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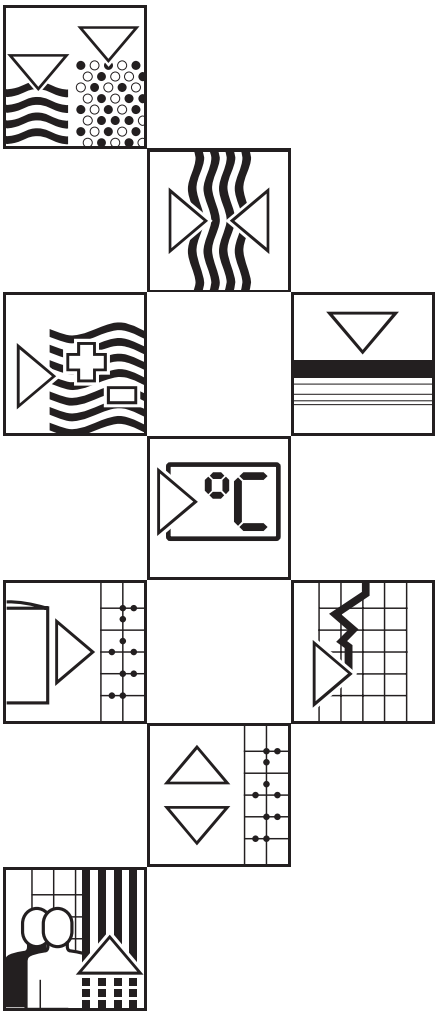
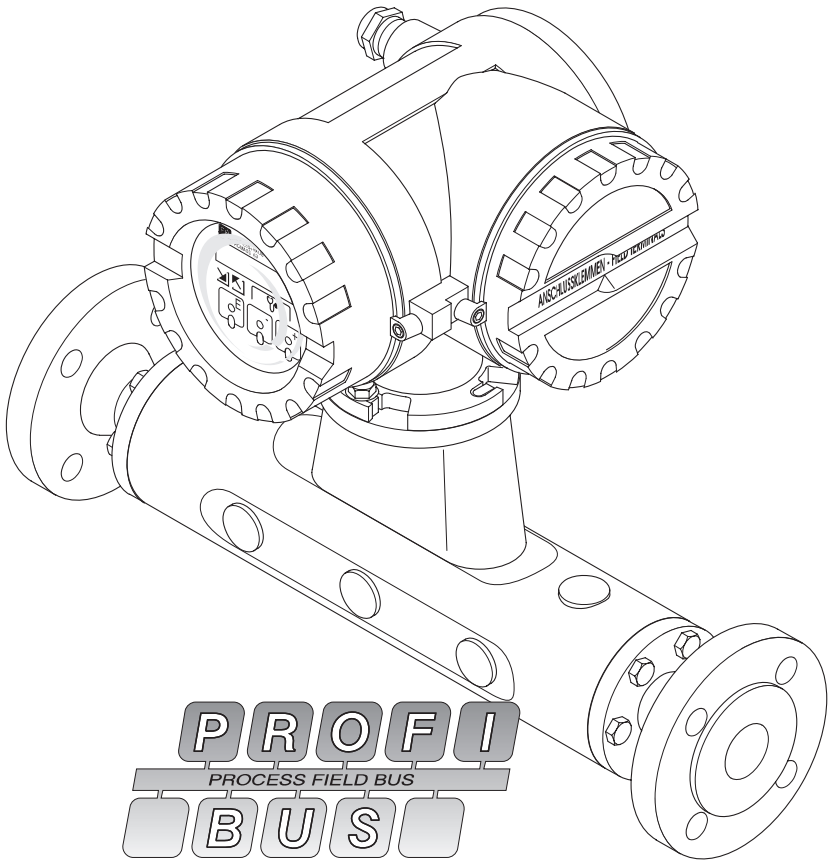
V 3.02.XX PBUS (communication)

promass 63 (PROFIBUS-DP/-PA)
Mass Flow Measuring System

Operating Manual





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The Power of Know How

Brief Operating Instructions

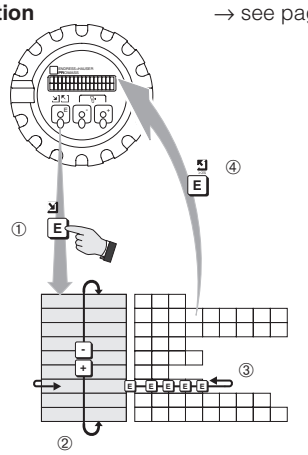
Based on the following instructions, you may quickly configure your measuring instrument and easily.

Safety instructions → see page 5

Mounting and electrical connection
- Mounting → see page 11
- Electrical connection → see page 17 ff.
- End-of-line resitors bus → see page 19

Switching on the instrument → see page 26

Operation → see page 57 ff.



Display configuration
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- Contrast → see page 87
- Assign line 1 → see page 87
- Assign line 2 → see page 87
- Number of decimal places → see page 87

continued: next column

Engineering units → see page 72 ff.

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PROFIBUS-DP /-PA
Setting the device address → see page 25
Commuwin II operating matrix → see page 50

Current output
(only available with PROFIBUS-PA)
- Assign output → see page 75
- Zero/full scale value → see page 75 ff.
- Current span → see page 77

Other applications
require a programming of additional functions. You will find the appropriate pages and functions in the
- Index → see page 145
- Operating matrix DP → see page 59
- Operating matrix PA → see page 60

For optimum measuring results
- Zero point adjustment → see page 63
- Density adjustment → see page 81
- Empty pipe detection → see page 91
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1 Safety Instructions

1.1 Correct usage

- The Promass 63 is only to be used to measure the mass flow rate of liquids and gases. At the same time, the system also measures the density and the temperature of fluids and thus allows the calculation of other parameters such as volumetric flow, solids content, or density units (°Brix, °Baumé, etc.).
- The manufacturer assumes no liability for damage caused by an incorrect use of the instrument.
- Instruments which are used in hazardous areas (only PROFIBUS-PA) are supplied with a separate “Ex documentation”, which is an *integral part of this Operating Manual*. The instructions and connected loads provided in this supplement must absolutely be observed.
  An appropriate icon is shown on the front of this document according to the approval given and the corresponding test center.

1.2 Dangers and notes

All instruments are designed to meet state-of-the-art safety requirements. They have been tested, and have left the factory in an operational perfectly safe condition.
The devices were developed according to EN 61010 “Protection Measures for Electronic Equipment for Measurement, Control, Regulation, and Laboratory Procedures”. A hazardous situation may occur if the flowmeter is not used for the purpose it was designed for or is used incorrectly. Carefully note the information provided in this Operating Manual indicated by the following pictograms:

Warning!
A “Warning” indicates actions or procedures which, if not performed correctly, may lead to personal injury or a safety hazard. Strictly observe the instructions supplied and proceed carefully.

Warning!

Caution!
A “Caution” indicates actions or procedures which, if not performed correctly, may lead to faulty operations or the destruction of the instrument. Strictly observe the respective instructions.

Caution!

Note!
A “Note” indicates actions or procedures which, if not performed correctly, may indirectly affect operations or lead to an unexpected instrument response.

Note!

1.3 Operational safety

- The Promass 63 measuring system fulfills the general EMC requirements according to the European Standard EN 50081 Parts 1 and 2 / EN 50082 Parts 1 and 2 as well as the NAMUR recommendations.
- Extensive self-monitoring of the measuring system provides complete operational safety. Existing errors can be automatically called up and their cause determined using the diagnosis function.
- Upon a power failure, all data of the measuring system are safely stored in the EEPROM (no batteries required).

1.4 Personnel for installation, start-up and operation

- Any mounting, electrical installation, start-up, and maintenance of the instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must without fail read and understand this Operating Manual before carrying out its instructions.
- The instrument may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this Manual are to be observed without fail.
- In case of corrosive fluids, the resistance of the material of all wetted parts such as measuring tubes, gaskets, and process connections is to be verified. This also applies to fluids used to clean the Promass sensor (for wetted parts materials, see chapter 10, 11).
  The user is responsible for the correct selection of suitable wetted parts materials having suitable resistance within the process. The manufacturer assumes no liability! Endress+Hauser will be glad to provide additional information and help.
- The installer has to make sure that the measuring system is correctly wired according to the wiring diagrams. The measuring system is to be grounded.
- Observe all provisions valid for your country and pertaining to the opening and repairing of electrical devices.

Warning!

Danger from electric shock!
With the housing cover removed, protection against accidental contact is no longer assured.

1.5 Repairs, dangerous chemicals

The following procedures must be carried out before a Promass 63 flowmeter is sent to Endress+Hauser for repair:

- A note must always be enclosed with the instrument, containing a description of the fault, the application, and the chemical and physical properties of the product being measured.
- Remove all residue which may be present. Pay special attention to the gasket grooves and crevices where fluid may be present. This is especially important if the fluid is dangerous to health, e.g. corrosive, poisonous, carcinogenic, radioactive, etc.
- No instrument should be returned without all dangerous material being removed first, e.g. in scratches or diffused through plastic.

Incomplete cleaning of the instrument may result in waste disposal or cause harm to personnel (burns, etc.). Any costs arising from this will be charged to the operator of the instrument.

1.6 Technical improvement

The manufacturer reserves the right to modify technical data without prior notice. Your local E+H Sales Office will supply you with all current information and any updates to this Operating Manual.

2 Description of the System

2.1 Application

The Promass 63 measuring system measures the mass and volume flow of fluids with widely differing characteristics:
- chocolate, condensed milk, syrup
- oils, fats
- acids, alkalis, varnishes, paints
- pharmaceuticals, catalysts, inhibitors
- suspensions, gases, etc.

The system also measures the density and temperature of fluids so that other variables can be calculated such as volumetric flow rate, solids content, and density (standard density, °Brix, °Baumé, °API).

The Promass 63 is used wherever mass flow measurement is of critical importance:
- mixing and batching of various raw materials
- controlling of processes
- measurement of fluids with quickly changing densities
- control and monitoring of product quality

The advantages of this measurement process are demonstrated by its successful use in food processing, the pharmaceutical industry, the chemical and petrochemical industry, waste disposal, energy production, etc.

2.2 Measuring principle

The measuring principle is based on the controlled generation of Coriolis forces. These forces are always present when both translational (straight line) and angular (rotational) movement occur simultaneously.

$$\vec{F}_C = 2 \cdot \Delta m \, (\vec{\omega} \cdot \vec{v})$$

$\vec{F}_C$ = Coriolis force
Δm = mass of moving body
$\vec{\omega}$ = angular velocity
$\vec{v}$ = radial velocity in a rotating or oscillating system

The amplitude of the Coriolis force depends on the moving mass Δm, its velocity in the system $\vec{v}$ and, therefore, its mass flow.

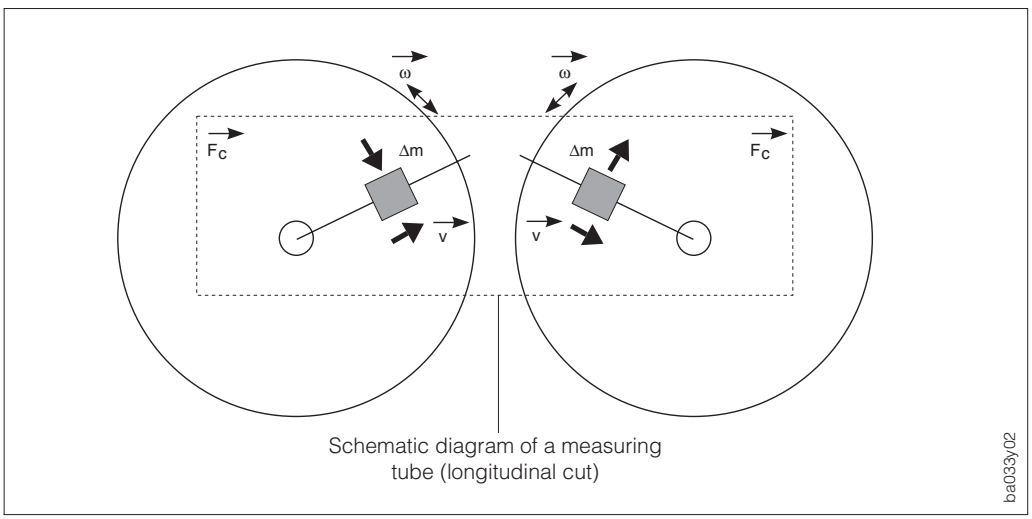


Fig. 1
Coriolis forces in the Promass measuring tubes

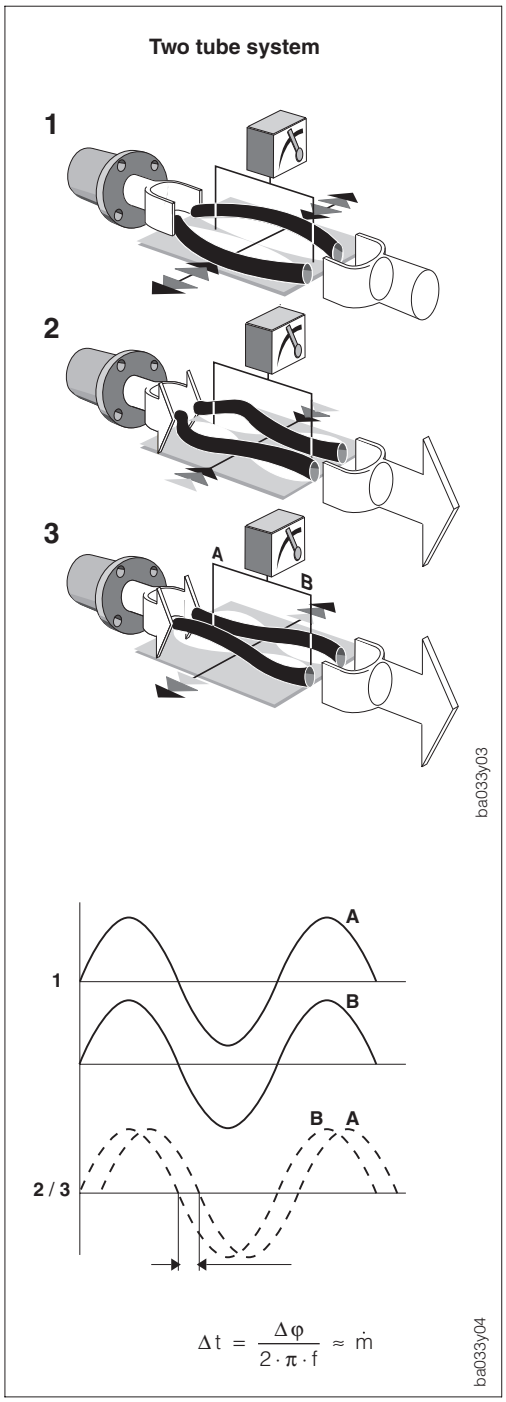


Fig. 2
Phase shift of tube vibration with mass flow.

The Promass uses an oscillation instead of a constant angular velocity $\vec{\omega}$. Promass M and F sensors use two parallel measuring tubes with fluid flowing through them, and are made to oscillate in antiphase so that they act like a tuning fork.

The Coriolis forces produced at the measuring tubes cause a phase shift in the tube oscillation (see Fig. 2):
- When there is zero flow, i.e. with the fluid standing still, both tubes oscillate in phase (**1**).
- When there is mass flow, the tube oscillation is decelerated at the inlet (**2**) and accelerated at the outlet (**3**).

As the mass flow rate increases, the phase difference also increases (**A-B**). The oscillations of the measuring tubes at the inlet and outlet are determined using electrodynamic sensors.

Unlike Promass M and F, Promass A and I only have a single measuring tube. However, the measuring principle and function of all sensors are identical.

The operating principle is independent of temperature, pressure, viscosity, or flow profile.

Balanced Measuring Systems

Two-tube system (Promass M, F)
The system balance is ensured by the two measuring tubes vibrating in antiphase.

Single tube system (Promass A, I)
For single tube systems, other design solutions are necessary for system balance than for two-tube systems.

Promass A:
For Promass A, an internal reference mass is used for this purpose.

Promass I:
For Promass I, the system balance necessary for flawless measurement is generated by exciting an eccentrically located, counter-oscillating pendulum mass.
This TMB™ (Torsion Mode Balanced) system is patented and guarantees accurate measurement, also with changing process and ambient conditions. For this reason the installation of Promass I is just as easy as with two-tube systems! Special fastening measures before and after the meter are, therefore, not necessary.

Density measurement
The measuring tubes are always made to oscillate at their resonant frequency. This excitation frequency automatically adjusts as soon as the mass, and, therefore, the density of the oscillating system changes (measuring tubes *and* fluid). The resonant frequency is, thus, a function of the fluid density and enables the microprocessor to produce a density signal.

Temperature measurement
The temperature of the measuring tubes is measured and used to compensate for temperature effects. The signal produced corresponds to the process temperature and can be used for external purposes.

2.3 Promass 63 measuring system

Mechanically and electronically, the Promass 63 measuring system is designed for maximum flexibility. Transmitters and sensors can be combined in any variation.

The measuring system consists of:
- transmitter Promass 63
- sensor Promass A, I, M or F

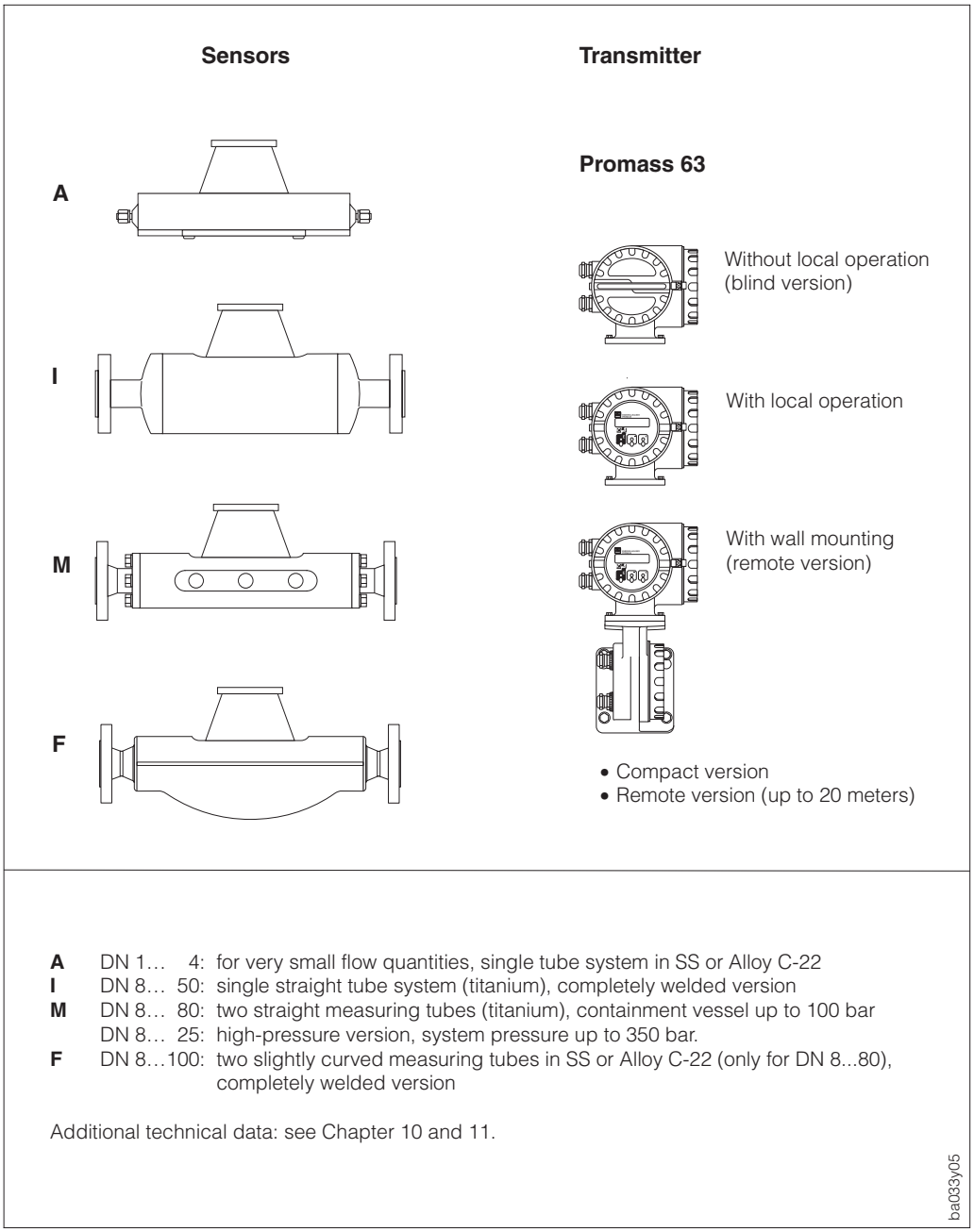


Fig. 3
Promass 63 measuring system

Caution!
The Promass 63 PROFIBUS-PA measuring system is available with various approvals. Your Endress+Hauser representative will be pleased to supply information on the approvals presently available. All Ex information and specifications are included in a separate documentation which can be obtained from Endress+Hauser on request.

3 Mounting and Installation

Warning!
- All instructions provided in this section are to be observed at all times in order to ensure safe and reliable operation of the measuring system.
- Mounting regulations and technical specifications for Ex-certified instruments (PROFIBUS-PA) may differ from those shown below. All mounting regulations and connection values in the Ex documentation must, therefore, be strictly observed.

Warning!

3.1 General information

Protection IP 67 (EN 60529)
The instruments fulfil all IP 67 requirements . After successful installation in the field or after servicing, the following points always have to be observed in order to guarantee IP 67 protection:

- Housing gaskets must be clean and undamaged when inserted in the gasket groove. The gaskets may need to be dried, cleaned, or replaced.
- All housing screws and the housing cover must be firmly tightened.
- The cables used for connecting must have the correct outer diameter.
- The cable gland must be firmly tightened (see Fig. 4).
- The cable must loop down before entering the cable gland to ensure that no moisture can enter it (see Fig. 4).
- Any cable glands not used are to be replaced with a blind plug.
- The protective bush should not be removed from the cable gland.

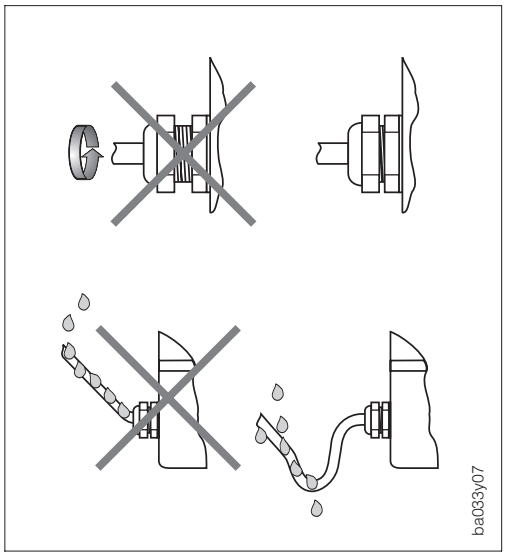


Fig. 4
Mounting notices for cable glands

Temperature ranges
- The maximum approved ambient and fluid temperatures must to be observed (see page 131).
- An all-weather cover should be used to protect the housing from direct sunlight when mounting in the open. This is especially important in warmer climates and with high ambient temperatures.

Tracing, thermal insulation
With certain fluids, heat transfer at the sensor has to be avoided. A wide range of materials can be used to provide the necessary insulation.
Heating can be provided either electrically, e.g. by heating sheets or supplied by copper pipes with heated water or steam. Heating elements for heat tracing are available for all sensors.

Caution!
Danger of the electronics overheating! The connector between the sensor/transmitter housings of the compact version must not be insulated or heated.
The connection housing of the remote version should also be kept free.
Depending on the fluid temperature, certain installation positions are to be observed (see Fig. 8).

Caution!

System pressure
It is important to avoid cavitation as this can affect the oscillation of the measuring tubes.
- No special measures need to be taken for fluids which have properties similar to those of water under normal conditions.
- With volatile liquids (hydrocarbons, solvents, liquified gas), the vapour pressure must not drop below a point where the liquid begins to boil. It is also important not to release gases which are found naturally in many liquids. This can be prevented by maintaining a sufficiently high system pressure.


Note!

Note!
The sensor is, therefore, best mounted:
- on the discharge side of pumps (avoiding low pressure)
- at the lowest point in vertical piping

Purge connections
The pressure vessel of the sensor is filled with dry nitrogen (N2). The purge connection may only be opened if the pressure vessel is to be immediately filled with a dry, inert gas (corrosion protection!)

3.2 Transporting to the measuring point (DN 40…100)

For transport, instruments with nominal diameters of DN 40…100 are not to be lifted by the transmitter housing or by the connection housing of the remote version.

Use shoulder straps for transport to the measuring points and wrap them around both process connections (see Fig. 5). Avoid using chains as this might damage the housing, e.g. scratch the paint.


Warning!

Warning!
Danger of injury by instrument slipping! The centre of gravity of the entire device is higher than the two suspension points of the shoulder straps. Make sure that the device does not turn or slip due to the higher centre of gravity during transport.

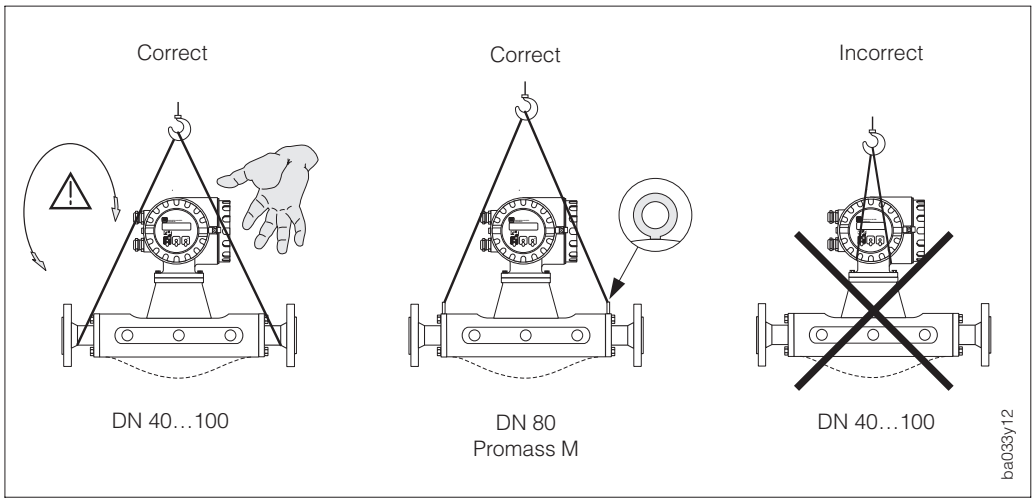


Fig. 5
Transporting of the sensor DN 40…100

3.3 Mounting

- No special fittings such as brackets are required. External forces are absorbed by the construction of the device, e.g. by the containment vessel.
- For mechanical reasons, and to protect the pipeline, support is recommended for heavy sensors.
- Due to the high frequency of the measuring pipes, the Promass 63 measuring system is unaffected by plant vibration.
- When mounting, no special precautions need to be taken for turbulence-generating devices (valves, bends T-pieces, etc.) as long as no cavitation occurs.

The following installation instructions are to be carried out for correct operation of the measuring system:

Orientation (Promass A)

Vertical
This is best with the flow direction upwards. Entrained solids sink downward and gases rise away from the measuring pipe when the fluid is not flowing. This also allows the measuring pipe to be completely drained and protects it from solids build-up.

Horizontal
When correctly installed, the transmitter housing is either above or below the piping. This assures that no gas bubbles may collect or solids be deposited in the curved measuring tube.

Wall and post mounting
To avoid excessive stress on the material around the process connection, the sensor should not be suspended in the piping, without support or fixation.

The sensor housing base plate permits table, wall, or post mounting.
The post mounting requires a special mounting set:

DN 1, 2: Order No. 50077972
DN 4: Order No. 50079218

DN	A [mm]	B [mm]
1	145	160
2	145	160
4	175	220

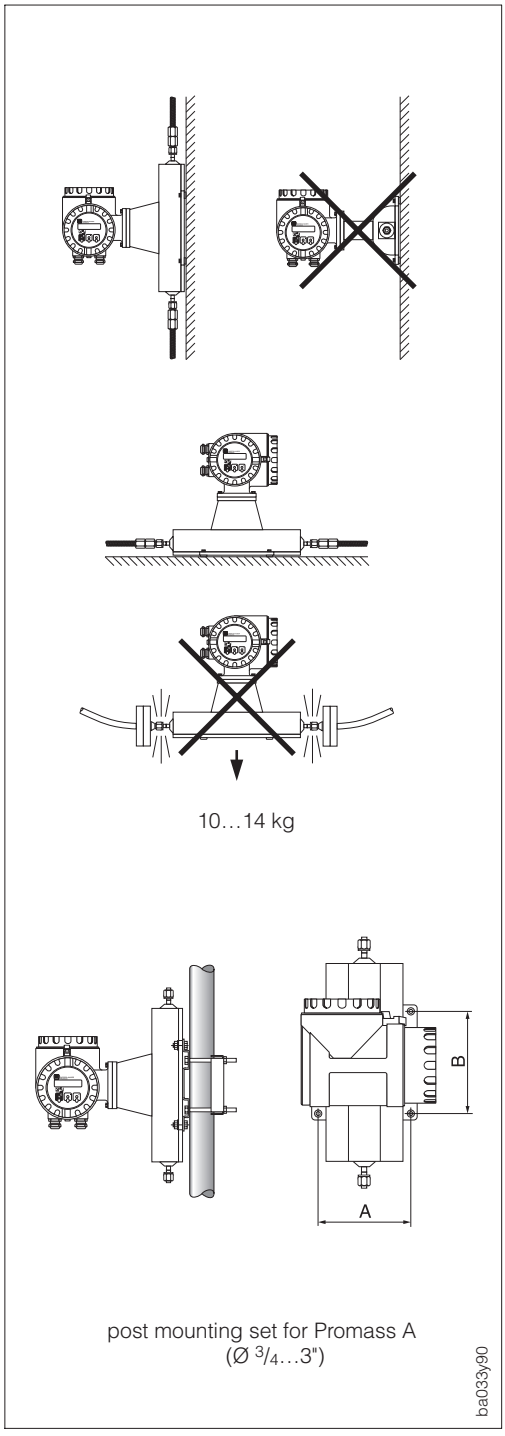


Fig. 6
Orientation Promass A

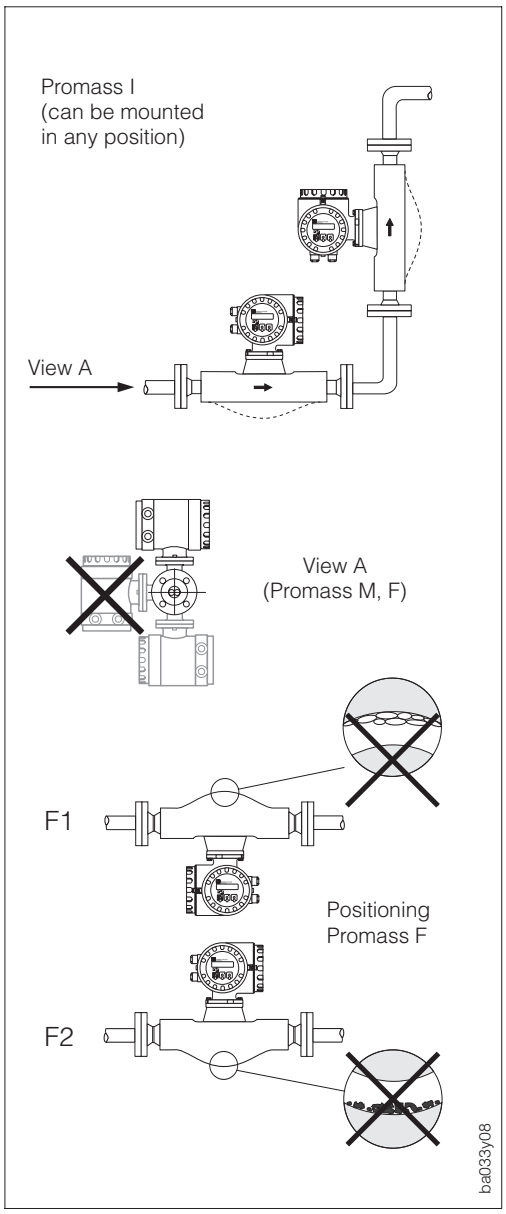


Fig. 7
Promass M, F orientation

Orientation (Promass I, M, F)

Vertical
This is best with the flow direction upwards. Entrained solids sink downward and gases rise away from the measuring pipes when the fluid is not flowing. This also allows the measuring pipes to be completely drained and protects them from solids build-up.

Horizontal
- Promass I (single pipe)
  Because of the straight measuring tube, the sensor can be mounted in any position in the piping.

- Promass M, F
  The measuring pipes must lie side by side. When correctly installed, the transmitter housing is either above or below the piping (see view A).

- Promass F
  Promass F measuring pipes are slightly curved. Therefore, for horizontal installation the sensor position is to be adapted to the fluid properties:

  F1: not suitable for outgassing fluids
  F2: not suitable for fluids with solids content

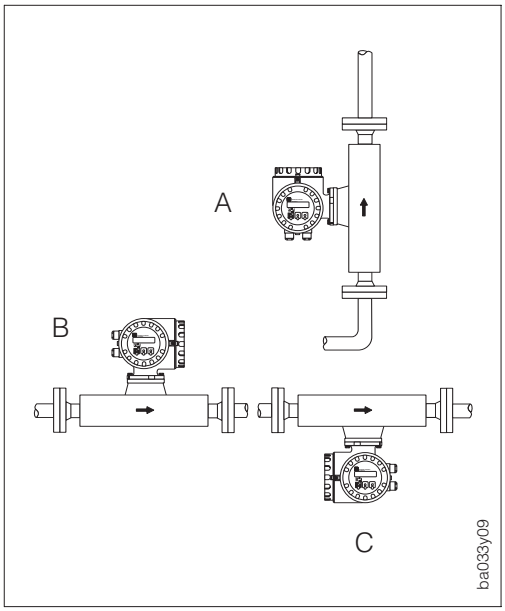


Fig. 8
Fluid temperature and orientation

Fluid temperature/Orientation
To ensure that the permitted ambient temperature range for the transmitter is not exceeded (–25…+60 °C) positioning is recommended as follows:

High fluid temperature
- Vertical piping: Position A
- Horizontal piping: Position C

Low fluid temperature
- Vertical piping: Position A
- Horizontal piping: Position B

Mounting location

With liquid flows, air or entrained gases in the measuring tube may cause errors in measurement and, therefore, the following mounting locations are to be avoided:

- Do not install at the highest point of the piping.
- Do not install in a vertical pipeline directly upstream of an open pipe outlet.

Correct installation is still possible in a vertical pipeline using the recommendation in the adjacent Figure. Restrictions in the piping or an orifice with a smaller cross section than the flowmeter can prevent the sensor from running empty during measurement.

Diameter	Ø orifice / pipe restriction
DN 1	0.8 mm
DN 2	1.5 mm
DN 4	3.0 mm
DN 8	6.0 mm
DN 15	10.0 mm
DN 15 *	15.0 mm
DN 25	14.0 mm
DN 25 *	24.0 mm
DN 40	22.0 mm
DN 40 *	35.0 mm
DN 50	28.0 mm
DN 80	50.0 mm
DN 100	65.0 mm

* DN 15, 25, 40 “FB”= full bore versions of Promass I

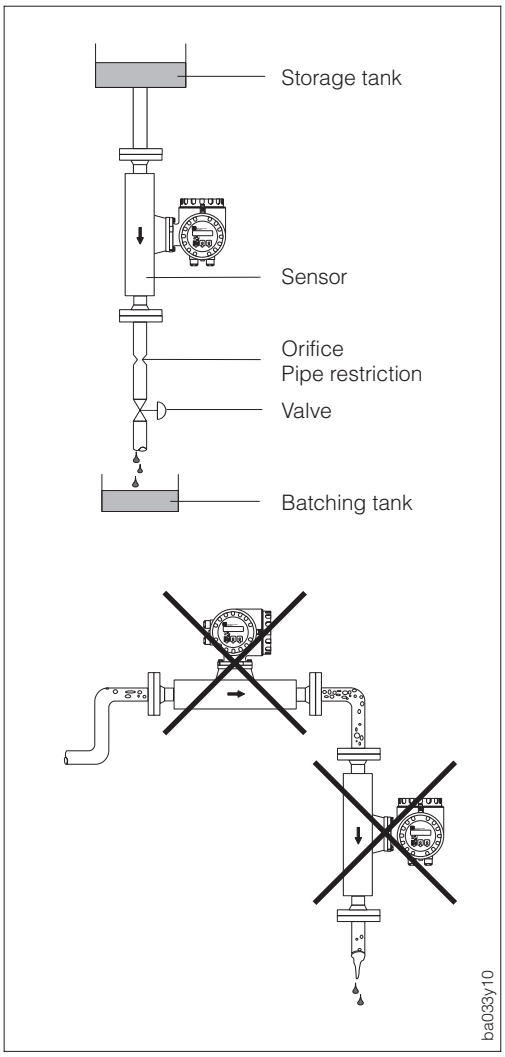


Fig. 9
Mounting location (vertical piping)

Mounting the transmitter

A wall bracket for the transmitter housing and a 10 or 20 m ready-to-use cable to the sensor is delivered with the remote version.

For post mounting, the transmitter, a special mounting set is available (order no. 50076905).

Caution!

- Please pay attention to page 21 “Connecting the remote version”.
- Fix the cable or lay it in a conduit.
- Do not lay cable in the vicinity of electrical machines or switching elements.
- In case of the remote version, the connection housing of the sensor should not be insulated.
- Ensure potential equalization between sensor and transmitter (see page 21).

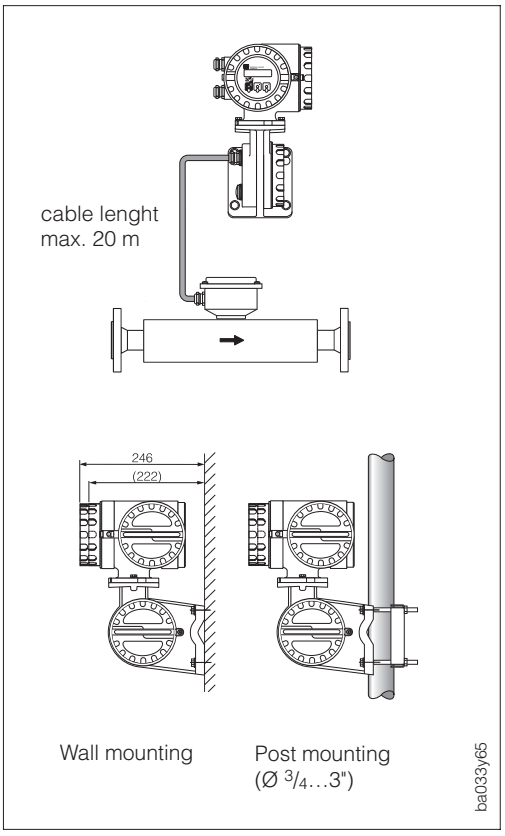


Fig. 10
Mounting the transmitter (remote version)

3.4 Rotating the transmitter housing and local display

The Promass 63 transmitter and display field can be rotated in 90° steps so that the instrument can be mounted in almost any position in the piping to ensure easier handling and viewing.

Warning!

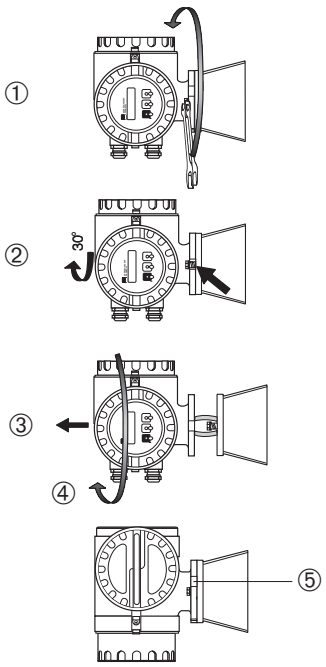
Warning!
The following procedure cannot be used for units with an explosion proof housing. The separate Ex-documentation has to be strictly observed.

Rotating the transmitter housing

1. Loosen the mounting screws (approx. two turns).
2. Rotate the transmitter housing as far as the screw slots.
3. Carefully pull out the transmitter housing.

   Caution!
   Do not damage the connection cable between the transmitter and sensor!
4. Rotate the transmitter housing in the position required.
5. Push back in the latch again and tighten the two srews securely.

Caution!



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Rotating the local display

Warning!
Danger of electrical shock!
Switch off power supply before opening the housing.

1. Loosen the safety claw (3 mm Allen screw).
2. Unscrew the electronics compartment cover.
3. Undo both Phillips screws.
4. Rotate the display.
5. Retighten the Phillips screws.
6. Replace the electronics compartment cover.
7. Securely tighten the safety claw Allen screws.

Warning!

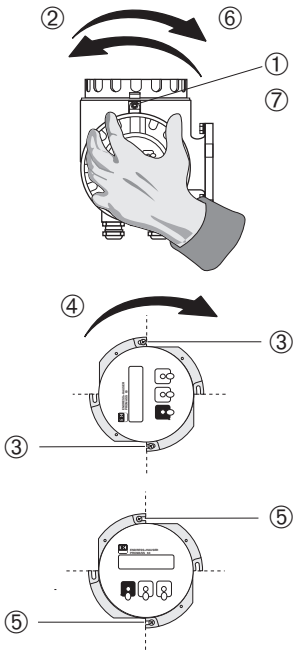

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Fig. 11
Rotating the transmitter housing and the local display

4 Electrical Connection

4.1 General Information

Warning!
- The information in Section 3.1 must be observed in order to maintain IP 67 protection.
- When connecting flowmeters with Ex approval (PROFIBUS-PA), all appropriate instructions and connecting diagrams in the seperate Ex documentation to this Operating Manual must be observed. The E+H representative will be pleased to help you.
- When using the remote version, only sensor and transmitter with the same serial number are to be connected together. Communication errors can occur if this is not the case.

4.2 Connecting the transmitter

Warning!
- Danger of electric shock! Switch off the power supply before unsrewing the cover.
- Connect the ground wire to the ground terminal on the housing before turning on the power supply.
- Check that the local power supply and frequency agree with the information on the nameplate. All relevant national regulations for mounting must be observed.

1. Loosen the screws of the safety grip (3 mm Allen key)
2. Unscrew the cover of the terminal compartment.
3. Push the power and signal cables through the appropriate cable glands.
4. Wire up according to the connection diagrams (see diagram in the srew cover or page 18 resp. 20):

   Power supply is connected to Terminal 1 (L1 or L+), Terminal 2 (N or L–) and the ground Terminal.
   – Stranded-wire cabling: cover with an end sleeve max. 4 mm^2
   – Single wire cabling: max. 6 mm^2
5. Screw the cover of the terminal compartment securely back onto the transmitter housing.
6. Tighten the Allen screws of the safety grip securely.

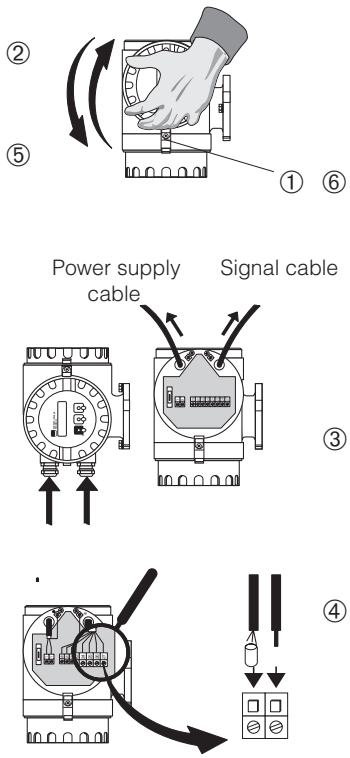
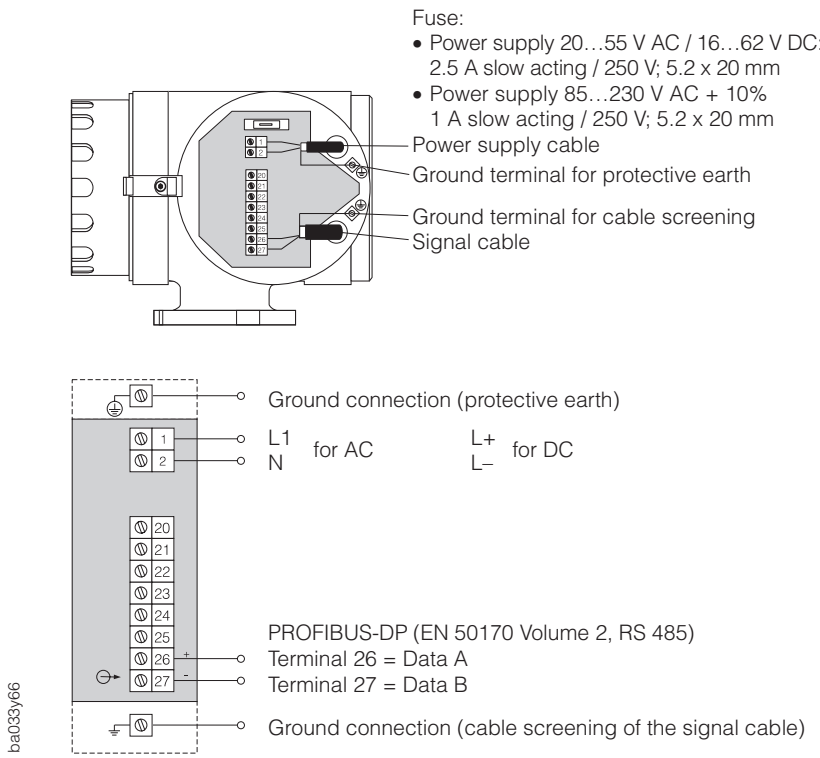


Fig. 12
Connecting the Promass 63 transmitter

4.3 Connection diagram for PROFIBUS-DP

Warning!

Warning!
Risk of electric shock! Switch off the power supply before unscrewing the cover of the terminal compartment of the transmitter.



Note!

Note!
- The grounding design of the plant is to be considered.
  The bus cable shield should always be connected to ground at both ends!

- Select bus address by: a) local operation (see page 89)
  b) miniature switches on the communication board (see page 25)

- Spur networks
  Length of spur cables up to 1.5 MBaud < 6.6 m.
  No spur cables should be used for transmission rates > 1.5 MBaud

  The cable between a distribution box and the bus driver in the field transmitter is called a spur cable. Experience with plants has shown that the planning of spur cables should be carried out very carefully. It cannot be assumed that the total lengths of all spur cables are always less than < 6.6 m for a transmission rate up to 1.5 MBaud. The actual layout of the field transmitters plays a significant role. It is thus recommended that, if possible, no spur cables are used for transmission rates > 1.5 MBaud. If spur cables must be used, then these should not have bus terminator.

Fig. 13
Electrical Connection
Promass 63 PROFIBUS-DP

Setting the end-of-line resistors of the bus cable
Because incorrect adjustments of impedance lead to reflections along the cabling, and can thus cause faulty communication, it is important to have the correct end-of-line resistors on the cabling.

Warning!
Risk of electric shock! Switch off the power supply before unscrewing the cover of the terminal compartment of the transmitter.

Warning!

The switches (termination switches SW1) are on the communication board PROFIBUS-DP RS 485 (see Fig. below).
For transmission rates up to 1.5 MBaud, the end-of-line resistor on the last transmitter on the bus is set by the termination switch SW1 to: ON - ON - ON - ON.

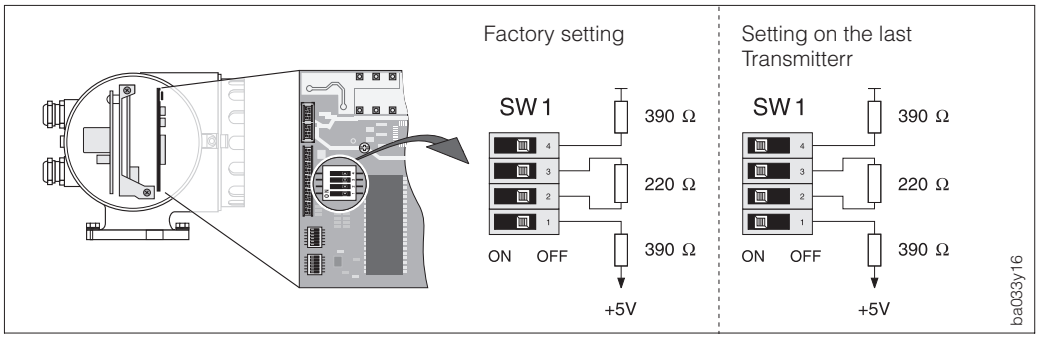


Fig. 14
Setting transmitter resistors

If the transmitter is to operate at a baud rate greater than 1.5 MBaud, then because of reflections along the cabling caused by the capacitive load of the peripherals, an external end-of-line connector is to be used, e.g. with a 9-pole Sub D connector with integrated inductance.

Note!
It is generally recommended to use an external terminator, because in case of an instrument defect this prevents a failure of the entire bus.

Note!

Transmission cabling
The maximum permissible cable length (segment length) of a PROFIBUS system depends on the speed of transmission. Only 32 transmitters, according to the fieldbus standard PROFIBUS-DP, may be operated within any one segment.

Maximum length of segment as a function of the baud rate:

Baud rate [kBit/s]	9.6 – 187.5	500	1500	12000
Length of a segment [m]	1000	400	200	100

The specifications on the maximum segment length in the table above refer to cable Type A specified in the PROFIBUS standard given in the table below with the following parameters:

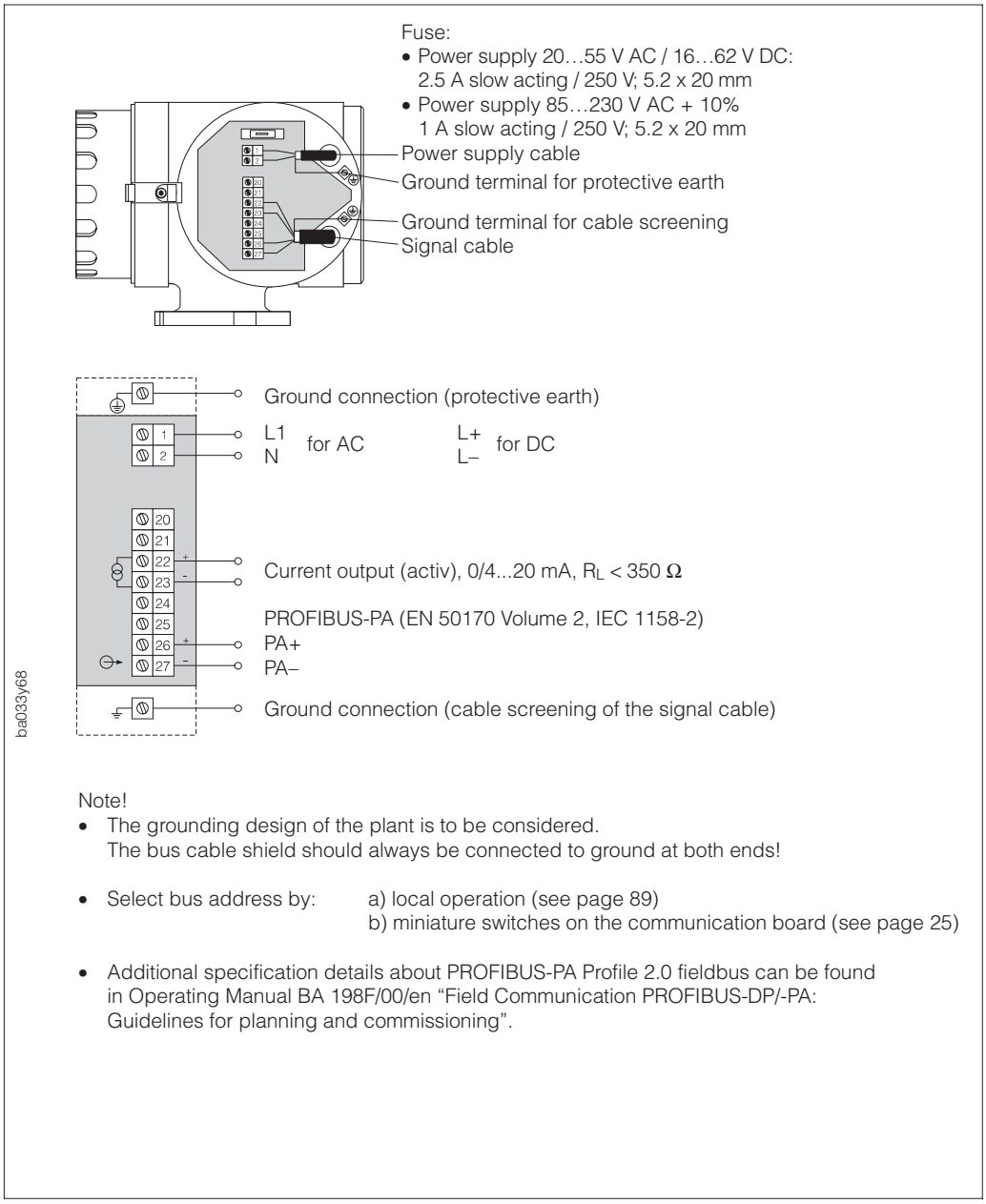
Spezifications of PROFIBUS RS 485 cable Type A:

Characteristic impedance	135 to 165 Ω, at a measurement from 3 to 20 MHz
Cable capacitance	< 30 pF per meter
Cross section area	> 0.34 mm^2, to AWG 22
Cable type	Twisted pairs, 1 x 2, 2 x 2 or 1 x 4 cable
Loop resistance	110 Ω per km
Signal attenuation	max. 9 dB over the entire lenght of the cable section
Screening	Braided copper screening, or braided and film screening

4.4 Connection diagram for PROFIBUS-PA

Warning!

Warning!
Risk of electric shock! Switch off the power supply before unscrewing the cover of the terminal compartment of the transmitter.



Note!

Note!
- The grounding design of the plant is to be considered.
  The bus cable shield should always be connected to ground at both ends!
- Select bus address by: a) local operation (see page 89)
  b) miniature switches on the communication board (see page 25)
- Additional specification details about PROFIBUS-PA Profile 2.0 fieldbus can be found in Operating Manual BA 198F/00/en “Field Communication PROFIBUS-DP/-PA: Guidelines for planning and commissioning”.

Fig. 15
Electrical Connection
Promass 63 PROFIBUS-PA

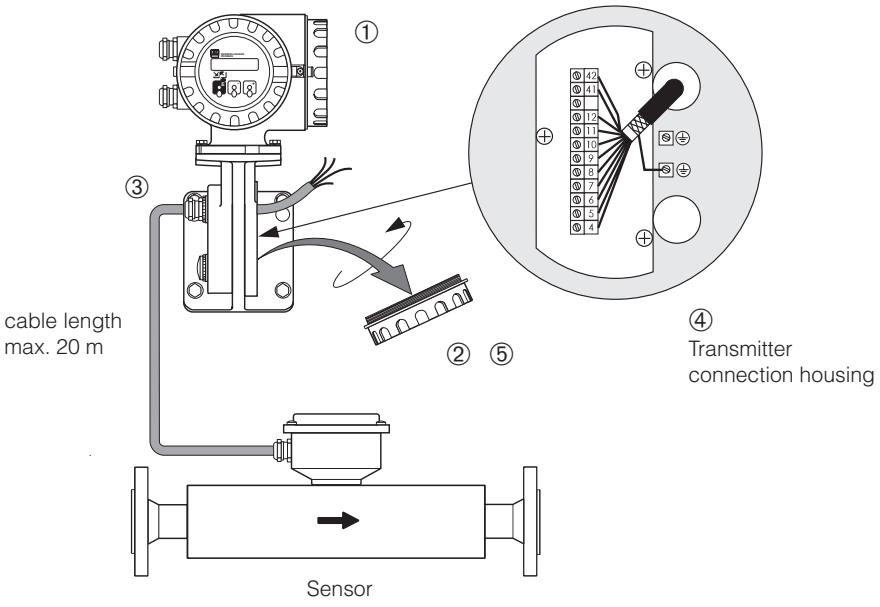
4.5 Connection the remote version PROFIBUS-DP/-PA

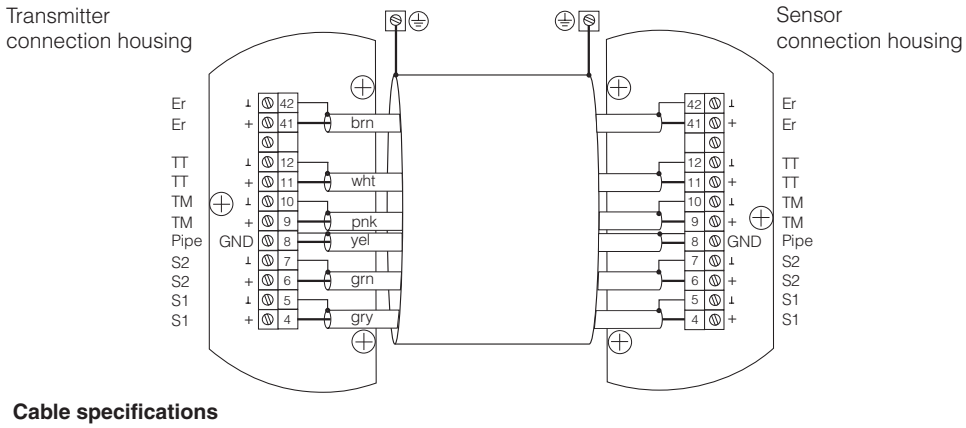
The remote version is supplied with a ready-to-use cable of 10 or 20 metres which is already connected to the sensor.

Warning!

Warning!
Danger of electric shock! Switch off the power supply before unscrewing the cover of electronics area from the transmitter housing and the cover from the connection housing.

1. Connection in the terminal area is carried out as described for the compact version (see page 17 ff.).
2. Loosen the safety claw (3 mm Allen key). Unscrew the cover of the transmitter connection housing.
3. Push the connection cable through the appropriate cable gland.
4. Connect the cable according to the electrical connection diagram (see Figure below or diagram in the screw cover).
5. Screw on the connection housingh cover again securely. Tighten the Allen screws of the safety grip securely.





Cable specifications
brn = brown, wht = white, pnk = pink, yel = yellow, grn = green, gry = grey
6×0.38 mm² PVC cable with common screening and individually screened cores.
Conductor resistance: ≤ 50 Ω/km; Capacitance: core / screen ≤ 420 pF/m;
Permanent operating temperature: –25…+90 °C

With the remote-mounted version the cables between sensor and transmitter must always be screened and grounded at both ends. This is done at the ground terminals inside the connection housing of the sensor and the transmitter.

Fig. 16
Connecting the remote version

5 Communication

5.1 PROFIBUS-DP interface

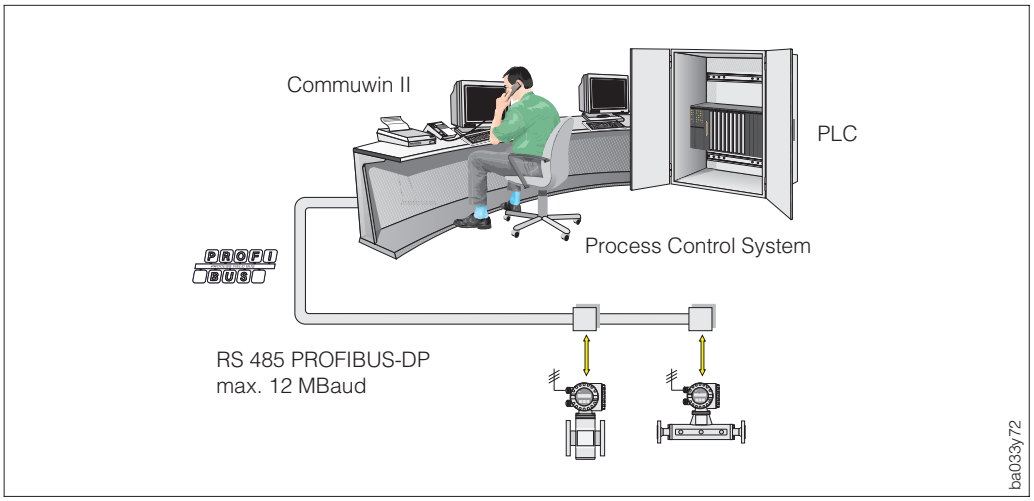


Fig. 17
General layout of the PROFIBUS-DP

General
The Promass 63 can be equipped with a PROFIBUS-DP (Decentralised Peripheral) interface according to the fieldbus standard PROFIBUS-DP, EN 50170 Volume 2. This enables the exchange of data with process control systems which comply with this standard. Integration into a control system must be performed in accordance with the specifications for PROFIBUS-PA profiles 2.0.

Transmission speed
The maximum PROFIBUS-**DP** bus speed of the Promass 63 is 12 MBaud.

Note!
- The Promass 63 can automatically identify the speed of data transmission. The instrument must be reset before loading a new speed of data transmission ("SYSTEM RESET" in the function group "SYSTEM PARAMETERS" or else the power should be switched off for a short time and than switched on again.
- Information on bus end-of-line resistors is given on page 19.

Note!

Communication partner
The Promass 63 always acts as a slave in a control system and, depending on the type of application, can therefore exchange data with one or several masters. The master can be a process control system, a PLC or a PC with a PROFIBUS-DP plug-in communication board.

Batching function
In contrast to the instrument functions of the Promass 63 without PROFIBUS, the internal batching procedure is not integrated into PROFIBUS-DP functions as the instrument has no relay function. However, for certain applications, it is possible to have a batching procedure using the function of the totaliser.

Note!
Additional specification details about PROFIBUS-PA Profile 2.0 fieldbus can be found in Operating Manual BA 198F/00/en "Field Communication PROFIBUS-DP/-PA: Guidelines for planning and commissioning".

Note!

5.2 PROFIBUS-PA Interface

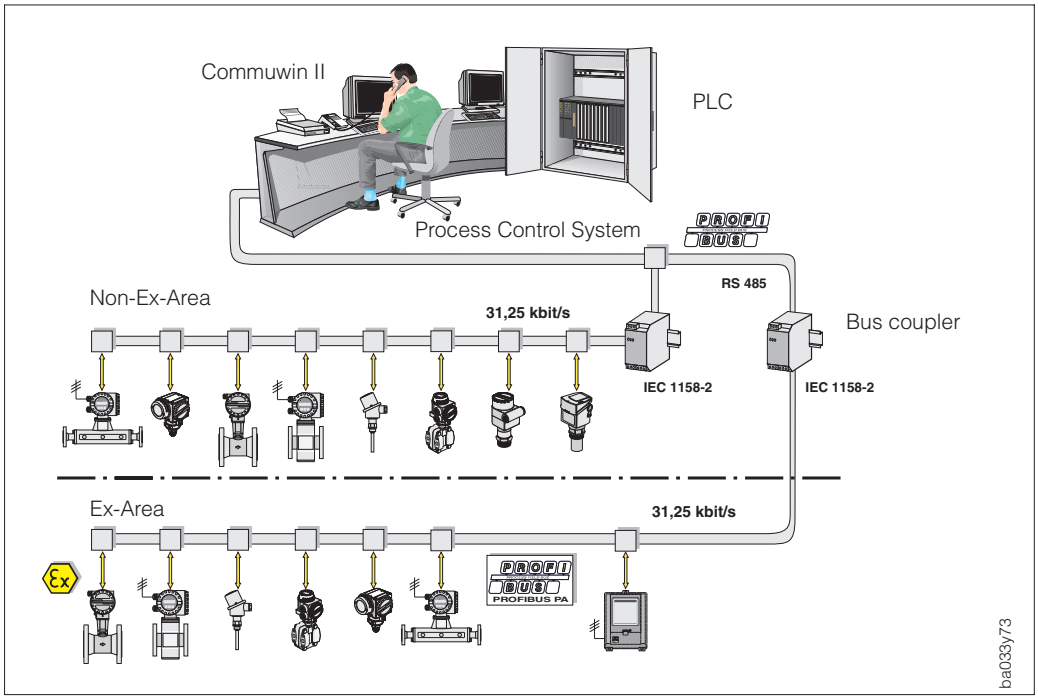


Fig. 18
General layout of the PROFIBUS-PA

General
The Promass 63 can be equipped with a PROFIBUS-PA (EN 50170) interface according to the fieldbus standard PROFIBUS-DP, EN 50170 Volume 2. This enables the exchange of data with process control systems which comply to this standard. Integrating into a control system must be in accordance with the specifications for PROFIBUS-PA profiles 2.0.

Communication partner
The Promass 63 always acts as a slave in a control system and, depending on the type of application, can therefore exchange data with one or several masters. The master can be a process control system, a PLC or a PC with a PROFIBUS-DP plug-in communication board.

Note!
In project management, note that the current consumption of the Promass 63 is 12 mA.

Caution!
In order to protect the PROFIBUS-PA segment from the effects of any serious faults occurring in the instrument (e.g. short circuiting), the IEC 1158-2 interface is equipped with a safety fuse. When the fuse blows, the instrument is permanently separated from the bus. The COM module must then be replaced (see also page 108).

Batching function
In contrast to the instrument functions of the Promass 63 without PROFIBUS, the internal batching procedure is not integrated into PROFIBUS-PA functions as the instrument has no relay function. However, for certain applications, it is possible to have a batching procedure using the function of the totaliser.

Note!
Additional specification details about PROFIBUS-PA Profile 2.0 fieldbus can be found in Operating Manual BA 198F/00/en “Field Communication PROFIBUS-DP/-PA: Guidelines for planning and commissioning”.

5.3 Setting the device addresses on the PROFIBUS-DP /-PA

Note!

- Adressing:
  The address must always be set for PROFIBUS-DP/PA transmitters. Valid addresses are 0...125. Every address can only be assigned once in a PROFIBUS-DP/-PA network. If an address is not correctly set, then the transmitter is not recognised by the master.
  The address 126 is reserved for the initial start-up and for service purposes.

- Setting when delivered:
  All transmitters are sent from the factory with the address 126 and software addressing. In the function group “COMMUNICATION” the option <local> is activated in the function “SYSTEM CONFIG.”. In this setting, the transmitter can be addressed either locally via local operation.

PROFIBUS-DP/-PA addressing through local operation

See page 89, Function “BUS ADDRESS”.

PROFIBUS-DP/-PA addressing using the DIP switches

Procedure

Warning!
Risk of electric shock! Switch off the power supply before unscrewing the cover of the transmitter housing.

❶ Loosen the safety claw Allen screws (3 mm Allen key).
❷ Unscrew the cover of the transmitter electronics compartment.
❸ Remove the local display unit (if present) by unscrewing the mounting screws of the display module.
❹ Configure the position of the DIP switches on the communication board.
❺ Re-assemble in reverse sequence.

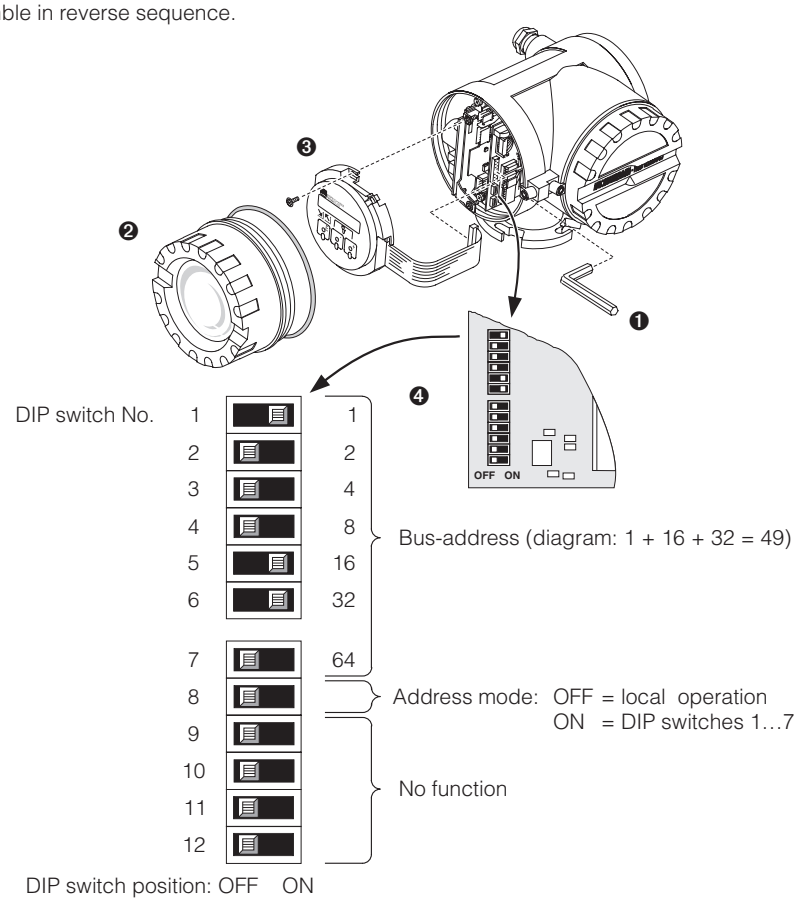


Fig. 19
Addressing using the DIP switches on the communications board

5.4 Switching on the instrument

Before switching on the measuring system, the following checks should be carried out again:

- *Installation*
  Check that the directional arrow on the nameplate agree with the actual flow direction in the piping.

- *Electrical connection*
  Check electrical connections and terminal coding. Check that the local power supply and the frequency agree with the information stated on the nameplate.

If these checks are successful, then switch on the power supply.
The measuring system runs though a series of internal checks and is ready for use.
During this procedure the following sequence of messages is shown on the display:

P	R	O	M	A	S	S		6	3					
V	3	.	0	2	.	0	0		P	B	U	S		

Display of the currently installed software version on the communication board and the identification of the communication board.

S	:		S	T	A	R	T	-	U	P				
			R	U	N	N	I	N	G					

Having started up successfully, normal operation begins. On the display two freely selectable measured variables appear simultaniously.

	5	9	.	8	7	0		k	g	/	m	i	n	
			1	7	8	3	0	.	5		k	g		

Example:
Line 1 → Mass flow
Line 2 → Totaliser

	2	9	0	.	8	2		k	g	/	h			↔
			2	.	1	0	8	0		k	g			

Communication with PROFIBUS-DP master is displayed in the “Home position” by an alternatively flashing double arrow.
During configuration and in case of error reports, the double arrow is masked out.


Note!

Note!
- If the keys ⊞ have been simultaniously activated during start up, the display messages are shown in english and with maximum contrast.
- If the start up is not successful, an error message is shown indicating the cause.


Caution!

Caution!
The type of access to the instrument is set in the function “SYSTEM CONFIG.”, within the function group “COMMUNICATION”.

Operation
- In mode **<local>**, the instrument is operated on site.
- In mode **<remote>**, the instrument is operated via the PROFIBUS network using an acyclic Class II master such as Commuwin II.

Switching between <local> and <remote> modes does not affect the cyclic exchange of measured values. When switching over, only the value of the status, the 5th byte of the actual measured value block, is changed (see Table on page 30).

5.5 System integration

The device specific data file (GSD) is required for engineering a PROFIBUS-DP network. The GSD (plain text file) contains, for example, a description of the speed the instrument used to transmit data and in which format the PLC is to receive the digital information from the transmitter.

Each instrument is given an identification number (ID No.) by the PROFIBUS Trade Organization (PTO). The name of the device master file (GSD) is derived from this. For Endress+Hauser, this ID No. always starts with "15XX".

Name of the instrument	ID-No.:	GSD	Type-File	Bitmaps
Promass 63 PROFIBUS-PA	1506 (hex)	EH__1506.gsd	EH_1506.200	EH_1506_d.bmp EH_1506_n.bmp EH_1506_s.bmp
Promass 63 PROFIBUS-DP	1512 (hex)	EH__1512.gsd	EH_1512.200	EH_1512_d.bmp EH_1512_n.bmp EH_1512_s.bmp

The GSD-Files of all Endress+Hauser data can be obtained as follows:

- Internet: Endress+Hauser → http://www.endress.com
  (Product Avenue → Downloadstreet → Field Communication St.)
  PTO → http://www.profibus.com
  (GSD libary)

- As a diskette from Endress+Hauser: Order number 943157-0000

Contents of the download file from the internet and on the diskette:
- All Endress+Hauser GSDs
- Endress+Hauser type files
- Endress+Hauser bitmap files
- Comprehensive information on the instruments

Handling GSD/type files
GSD files must be loaded in a specific subdirectory of the PROFIBUS-DP project management software of your PLC.

Example 1
The project management software Siemens STEP 7 of the Siemens PLC S7-300/400 is in the subdirectory ...\siemens\step7\s7data\gsd.
Bitmap files also belong to the GSD files. The measuring point is shown graphically using these bitmap files. These files must be loaded into the subdirectory ...\siemens\step7\s7data\nsbmp.

Example 2
Type files (x.200 files) are required if a Siemens S5 PLC is being used and the PROFIBUS-PA network is being designed with the project management software COM ET 200.

Example 3
There is a subdirectory in the GSD directory containing GSD files with a standard DP identification code (0 x 94). These files are to be used with, e.g. a PLC 5 from Allen-Bradley.

For other project management software, please contact the manufacturer of your PLC for the correct subdirectory.

5.6 Cyclic data exchange

Structure of a cyclic file telegram
Using Data_Exchange, a PLC can send the output data to a Promass 63 and read the input files in an answer telegram. For optimum configuration of the Promass 63, the cyclic file telegram has the following structure:

PLC → Promass 63 (Output-Data)

Byte	Data	Access	Data format	Units
0	Control	write	Every time this byte is changed from 00h to another digit, a binary control is carried out by the cyclic service. Changing from any digit to 00h has no effect. 0 → 1: Reset Totalizer 1 0 → 2: Reset Totalizer 2 0 → 3: Reset Totalizer 1 & 2 0 → 4: Zero point adjustment 0 → 5: Activate positive zero return 0 → 6: Deactivate positive zero return 0 → 7...255: Reserved	—

Promass 63 → PLC (Input-Data)

Byte	Data	Access	Data format	Units
0, 1, 2, 3	Mass flow	read	32-digit floating point number (IEEE-754)	kg/s
4	Status Mass flow	read	see the status code on page 31	—
5, 6, 7, 8	Totalizer 1	read	32-digit floating point number (IEEE-754)	default: kg
9	Status Totalizer	read	see the status code on page 31	—
10, 11, 12, 13	Density	read	32-digit floating point number (IEEE-754)	kg/m3
14	Status Density	read	see the status code on page 31	—
15, 16, 17, 18	Temperature	read	32-digit floating point number (IEEE-754)	K
19	Status Temperature	read	see the status code on page 31	—
20, 21, 22, 23	Totalizer 2	read	32-digit floating point number (IEEE-754)	default: off
24	Status Totalizer	read	see the status code on page 31	—
25, 26, 27, 28	Volumeflow	read	32-digit floating point number (IEEE-754)	l/s
29	Status Volumeflow	read	see the status code on page 31	—
30, 31, 32, 33	Std. Volumeflow	read	32-digit floating point number (IEEE-754)	Nl/s
34	Status Std. Volumeflow	read	see the status code on page 31	—
35, 36, 37, 38	Targetflow	read	32-digit floating point number (IEEE-754)	kg/s or l/s
39	Status Targetflow	read	see the status code on page 31	—
40, 41, 42, 43	Carrierflow	read	32-digit floating point number (IEEE-754)	kg/s or l/s
44	Status Carrierflow	read	see the status code on page 31	—
45, 46, 47, 48	Std. Density	read	32-digit floating point number (IEEE-754)	%
49	Status Std. Density	read	see the status code on page 31	—


Note!

Note!
The system units in the table above correspond to the default factory units which are transmitted in the cyclic data exchange. They are only in part identical to the default units shown on the local display.

General Information
The appropriate function in the instrument must be activated in order to reserve measured values for those data blocks dependent on device settings.
When the instrument is delivered, the data blocks mass flow, Totaliser 1, density and temperature are activated. Data blocks still available must be set via local operation or by using project management software Class II master, such as Commuwin II.

If not all output variables of the Promass 63 are used, then individual data blocks can be deactivated using the "FREE PLACE" block in the project management software (Class I master). In order to achieve the appropriate structures for the cyclic data telegram, the specification FREE PLACE (00h) must be sent to the transmitter for these non-activated blocks (see also the example for constructing a data telegram on page 30).
The FREE PLACE block is contained in the GSD.

Note!
The status 08 hexadecimal (hex) in Class I master is shown for those data blocks which are not activated.


Note!

Only those data blocks should be activated which are to be processed in the control system. This increases the data rate in a PROFIBUS-DP/-PA network. The cyclic exchange of data to the Class I master (e.g. PLC) is shown on the local display by a flashing double arrow.

Caution!
- When data blocks are activated, their place in the sequence must be noted.
- The instrument must be reset before loading a new device configuration ("SYSTEM RESET" in the function group "SYSTEM PARAMETERS" or else the power should be switched off for a short time and then switched on again).


Caution!

Note!
The measured values are transmitted to the Class I master in the system units as shown in the table on page 28 using the cyclic data exchange. If the unit of a measured value is changed by local operation, then this has no effect on the unit of this measured value in Class I master communication. Only after activating the function “UNIT TO BUS” in the function group “COMMUNICATION” is the modified system of units of the measured value transmitted to the Class I master.


Note!

IEEE floating point numbers
For converting a hex value into an IEEE floating point number for processing measured values. Measured values are transmitted to the Class I master in the IEEE-754 number format as shown below:

Byte n			**Byte n + 1**			**Byte n + 2**			**Byte n + 3**		
Bit 7	Bit 6	Bit 0	Bit 7	Bit 6	Bit 0	Bit 7		Bit 0	Bit 7		Bit 0
VZ	2^7 2^6 2^5 2^4 2^3 2^2 2^1		2^0	2^{-1} 2^{-2} 2^{-3} 2^{-4} 2^{-5} 2^{-6} 2^{-7}		2^{-8} 2^{-9} 2^{-10} 2^{-11} 2^{-12} 2^{-13} 2^{-14} 2^{-15}			2^{-16} 2^{-17} 2^{-18} 2^{-19} 2^{-20} 2^{-21} 2^{-22} 2^{-23}		
	Index			**Mantissa**		**Mantissa**			**Mantissa**		

Formula = $(-1)^{VZ} * 2^{(Index\ -127)} * (1 + Mantissa)$

Example: 40 F0 00 00 hex = 0100 0000 1111 0000 0000 0000 0000 0000 binary

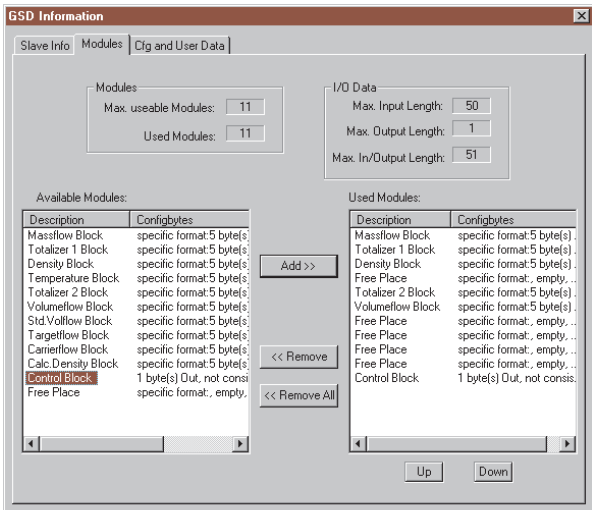
$$Value = (-1)^0 * 2^{(129-127)} * (1 + 2^{-1} + 2^{-2} + 2^{-3})$$
$$= 1 * 2^2 * (1 + 0.5 + 0.25 + 0.125)$$
$$= 1 * 4 * 1.875 = 7.5$$

Example for construction a data telegram
The configuration data (CHK_CFG) used in this example are:
[42h, 84h, 08h, 05h]; [42h, 84h, 08h, 05h]; [42h, 84h, 08h, 05h]; [00h];
[42h, 84h, 08h, 05h]; [42h, 84h, 08h, 05h]; [00h]; [00h]; [00h]; [00h]; 20h]

The cyclic data telegram contains 26 bytes of device data, with 6 blocks activated and 5 blocks deactivated.

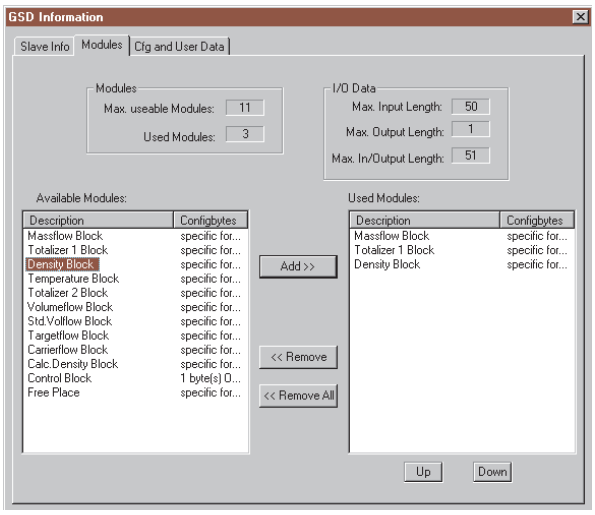
Byte Lenght	Data blocks	Status	Access	GSD block name	Configuration data (dependent on the PROFIBUS Master)
0 ..4	Massflow + Status	active	read	Massflow Block	42h, 84h, 08h, 05h
5.. 9	Totalizer 1 + Status	active	read	Totalizer 1 Block	42h, 84h, 08h, 05h
10 .. 14	Density + Status	active	read	Density Block	42h, 84h, 08h, 05h
—	Temperature + Status	inactive	read	Temperature Block	00h
15 .. 19	Totalizer 2 + Status	active	read	Totalizer 2 Block	42h, 84h, 08h, 05h
20 .. 24	Volumeflow + Status	active	read	Volumeflow Block	42h, 84h, 08h, 05h
—	Std. Volumeflow + Status	inactive	read	Std. Volflow Block	00h
—	Targetflow + Status	inactive	read	Targetflow Block	00h
—	Carrierflow + Status	inactive	read	Carrierflow Block	00h
—	Calc. Density + Status	inactive	read	Calc. Density Block	00h
0	Control	active	write	Control Block	20h

Example in an engineering software:



Example 1:
With this configuration, the following blocks will be transmitted to the DP master, with a data length of 25 input bytes and 1 output byte:
– Massflow + Status
– Totalizer 1 + Status
– Density + Status
– Totalizer 2 + Status
– Volumeflow + Status
– Control

FREE PLACE is to be selected for blocks which are not required:



Example 2:
With this configuration, the following blocks will be transmitted to the DP master, with a data length of 15 input bytes:
– Massflow + Status
– Totalizer 1 + Status
– Density + Status

Status code
Encoding the status according to PROFIBUS profiles “PROFIBUS-PA Profiles for Process Control Devices - General Requirements” V 2.0:

Status Code	Meaning	Condition of the instrument
00 Hex	non-specific	BAD
04 Hex	configuration-error	BAD
08 Hex	not connected	BAD
0C Hex	device failure	BAD
10 Hex	sensor failure	BAD
14 Hex	no communication (last usable value)	BAD
18 Hex	no communication (no usable value)	BAD
1C Hex	out of service	BAD
20 Hex	configuration error, variable not supported	BAD
40 Hex	non-specific	UNCERTAIN
44 Hex	last usable value	UNCERTAIN
48 Hex	substitute-set	UNCERTAIN
4C Hex	initial value	UNCERTAIN
50 Hex	sensor conversion not accurate	UNCERTAIN
54 Hex	engineering unit range violation	UNCERTAIN
58 Hex	sub-normal	UNCERTAIN
5C Hex	configuration error, value adapted	UNCERTAIN
64 Hex	empty pipe detection	UNCERTAIN
68 Hex	pos. zero return active	UNCERTAIN
80 Hex	ok	GOOD
81 Hex	LO_LIM (Alarm active)	GOOD
82 Hex	HI_LIM (Alarm active)	GOOD
83 Hex	low and high limit bit set value constant	GOOD
84 Hex	active block alarm	GOOD
88 Hex	active advisory alarm	GOOD
8C Hex	active critical alarm	GOOD
90 Hex	unacknowleged block alarm	GOOD
94 Hex	unacknowleged advisory alarm	GOOD
98 Hex	unacknowleged critical alarm	GOOD
9C Hex	good-local operating possible	GOOD
9D Hex	LO_LIM (Alarm active)	GOOD
9E Hex	HI_LIM (Alarm active)	GOOD
9F Hex	good-local operating possible low and high limit bit set value constant	GOOD
AC Hex	initiate fail safe	GOOD

Note!


Note!

- If the instrument detects the process error EPD (Empty Pipe Detection), in the mode **>remote<** (80 Hex) or in the mode **>local<** (9C Hex), the status of the measured value will be set to 64 Hex.
- If the zero point return is be activated in the mode **>remote<** (80 Hex) or in the mode **>local<** (9C Hex), the status of the measured value will be set to 68 Hex.
- To optimize a subsequent control process, it is recommended that the status of the measured value be analyzed.

5.7 Acyclic data exchange

Using acyclic functions, the Class II master is able to change the parameters in the blocks shown below, e.g. time constant of flow rate, type of function, deleting totalisers, etc.

The Promass 63 software consists of four different blocks corresponding to PROFIBUS-PA profile definitions:

- 1 *Physical* block
  The physical block contains device-specific information such as measuring point ID, software version, etc.

- 1 *Transducer* block for flow rate, temperature and density.
  The transducer block contains sensor data such as the calibration factor or nominal diameter.

- 2 *Function* blocks for totalizer
  The totaliser blocks enable the control system direct access to the totaliser of the Promass 63.

- *AI* block (AI = Analogue Input)
  This universal function block makes available to the control system all parameters required for the processing of measured variables given below (filtering, scaling, mode and status handling).

These AI blocks make available to the control system the parameters for determining mass, flow, temperature and density.

The Promass 63 software contains the following block model:
8 AI blocks (AI = Analog Input)

These analogue input blocks include:
- Massflow
- Density
- Temperature
- Volumeflow
- Std. Volumeflow
- Targetflow
- Carrierflow
- Calc. Densitye

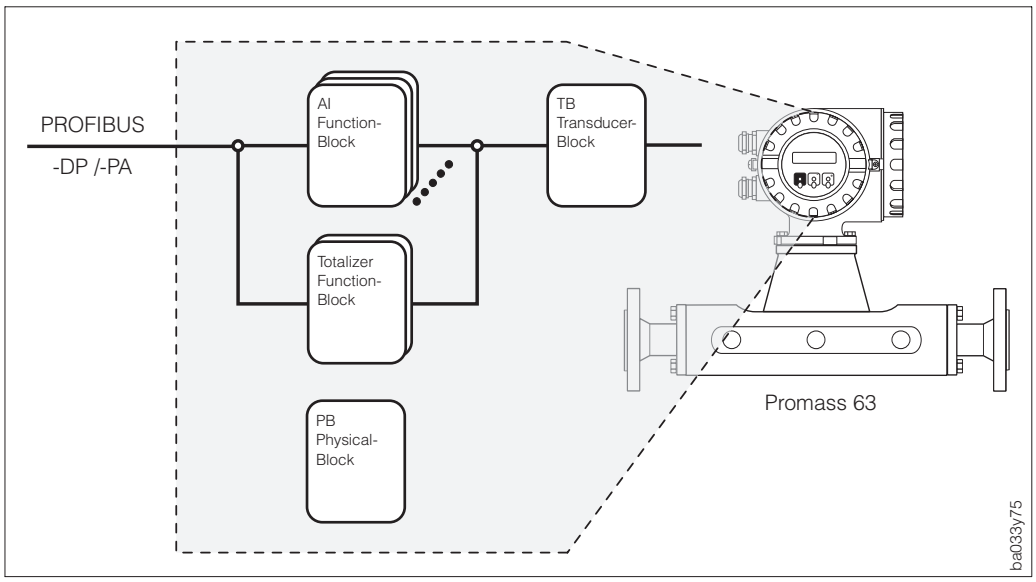
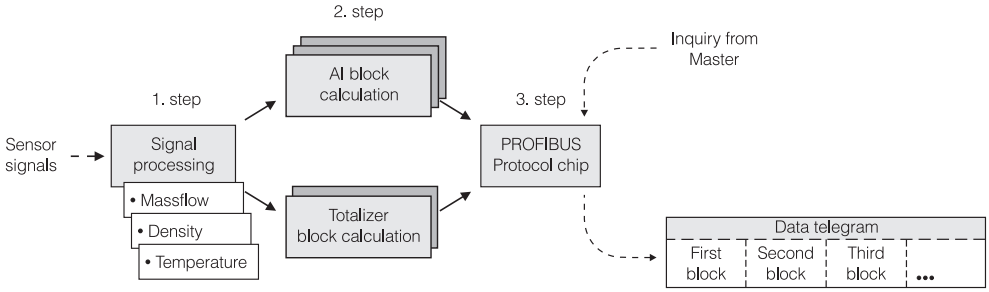


Fig. 20
Function block model of the Promass 63 PROFIBUS-PA

5.8 Cycle times

Processing of the internal measured value and data communication of the Promass 63 is carried out in three steps:



- **1st step: Signal processing**
  In the signal processing block, the primary measured variables of mass flow, density and temperature are calculated from the sensor signals.
  The length of the sampling interval depends on the type of sensor, the nominal diameter and the actual flow (mass and density) of the medium.

  Typical processing times of Promass 63:

Sensor	Scanning interval [ms]		Measurement [ms]
	SELF CHECKING “CYCLIC” * interval (2 s)	SELF CHECKING “SMART PLUS” * interval (5 min)	Time interval for “CYCLIC” and “SMART PLUS”
Promass F	38 ms	19 ms	60 ms
Promass M	38 ms	19 ms	60 ms
Promass A	68 ms	34 ms	100 ms
Promass I	28 ms	28 ms	60 ms

* The "CYCLIC" or "SMART PLUS" functions are set in the function group "SYSTEM PARAMETER", in the function "SELF CHECKING" (see page 89).

- **2nd step: AI block evaluation**
  With the measured values calculated from the signal processing (mass flow, density and temperature), the output values of the AI blocks and the totalisers are evaluated in this step and copied into a cyclic data telegram.
  The AI block evaluation has a delay of max. 3 ms per block.

  Note!
  Only one AI block or totaliser is calculated per cycle. Only the AI blocks or totaliser block are calculated (see page 30). By deactivating parameters not required in the cyclic data telegram, the real time response of the measurement unit is improved.

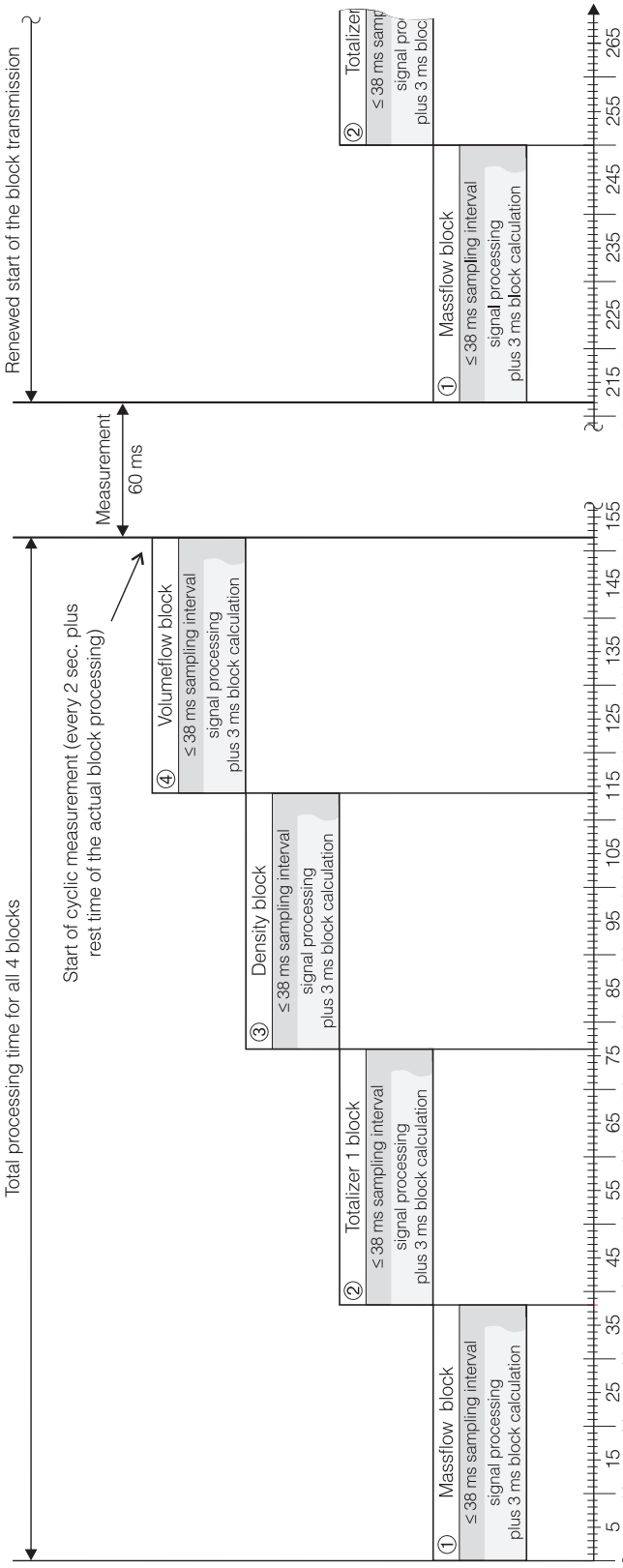
- **3rd step: PROFIBUS protocol chip**
  The cyclic data telegram is transferred to the protocol chip and sent on request to the master at the appropriate data transmission speed.


Note!

Note!
An automatic calibration (Measurement) of the signal processing is carried out at appropriate intervals. No signal processing is carried out during this calibration procedure and the last value determined is held.

Example for the timing of the block calculation and signal processing (see also Table on page 33)**:**

- Promass F = Scanning interval ≤ 38 ms
- Measurement "cyclical" = every 2 s plus rest time of the actual block processing (the actual block processing will be finished first)
- 4 activated blocks: = AI block calculation / Totalizer block calculation: 3 ms per block
  - ① Massflow
  - ② Totalizer 1
  - ③ Density
  - ④ Volumeflow



5.9 Slot / Index lists

The PTO profile is used as the basis for the definition. All parameters in **Slot 1**, the index are derived from the following tables:

Name	E+H Matrix	Index	Read	Write	Object typ	* Parameter	Data type	Size bytes	Storage class
Device Management									
Directory_Header/ Composite_Directory_Entries		0	X		Record	M	Unsigned 16	12	C
Composite_Directory_Entry/ Composite_Directory_Entries		1	X		Record	M	Unsigned 16	60	C
not used		2							
not used		3							
not used		4							
not used		5							
not used		6							
not used		7							
not used		8							
not used		9							
not used		10							
not used		11							
not used		12							
not used		13							

* Parameter: O = Optional
M = Mandatory

Name	E+H Matrix	Index	Read	Write	Object typ	* Parameter	Data type	Size bytes	Storage class
Physical Block									
BLOCK OBJECT		14	X		Record	M	DS-32	20	C
ST_REV	V8H1	15	X		Simple	M	Unsigned 16	2	N
TAG_DESC	V8H0	16	X	X	Simple	M	Octet String	32	S
STRATEGY		17	X	X	Simple	M	Unsigned 16	2	S
ALERT_KEY		18	X	X	Simple	M	Unsigned 8	1	S
TARGET_MODE		19	X	X	Simple	M	Unsigned 8	1	S
MODE_BLK		20	X		Record	M	DS-37	3	
ALARM_SUM	V7H0/1	21	X		Record	M	DS-42	8	D
SOFTWARE_REVISION	V9H6	22	X		Simple	M	Octet String	16	Cst
HARDWARE_REVISION	V9H7	23	X		Simple	M	Octet String	16	Cst
DEVICE_MAN_ID	VAH1	24	X		Simple	M	Unsigned 16	2	Cst
DEVICE_ID	VAH2	25	X		Simple	M	Octet String	16	Cst
DEVICE_SER_Num	VAH3	26	X		Simple	M	Octet String	16	Cst
DIAGNOSIS	V9H0	27	X		Simple	M	Octet String	4	D
DIAGNOSIS_EXTENSION	V9H8	28	X		Simple	O	Octet String	6	D
DIAGNOSIS_MASK	V9H3	29	X		Simple	M	Octet String	4	Cst
DIAGNOSIS_MASK_ EXTENSION	V9H9	30	X		Simple	O	Octet String	6	Cst
DEVICE_CERTIFICATION	VAH6	31	X	X	Simple	O	Octet String	16	N
SECURITY_LOCKING	VAH7	32	X	X	Simple	O	Unsigned 16	2	N
FACTORY_RESET	VAH8	33		X	Simple	O	Unsigned 16	2	S
not used		34							
not used		35							

* Parameter: O = Optional
M = Mandatory

Name	E+H Matrix	Index	Read	Write	Object typ	* Parameter	Data type	Size bytes	Storage class
Physical Block (continued)									
not used		36							
not used		37							
not used		38							
not used		39							
not used		40							
not used		41							
not used		42							
not used		43							
DESCRIPTOR	VAH0	44	X	X	Simple	M	Octet String	32	S
DEVICE_MESSAGE	VAH5	45	X	X	Simple	M	Octet String	32	S
DEVICE_INSTAL_DATE	VAH4	46	X	X	Simple	M	Octet String	8	S
not used		47							
not used		48							
not used		49							
not used		50							
not used		51							
Actual Error		52	X		Simple	O	Unsigned 16	2	D
not used		53							
UpDownFeaturesSupported		54	X		Simple	M	Octet String	1	Cst
UpDownCtrl parameter		55		X	Simple	O	Unsigned 8	1	D
UpDown parameter		56	X	X	Record	O	UpDownData	20	D
Device Bus Address		57	X		Simple	O	Unsigned 8	1	D
not used		58							
not used		59							
not used		60							
not used		61							
not used		62							
not used		63							
not used		64							

* Parameter: O = Optional
M = Mandatory

Name	E+H Matrix	Index	Read	Write	Object typ	* Para-meter	Data type	Size bytes	Storage class
Transducer Block									
BLOCK OBJECT		65	X		Record	M	DS-32	20	C
ST_REV	V8H1	66	X		Simple	M	Unsigned 16	2	N
TAG_DESC	V8H0	67	X	X	Simple	M	Octet String	32	S
STRATEGY		68	X	X	Simple	M	Unsigned 16	2	S
ALERT_KEY		69	X	X	Simple	M	Unsigned 8	1	S
TARGET_MODE		70	X	X	Simple	M	Unsigned 8	1	S
MODE_BLK		71	X		Record	M	DS-37	3	
ALARM_SUM	V7H0/1	72	X		Record	M	DS-42	8	D
FLOWRATE	V0H0	73	X		Simple	M	Float	4	D
NOMINAL_SIZE	V4H1	74	X	X	Simple	M	Float	4	S
FILTER_TYPE	V9H4	75	X	X	Simple	O	Unsigned 8	1	S
DEVICE_MODE	V9H0	76	X	X	Simple	O	Unsigned 8	1	S
FLOWRATE_UNITS	V0H1	77	X	X	Simple	M	Unsigned 16	2	S
SELF_CHECKING	V9H1	78	X	X	Simple	O	Unsigned 8	1	S
CALIBRATION_FACTOR	V4H0	79	X	X	Simple	M	Float	4	S
ZERO_POINT	V9H3	80	X	X	Simple	O	Float	4	N
FLOW_DIRECTION	V5H3	81	X	X	Simple	O	Unsigned 8	1	S
UPPER_SENSOR_LIMIT (not used)		82	X		Simple	M	Float	4	S
LOWER_SENSOR_LIMIT (not used)		83	X		Simple	M	Float	4	S
SAMPLE_RATE (not used)		84	X	X	Simple	O	Float	4	S
EPD _THRESHOLD	V5H2	85	X	X	Simple	O	Float	4	S
LOW_FLOW_CUTOFF	V5H1	86	X	X	Simple	O	Float	4	S
MASS_FLOWRATE	V1H0	87	X		Simple	M	Float	4	D
MASS_FLOWRATE_UNITS	V1H1	88	X	X	Simple	M	Unsigned 16	2	S
ZERO_POINT_ADJUST	V9H2	89	X	X	Simple	O	Unsigned 8	1	N
OSCILLATION_FREQ.	V5H0	90	X		Simple	O	Float	4	D
VORTEX_FREQ. (not used)		91	X		Simple	O	Float	4	D
VOLUME_FLOW		92	X		Simple	O	Float	4	D
VOLUME FLOW UNITS		93	X	X	Simple	O	Unsigned 16	2	S
TEMPERATURE	V3H2	94	X		Simple	O	Float	4	D
TEMPERATURE UNITS	V3H3	95	X	X	Simple	O	Unsigned 16	2	S
DENSITY	V3H0	96	X		Simple	O	Float	4	D
DENSITY_UNITS	V3H1	97	X	X	Simple	O	Unsigned 16	2	S
not used		98							
not used		99							
TB_DENSC		100	X		Simple	O	Float	4	D
TB_TARGET_FLOW		101	X		Simple	O	Float	4	D
TB_CARRIER_FLOW		102	X		Simple	O	Float	4	D
TB_STDVOL_FLOW		103	X		Simple	O	Float	4	D
TB_TOT1_OV		104	X		Simple	O	Signed 16	2	D
TB_TOT2_OV		105	X		Simple	O	Signed 16	2	D
TB_GAL_BAR		106	X	X	Simple	O	Unsigned 16	2	S
TB_STDVOL_FLOW_UNITS		107	X	X	Simple	O	Unsigned 16	2	S
TB_STDDENS_UNITS		108	X	X	Simple	O	Unsigned 16	2	S
TB_DIA_UNITS		109	X	X	Simple	O	Unsigned 16	2	S
TB_MASS_UNITS		110	X	X	Simple	O	Unsigned 16	2	S
TB_VOLUME_UNITS		111	X	X	Simple	O	Unsigned 16	2	S
TB_STDVOLUME_UNITS		112	X	X	Simple	O	Unsigned 16	2	S

* Parameter: O = Optional
M = Mandatory

Name	E+H Matrix	Index	Read	Write	Object typ	* Parameter	Data type	Size bytes	Storage class
Transducer Block (continued)									
TB_DENSC_UNITS		113	X	X	Simple	O	Unsigned 16	2	S
TB_PZR		114	X	X	Simple	O	Unsigned 8	1	N
TB_DENS_FIL_TYPE		115	X	X	Simple	O	Unsigned 8	1	S
TB_SENS_SW_VER		116	X		Simple	O	Octet String	16	Cst
TB_SENS_DAT_SEL		117	X	X	Simple	O	Unsigned 8	1	N
TB_SENS_DAT		118	X	X	Simple	O	Float	4	N
TB_DENS_ADJ_VAL		119	X	X	Simple	O	Float	4	N
TB_DENS_ADJ		120	X	X	Simple	O	Unsigned 8	1	S
TB_VOLUMEFLOW_MEAS		121	X	X	Simple	O	Unsigned 8	1	S
TB_STDVOL_CALC		122	X	X	Simple	O	Unsigned 8	1	S
TB_REF_TEMP		123	X	X	Simple	O	Float	4	S
TB_EXP_COEFF		124	X	X	Simple	O	Float	4	S
TB_FIX_STD_DENS		125	X	X	Simple	O	Float	4	S
TB_CARRIER_DENS		126	X	X	Simple	O	Float	4	S
TB_CARRIER_EXP_COEFF		127	X	X	Simple	O	Float	4	S
TB_TARGET_DENS		128	X	X	Simple	O	Float	4	S
TB_TARGET_EXP_COEFF		129	X	X	Simple	O	Float	4	S
TB_ASSIGN_DISP_LINE1		130	X	X	Simple	O	Unsigned 8	1	N
TB_ASSIGN_DISP_LINE2		131	X	X	Simple	O	Unsigned 8	1	N
TB_ASSIGN_LANGUAGE		132	X	X	Simple	O	Unsigned 8	1	N
TB_DISP_CONTRAST		133	X	X	Simple	O	Unsigned 8	1	N
TB_DISP_DAMP		134	X	X	Simple	O	Float	4	N
TB_DISP_FORM_FLOW		135	X		Simple	O	Unsigned 8	1	N
TB_ASSIGN_TOT1		136	X	X	Simple	O	Unsigned 8	1	S
TB_ASSIGN_TOT2		137	X	X	Simple	O	Unsigned 8	1	S
TB_IOUT_ASSIGN		138	X	X	Simple	O	Unsigned 8	1	S
TB_IOUT_LRV		139	X	X	Simple	O	Float	4	S
TB_IOUT_URV		140	X	X	Simple	O	Float	4	S
TB_IOUT_TAU		141	X	X	Simple	O	Float	4	S
TB_IOUT_CURR_RANGE		142	X	X	Simple	O	Unsigned 8	1	S
TB_IOUT_FAILSAVE		143	X	X	Simple	O	Unsigned 8	1	S
TB_IOUT_SIM_CURR		144	X	X	Simple	O	Unsigned 8	1	N
TB_IOUT_ACT_VAL		145	X		Simple	O	Float	4	D
TB_SERVICE1		146	X	X	Simple	O	Float	4	D
TB_SERVICE2		147	X	X	Simple	O	Float	4	D
TB_SERVICE3		148	X	X	Simple	O	Float	4	D
TB_SERVICE4		149	X	X	Simple	O	Float	4	D
TB_SERVICE5		150	X	X	Simple	O	Float	4	D
TB_SERVICE6		151	X	X	Simple	O	Float	4	D
TB_LOCAL_REMOTE		152	X	X	Simple	O	Unsigned 8	1	N
TB_CODE_PAGE		153	X	X	Simple	O	Signed 16	2	N
TB_TOT_1		154	X		Simple	O	Float	4	D
TB_TOT_2		155	X		Simple	O	Float	4	D
not used		156							
not used		157							
not used		158							
not used		159							

* Parameter: O = Optional
M = Mandatory

Name	E+H Matrix	Index	Read	Write	Object typ	* Para-meter	Data type	Size bytes	Storage class
AI - Massflow Block									
BLOCK OBJECT		160	X		Record	M	DS-32	20	C
ST_REV	V8H1	161	X		Simple	M	Unsigned 16	2	N
TAG_DESC	V8H0	162	X	X	Simple	M	Octet String	32	S
STRATEGY		163	X	X	Simple	M	Unsigned 16	2	S
ALERT_KEY		164	X	X	Simple	M	Unsigned 8	1	S
TARGET_MODE	V6H0	165	X	X	Simple	M	Unsigned 8	1	S
MODE_BLK	V6	166	X		Record	M	DS-37	3	
ALARM_SUM	V7	167	X		Record	M	DS-42	8	D
not used		168							
not used		169							
OUT	V0	170	X		Record	M	DS-33	5	D
PV_SCALE	V0H5/6	171	X	X	Record	M	DS-36	11	S
OUT_SCALE	V0H2/3	172	X	X	Record	M	DS-36	11	S
not used		173							
CHANNEL		174	X	X	Simple	M	Unsigned 16	2	S
not used		175							
PV_FTIME	V0H8	176	X	X	Simple	M	Float	4	N
not used		177							
not used		178							
ALARM_HYS	V1H0	179	X	X	Simple	M	Float	4	S
not used		180							
HI_HI_LIM	V2H0	181	X	X	Simple	M	Float	4	S
not used		182							
HI_LIM	V3H0	183	X	X	Simple	M	Float	4	S
not used		184							
LO_LIM	V4H0	185	X	X	Simple	M	Float	4	S
not used		186							
LO_LO_LIM	V5H0	187	X	X	Simple	M	Float	4	S
not used		188							
not used		189							
HI_HI_ALM	V2	190	X		Record	M	DS-39	16	D
HI_ALM	V3	191	X		Record	M	DS-39	16	D
LO_ALM	V4	192	X		Record	M	DS-39	16	D
LO_LO_ALM	V5	193	X		Record	M	DS-39	16	D
SIMULATE	V9	194	X	X	Record	M	DS-50	6	N
not used		195							
not used		196							
not used		197							
not used		198							
not used		199							
AI1_TYPE		200	X		Simple	O	Unsigned	2	Cst
VIEW_PHYSICAL BLOCK		201	X		Record	M	Unsigned 16, DS-37,DS-42, Octet String [4]	17	D
VIEW_TRANSDUCER BLOCK		202	X		Record	M	Unsigned 16, DS-37,DS-42, Float	17	D
VIEW_AI		203	X		Record	M	Unsigned 16, DS-37,DS-42, DS-33	18	D

* Parameter: O = Optional
M = Mandatory

All parameters in **Slot 2**, the index are derived from the following tables:

Name	E+H Matrix	Index	Read	Write	Object typ	* Parameter	Data type	Size bytes	Storage class
Totalizer 1 Block									
BLOCK OBJECT		0	X		Record	M	DS-32	20	C
ST_REV		1	X		Simple	M	Unsigned 16	2	N
TAG_DESC		2	X	X	Simple	M	Octet String	32	S
STRATEGY		3	X	X	Simple	M	Unsigned 16	2	S
ALERT_KEY		4	X	X	Simple	M	Unsigned 8	1	S
TARGET_MODE		5	X	X	Simple	M	Unsigned 8	1	S
MODE_BLK		6	X		Record	M	DS-37	3	
ALARM_SUM		7	X		Record	M	DS-42	8	D
not used		8							
not used		9							
OUT_TOTAL		10	X		Record	M	DS-33	5	D
not used		11							
TOT_UNITS		12	X	X	Index	M	Unsigned 16	2	S
not used		13							
CHANNEL		14	X	X	Simple	M	Unsigned 16	2	S
RESET_TOT		15	X	X	Simple	M	Unsigned 8	1	N
MODE_TOT		16	X	X	Simple	M	Unsigned 8	1	S
not used		17							
FAIL_TOT		18	X	X	Simple	M	Unsigned 8	1	S
not used		19							
POLAR_TOT		20	X	X	Simple	M	Unsigned 8	1	S
not used		21							
ALARM_HYS		22	X	X	Simple	M	Float	4	S
HI_HI_LIM		23	X	X	Simple	M	Float	4	S
HI_LIM		24	X	X	Simple	M	Float	4	S
HI_HI_ALM		25	X		Record	M	DS-39	16	D
HI_ALM		26	X		Record	M	DS-39	16	D
not used		27							
not used		28							
not used		29							
not used		30							
not used		31							
TOT1_TYPE		32	X		Simple	O	Unsigned 16	2	Cst
VIEW_TOT		33	X		Record	M	Unsigned 16	18	D

* Parameter: O = Optional
M = Mandatory

All parameters in **Slot 3**, the index are derived from the following tables:

Name	E+H Matrix	Index	Read	Write	Object typ	* Parameter	Data type	Size bytes	Storage class
AI 2 - Density Block									
BLOCK OBJECT		0	X		Record	M	DS-32	20	C
ST_REV	V8H1	1	X		Simple	M	Unsigned 16	2	N
TAG_DESC	V8H0	2	X	X	Simple	M	Octet String	32	S
STRATEGY		3	X	X	Simple	M	Unsigned 16	2	S
ALERT_KEY		4	X	X	Simple	M	Unsigned 8	1	S
TARGET_MODE	V6H0	5	X	X	Simple	M	Unsigned 8	1	S
MODE_BLK	V6	6	X		Record	M	DS-37	3	
ALARM_SUM	V7	7	X		Record	M	DS-42	8	D
not used		8							
not used		9							
OUT	V0	10	X		Record	M	DS-33	5	D
PV_SCALE	V0H5/6	11	X	X	Record	M	DS-36	11	S
OUT_SCALE	V0h2/3	12	X	X	Record	M	DS-36	11	S
not used		13							
CHANNEL		14	X		Simple	M	Unsigned 16	2	S
not used		15							
PV_FTIME	V0H8	16	X	X	Simple	M	Float	4	N
not used		17							
not used		18							
ALARM_HYS	V1H0	19	X	X	Simple	M	Float	4	S
not used		20							
HI_HI_LIM	V2H0	21	X	X	Simple	M	Float	4	S
not used		22							
HI_LIM	V3H0	23	X	X	Simple	M	Float	4	S
not used		24							
LO_LIM	V4H0	25	X	X	Simple	M	Float	4	S
not used		26							
LO_LO_LIM	V5H0	27	X	X	Simple	M	Float	4	S
not used		28							
not used		29							
HI_HI_ALM	V2	30	X		Record	M	DS-39	16	D
HI_ALM	V3	31	X		Record	M	DS-39	16	D
LO_ALM	V4	32	X		Record	M	DS-39	16	D
LO_LO_ALM	V5	33	X		Record	M	DS-39	16	D
SIMULATE	V9	34	X	X	Record	M	DS-50	6	N
not used		35							
not used		36							
not used		37							
not used		38							
not used		39							
AI2_TYPE		40	X		Simple	O	Unsigned 16	2	Cst
VIEW_AI		41	X		Record	M	Unsigned 16, DS-37, DS-42, DS-33	18	D

* Parameter: O = Optional
M = Mandatory

All parameters in **Slot 4**, the index are derived from the following tables:

Name	E+H Matrix	Index	Read	Write	Object typ	* Parameter	Data type	Size bytes	Storage class
AI 3 - Temperature Block									
BLOCK OBJECT		0	X		Record	M	DS-32	20	C
ST_REV	V8H1	1	X		Simple	M	Unsigned 16	2	N
TAG_DESC	V8H0	2	X	X	Simple	M	Octet String	32	S
STRATEGY		3	X	X	Simple	M	Unsigned 16	2	S
ALERT_KEY		4	X	X	Simple	M	Unsigned 8	1	S
TARGET_MODE	V6H0	5	X	X	Simple	M	Unsigned 8	1	S
MODE_BLK	V6	6	X		Record	M	DS-37	3	
ALARM_SUM	V7	7	X		Record	M	DS-42	8	D
not used		8							
not used		9							
OUT	V0	10	X		Record	M	DS-33	5	D
PV_SCALE	V0H5/6	11	X	X	Record	M	DS-36	11	S
OUT_SCALE	V0h2/3	12	X	X	Record	M	DS-36	11	S
not used		13							
CHANNEL		14	X	X	Simple	M	Unsigned 16	2	S
not used		15							
PV_FTIME	V0H8	16	X	X	Simple	M	Float	4	N
not used		17							
not used		18							
ALARM_HYS	V1H0	19	X	X	Simple	M	Float	4	S
not used		20							
HI_HI_LIM	V2H0	21	X	X	Simple	M	Float	4	S
not used		22							
HI_LIM	V3H0	23	X	X	Simple	M	Float	4	S
not used		24							
LO_LIM	V4H0	25	X	X	Simple	M	Float	4	S
not used		26							
LO_LO_LIM	V5H0	27	X	X	Simple	M	Float	4	S
not used		28							
not used		29							
HI_HI_ALM	V2	30	X		Record	M	DS-39	16	D
HI_ALM	V3	31	X		Record	M	DS-39	16	D
LO_ALM	V4	32	X		Record	M	DS-39	16	D
LO_LO_ALM	V5	33	X		Record	M	DS-39	16	D
SIMULATE	V9	34	X	X	Record	M	DS-50	6	N
not used		35							
not used		36							
not used		37							
not used		38							
not used		39							
AI3_TYPE		40	X		Simple	O	Unsigned 16	2	Cst
VIEW_AI		41	X		Record	M	Unsigned 16, DS-37, DS-42, DS-33	18	D

* Parameter: O = Optional
M = Mandatory

All parameters in **Slot 5**, the index are derived from the following tables:

Name	E+H Matrix	Index	Read	Write	Object typ	* Parameter	Data type	Size bytes	Storage class
Totalizer 2 Block									
BLOCK OBJECT		0	X		Record	M	DS-32	20	C
ST_REV		1	X		Simple	M	Unsigned 16	2	N
TAG_DESC		2	X	X	Simple	M	Octet String	32	S
STRATEGY		3	X	X	Simple	M	Unsigned 16	2	S
ALERT_KEY		4	X	X	Simple	M	Unsigned 8	1	S
TARGET_MODE		5	X	X	Simple	M	Unsigned 8	1	S
MODE_BLK		6	X		Record	M	DS-37	3	
ALARM_SUM		7	X		Record	M	DS-42	8	D
not used		8							
not used		9							
OUT_TOTAL		10	X		Record	M	DS-33	5	D
not used		11							
TOT_UNITS		12	X	X	Index	M	Unsigned	2	S
not used		13							
CHANNEL		14	X	X	Simple	M	Unsigned 16	2	S
RESET_TOT		15	X	X	Simple	M	Unsigned 8	1	N
MODE_TOT		16	X	X	Simple	M	Unsigned 8	1	S
not used		17							
FAIL_TOT		18	X	X	Simple	M	Unsigned 8	1	S
not used		19							
POLAR_TOT		20	X	X	Simple	M	Unsigned 8	1	S
not used		21							
ALARM_HYS		22	X	X	Simple	M	Float	4	S
HI_HI_LIM		23	X	X	Simple	M	Float	4	S
HI_LIM		24	X	X	Simple	M	Float	4	S
HI_HI_ALM		25	X		Record	M	DS-39	16	D
HI_ALM		26	X		Record	M	DS-39	16	D
not used		27							
not used		28							
not used		29							
not used		30							
not used		31							
TOT2_TYPE		32	X		Simple	O	Unsigned 16	2	Cst
VIEW_TOT		33	X		Record	M	Unsigned 16, DS-37, DS-42, DS-33	18	D

* Parameter: O = Optional
M = Mandatory

All parameters in **Slot 6**, the index are derived from the following tables:

Name	E+H Matrix	Index	Read	Write	Object typ	* Para-meter	Data type	Size bytes	Storage class
AI 4 - Volumeflow Block									
BLOCK OBJECT		0	X		Record	M	DS-32	20	C
ST_REV	V8H1	1	X		Simple	M	Unsigned 16	2	N
TAG_DESC	V8H0	2	X	X	Simple	M	Octet String	32	S
STRATEGY		3	X	X	Simple	M	Unsigned 16	2	S
ALERT_KEY		4	X	X	Simple	M	Unsigned 8	1	S
TARGET_MODE	V6H0	5	X	X	Simple	M	Unsigned 8	1	S
MODE_BLK	V6	6	X		Record	M	DS-37	3	
ALARM_SUM	V7	7	X		Record	M	DS-42	8	D
not used		8							
not used		9							
OUT	V0	10	X		Record	M	DS-33	5	D
PV_SCALE	V0H5/6	11	X	X	Record	M	DS-36	11	S
OUT_SCALE	V0h2/3	12	X	X	Record	M	DS-36	11	S
not used		13							
CHANNEL		14	X	X	Simple	M	Unsigned 16	2	S
not used		15							
PV_FTIME	V0H8	16	X	X	Simple	M	Float	4	N
not used		17							
not used		18							
ALARM_HYS	V1H0	19	X	X	Simple	M	Float	4	S
not used		20							
HI_HI_LIM	V2H0	21	X	X	Simple	M	Float	4	S
not used		22							
HI_LIM	V3H0	23	X	X	Simple	M	Float	4	S
not used		24							
LO_LIM	V4H0	25	X	X	Simple	M	Float	4	S
not used		26							
LO_LO_LIM	V5H0	27	X	X	Simple	M	Float	4	S
not used		28							
not used		29							
HI_HI_ALM	V2	30	X		Record	M	DS-39	16	D
HI_ALM	V3	31	X		Record	M	DS-39	16	D
LO_ALM	V4	32	X		Record	M	DS-39	16	D
LO_LO_ALM	V5	33	X		Record	M	DS-39	16	D
SIMULATE	V9	34	X	X	Record	M	DS-50	6	N
not used		35							
not used		36							
not used		37							
not used		38							
not used		39							
AI4_TYPE		40	X		Simple	O	Unsigned 16	2	Cst
VIEW_AI		41	X		Record	M	Unsigned 16, DS-37, DS-42, DS-33	18	D

* Parameter: O = Optional
M = Mandatory

All parameters in **Slot 7**, the index are derived from the following tables:

Name	E+H Matrix	Index	Read	Write	Object typ	* Parameter	Data type	Size bytes	Storage class
AI 5 - Std. Volumeflow Block									
BLOCK OBJECT		0	X		Record	M	DS-32	20	C
ST_REV	V8H1	1	X		Simple	M	Unsigned 16	2	N
TAG_DESC	V8H0	2	X	X	Simple	M	Octet String	32	S
STRATEGY		3	X	X	Simple	M	Unsigned 16	2	S
ALERT_KEY		4	X	X	Simple	M	Unsigned 8	1	S
TARGET_MODE	V6H0	5	X	X	Simple	M	Unsigned 8	1	S
MODE_BLK	V6	6	X		Record	M	DS-37	3	
ALARM_SUM	V7	7	X		Record	M	DS-42	8	D
not used		8							
not used		9							
OUT	V0	10	X		Record	M	DS-33	5	D
PV_SCALE	V0H5/6	11	X	X	Record	M	DS-36	11	S
OUT_SCALE	V0h2/3	12	X	X	Record	M	DS-36	11	S
not used		13							
CHANNEL		14	X	X	Simple	M	Unsigned 16	2	S
not used		15							
PV_FTIME	V0H8	16	X	X	Simple	M	Float	4	N
not used		17							
not used		18							
ALARM_HYS	V1H0	19	X	X	Simple	M	Float	4	S
not used		20							
HI_HI_LIM	V2H0	21	X	X	Simple	M	Float	4	S
not used		22							
HI_LIM	V3H0	23	X	X	Simple	M	Float	4	S
not used		24							
LO_LIM	V4H0	25	X	X	Simple	M	Float	4	S
not used		26							
LO_LO_LIM	V5H0	27	X	X	Simple	M	Float	4	S
not used		28							
not used		29							
HI_HI_ALM	V2	30	X		Record	M	DS-39	16	D
HI_ALM	V3	31	X		Record	M	DS-39	16	D
LO_ALM	V4	32	X		Record	M	DS-39	16	D
LO_LO_ALM	V5	33	X		Record	M	DS-39	16	D
SIMULATE	V9	34	X	X	Record	M	DS-50	6	N
not used		35							
not used		36							
not used		37							
not used		38							
not used		39							
AI5_TYPE		40	X		Simple	O	Unsigned 16	2	Cst
VIEW_AI		41	X		Record	M	Unsigned 16, DS-37, DS-42, DS-33	18	D

* Parameter: O = Optional
M = Mandatory

All parameters in **Slot 8**, the index are derived from the following tables:

Name	E+H Matrix	Index	Read	Write	Object typ	* Para-meter	Data type	Size bytes	Storage class
AI 6 - Targetflow Block									
BLOCK OBJECT		0	X		Record	M	DS-32	20	C
ST_REV	V8H1	1	X		Simple	M	Unsigned 16	2	N
TAG_DESC	V8H0	2	X	X	Simple	M	Octet String	32	S
STRATEGY		3	X	X	Simple	M	Unsigned 16	2	S
ALERT_KEY		4	X	X	Simple	M	Unsigned 8	1	S
TARGET_MODE	V6H0	5	X	X	Simple	M	Unsigned 8	1	S
MODE_BLK	V6	6	X		Record	M	DS-37	3	
ALARM_SUM	V7	7	X		Record	M	DS-42	8	D
not used		8							
not used		9							
OUT	V0	10	X		Record	M	DS-33	5	D
PV_SCALE	V0H5/6	11	X	X	Record	M	DS-36	11	S
OUT_SCALE	V0h2/3	12	X	X	Record	M	DS-36	11	S
not used		13							
CHANNEL		14	X	X	Simple	M	Unsigned 16	2	S
not used		15							
PV_FTIME	V0H8	16	X	X	Simple	M	Float	4	N
not used		17							
not used		18							
ALARM_HYS	V1H0	19	X	X	Simple	M	Float	4	S
not used		20							
HI_HI_LIM	V2H0	21	X	X	Simple	M	Float	4	S
not used		22							
HI_LIM	V3H0	23	X	X	Simple	M	Float	4	S
not used		24							
LO_LIM	V4H0	25	X	X	Simple	M	Float	4	S
not used		26							
LO_LO_LIM	V5H0	27	X	X	Simple	M	Float	4	S
not used		28							
not used		29							
HI_HI_ALM	V2	30	X		Record	M	DS-39	16	D
HI_ALM	V3	31	X		Record	M	DS-39	16	D
LO_ALM	V4	32	X		Record	M	DS-39	16	D
LO_LO_ALM	V5	33	X		Record	M	DS-39	16	D
SIMULATE	V9	34	X	X	Record	M	DS-50	6	N
not used		35							
not used		36							
not used		37							
not used		38							
not used		39							
AI6_TYPE		40	X		Simple	O	Unsigned 16	2	Cst
VIEW_AI		41	X		Record	M	Unsigned 16, DS-37, DS-42, DS-33	18	D

* Parameter: O = Optional
M = Mandatory

All parameters in **Slot 9**, the index are derived from the following tables:

Name	E+H Matrix	Index	Read	Write	Object typ	* Parameter	Data type	Size bytes	Storage class
AI 7 - Carrierflow Block									
BLOCK OBJECT		0	X		Record	M	DS-32	20	C
ST_REV	V8H1	1	X		Simple	M	Unsigned 16	2	N
TAG_DESC	V8H0	2	X	X	Simple	M	OctetString	32	S
STRATEGY		3	X	X	Simple	M	Unsigned 16	2	S
ALERT_KEY		4	X	X	Simple	M	Unsigned 8	1	S
TARGET_MODE	V6H0	5	X	X	Simple	M	Unsigned 8	1	S
MODE_BLK	V6	6	X		Record	M	DS-37	3	
ALARM_SUM	V7	7	X		Record	M	DS-42	8	D
not used		8							
not used		9							
OUT	V0	10	X		Record	M	DS-33	5	D
PV_SCALE	V0H5/6	11	X	X	Record	M	DS-36	11	S
OUT_SCALE	V0h2/3	12	X	X	Record	M	DS-36	11	S
not used		13							
CHANNEL		14	X	X	Simple	M	Unsigned 16	2	S
not used		15							
PV_FTIME	V0H8	16	X	X	Simple	M	Float	4	N
not used		17							
not used		18							
ALARM_HYS	V1H0	19	X	X	Simple	M	Float	4	S
not used		20							
HI_HI_LIM	V2H0	21	X	X	Simple	M	Float	4	S
not used		22							
HI_LIM	V3H0	23	X	X	Simple	M	Float	4	S
not used		24							
LO_LIM	V4H0	25	X	X	Simple	M	Float	4	S
not used		26							
LO_LO_LIM	V5H0	27	X	X	Simple	M	Float	4	S
not used		28							
not used		29							
HI_HI_ALM	V2	30	X		Record	M	DS-39	16	D
HI_ALM	V3	31	X		Record	M	DS-39	16	D
LO_ALM	V4	32	X		Record	M	DS-39	16	D
LO_LO_ALM	V5	33	X		Record	M	DS-39	16	D
SIMULATE	V9	34	X	X	Record	M	DS-50	6	N
not used		35							
not used		36							
not used		37							
not used		38							
not used		39							
AI7_TYPE		40	X		Simple	O	Unsigned 16	2	Cst
VIEW_AI		41	X		Record	M	Unsigned 16, DS-37, DS-42, DS-33	18	D

* Parameter: O = Optional
M = Mandatory

All parameters in **Slot 10**, the index are derived from the following tables:

Name	E+H Matrix	Index	Read	Write	Object typ	* Para-meter	Data type	Size bytes	Storage class
AI 8 - Calc. Density Block									
BLOCK OBJECT		0	X		Record	M	DS-32	20	C
ST_REV	V8H1	1	X		Simple	M	Unsigned 16	2	N
TAG_DESC	V8H0	2	X	X	Simple	M	Octet String	32	S
STRATEGY		3	X	X	Simple	M	Unsigned 16	2	S
ALERT_KEY		4	X	X	Simple	M	Unsigned 8	1	S
TARGET_MODE	V6H0	5	X	X	Simple	M	Unsigned 8	1	S
MODE_BLK	V6	6	X		Record	M	DS-37	3	
ALARM_SUM	V7	7	X		Record	M	DS-42	8	D
not used		8							
not used		9							
OUT	V0	10	X		Record	M	DS-33	5	D
PV_SCALE	V0H5/6	11	X	X	Record	M	DS-36	11	S
OUT_SCALE	V0h2/3	12	X	X	Record	M	DS-36	11	S
not used		13							
CHANNEL		14	X	X	Simple	M	Unsigned 16	2	S
not used		15							
PV_FTIME	V0H8	16	X	X	Simple	M	Float	4	N
not used		17							
not used		18							
ALARM_HYS	V1H0	19	X	X	Simple	M	Float	4	S
not used		20							
HI_HI_LIM	V2H0	21	X	X	Simple	M	Float	4	S
not used		22							
HI_LIM	V3H0	23	X	X	Simple	M	Float	4	S
not used		24							
LO_LIM	V4H0	25	X	X	Simple	M	Float	4	S
not used		26							
LO_LO_LIM	V5H0	27	X	X	Simple	M	Float	4	S
not used		28							
not used		29							
HI_HI_ALM	V2	30	X		Record	M	DS-39	16	D
HI_ALM	V3	31	X		Record	M	DS-39	16	D
LO_ALM	V4	32	X		Record	M	DS-39	16	D
LO_LO_ALM	V5	33	X		Record	M	DS-39	16	D
SIMULATE	V9	34	X	X	Record	M	DS-50	6	N
not used		35							
not used		36							
not used		37							
not used		38							
not used		39							
AI8_TYPE		40	X		Simple	O	Unsigned 16	2	Cst
VIEW_AI		41	X		Record	M	Unsigned 16, DS-37, DS-42, DS-33	18	D

* Parameter: O = Optional
M = Mandatory

5.10 Commuwin II operating matrix

Note!
Several operating matrixes are available in Commuwin II. They are all shown with their basic settings. Additional functions might become available depending on selection of specific functions.

Transmitter Device-Block (evaluation mode 1), PROFIBUS-DP

	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
V0 MEASURED VALUE	MASS FLOW	TOTALIZER 1	TOTALIZER 1 OVERFLOW							
V1 MEASURED VALUE	DENSITY	TEMPERATURE								
V2 COMMUNI-CATION	EVALUATION MODE	ACCESS CODE	DIAGNOSTIC CODE	LOC OPERATION	BUS ADDRESS		SW-VERSION COM	HW-VERSION DP		
V3 SYSTEM UNITS	MASS FLOW UNIT	MASS UNIT			GALLON / BARREL			PIPE SIZE UNIT		
V4 DISPLAY	RESET TOTALIZER	ASSIGN TOTAL 1	ASSIGN TOTAL 2	LCD CONTRAST	LANGUAGE	DISPLAY DAMPING	DISPLAY LINE 1	DISPLAY LINE 2	FORMAT FLOW	
V5										
V6										
V7 PROCESSING PARAMETER	LOW FLOW CUTOFF	NOISE SUPPRESSION	DEVICE MODE	FLOW DIRECTION	EPD THRESHOLD	DENSITY FILTER	SELF CHECK			
V8 SYSTEM PARAMETER		ZERO ADJUST			POS. ZERO RETURN					
V9 SENSOR DATA	CALIBR. FACTOR	ZERO POINT	NOMINAL DIAMETER	SENSOR DATA		SERIAL NUMBER	SOFTWARE VERSION			
VA SENSOR	TAG NUMBER									

Commuwin II Operating matrix
Transmitter Device Block (evaluation mode 2), PROFIBUS-DP

	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
V0 MEASURED VALUE	MASS FLOW	TOTALIZER 1	TOTALIZER 1 OVERFLOW							
V1 MEASURED VALUE	DENSITY	TEMPERATURE								
V2 COMMUNI-CATION	EVALUATION MODE	ACCESS CODE	DIAGNOSTIC CODE	LOC OPERATION	BUS ADDRESS		SW-VERSION COM	HW-VERSION DP		
V3 SYSTEM UNITS	DENSITY UNIT		TEMPERATURE UNIT							
V4 DISPLAY	RESET TOTALIZER	ASSIGN TOTAL 1	ASSIGN TOTAL 2	LCD CONTRAST	LANGUAGE	DISPLAY DAMPING	DISPLAY LINE 1	DISPLAY LINE 2	FORMAT FLOW	
V5										
V6 DENSITY FUNCTION	CALC. DENSITY	VOLUME FLOW MEAS.								
V7 DENSITY FUNCTION	DENS. ADJ. VALUE	CALIBR. MODE								
V8 SYSTEM PARAMETER		ZERO ADJUST			POS. ZERO RETURN					
V9 SENSOR DATA	CALIBR. FACTOR	ZERO POINT	NOMINAL DIAMETER	SENSOR DATA		SERIAL NUMBER	SOFTWARE VERSION			
VA SENSOR	TAG NUMBER									

Commuwin II Operating matrix
Transmitter Device-Block (evaluation mode 1), PROFIBUS-PA

	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
V0 MEASURED VALUE	MASS FLOW	TOTALIZER 1	TOTALIZER 1 OVERFLOW							
V1 MEASURED VALUE	DENSITY	TEMPERATURE								
V2 COMMUNI-CATION	EVALUATION MODE	ACCESS CODE	DIAGNOSTIC CODE	LOC OPERATION	BUS ADDRESS		SW-VERSION COM	HW-VERSION PA		
V3 SYSTEM UNITS	MASS FLOW UNIT	MASS UNIT			GALLON / BARREL			PIPE SIZE UNIT		
V4 DISPLAY	RESET TOTALIZER	ASSIGN TOTAL 1	ASSIGN TOTAL 2	LCD CONTRAST	LANGUAGE	DISPLAY DAMPING	DISPLAY LINE 1	DISPLAY LINE 2	FORMAT FLOW	
V5 SELECT CURRENT	ASSIGN OUTPUT	VALUE FOR 0/4 mA	FULL SCALE 1				TIME CONSTANT	CURRENT RANGE	FAILSAFE MODE	SIMULATION CURR.
V6										
V7 PROCESSING PARAMETER	LOW FLOW CUTOFF	NOISE SUPPRESSION	DEVICE MODE	FLOW DIRECTION	EPD THRESHOLD	DENSITY FILTER	SELF CHECK			
V8 SYSTEM PARAMETER		ZERO ADJUST			POS. ZERO RETURN					
V9 SENSOR DATA	CALIBR. FACTOR	ZERO POINT	NOMINAL DIAMETER	SENSOR DATA		SERIAL NUMBER	SOFTWARE VERSION			
VA SENSOR	TAG NUMBER									

Commuwin II Operating matrix
Transmitter Device-Block (evaluation mode 2), PROFIBUS-PA

	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
V0 MEASURED VALUE	MASS FLOW	TOTALIZER 1	TOTALIZER 1 OVERFLOW							
V1 MEASURED VALUE	DENSITY	TEMPERATURE								
V2 COMMUNI-CATION	EVALUATION MODE	ACCESS CODE	DIAGNOSTIC CODE	LOC OPERATION	BUS ADDRESS		SW-VERSION COM	HW-VERSION PA		
V3 SYSTEM UNITS	DENSITY UNIT		TEMPERATURE UNIT							
V4 DISPLAY	RESET TOTALIZER	ASSIGN TOTAL 1	ASSIGN TOTAL 2	LCD CONTRAST	LANGUAGE	DISPLAY DAMPING	DISPLAY LINE 1	DISPLAY LINE 2	FORMAT FLOW	
V5 SELECT CURRENT	ASSIGN OUTPUT	VALUE FOR 0/4 mA	FULL SCALE 1				TIME CONSTANT	CURRENT RANGE	FAILSAFE MODE	SIMULATION CURR.
V6 DENSITY FUNCTION	CALC. DENSITY	VOLUME FLOW MEAS.								
V7 DENSITY FUNCTION	DENS. ADJ. VALUE	CALIBR. MODE								
V8 SYSTEM PARAMETER		ZERO ADJUST			POS. ZERO RETURN					
V9 SENSOR DATA	CALIBR. FACTOR	ZERO POINT	NOMINAL DIAMETER	SENSOR DATA		SERIAL NUMBER	SOFTWARE VERSION			
VA SENSOR	TAG NUMBER									

Commuwin II Operating matrix
Transmitter Physical Block, PROFIBUS-DP/-PA

	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
V0										
V1										
V2										
V3										
V4										
V5										
V6										
V7 ALARM-STATUS	CURRENT	DISABLE								
V8 BLOCK PARAMETER	TAG NUMBER	ST REVISION								
V9 DIAGNOSIS	DIAGNOSIS	DIAGNOSIS 2	DIAGNOSIS 3	MASK	MASK 2	MASK 3	SOFTWARE VERSION	HARDWARE VERSION	DIAGNOSIS EXT	DIAG MASK EXT
VA DEVICE DATA	DESCRIPTOR	MANU-FACTURER ID	DEVICE ID	SERIAL NUMBER	INSTALLATION DATE	MESSAGE	DEVICE CERTIFICAT	SECURITY LOCKING	SOFTWARE-RESET	

Commuwin II Operating matrix
Transmitter Flow Block, PROFIBUS-DP/-PA

	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
V0 FLOWRATE	FLOWRATE	FLOW UNIT								
V1 MASS FLOW	MASS FLOW	MASS FLOW UNIT								
V2										
V3 PROCESS VARIABLE	DENSITY	DENSITY UNIT	TEMPERATURE	TEMPERATURE UNIT						
V4 SENSOR DATA	CALIBR. FACTOR	NOMINAL DIAMETER								
V5 PROCESS PARAMETER	OSCILLATION FREQ.	LOW FLOW CUTOFF	EPD THRESHOLD	FLOW DIRECTION						
V6										
V7 ALARM STATUS	CURRENT	DISABLE								
V8 BLOCK PARAMETER	TAG NUMBER	ST VERSION								
V9 SYSTEM PARAMETER	DEVICE MODE	SELFCHECK	ZERO ADJUST	ZERO POINT						
VA										

Commuwin II Operating matrix
Transmitter Analog Input Block, PROFIBUS-DP /-PA
(here only one Transmitter Analog Input Block is shown, all other Transmitter Analog Input Blocks are identical).

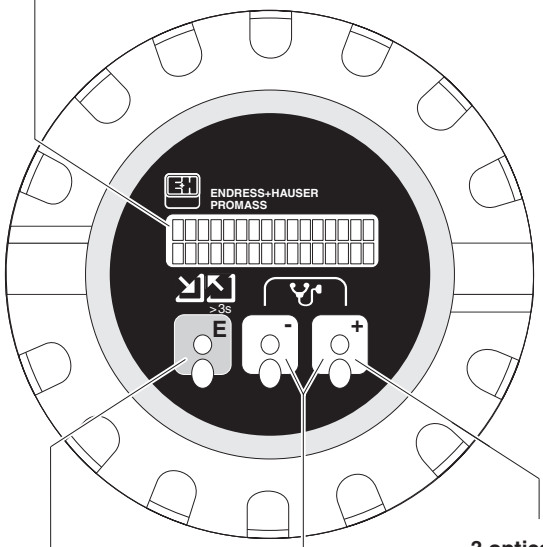
	H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
V0 OUT	OUT VALUE	OUT STATUS	OUT MIN	OUT MAX	OUT UNIT	PV MIN	PV MAX	PV SCALE UNIT	INTEGRATION TIME	
V1 ALARM-LIMITS	ALARM HYSTERESE									
V2 HI_HI_ALARM	HI_HI_LIM	VALUE	ALARM STATUS	SWITCH ON POINT	SWITCH OFF POINT					
V3 HI_ALARM	HI_LIM	VALUE	ALARM STATUS	SWITCH ON POINT	SWITCH OFF POINT					
V4 LO_ALARM	LO_LIM	VALUE	ALARM STATUS	SWITCH ON POINT	SWITCH OFF POINT					
V5 LO_LO_ALARM	LO_LO_LIM	VALUE	ALARM STATUS	SWITCH ON POINT	SWITCH OFF POINT					
V6 BLOCK MODE	TARGET MODE	ACTUAL	PERMITTED	NORMAL						
V7 ALARM-SUMMARY	CURRENT	DISABLE								
V8 BLOCK-PARAMETER	TAG NUMBER	ST REVISION								
V9 SIMULATION	VALUE	STATUS	ON OFF							
VA										

6 Operation

6.1 Display and operating elements

LC Display

- Illuminated, double-spaced with 16 characters.
- Displayed are menu texts and numerical values as well as error, alarm, and status messages
- Display during normal measuring operation (HOME position):
  Upper line → freely selectable measured variable (factory setting: "MASS FLOW")
  Bottom line → freely selectable measured variable (factory setting: "TOTALIZER 1")



3 optical operating elements "Touch Control"

up: infrared transmitter diode
down: infrared receiver diode

+ / – keys

- Select function group (>GROUP SELECT.<)
- Enter numerical values (if keys are kept pressed, the numbers displayed will begin changing at accelerated rate)
- Select parameters/settings

Diagnostic and help function
(activate +/– operating elements simultaneously)

ENTER key

E — Access to the operating matrix

E (>3s) — Leave operating matrix → return to HOME position
(activate E operating element for more than 3 seconds)

E — Access function
Save entered figures and settings

ba033y17

Fig. 21
Display and operating elements

6.2 E+H operating matrix (select functions)

① Access to the operating matrix

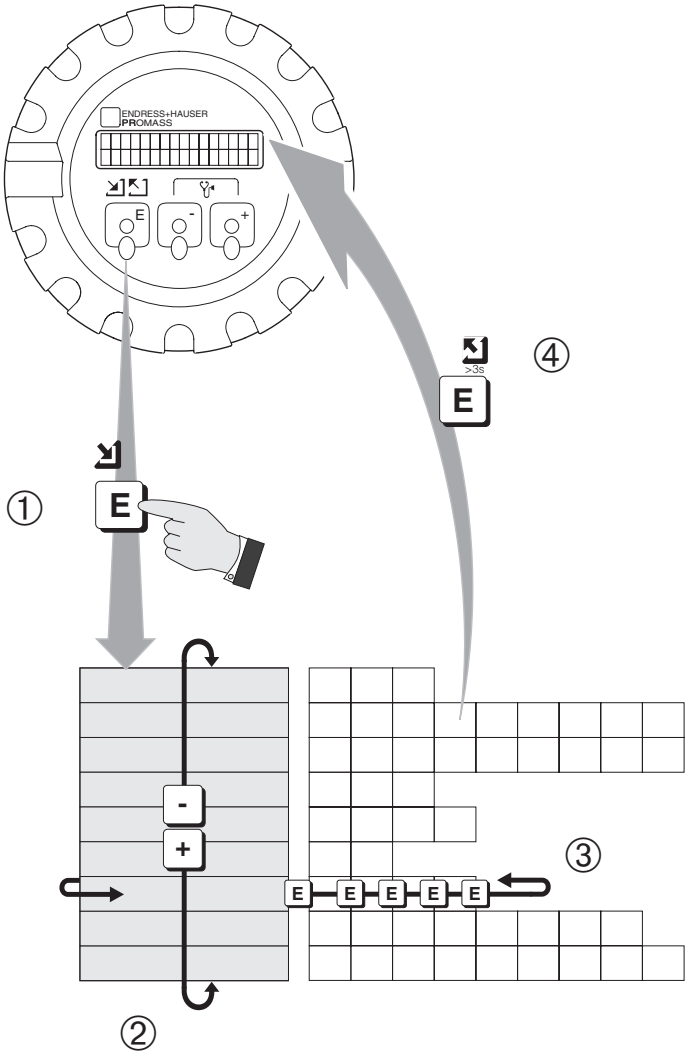
② Select function group (>GROUP SELECT.<)

③ Select function (entering/setting data with ± ; saving with E)

④ Leave operating matrix → return to the HOME position from any matrix position, e.g. after programming

Note!

Note!
Operating matrix DP / PA → page 59 / 60
Programming example → page 62
Function description → page 67 ff.



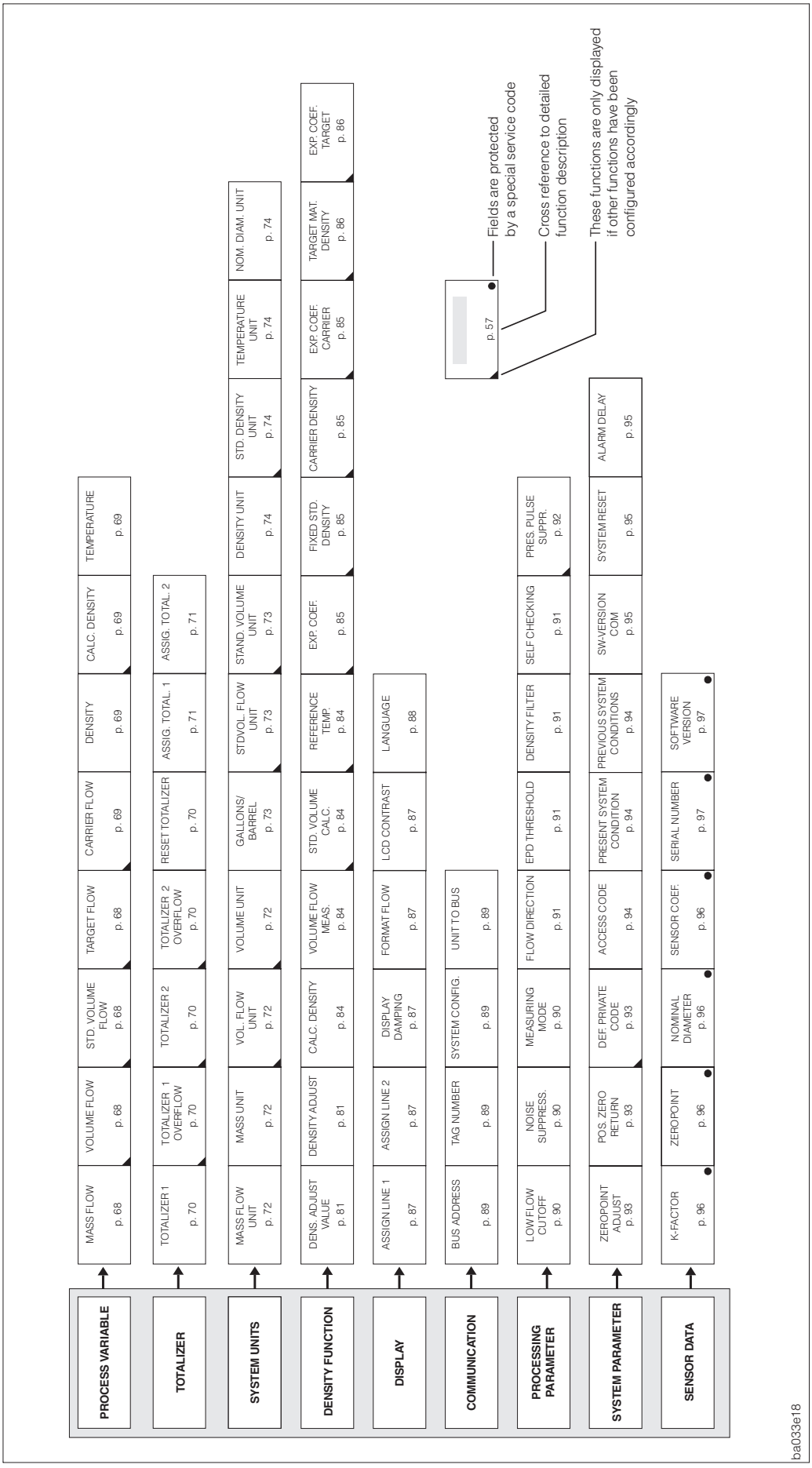
Notes!
- An automatic return to the HOME position will be made if the operating elements are not pressed for 60 seconds (only if the programming is locked).
- If the diagnosis function ± is activated from the HOME position, an automatic return to the HOME position will be made if the operating elements are not pressed within 60 seconds; no matter whether the programming is enabled or locked.

Note!

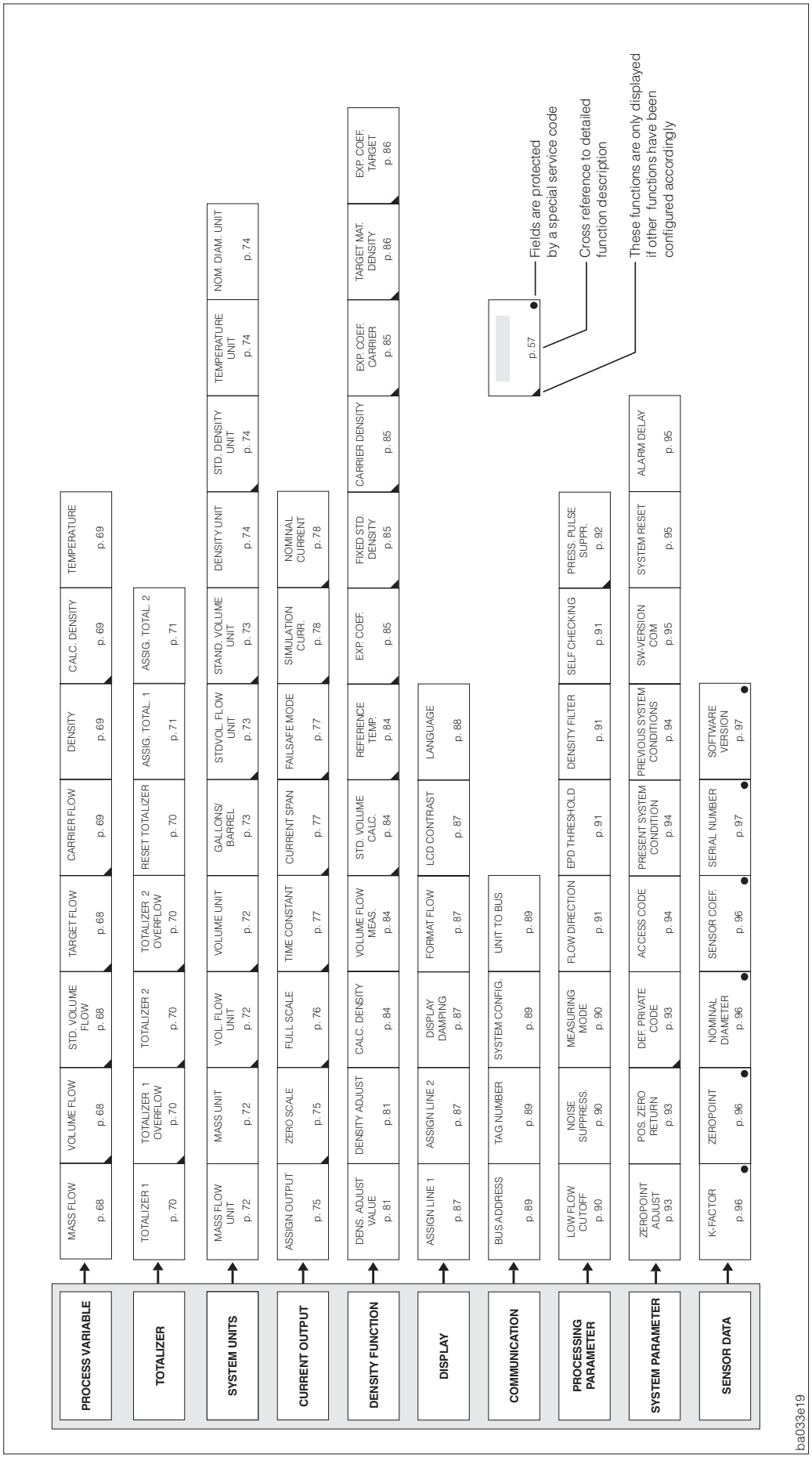
ba033y18

Fig. 22
Selecting functions in the E+H operating matrix

Operating matrix Promass 63 PROFIBUS-DP:



Operating matrix Promass 63 PROFIBUS-PA:



Further information on programming
For the Promass 63 measuring system, there is a wide choice of functions available which the user can set individually and adapt to process conditions.

Please follow the listed important programming notes:
- If the power supply cuts out, all calibrated and set values are safely stored in the EEPROM (without requiring batteries).
- Functions which are not required, e.g. volume flow, can be set to "OFF". In this case the appropriate functions in other function groups do no longer appear on the display.
- If, while programming, you wish to undo a setting carried out with ± select "CANCEL" option. This is only possible for settings which have not yet been saved by pressing E.
- In certain functions, a prompt is given after entering data for safety reasons. Select "SURE? [YES]" with the ± keys and confirm by pressing E again. The setting is now saved or a function, e.g. zero point calibration, is activated.
- The Promass may not show values with all decimal places as this depends on the engineering unit used and the number of decimal places selected, see function "FORMAT FLOW", page 87). During data input an arrow is, therefore, shown between the measured value and the engineering unit (e.g. 1.2 → kg/h).

Enable programming (entering the code number)
Normally programming is locked. Any unauthorized changes to the instrument functions, values, or factory settings are, therefore, not possible. Only a code has been entered (factory setting = 63), parameters can be entered or changed. The use of a personal code number, which can be freely chosen, prevents unauthorized personnel from gaining access to data (see page 93).

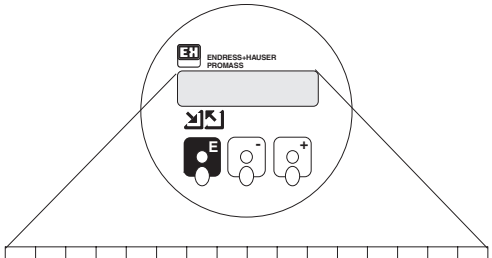

Caution!

Caution!
- If programming is locked and the ± keys are pressed in a given function a prompt to enter the code is automatically displayed.
- With code "0" (zero), the programming is **aways** enabled!
- If the personal code number is no longer available, please contact the Endress+Hauser service organization, which will pleased to help you.

Locking the programming function
- After returning to the HOME position, programming is again locked after 60 seconds if no operating element is pressed.
- Programming can also be locked by entering any number (other than the customer code number) in the "ACCESS CODE" function.

6.3 Example of programming

If you want to change the bus address setting from “126” to “25”, proceed as follows:



E — Enter the operating matrix.

PROCESS VARIABLE
> GROUP SELECT. <

+ / – — Select the desired function group “COMMUNICATION”

COMMUNICATION
> GROUP SELECT. <

E — Select function “BUS ADDRESS”

126
BUS ADDRESS

+ / – — On pressing + or – the entry of the code is automatically prompted.

0
ACCESS CODE

+ / – — Enter the code number
Factory setting = 63

63
ACCESS CODE

E — Programming is now enabled.

EDITING ENABLED

The programmable value flashes.

126
BUS ADDRESS

+ / – — Select the desired address.
The display stops flashing.
Setting: 25

25
BUS ADDRESS

E — Save the input.

INPUT STORED

The display flashes and the value can be changed once again.

25
BUS ADDRESS

E — Return to the “HOME” position (press the E key for more than 3 sec.).
In the “HOME” position, the programming level is locked again after 60 sec. if none of the operating keys are pressed.

E — Select other functions.
Following the last function, there is an automatic return to >GROUP SELECT.<.

BACK TO GROUP
SELECTION

7 Commissioning

7.1 Zero-Point adjustment

All Promass 63 transmitters are calibrated using the most up-to-date technology available. The zero-point is printed on the nameplate. Calibration is carried out at reference conditions (see page 129). Therefore, a zero-point adjustment for Promass is basically **not** necessary!

Practical experience has shown that a zero-point adjustment is recommended only in special cases:
- to achieve the highest possible measuring accuracy
- for extreme process conditions (e.g in case of very high fluid temperatures or very high viscosity of the liquid).

Requirements for zero-point adjustment

– Fluids **without** gas or solids.
– Zero-point adjustment is carried out using completely filled measuring tubes and at no-flow with e.g. shut-off valves both upstream and downstream of the sensor or by using existing shut-off and sliding valves, etc.:

Normal operation
- Open valves A and B

*Zero-point calibration **with** pump pressure*
- Open valve A
- Close valve B

*Zero-point calibration **without** pump pressure*
- Close valve A
- Open valve B

Caution!
With difficult fluids (outgassing fluids or fluids with solids content), it is possible that a stable zero-point cannot be achieved despite carrying out a number of zero-point adjustments. In such cases, please contact your E+H Service Centre.

Actual zero-point → see page 96

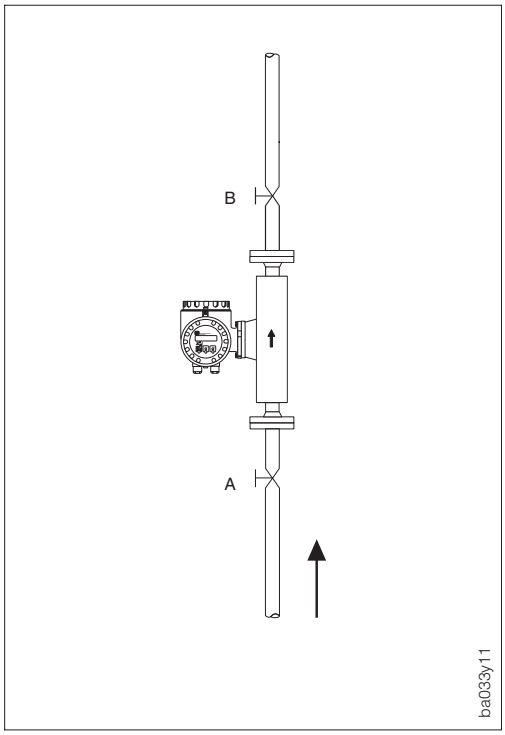
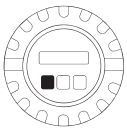


Fig. 23
Zero-point adjustment and shut-off valves

Carrying out a zero-point adjustment

1. Run the plant for as long as necessary until it is operating normally.
2. Stop the flow.
3. Check the shut-off valves (for leaks). Also check the operating pressure.
4. Carry out the adjustment using the local display as follows:

Display / Operating keys 

E	PROCESS VARIABLE > GROUP SELECT. <	Enter the operating matrix
±	SYSTEM PARAMETER > GROUP SELECT. <	Select function group “SYSTEM PARAMETER”
±	CANCEL ZERO-POINT ADJUST	Select function “ZERO-POINT ADJUST”
±	0 ACCESS CODE	On pressing ±
±	63 ACCESS CODE	Enter access code (63 = factory setting, access code can be changed)
E	EDITING ENABLE	Press “ENTER”
	CANCEL ZERO-POINT ADJUST	Display flashes
±	START ZERO-POINT ADJUST	Select “START”
E	SURE? [NO] ZERO-POINT ADJUST	Safety query on the display
±	SURE? [YES] ZERO-POINT ADJUST	Select “YES” and press “ENTER”
E	S: ZERO ADJUST RUNNING	This message is displayed during zero-point adjustment for approx. 30…60 sec. If the velocity of the fluid is >0.1 m/s, an error message is displayed.
	CANCEL ZERO-POINT ADJUST	Zero-point calibration is completed. The new zero-point value can immediately be called up with the diagnosis function (simultaneously pressing ±). The value in the function “ZERO-POINT” is overwritten.

E Back to HOME position (= display during normal measuring operation)

7.2 Gas measurement

Introductory remarks

The Promass 63 is not only suitable for measuring liquids. Direct mass flow measurement using the Coriolis principle is also useful for gases.

In contrast to liquids, other flow ranges and accuracies are to be noted when using it for gas applications.

Specific settings for gas measurement

1) *Deactivate EPD*
(in function group "PROCESSING PARA.", see page 91)
In order to measure even at low gas pressures, the EPD function must be switched off. This is done by entering an EPD response value of 0.0000 kg/l.

2) *Adapt low flow cutoff*
(in function group "PROCESSING PARA.", see page 90)
Due to the low flow rate with gas flow measurement, the low flow cutoff value must be set accordingly.

3) *Standard volume measurement*
If the standard volume flow is to be displayed and made available at the output (e.g. in Nm^3/h) instead of the mass flow rate (e.g. in kg/h), then the following settings are to be selected or values entered:

- Function "VOLUME FLOW MEAS." (see page 84) → Select "STD. VOLUME FLOW"
- Function "STD. VOL. CALC." (see page 84) → Select "FIXED STD. DENSITY"
- Function "FIXED STD. DENSITY" (see page 85) → Input of the gas-dependent **standard density** (i.e. the density calculated from the reference temperature and pressure).

  Example for air:
  Standard density = 1.2928 kg/Nm^3
  (at 0 °C and 1.013 bar)
- Function "STD. DENSITY UNIT" (see page 74) → Select the desired unit
- Function "STD. VOLUME UNIT" (see page 73) → Select the desired unit
- Normal volume flow can now be assigned to → a display line (see page 87)
  → the current output PROFIBUS-PA (see page 73)

8 Function Description

This section lists in detail a description as well as all information required for the individual functions of the Promass 63. Factory settings are shown in ***bold italics***. On request, Promass 63 measuring instruments are also available with customised parameterisation. In such case, values/settings may differ from the factory setting shown here.

Function group PROCESS VARIABLE → page 68
Function group TOTALIZER → page 70
Function group SYSTEM UNITS → page 72
Function group CURRENT OUTPUT → page 75
Function group DENSITY FUNCTION → page 79
Function group DISPLAY → page 87
Function group COMMUNICATION → page 89
Function group PROCESSING PARAMETER → page 90
Function group SYSTEM PARAMETER → page 93
Function group SENSOR DATA → page 96


Caution!

Caution!
Important when programming

- Many functions and options are only displayed when other functions have been adequately configured.
- Functions not required, e.g. current output, can be switched “OFF”. Corresponding functions in other function groups will then not be displayed. Functions can only be switched off if the appropriate settings in other functions have been **previously** reconfigured.

  Example 1:
  The function “VOLUME FLOW MEAS” (see page 84) is set to “OFF”. Therefore, the functions “VOL.FLOW UNIT / VOLUME UNIT / STD.VOL.FLOW UNIT”, etc. do not appear on the display. As a result, the “VOLUME FLOW” option in the “ASSIGN OUTPUT” function can no longer be selected.

  Example 2:
  The “ASSIGN TOTAL. 1” function is set to ”VOLUME” (see page 71). In the “VOLUME FLOW MEAS.” function, the “OFF” option can no longer be selected.
- If, while programming, you wish to undo a setting carried out with ⊞, select “CANCEL”. This is only possible for settings which have not yet been saved by pressing E.
- In certain functions, a prompt is given after entering data for safety reasons. Select “SURE? [YES]” with the ⊞ keys and confirm by pressing E again. The setting is now saved or a function, e.g. zero-point calibration, is activated.
- The Promass may not show values with all decimal places as this depends on the engineering unit used and the number of decimal places selected. During data input an arrow is, therefore, shown between the measured value and the engineering unit (e.g. 1.2 → kg/h).

Function group **PROCESS VARIABLE**	
Notes! • The engineering units of all variables shown here can be set in the “SYSTEM-UNITS” function group. • If the fluid in the piping flows backwards, then the flow rate value is indicated by a negative sign on the display independent of the setting in the “MEASURING MODE” function (see page 90).	
MASS FLOW	Selecting this function automatically displays the current flow rate. Display: 5-digit number with floating decimal point, incl. engineering units and arithmetic sign (e.g. 462.87kg/h; -731.63 lb/min; etc.)
VOLUME FLOW	After selecting this function, the display automatically shows the currently measured volumetric flow rate. The volumetric flow rate is derived from the measured mass flow rate and the measured fluid density. Display: 5-digit number with floating decimal point, incl. units and arithmetical sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; -731.63 gal/d; etc.) Note! This function is only available if the setting “VOLUME FLOW” or “VOLUME & STD.VOL” is selected in the function “VOLUME FLOW MEAS” within the function group “DENSITY FUNCTION”.
STD. VOLUME FLOW	After selecting this function, the display automatically shows the currently measured standardized volumetric flow rate. The volumetric flow rate is derived from the measured mass flow rate and the standard (or fixed entry) density of the measured fluid. Display: 5-digit number with floating decimal point, incl. units and arithmetical sign (e.g. 1.3549 Nm^3/h; 7.9846 scm/day; etc.). FIXED STD. DENSITY or CALC. DENS.: Display whether the density value used for calculating the standardized volumetric flow rate is a fixed entry value or derived from process data (see page 84). Note! This function is only available if the setting “STD. VOLUME FLOW” or “VOLUME & STD.VOL” is selected in the function “VOLUME FLOW MEAS” within the function group “DENSITY FUNCTION”.
TARGET FLOW	After selecting this function, the display automatically shows the currently measured flow rate of the target fluid as a mass or volumetric flow rate. *Target fluid* = material transported, e.g. lime powder (see page 79). Display: 5-digit number with floating decimal point, incl. units and arithmetical sign (e.g. 0.1305 m^3/h; 1.4359 t/h; etc.) Note! This function is only available if the setting “%-MASS”, “%-ALCOHOL”, “%-BLACK LIQUOR” or “%-VOLUME” is selected in the function “CALC. DENSITY” within the function group “DENSITY FUNCTION”.

Function group **PROCESS VARIABLE**	
CARRIER FLOW	After selecting this function, the display automatically shows the currently measured flow rate of the carrier fluid as a mass or volumetric flow rate. *Carrier fluid* = transporting material, e.g. water (see page 79). Display: 5-digit number with floating decimal point, incl. units and arithmetical sign (e.g. 0.0835 m^3/h; 16.4359 t/h; etc.) Note! This function is only available if the setting “%-MASS”, “%-ALCOHOL”, “%-BLACK LIQUOR” or “%-VOLUME” is selected in the function “CALC. DENSITY” within the function group “DENSITY FUNCTION”.
DENSITY	Selecting this function automatically displays the current fluid density or its specific gravity. Display: 5-digit number with fixed decimal point, incl. engineering units corresponding to 0.10000…6.0000 kg/dm^3 (e.g. 1.2345 kg/dm^3; 993.5 kg/dm^3; 1.0015 SG_20 °C; etc.)
CALC. DENSITY	After selecting this function, the display automatically shows the calculated value using a density function (see function group “DENSITY FUNCTION”, page 79 ff.). Display: 5-digit number with fixed decimal point, incl. units (e.g. 76.409 °Brix; 39.170 %v; 1391.7 kg/Nm^3; etc.) Display of current density function used by the measuring system, e.g. °BRIX, %-VOLUME, etc. Note! This function is only available, if a density function is selected in the function “CALC. DENSITY” within the function group “DENSITY FUNCTION”.
TEMPERATURE	Selecting this function the current temperature of the fluid is automatically displayed. Display: max. 4-digit number with fixed decimal point, incl. engineering units and arithmetic sign (e.g. -23.40 °C; 160.0 °F; 295.4 K, etc.)

Note!

Note!

Function group **TOTALIZER**	
TOTALIZER 1	Selecting this function automatically displays the totalised flow quantity from when measurement began. This value is either positive or negative depending on the direction of flow. Notes! • If the count has more figures than can be shown, e.g. with overflow, then the symbols “>” (pos. values) or “–” (neg. values) are shown before the value. • If the function “MEASURING MODE” is set to “UNIDIRECTIONAL” (see page 90), then the totalizer only registers flow in the positive direction. Display: max. 7-digit number with floating decimal point, incl. engineering units (e.g. 1.546704 t; –4925.631 kg) ASSIGN TOTAL. 1 Display of which measuring variable is assigned to totalizer 1.
TOTAL. 1 OVERFLOW	The totalised flow is shown as a max. 7-digit number with floating decimal point. Larger numbers (>9 999 999) can be read off in this function as overruns. The effective amount is calculated from the sum of the ‘overrun’ and the value shown in the function “TOTALIZER 1”. Example: Display of 2 overruns: **2 e7 kg** (= 20,000,000 kg). The value shown in the function “TOTALIZER 1” is 196,845.7 kg. Total amount = 20,196,845.7 kg Note! • This function is displayed only if overruns have occurred. • The value 0 e7 (incl. units) is shown in the HOME position, if *no* overrun occurs. Display: Integer to a decimal power e.g. 10 e7 kg ASSIGN TOTAL. 1 Display of which measuring variable is assigned to totalizer 1.
TOTALIZER 2	Function description → corresponding to function “TOTALIZER 1”
TOTAL. 2 OVERFLOW	Function description → corresponding to “TOTAL. 1 OVERFLOW”
RESET TOTALIZER	The totalizers can be reset to ‘Zero’ in this function (= reset). Note! The OVERFLOW as well as the value shown in the “TOTALIZER 1” function are reset to zero. ***CANCEL*** – TOTALIZER 1 – TOTALIZER 2 – TOTALIZERS 1&2

Function group **TOTALIZER**	
ASSIGN TOTAL. 1	With this function, a desired variable can be assigned to totalizer 1. Note! The totalizer is reset to zero if the assignment in this function is changed again. OFF – ***MASS*** – MASS (+) – VOLUME – STD. VOLUME VOLUME (+) – STD. VOLUME (+) – TARGET MATERIAL – TARGET MAT. (+) – CARRIER FLUID – CARRIER FLUID (+) CANCEL (+): The totalizer only registers flow in the *positive* direction. UNIDIRECTIONAL or BIDIRECTIONAL Display to show whether the flowmeter measures in one or in both flow directions (see "MEASURING MODE" function, page 90).
ASSIGN TOTAL. 2	With this function, a variable required can be assigned to totalizer 2. Note! The totalizer is reset to zero if the assignment in this function is changed again. ***OFF*** – MASS – MASS (-) – VOLUME – STD. VOLUME VOLUME (-) – STD. VOLUME (-) – TARGET MATERIAL – TARGET MAT. (-) – CARRIER FLUID – CARRIER FLUID (-) CANCEL (-): The totalizer only registers flow in the *negative* direction. UNIDIRECTIONAL or BIDIRECTIONAL Display to show whether the flowmeter measures in one or in both flow directions (see "MEASURING MODE" function, page 90).

Note!

Note!

Function group SYSTEM-UNITS	
MASS FLOW UNIT	With this function, select the engineering units required from those displayed for mass flow rate (mass/time). The engineering units selected here also define those for: • zero and full scale value for current • creep rate • flow rate of the target and carrier fluid g/min – g/h – kg/s – kg/min – ***kg/h*** – t/min – t/h – t/d – lb/s lb/min – lb/hr – ton/min – ton/hr – ton/day – CANCEL Display of current mass flow rate. The total flow rate is always displayed, also with two-phase media.
MASS UNIT	This function select the engineering units from those displayed for mass. The engineering units selected here also define those for: • totalizer g – ***kg*** – t – lb – ton – CANCEL
VOLUME FLOW UNIT	With this function, the units required for flow rate (volume/time) can be selected from those displayed. The volumetric flow rate is derived from the measured fluid density and the mass flow rate. The units selected here also define those for: • zero and full-scale value of the current output • flow rate of the target and carrier fluid cm^3/min – cm^3/h – dm^3/s – dm^3/min – ***dm^3/h*** – l/s – l/min l/h – hl/min – hl/h – m^3/min – m^3/h – cc/min – cc/hr – gal/min gal/hr – gal/day – gpm – gph – gpd – mgd – bbl/min – bbl/hr bbl/day – CANCEL Display of actual volumetric flow rate. The total flow rate is always displayed, also with two-phase media. Note! This function is only available if the setting “VOLUME FLOW” or “VOLUME & STD.VOL” is selected in the function “VOLUME FLOW MEAS” within the function group “DENSITY FUNCTION”.
VOLUME UNIT	In this function, the units required for volume are selected from those displayed. The volumetric flow rate is derived from the measured fluid density and the mass flow rate. The engineering units selected here also define those for the totalizers. cm^3 – ***dm^3*** – l – hl – m^3 – cc – gal – bbl – CANCEL Note! This function is only available if the setting “VOLUME FLOW” or “VOLUME & STD.VOL” is selected in the function “VOLUME FLOW MEAS” within the function group “DENSITY FUNCTION”.

Note!

Note!

Function group **SYSTEM-UNITS**	
GALLONS/ BARREL	In the US and the UK, the ratio of barrels (bbl) to gallons (gal) is defined according to the fluid used and the specific industry. Therefore, the following definitions have to be selected: • US or imperial gallons • ratio gallons/barrel Note! The definition selected here also determines the engineering unit in other functions e.g. in "VOLUME UNIT, VOLUME FLOW UNIT, DENSITY UNIT". If a new definition is selected, the values in the display will change accordingly. US: 31.0 gal/bbl → for beer ***US: 31.5 gal/bbl*** → for liquids (used in normal cases) US: 42.0 gal/bbl → for oil (petrochemicals) US: 55.0 gal/bbl → for filling tanks Imp: 36.0 gal/bbl → for beer and similar liquids Imp: 42.0 gal/bbl → for oil (petrochemicals) CANCEL US: 1 gal = 3.785 l (litre) Imp: 1 gal = 4.546 l (litre)
STDVOL. FLOW UNIT	With this function, the units required for a standard volumetric flow rate (standardized volume/time) are selected from those displayed. The standard volumetric flow rate is derived from the measured fluid density (see page 79) and the mass flow rate. The units selected here also define those for: • zero and full-scale value of the current output Nl/s – Nl/min – Nl/h – Nl/d – Nm^3/s – ***Nm^3/min*** – Nm^3/h – Nm^3/d – scm/s – scm/min – scm/hr – scm/day – scf/s – scf/min – scf/hr – scf/day – CANCEL Display of the actual standardized volumetric flow rate. Note! This function is only available if the setting "STD. VOLUME FLOW" or "VOLUME & STD.VOL" is selected in the function "VOLUME FLOW MEAS" within the function group "DENSITY FUNCTION".
STD. VOLUME UNIT	With this function, the units required for standardized volume are selected from those displayed. The standardised volume is derived from the standardized density (see page 79) and the mass flow rate. ***Nm^3*** – Nl – scm – scf – CANCEL Note! This function is only available if the setting "STD. VOLUME FLOW" or "VOLUME & STD.VOL" is selected in the function "VOLUME FLOW MEAS" within the function group "DENSITY FUNCTION".

Note!

Note!

Note!

Function group **SYSTEM-UNITS**	
DENSITY UNIT	With this function, select the required engineering units from those displayed for density. The units selected here also define those for: • zero and full-scale value for current • density response value for Empty Pipe Detection • density adjustment value g/cm³ – kg/dm³ – ***kg/l*** – kg/m³ – SD_4 °C – SD_15 °C – SD_20 °C g/cc – lb/cf – lb/USgal resp. lb/gal * – lb/bbl – SG_59 °F – SG_60 °F – SG_68 °F – SG_4 °C – SG_15 °C – SG_20 °C – CANCEL * see "GALLON/BARREL" function, page 73 SD = Specific Density, SG = Specific Gravity The specific gravity is the ratio between the density of the fluid and the density of water (at water temperatures = 4, 15, 20 °C or 59, 60, 68 °F) Display showing current density or specific gravity.
STD. DENSITY UNIT	With this function, the units required for the standardized fluid density are selected from those displayed. The units selected here also define those for: • zero and full-scale value for current • fixed standard density (to measure standard volume flow) ***kg/Nm³*** – kg/Nl – g/scc – kg/scm – lb/scf – CANCEL Display of actual standard density value. Note! This function is only available, if a density function is selected in the function "CALC. DENSITY" within the function group "DENSITY FUNCTION".
TEMPERATURE UNIT	With this function, select the required engineering units from those displayed for temperature. The units selected here also define those for: • zero and full scale value for current • reference temperature (for density functions) • min./max. temperatures (sensor coefficients) ***°C (CELSIUS)*** – K (KELVIN) – °F (FAHRENHEIT) – °R (RANKINE) – CANCEL Display showing the current medium temperature
NOM. DIAM. UNIT	With this function, select the required engineering units from those shown for the nominal diameter of the sensor. ***mm*** – inch – CANCEL Display showing the nominal diameter of the sensor in current use.

Note!

Function group
CURRENT OUTPUT (only with PROFIBUS-PA available)

ASSIGN OUTPUT

In this function, any variable required can be assigned to the current output.

OFF – ***MASS FLOW*** – VOLUME FLOW – STD. VOLUME FLOW
TARGET FLOW – CARRIER FLOW – DENSITY –
CALC. DENSITY – TEMPERATURE – CANCEL

Diagnosis (for flow rate variables only):

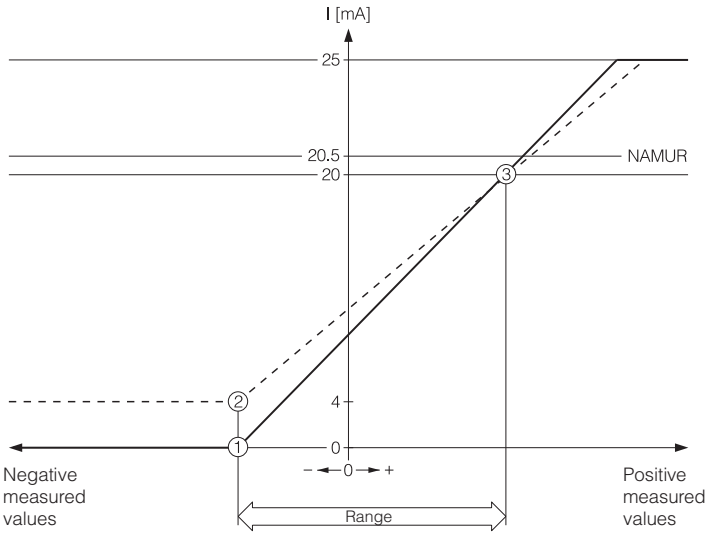
UNIDIRECTIONAL or BIDIRECTIONAL:
Display showing if the flowmeter is measuring in one or both flow directions. With unidirectional measurement a 0/4…20 mA current signal is only produced for the positive flow direction (forward); the current stays at 0 or 4 mA for the negative direction.

ZERO SCALE

In this function, assign the 0/4 mA quiescent current to the required zero value.

Notes!
- The zero value can be larger or smaller than the “full scale value”. (see function “FULL SCALE”, page 76)
- The range between the zero and full scale value should not fall below a minimum value (see Figure):

Note!



Min. set value
Q = –180 t/h **
ρ = 0.0 kg/dm³
T = –273.15 °C

Min. range
Q = 0.5 m/s *
ρ = 0.1 kg/dm³.
T = 10 K

Max. set value
Q = 180 t/h **
ρ = 5.999 kg/dm³
T = 300.00 °C

① Zero scale value 0…20 mA
② Zero scale value 4…20 mA
③ Full scale value 0/4...20 mA

* depent on density
** depentent on nominal diameter

5-digit number with floating decimal point and arithmetic sign (e.g. –1.500 kg/h; 245.92 kg/m³; 105.60 °C)
Factory setting: ***0.0000 kg/h*** resp. ***0.0000 kg/l*** resp. ***–50.000 °C***

Display showing which process variable is assigned to the current output.

Note!

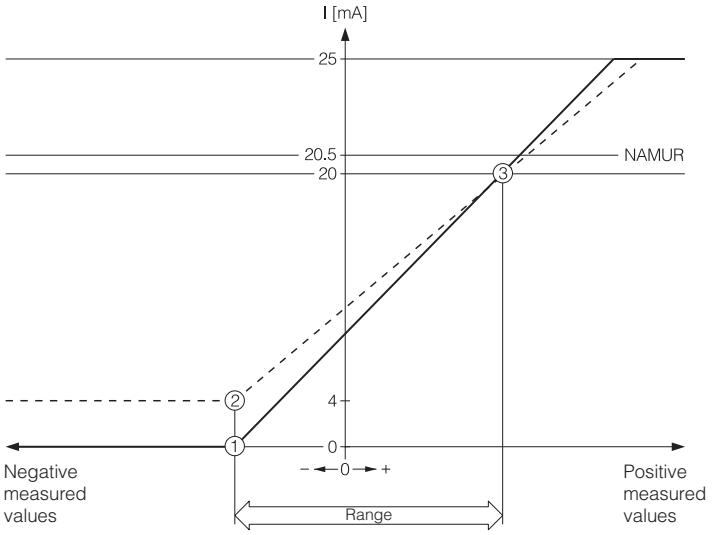
Function group

CURRENT OUTPUT (only with PROFIBUS-PA available)

FULL SCALE

In this function, assign the full scale value required to the 20 mA current (= scaling the full scale value) for that variable selected in function "ASSIGN OUTPUT".
With flow variables the scaling is always for both flow directions (bidirectional).

Note!
- The full scale value can be larger or smaller than the zero value (see function "ZERO SCALE", page 75).
- The range between the zero and full scale value should not fall below a minimum value:



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Min. set value	Min. range	Max. set value
Q = –180 t/h **	Q = 0.5 m/s *	Q = 180 t/h **
ρ = 0.0 kg/dm³	ρ = 0.1 kg/dm³	ρ = 5.999 kg/dm³
T = –273.15 °C	T = 10 K	T = 300.00 °C

① Zero scale value 0…20 mA
② Zero scale value 4…20 mA
③ Full scale value 0/4…20 mA

* dependent on density
** dependent on nominal diameter

5-digit number with floating decimal point and arithmetic sign, depending on the variable,
(e.g. –566.00 kg/min; 0.9956 kg/dm³; 105.60 °C; etc.)

Factory setting: Mass flow: ***dependent*** on the nominal diameter
Density: ***2.0000 kg/l***
Temperature: ***200.00 °C***

Display showing which process variable is assigned to the current output.

Function group

CURRENT OUTPUT (only with PROFIBUS-PA available)

TIME CONSTANT

Selecting the time constant determines whether the current output signal reacts quickly (small time constant) to rapidly fluctuating variables e.g. flow rate or slowly (long time constant). The time constant does not influence the behaviour of the display.

3-digit number with floating decimal point (0.01…100.00 s)
Factory setting: ***1.00 s***

Display showing which process variable is assigned to the current output.

CURRENT SPAN

With this function, set the 0/4 mA quiescent current. The current for the scaled full-scale value (100%) is always 20 mA. A choice can be made between the current output corresponding to NAMUR recommendations (max. 20.5 mA) or the current output with a maximum of 25 mA.

Note!
The current output can be driven up to 125% (25 mA) or 102.5% (20.5 mA) of the full scale value depending on the current span selected here.

Note!

0–20 mA (25 mA)	→	maximum 25 mA
4–20 mA (25 mA)	→	maximum 25 mA
0–20 mA	→	maximum 20.5 mA (NAMUR)
4–20 mA	→	maximum 20.5 mA (NAMUR)
CANCEL		

Display showing which process variable is assigned to the current output.

FAILSAFE MODE

In cases of an instrument error it is advisable for safety reasons that the current output assumes a previously defined status which can be set in this function. The setting chosen only affects the current output. Other outputs or the display (e.g. totalizer) are not affected.

MIN. CURRENT	Current signal is set to 0 mA (0…20 mA) or 2 mA (4…20 mA) on error.
MAX. CURRENT	Current signal set to 25 mA for 0/4…20 mA (25 mA) or to 22 mA for 4…20 mA on error.
HOLD VALUE	Last valid measured value is held
ACTUAL VALUE	Normal measured value given despite error
CANCEL	

Display showing which process variable is assigned to the current output.

Function group **CURRENT OUTPUT (only with PROFIBUS-PA available)**	
SIMULATION CURR.	In this function, the output current can be simulated corresponding to 0%, 50% or 100% of the set current range. The error mode 2 mA (for 4…20 mA) and 25 mA (maximum possible value) or 22 mA for NAMUR can also be simulated. *Application example:* Checking instruments connected or checking the internal adjustment of the current signal. Note! • After activating the simulation mode, the message “S: CURRENT OUTPUT SIMUL. ACTIVE” appears on the display in the HOME position. • The selected simulation mode affects only the current output. The flowmeter remains fully operational for measurement, i.e. totalizer, flow display etc. are operating normally. • Positive zero return interrupts any simulation being carried out and sets the output current to 0 mA or 4 mA (see function “POS.ZERO RETURN”, page 93). • Current output according to NAMUR → the 22 mA value only can be selected, not the 25 mA value. ***OFF*** – 0 mA – 10 mA – 20 mA – 22 mA – 25 mA (at 0…20 mA) 2 mA – 4 mA – 12 mA – 20 mA – 22 mA – 25 mA (at 4…20 mA) CANCEL
NOMINAL CURRENT	With this function, the calculated value of the output current is displayed (0.00…25.0 mA). The effective current can vary slightly due to external effects such as temperature. Display: calculated current (0.00…25.0 mA) Display showing the process variable assigned to the current output.

Note!

Function group
DENSITY FUNCTION

Introduction
The Promass 63 determines three variables simultaneously: mass flow – density – temperature.

This, for example, allows *volumetric flow* to be calculated. It also offers a wide variety of other calculations to be done, especially for *special density calculations* in various applications:
- calculating temperature-compensated density values (standard density).
- calculating percentage contents in two-phase media (carrier fluid and target fluid)
- converting fluid density into special density units, such as °Brix, °Baumé, °API, etc. (see following explanations)

Standard density
Many density calculations are mathematically derived from temperature-compensated standard densities. Standard density is calculated as follows:

$\rho_N = \rho \cdot (1 + \alpha\, \Delta t)$; where $\Delta t = t - t_N$

ρ_N = standard density
ρ = actual measured fluid density (measured value Promass 63)
t = actual measured fluid temperature (measured value Promass 63)
t_N = standard temperature for calculating standard density (e.g. 15 °C)
α = fluid volumetric expansion coefficient. Unit = [1/K]; K = Kelvin

°**API** (= American Petroleum Institute)
Density units specifically used in North America for liquefied oil products.

°**BAUME**
This density unit or scale is mainly used for acidic solutions, e.g. ferric chloride solutions.
Two Baumé scales are used in practice:
- BAUME > 1 kg/l: for solutions heavier than water
- BAUME < 1 kg/l: for solutions lighter than water

°**BRIX**
Density units used for the foodstuffs industry which deal with the saccharose content of aqueous solutions, e.g. for measuring solutions containing sugar such as fruit juice, etc.
The ICUMSA table for Brix units given on page 136 is the basis for calculations.

%-MASS and %-VOLUME
By using the functions for two-phase-media, it is possible to calculate the percentage mass or volume contents of the carrier fluid or the target fluid.
The basic formula (without temperature compensation) are:

$$\text{mass}\,[\%] = \frac{D2 \cdot (\rho - D1)}{\rho \cdot (D2 - D1)} \cdot 100\,\% \qquad \text{volume}\,[\%] = \frac{(\rho - D1)}{(D2 - D1)} \cdot 100\,\%$$

D1 = density of carrier fluid → transporting liquid, e.g. water
D2 = density of target fluid → material transported, e.g. lime powder or a second liquified material to be measured
ρ = total density measured

%-BLACK LIQUOR
The units of concentration used in the paper industry for black liquor in % by mass.
The formula used for the calculation is the same as for %-MASS.

%-ALCOHOL
Density measurement for units of concentration for alcohol-containing solutions in % by volume.
The formula used for the calculation is the same as for %-VOLUME, however **does not** allow for a possible volume concentration.

Field density adjustment (calibration)
Promass 63 offers the option of "field calibration" carried out in the "DENSITY ADJUST" function to provide optimum accuracy for calculating density functions → see page 81.

Caution!
- A field density adjustment alters the factory-set density calibration values.
- These calculations assume a linear responce of two-phase flow, which is not always in case in praxis.


Caution!

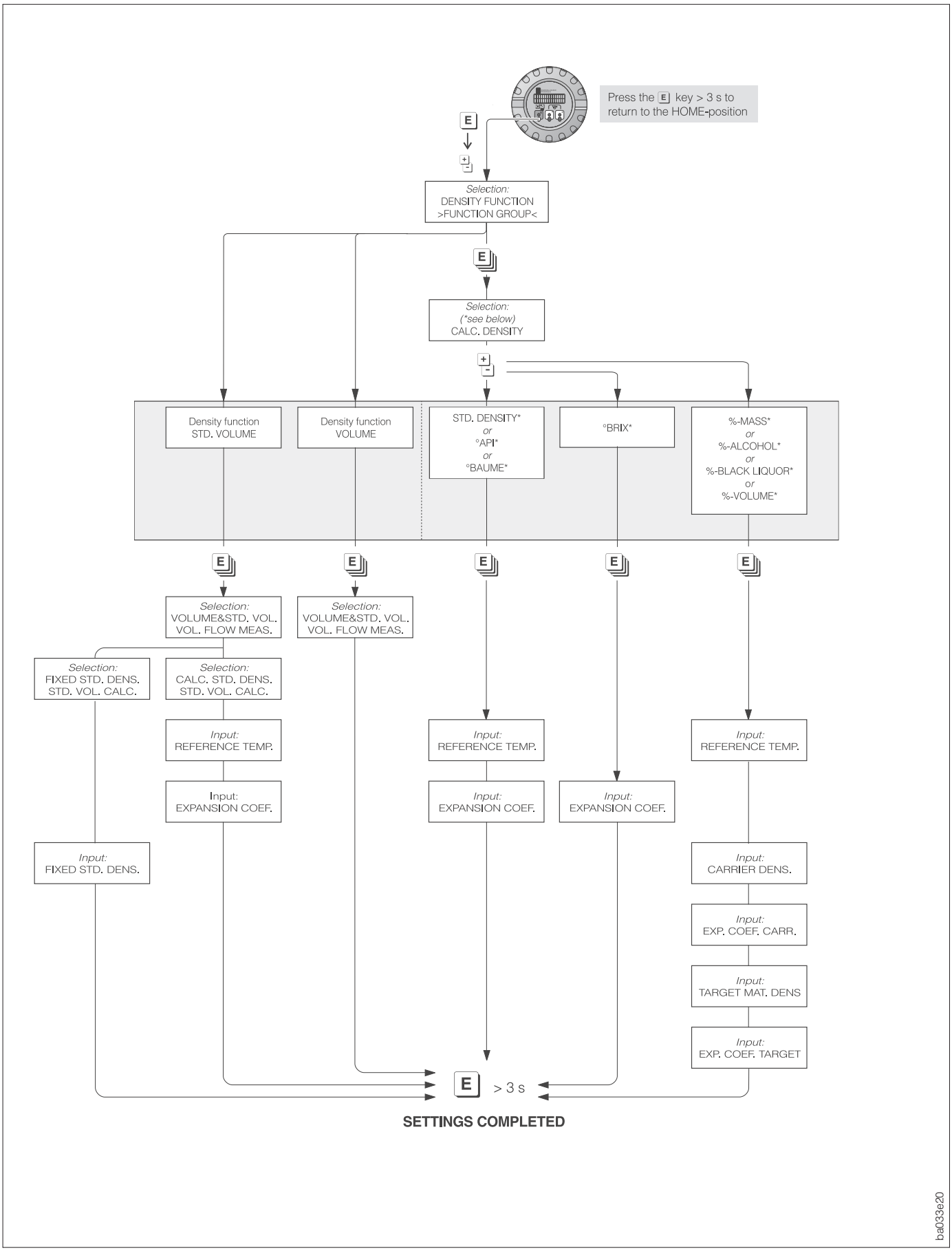


Fig. 24
Procedure for setting density functions

Function group **DENSITY FUNCTION**	
DENS. ADJ. VALUE	In this function, enter the "target density" (= density adjust value) of the particular fluid for which you want to carry out a field density adjustment. Implementation and procedure of this field adjustment is described in detail in the following function "DENSITY ADJUST". Note! • With two-point density adjustment, a target density value is to be given in this function for each of the two media. The two target density values must differ from each other by at least 0.2 kg/dm^3. • The preset density entered here should vary from the actual fluid density by a maximum ±10%. 5-digit number with floating decimal point, incl. units corresponding to 0.1…5.9999 kg/l MANUAL DENSITY CALIBRATION
DENSITY ADJUST	With this function a density adjustment can be carried out on site. The density adjustment values will thus be recalculated and stored. This ensures that the values dependent on density calculations are as accurate as possible. Two types of adjustment are to be distinguished: **1-point density adjustment** (with *one* fluid) This type of density adjustment is necessary under the following conditions: • The sensor does not measure the density accurately which the operator expects from laboratory trials. • The characteristics of the fluid are outside the measuring points set at the factory or reference conditions under which the flowmeter has been calibrated. • The plant is used solely for measuring a fluid whose density is to be determined very accurately under constant conditions. *Examples:* Brix density measurement for apple juice. **2-point density adjustment** (with *two* fluids) This type of adjustment is always to be carried out if the measuring tubes have been mechanically altered by, e.g. • material build-up • abrasion • corrosion In such cases, the resonant frequency of the measuring tubes has been affected by these factors and is no longer compatible with the calibration data set at the factory. The 2-point density adjustment allows for these mechanical changes and recalculates new revised data. ***CANCEL*** – SAMPLE FLUID 1 – SAMPLE FLUID 2 – DENSITY ADJUST Display of actual target density value (see function "DENS. ADJ. VALUE") (continued on next page)

Note!

Function group
DENSITY FUNCTION

DENSITY ADJUST

Carrying out density adjustment (see page 83, Fig. 25)

Caution!

Caution!
- Density adjustment on site always demands that the operator accurately knows the density of the fluid, for example, from laboratory trials.
- The density adjust value entered here may deviate from the currently measured fluid density by max. ±10%.
- Errors when entering the target density affects all calculated density and volume functions.
- Density adjustment changes the density calibration values entered at the factory or by the service engineer.

1-point density adjustment

1. Fill the sensor with fluid. Ensure that the measuring tubes are completely filled and that the fluid is free of gas bubbles.
2. Wait until the temperature between the fluid and the measuring tube is constant (time taken → depends on the temperature and the medium).
3. Enter the target value of your medium in the function “DENS.ADJ.VALUE” with ± and store this value with E (see page 81).
4. Select the setting “SAMPLE FLUID **1**” in the function “DENSITY ADJUST” with ± and press E. The message “SAMPLE FLUID 1 RUNNING” is shown on the display for approx. 10 seconds. During this time, Promass 63 measures a new density specific resonance frequency for the measuring tubes and the fluid.

   Note!
   Repeat the procedure if an error message is displayed.
   Check the plant and process conditions if necessary.

Note!

5. Select the setting “DENSITY ADJUST” with ± and press E.
   The prompt is displayed: Select “SURE [YES]” with ± and confirm with E.
   The density adjustment values are now calculated and then stored in the Promass measuring system.

2-point density adjustment

Note!
This type of density adjustment is only possible if both target density values are different from each other by at least 0.2 kg/l, otherwise the message “DENSITY ADJUST FAILURE” is shown on the display during adjustment.

Note!

1. Fill the sensor with the fluid. Ensure that the measuring tubes are completely filled and that the fluid is free of gas bubbles.
2. Wait until the temperature between the fluid and the measuring tube is constant (time taken → depends on the temperature and the medium).
3. Enter the target value of your medium in the function “DENS. ADJ.VALUE” with ± and store this value pressing E (see page 81).
4. Select the setting “SAMPLE FLUID **1**” in the function “DENSITY ADJUST” with ± and press E. The message “SAMPLE FLUID 1 RUNNING” is shown on the display for approx. 10 seconds. During this time, Promass 63 measures a new density specific resonance frequency for the measuring tubes.

   Note!
   Repeat the procedure if an error message is displayed.
   Check the plant and process conditions if necessary.

Note!

5. Repeat step 1 to 4 for a second fluid. Select the setting “SAMPLE FLUID **2**” for your second medium.
6. Select the setting “DENSITY ADJUST” with ± and press E.
   The prompt is displayed: Select “SURE [YES]” with ± and confirm with E.
   The density adjustment values are now calculated and then stored in the Promass measuring system.

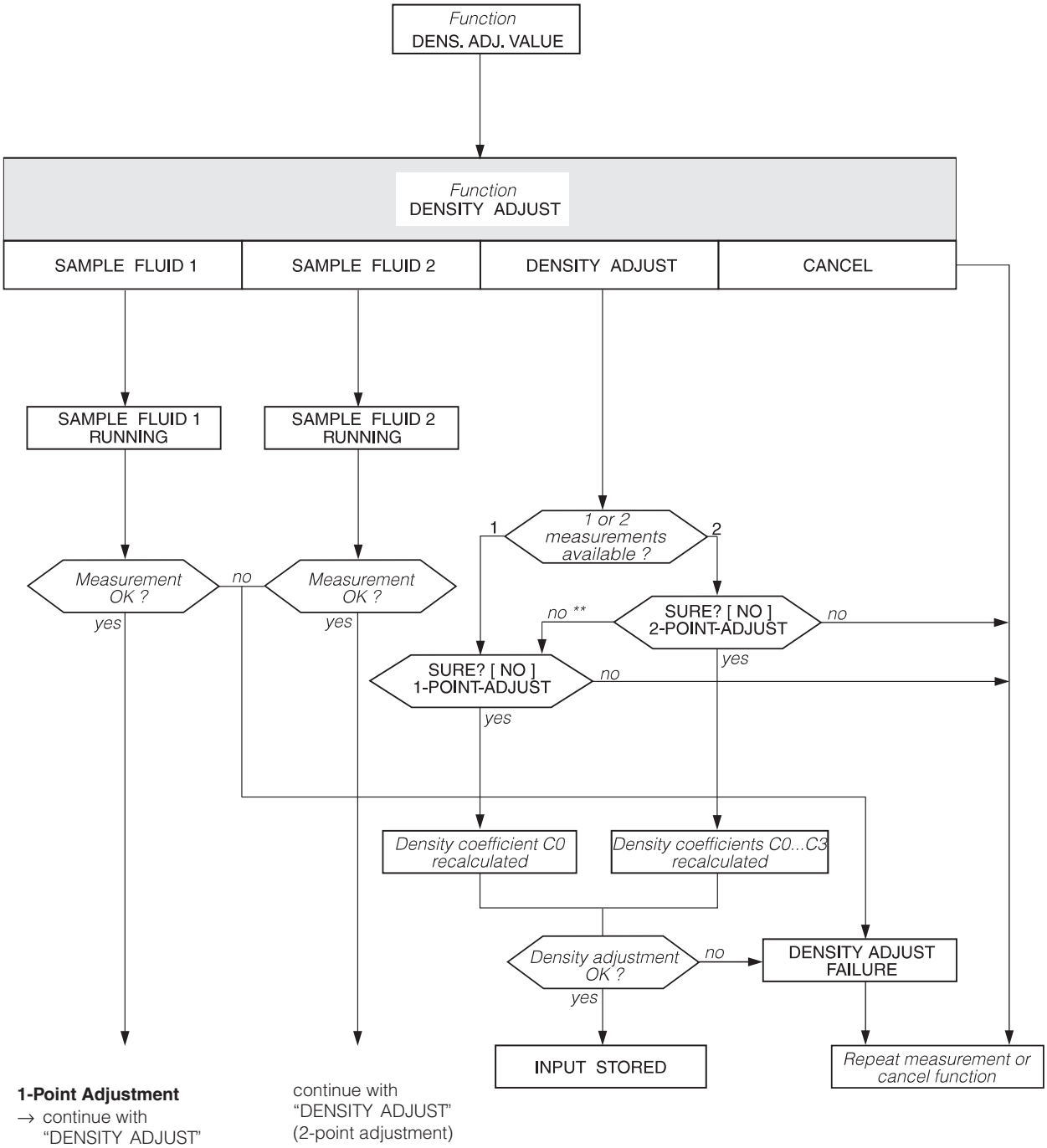


Fig. 25
Carrying out density adjustment (flow diagram) 1-point and 2-point density adjustment

Function group **DENSITY FUNCTION**	
CALC. DENSITY	In this function, select the density function required with which the special density values or the percentage contents of components in the two-phase fluid are calculated. ***OFF*** %-MASS [%m] %-VOLUME [%v] STD. DENSITY [……..] °BRIX [°Brix] °BAUME >1.0 SG [°Baume] °BAUME <1.0 SG [°Baume] °API [°API] %-BLACK LIQUOR [%Bl.Liq] %-ALCOHOL [%alc] °PLATO [°PLATO] °BALLING [°BALLING] CANCEL For details: see page 79 [ ] → displayed measuring unit Display of actual value to be calculated using the density function and variables selected above.
VOLUME FLOW MEAS	Volume and standard volume measurement are only available in other functions if the appropriate setting is activated here. ***OFF*** – VOLUME FLOW – STD. VOLUME FLOW – VOLUME & STD. VOL. – CANCEL
STD.VOL.CALC.	This function is used to set the standard density for calculating the standardised volumetric flow. Note! This function is only available if the setting “STD. VOLUME FLOW” or “VOLUME & STD.VOL.” has been selected in the above function. ***CALC. STD.DENS.*** The standard density is determined from the process data measured. FIXED STD.DENS. The standard density is entered as a fixed (known) value → see page 85 CANCEL Display of the actual calculated standard volumetric flow.
REFERENCE TEMP.	Input of the reference temperature for calculation standard volume flow measurement, standard volumes and the density functions °BAUME >1.0 SG, °BAUME <1.0 SG, °API, %-MASS, %-VOLUME, %-BLACK LIQUOR, %-ALCOHOL and STD. DENSITY. 5-digit number with fixed decimal point, units and arithmetical sign (e.g. 25.000 °C; –10.500 °C; 60.000 °F; etc.) Factory setting: ***15.000 °C*** Display of actual engineering units used for the medium temperature (see Function “TEMPERATURE UNIT”, page 74) Note! This function is only available if a density function is selected in the group “CALC.DENSITY” or “VOLUME FLOW MEAS.” within the function group “DENSITY FUNCTION”.

Note!

Note!

Function group **DENSITY FUNCTION**	
EXP. COEF.	For temperature-compensated calculations of the standard density, the expansion coefficient specific to the fluid is required and can be entered in this function. Note! This function is only displayed if you have configured other functions, accordingly: • CALC. DENSITY → °API, °BAUME, °BRIX, °PLATO, °BALLING or STD. DENSITY • STD. VOL. CALC. → CALC. STD. DENS. 5-digit number with floating decimal point, incl. units and arithmetical sign (e.g. 0.4400 e-3 1/K) Factory setting: ***0.5000 e-3 1/K***
FIXED STD. DENSITY	In this function, a fixed value for the standard density can be entered, with which the standard volumetric flow rate or the standard volume is calculated. Note! This function is displayed only if the setting “FIXED STD.DENS.” is set in the function “STD.VOL.CALC.” (see page 84). 5-digit number with fixed decimal point, incl. units (e.g. 1.0000 kg/sl; 1000.0 kg/Nm^3) Factory setting: ***1000.0 kg/Nm^3*** Display showing actual units used for the standard density (see Function “STD. DENSITY UNIT”, page 74)
CARRIER DENSITY	In this function, the density for the carrier fluid is entered. This density value is required for calculating the target fluid contained in a two-phase fluid. (calculation formula → see page 79). *Carrier fluid* = transporting liquid (e.g. water) *Target fluid* = material transported (e.g. lime powder) 5-digit number with fixed decimal point, incl. units (e.g.1.0000 kg/dm^3; 1.0016 SG) Factory setting: ***1.0000 kg/l*** Display showing the actual density units (see Function “DENSITY UNIT”, page 74) Note! This function is only available if the setting “%-MASS”, “%-ALCOHOL”, “%-BLACK LIQUOR” or “%-VOLUME” is selected in the function “CALC. DENSITY” within the function group “DENSITY FUNCTION”.
EXP. COEF. CARRIER	In this function, the expansion coefficient of the carrier fluid is entered. This value is required for the *temperature-compensated* calculation of the target fluid contents in a two-phase fluid. *Carrier fluid* = transporting liquid (e.g. water) *Target fluid* = material transported (e.g. lime powder) 5-digit number with floating decimal point, incl. arithmetical sign and units (e.g. 0.5000 e-3 1/K) Factory setting: ***0.0000 e-3 1/K*** Note! This function is only available if the setting “%-MASS”, “%-ALCOHOL”, “%-BLACK LIQUOR” or “%-VOLUME” is selected in the function “CALC. DENSITY” within the function group “DENSITY FUNCTION”.

Note!

Note!

Note!

Note!

Function group **DENSITY FUNCTION**	
TARGET MAT. DENS.	In this function, the density for the target fluid is entered. This density value is required for calculating the target medium contents in a two-phase fluid. (calculation formula → see page 79). *Carrier fluid* = transporting liquid (e.g. water) *Target fluid* = material transported (e.g. lime powder) 5-digit number with fixed decimal point, incl. units (e.g.1.0000 kg/dm^3; 1.0016 SG) Factory setting: ***2.0000 kg/l*** Display showing the actual density units (see Function "DENSITY UNIT", page 74) Note! This function is only available if the setting "%-MASS", "%-ALCOHOL", "%-BLACK LIQUOR" or "%-VOLUME" is selected in the function "CALC. DENSITY" within the function group "DENSITY FUNCTION".
EXP. COEF. TARGET	In this function, the expansion coefficient of the target fluid is entered. This value is required for the *temperature-compensated* calculation of the target fluid contents in a two-phase medium. *Carrier fluid* = transporting liquid (e.g. water) *Target fluid* = material transported (e.g. lime powder) 5-digit number with floating decimal point, incl. arithmetical sign and units (e.g. 0.5000 e-3 1/K) Factory setting: ***0.0000 e-3 1/K*** Note! This function is only available if the setting "%-MASS", "%-ALCOHOL", "%-BLACK LIQUOR" or "%-VOLUME" is selected in the function "CALC. DENSITY" within the function group "DENSITY FUNCTION".

Note!

Note!

Function group **DISPLAY**	
ASSIGN LINE 1	With this function the variable is defined which should be displayed on the *upper* display line during normal operation ("HOME" position). ***MASS FLOW*** – VOLUME FLOW – STD. VOLUME FLOW – TARGET FLOW – CARRIER FLOW – DENSITY – CALC. DENSITY – TEMPERATURE – TOTALIZER 1 – TOTAL. 1 OVERFLOW – TOTALIZER 2 – TOTAL. 2 OVERFLOW – CANCEL
ASSIGN LINE 2	With this function the variable is defined which should be displayed on the *lower* display line during normal operation ("HOME" position). OFF – MASS FLOW – VOLUME FLOW – STD. VOLUME FLOW – TARGET FLOW – CARRIER FLOW – DENSITY – CALC. DENSITY – TEMPERATURE – ***TOTALIZER 1*** – TOTAL. 1 OVERFLOW – TOTALIZER 2 – TOTAL. 2 OVERFLOW – BATCH PRESET – CANCEL
DISPLAY DAMPING	Selecting a time constant determines whether the display reacts quickly (small time constant) or slowly (large time constant) to widely changing flow variables. Note! • Damping is inactivated when set to "zero". • The time constant does not affect the behaviour of the current output. Max. 2-digit number: 0…99 seconds Factory setting: ***1 s***
FORMAT FLOW	In this function set the maximum number of decimal places of all measured values and parameters of flow variables. Note! • The settings carried out here only affect the display. They do not affect the accuracy of the calculation within the system itself. • The decimal places calculated by the Promass cannot be shown always as they depend on the settings and the engineering unit selected. In these cases an arrow is shown between the measured value and the engineering unit (e.g. 1.2 → kg/h). This means the measuring system calculates internally using more decimal places than can be shown. xxxxx. – xxxx.x – xxx.xx – xx.xxx – ***x.xxxx*** – CANCEL
LCD CONTRAST	The display contrast can be optimally adjusted to match prevailing operating conditions on site (ambient temperature). Caution! Below freezing point (< 0 °C), the visibility of the LCD is no longer assured. The display contrast is at a maximum if the ± keys are simultaneously pressed when starting up the flowmeter. IIIIIIIIIII…….. Any change in contrast is immediately seen with the adjustable bar graph.

Note!

Note!

Caution!


Note!

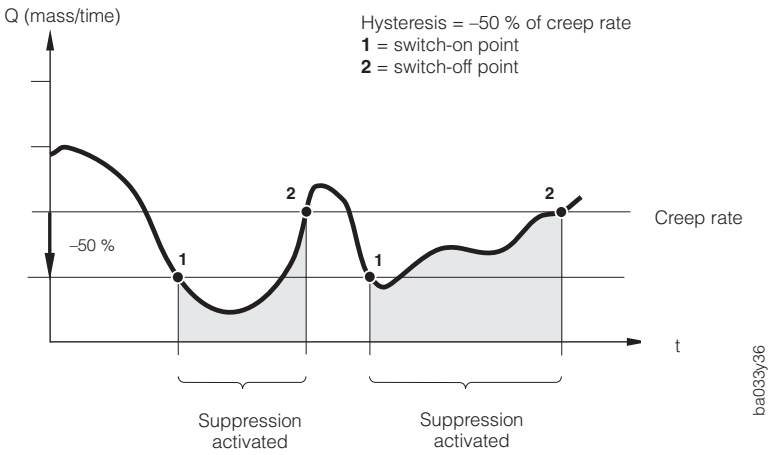
Function group **DISPLAY**	
LANGUAGE	In this function the appropriate language is selected in which all text, parameters and operating messages are to be displayed. Note! English is selected if the ± keys are simultaneously pressed when starting up the flowmeter. ± ENGLISH – DEUTSCH – FRANCAIS – ESPANOL – ITALIANO NEDERLANDS – DANSK – NORSK – SVENSKA – SUOMI BAHASA INDONESIA – JAPANESE (in original alphabet) CANCEL

Function group **COMMUNICATION**	
BUS ADDRESS	This function sets the bus address. The configuration for local operation can be deactivated using a miniature switch on the communications board (see page 25). If this is done, "SELECTION SWITCH" is displayed.  3-digit number: 0…126 Factory setting: ***126***  In case the address is assigned with the selection switch, the configured bus address is displayed
TAG NUMBER	This function displays the actual measuring-point designation (name), which can only be assigned by a PROFIBUS master, e.g. Commuwin II. The measuring-point designation corresponds to the TAG-DESC of the physical block as defined in the PROFIBUS-PA profile B.  Up to 32 characters of the full measuring-point designation are displayed
SYSTEM CONFIG.	Using this function, it is possible to switch between local operation with E+H matrix and remote operation via PROFIBUS-DP /-PA. The device can only be operated either via local operation in **>local<** mode or via PLC (Class I master / Class II master) in **>remote<** mode at one time. The system configuration and parameters are independent from the operation mode and valid even in the event of a change of the operating mode.  ***LOCAL*** – REMOTE
UNIT TO BUS	In this function the system units set on the instrument are transmitted to the bus or to Class I master. This function is only required if the system unit have been changed via the local operation and this change shall be propagated to the AI blocks. Changes to the system units via local operation are not automatically transmitted to the bus or master. Only after the function "UNIT TO BUS" is activated, the system units will be transmitted to the bus or master and updated there.  ***CANCEL*** – UNIT TO BUS

Function group
PROCESSING PARA.

LOW FLOW CUTOFF

In this function, the required switching point for creep suppression (low flow cutoff) can be entered. The creep suppression prevents the flow rate being measured in the lower part of measuring range (e.g. a variable column of liquid at standstill). When creep suppression is active, the sign of the flow appears optically inverted on the display.



5-digit number with floating decimal point (e.g. 25.000 kg/min)
Factory setting: ***dependent on*** the nominal diameter

HYSTERESIS = 50%
Creep suppression operates with a negative hysteresis of 50% (see above figure).

NOISE SUPPRESS.

Using the interference blanking (= time constant for exponential filter) the sensitivity of the flow measurement signal to transient flows and interference peaks can be reduced; e.g. with media containing solids or gas bubbles. Small negative parts will be smoothed.

0.00...2.00 s (in 10 ms-steps)

0 seconds → OFF
2 seconds → high damping

MEASURING MODE

The Promass 63 measuring system generally measures flow in both directions.

- Unidirectional: Signal output in the positive direction only (forward). Flows in a negative direction (backwards) are not included or totalised by the Promass measuring system.
- Bidirectional: Signal output in both directions (forward and reverse).

UNIDIRECTIONAL – BIDIRECTIONAL – CANCEL

Function group **PROCESSING PARA.**	
FLOW DIRECTION	In special cases it is possible that the arrow marked on the sensor nameplate does not agree with the actual flow direction of the fluid. In this function you have the option to change the arithmetical sign of the flow variable. ***FORWARD*** – REVERSE – CANCEL
EPD THRESHOLD	EPD = Empty Pipe Detection: With empty measuring tubes the fluid density falls below a specified value (= response or threshold value) which can be specified in this function. Note! • When the preset response value is reached or exceeded the display shows the error message “A: EMPTY PIPE”. The flow is then set to the value ‘0.0000’ and the density to the EPD threshold value. • Switching on and off the EPD operates at a time constant of 1 second. • Empty Pipe Detection is switched off if the EPD threshold value is set to the value ‘0.0000’. Caution! • Select a correspondingly low EPD response value so that the difference to the effective density of the medium is sufficiently large enough. This ensures that totally empty measuring tubes and not partially filled ones are detected. • For gas measurement we strictly recommend to switch off empty pipe detection (set “EPD THRESHOLD” to 0.0000 kg/l). 5-digit number with fixed decimal point, incl. engineering units corresponding to 0.0000…5.9999 kg/l Factory setting: ***0.2000 kg/l***
DENSITY FILTER	The density filter allows the sensitivity of the density measuring signal to be lowered with respect to variations in the density of the medium, e.g. with heterogeneous liquids. OFF – LOW – ***MEDIUM*** – HIGH – CANCEL
SELF CHECKING	Better reproducibility for short batching cycles (<60 s) can be guaranteed by activating the selection “SMART PLUS”. Note! Select “CYCLIC” for batching times >60 s and for continuous measuring mode. ***CYCLIC*** – SMART PLUS – CANCEL


Note!


Caution!


Note!

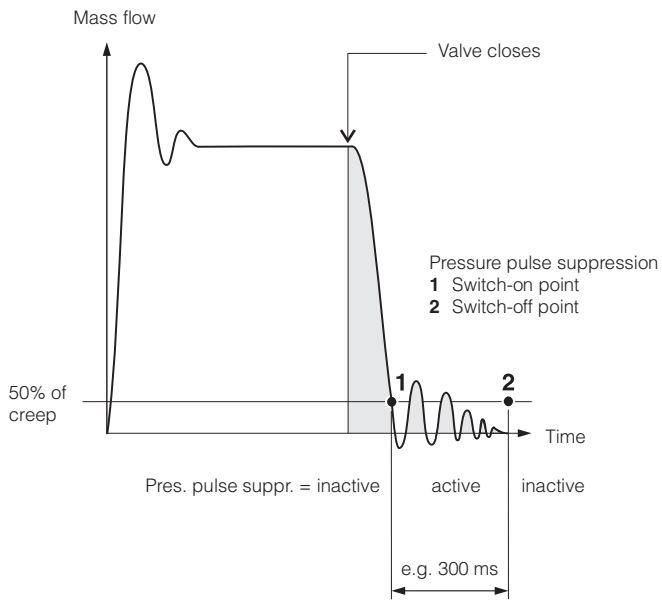
Function group
PROCESSING PARA.

PRES. PULSE SUPPR.

When closing a valve, there may be a sudden but strong rush of liquid in the piping which is then detected by the measuring system. The pulses will be counted, especially those from filling cycles, and produce an incorrect result in the totaliser. Because of this, the Promass 63 has a function for pressure pulse suppression (= transient signal suppression) which can eliminate interference coming from the plant.
The time interval of the active pressure pulse suppression is defined in this function:

Switch-on point
Pressure pulse suppression is activated after the flow velocity falls below 50% of the creepage value (see page 88). The following applies during the pressure pulse suppression:
- Current output → is set to 0 mA or 4 mA (only with PROFIBUS-PA)
- Display flow = 0
- Display totaliser → both totalisers (TOTALIZER 1 and 2) remain at the last applicable value.
- Temperature and density values continue to be shown.

Switch-off point
The pressure pulse suppression is again deactivated after the set time interval.



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Max. 4-digit number, incl. units (0.00...10.00 seconds)
Factory setting: ***0.00 s***

Note!
- When using the pressure pulse suppression, the low flow cutoff must be set to a value > 0.

Note!

Function group **SYSTEM PARAMETER**	
ZEROPOINT ADJUST	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 function "ZEROPOINT". In the function "SELECT ZEROPOINT" specify which zero point (1 or 2) should be recalibrated. Caution! Before carrying out the calibration please refer to chapter 7, where a detailed description of the zero point adjustment is given. Note! • Programming is locked during zero point adjustment and the display shows "S: ZERO ADJUST RUNNING". • If the zeropoint adjustment is not possible, e.g. with a flow velocity > 0.1 m/s, or has been cancelled, then the alarm message "A: ZERO ADJUST NOT POSSIBLE" is shown on the display. + / − ***CANCEL*** – START + / − Display showing the current zero point value used by the measuring system.
POS. ZERO RETURN	This function assigns 0 to the corresponding data items of the PROFIBUS-PA function blocks and sets from the current output to the fallback value, e.g. for interrupting the measurement for cleaning the piping. • Flow rate = 0 for the Analog In Blocks of the PROFIBUS-PA interface • Current output → set to 0 mA or 4 mA • Display flow = 0 • Both totalizers remain at the last applicable value. • Temperature and density values are still shown. Note! • This function has top priority over all other functions of the instrument. Simulations are suppressed for example. • After positive zero return is activated, the display shows the message "S: POS. ZERO-RET. ACTIVE". + / − ***OFF*** – ON + / − ALL SIGNALS SET TO ZERO (for description: see above)
DEF. PRIVATE CODE	This function enables a personal code number to be selected with which programming can be enabled. Note! • Programming is always enabled with the code number "0". • When programming is locked this function is not available and access to the personal code number by third parties is not possible. • The code number can only be altered when programming has been enabled. + / − Max. 4-digit number (0…9999) Factory setting: ***63***


Caution!


Note!


Note!


Note!

Function group **SYSTEM PARAMETER**	
ACCESS CODE	All data of the Promass 63 measuring system are protected against unauthorised access. Only by first entering a code number in this function programming with Commuwin II resp local operation is enabled and the settings of the instrument can then be altered. If in any function the ± operating elements are pressed, then the measuring system jumps automatically into this function and the display shows the prompt to enter the code number (if programming is locked): → Enter code number 63 (factory setting) or → Enter personal code number (see function "DEF. PRIVATE CODE", page 93) Note! • After jumping to the HOME position programming is again locked after 60 seconds if no operating element is pressed during this time. • Programming can also be locked by entering any number (not the customer code number) in this function. • If you can no longer find your personal code number, then the Endress+Hauser service organisation will be pleased to help you. ± Max. 4-digit number (0…9999) Factory setting: ***0***
PRESENT SYSTEM CONDITION	System/process errors as well as status messages which occur while measurement is in progress can be called up according to their priority. Error and status messages are displayed in the HOME position alternately with the actual measurement variable. Note! • On activating the diagnosis function ± there is automatically a jump to this function. • A complete listing of all possible system/process errors and status messages is found on page 101 ff. ± Calling up other current errors or status messages "+" → message with higher display priority "–" → message with lower display priority When the listing is complete the display shows the message "END OF LIST". ± By pressing the diagnosis function again when a system error occurs you can also call up error descriptions. In such cases a diagnosis symbol (stethoscope) is shown on the display.
PREVIOUS SYSTEM CONDITIONS	In this function, all system/process errors and status messages that have occurred so far are listed in *chronological* order (error history with max. 15 entries). Note! • A complete list of all possible system/process errors and status messages is given on page 101 ff. • If no error or status messages have occurred since the measuring system was last started up then the display shows the message "S: NO ENTRY EXISTING". • With more than 15 entries the oldest message is overwritten. • Storage of this list is volatile and is lost if there is a supply failure. ± Calling up other system/process errors and status messages "+" Listing is done chronologically with the oldest, second oldest …etc. message "–" Listing is done chronologically with the latest, second latest …etc. message When the listing is complete the display shows the message "END OF LIST". ± By activating the diagnosis function when a system error occurs you can also call up error descriptions.

Function group **SYSTEM PARAMETER**	
SOFTWARE VER. COM	In this function, the current software is shown which is installed on the communications board. The numbers of the software version have the following meaning: V 3 . 02. XX PBUS – Communication interface – Number changes if minor alterations are made to the new software. This also applies to special software versions. – Number changes if the new software contains additional functions. – Number changes if basic alterations have to be made to the software, e.g. due to technical modifications to the instrument. Note! If the display does not show “PBUS” there is no PROFIBUS-DP/-PA communication board installed, but another type.
SYSTEM RESET	With this function the Promass 63 can be restarted without the power supply being switched off and on again. Note! With a “restart” all error entries in the function “PREVIOUS SYSTEM CONDITIONS” are deleted. ***CANCEL*** – RESTART SYSTEM
ALARM DELAY	With this function a time interval can be defined (0...100 seconds), in which an error message is suppressed when faults or alarms occur. Depending on the setting and type of error, this suppression effects: • display • current output (only PROFIBUS-PA) • PROFIBUS interface Range: 0...100 seconds (in one second steps) Factory setting: ***0 s*** Caution! When using this function, error and alarm messages are sent to higher control systems (PLC, etc.) only after a preset delay. It must first be determined if the safety of the process permits this. If no delay is permitted for fault and alarm messages, then a value of 0 seconds must be set.

Note!

Note!

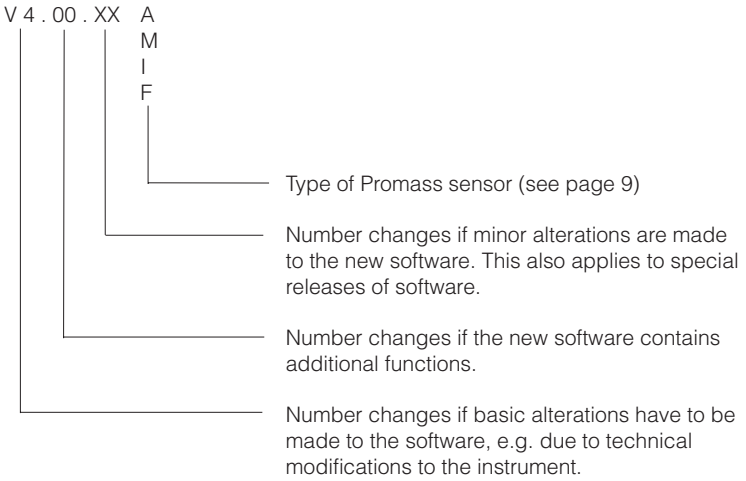
Caution!

Function group **SENSOR DATA**	
K-FACTOR	In this function, the current calibration factor of the sensor is shown: Max. 5-digit number with fixed decimal point (0.1000…5.9999) Factory setting: ***dependent*** on the nominal diameter of sensor and its calibration Caution! The calibration factor may only be altered under special circumstances. The appropriate E+H Service Centre should first be contacted before this is done.
ZEROPOINT	In this function, the zero point correction currently used by the sensor can be called up and/or changed. Note! The zero point adjustment is described in detail in chapter 7. Max. 5-digit number (-10000…+10000) Factory setting: ***dependent*** on the nominal diameter of sensor and its calibration *Example:* Correction factor 100 = 1% of Q_{ref} with v = 1 m/s (ρ = 1 kg/l) Correction factor 100 = 0.5% of Q_{ref} with v = 2 m/s (ρ = 1 kg/l) ZEROPOINT 1 or ZEROPOINT 2 Display showing the active zero point
NOMINAL DIAMETER	In this function, the actual nominal diameter of the sensor is shown (e.g. 25 mm, 2 inch, etc.).
SENSOR COEF.	In this function, other calibration data and information on the sensor can be called up. Changes to the calibration values shown in this function can only be carried out by an E+H service technician. This also applies to resetting calibration values originally done in the factory. Caution! A density adjustment on site (see page 81) can alter the calibration values C0, C1, C2, C3, C4 and C5. CANCEL — By selecting “CANCEL” and confirming with E you jump to the next function. DENSITY COEF. C 0 DENSITY COEF. C 1 DENSITY COEF. C 2 DENSITY COEF. C 3 DENSITY COEF. C 4 DENSITY COEF. C 5 TEMP. COEF. Km TEMP. COEF. Kt CAL. COEF. Kd1 CAL. COEF. Kd2 MIN. TEMPERATURE (lowest fluid temperature measured) MAX. TEMPERATURE (highest fluid temperature measured) E For each of these calibration coefficients you can call up the particular value by pressing E. You jump back to the options by pressing E.

Caution!

Note!

Caution!

Function group **SENSOR DATA**	
SERIAL NUMBER	In this function the serial number of the sensor is shown: 6-digit number (100000…999999).
SOFTWARE VERSION	In this function, the current software is shown which is installed on the amplifier board. The numbers of the software version have the following meaning: 

9 Diagnosis and Trouble-shooting

9.1 Response of the measuring system on fault or alarm

Error indications which occur during operation are indicated in the HOME position alternately with the measured values. The Promass 63 measuring system has two types of error:

Type of error	Response of the instrument
Fault (system error, failure) Errors due to failure of the instrument	➜ An appropriate error message is shown on the display (see page 101). ➜ The current output responds according to set failure mode (see page 77).
Alarm (process errors) Errors due to process conditions	➜ An appropriate alarm message is shown on the display (see page 105).


Caution!

Caution!
Please note the following points on **positive zero return** or active **simulation**:

Positive Zero return
- This function has top priority above all other instrument functions. Simulations are suppressed for example.
- After measurand suppression is activated, the display shows the message "S: POS. ZERO-RET. ACTIVE".

Simulation
- This function has the second highest priority. Specific status messages can still only be called up and shown using the diagnosis function.

9.2 Diagnosis flow chart and trouble-shooting

All instruments undergo various stages of quality control during production. However, should an error or fault occur during set-up or operation, then refer to the flow chart below to identify possible causes.

Error type	Remedy
• No indication on the display. → • No output signal. →	1. Check the power supply on Terminal No. 1 and No. 2. 2. Check the power line fuses: 85...260 V AC: 1 A slow-acting 20... 55 V AC: 2.5 A slow-acting 16... 62 V DC: 2.5 A slow-acting 3. Replace electronics module (see page 107).
• Poor contrast on the display. Output signals functioning correctly. →	1. Check connector No. 3b (see page 107). 2. Replace display. 3. Replace electronics module (see page 107).
• No understandable language on the display. →	1. Change the language : a) Switch off the power supply. b) Press the ± -keys at the same time. c) Keep the ± -keys pressed while turning on the power supply again. → Display is reset to English.
• No current output despite a message on the display (only with PROFIBUS-PA). →	1. Check connector No. 8 (see page 107). 2. Replace electronics module (see page 107).
• Flow- or density display unsteady with continuous flow. →	See Notes on page 106.
• Error, alarm- or status messages shown which are not described in Section 9.3. →	Please contact your E+H service organisation (see also Notes below).

Notes on remedying errors together with E+H Service

When requesting a customer service engineer, the following informations are required →	• Short decription of the error • Order code stated on the nameplate
When returning the instrument, the following informations are required →	• Delivery note • Description of the error
When ordering an electronics module, the following informations are required →	• Order code for electronics module: Promass 63 A MOD - **XXXX** Promass 63 F MOD - **XXXX** Promass 63 M MOD - **XXXX** Promass 63 I MOD - **XXXX** **XXXX** = the last four characters on the code as stated on the transmitter nameplate.

9.3 Error, alarm and status messages

Error message **F:** (System error, failure)	Error code	Cause Call up by ±	Remedy
	0	No system error or failure	–
F: SYSTEM ERROR AMPLIFIER	**1**	**: LOW VOLTAGE DETECTED** The amplifier is detecting a too low voltage. Power supply or amplifier defective.	1. Check the power supply voltage. 2. Replace the electronics module (see page 107).
F: TUBES NOT OSCILLATING	**2**	**: NO DIAGNOSIS** Instrument error or application problem.	1. Mount the instrument on the pressure side of the pump. 2. Using the valve, choke the piping downstream from the instrument and thus increase the pressure in the instrument. 3. Install an orifice plate downstream from the instrument. 4. Provide suitable equipment to increase the pressure in the system. 5. Refer to notes on trouble-shooting.
F: SYSTEM ERROR AMPLIFIER	**3**	**: DAT FAILURE** Error on access to data in DAT (calibration values of sensor).	1. Check to see if the DAT is plug in. 2. Replace the electronics module (see page 107). 3. Order a new DAT using the serial number and the order code and then replace.
F: SYSTEM ERROR AMPLIFIER	**4**	**: EEPROM FAILURE** Error on access to EEPROM data (calibration values of the amplifier).	1. Check to see if the DAT is plug in. 2. Replace the electronics module. 3. Order an new DAT using the serial number and the order code and then replace.
F: SYSTEM ERROR AMPLIFIER	**5**	**: RAM FAILURE** Error on access to working memory (RAM) of the processor	Replace the electronics module.
F: PICK-UP FAILURE	**6**	**: NO DIAGNOSIS** The sensor coil is defective.	1. Check Connection No. 7 (see Fig. 26, see page 107) 2. For remote version, check Terminal No. 4, 5, 6 and 7 on the sensor and transmitter. 3. Refer to notes on trouble-shooting.
F: SYSTEM ERROR AMPLIFIER	**8**	**: TEMP. SENSOR MEAS. TUBES** The temperature sensor of the measuring tube(s) is defective.	Replace the electronics module (see page 107).

Error message **F:** (System error, failure)	**Error code**	**Cause** Call up by ⊞	**Remedy**
F:SYSTEM ERROR AMPLIFIER	**9**	**: ASIC FAILURE** The ASIC on the amplifier board is defective.	Replace the electronics module (see page 107).
F: SYSTEM ERROR AMPLIFIER	**10**	**: TEMP. CIRCUIT FAILURE** Temperature switching of the amplifier is defective.	1. Check Connection No. 5 (see Fig. 26, on page 107). 2. For remote version, check Terminal No. 9 and No. 10 on the sensor and transmitter.
F: SYSTEM ERROR AMPLIFIER	**11**	**: TEMP. SENSOR CARRIER TUBE** The temperature sensor of the secondary containment is defective.	1. Check Connection No. 5 (see Fig. 26, on page 107). 2. For remote version, check Terminal No. 11 and No. 12 on the sensor and transmitter.
F: SYSTEM ERROR AMPLIFIER	**13**	**: HW-TYPE INCOMPATIBLE**	1. Check to see if the electronics module is suitable for the sensor types: A, M, F or I. 2. Replace the electronics module (see page 107).
F: NO AMPLIFIER RESPONSE	**24**	**: NO DIAGNOSIS** Data transfer between amplifier and communications module is not possible.	1. Check Connection No. 5 (see Fig. 26, on page 107). If there is already one of above error messages present then the system pressure is possibly too low. 2. If there is still an error message, then replace the electronics module. 3. Refer to notes on trouble-shooting.
F: SYSTEM ERROR AMPLIFIER	**34**	**: SW-TYPE INCOMPATIBLE**	Replace the electronics module (see page 107).
F: SYSTEM ERROR AMPLIFIER	**35**	**: HW-VERSION INCOMPATIBLE**	Replace the electronics module (see page 107).
F: SYSTEM ERROR AMPLIFIER	**36**	**: SW-VERSION INCOMPATIBLE**	Replace the electronics module (see page 107).
F: SYSTEM ERROR POWER SUPPLY	**42**	**: LOW VOLTAGE DETECTED** The power supply board is supplying a too low voltage.	1. Check the power supply voltage. 2. Replace the electronics module (see page 107).

Error message **F:** (System error, failure)	**Error code**	**Cause** Call up by ⊞	**Remedy**
F: VALUE NOT ACCEPTED	**25**	**: NO DIAGNOSIS** An internally stored value can not be read by the communications module.	1. Restart the measuring system (switch the power supply off and then on). 2. Replace the electronics module (see page 107).
F: SYSTEM ERROR COM-MODULE	**26**	**: EEPROM FAILURE** Error on access to EEPROM data. (process and calibration data of communications module).	Replace the electronics module (see page 107).
F: SYSTEM ERROR COM-MODULE	**27**	**: RAM FAILURE** Error on access to working memory (RAM).	Replace the electronics module (see page 107).
F: SYSTEM ERROR COM-MODULE	**28**	**: ROM FAILURE** Error on access to program memory (ROM).	Replace the electronics module (see page 107).
F: SYSTEM ERROR COM-MODULE	**29**	**: LOW VOLTAGE DETECTED** DC/DC converter on the communications module is supplying a power voltage which is too low.	1. Check the power supply voltage. 2. Replace the electronics module (see page 107).
F: SYSTEM ERROR COM-MODULE	**30**	**: VOLTAGE REFERENCE** The reference voltage of the communications module is outside the tolerance, i.e. correct functioning of the current output is no longer guaranteed.	Replace the electronics module (see page 107).
F: SYSTEM ERROR COM-MODULE	**31**	**: EEPROM HW DATA ERROR** A part of the EEPROM data of the communications module is damaged or has been over-written. Default values from the ROM are written in. The measuring system can still operate on a makeshift basis using these values.	Replace the electronics module (see page 107).

Error message **F:** (System error, failure)	**Error code**	**Cause** Call up by ±	**Remedy**
F: SYSTEM ERROR COM-MODULE	**32**	**: EEPROM PARA. DATA ERR** A part of the EEPROM data of the communications module is damaged or has been over-written. Default values from the ROM are written in. The measuring system can still operate on a makeshift basis using these values.	Replace the electronics module (see page 107).
F: SYSTEM ERROR COM-MODULE	**33**	**: EEPROM TOT. DATA ERROR** A part of the EEPROM data of the communications module (totaliser block) is damaged or has been overwritten. Default values “0” is entered in the totaliser.	Replace the electronics module (see page 107).
F: SYSTEM ERROR COM-MODULE	**37**	**: EEPROM DEFAULT VALUE**	1. Switch the instrument off and then on. 2. Reconfigure the instrument.
F: SYSTEM ERROR COM-MODULE	**38**	**: HW-TYPE INCOMPATIBLE**	Replace the electronics module (see page 107).
F: SYSTEM ERROR COM-MODULE	**40**	**: SW-TYPE REPLACED**	Replace the electronics module (see page 107).
F: SYSTEM ERROR COM-MODULE	**41**	**: SW-DOWNGRADE NOT POSSIBLE**	Replace the electronics module (see page 107).

Alarm message **A:** (Processor error)	Alarm code	Cause	Remedy
A: DAT CONTAINS DEFAULT DATA	**49**	Empty DAT on the amplifier board. The instrument is operating with the default values (factory settings).	1. Check to see if the DAT is plug in. 2. Replace the electronics module (see page 107). 3. Order a new DAT using the serial number and the order code and then replace
A: EXCIT. CURRENT LIMIT	**50**	The maximum excitation current for the excitation coil has been attained with specified fluid characteristics at limit values (e.g. gas or solid content). The instrument is continuing to operate correctly.	1. Mount the instrument on the pressure side of the pump. 2. Using the valve, choke the piping downstream from the instrument and thus increase the pressure in the instrument. 3. Install an orifice plate downstream from the instrument. 4. Provide suitable equipment to increase the pressure in the system. 5. Refer to notes on trouble-shooting.
A: SLUG FLOW CONDITIONS	**51**	The medium is heterogeneous (gas or solids content). The current needed to excite the measuring tube(s) therefore varies significantly.	1. Mount the instrument on the pressure side of the pump. 2. Using the valve, choke the piping downstream from the instrument and thus increase the pressure in the instrument. 3. Install an orifice plate downstream from the instrument. 4. Provide suitable equipment to increase the pressure in the system. 5. Refer to notes on trouble-shooting.
A: EMPTY PIPE	**52**	Applicational problem: • gas in the measuring tubes • density too low (s. page 91, Empty Pipe Detection).	1. Fill the measuring pipe and ensure that no gas bubbles are in the medium. 2. Set the parameter for EPD threshold value to be the same as the density of the medium.
A: FLOW TOO HIGH	**53**	Velocity of liquid in the measuring tubes is >12,5 m/s. Measuring range of transmitter electronics is exceeded.	Lower the flowrate.
A: ZERO ADJUST NOT POSSIBLE	**54**	The zero point calibration is not possible or has been cancelled.	Check if fluid velocity = 0 m/s.
A: CURRENT OUTPUT OVERFLOW (only PROFIBUS-PA)	**72**	The actual measured value is outside the range preset by the scaled zero and full scale values.	1. Change scaled zero and full values (see pages 75, 76) or change measured variable. 2. Refer to notes on trouble-shooting.
A: DENSITY ADJUST FAILURE	**75**	Both target density values are not different from each other by at least 0.2 kg/l.	1. Change density adjust value. 2. Repeat measurement

Status message **S:** (status)	**Status code**	**Cause**	**Remedy**
S: POS. ZERO-RET. ACTIVE	**96**	Positive zero return is activated. This message has highest priority for the measuring system.	1. Switch off the function "POS. ZERO RETURN" (see page 93).
S: CURRENT OUTPUT SIMUL. ACTIVE	**101**	Current output simulation is activated.	Switch off the current output simulation (see page 78).
S: ZERO ADJUST RUNNING	**–**	Zero point adjustment is running.	Not required


Note!

Note!
If the following messages occur: "EXCIT. CURRENT LIMIT", "TUBES NOT OSCILLATING", "SLUG FLOW CONDITIONS", "NO AMPLIFIER RESPONSE", either singly or in combination, then it is possible that the measuring pipes are too strongly dampened by the fluid whereas the measuring system itself is not sufficiently dampened

Possible causes:
- Partially filled pipe
- High gas content in the fluid
- Pressure is below the vapour pressure of the fluid
- Cavitation
- Highly viscous medium (from experience also with high gas component)

Possible remedies:
- Ensure that there is sufficient pressure in the system (see page 12).
- Install the flowmeter downstream from the pump on the pressure side.
- Use a valve to choke the piping downstream from the flowmeter.
- Install an orifice plate downstream from the flowmeter (see page 15).
- Install the flowmeter vertically into the piping (see page 14).

9.4 Replacing the transmitter electronics

Warning!
- Danger of electrical shock! Switch of the power supply before opening the elctronics housing.
- The local power supply voltage and frequency must agree with the technical data of the power supply boards used.
- When using Ex instruments, the regulations given in the separate Ex documentation have to be observed.

Warning!

❶ Loosen the screw of the safety claw (3 mm Allen key).

❷ Unscrew the cover of the transmitter electronics compartment.

❸ Remove the local display (if present):
a) Loosen the mounting screws of the display module.
b) Unplug the ribbon cable of the display module from the communications board.

❹ Unplug the two-pole plug of the power supply cable by pressing down the vatch from the power supply board.

❺ Remove cable board of the screened signal cable (incl. the DAT module connected) from the amplifier board.

❻ Loosen the two Phillips screws of the board support plate. Carefully remove the board plate approx. 4…5 cm out of the transmitter housing.

❼ Remove the excitation current cable plug from the power supply board.

❽ Remove the ribbon cable plug (connection cable to the terminal area) from the communications board.

❾ The entire transmitter electronics, together with the board support plate, can now be completely removed from the housing.

Caution!
The Promass M and F electronics are not identical with those of Promass A or I.

Caution!

❿ Replace the old transmitter electronics and reassemble in reverse sequence.

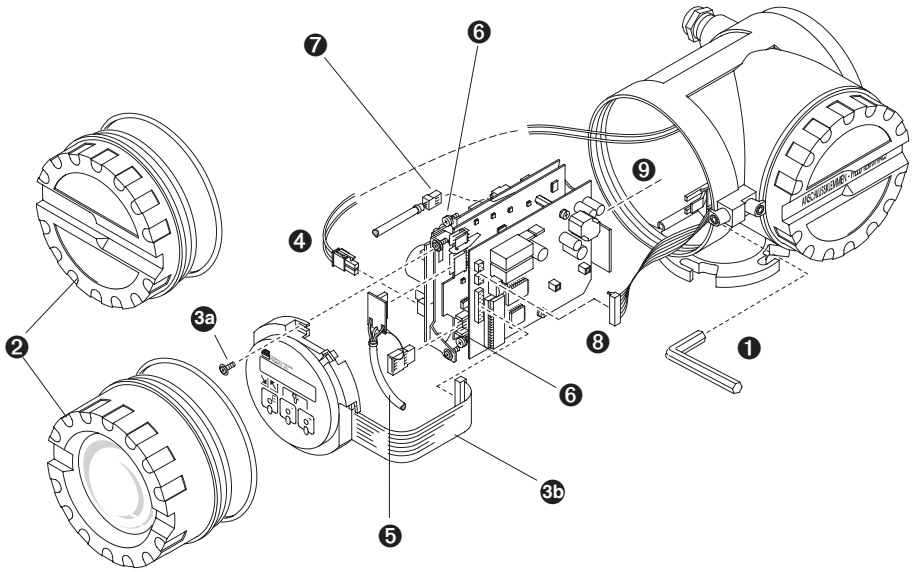


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Fig. 26
Replacing the Promass 63 transmitter electronics

9.5 Replacing the COM-Modul PROFIBUS-DP/-PA


Warning!

Warning!
- Danger of electrical shock! Switch of the power supply before opening the elctronics housing.
- The local power supply voltage and frequency must agree with the technical data of the power supply boards used.
- When using Ex instruments, the regulations given in the separate Ex documentation have to be observed.

❶ a) Loosen the screw of the safety claw (3 mm Allen key).
b) Unscrew the cover of the transmitter electronics compartment.

❷ Remove the local display (if present):
a) Loosen the mounting screws of the display module.
b) Unplug the ribbon cable of the display module from the communications board.

❸ Unplug the two-pole plug of the power supply cable by pressing down the vatch from the power supply board.

❹ Remove cable board of the screened signal cable (incl. the DAT module connected) from the amplifier board.

❺ Loosen the two Phillips screws of the board support plate. Carefully remove the board plate approx. 4…5 cm out of the transmitter housing

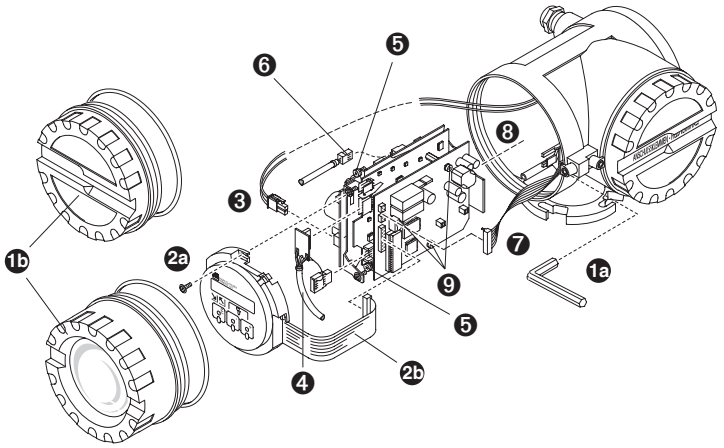
❻ Remove the excitation current cable plug from the power supply board.

❼ Remove the ribbon cable plug (connection cable to the terminal area) from the communications board..

❽ The entire transmitter electronics, together with the board support plate, can now be completely removed from the housing.

❾ Loosen the three Phillips screws of the communication board.

❿ Replace the old communication board and reassemble in reverse sequence.



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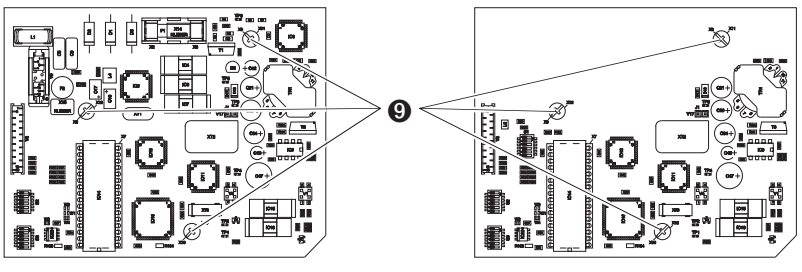

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Fig. 27
Replaycing the COM-Modul Promass 63

9.6 Replacing the fuse

Warning!
- Danger of electrical shock! Switch off the power supply before opening the housing of the transmitter housing.
- When using Ex instruments, the regulations given in the separate Ex documentation have to be observed.

The instrument fuse can be found in the terminal compartment → see page 18 resp. page 20.

Exclusively use the following types of fuses:

- Power supply 20…55 V DC / 16…62 V DC
  2.5 A slow acting / 250 V; 5.2×20 mm

- Power supply 85…230 V AC ±10%
  1 A slow acting / 250 V; 5.2×20 mm

10 Dimensions

Note!
Information on dimensions and weights of Ex instruments may differ from that shown.
Please refer to the separate Ex documentation.

Note!

10.1 Dimensions Promass 63 A

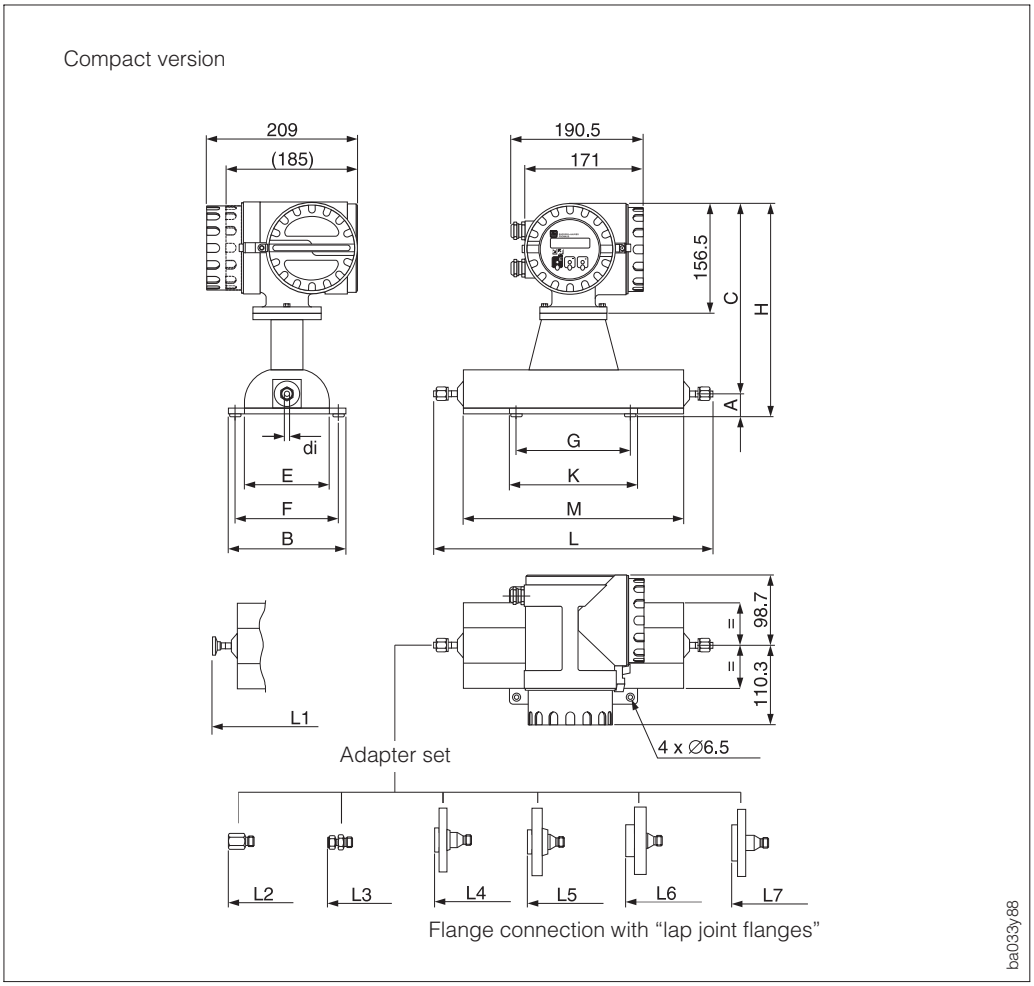


Fig. 28
Dimensions Promass 63 A
Compact version

Process connection	**L** 4-VCO-4 fittings	**L1** 1/2" Tri-Clamp	**L2** 1/4" NPT-F	**L3** SWAGELOK DN 1, 2: 1/8" or 1/4"; DN 4: 1/4"	**L4** **L5** 1/2" flange (ANSI)		**L6** **L7** DN 15 flange (DIN, JIS)	
					Cl 150	Cl 300	PN 40	10 K
DN 1	290	296	361	359.6	393	393	393	393
DN 2	372	378	443	441.6	475	475	475	475
DN 4	497	503	568	571.6	600	600	600	600

Diameter DIN	ANSI	**di**	**A**	**B**	**C**	**E**	**F**	**G**	**H**	**K**	**M**	**Weight** [kg]
DN 1	1/24"	1.1	32	165	269.5	120	145	160	301.5	180	228	10
DN 2	1/12"	1.8	32	165	269.5	120	145	160	301.5	180	310	11
DN 2*	1/12"	1.4	32	165	269.5	120	145	160	301.5	180	310	11
DN 4	1/8"	3.5	32	195	279.5	150	175	220	311.5	240	435	15
DN 4*	1/8"	3.0	32	195	279.5	150	175	220	311.5	240	435	15

All dimensions in [mm]
* High pressure version

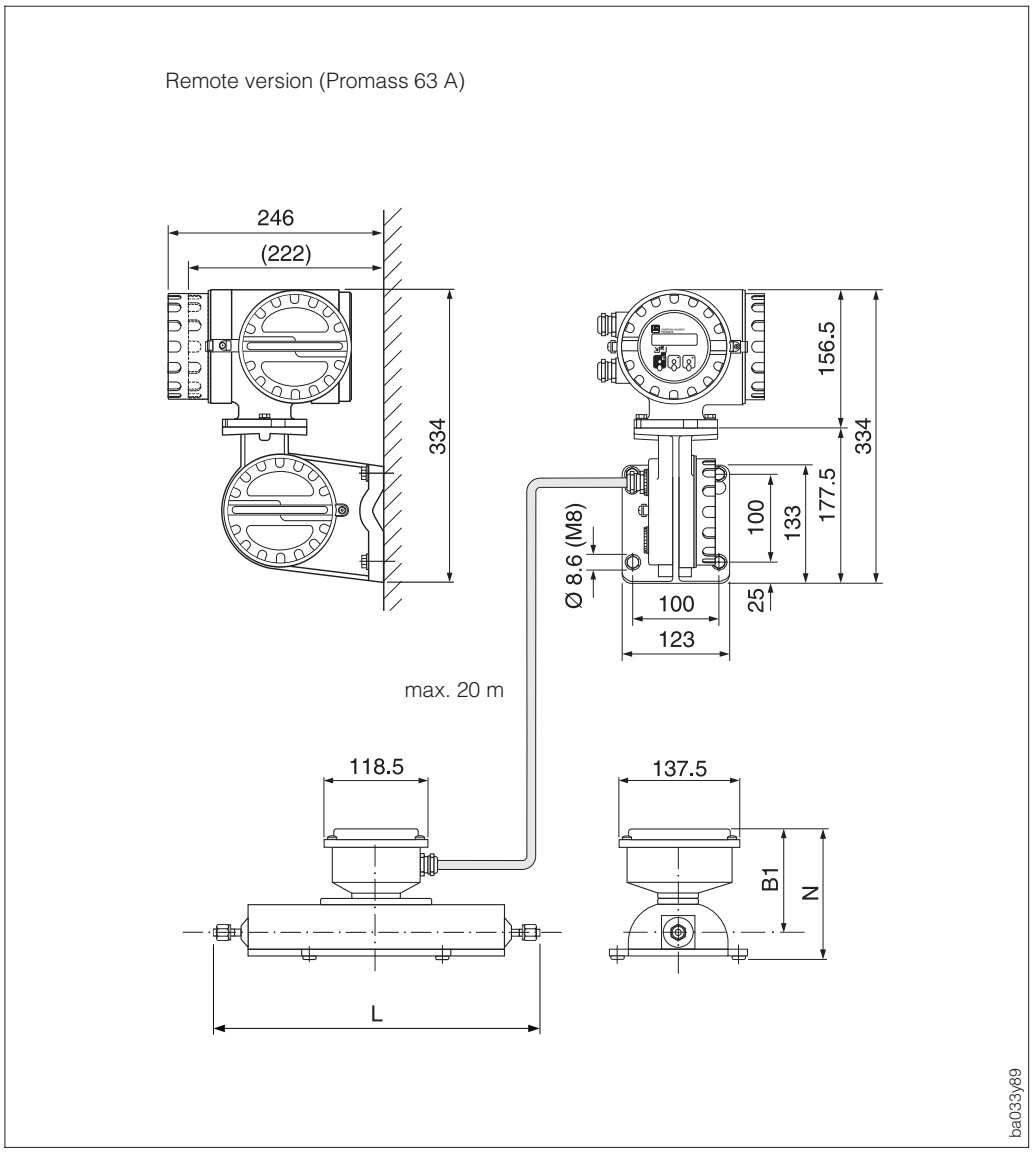


Fig. 29
Dimensions Promass 63 A
Remote version

Diameter DIN	Diameter ANSI	B1 [mm]	N [mm]	L
DN 1	1/24"	122	154	Dimensions dependent on the process connections (see previous page)
DN 2	1/12"	122	154	
DN 4	1/8"	132	164	

Wetted parts materials:

Measuring tube:	SS 1.4539 (904L), Alloy C-22 2.4602 (N 06022)
4-VCO-4 fittings:	SS 1.4539 (904L), Alloy C-22 2.4602 (N 06022)
1/2" Tri-Clamp:	SS 1.4539 (904L)
Adapter sets:	
1/8" or 1/4" SWAGELOK	SS 1.4401 (316)
1/4" NPT-F	SS 1.4539 (904L), Alloy C-22 2.4602 (N 06022)
Flange DIN, ANSI, JIS	SS 1.4539 (904L), Alloy C-22 2.4602 (N 06022) lap joint flanges (not wetted) in SS 1.4404 (316L)
Gasket (O-ring):	Viton (–15...+200 °C), Kalrez (–30...+210 °C), Silicone (–60...+200 °C), EPDM (–40...+160 °C)

10.2 Dimensions Promass 63 I

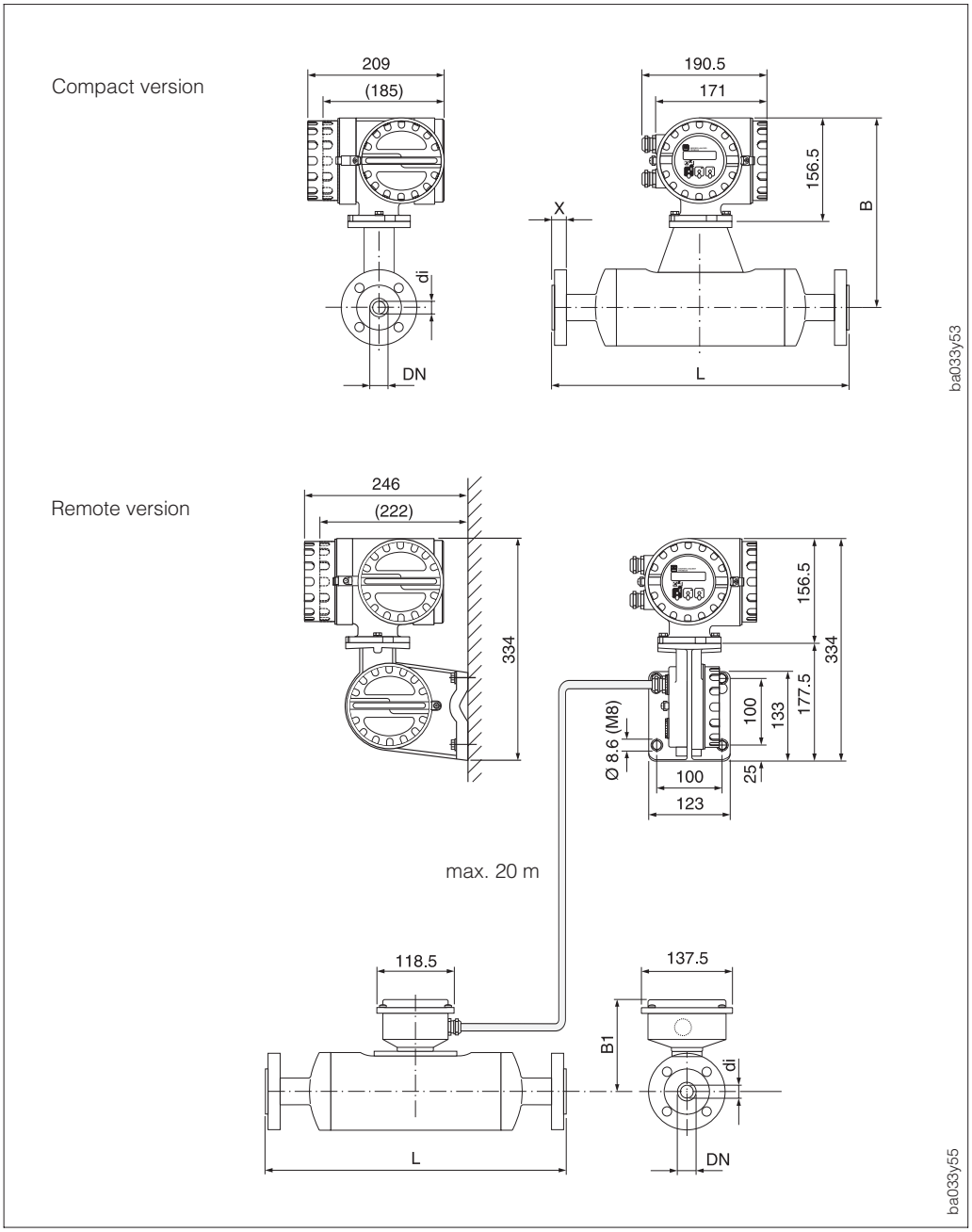


Fig. 30
Dimensions Promass 63 I

Diameter DIN	Diameter ANSI	L	x	B [mm]	B1 [mm]	di [mm]	Weight [kg]
DN 8	3/8"	Dimensions dependent on process connections (see page 118 ff.)		288.0	138.5	8.55	12
DN 15	1/2"			288.0	138.5	11.38	15
DN 15 *	1/2"			288.0	138.5	17.07	20
DN 25	1"			288.0	138.5	17.07	20
DN 25 *	1"			301.5	152.0	25.60	41
DN 40	1 1/2"			301.5	152.0	25.60	41
DN 40 *	1 1/2"			316.5	167.0	35.62	67
DN 50	2"			316.5	167.0	35.62	67

DN 8: with DN 15 flanges as standard;
* DN 15, 25, 40 “FB” = Full bore versions of Promass I;
All weights stated are those for the compact version

10.3 Dimensions Promass 63 M

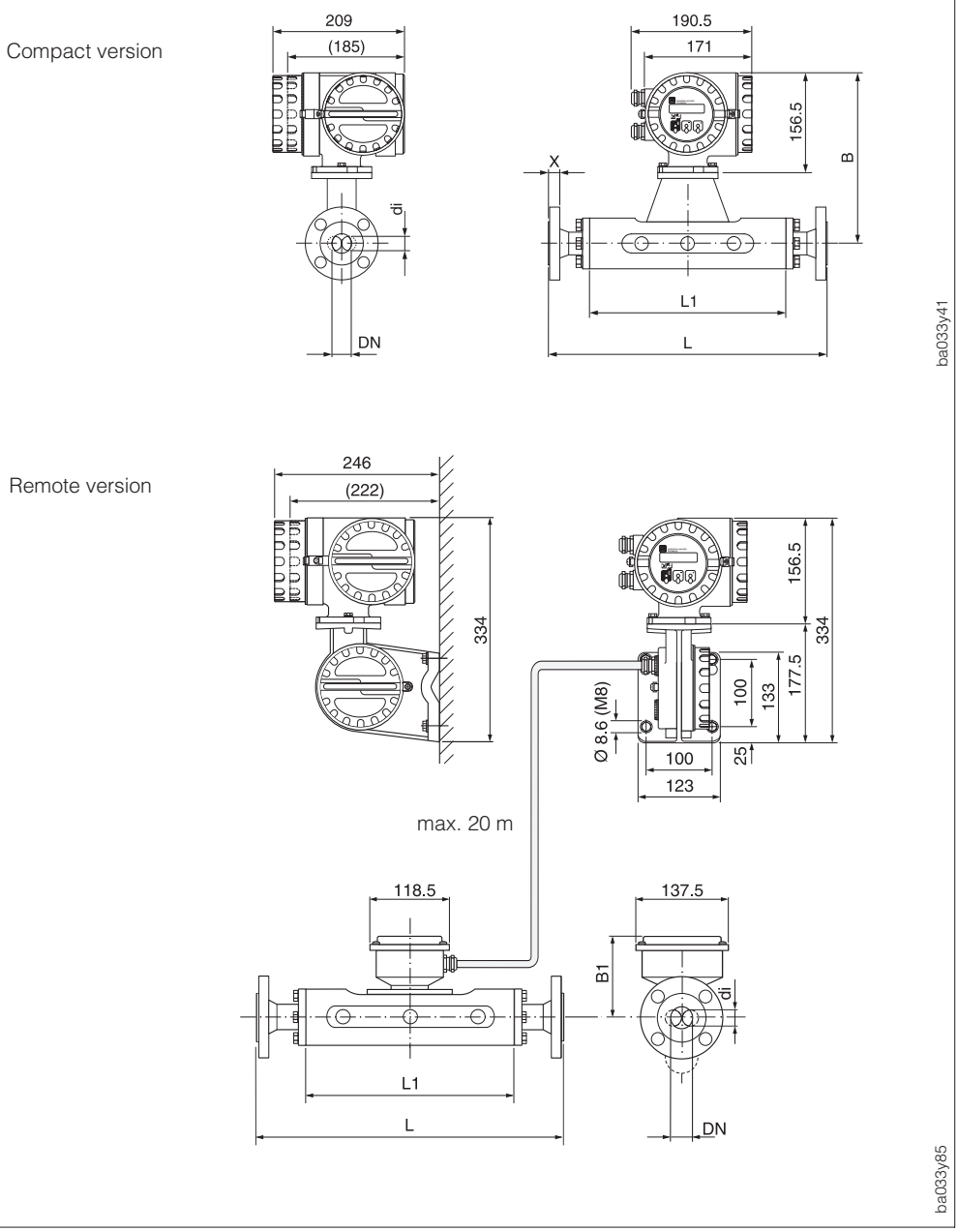


Fig. 31
Dimensions Promass 63 M

Diameter DIN	Diameter ANSI	L	x	L1 [mm]	B [mm]	B1 [mm]	di [mm]	Weight [kg]
DN 8	3/8"	Dimensions dependent on process connections (see page 118 ff.)		256	262.5	113.0	5.53	11
DN 15	1/2"			286	264.5	114.5	8.55	12
DN 25	1"			310	268.5	119.0	11.38	15
DN 40	1 1/2"			410	279.5	130.0	17.07	24
DN 50	2"			544	289.5	140.0	25.60	41
DN 80	3"			644	305.5	156.0	38.46	67
DN 100 *	4"			–	305.5	156.0	38.46	71

DN 8: with DN 15 flanges as standard;
* DN 100 / 4": nominal diameter DN 80 / 3" with DN 100 / 4" flanges;
All weights stated are those for the compact version

10.4 Dimension Promass 63 M (high pressure)

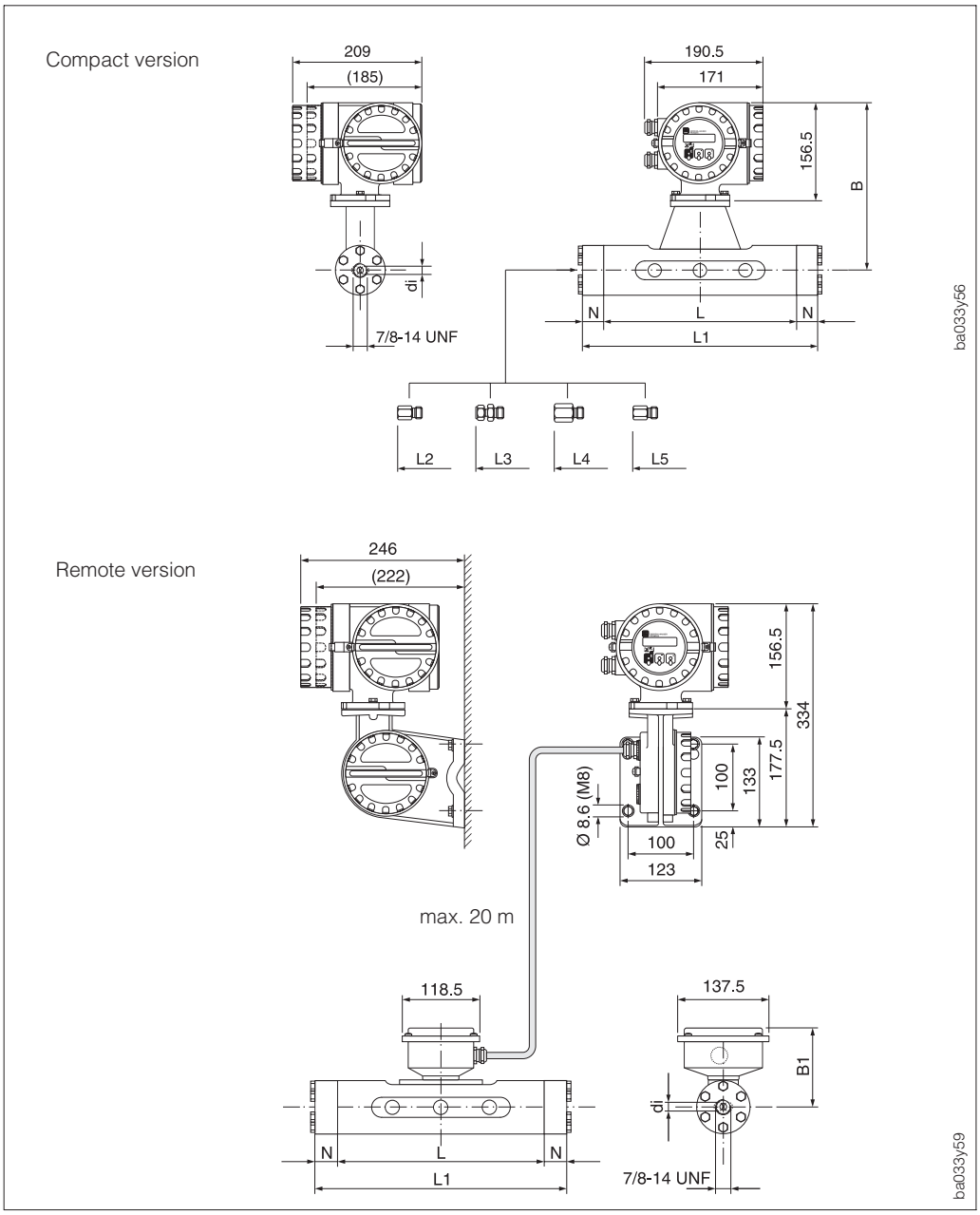


Fig. 32
Dimensions Promass 63 M (High pressure version)

Process connection	N	L without connector	L1 with connector	L2 G $^3/_8$" [mm]	L3 VCO with $^1/_2$" SWAGELOK [mm]	L4 $^1/_2$" NPT [mm]	L5 $^3/_8$" NPT [mm]
DN 8	24	256	304	355.8	366.4	370	355.8
DN 15	24	286	334	385.8	396.4	400	385.8
DN 25	34	310	378	429.8	440.4	444	429.8

Process connection materials
Connectors → SS 1.4404 (316L)
Fittings → SS 1.4401 (316)

Couplings and connectors optimized for CNG (Compressed Natural Gas) applications.

Diameter DIN	Diameter ANSI	B [mm]	B1 [mm]	di [mm]	Weight [kg]
DN 8	$^3/_8$"	262.5	113.0	4.93	11
DN 15	$^1/_2$"	264.5	114.5	7.75	12
DN 25	1"	268.5	119.0	10.20	15

10.5 Dimensions Promass 63 M (without process connection)

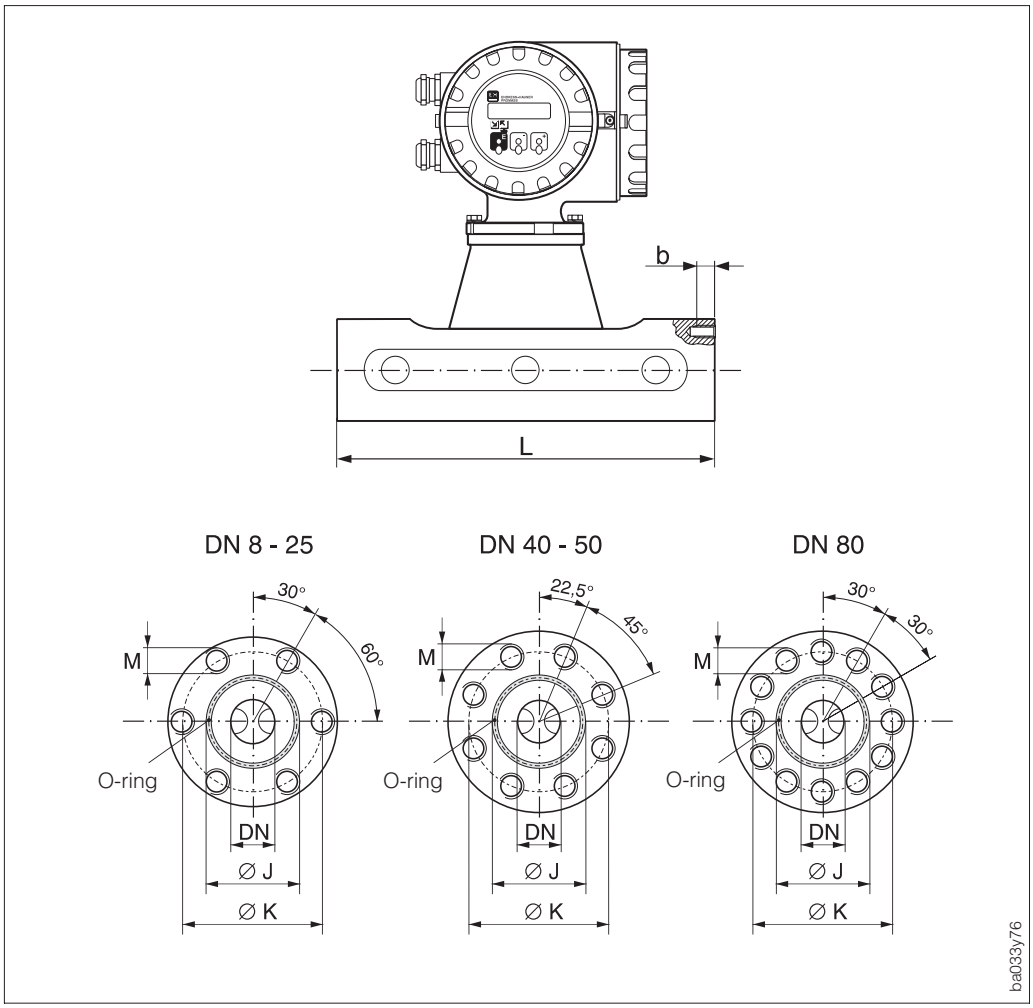


Fig. 33
Dimensions Promass 63 M without process connections

Diameter DN		Dimensions			Coupling		Minimum screw depth	Torque	Lubricated thread	O-ring	
DIN	ANSI	Ø L [mm]	Ø J [mm]	Ø K [mm]	Screws M	Depth b [mm]	[mm]	[Nm]	yes / no	Diam. [mm]	Inside-Ø [mm]
8	3/8"	256	27	54	6 x M 8	12	10	30.0	no	2.62	21.89
8*	3/8"	256	27	54	6 x M 8	12	10	19.3	yes	2.62	21.89
15	1/2"	286	35	56	6 x M 8	12	10	30.0	no	2.62	29.82
15*	1/2"	286	35	56	6 x M 8	12	10	19.3	yes	2.62	29.82
25	1"	310	40	62	6 x M 8	12	10	30.0	no	2.62	34.60
25*	1"	310	40	62	6 x M 8	12	10	19.3	yes	2.62	34.60
40	1 1/2"	410	53	80	8 x M 10	15	13	60.0	no	2.62	47.30
50	2"	544	73	94	8 x M 10	15	13	60.0	yes	2.62	67.95
80	3"	644	102	128	12 x M 12	18	15	100.0	yes	3.53	94.84

* High pressure version;
Permissible thread: A4 - 80; Lubricant: Molykote P37

10.6 Dimensions Promass 63 F

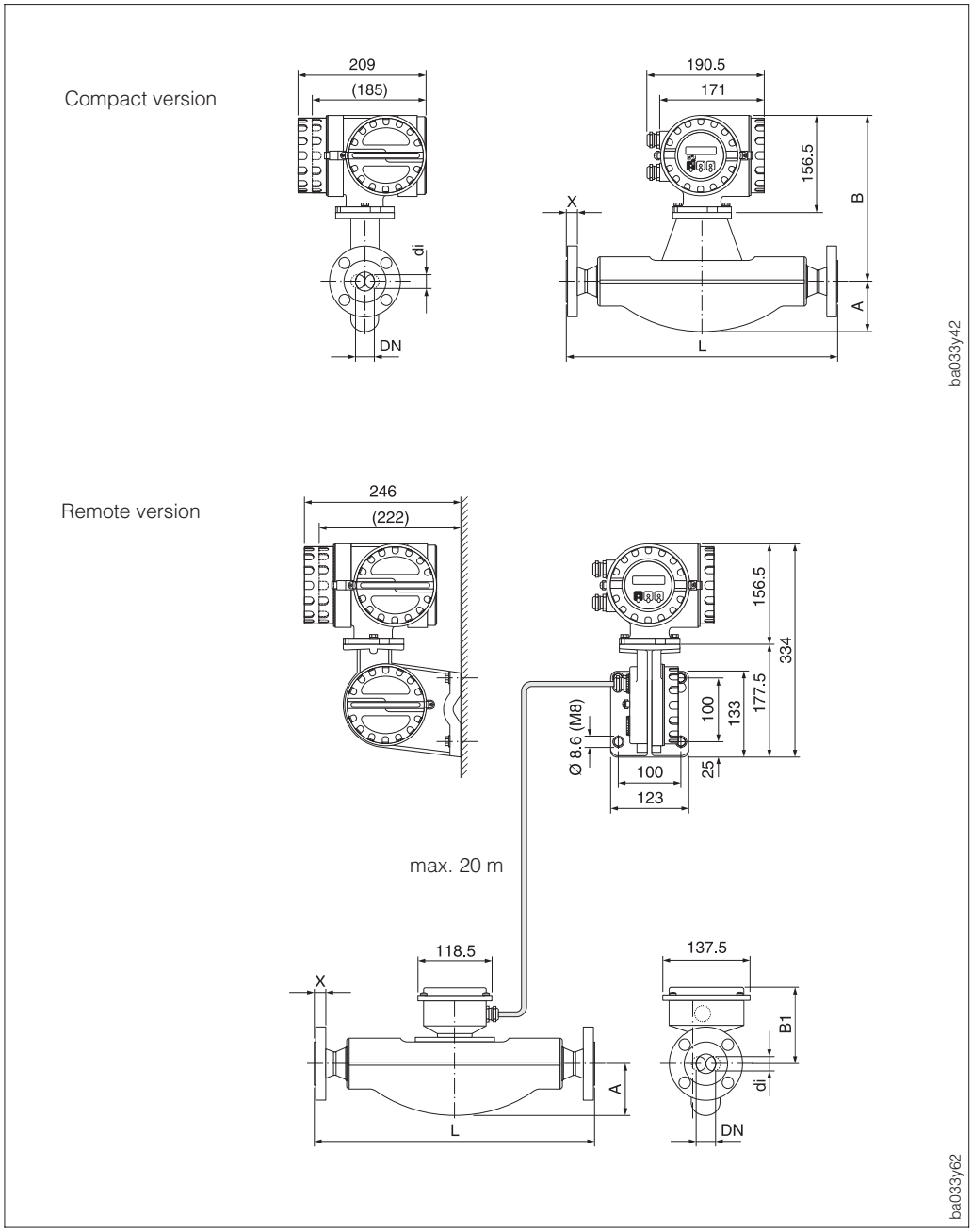


Fig. 34
Dimensions Promass 63 F

Diameter DIN	Diameter ANSI	L	x	A [mm]	B [mm]	B1 [mm]	di [mm]	Weight [kg]
DN 8	3/8"	Dimensions dependent on process connections (see page 118 ff.)		75	262.5	113.0	5.35	11
DN 15	1/2"			75	262.5	113.0	8.30	12
DN 25	1"			75	262.5	113.0	12.00	14
DN 40	1 1/2"			105	267.5	118.0	17.60	19
DN 50	2"			141	279.5	130.0	26.00	30
DN 80	3"			200	301.0	151.5	40.50	55
DN 100 *	4"			200	301.0	151.5	40.50	61
DN 100	4"			247	320.0	163.0	51.20	96
DN 100 **	6"			247	320.0	163.0	51.20	108

DN 8: with DN 15 flanges as standard;
All weights stated are those for the compact version;
* DN 100 / 4": nominal diameter DN 80 / 3" with DN 100 / 4" flanges;
** DN 150 / 6": nominal diameter DN 100 / 4" with DN 150 / 6" flanges;

10.7 Dimensions: process connections Promass 63 I, M, F

DIN 2501 process connections

Promass I

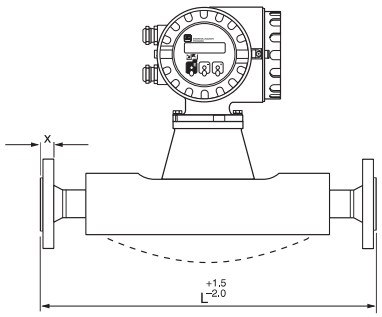
Wetted parts materials:	titanium Grade 9
Welded process connections:	no internal gaskets

Promass M

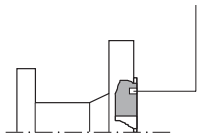
Flange material:	SS 1.4404 (316L), titanium Grade 2
Gasket material:	O-rings in Viton (–15...+200 °C), Kalrez (–30...+210 °C), Silicone (–60...+200 °C), EPDM (–40...+160 °C), FEP coated (–60...+200 °C)

Promass F

Flange material:	(DN 8...100) SS 1.4404 (316L), (DN 8...80) Alloy C-22 2.4602 (N 06022)
Welded process connections:	no internal gaskets



Flanges also available with grooves to DIN 2512 N (not for Promass I)



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Surface finish of the flanges

For PN 16, PN 40:
DIN 2526 Form C, R_a 6.3...12.5 µm

For PN 64, PN 100:
DIN 2526 Form E, R_a 1.6...3.2 µm

Promass I

Diameter	PN 40 L [mm]	PN 40 x [mm]	PN 64 L [mm]	PN 64 x [mm]	PN 100 L [mm]	PN 100 x [mm]
DN 8	402	20	–	–	402	25
DN 15	438	20	–	–	438	25
DN 15 *	572	19	–	–	578	26
DN 25	578	23	–	–	578	29
DN 25 *	700	22	–	–	706	31
DN 40	708	26	–	–	708	32
DN 40 *	819	24	–	–	825	33
DN 50	827	28	832	34	832	36

DN 8: with DN 15 flanges as standard;
* DN 15, 25, 40 "FB" = Full bore version of Promass I

Promass M, F

Diameter	PN 16 L [mm]	PN 16 x [mm]	PN 40 L [mm]	PN 40 x [mm]	PN 64 L [mm]	PN 64 x [mm]	PN 100 L [mm]	PN 100 x [mm]
DN 8 **	–	–	370	16	400	20	400	20
DN 15 **	–	–	404	16	420	20	420	20
DN 25	–	–	440	18	470	24	470	24
DN 40	–	–	550	18	590	26	590	26
DN 50	–	–	715	20	724	26	740	28
DN 80	–	–	840	24	875	28	885	32
DN 100 ***	874	20	874	24	–	–	–	–
DN 100	1128	20	1128	24	1128	30	1128	36
DN 150 ****	1168	22	1168	28	–	–	–	–

DN 8: with DN 15 flanges as standard; Nominal Diameter DN 100: only for Promass F available;
** DN 8, 15: also available with DN 25, PN 40 flanges (L = 440 mm, x = 18 mm);
*** DN 100: diameter DN 80 with DN 100 flanges;
**** DN 150: diameter DN 100 with DN 150 flanges

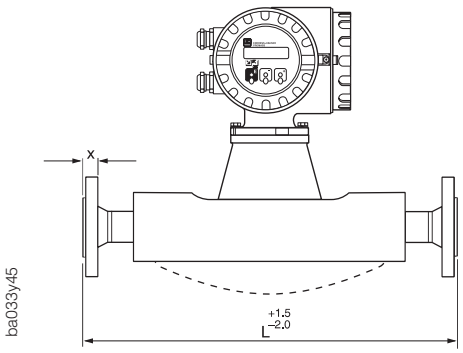
Fig. 35
Dimensions
DIN process connections

ANSI B 16.5 process connections

Promass I
Wetted parts materials: titanium Grade 9
Welded process connections: no internal gaskets

Promass M
Flange material: SS 1.4404 (316L), titanium Grade 2
Gasket material: O-rings in Viton (–15...+200 °C), Kalrez (–30...+210 °C), Silicone (–60...+200 °C), EPDM (–40...+160 °C), FEP coated (–60...+200 °C)

Promass F
Flange material: (DN 8...100) SS 1.4404 (316L), (DN 8...80) Alloy C-22 2.4602 (N 06022)
Welded process connections: no internal gaskets



Surface finish of the flanges

For Class 150, Class 300, Class 600:
R_a 3.2...6.3 µm

Promass I

Diameter		Class 150		Class 300		Class 600	
ANSI	DIN	L [mm]	x [mm]	L [mm]	x [mm]	L [mm]	x [mm]
3/8"	DN 8	402	20	402	20	402	20
1/2"	DN 15	438	20	438	20	438	20
1/2" *	DN 15 *	572	19	572	19	578	22
1"	DN 25	578	23	578	23	578	23
1" *	DN 25 *	700	22	700	22	706	25
1 1/2"	DN 40	708	26	708	26	708	28
1 1/2" *	DN 40 *	819	24	819	24	825	29
2"	DN 50	827	28	827	28	832	33

3/8": with 1/2" flanges as standard;
* DN 15, 25, 40 “FB” = Full bore versions of Promass I

Promass M, F

Diameter		Class 150		Class 300		Class 600	
ANSI	DIN	L [mm]	x [mm]	L [mm]	x [mm]	L [mm]	x [mm]
3/8"	DN 8	370	11.2	370	14.2	400	20.6
1/2"	DN 15	404	11.2	404	14.2	420	20.6
1"	DN 25	440	14.2	440	17.5	490	23.9
1 1/2"	DN 40	550	17.5	550	20.6	600	28.7
2"	DN 50	715	19.1	715	22.3	742	31.8
3"	DN 80	840	23.9	840	28.4	900	38.2
4" **	DN 100 **	874	23.9	894	31.7	–	–
4"	DN 100	1128	23.9	1128	31.7	1158	48.4
6" ***	DN 150 ***	1168	25.4	–	–	–	–

3/8" with 1/2" flanges as standard; Nominal diameter 4" / DN 100: only for Promass F available;
** 4"/DN 100: nominal diameter 3"/DN 80 with 4"/DN 100 flanges;
*** 6"/DN 150: nominal diameter 4"/DN 100 with 6"/DN 150 flanges

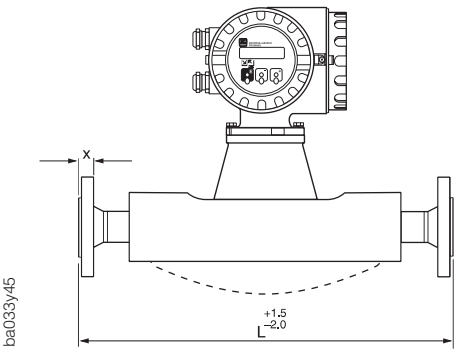
Fig. 36
Dimensions
ANSI process connections

JIS B2238 process connections

Promass I
Wetted parts materials: titanium Grade 9
Welded process connections: no internal gaskets

Promass M
Flange material: SS 1.4404 (316L), titanium Grade 2
Gasket material: O-rings in Viton (–15...+200 °C), Kalrez (–30...+210 °C), Silicone (–60...+200 °C), EPDM (–40...+160 °C), FEP coated (–60...+200 °C)

Promass F
Flange material: (DN 8...100) SS 1.4404 (316L), (DN 8...80) Alloy C-22 2.4602 (N 06022)
Welded process connections: no internal gaskets



Surface finish of the flanges

For 10K, 20K, 40K, 63K:
R_a 3.2...6.3 µm

Promass I

Diameter	10K		20K		40K		63K	
	L [mm]	x [mm]	L [mm]	x [mm]	L [mm]	x [mm]	L [mm]	x [mm]
DN 8	–	–	402	20	404	20	404	20
DN 15	–	–	438	20	440	20	440	20
DN 15 *	–	–	572	19	580	23	580	23
DN 25	–	–	578	23	580	23	580	23
DN 25 *	–	–	700	22	706	25	706	25
DN 40	–	–	708	26	708	26	708	26
DN 40 *	–	–	819	24	826	29	826	29
DN 50	827	28	827	28	828	28	828	28

DN 8: with DN 15 flanges as standard;
* DN 15, 25, 40 “FB” = Full bore versions of Promass I

Promass M, F

Diameter	10K		20K		40K		63K	
	L [mm]	x [mm]	L [mm]	x [mm]	L [mm]	x [mm]	L [mm]	x [mm]
DN 8	–	–	370	14	400	20	420	23
DN 15	–	–	404	14	425	20	440	23
DN 25	–	–	440	16	485	22	494	27
DN 40	–	–	550	18	600	24	620	32
DN 50	715	16	715	18	760	26	775	34
DN 80	832	18	832	22	890	32	915	40
DN 100 **	864	18	–	–	–	–	–	–
DN 100	1128	18	1128	24	1168	36	1168	44
DN 150 ***	1168	22	–	–	–	–	–	–

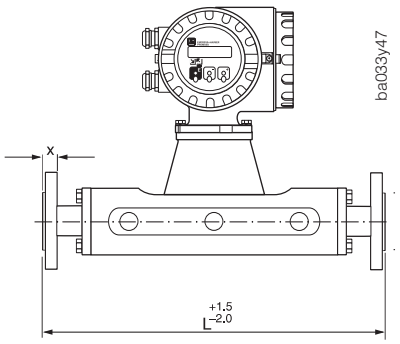
DN 8: with DN 15 flanges as standard; Nominal diameter DN 100: only for Promass F available;
** DN 100: diameter DN 80 with DN 100 flanges;
*** DN 150: diameter DN 100 with DN 150 flanges

Fig. 37
Dimensions
JIS process connections

PVDF process connections (DIN 2501 / ANSI B 16.5 / JIS B2238)

This process connection is **only** available for **Promass M**

Flange material: PVDF
Gasket material: O-rings in Viton (–15...+200 °C), Kalrez (–30...+210 °C), Silicone (–60...+200 °C), EPDM (–40...+160 °C)



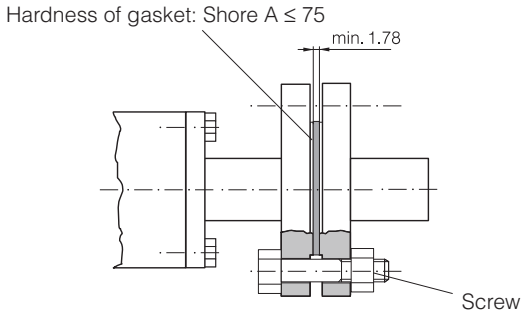
Promass M

Diameter		PN 16 / Cl 150 / 10K	
DIN	ANSI	L [mm]	x [mm]
DN 8	3/8"	370	16
DN 15	1/2"	404	16
DN 25	1"	440	18
DN 40	1 1/2"	550	21
DN 50	2"	715	22

DN 8 resp. 3/8": with DN 15 resp. 1/2" flanges as standard

Screw tightening torques (PVDF process connections)

Diameter		PN 16		Cl 150		10K	
DIN	ANSI	[Nm]	Screw	[Nm]	Screw	[Nm]	Screw
DN 8	3/8"	4.8	4 x M 12	3.4	4 x UNC 1/2	5.9	4 x M 12
DN 15	1/2"	4.8	4 x M 12	3.4	4 x UNC 1/2	5.9	4 x M 12
DN 25	1"	11.2	4 x M 12	7.3	4 x UNC 1/2	14.1	4 x M 16
DN 40	1 1/2"	25.7	4 x M 16	15.7	4 x UNC 1/2	22.7	4 x M 16
DN 50	2"	35.8	4 x M 16	30.7	4 x UNC 5/8	32.6	4 x M 16



Caution!
- When using PVDF process connections:
  – use only gaskets as specified above
  – use only the specified tightening torques
- For large diameters and heavy dead weights → sensor must be supported!

Caution!

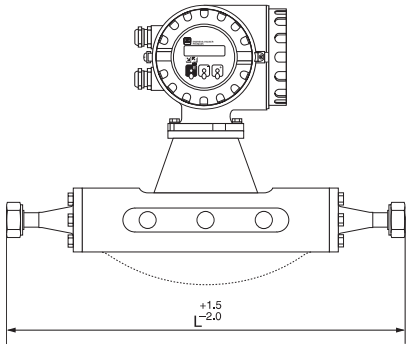
Fig. 38
Dimensions and screw tightening torques PVDF process connections

Dimensions Process Connections according to VCO

Promass I
Process connection materials: titanium Grade 2
Welded process connections: no internal gaskets

Promass M
Process connection materials: SS 1.4404 (316L)
Gasket materials: O-rings in Viton (–15...+200 °C), Kalrez (–30...+210 °C), Silicone (–60...+200 °C), EPDM (–40...+160 °C)

Promass F
Process connection materials: SS 1.4404 (316L)
Welded process connections: no internal gaskets



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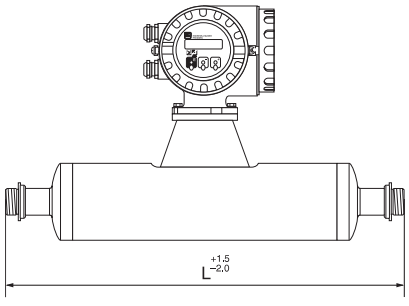
Diameter / Connection	**Promass M**	**Promass F**
	L [mm]	L [mm]
DN 8 8-VCO-4 ($^1/_2$")	390	390
DN 15 12-VCO-4 ($^3/_4$")	430	430

Fig. 39
Dimensions
VCO-process connection
(Promass M, F)



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Diameter / Connection (without nut)	**Promass I**
	L [mm]
DN 8 12-VCO-4 ($^3/_4$")	429
DN 15 12-VCO-4 ($^3/_4$")	465

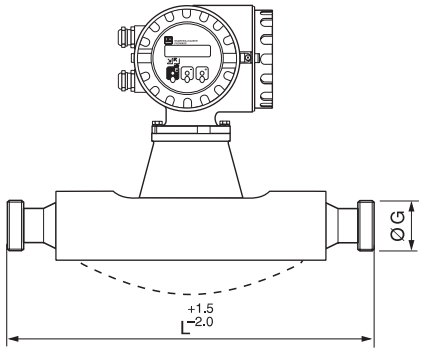
Fig. 40
Dimensions
VCO-process connection
(Promass I)

Hygienic coupling (DIN 11851 / SMS 1145)

Promass I (completely welded version)
Coupling: titanium Grade 2

Promass M (connections with internal gaskets)
Coupling: SS 1.4404 (316L)
Gasket: Silicone flat gasket (–60...+200 °C) or
EPDM (–40...+160 °C), FDA licensed gasket materials

Promass F (completely welded version)
Coupling: SS 1.4404 (316L)



ba033y50

Promass M, F

Diameter	L [mm]	ØG DIN 11851	ØG SMS 1145
DN 8	367	Rd 34 x 1/8"	Rd 40 x 1/6"
DN 15	398	Rd 34 x 1/8"	Rd 40 x 1/6"
DN 25	434	Rd 52 x 1/6"	Rd 40 x 1/6"
DN 40	560	Rd 65 x 1/6"	Rd 60 x 1/6"
DN 50	720	Rd 78 x 1/6"	Rd 70 x 1/6"
DN 80 M	815	Rd 110 x 1/4"	–
DN 80 M	792	–	Rd 98 x 1/6"
DN 80 F	900	Rd 110 x 1/4"	Rd 98 x 1/6"
DN 100 *	1128	Rd 130 x 1/4"	Rd 132 x 1/6"

DN 8: with DN 15 flanges as standard;
* Nominal diameter DN 100: only for Promass F available;
3A version with $R_a \leq 0.8$ µm available

Promass I

	DIN 11851		SMS 1145	
Diameter	L [mm]	ØG	L [mm]	ØG
DN 8	426	Rd 28 x 1/8"	–	–
DN 8	427	Rd 34 x 1/8"	427	Rd 40 x 1/6"
DN 15	462	Rd 28 x 1/8"	–	–
DN 15	463	Rd 34 x 1/8"	463	Rd 40 x 1/6"
DN 15 *	602	Rd 34 x 1/8"	–	–
DN 25	603	Rd 52 x 1/6"	603	Rd 40 x 1/6"
DN 25 *	736	Rd 52 x 1/6"	736	Rd 40 x 1/6"
DN 40	731	Rd 65 x 1/6"	738	Rd 60 x 1/6"
DN 40 *	855	Rd 65 x 1/6"	857	Rd 60 x 1/6"
DN 50	856	Rd 78 x 1/6"	858	Rd 70 x 1/6"

** DN 15, 25, 40 "FB" = Full bore versions of Promass I;
3A version with $R_a \leq 0.8$ µm as standard

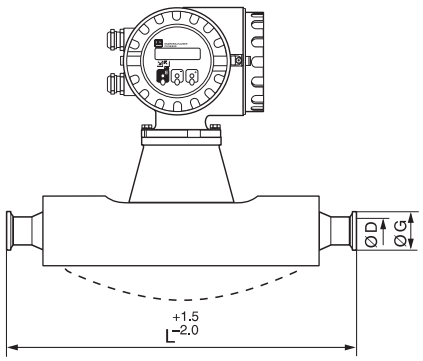
Fig. 41
Dimensions
Hygienic coupling
DIN 11851 / SMS 1145

Tri-Clamp

Promass I (completely welded version)
Tri-Clamp: titanium Grade 2

Promass M (connections with internal gaskets)
Tri-Clamp: SS 1.4404 (316L)
Gasket: Silicone flat gasket (–60...+200 °C) or
EPDM (–40...+160 °C), FDA licensed gasket materials

Promass F (completely welded version)
Tri-Clamp: SS 1.4404 (316L)



ba033y52

Promass M, F

Diameter DIN	Diameter ANSI	Clamp	L [mm]	ØG [mm]	ØD [mm]
DN 8	3/8"	1/2"	367	25.0	9.5
DN 8	3/8"	1"	367	50.4	22.1
DN 15	1/2"	1/2"	398	25.0	9.5
DN 15	1/2"	1"	398	50.4	22.1
DN 25	1"	1"	434	50.4	22.1
DN 40	1 1/2"	1 1/2"	560	50.4	34.8
DN 50	2"	2"	720	63.9	47.5
DN 80 M	3"	3"	801	90.9	72.9
DN 80 F	3"	3"	900	90.9	72.9
DN 100 *	4"	4"	1128	118.9	97.4

3/8" and 1/2": with 1" connection as standard; 3A version with $R_a \leq 0.8$ µm available;
* Nominal diameter DN 100: only for Promass F available

Promass I

Diameter DIN	Diameter ANSI	Clamp	L [mm]	ØG [mm]	ØD [mm]
DN 8	3/8"	1/2"	426	25.0	9.5
DN 8	3/8"	3/4"	426	25.0	16.0
DN 8	3/8"	1"	427	50.4	22.1
DN 15	1/2"	1/2"	462	25.0	9.5
DN 15	1/2"	3/4"	462	25.0	16.0
DN 15	1/2"	1"	463	50.4	22.1
DN 15 **	1/2"	3/4"	602	25.0	16.0
DN 25	1"	1"	603	50.4	22.1
DN 25 **	1"	1"	730	50.4	22.1
DN 40	1 1/2"	1 1/2"	731	50.4	34.8
DN 40 **	1 1/2"	1 1/2"	849	50.4	34.8
DN 50	2"	2"	850	63.9	47.5

** DN 15, 25, 40 "FB" = Full bore versions of Promass I;
3A version with $R_a \leq 0.8$ µm or $R_a \leq 0.4$ µm as standard

Fig. 42
Dimensions Tri-Clamp

10.8 Dimensions of purge connections (pressure vessel monitoring)

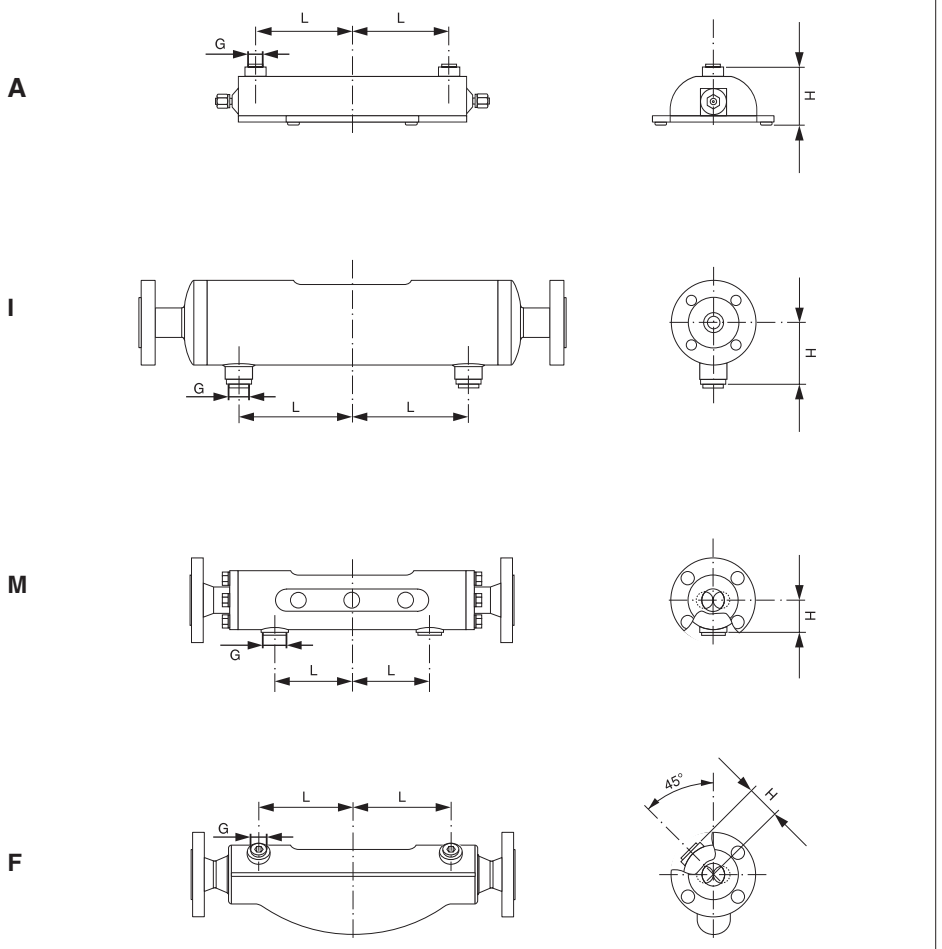


Fig. 43
Dimensions of purge connections (pressure vessel monitoring)

Diameter		Promass A		Promass I		Promass M		Promass F		Connection
DIN	ANSI	L	H	L	H	L	H	L	H	G
DN 1	1/24"	92.0	87.0	–	–	–	–	–	–	1/2" NPT
DN 2	1/12"	130.0	87.0	–	–	–	–	–	–	1/2" NPT
DN 4	1/8"	192.5	97.1	–	–	–	–	–	–	1/2" NPT
DN 8	3/8"	–	–	61	78.15	85	44.0	108	47	1/2" NPT
DN 15	1/2"	–	–	79	78.15	100	46.5	110	47	1/2" NPT
DN 15 *	1/2"	–	–	79	78.15	–	–	–	–	1/2" NPT
DN 25	1"	–	–	148	78.15	110	50.0	130	47	1/2" NPT
DN 25 *	1"	–	–	148	78.15	–	–	–	–	1/2" NPT
DN 40	1 1/2"	–	–	196	90.85	155	59.0	155	52	1/2" NPT
DN 40 *	1 1/2"	–	–	196	90.85	–	–	–	–	1/2" NPT
DN 50	2"	–	–	254	105.25	210	67.5	226	64	1/2" NPT
DN 80	3"	–	–	–	–	210	81.5	280	86	1/2" NPT
DN 100	4"	–	–	–	–	–	–	342	100	1/2" NPT

* DN 15, 25, 40 “FB” = Full bore versions of Promass I

11 Technical Data

Application

Instrument name: Flow measuring system Promass 63 PROFIBUS-DP/-PA

Instrument function: Mass and volumetric flow measurement of liquids and gases in closed piping.

Function and system design

Measuring principle: Mass flow measurement according to the Coriolis measuring principle (see page 7 ff.)

Measuring system:

Instrument family "Promass 63" consisting of:
Transmitter: Promass 63
Sensors: Promass A, I, M and F

- Promass A DN 1, 2, 4 and DN 2, 4 (high pressure version)
  Single tube system in SS or Alloy C-22
- Promass I DN 8, 15, 25, 40, 50 (completely welded version)
  Straight single tube system in titanium
  DN 15 "FB", DN 25 "FB", DN 40 "FB":
  Full bore versions with a higher full scale value
  (see table below)
- Promass F DN 8, 15, 25, 40, 50, 80, 100 (completely welded versions)
  Two slightly curved measuring tubes in SS or
  Alloy C-22 (only for DN 8...80)
- Promass M DN 8, 15, 25, 40, 50, 80
  Two straight measuring tubes in titanium
  Containment vessel up to 100 bar.
  DN 8, 15, 25 high pressure version for
  operating pressures up to 350 bar.

Two versions are available:
- Compact version
- Remote version (max. 20 m)

Input variables

Measured variables:
- Mass flow rate (is proportinal to the phase difference of the two sensors on the measuring tube which detect differences in its oscillation)
- Fluid density (is proportional to the resonance frequency of the measuring tubes)
- Fluid temperature (is measured with temperature sensors)

Measuring range:

DN [mm]	Range for full scale values: Liquid $\dot{m}_{min(L)} \ldots \dot{m}_{max(L)}$	Range for full scale values: Gas $\dot{m}_{min(G)} \ldots \dot{m}_{max(G)}$
1	0... 20.0 kg/h	The full scale depends on the density of the gas. The full scale value can be determined with the following formula: $\dot{m}_{max(G)} = \frac{\dot{m}_{max(L)} \cdot \rho_{(G)}}{x \cdot 16}$ $\dot{m}_{max(G)}$ = Full scale value gas [t/h] $\dot{m}_{max(L)}$ = Full scale value liquid [t/h] (value from table) $\rho_{(G)}$ = gas density [kg/m³] (at operating condition) x = constant [kg/m³] Promass A x = 20 Promass I, M, F x = 100
2	0...100.0 kg/h	
4	0...450.0 kg/h	
8	0... 2.0 t/h	
15	0... 6.5 t/h	
15 *	0... 18.0 t/h	
25	0... 18.0 t/h	
25 *	0... 45.0 t/h	
40	0... 45.0 t/h	
40 *	0... 70.0 t/h	
50	0... 70.0 t/h	
80	0...180.0 t/h	
100	0...350.0 t/h	

* DN 15, 25, 40 "FB" = Full bore versions of Promass I

(continued on next page)

Input variables (continued)	
Measuring range (continued)	Example for calculating a gas full scale: Sensor: Promass F → x = 100 Nominal diameter DN 50 → 70.0 t/h (full scale value liquid from table on page 125). Gas: Air with a density of 60.3 kg/m^3 (at 20°C and 50 bar) $\dot{m}_{max(G)} = \frac{\dot{m}_{max(L)} \cdot \rho_{(G)}}{x \cdot 1.6} = \frac{70.0 \cdot 60.3}{100 \cdot 1.6} = 26.4$ t/h
Operable flow range	up to 1000 : 1 This enables totalizer values to be accurately determined even in pulsating systems, e.g. reciprocating pumps.
Output variables PROFIBUS-DP	
Output signal	*PROFIBUS-DP interface:* PROFIBUS-DP according EN 50170 Volume 2, RS 485
Signal on alarm	*PROFIBUS-DP interface:* Status message according to PROFIBUS profile version 2
Speed of transmision	*Baud rate used:* 9.6 kBaud; 19.2 kBaud; 93.75 kBaud; 187.5 kBaud; 500 kBaud; 1.5 MBaud; 3 MBaud; 6 MBaud; 12 MBaud
Signal encoding	NRZ code
Output variables PROFIBUS-PA	
Output signal	*PROFIBUS-PA interface:* PROFIBUS-PA according to EN 50170 Volume 2, IEC 1158-2, profile version 2.0, galvanically isolated *Current output:* 0/4…20 mA, galvanically isolated, R_L = max. 350 Ω, time constant selectable, full scale value scalable, temperature coefficient typ.: 0.005% v.M./°C
Signal on alarm	*PROFIBUS-PA interface:* Status and alarms according to PROFIBUS profile version 2. *Current output:* In case of an alarm the current output delivers the previous defined signal.
Current consumption	Current consumption = 12 mA
Permissble power voltage	Non intrinsically safe = 9 V...32 V
FDE (Fault Disconnection Electronic)	0 mA
Speed of transmision	Baud rate used = 31.25 kBaud
Signal encoding	Manchester II
Output variables general	
Creep suppression	Switch points for low flow selectable (see page 90). Hysteresis: –50 %

Accuracy

Reference conditions

Error limits based on ISO / DIS 11631:
- 20…30 °C; 2…4 bar
- Calibration rig based on national standards
- Zero point calibrated under operating conditions
- Field density calibration carried out (for special density calibration)

Measured error

- *Mass flow rate (liquids):*
  Promass A, M, F ± 0.10% ± [zero stability / flow rate) x 100]% of rate
  Promass I ± 0.15% ± [zero stability / flow rate) x 100]% of rate

- *Mass flow rate (gas):*
  Promass A, I, M, F ± 0.50% ± [zero stability / flow rate) x 100]% of rate

- *Volume flow rate (liquids):*
  Promass A, M ± 0.25% ± [zero stability / flow rate) x 100]% of rate
  Promass I ± 0.50% ± [zero stability / flow rate) x 100]% of rate
  Promass F ± 0.15% ± [zero stability / flow rate) x 100]% of rate

  zero stability → see table below

Note!
- The values refer to the PROFIBUS-PA interface.
- Additional measuring error of the current output: ±5 µA typical.

Note!

DN [mm]	Max. full scale [kg/h] or [l/h]	Zero stability Promass A, M, F [kg/h] or l/h]	Zero stability Promass I [kg/h] or [l/h]
1	20	0.0010	—
2	100	0.0050	—
4	450	0.0225	—
8	2000	0.1000	0.200
15	6500	0.3250	0.650
15 *	18000	—	1.800
25	18000	0.90	1.800
25 *	45000	—	4.500
40	45000	2.25	4.500
40 *	70000	—	7.000
50	70000	3.50	7.000
80	180000	9.00	—
100	350000	14.00	—

* DN 15, 25, 40 “FB” = Full bore versions of Promass I

Example for calculating the measuring error:

Promass F → ± 0.10% ± [zero stability / flow rate) x 100]% of rate
DN 25, Q = 3.6 t/h = 3600 kg/h

$$\text{Measured error} \rightarrow \pm 0.10\% \pm \frac{0.9\ \text{kg/h}}{3600\ \text{kg/h}} \cdot 100\ \% = \pm 0.125\ \%$$

Density (liquid):

- Standard calibration:
  Promass A, I, M ± 0.02 g/cc (1 g/cc = 1 kg/l)
  Promass F ± 0.01 g/cc

- Special calibration (optional):
  Calibration range = 0.8...1.8 kg/l, 5...80 °C
  Promas A, M ± 0.002 g/cc
  Promass I ± 0.004 g/cc
  Promass F ± 0.001 g/cc

- Density calibration in the field:
  Promass A, M ± 0.0010 g/cc
  Promass I ± 0.0020 g/cc
  Promass F ± 0.0005 g/cc

Temperature:
Promass A, I, M, F ± 0.5 °C ± 0.005 · T (T = fluid temperature in °C)

Accuracy (continued)

Repeatability

- *Mass flow rate (liquids):*
  Promass A, I, M, F
  ± 0.05% ± [$^1/_2$ x (zero stability / flow rate) x 100]% of rate

- *Mass flow rate (gas):*
  Promass A, I, M, F
  ± 0.25% ± [$^1/_2$ x (zero stability / flow rate) x 100]% of rate

- *Volume flow rate (liquids):*
  Promass A, M, ± 0.10% ± [$^1/_2$ x (zero stability / flow rate) x 100]% of rate
  Promass I ± 0.20% ± [$^1/_2$ x (zero stability / flow rate) x 100]% of rate
  Promass F ± 0.05% ± [$^1/_2$ x (zero stability / flow rate) x 100]% of rate

  zero stability → (see table page 129)

Example for calculating repeatability:
Promass F → ± 0.05% ± [$^1/_2$ x (zero stability / flow rate) x 100]% of rate
DN 25, Q = 3.6 t/h = 3600 kg/h

$$\text{Repeatability} \rightarrow \pm 0.05\,\% \pm \frac{1}{2} \cdot \frac{0.9\ \text{kg/h}}{3600\ \text{kg/h}} \cdot 100\,\% = \pm 0.0625\,\%$$

- *Density measurement (liquids):*
  Promass A, M ± 0.00050 g/cc (1 g/cc = 1 kg/l)
  Promass I ± 0.00100 g/cc
  Promass F ± 0.00025 g/cc

- *Temperature measurement:*
  Promass A, I, M, F ±0.25 °C ±0.0025 · T (T = fluid temperature in °C)

Process effects

- *Process temperature effects:*
  The below value represents the zero point error due the changing process temperature away from the temperature at which a zero point adjustment was carried out: Promass A, I, M, F typical = ± 0,0002 % / °C

- *Process pressure effects:*
  The below defined values represent the effect on accuracy of mass flow due to changing process pressure away from calibration pressure (values in % of rate / bar).

Diameter DN [mm]	Promass A Flow rate % o.r.** / bar	Promass I Flow rate % o.r.** / bar	Promass M Flow rate % o.r.** / bar	Promass MP Flow rate % o.r.** / bar	Promass F Flow rate % o.r.** / bar
1	none	—	—	—	—
2	none	—	—	—	—
4	none	—	—	—	—
8	—	0.006	0.009	0.006	none
15	—	0.004	0.008	0.005	none
15 *	—	0.006	—	—	—
25	—	0.006	0.009	0.003	none
25 *	—	none	—	—	—
40	—	none	0.005	—	–0.003
40 *	—	0.006	—	—	—
50	—	0.006	none	—	–0.008
80	—	—	none	—	–0.009
100	—	—	—	—	–0.012

* DN 15, 25, 40 “FB” = Full bore version of Promass I
** o.r. = of rate

Operating conditions

Installation conditions

Installation instructions	Orientation: vertical or horizontal Restrictions and other recommendations → see page 11 ff.
Inlet and outlet sections	Installation site is independent of inlet and outlet sections
Connection cable length	max. 20 m (remote version)

Operating conditions (continued)	
Ambient conditions	
Ambient temperature	Transmitter and Sensor: –25…+60 °C (version with enhanced climate resistance: –40…+60 °C) • Depending on the product temperature, certain installation positions are to be observed to ensure that the permitted ambient temperature range for the transmitter is not exceeded (see page 14). • An all-weather cover should be used to protect the housing from direct sunlight when mounting in the open. This is especially important in warmer climates and with high ambient temperatures. • If the ambient temperature is below –25 °C, it is not recommended to use a version with display.
Storage temperature	–40…+80 °C
Degree of protection (EN 60529)	Transmitter: IP 67; NEMA 4X Sensor: IP 67; NEMA 4X
Shock resistance	according to IEC 68-2-31
Vibrational resistance	up to 1 g, 10…150 Hz according to IEC 68-2-6
Electromagnetic compatibility (EMC)	According to EN 50081 Part 1 and 2 / EN 50082 Part 1 and 2 as well as to NAMUR recommendations
Process conditions	
Fluid temperature	• *Sensor* Promass A –50…+200 °C Promass I –50…+150 °C Promass M –50…+150 °C Promass F –50…+200 °C • *Gaskets* Viton (–15…+200 °C), EPDM (–40…+160 °C), Silicone (–60…+200 °C), Kalrez (–30…+210 °C), FEP coated (–60…+200 °C)
Nominal pressure	• *Promass A* Fittings: max. 160 bar (standard version), max. 400 bar (high pressure version) Flanges: DIN PN 40 / ANSI Cl 150, Cl 300 / JIS 10K Containment vessel: 25 bar resp. 375 psi • *Promass I* Flanges: DIN PN 40...PN 100 / ANSI Cl 150, Cl 300, Cl 600 / JIS 10K, 20K, 40K, 63K Containment vessel: 25 bar (optional 40 bar) resp. 375 psi (optional 600 psi) • *Promass M* Flanges: DIN PN 40…100 / ANSI Cl 150, Cl 300, Cl 600 / JIS 10K, 20K, 40K, 63K Containment vessel: 40 bar (optional 100 bar) resp. 600 psi (optional 1500 psi) • *Promass M (High pressure version)* Measuring tubes, connectors, fittings: maximum 350 bar Containment vessel: 100 bar resp. 1500 psi • *Promass F* Flanges: DIN PN 16…100 / ANSI Cl 150, Cl 300, Cl 600 / JIS 10K, 20K, 40K, 63K Containment vessel: DN 8...80: 25 bar resp. 375 psi DN 100: 16 bar resp. 250 psi DN 8...50: optional 40 bar resp. 600 psi) Caution! The material load curves (p-T-load diagrams) for all process connections can be found in the Technical Information TI 030D/06/en for Promass 63.
Pressure loss	Dependent on nominal diameter and sensor type (see page 134 ff.)


Caution!

Mechanical construction	
Design / Dimensions	see page 111 ff.
Weights	see page 111 ff.
Materials	• *Transmitter housing* Powder-coated die-cast aluminium • *Sensor housing / containment vessel* Promass A, I, F: Surface resistance to acids and alkalis SS 1.4301 (304L) Promass M: Surface resistance to acids and alkalis DN 8…50: chemically nickel-plated steel DN 80: SS 1.4313 • *Sensor connection housing (remote version)* SS 1.4301 (304L) • *Process connections:* Promass A → see page 111 Promass M (high pressure) → see page 115 Promass I, M, F → see page 118 ff. • *Measuring tubes* Promass A: SS 1.4539 (904L), Alloy C-22 2.4602 (N 06022) Promass I: titanium Grade 9 Promass M: titanium Grade 2 (DN 80), titanium Grade 9 (DN 8…50) Promass F: (DN 8...100) SS 1.4539 (904L), (DN 8...80) Alloy C-22 2.4602 (N 06022) • *Gaskets:* Promass A, F: no internal seals Promass I, M: see page 118–124 Promass M: (for high pressure version) Silicone, Viton
Process connections	Promass A: *Welded process connections:* 4-VCO-4 fittings, $^1/_2$" Tri-Clamp *Screw-on process connections:* Flanges (DIN, ANSI, JIS B2238), NPT-F and SWAGELOK fittings Promass I: *Welded process connections:* 12-VCO-4 fittings, Flanges (DIN 2501, ANSI B16.5, JIS B2238) *Sanitary connections:* Tri-Clamp, Hygienic coupling DIN 11851 / SMS 1145 Promass M: *Screw-on process connections:* 8-VCO-4 fittings, 12-VCO-4 fittings, Flanges (DIN 2501, ANSI B16.5, JIS B2238) *Sanitary connections:* Tri-Clamp, Hygienic coupling DIN 11851 / SMS 1145 Promass M High pressure: *Screw-on process connections:* G $^3/_8$", $^1/_2$" NPT, $^3/_8$" NPT or $^1/_2$" SWAGELOK coupling; connector with 7/8 14UNF internal thread Promass F: *Welded process connections:* 8-VCO-4 fittings, 12-VCO-4 fittings, Flanges (DIN 2501, ANSI B16.5, JIS B2238) *Sanitary connections:* Tri-Clamp, Hygienic coupling DIN 11851 / SMS 1145
Electrical connection	• *Wiring diagram:* see Chapter 4 • *Cable glands (In-/outputs; remote version):* PG 13.5 cable glands (5…15 mm) or $^1/_2$" NPT, M20 x 1.5 (8…15 mm), G $^1/_2$" threads for cable glands • *Galvanic isolation:* All circuits for inputs, outputs, power supply, and sensor are galvanically isolated from each other. • *Cable specifications (remote version):* see page 21

User interface	
Operation	On-site operation with 3 operating elements for setting all instrument functions in the E+H operating matrix (see page 59 resp. 60)
Display	LC-display, illuminated, double-spaced with 16 characters each
Communication	PROFIBUS-DP/-PA
Power supply	
Supply voltage, frequency	*Transmitter:* 85…260 V AC (50…60 Hz) 20…55 V AC, 16…62 V DC *Sensor:* • is supplied by the transmitter
Power consumption	AC: <15 VA (incl. sensor) DC: <15 W (incl. sensor)
Power supply failure	Bridges min. one power cycle (22 ms). • EEPROM saves measuring system data on power failure (no batteries required) • DAT = exchangeable data storage module which stores all sensor data such as calibration data, nominal diameter, sensor version, etc. When replacing the transmitter or its electronics, the old DAT module is simply inserted into the new transmitter. When the system is restarted, the measuring point then operates using the variables stored in the DAT.
Certificates and approvals	
Ex approvals (only for PROFIBUS-PA)	Information on presently available Ex versions (e.g. ATEX / CENELEC, FM, CSA) can be supplied by your E+H Sales Centre on request. All explosion protection data are given in separate documentation available on request.
CE mark	By attaching the CE-mark, Endress+Hauser confirms that the Promass 63 PROFIBUS-DP/-PA measurement system has been successfully tested and fulfils all legal requirements of the relevant EC directives.
Order information	
Accessories	• Post mounting set for Promass A: DN 1, 2: Order No. 500 77972 DN 4: Order No. 500 79218 • Post mounting set for remote transmitter housing: Order No. 500 76905
Supplementary documentation	System Information Promass SI 014D/06/en Technical Information Promass 60 TI 029D/06/en Technical Information Promass 63 TI 030D/06/en Operating Manual Promass 60 BA 013D/06/en
Other standards and guidelines	
EN 50170	PROFIBUS, Volume 2
EN 60529	Degree of protection
EN 61010	Protection Measures for Electronic Equipment for Measurement, Control, Regulation and Laboratory Procedures
EN 50081	Part 1 and 2 (interference emission)
EN 50082	Part 1 und 2 (interference immunity)
NAMUR	Association of Standards for Control and Regulation in the Chemical Industry

Pressure loss

The pressure loss is dependent on the characteristics of the fluid and its flow rate. The following formulae can be used for liquids to approximately calculate the pressure loss:

	Promass A / I	**Promass M / F**
Reynolds No.	$Re = \frac{4 \cdot \dot{m}}{\pi \cdot d \cdot \upsilon \cdot \rho}$	$Re = \frac{2 \cdot \dot{m}}{\pi \cdot d \cdot \upsilon \cdot \rho}$
Re ≥ 2300 *	$\Delta p = K \cdot \upsilon^{0.25} \cdot \dot{m}^{1.75} \cdot \rho^{-0.75} + \frac{K3 \cdot \dot{m}^2}{\rho}$	$\Delta p = K \cdot \upsilon^{0.25} \cdot \dot{m}^{1.85} \cdot \rho^{-0.86}$
Re < 2300	$\Delta p = K1 \cdot \upsilon \cdot \dot{m} + \frac{K3 \cdot \dot{m}^2}{\rho}$	$\Delta p = K1 \cdot \upsilon \cdot \dot{m} + \frac{K2 \cdot \upsilon^{0.25} \cdot \dot{m}^2}{\rho}$

Δp = pressure loss [mbar]
υ = kinematic viscosity [m^2/s]
$\dot{m}$ = mass flow rate [kg/s]
ρ = fluid density [kg/m^3]
d = internal diameter of measuring tubes [m]
K...K3 = constants dependent on the nominal diameter

* For gases the pressure loss has always to be calculated by use of the formula for Re ≥ 2300.

	Diameter	d [m]	K	K1	K2	K3
Promass A	DN 1	$1.10 \cdot 10^{-3}$	$1.2 \cdot 10^{11}$	$1.3 \cdot 10^{11}$	–	0
	DN 2	$1.80 \cdot 10^{-3}$	$1.6 \cdot 10^{10}$	$2.4 \cdot 10^{10}$	–	0
	DN 4	$3.50 \cdot 10^{-3}$	$9.4 \cdot 10^{8}$	$2.3 \cdot 10^{9}$	–	0
Promass A High press.	DN 2	$1.40 \cdot 10^{-3}$	$5.4 \cdot 10^{10}$	$6.6 \cdot 10^{10}$	–	0
	DN 4	$3.00 \cdot 10^{-3}$	$2.0 \cdot 10^{9}$	$4.3 \cdot 10^{9}$	–	0
Promass I	DN 8	$8.55 \cdot 10^{-3}$	$8.1 \cdot 10^{6}$	$3.9 \cdot 10^{7}$	–	$129.95 \cdot 10^{4}$
	DN 15	$11.38 \cdot 10^{-3}$	$2.3 \cdot 10^{6}$	$1.3 \cdot 10^{7}$	–	$23.33 \cdot 10^{4}$
	DN 15 *	$17.07 \cdot 10^{-3}$	$4.1 \cdot 10^{5}$	$3.3 \cdot 10^{6}$	–	$0.01 \cdot 10^{4}$
	DN 25	$17.07 \cdot 10^{-3}$	$4.1 \cdot 10^{5}$	$3.3 \cdot 10^{6}$	–	$5.89 \cdot 10^{4}$
	DN 25 *	$25.60 \cdot 10^{-3}$	$7.8 \cdot 10^{4}$	$8.5 \cdot 10^{5}$	–	$0.11 \cdot 10^{4}$
	DN 40	$25.60 \cdot 10^{-3}$	$7.8 \cdot 10^{4}$	$8.5 \cdot 10^{5}$	–	$1.19 \cdot 10^{4}$
	DN 40 *	$35.62 \cdot 10^{-3}$	$1.3 \cdot 10^{4}$	$2.0 \cdot 10^{5}$	–	$0.08 \cdot 10^{4}$
	DN 50	$35.62 \cdot 10^{-3}$	$1.3 \cdot 10^{4}$	$2.0 \cdot 10^{5}$	–	$0.25 \cdot 10^{4}$
Promass M	DN 8	$5.53 \cdot 10^{-3}$	$5.2 \cdot 10^{7}$	$8.6 \cdot 10^{7}$	$1.7 \cdot 10^{7}$	–
	DN 15	$8.55 \cdot 10^{-3}$	$5.3 \cdot 10^{6}$	$1.7 \cdot 10^{7}$	$9.7 \cdot 10^{5}$	–
	DN 25	$11.38 \cdot 10^{-3}$	$1.7 \cdot 10^{6}$	$5.8 \cdot 10^{6}$	$4.1 \cdot 10^{5}$	–
	DN 40	$17.07 \cdot 10^{-3}$	$3.2 \cdot 10^{5}$	$1.2 \cdot 10^{6}$	$1.2 \cdot 10^{5}$	–
	DN 50	$25.60 \cdot 10^{-3}$	$6.4 \cdot 10^{4}$	$4.5 \cdot 10^{5}$	$1.3 \cdot 10^{4}$	–
	DN 80	$38.46 \cdot 10^{-3}$	$1.4 \cdot 10^{4}$	$8.2 \cdot 10^{4}$	$3.7 \cdot 10^{3}$	–
Promass M High press.	DN 8	$4.93 \cdot 10^{-3}$	$6.0 \cdot 10^{7}$	$1.4 \cdot 10^{8}$	$2.8 \cdot 10^{7}$	–
	DN 15	$7.75 \cdot 10^{-3}$	$8.0 \cdot 10^{6}$	$2.5 \cdot 10^{7}$	$1.4 \cdot 10^{6}$	–
	DN 25	$10.20 \cdot 10^{-3}$	$2.7 \cdot 10^{6}$	$8.9 \cdot 10^{6}$	$6.3 \cdot 10^{5}$	–
Promass F	DN 8	$5.35 \cdot 10^{-3}$	$5.70 \cdot 10^{7}$	$9.60 \cdot 10^{7}$	$1.90 \cdot 10^{7}$	–
	DN 15	$8.30 \cdot 10^{-3}$	$5.80 \cdot 10^{6}$	$1.90 \cdot 10^{7}$	$10.60 \cdot 10^{5}$	–
	DN 25	$12.00 \cdot 10^{-3}$	$1.90 \cdot 10^{6}$	$6.40 \cdot 10^{6}$	$4.50 \cdot 10^{5}$	–
	DN 40	$17.60 \cdot 10^{-3}$	$3.50 \cdot 10^{5}$	$1.30 \cdot 10^{6}$	$1.30 \cdot 10^{5}$	–
	DN 50	$26.00 \cdot 10^{-3}$	$7.00 \cdot 10^{4}$	$5.00 \cdot 10^{5}$	$1.40 \cdot 10^{4}$	–
	DN 80	$40.50 \cdot 10^{-3}$	$1.10 \cdot 10^{4}$	$7.71 \cdot 10^{4}$	$1.42 \cdot 10^{4}$	–
	DN 100	$51.20 \cdot 10^{-3}$	$3.54 \cdot 10^{3}$	$3.54 \cdot 10^{4}$	$5.40 \cdot 10^{3}$	–

Pressure loss data **inclusive** interface measuring tube(s) / piping
Pressure loss diagrams for water can be found on the following page.

* DN 15, 25, 40 “FB” = Full bore versions of Promass I

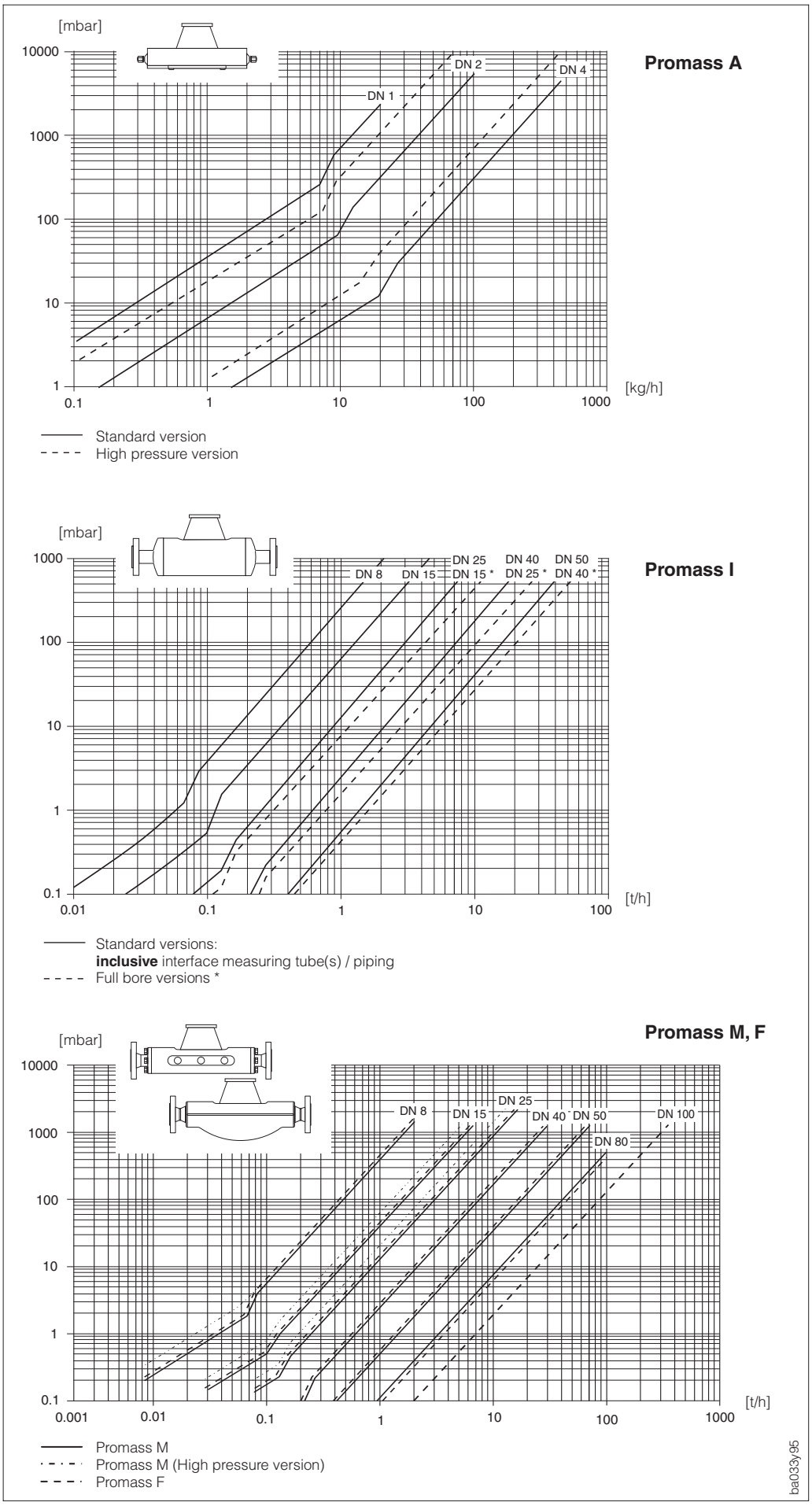


Fig. 44
Pressure loss with water

Density Calculation / °Brix

Density of hydrous saccharose solution in kg/m^3								
°Brix	**10 °C**	**20 °C**	**30 °C**	**40 °C**	**50 °C**	**60 °C**	**70 °C**	**80 °C**
0	999.70	998.20	995.64	992.21	988.03	983.19	977.76	971.78
5	1019.56	1017.79	1015.03	1011.44	1007.14	1002.20	996.70	989.65
10	1040.15	1038.10	1035.13	1031.38	1026.96	1021.93	1016.34	1010.23
15	1061.48	1059.15	1055.97	1052.08	1047.51	1042.39	1036.72	1030.55
20	1083.58	1080.97	1077.58	1073.50	1068.83	1063.60	1057.85	1051.63
25	1106.47	1103.59	1099.98	1095.74	1090.94	1085.61	1079.78	1073.50
30	1130.19	1127.03	1123.20	1118.80	1113.86	1108.44	1102.54	1096.21
35	1154.76	1151.33	1147.58	1142.71	1137.65	1132.13	1126.16	1119.79
40	1180.22	1176.51	1172.25	1167.52	1162.33	1156.71	1150.68	1144.27
45	1206.58	1202.61	1198.15	1193.25	1187.94	1182.23	1176.14	1169.70
50	1233.87	1229.64	1224.98	1219.93	1214.50	1208.70	1202.56	1196.11
55	1262.11	1257.64	1252.79	1247.59	1242.05	1236.18	1229.98	1223.53
60	1291.31	1286.61	1281.59	1276.25	1270.61	1264.67	1258.45	1251.88
65	1321.46	1316.56	1311.38	1305.93	1300.21	1294.21	1287.96	1281.52
70	1352.55	1347.49	1342.18	1336.63	1330.84	1324.80	1318.55	1312.13
75	1384.58	1379.38	1373.88	1368.36	1362.52	1356.46	1350.21	1343.83
80	1417.50	1412.20	1406.70	1401.10	1395.20	1389.20	1383.00	1376.60
85	1451.30	1445.90	1440.80	1434.80	1429.00	1422.90	1416.80	1410.50

Table of °Brix used in the Brix density calculation

Source:
A.&L. Emmerich, Technical University of Brunswick; officially recommended by ICUMSA, 20th Session, 1990.

12 Functions at a glance

PROCESS VARIABLE	
MASS FLOW (p. 68)	Display: 5-digit number with floating decimal point; incl. engineering units and arithmetic sign (e.g. 462.87 kg/h; -731.63 lb/min. etc.)
VOLUME FLOW (p. 68)	Display: 5-digit number with floating decimal point; incl. engineering units and arithmetic sign (e.g. 5.5445 dm^3/min; 1.4359 m^3/h; etc.)
STD. VOLUME FLOW (p. 68	Display: 5-digit number with floating decimal point; incl. engineering units and arithmetic sign (e.g. 1.3459 Nm^3/h; 7.9846 scm/day; etc.)
TARGET FLOW (p. 68)	Display: 5-digit number with floating decimal point; incl. engineering units and arithmetic sign (e.g. 0.1305 m^3/h; 1.4359 t/h; etc.)
CARRIER FLOW (p. 69)	Display: 5-digit number with floating decimal point; incl. engineering units and arithmetic sign (e.g. 0.0835 m^3/h; 16.4359 t/h; etc.)
DENSITY (p. 69)	Display: 5-digit number with fixed decimal point; incl. engineering units (corresp. to 0.10000...6.0000 kg/dm^3) (e.g. 1.2345 kg/dm^3; 993.5 kg/m^3; 1.0015 SG_20 °C; etc.)
CALC. DENSITY (p. 69)	Display: 5-digit number with fixed decimal point; incl. engineering units (e.g. 76.409 °Brix; 39.170 %v; 1391.7 kg/Nm^3; etc.)
TEMPERATURE (p. 69)	Display: 4-digit number with fixed decimal point; incl. engineering units and arithmetic sign (e.g. -23.40 °C; 160.0 °F; 295.4 K, etc.)

TOTALIZER	
TOTALIZER 1 (p. 70)	Display: max. 7-digit number with floating decimal point; incl. engineering units and arithmetic sign (e.g. 1.546704 t; -4925.631 kg; etc.)
TOTAL. 1 OVERFLOW (p. 70)	Display: Integer to a decimal power e.g. 10 e7 kg
TOTALIZER 2 (p. 70)	Display: max. 7-digit number with floating decimal point; incl. engineering units and arithmetic sign (e.g. 1.546704 t; -4925.631 kg)
TOTAL. 2 OVERFLOW (p. 70)	Display: Integer to a decimal power e.g. 10 e7 kg
RESET TOTALIZER (p. 70)	***CANCEL*** – TOTALIZER 1 – TOTALIZER 2 – TOTALIZER 1&2 Your setting: .....
ASSIGN TOTAL. 1 (p. 71)	OFF – ***MASS*** – MASS (+) – VOLUME – STD.VOLUME – VOLUME (+) – STD.VOLUME (+) – TARGET MATERIAL – TARGET MAT.(+) – CARRIER FLUID – CARRIER FLUID (+) – CANCEL (+) = The totalizer only registers flow in *positive* direction. Your setting: .....
ASSIGN TOTAL. 2 (p. 71)	***OFF*** – MASS – MASS (–) – VOLUME – STD.VOLUME – VOLUME (–) – STD.VOLUME (–) – TARGET MATERIAL – TARGET MAT.(–) – CARRIER FLUID – CARRIER FLUID (–) – CANCEL (–) = The totalizer only registers flow in *negative* direction. Your setting: .....

SYSTEM-UNITS	
MASS FLOW UNIT (p. 72)	g/min – g/h – kg/s – kg/min – ***kg/h*** – t/min – t/h – t/d – lb/s – lb/min – lb/hr – ton/min – ton/hr – ton/day – CANCEL Your setting: .....
MASS UNIT (p. 72)	g – ***kg*** – t – lb – ton – CANCEL Your setting: .....
VOLUME FLOW UNIT (p. 72)	cm^3/min – cm^3/h – dm^3/s – dm^3/min – ***dm^3/h*** – l/s – l/min – l/h – hl/min– hl/h – m^3/min – m^3/h – cc/min – cc/hr – gal/min – gal/hr – gal/day – gpm – gph – gpd – mgd – bbl/min – bbl/hr – bbl/day – CANCEL Your setting: .....
VOLUME UNIT (p. 72)	cm^3 – ***dm^3*** – l – hl – m^3 – cc – gal – bbl – CANCEL Your setting: .....
GALLONS / BARREL (p. 73)	US: 31.0 gal/bbl – ***US: 31.5 gal/bbl*** – US: 42.0 gal/bbl – US: 55.0 gal/bbl – Imp: 36.0 gal/bbl – Imp: 42.0 gal/bbl – CANCEL Your setting: .....
STDVOL. FLOW UNIT (p. 73)	Nl/s – Nl/min – Nl/h – Nl/d – Nm^3/s – ***Nm^3/min*** – Nm^3/h – Nm^3/d – scm/s – scm/min – scm/hr – scm/day – scf/s – scf/min – scf/hr – scf/day – CANCEL Your setting: .....
STD.VOLUME UNIT (p. 73)	***Nm^3*** – Nl – scm – scf – CANCEL Your setting: .....
DENSITY UNIT (p. 74)	g/cm^3 – kg/dm^3 – ***kg/l*** – kg/m^3 – SD_4 °C – SD_15 °C – SD_20 °C – g/cc – lb/cf – lb/USgal bzw. lb/gal * – lb/bbl – SG_59 °F – SG_60 °F – SG_68 °F – SG_4 °C – SG_15 °C – SG_20 °C – CANCEL * see function "GALLONS/BARREL" Your setting: .....
STD.DENSITY UNIT (p. 74)	***kg/Nm^3*** – kg/Nl – g/scc – kg/scm – lb/scf – CANCEL Your setting: .....
TEMPERATUREE UNIT (p. 74)	***°C (CELSIUS)*** – K (KELVIN) – °F (FAHRENHEIT) – °R (RANKINE) – CANCEL Your setting: .....
NOM.DIAM. UNIT (p. 74)	***mm*** – inch – CANCEL Your setting: .....

CURRENT OUTPUT (only with PROFIBUS-PA available)	
ASSIGN OUTPUT (p. 75)	OFF – ***MASS FLOW*** – VOLUME FLOW – STD.VOLUME FLOW – TARGET FLOW – CARRIER FLOW – DENSITY – STD. DENSITY – TEMPERATURE – CANCEL Your setting: .....
ZERO SCALE (p. 75)	5-digit number with floating decimal point, incl. arithmetic sign (e.g. –1.500 kg/h; 245.92 kg/m^3; 105.60 °C) Factory setting: Mass flow: ***0.0000 kg/h*** Density: ***0.0000 kg/l*** Temperature: ***-50.000 °C*** Your setting: .....
FULL SCALE (p. 76)	5-digit number with floating decimal point, incl. arithmetic sign, depending on the variable (e.g. –566.00 kg/min; 0.9956 kg/dm^3; 105.60 °C) Factory setting: Mass flow: ***dependent*** on the nom. diam. Density: ***2.0000 kg/l*** Temperature: ***200.00 °C*** Your setting: .....
TIME CONSTANT (p. 77)	3- to 5-digit with fixed decimal point (0.01...100.00 s) Factory setting: ***1.00 s*** Your setting: .....
CURRENT SPAN (p. 77)	0–20 mA (25 mA) – 4–20 mA (25 mA) – 0–20 mA – ***4–20 mA*** – CANCEL Your setting: .....
FAILSAFE MODE (p. 77)	***MIN. CURRENT*** Current signal is set to 0 mA (0...20 mA) or 2 mA (4...20 mA) on error. MAX. CURRENT Current signal is set to 25 mA for 0/4...20 mA (25 mA) or 22 mA for 4...20 mA on error. HOLD VALUE Last valid measured value is held. ACTUAL VALUE Normal measured value is given despite error. CANCEL Your setting: .....

CURRENT OUTPUT (only with PROFIBUS-PA available)	
SIMULATION CURR. (p. 78)	***OFF*** – 0 mA – 10 mA – 20 mA – 22 mA – 25 mA (bei 0...20 mA) – 2 mA – 4 mA – 12 mA – 20 mA – 22 mA – 25 mA (bei 4...20 mA) – CANCEL Your setting: .....
NOMINAL CURRENT (p. 78)	Display: 3-digit number with floating decimal point (0.00...25.0 mA)

DENSITY FUNCTION	
DENS. ADJ. VALUE (p. 81)	5-digit number with floating decimal point; incl. engineering units (corresponding to 0.1...5.9999 kg/l)
DENSITY-ADJUST (p. 81)	***CANCEL*** – SAMPLE FLUID 1 – SAMPLE FLUID 2 – DENSITY ADJUST Your setting: .....
CALC. DENSITY (p. 84)	***OFF*** – %-MASS – %-VOLUME – STD. DENSITY – °BRIX – °BAUME >1kg/dm^3 – °BAUME <1kg/dm^3 – °API – %-BLACK LIQUOR – %-ALCOHOL – °PLATO °BALLING CANCEL Your setting: .....
VOLUME FLOW MEAS (p. 84)	***OFF*** – VOLUME FLOW – STD.VOLUME FLOW – VOLUMEN & STD. VOL. – CANCEL Your setting: .....
STD. VOL. CALC. (p. 84)	***CALC. STD. DENSITY*** – FIXED STD. DENSITY – CANCEL Your setting: .....
REFERENCE TEMP. (p. 84)	5-digit number with floating decimal point; incl. engineering units and arithmetic sign (e.g. 25.000 °C; -10.500 °C; 60.000 °F) Factory setting: ***15.000 °C*** Your setting: .....
EXP. COEF. (p. 85)	5-digit number with floating decimal point; incl. engineering units and arithmetic sign (e.g. 0.4400 e-3 1/K) Factory setting: ***0.5000 e-3 1/K*** Your setting: .....
FIXED STD. DENSITY (p. 85)	5-digit number with floating decimal point; incl. engineering units and arithmetic sign (e.g. 1.0000 kg/sl; 1000.0 kg/Nm^3) Factory setting: ***1000.0 kg/Nm^3*** Your setting: .....
CARRIER DENSITY (p. 85)	5-digit number with floating decimal point; incl. engineering units (e.g.1.0000 kg/dm^3; 1.0016 SG) Factory setting: ***1.0000 kg/l*** Your setting: .....

DENSITY FUNCTION	
EXP. COEF. CARRIER (p. 85)	5-digit number with floating decimal point; incl. engineering units and arithmetic sign (e.g. 0.5000 e-3 1/K) Factory setting: ***0.0000 e-3 1/K*** Your setting: .....
TARGET MAT. DENSITY (p. 86)	5-digit number with floating decimal point; incl. engineering units and arithmetic sign (e.g.1.0000 kg/dm^3; 1.0016 SG) Factory setting: ***2.0000 kg/l*** Your setting: .....
EXP. COEF. TARGET (p. 86)	5-digit number with floating decimal point; incl. engineering units and arithmetic sign (e.g. 0.5000 e-3 1/K) Factory setting: ***0.0000 e-3 1/K*** Your setting: .....

DISPLAY	
ASSIGN LINE 1 (p. 87)	***MASS FLOW*** – VOLUME FLOW – STD. VOLUME FLOW – TARGET FLOW – CARRIER FLOW – DENSITY – STD. DENSITY – TEMPERATURE – TOTALIZER 1 – TOTALIZER 1 OVERFLOW – TOTALIZER 2 – TOTALIZER 2 OVERFLOW – CANCEL Your setting: .....
ASSIGN LINE 2 (p. 87)	OFF – MASS FLOW – VOLUME FLOW – STD. VOLUME FLOW – TARGET FLOW – CARRIER FLOW – DENSITY – STD. DENSITY – TEMPERATURE – ***TOTALIZER 1*** – TOTALIZER 1 OVERFLOW – TOTALIZER 2 – TOTALIZER 2 OVERFLOW – CANCEL Your setting: .....
DISPLAY DAMPING (p. 87)	max. 2-digit number (0...99 seconds) Factory setting: ***1 s*** Your setting: .....
FORMAT FLOW (p. 87)	xxxxx. – xxxx.x – xxx.xx – xx.xxx – ***x.xxxx*** – CANCEL Your setting: .....
LCD CONTRAST (p. 87)	**IIIIIIIIIII**..... Any change in contrast is immediately seen with the adjustable bar graph.
LANGUAGE (p. 88)	ENGLISH – DEUTSCH – FRANCAIS – ESPANOL – ITALIANO – NEDERLANDS – DANSK – NORSK – SVENSKA – SUOMI – BAHASA INDONESIA – JAPANESE (in orginal alphabet) – CANCEL Your setting: .....

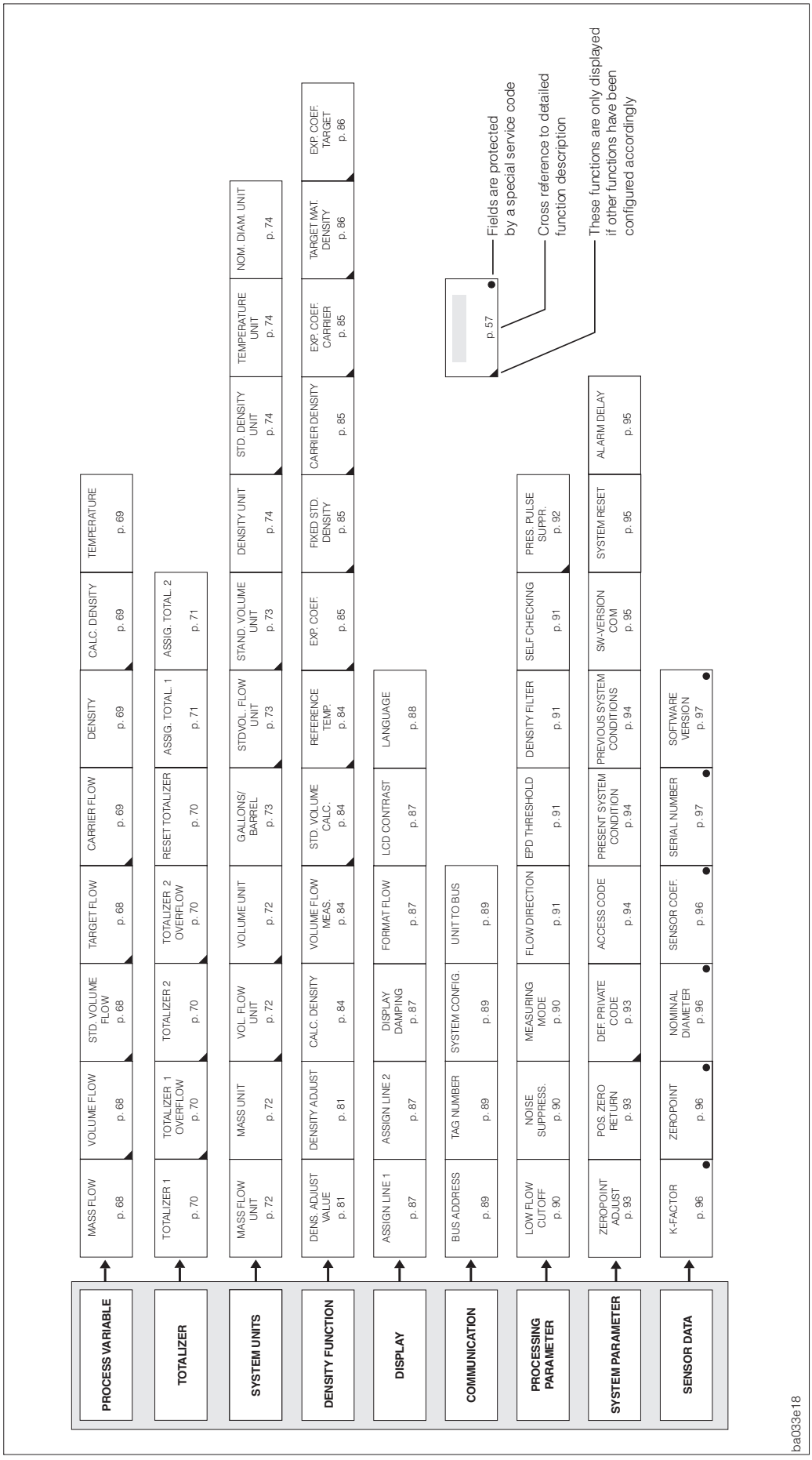
COMMUNICATION	
BUS-ADDRESS (p. 89)	3-digit number (0...126) Factory setting: ***126*** Your setting: .....
TAG NUMBER (p. 89)	This function displays the actual measuring-point designation (name), which can only be assigned by a PROFIBUS master, e.g. Commuwin II.
SYSTEM CONFIG. (p. 89)	Possibility to change between **>local<** operation with E+H matrix and **>remote<** operation via PROFIBUS-DP /-PA. ***LOCAL*** – REMOTE
UNIT TO BUS (p. 89)	The system units localy set on the instrument are transmitted to the bus or to Class I master after activation of this function. ***CANCEL*** – UNIT TO BUS

PROCESSING PARA.	
LOW FLOW CUTOFF (p. 90)	5-digit number with floating decimal point (e.g. 25.000 kg/min) Factory setting: ***dependent*** on the nominal diameter Your setting: .....
NOISE SUP-PRESS. (p. 90)	***OFF*** – LOW – MEDUIM – HIGH – CANCEL Your setting: .....
MEASURING MODE (p. 90)	***UNIDIRECTIONAL*** – BIDIRECTIONAL – CANCEL Your setting: .....
FLOW DIRECTION (p. 91)	***FORWARD*** – REVERSE – CANCEL Your setting: .....
EPD THRESHOLD (p. 91)	5-digit number with floating decimal point; incl. engineering units and arithmetic sign (corresponding 0.0000...5.9999 kg/l) Factory setting: ***0.2000 kg/l*** Your setting: .....
DENSITY FILTER (p. 91)	OFF – LOW – ***MEDUIM*** – HIGH – CANCEL Your setting: .....
SELF CHECKING (p. 91)	***CYCLIC*** – SMART – CANCEL Your setting: .....
PRES. PULSE SUPPR. (p. 92)	Max. 4-digit number, incl. unit ***0.00***...10.00 seconds Your setting: .....

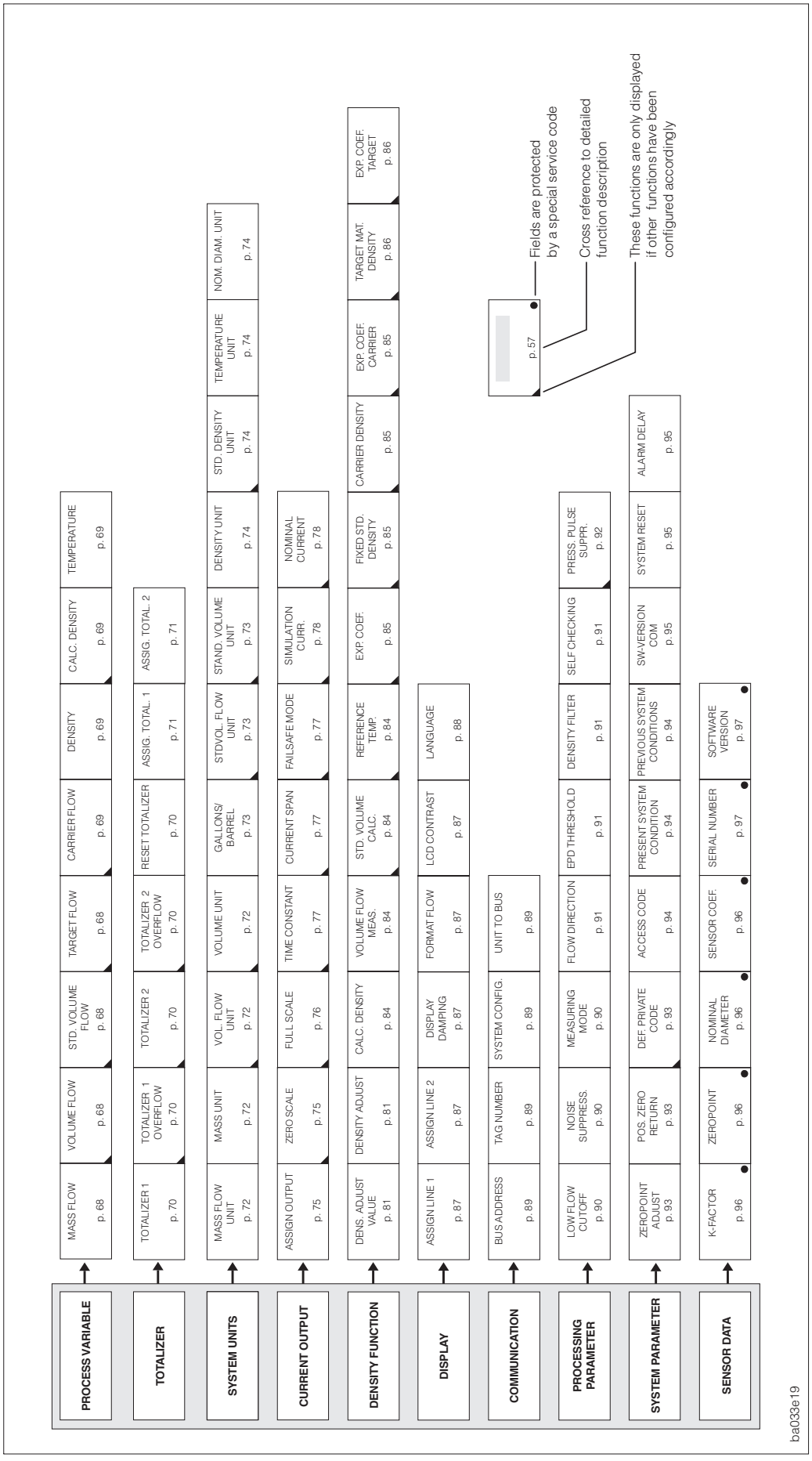
SYSTEM PARAMETER	
ZEROPOINT ADJUST (p. 93)	***CANCEL*** – START
POS. ZERO RETURN (p. 93)	***OFF*** – ON Your setting: .....
DEF. PRIVATE CODE (p. 93)	Max. 4-digit number (0...9999) Factory setting: ***63*** Your setting: .....
ACCESS CODE (p. 94)	Max. 4-digit number (0...9999) Factory setting: ***0*** Your setting: .....
PRESENT SYSTEM CONDITION (p. 94)	Display (listed in priority): F: ....= Error message (System error) A: ....= Alarm message (Processor error) S: ....= Status message
PREVIOUS SYSTEM CONDITION (p. 94)	Display (listed in chronological): F: ....= Error message (System error) A: ....= Alarm message (Processor error) S: ....= Status message
SOFTWARE VER. COM (p. 95)	Display: e.g. V3.02.XX PBUS
SYSTEM RESET (p. 95)	***CANCEL*** – RESTART SYSTEM
ALARM DELAY (p. 95)	Max. 3-digit number ***0***...100 seconds (in one second steps) Your setting: .....

SENSOR DATA	
K-FACTOR (p. 96)	5-digit number with fixed decimal point (0.1000...5.9999) Factory setting: ***dependent*** on the nominal diameter and calibration Your setting: .....
ZEROPOINT (p. 96)	Max. 5-digit number (-10000...+10000) Factory setting: ***dependent*** on the nominal diameter and calibration Your setting: .....
NOMINAL DIAMETER (p. 96)	[actual nominal diameter of the sensor] – ***CANCEL*** Factory setting: ***dependent*** on the nominal diameter and calibration
SENSOR COEF. (p. 96)	CANCEL DENSITY COEF. (C 0)* – DENSITY COEF. (C 1)* – DENSITY COEF. (C 2)* – DENSITY COEF. (C 3)* – DENSITY COEF. (C 4)* – DENSITY COEF. (C 5)* – TEMP. COEF. Km – TEMP. COEF. Kt – CAL. COEF. Kd1 – CAL. COEF. Kd2 – MIN. TEMPERATURE – MAX. TEMPERATURE – * A local density calibration can alter these values.
SERIAL NUMBER (p. 97)	Display: 6-digit serial number of the sensor (100 000...999 999)
SOFTWARE VERSION (p. 97)	Display: e.g. V 4.00.XX F

Operating matrix Promass 63 PROFIBUS-DP:



Operating matrix Promass 63 PROFIBUS-PA:



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