. 2 OUT VALUE (totalizer 2) Factory setting: TOT. 1 OUT VALUE
100% VALUE	 Note! This function is only available if VOLUME FLOW IN % or VOLUME FLOW BARGRAPH IN % was selected in the ASSIGN LINE 1 or ASSIGN LINE 2 function. Use this function to specify 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 (see Page 34 ff.).
FORMAT	Use this function to select the number of digits after the decimal point shown for the display value on the top 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 → l/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.

USER INTERFACE function description	
DISPLAY DAMPING	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: 3 s  Note! Setting the time constant to zero seconds switches off damping.
CONTRAST LCD	Use this function to set the display contrast to suit local operating conditions. User input: 10...100% Factory setting: 50%
BACKLIGHT	Use this function to set the backlight to suit local operating conditions. User input: 0...100%  Note! Entering the value “0” means that the backlight is “switched off”. The display then no longer emits any light, i.e. the display texts can no longer be read in the dark. Factory setting: 50%
TEST DISPLAY	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 and additional line are darkened for minimum 0.75 seconds. 3. Main line and additional line show an “8” in each field for minimum 0.75 seconds. 4. Main line and additional line show a “0” in each field for minimum 0.75 seconds. 5. Main line and additional 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.

7 Group TOTALIZER

TOTALIZER function description	
SELECT TOTALIZER	Use this function to select the totalizer.  Note! The measuring device has only one totalizer. Options: TOTALIZER 1 TOTALIZER 2 Factory setting: TOTALIZER 1
TOTALIZER OUT VALUE 1	Use this function to display the current totalizer value incl. unit. Display: floating-point number, including unit and sign.
OVERFLOW	Use this function to display totalizer overflow aggregated since measuring began. Total flow quantity is represented by a floating-point number consisting of max. 7 digits. You can use this function to view higher numerical values (> 9,999,999) as overflows. The effective quantity is thus the total of the TOTALIZER 1 OUT VALUE function plus the value returned by the SUM function. Example: Reading after 2 overflows: 2 E7 dm³ (= 20,000,000 dm³) The value displayed in the TOTALIZER 1 OUT VALUE function = 896,845.7 dm³ Effective total quantity = 20,896,845.7 dm³ Display: Integer with exponent, including sign, e.g. 2 E7 dm³.
CHANNEL	Use this function to assign the measured variable (volume flow) to the totalizer. Options: OFF VOLUME FLOW Factory setting: VOLUME FLOW  Note! The totalizer is reset to 0 as soon as the selection is changed.
UNIT TOTALIZER	Use this function to select the unit of the totalizer. Options: Metric → cm³; dm³; m³; ml; l; hl; Ml Mega US → cc; af; ft³; oz f; gal; Kgal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals); bbl (filling tanks) Imperial → gal; Mgal; bbl (beer); bbl (petrochemicals) Factory setting: m³

TOTALIZER function description	
SET TOTALIZER	Control of totalizer. Options: TOTALIZE Totalizes the measured variable selected in the CHANNEL function. RESET (reset) Reset the totalizer to 0. PRESET The totalizer is set to the value defined in the PRESET TOTALIZER function.  Note! If RESET or PRESET is selected, the totalizer is set to 0 or the preset value but it does not stop totalizing. In other words, it continues totalizing from the value in question. To stop the totalizer, the HOLD VALUE option has to be selected in the TOTALIZER MODE function. Factory setting: TOTALIZE
PRESET TOTALIZER	Specifies a start value.  Note! This value is not accepted by the totalizer unless the PRESETTING option is selected in the SET TOTALIZER function. User input: –99999...99999 Factory setting: 0
TOTALIZER MODE	Use this function to select the totalizing mode of the totalizer. Options: BALANCE Positive and negative flow components. The positive and negative flow components are balanced. In other words, net flow in the flow direction is registered. POSITIVE (forwards) Positive flow components only. NEGATIVE (backwards) Negative flow components only HOLD VALUE The totalizer stays at the last value. No more flow components are totaled. Factory setting: BALANCE  Note! The BIDIRECTIONAL option has to be selected in the MEASURING MODE function (→ Page 27) for the counting of the positive and negative flow components (BALANCE) or of only the negative flow components (NEGATIVE) to be executed correctly.

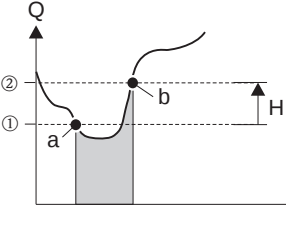
TOTALIZER function description	
CYCL. CALC. TOT.	Use this function to define whether the totalizer is updated on the local display and in the operating programming (E.G. FieldCare). Options: ON Totalizer is always updated. OFF Totalizer is only updated if the totalizer function block (TOTAL module resp. function) has been configured for cyclic data transmission. Factory setting: ON  Note! The system can be optimized particularly in time-critical applications if totalizer function block is not required. For this purpose, select "OFF" in this function. Please note that if "OFF" is selected, the totalizer is no longer updated on the local display and in the operating program (e.g. FieldCare).

8 Group COMMUNICATION

COMMUNICATION function description	
TAG NAME	Use this function to enter a tag name for the device. You can edit and read this tag name at the local display or via the PROFIBUS protocol (Class 2 master). User input: max. 16-character text, permissible: A–Z, 0–9, +, –, punctuation marks Factory setting: “ _____ ” (No text)
FIELD BUS ADDRESS	Use this function to enter the device address. User input: 0...126 Factory setting: 126
WRITE PROTECT	Use this function to check whether the measuring device can be write-accessed via PROFIBUS (acyclic data transfer, e.g. via FieldCare). Display: OFF (write access possible) ON (write access disabled) Factory setting: OFF  Note! Hardware write protection is activated and deactivated by means of a jumper on the I/O module (see Operating Instructions BA055D).
SELECTION GSD	Select the operating mode (GSD file) which should be used for cyclic communication with the PROFIBUS master (Class 1). Options: MANUFACT. SPEC. → The measuring device is operated with complete device functionality. MANUFACT V2.0 → The measuring device is used as the replacement for the previous Promag 33 model (compatibility mode). PROFILE-GSD → The measuring device is operated in the PROFIBUS Profile mode. Factory setting: MANUFACT. SPEC.  Note! For PROFIBUS network configuration, make sure that the right device master file (GSD file) of the measuring device is used for the selected operating mode (see BA056D/06/, Promag 50 PROFIBUS DP/PA).
UNIT TO BUS	If this function is executed, the volume flow (AI module) transmitted cyclically is transmitted to the PROFIBUS master (Class 1) with the system unit configured in the measuring device. Options: OFF SET UNITS (transmission is started by pressing the  key)  Caution! Activating this function can cause the volume flow (AI module) transmitted to the PROFIBUS master (Class 1) to change suddenly; this, in turn, can affect subsequent control routines.

COMMUNICATION function description	
PROFILE VERSION	Use this function to display the PROFIBUS profile version. Display: 3.0
ACTUAL BAUDRATE	Use this function to display the data transmission rate with which the device is communicating.
DEVICE ID	Use this function to display the manufacturer-specific device ID. The display depends on the option selected in the SELECTION GSD function: Display If MANUFACTURER SPEC. is selected: ■ For a PROFIBUS DP communication output = 1546 Hex ■ For a PROFIBUS PA communication output = 1525 Hex If MANUFACT V2.0 is selected: ■ For a PROFIBUS DP communication output = 1511 Hex ■ For a PROFIBUS PA communication output = 1505 Hex If PROFILE-GSD is selected: ■ For a PROFIBUS DP communication output = 9740 Hex ■ For a PROFIBUS PA communication output = 9740 Hex
CHECK CONFIGURATION	Displays whether the configuration for the cyclic data exchange of the PROFIBUS master (Class 1) was accepted by the device. Display: ACCEPTED (configuration accepted) NOT ACCEPTED (configuration not accepted)
BLOCK SELECTION	Use this function to select a PROFIBUS function block. If you select the Analog Input, the current measured value is displayed in the OUT VALUE function. If you select the Analog Output, the current measured value is displayed in the DISPLAY VALUE function. Options: ANALOG INPUT 1 → Display in the OUT VALUE function ANALOG OUTPUT 1 → Display in the DISPLAY VALUE function Factory setting: ANALOG INPUT 1
OUT VALUE	 Note! This function is not available unless the ANALOG INPUT 1 option was selected in the BLOCK SELECTION function. Use this function to display the volume flow (AI module), incl. the unit, which is cyclically transmitted to the PROFIBUS master (Class 1).
DISPLAY VALUE	 Note! This function is not available unless the ANALOG OUTPUT 1 option was selected in the BLOCK SELECTION function. Use this function to display the measured variable (DISPLAY_VALUE module) which is cyclically transmitted from the PROFIBUS master (Class 1).
CHANNEL	 Note! This function is not available unless the ANALOG INPUT 1 option was selected in the BLOCK SELECTION function. Use this function to display the measured variable assigned to the Analog Input 1. Display: VOLUME FLOW

9 Group PROCESS PARAMETER

PROCESS PARAMETER function description	
ASSIGN LOW FLOW CUT OFF	Use this function to assign the switch-point for low flow cut off. Options: OFF VOLUME FLOW Factory setting: VOLUME FLOW
ON-VALUE LOW FLOW CUT OFF	Use this function to enter the switch-on point for low flow cut off. Low flow cut off is active if the value entered is not equal to 0. The sign of the flow value is highlighted on the display to indicate that low flow cut off is active. User input: 5-digit floating-point number [unit] Factory setting: Depends on nominal diameter and country (see Page 34).  Note! The appropriate unit is taken from the SYSTEM UNITS group (see Page 8).
OFF-VALUE LOW FLOW CUT OFF	Use this function to enter the switch-off point (b) for low flow cut off. Enter the switch-off point as a positive hysteresis from the switch-on point (a). User input: Integer 0...100% Factory setting: 50%  ① = switch-on point, ② = sitch-off point <i>a</i> = Low flow cut off is switched on <i>b</i> = Low flow cut off is switched off ($a + a \cdot H$) <i>H</i> = Hysteresis: 0...100% ■ = Low flow cut off is active <i>Q</i> = Flow

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PROCESS PARAMETER function description	
EMPTY PIPE DETECTION	Flow cannot be measured correctly unless the measuring pipe is completely full. This status can be monitored at all times with the empty pipe detection function. Use this function to activate empty pipe detection (EPD) or open electrode detection (OED). ■ EPD = empty pipe detection (with the help of an EPD electrode) ■ OED = open electrode detection (empty pipe detection with the help of the measuring electrodes, if the sensor is not equipped with an EPD electrode or the orientation is not suitable for using EPD). Options: OFF (neither EPD nor OED are active) ON SPECIAL (for DN <400 only): Switch on the empty pipe detection (EPD) for remote version devices: OED: Switching on the Open Electrode Detection (OED). ON STANDARD: Switching on the empty pipe detection (EPD) for: – Device compact version – Applications where a facing and coating of the fluid on the measuring tube line and measuring electrode accrues. Factory setting: OFF  Note! ■ The options ON STANDARD and ON SPECIAL are not available unless the sensor is equipped with an EPD electrode. ■ The default setting for the EPD/OED functions when the device is delivered is OFF. The functions must be activated as required. ■ The devices are calibrated at the factory with water (approx. 500 µS/cm). If the conductivity of certain liquids deviates from this reference, empty-pipe/full-pipe adjustment must be performed again on site (see EPD/OED ADJUSTMENT → Page 24). ■ The adjustment coefficients must be valid before you can switch on the EPD or OED. If these coefficients are not available, the EPD/OED ADJUSTMENT function is displayed . ■ If there are problems with the adjustment, the following error messages appear on the screen: – ADJUSTMENT FULL = EMPTY: The adjustment values for empty pipe and full pipe are identical. In such instances, empty-pipe adjustment/full-pipe adjustment must be carried out again. – ADJUSTMENT NOT OK: Adjustment is not possible as the fluid conductivity values are outside the permitted range. Notes on empty pipe detection (EPD and OED) ■ Flow cannot be measured correctly unless the measuring pipe is completely full. This status can be monitored at all times by means of the EPD/OED. ■ An empty or partially filled pipe is a process error. A default factory setting defines that a fault message is issued and that this process error has an effect on the outputs. ■ A plausibility check of the adjustment values will only be executed by activating the empty pipe detection. If an empty or full-pipe adjustment is performed while empty pipe detection is active, empty pipe detection has to be switched off and switched on again, after finishing the adjustment, to start the plausibility check. Response to partially filled pipes If the EPD/OED is switched on and responds to a partially filled or empty pipe, the notice message “EMPTY PIPE” appears on the display. If the pipe is partially empty and the EPD/OED is not switched on, the response can vary in identically configured systems: ■ Flow reading fluctuates ■ Zero flow ■ Excessively high flow values (continued on next page)

PROCESS PARAMETER function description	
EMPTY PIPE DETECTION (continued)	Notes on open electrode detection (OED) Open electrode detection (OED) functions like the empty pipe detection (EPD). In contrast to the EPD where the measuring device must be equipped with a separate (optional) electrode, the OED detects partial filling by means of the two measuring electrodes which are present as standard (fluid no longer covers the measuring electrodes). Open electrode detection can also be used if: ■ the sensor is not installed in the optimal position for using EPD (optimal = installed horizontally). ■ the sensor is not equipped with an additional (optional) EPD electrode.  Note! ■ Cable connection length: When mounting a remote version, please observe the maximum permissible cable length of 15 meters in order to keep the OED function. ■ OED empty-pipe adjustment: To achieve the best results for the open electrode detection, it is important to have the electrodes surface as dry as possible (no liquid film) while the empty-pipe adjustment is being made. Even during normal operation, the OED function is only secured if there is no longer any liquid film present on the electrodes when the measuring pipe is empty.
EPD/OED ADJUSTMENT	Use this function to start the EPD/OED adjustment for an empty or full measuring tube.  Note! A detailed description of "empty pipe detection" can be found on Seite 23 ff.. Options: OFF FULL PIPE ADJUST EMPTY PIPE ADJUST OED FULL ADJUST OED EMPTY ADJUST Factory setting: OFF Procedure for EPD or OED empty-pipe / full-pipe adjustment 1. Empty the piping. In case of an EPD adjustment, the wall of the measuring tube should be wetted with fluid for the adjustment procedure but this is not the case with an OED adjustment! 2. Start empty-pipe adjustment: Select "EMPTY PIPE ADJUST" or "OED EMPTY ADJUST" and press  to confirm. 3. After empty-pipe adjustment, fill the piping with fluid. 4. Start full-pipe adjustment: Select "FULL PIPE ADJUST" or "OED FULL ADJUST" and press  to confirm. 5. Having completed the adjustment, select the setting "OFF" and exit the function by pressing . 6. Now select the "EPD" function (see Page 23). Switch on empty pipe detection by selecting the following settings: – EPD → Select ON STANDARD or ON SPECIAL and press  to confirm. – OED → Select OED and confirm with .  Caution! The adjustment coefficients must be valid before you can activate the EPD/OED function. If there are problems with the adjustment, the following error messages appear on the screen: ■ ADJUSTMENT FULL = EMPTY: The adjustment values for empty pipe and full pipe are identical. In such instances, empty-pipe adjustment/full-pipe adjustment must be carried out again. ■ ADJUSTMENT NOT OK: Adjustment is not possible as the fluid conductivity values are outside the permitted range.

PROCESS PARAMETER function description	
EPD/OED RESPONSE TIME	 Note! This function is not available unless ON STANDARD, ON SPECIAL or OED was selected in the EPD function . Use this function to specify a time span for which the criteria for an “empty” pipe have to be satisfied without interruption before a notice message or fault message is generated. The setting defined here is used by the active empty pipe detection (EPD) or open electrode detection (OED). User input: fixed-point number: 1.0...100 s Factory setting: 1.0 s  Note! OED detection time: The recognition of open electrodes is, in contrast to the empty pipe detection, very slow in reacting (delay at least 25 seconds) and only afterwards activates the programmed response time! We recommend in most applications to use the empty pipe detection (EPD) which is an optimal solution for detecting partly filled measuring tubes.
ECC	 Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Activate cyclic electrode cleaning. Options: OFF ON Factory setting: ON (only if the optional electrode cleaning function ECC is available) Notes on electrode cleaning (ECC) Conductive deposits on the electrodes and on the walls of the measuring tube (e.g. magnetite) can falsify measurement values. The Electrode Cleaning Circuitry (ECC) was developed to prevent such conductive deposits accreting in the vicinity of the electrodes. ECC functions as described above for all available electrode materials except tantalum. If tantalum is used as the electrode material, the ECC protects the electrode surface only against oxidation.  Caution! If the ECC is switched off for a prolonged period in applications with conductive deposits, a layer forms inside the measuring tube and this can falsify measurement values. If the layer is allowed to accrete beyond a certain level, it might no longer be possible to remove it by switching on the ECC. If this happens the measuring tube must be cleaned and the layer removed.

PROCESS PARAMETER function description	
ECC DURATION	 Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to specify the cleaning duration for electrode cleaning. User input: fixed-point number: 0.01...30.0 s Factory setting: 2.0 s
ECC RECOVERY TIME	 Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to specify the recovery time for which the last flow value measured prior to cleaning is retained. A recovery time is necessary as the signal outputs can fluctuate after electrode cleaning on account of electrochemical interference voltages. User input: max. 3-digit number: 1...600 s Factory setting: 5 s  Caution! The last value measured prior to cleaning is output for the duration of the recovery time (max. 600 s). This in turn means that the measuring system does not register changes in flow, e.g. stoppage, during this time span.
ECC CLEANING CYCLE	 Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to specify the cleaning cycle for electrode cleaning. User input: Integer: 30...10080 min Factory setting: 40 min

10 Group SYSTEM PARAMETER

SYSTEM PARAMETER function description	
INSTALLATION DIRECTION SENSOR	Use this function to select or change the sign of the flow measured variable. Options: NORMAL (flow as indicated by the arrow) INVERSE (flow opposite to direction indicated by the arrow) Factory setting: NORMAL  Note! Ascertain the actual direction of fluid flow with reference to the direction indicated by the arrow on the sensor (nameplate).
MEASURING MODE	Select how flow components should be recorded by the measuring device. Options: UNIDIRECTIONAL (only the positive flow components) BIDIRECTIONAL (the positive and negative flow components) Factory setting: UNIDIRECTIONAL
POSITIVE ZERO RETURN	Interrupts the evaluation of measured variables (affects all the functions and outputs of the measuring device). This is necessary when a piping system is being cleaned, for example. Options: OFF ON → Signal output is set to the “ZERO FLOW” value. Factory setting: OFF
SYSTEM DAMPING	Use this function to specify 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 decreases with an increasing filter setting. User input: 0...15 Factory setting: 7  Note! The system damping acts on all functions and outputs of the measuring device.
INTEGRATION TIME	Use this function to specify the output damping. User input: 3.3...65 ms Factory (under normal circumstances, does not have to be changed!): 20 ms at 50 Hz → power supply frequency (e.g. Europe) 16.7 ms at 60 Hz → power supply frequency (e.g. USA)  Caution! The integration time must not be selected with a greater value than the measuring period (see Page 29).  Note! The integration time defines the duration of internal totaling of the induced voltage in the fluid (measured by the measuring electrode), i.e. the time in which the measuring device records the true flow (afterwards the magnetic field for the next integration is created from the opposite pole).

11 Group SENSOR DATA

SENSOR DATA functional description	
All sensor data (calibration factors, zero point, nominal diameter etc.) are set at the factory and saved on the S-DAT sensor memory chip.  Caution! Under normal circumstances you should not change the following parameter settings, because changes affect numerous functions of the entire measuring facility in general and the accuracy of the measuring system in particular. For this reason, the functions described below cannot be changed even when you enter your personal code. Contact the Endress+Hauser service organization if you have any questions about these functions.	
CALIBRATION DATE	Use this function to view the current calibration date and time for the sensor. User interface: Calibration date and time Factory setting: Calibration date and time of the current calibration.  Note! The calibration date and time format is defined in the FORMAT DATE/TIME function, → Page 9.
K-FACTOR	Use this function to display the current calibration factor for the sensor. The calibration factor is determined and set at the factory. Display: 5-digit fixed-point number: 0.5000...2.0000 Factory setting: Depends on nominal diameter and calibration  Note! This value is also provided on the sensor nameplate.
ZERO POINT	This function shows the current zero-point correction value for the sensor. Zero-point correction is determined and set at the factory. Display: max. 4-digit number: -1000...+1000 Factory setting: Depends on nominal diameter and calibration  Note! This value is also provided on the sensor nameplate.
NOMINAL DIAMETER	This function shows the nominal diameter for the sensor. The nominal diameter depends on the size of the sensor and is set at the factory. Display: 2...2000 mm or 1/12...78" Factory setting: Depends on the size of the sensor  Note! This value is also provided on the sensor nameplate.

SENSOR DATA functional description	
MEASURING PERIOD	Use this function to specify the time for a complete measuring period. The duration of the measuring period is calculated from the rise time of the magnetic field, the brief recovery time, the integration time (which can be set) and the empty pipe detection time. User input: 0.0...1000 ms Factory setting: Depends on nominal diameter  Note! The system checks the time entered and sets the measuring period which is actually used internally to a plausible value. If you enter 0 ms, the system automatically computes the shortest time.
OVERVOLTAGE TIME	Use this function to specify the time in which overvoltage is applied to the coil circuit in order to build up the magnetic field as fast as possible. The overvoltage time is adjusted automatically while measuring is in progress. The overvoltage time depends on the sensor type and the nominal diameter and is set at the factory. Display: 4-digit floating-point number 0.0...100.0 ms Factory setting: Depends on nominal diameter
EPD ELECTRODE	Use this function to check whether the sensor is equipped with an EPD electrode. Display: YES NO Factory setting: YES → Electrode fitted as standard
POLARITY ECC	 Note! This function is not available unless the measuring device is equipped with the optional electrode cleaning function (ECC). Use this function to display the present current polarity for optional electrode cleaning (ECC). Electrode cleaning uses either a positive or negative current, depending on the electrode material. The measuring device automatically selects the correct polarity on the basis of the electrode material data stored in the S-DAT. Display: POSITIVE → for electrodes made of: 1.4435, alloy C-22, platinum, titanium NEGATIVE → for electrodes made of: tantalum  Caution! If the incorrect current is applied to the electrodes, the electrode material is destroyed.

12 Group SUPERVISION

SUPERVISION function description	
ACTUAL SYSTEM CONDITION	Use this function to display the current system condition. Display: "SYSTEM OK" or the fault / notice message with the highest priority.
PREVIOUS SYSTEM CONDITIONS	Use this function to view the fifteen most recent fault and notice messages since measuring last started. Display: The 15 most recent fault or notice messages.
ALARM DELAY	Use this function to specify the time span for which the criteria for an error have to be satisfied without interruption before a notice message or fault message is generated. Depending on the setting and the type of fault, this suppression acts on: ■ Display ■ PROFIBUS User input: 0...100 s (in steps of one second) Factory setting: 0 s  Caution! If this function is activated fault and notice messages are delayed by the time corresponding to the setting before being transmitted to the higher-order controller (process controller, etc.). It is therefore imperative to check in advance in order to make sure whether a delay of this nature could affect the safety requirements of the process. If fault and notice messages may not be suppressed, a value of 0 seconds must be entered here.
SYSTEM RESET	Use this function to reset the measuring system. Options: NO RESTART SYSTEM (restart without interrupting power supply) Factory setting: NO
OPERATION HOURS	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 = 0:00:00 (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)
PERMANENT STORAGE	This function indicates whether permanent storage of all parameters in the EEPROM has been switched on or off. Display: 0 = OFF 1 = ON Factory setting: ON

13 Group SIMULATION SYSTEM

SIMULATION SYSTEM function description	
SIMULATION FAILSAFE MODE	Use this function to set the Analog Input function block and the Totalizer function block to their defined fault response modes, in order to check whether they respond correctly. During this time, the words "SIMULATION FAILSAFE MODE" appear on the display. Options: ON OFF Factory setting: OFF  Note! The failsafe mode of the PROFIBUS function blocks must be defined in the appropriate Analog Input function block or Totalizer function block.
SIMULATION MEASURAND	Simulation of volume flow. During this time, the words "SIMULATION MEASURAND" appear on the display. Options: OFF VOLUME FLOW Factory setting: OFF  Caution! ■ The measuring device cannot be used for measuring while this simulation is in progress. ■ The setting is not saved in the event of a power failure.
VALUE SIMULATION MEASURAND	 Note! The function is not available unless the SIMULATION MEASURAND function is active (= VOLUME FLOW). Use this function to specify an arbitrary value (e.g. 12 m³/s) which is used to test downstream devices or the measuring device itself. User input: 5-digit floating-point number [unit] Factory setting: 0 [unit]  Caution! The setting is not saved in the event of a power failure.  Note! The appropriate unit is taken from the SYSTEM UNITS group (see Page 8).

14 **Group SENSOR VERSION**

SENSOR VERSION function description	
SERIAL NUMBER	Use this function to view the serial number of the sensor.
SENSOR TYPE	Use this function to view the sensor type.
HARDWARE REVISION NUMBER SENSOR	Use this function to display the hardware revision number of the sensor.
SOFTWARE REVISION NUMBER S-DAT	Use this function to view the software revision number of the software used to create the content of the S-DAT.

15 Group AMPLIFIER VERSION

AMPLIFIER VERSION function description	
DEVICE SOFTWARE	Displays the current device software version.
SOFTWARE REVISION NUMBER AMPLIFIER	Use this function to view the software revision number of the amplifier.
LANGUAGE GROUP	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 function. ■ You can change the language group via the configuration software FieldCare. Please do not hesitate to contact your Endress+Hauser sales office if you have any questions.
I/O MODULE TYPE	Use this function to display the I/O module type.
SOFTWARE REVISION NUMBER I/O MODULE	Use this function to view the software revision number of the I/O module.

16 Factory settings

16.1 SI units (not for USA and Canada)

Low flow cut off

Nominal diameter		Low flow cut off	
[mm]	[inch]	(approx. $v = 0.04 \text{ m/s}$)	
2	$1/12''$	0.01	dm^3/min
4	$5/32''$	0.05	dm^3/min
8	$5/16''$	0.1	dm^3/min
15	$1/2''$	0.5	dm^3/min
25	1"	1	dm^3/min
32	$1\ 1/4''$	2	dm^3/min
40	$1\ 1/2''$	3	dm^3/min
50	2"	5	dm^3/min
65	$2\ 1/2''$	8	dm^3/min
80	3"	12	dm^3/min
100	4"	20	dm^3/min
125	5"	30	dm^3/min
150	6"	2.5	m^3/h
200	8"	5.0	m^3/h
250	10"	7.5	m^3/h
300	12"	10	m^3/h
350	14"	15	m^3/h
375	15"	20	m^3/h
400	16"	20	m^3/h

Nominal diameter		Low flow cut off	
[mm]	[inch]	(approx. $v = 0.04 \text{ m/s}$)	
450	18"	25	m^3/h
500	20"	30	m^3/h
600	24"	40	m^3/h
700	28"	50	m^3/h
–	30"	60	m^3/h
800	32"	75	m^3/h
900	36"	100	m^3/h
1000	40"	125	m^3/h
–	42"	125	m^3/h
1200	48"	150	m^3/h
–	54"	200	m^3/h
1400	–	225	m^3/h
–	60"	250	m^3/h
1600	–	300	m^3/h
–	66"	325	m^3/h
1800	72"	350	m^3/h
–	78"	450	m^3/h
2000	–	450	m^3/h

Language

Country	Language
Australia	English
Austria	Deutsch
Belgium	English
Czech Republic	Czech
Denmark	English
England	English
Finland	Suomi
France	Francais
Germany	Deutsch
Holland	Nederlands
Hong Kong	English
Hungary	English
India	English
Indonesia	Bahasa Indonesia

Country	Language
Instruments International	English
Italy	Italiano
Japan	Japanese
Malaysia	English
Norway	Norsk
Poland	Polish
Portugal	Portuguese
Russia	Russian
Singapore	English
Spain	Espanol
Sweden	Svenska
Switzerland	Deutsch
South Africa	English
Thailand	English

Length

	Unit
Length	mm

16.2 US units (only for USA and Canada)

Low flow cut off

Nominal diameter		Low flow cut off	
[inch]	[mm]	(approx. $v = 0.04 \text{ m/s}$)	
$1/12''$	2	0.002	gal/min
$5/32''$	4	0.008	gal/min
$5/16''$	8	0.025	gal/min
$1/2''$	15	0.10	gal/min
1"	25	0.25	gal/min
$1\ 1/4''$	32	0.50	gal/min
$1\ 1/2''$	40	0.75	gal/min
2"	50	1.25	gal/min
$2\ 1/2''$	65	2.0	gal/min
3"	80	2.5	gal/min
4"	100	4.0	gal/min
5"	125	7.0	gal/min
6"	150	12	gal/min
8"	200	15	gal/min
10"	250	30	gal/min
12"	300	45	gal/min
14"	350	60	gal/min
15"	375	60	gal/min
16"	400	60	gal/min

Nominal diameter		Low flow cut off	
[inch]	[mm]	(approx. $v = 0.04 \text{ m/s}$)	
18"	450	90	gal/min
20"	500	120	gal/min
24"	600	180	gal/min
28"	700	210	gal/min
30"	–	270	gal/min
32"	800	300	gal/min
36"	900	360	gal/min
40"	1000	480	gal/min
42"	–	600	gal/min
48"	1200	600	gal/min
54"	–	1.3	Mgal/d
–	1400	1.3	Mgal/d
60"	–	1.3	Mgal/d
–	1600	1.7	Mgal/d
66"	–	2.2	Mgal/d
72"	1800	2.6	Mgal/d
78"	–	3.0	Mgal/d
–	2000	3,0	Mgal/d

Language

Country	Language
Canada	English
USA	English

Length

	Unit
Length	inch

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