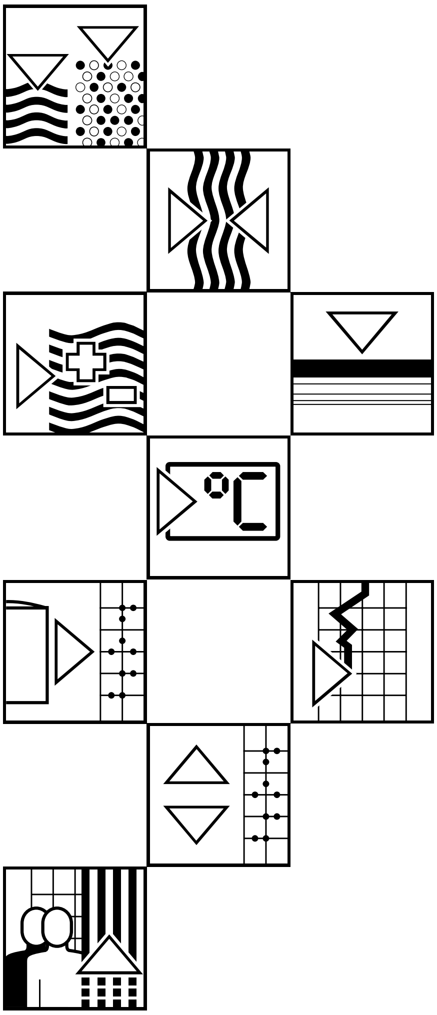
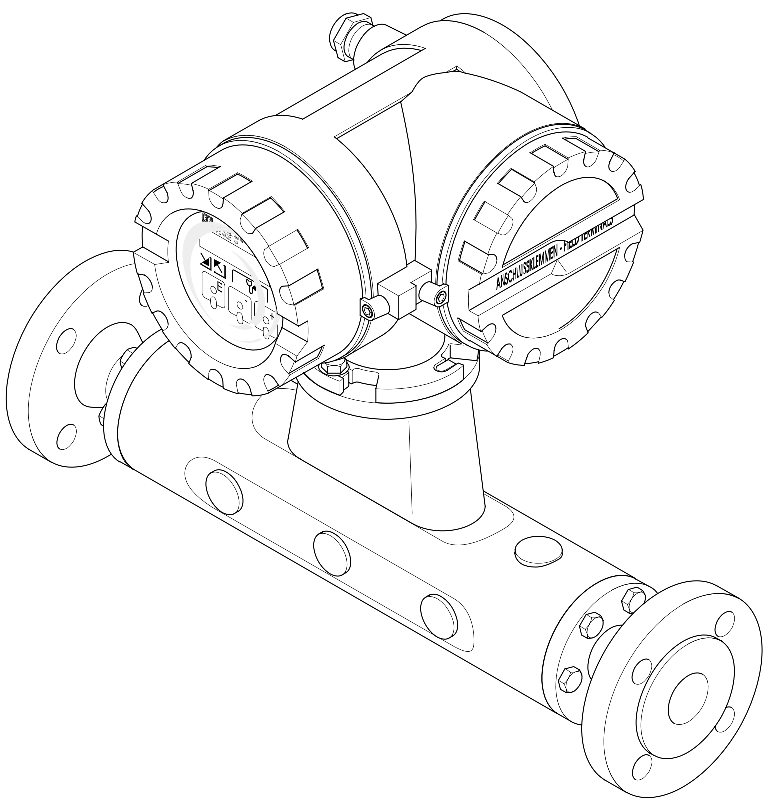
BA 014D/06/en/12.99
No. 50070498
CV 5.0

Valid as of software version
V 4.00.XX (amplifier)
V 3.02.XX (communications)

promass 63
Mass Flow Measuring System

Operating Manual





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The Power of Know How

Brief Operating Instructions

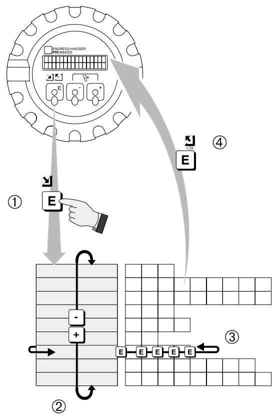
With the following instructions, you may configure your measuring instrument quickly and easily. Please consult the Safety Instructions on page 5.

Safety instructions → see page 5

Mounting and electrical connection
- Mounting → see page 11
- Electrical connection → see page 17

Switching on the instrument → see page 26

Operation → see page 27 ff.



Display configuration
- Language → see page 92
- Contrast → see page 91
- Assign line 1 → see page 91
- Assign line 2 → see page 91
- Number of decimal digits → see page 91

Engineering units → see page 64 ff.

continued: next column

Commissioning
- Pulsating flow → see page 42
- Batching → see page 47
- Density functions → see page 52
- Density adjustment → see page 54
- Zero point adjustment → see page 56
- Gas measurement → see page 58

Configuration of outputs

Current output
- Assign output → see page 67
- Zero/full scale value → see page 67 ff.
- Current span → see page 70

Pulse/frequency output
- Operation mode → see page 72
- Assign output → see page 72
- Pulse value → see page 72
- Pulse width → see page 73
- Zero/full scale value → see page 75
- Full scale frequency → see page 74
- Output signal → see page 76

Other applications
require programming of additional functions. You will find the appropriate pages and functions in the
- Index → see page 151
- Operating matrix → see page 29

Relay outputs → see page 82 ff.

For optimum measuring results
- Zero point calibration → see page 56
- Density adustment → see page 87
- Empty pipe detection → see page 97
- Creep suppression → see page 96

Note!

Note!
As blind versions, all Promass instruments can also be connected to the multifunctional *"Procom DZL 363"* transmitter. Corresponding information can be provided in a separate Operating Manual (BA 036D/06/en).

Contents

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1 Safety Instructions

1.1 Correct usage

- The Promass 63 is only to be used for measuring the mass flowrate of liquids and gases. At the same time, the system also measures the density and the temperature of fluids and thus allows calculation of other parameters such as volumetric flow, solids content or density units (standard density, °Brix, °Baumé, °API).
- The manufacturer assumes no liability for damage caused by incorrect use of the instrument.
- Instruments which are used in the explosion hazardous area 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 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 works in an operationally 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. Please 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. Please 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. Please 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 Part 1 and 2 / EN 50082 Part 1 and 2 as well as the NAMUR recommendations.
- Extensive self-monitoring of the measuring system gives complete operational safety. Any errors or power failure which may occur are immediately given at configured relay output 1. Existing errors can be automatically called up and their cause determined using the diagnosis function.
- On 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

- 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 absolutely and 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 page 136).
  The user is responsible for the correct selection of suitable wetted parts materials having suitable resistance within the process. The manufacturer is not liable! Endress+Hauser will be glad to provide 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.
- Please 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 present.

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 to us 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 having widely differing characteristics:
- Chocolate, condensed milk, syrup
- Oils, fats
- Acids, alkalis
- Varnishes, paints
- Pharmaceuticals, catalytic converters, inhibitors
- Suspensions, gases, etc.

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

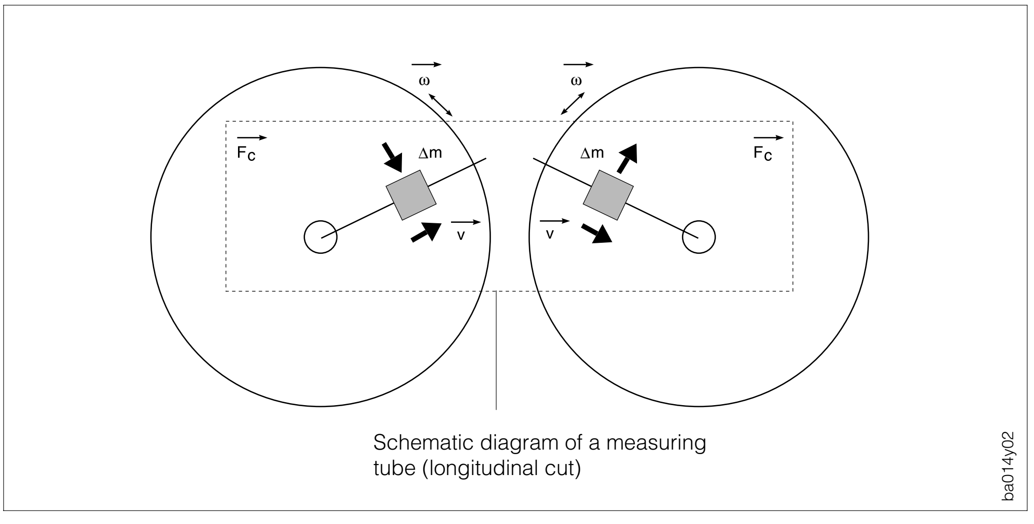
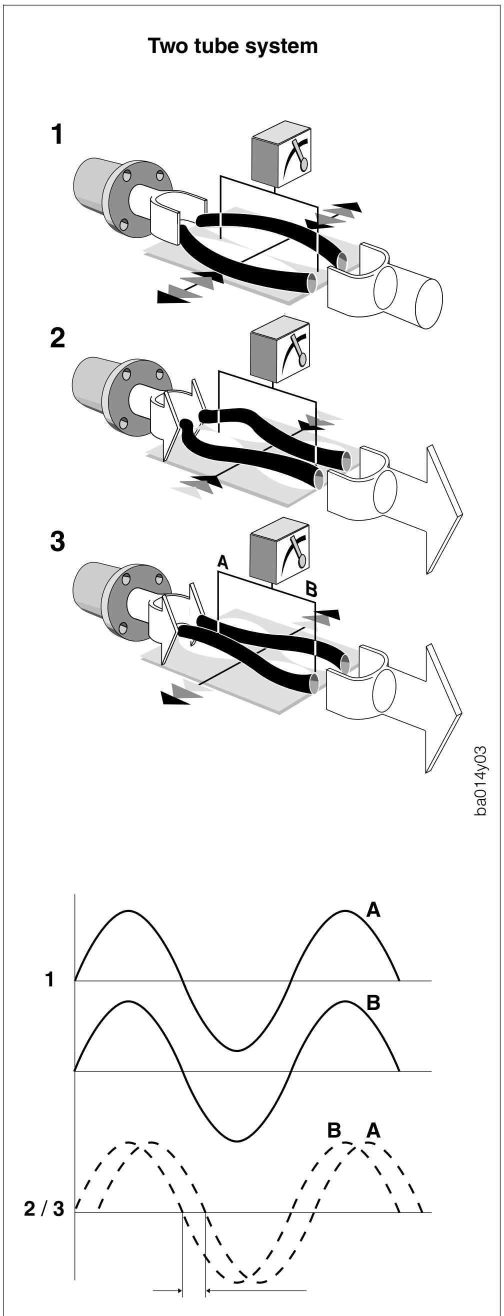


Fig. 1
Coriolis forces in the Promass measuring tubes



$$\Delta t = \frac{\Delta\varphi}{2 \cdot \pi \cdot f} \approx \dot{m}$$

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

The Promass uses an oscillation instead of a constant angular velocity $\vec{\omega}$ and two parallel measuring tubes (Promass M and F), with fluid flowing through them, 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 flowrate increases, the phase difference also increases (**A-B**). The oscillations of the measuring tubes are determined using electrodynamic sensors at the inlet and outlet.

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. The installation of Promass I is for this reason 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 adjusts automatically as soon as the mass, and therefore the density of the oscillating system changes (measuring tubes *and* medium). The resonant frequency is thus a function of the density of the medium and enables the microprocessor to produce a density signal.

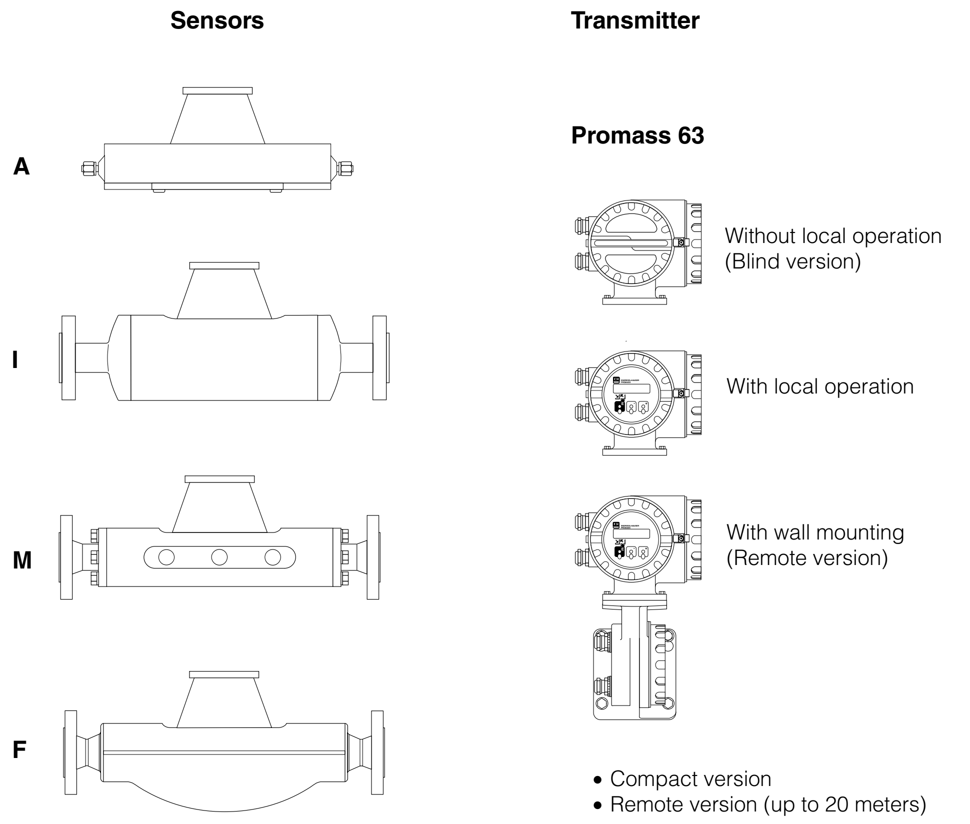
Temperature measurement

The temperature of the measuring tubes is determined and used to compensate for temperature effects. The signal produced is a function of the process temperature and can be used for external purposes.

2.3 Promass 63 measuring system

Das Promass 63 measuring system is mechanically and electronically designed for maximum flexibility with the transmitters and sensors being combined in any variation.

The measuring system consists of:
- Transmitter Promass 63
- Sensor Promass A, I, M or F



A	DN 1... 4:	For very small flow quantities, single tube system in SS or Alloy C-22
I	DN 8... 50:	Single straight tube system (titanium), completely welded version
M	DN 8... 80:	Two straight measuring tubes (titanium), containment vessel up to 100 bar
	DN 8... 25:	High pressure version, system pressure up to 350 bar.
F	DN 8...100:	Two slightly curved measuring tubes in SS or Alloy C-22 (only for DN 8...80), completely welded version

Technical data: see Chapter 9, 10

ba014y05

Fig. 3
Promass 63 measuring system

As blind version, all Promass instruments can also be connected to the mulifunctional "Procom DZL 363" transmitter. Corresponding information can be provided in a seperate Operating Manual (BA 036D/06/en).

Caution!
The Promass 63 measuring system is available with various approvals.
Your Endress+Hauser representative will be pleased to supply information on the approvals available at present. All Ex information and specifications are included in a separate documentation which can be sent by Endress+Hauser on request.

Caution!

3 Mounting and Installation

Warning!

- All instructions given 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 may differ from those given below. All mounting regulations and connection values in the Ex documentation must, therefore, be strictly observed.

3.1 General information

Protection IP 67 (EN 60529)

The instruments fulfil all the requirements for IP 67. After successful installation in the field or after servicing, the following points must always be observed in order to ensure protection to IP 67:

- 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.

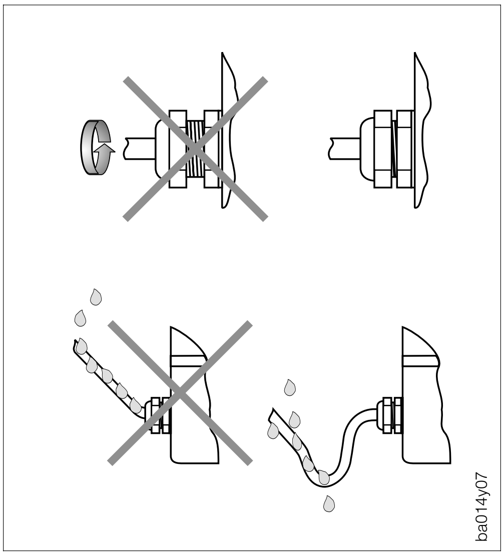


Fig. 4
Mounting notices for cable glands

Temperature ranges

- The maximum approved ambient and fluid temperature must be observed (see page 134, 135)
- 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 must be avoided. A wide range of materials can be used to assure 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).

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 then 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 high enough system pressure.

Note!

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

Purge connections
The pressure vessel of the sensor is filled with dry nitrogen (N2). The purge connections 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, measuring instruments with nominal diameters of DN 40...100 may not be lifted at the transmitter housing or at 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 coat of lacquer.

Warning!

Warning!
Danger of injury by slipping measuring instrument! 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.

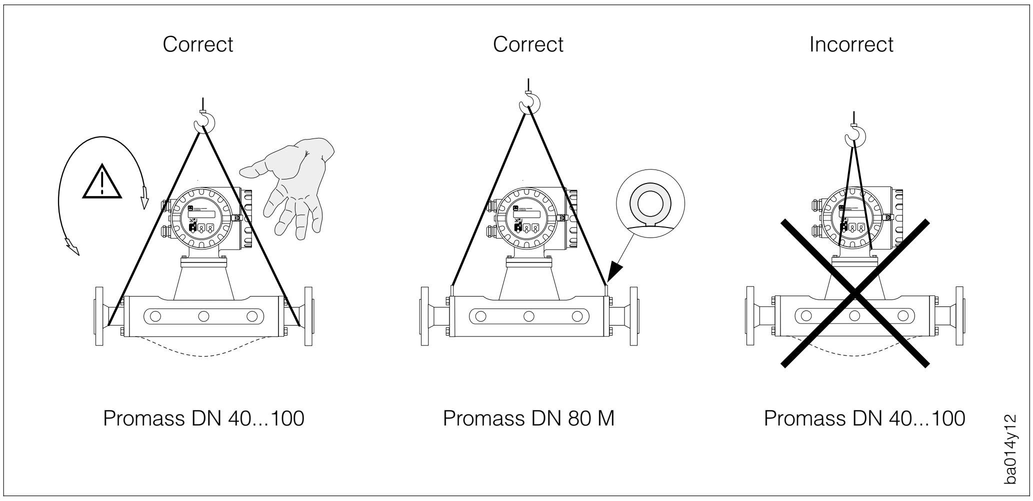


Fig. 5
Transporting of the sensor DN 40...100

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 product 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 pipe.

Wall and post mounting
The sensor may not be suspended in the piping, that is, without support or fixation to avoid excessive stress on the material around the process connection.

The sensor housing base plate allows a 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

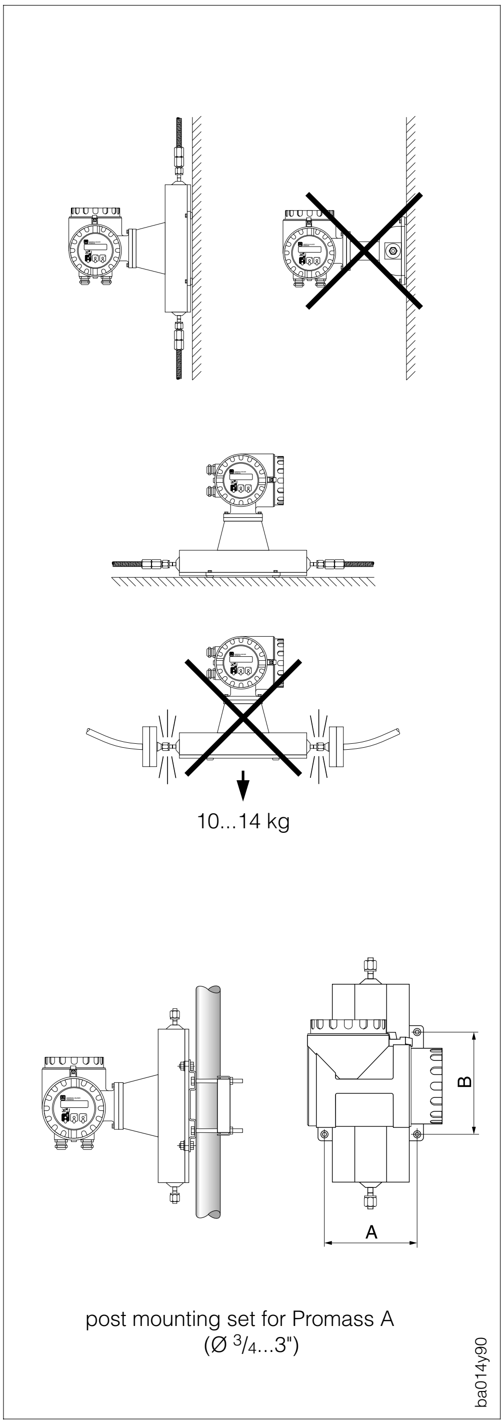


Fig 6
Orientation Promass A

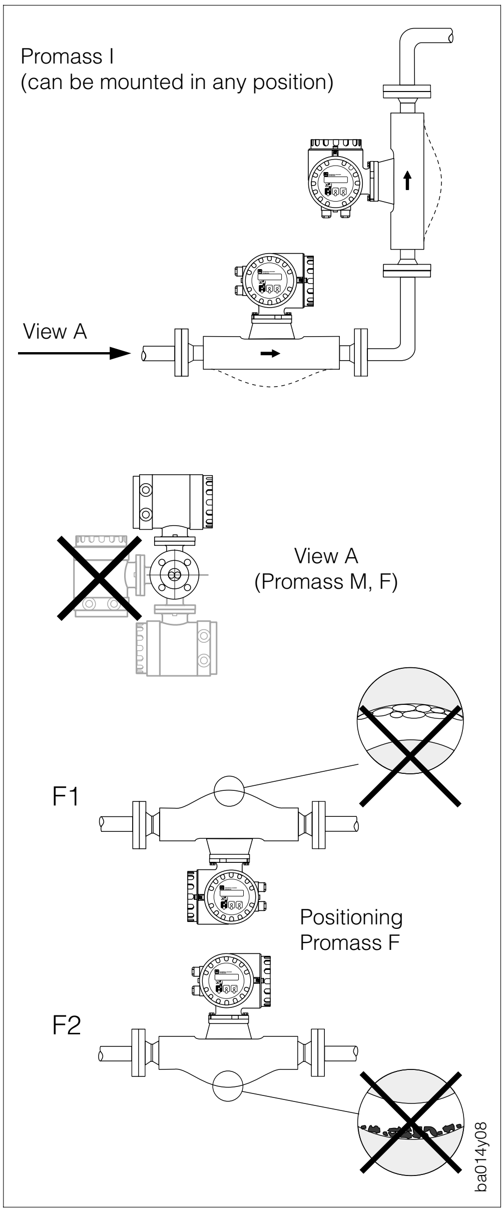


Fig. 7
Orientation Promass I, M, F

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 product 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 of 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, the sensor position is to be adapted to the fluid properties for horizontal installation:

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

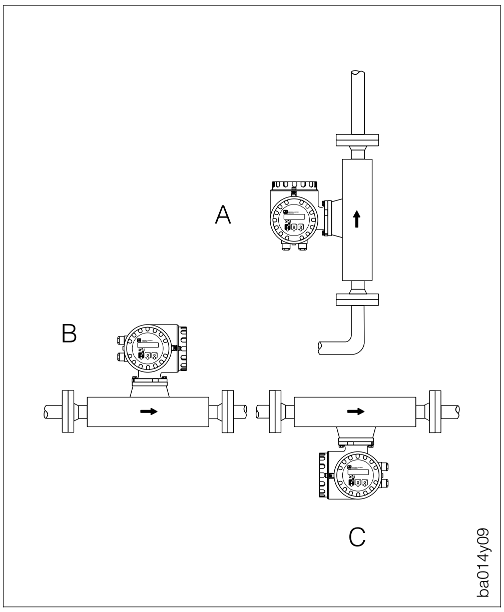


Fig. 8
Fluid temperature and orientation

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

Air or entrained gases in the measuring pipe 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 a free 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 measuring instrument 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

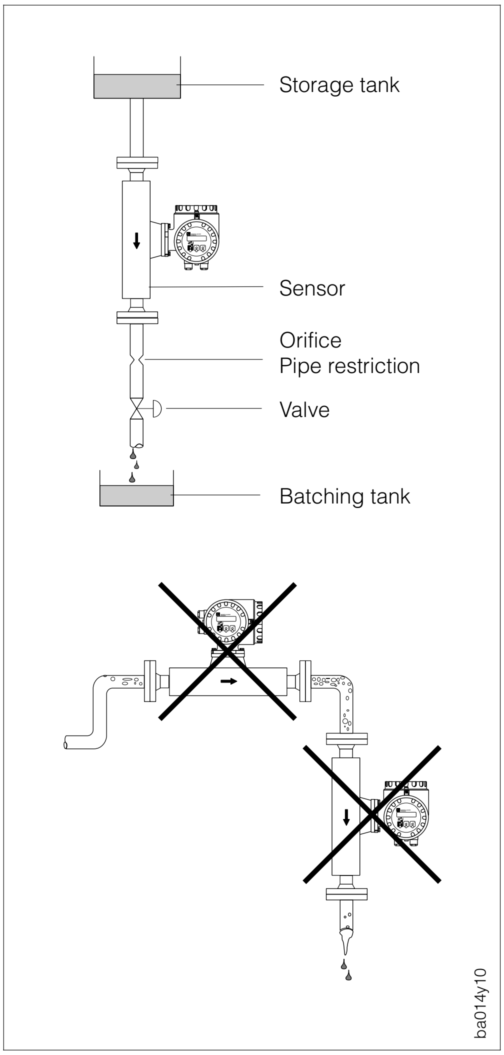


Fig. 9
Mounting location (vertical piping)

Mounting the transmitter

A wall bracket for the transmitter housing and a 10 or 20 m ready-to-use cable to the sensor is in the scope of supply for the remote version.

For post mounting a special mounting set is available (Order No. 50076905).

Caution!

- Please pay attention to page 21 "Connecting the remote version".
- Fix the cable or fix it in a conduit.
- Do not lay cable in the vicinity of electrical machines or switching elements.
- Do not lay cables near electrical machinery or switching units.
- In case of the remote version, the connection housing of the sensor may not be insulated.
- Ensure potential compensation between sensor and transmitter (see page 21).

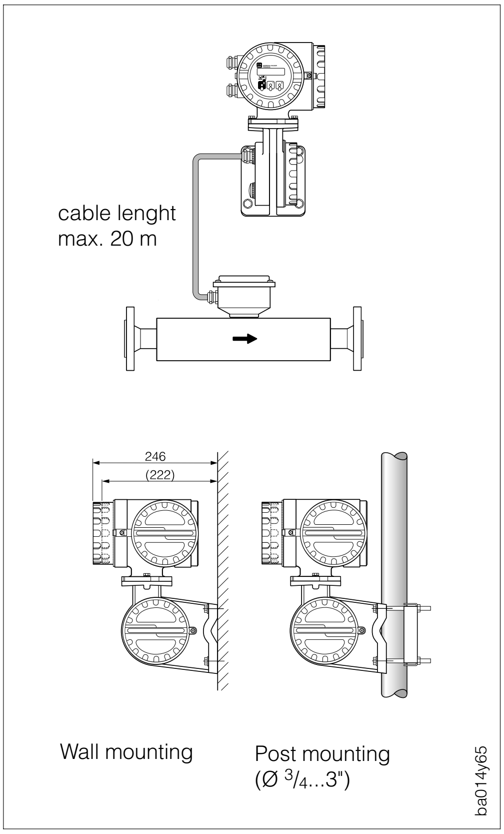


Fig. 10
Mounting the transmitter (remote version)

Caution!

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 read-off.

Warning!

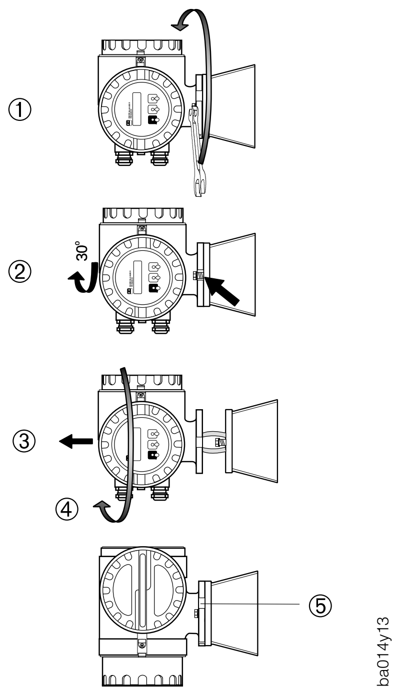
Warning!
The following procedure cannot be used for units with Ex approvals. The separate Ex-documentation must, therefore, be strictly observed.

Rotating the transmitter housing

1. Loosen the mounting screws (approx. two turns).
2. Rotate the transmitter housing as far as the groove of the nut.
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!



Rotating the local display

Warning!

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

1. Loosen the safety grip (3 mm Allen screw).
2. Unsrew the cover from the electronics area.
3. Undo both Phillips screws.
4. Rotate the display.
5. Tighten the Phillips screws again.
6. Replace the cover of the electronics area on the transmitter housing.
7. Tighten the Allen screws of the safety grip securely.

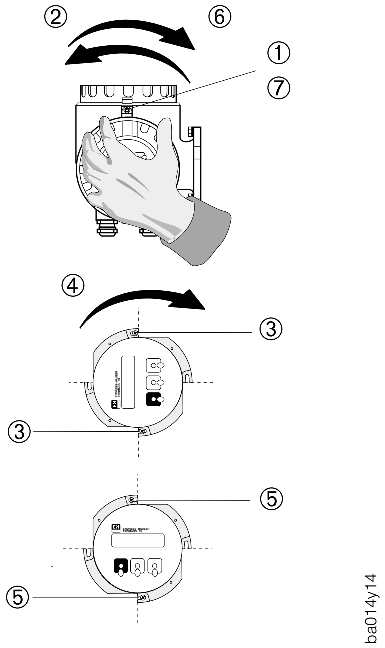


Fig. 11
Rotating the transmitter housing and the local display

4 Electrical Connection

4.1 General information

Warning!

- The information in Section 3.1 must be observed in order to maintain protection to IP 67.
- When connecting flowmeters with Ex approval, all appropriate instructions and connections diagrams in the separate 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 sensors and transmitters with the same serial number are to be connected together. Communication errors can occur if this is not the case.

Warning!

4.2 Connecting the transmitter

Warning!

- Danger from electric shock! Switch off the power supply before unscrewing 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 also be observed.

Warning!

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 screw cover or page 18 ff.):

   The 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.

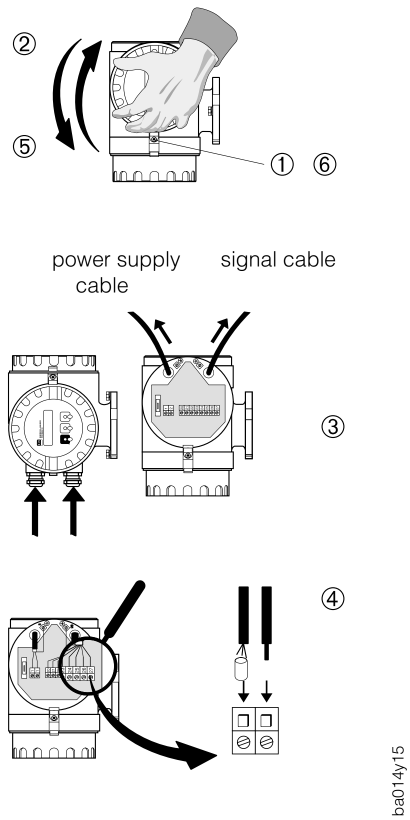
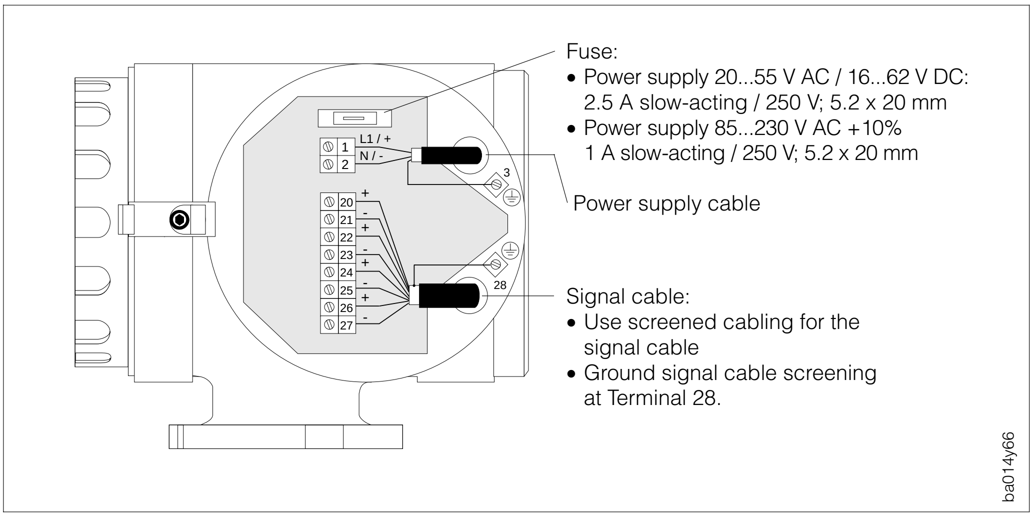


Fig. 12
Connecting the Promass 63 transmitter

Connection to the “Procom DZL 363” transmitter
The terminal assignment of Procom DZL 363 is described in a separate Operating Manual (BA 036D/06/en).
With the DoS version (DZL board), the connecting cable between the Promass sensor and the “Procom DZL 363” transmitter is galvanically connected to its power supply. For cabling use only screened cable which can also carry the power supply load.

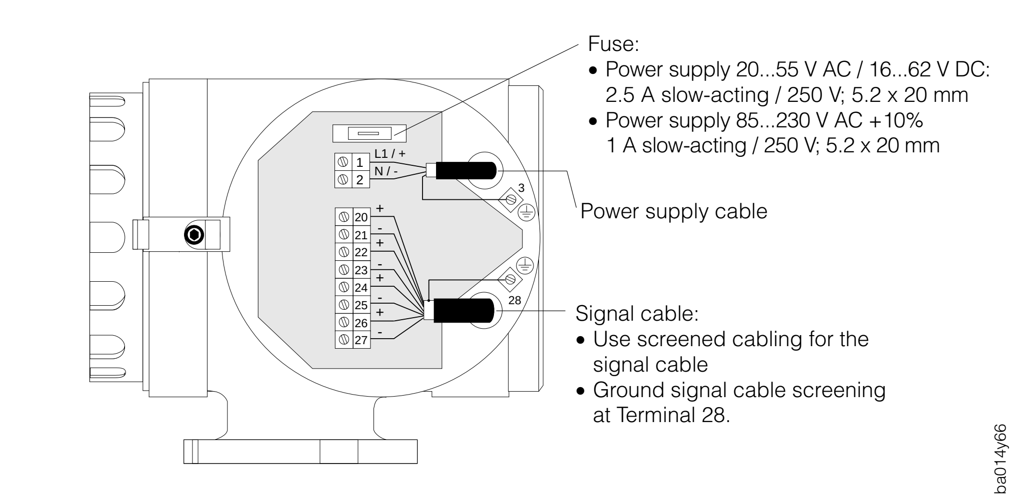


Note!

Note!
When using an "Ex i-board" the electrical connection is to be carried out as shown in the separate Ex documentation.

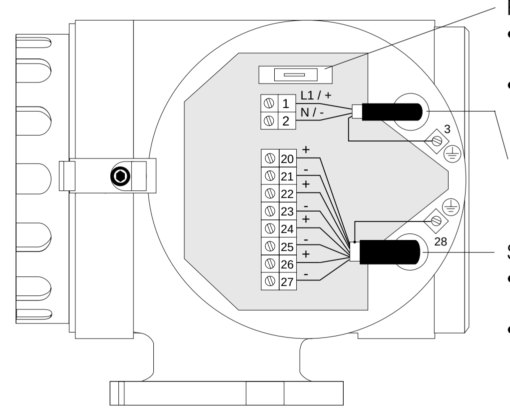
- CENELEC: Ex 019D/06/A2
- SEV: Ex 022D/06/C2
- FM: Ex 023D/06/A2
- CSA: Ex 024D/06/D2

	Terminal connection: "HART" interface (Current output)	
3	Ground connection (ground wire)	
1 **2**	L1 N for AC	L+ L– for DC power supply
20 (+) **21 (–)**	Puls/frequency output	active / passive, f = 2...10000 Hz (max. 16383 Hz) active: 24 V DC, 25 mA (250 mA during 20 ms) passive: 30 V DC, 25 mA (250 mA during 20 ms)
22 (+) **23 (–)**	Relay 1	max. 60 V AC / 0.5 A max. 30 V DC / 0.1 A can be configured, e.g. for failure
24 (+) **25 (–)**	Relay 2	max. 60 V AC / 0.5 A max. 30 V DC / 0.1 A can be configured: e.g. for limit value
26 (+) **27 (–)**	Current output 1	active, 0/4...20 mA, $R_L < 700\ \Omega$ with HART protocol: 4...20 mA, $R_L \geq 250\ \Omega$
28	Ground connection (screen of signal cable)	



	Terminal connection: "RS 485" interface	
3	Ground connection (ground wire)	
1 **2**	L1 for AC N	L+ for DC power supply L–
20 (+) **21 (–)**	Input / output	RS 485 or auxiliary input A +/– 3...30 V DC B –/+
22 (+) **23 (–)**	Relay 1	max. 60 V AC / 0.5 A max. 30 V DC / 0.1 A can be configured, e.g. for failure
24 (+) **25 (–)**	Relay 2	max. 60 V AC / 0.5 A max. 30 V DC / 0.1 A can be configured, e.g. for limit value
26 (+) **27 (–)**	Current output or Puls / frequency output	active, 0/4...20 mA, R_L < 700 Ω active / passive, f_{max} = 10 kHz active: 24 V DC, 25 mA (250 mA during 20 ms) passive: 30 V DC, 25 mA (250 mA during 20 ms)
28	Ground connection (screen of signal cable)	

	Terminal connection: "2 CUR." interface (2 Current outputs)	
3	Ground connection (ground wire)	
1 **2**	L1 for AC N	L+ for DC power supply L–
20 (+) **21 (–)**	Current output 2	active, 0/4...20 mA R_L < 700 Ω
22 (+) **23 (–)**	Relay 1	max. 60 V AC / 0.5 A max. 30 V DC / 0.1 A can be configured, e.g. for failure
24 (+) **25 (–)**	Relay 2	max. 60 V AC / 0.5 A max. 30 V DC / 0.1 A can be configured, e.g. for limit value
26 (+) **27 (–)**	Current output 1	active, 0/4...20 mA, R_L < 700 Ω with HART protocol: 4...20 mA, $R_L \geq 250$ Ω
28	Ground connection (screen of signal cable)	



	Terminal connection: "DZL 363"- interface	
	DoS version *	***Dx version *****
3	Ground connection (ground wire)	Ground connection (ground wire)
1 **2**	Terminal 1 connected with Terminal 24 Terminal 2 connected with Terminal 25	L1 N for AC; L+ L– for DC; power supply
20 (+) **21 (–)**	DoS+ DoS–	not used
22 (+) **23 (–)**	not used	Dx+ (A-data) Dx– (B-data)
24 **25**	Terminal 24 connected with Terminal 1 Terminal 25 connected with Terminal 2	not used
26 **27**	not used	not used
28	Ground connection (screen of signal cable)	Ground connection (screen of signal cable)

* **DoS version**
The Promass sensor is powered by the "Procom DZL 363" transmitter.

** **Dx version**
Promass sensor and "Procom DZL 363" transmitter are powered with seperate power supplies.

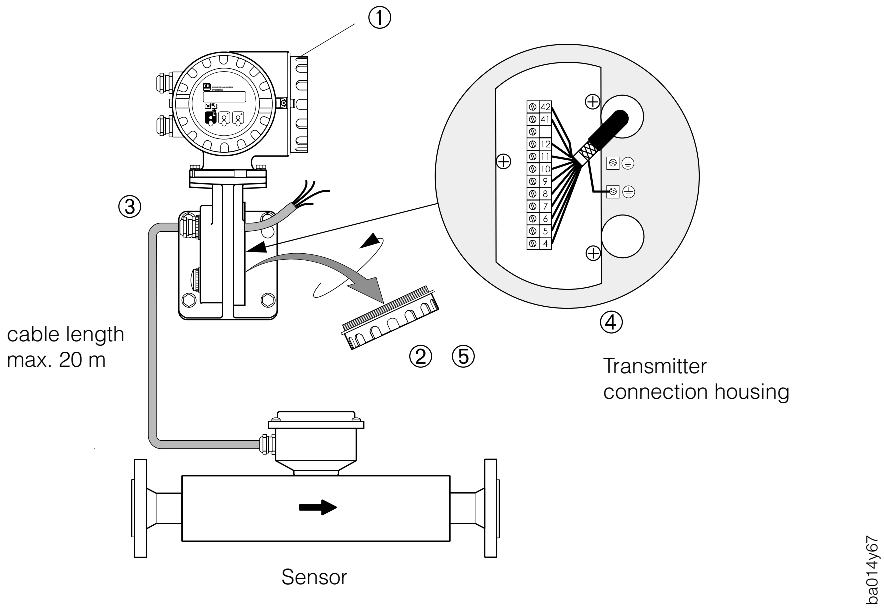
4.3 Connecting the remote version

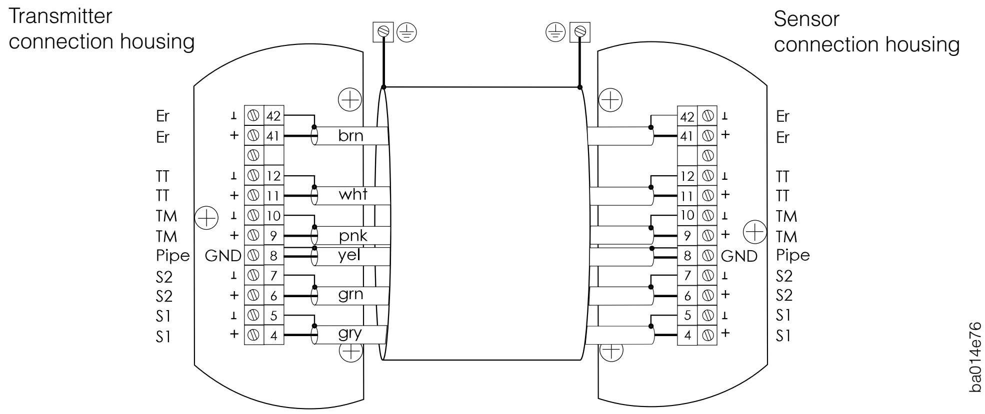
The remote version is supplied with a 10 or 20 meter ready to use cable which is already connected to the sensor.

Warning!

Warning!
Danger from electrical shock! Switch off the power supply before unscrewing the cover of the 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 grip (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 housing cover again securely. Tighten the Allen screws of the safety grip securely.





Cable specifications:
brn = brown, wht = white, pnk = pink, ye l= yellow, grn = green, gry = grey
6 x 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 sensor and transmitter.

Fig. 13
Connecting the remote version

4.4 Connecting E+H Rackbus and Rackbus RS 485

Promass 63 can be linked to other E+H measuring instruments using an E+H-Rackbus and a Rackbus RS 485 and connected to superset process-control systems such as MODBUS or PROFIBUS, ControlNet, etc., with the help of a corresponding gateway (see Fig.14).
A maximum of 64 adresses can be connected to a ZA 672 gateway, including the max. 50 adresses which are connected to the FXA 675.

- **E+H Rackbus (19" Racksyst cassette)**
  – For use in a control room up to a max. distance of 15 meters.
  – Via the ZA 672 a maximum of 64 adresses can be integrated into this bus.

- **Rackbus RS 485 (panel, field housing)**
  – For use in the field up to a max. distance of 1200 meters.
  – In one non Ex line, a maximum of 25 measuring instruments can be integrated with the Rackbus RS 485 to a FXA 675 (2 channel).

Commubox FXA 192 allows a direct connection to a PC (see Fig. 15).
Up to 25 Promass transmitters can be connected; however, the actual number depends on the network topology and the application conditions.

Caution!

Caution!
Even if only a single instrument (with Rackbus RS 485) has been installed in an hazardous area, not more than ten instruments (with Rackbus RS 485) may be connected to the bus.

Note!

Note!
For the initial installation of a Rackbus network, please refer to the operating instructions of the instruments and software you use, in particular:
- BA 134 F/00/e “Rackbus RS 485 – Topology, Components, Software”
- BA 124 F/00en“Commuwin II operating program”

Gateway connections to PCs or process-control systems

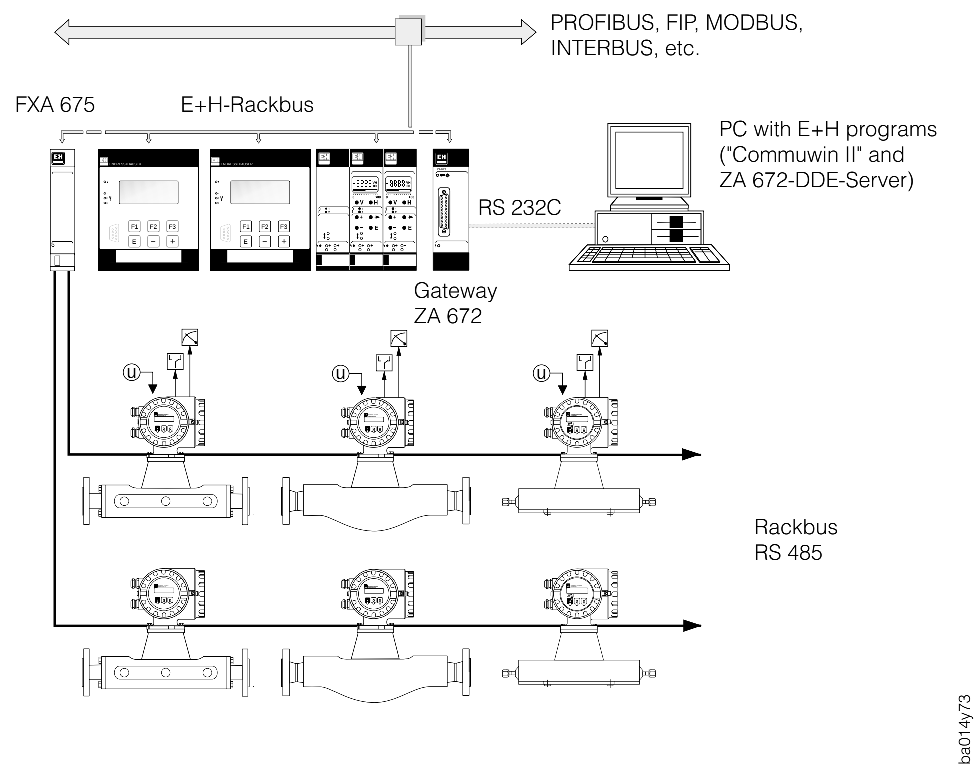


Fig. 14
Connection versions with the E+H-Rackbus / Rackbus RS 485

Direct connection to a PC

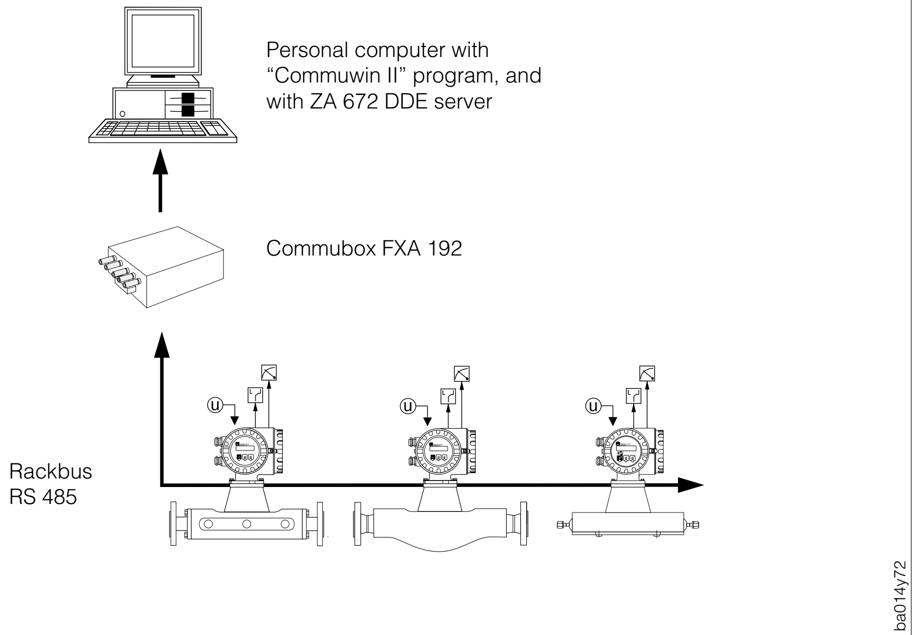


Fig. 15
Direct PC connection to Rackbus RS 485 via Commubox FXA 192

E+H-Rackbus and Rackbus RS 485 wiring

Warning!

Warning!
When connection flowmeters with Ex approval, all appropriate instructions and connections diagramms in the seperate Ex documentation to this Operating Manual must be observed.

1. Wire up according to Figure 16.
   The bus connection is executed by the way of the FXA 675 assembly modul or the Commubox FXA 192 (see Fig. 14, 15), which are galvanically isolated.

   Cable spezifications for Rackbus RS 485:
   - Connection cable: two-core, twisted, screened
   - Conductor cross-section/cable diameter: ≥ 0.20 mm^2 (24 AWG)
     cable length: max. 1200 m (3900 ft)

2. Set terminating resistors if necessary (see Fig. 17)
   Normally, the corresponding selection switches on the CPU board may be left in the factory setting position (all switches = OFF).

3. Subsequent to the bus installation, the following functions of the operating matrix have to be set:

   “PROTOCOL” (see page 93) → Select communication protocol “RACKBUS” (factory setting = OFF)

   “BUS ADDRESS” (see page 93) → Set bus address for the respective transmitter (0...63)

Connecting the Promass 63 to a Rackbus RS 485

Warning!

Warning!
- Danger from electrical shock! Switch off power supply before opening the transmitter housing.
- If instruments with Ex approvals are applied, please observe all instructions and regulations of the Ex supplementary documentation.

1. Loosen the Allen screw of the safety grip (3mm Allen screw).
2. Unscrew the cover of the connection area.
3. Wire up:
   – Terminal 20 → Data A
   – Terminal 21 → Data B
   – Terminal 28 → ground bus screening
4. Screw the cover up tight again on the transmitter housing.
5. Tighten the Allen screw of the safety grip securely.

Note!

Note!
If the bus is grounded at both sides, then potential compensation must also be present!

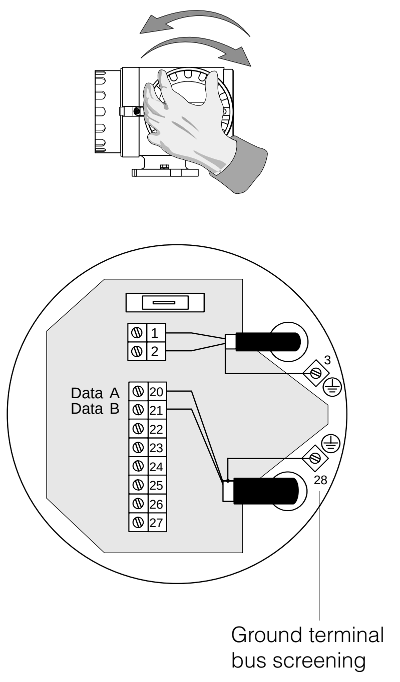


Fig. 16
Electrical connection for the Rackbus RS 485

Each transmitter receives an individual operating bus address. This address is read or changed via the E+H operating matrix (see page 93)

Setting the termination resistors

Warning!

Warning!
Danger from electrical shock! Switch off power supply before opening the cover from the electronics area.

The termination switches are on the RS 485 communication board (see Fig. below).
The termination switches can usually be left at the factory setting (all switches → OFF).

- With the last transmitter on the bus (furthest from the PC), turn on the termination resistor via the selector switches to: OFF – ON – ON – OFF
- If a bus initial voltage is to be provided, then position the selector switches to: ON – ON – ON – ON.

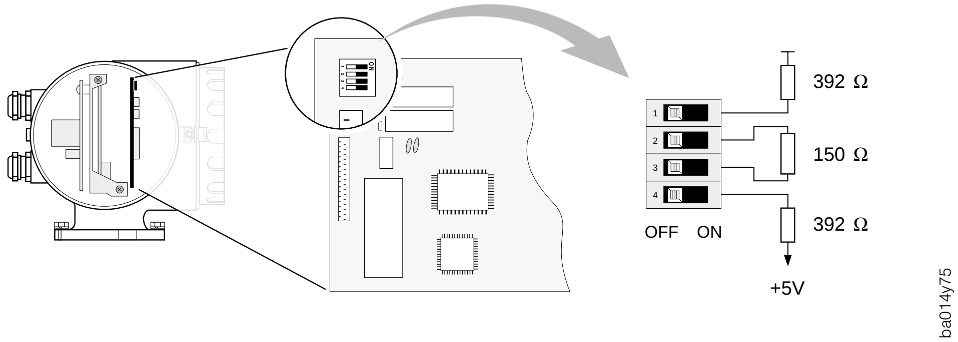


Fig. 17
Setting the termination resistors

4.5 Connecting HART Communicator

The following connection versions are available to the user:
- Direct connection to the Promass transmitter via Terminals 26 / 27
- Connection via the analogue 4...20 mA cable of the current output 1

Note!

Note!
The measuring loop must have a minimum resistance of 250 Ω.

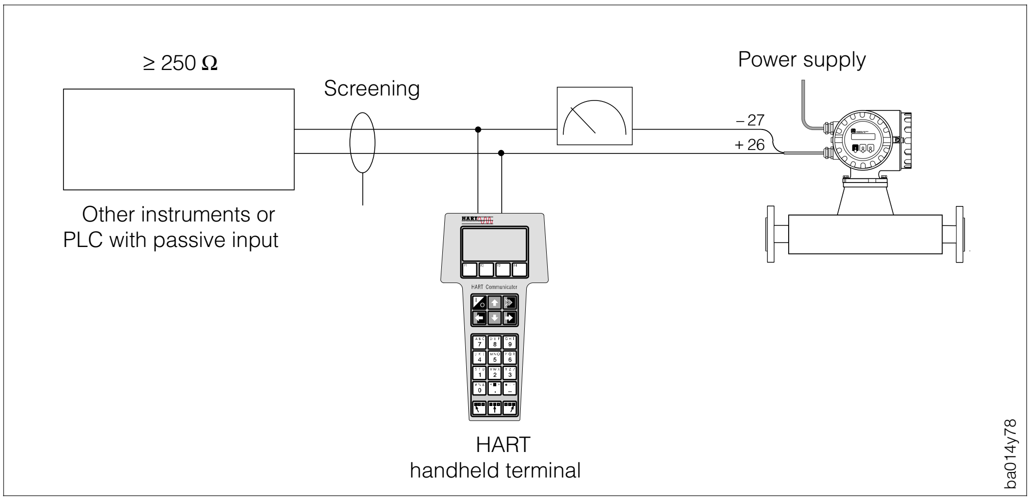


Fig. 18
Electrical connection HART communicator

4.6 Connecting Commubox FXA 191 (Commuwin II Software)

The following connection versions are available to the user:
- Direct connection to the Promass transmitter via Terminals 26 / 27
- Connection via the analogue 4...20 mA cable of the current output 1

Note!

Note!
- The measuring loop must have a minimum resistance of 250 Ω.
- Move the DIP-switch on the Commubox to 'HART'!
- Set the function "CURRENT SPAN" to 4-20 mA (see page 70) and the function "PROTOCOL" to HART (see page 93).
- When connecting up, also take into account the information given in the documentation issued by the HART Communication Foundation.
  This applies especially to HCF LIT 20: "HART, a technical summary".

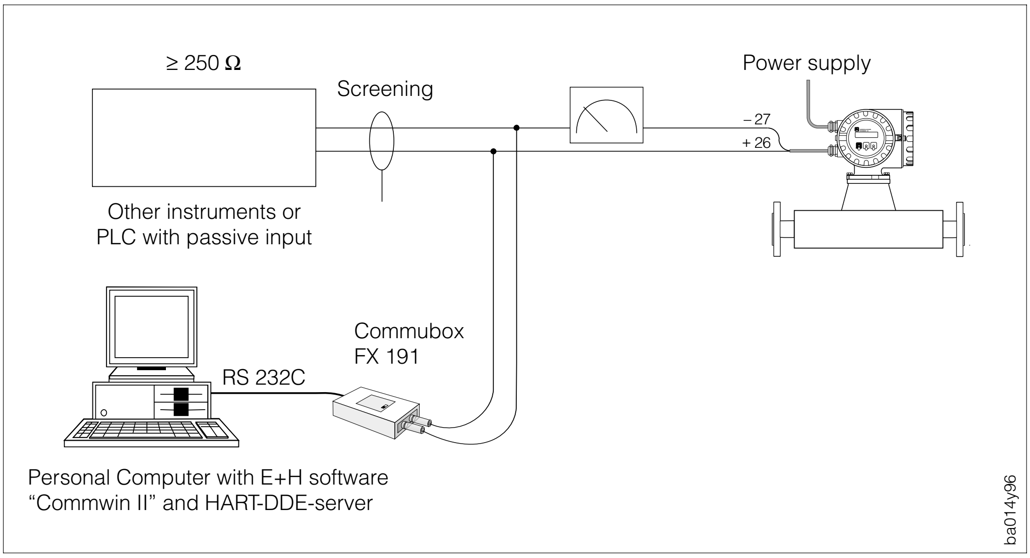


Fig. 19
Electrical connection Commubox FXA 191

4.7 Switching on the instrument

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

- *Installation*
  Does 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 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:

```
PROMASS 63
V3.02.00 HART
V3.02.00 2CUR.
V3.02.00 RS485
V3.02.00 Ex i
V3.02.00 PBUS
```

The communication board software will appear on the display.

Note!
Separate documentation is available for PROFIBUS and Ex versions of the flowmeter.

Note!

```
S:  START-UP
    RUNNING
```

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

```
 59.870 kg/min
   17830.5 kg
```

Example:
Line 1 → Mass flow
Line 2 → Totaliser

Note!

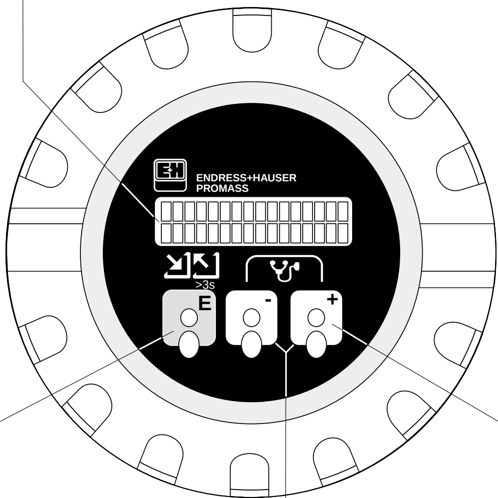
Note!
- If the +/− keys are simultaniously actuated when starting up, then the display messages are shown in English and with maximum contrast.
- If start up is not successful, then an error message is shown indicating the cause.

5 Operation

5.1 Display and operating elements

LC-Display

- Illuminated, double-spaced with 16 characters.
- Displayed are menue textes 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 values and settings

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Fig. 20
Display and operating elements

5.2 E+H operating matrix (select functions)

① Access to the operating matrix

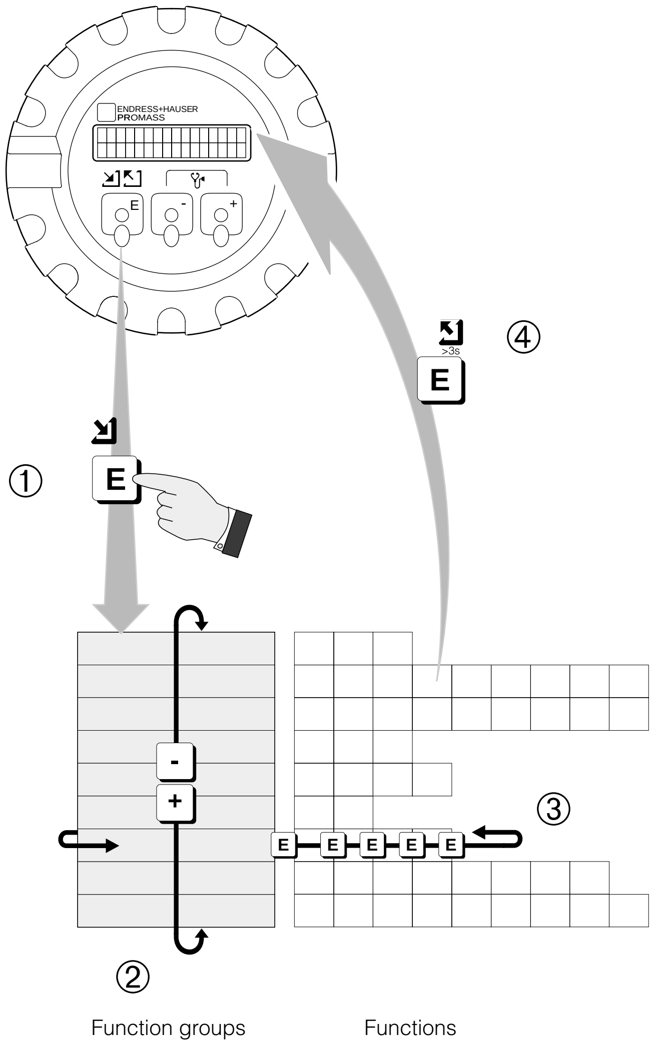
② Select function group (>GROUP SELECT.<)

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 → see page 29
Programming example → see page 31
Function description → see page 59 ff.



Note!

Notes!
- An automatic return to the HOME position will be made if the operating elements are not pressed for 60 seconds (only when the programming is locked).
- If the diagnosis function is activated from the HOME position, then an automatic return to HOME position will be made if the operating elements are not pressed within 60 seconds; whether the programming is enabled or locked.

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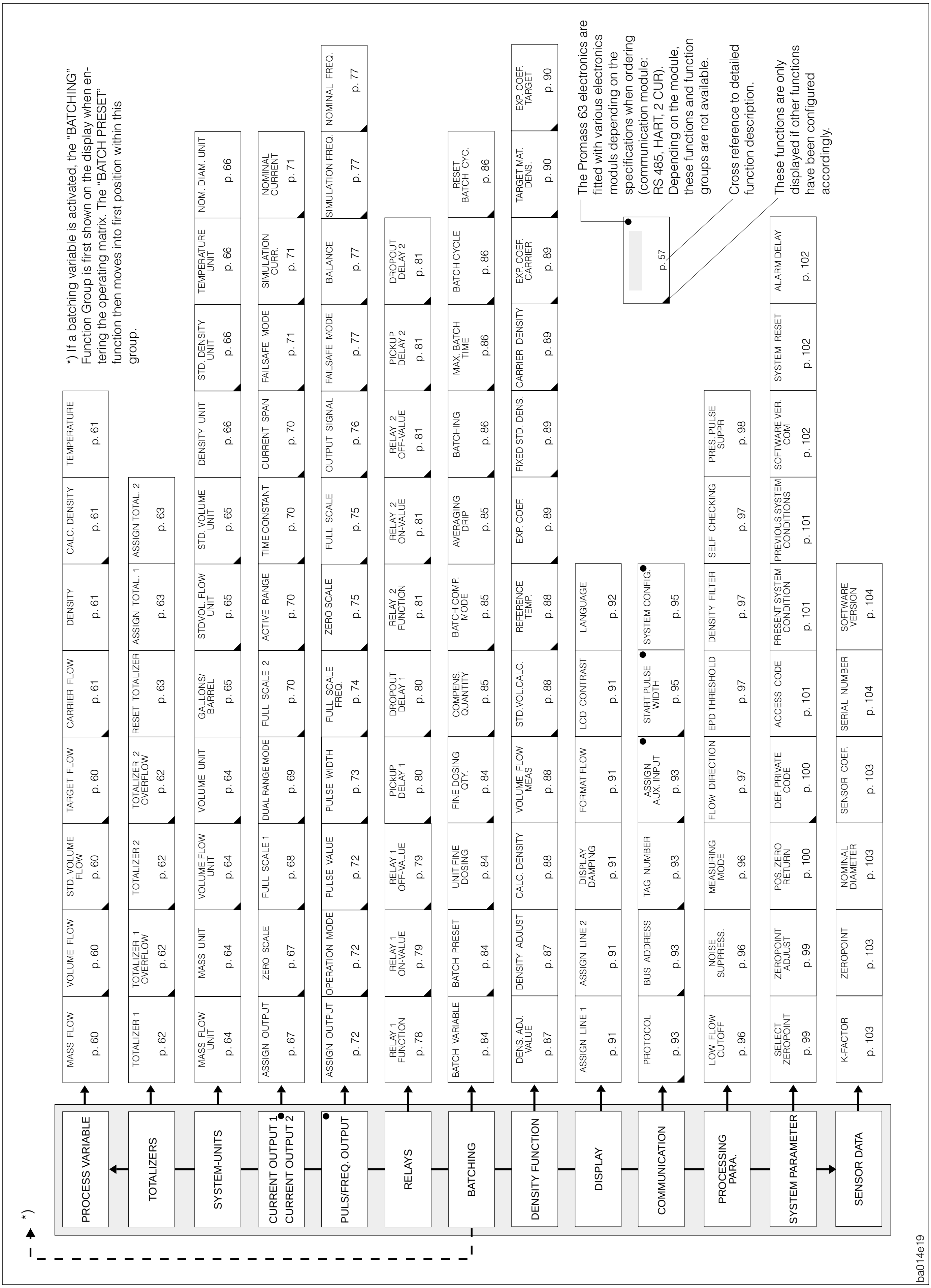
Fig. 21
Selecting functions in the E+H operating matrix


*) If a batching variable is activated, the "BATCHING" Function Group is first shown on the display when entering the operating matrix. The "BATCH PRESET" function then moves into first position within this group.
*)
PROCESS VARIABLE
MASS FLOW p. 60
VOLUME FLOW p. 60
STD. VOLUME FLOW p. 60
TARGET FLOW p. 60
CARRIER FLOW p. 61
DENSITY p. 61
CALC. DENSITY p. 61
TEMPERATURE p. 61
TOTALIZERS
TOTALIZER 1 p. 62
TOTALIZER 1 OVERFLOW p. 62
TOTALIZER 2 p. 62
TOTALIZER 2 OVERFLOW p. 62
RESET TOTALIZER p. 63
ASSIGN TOTAL. 1 p. 63
ASSIGN TOTAL. 2 p. 63
SYSTEM-UNITS
MASS FLOW UNIT p. 64
MASS UNIT p. 64
VOLUME FLOW UNIT p. 64
VOLUME UNIT p. 64
GALLONS/BARREL p. 65
STDVOL. FLOW UNIT p. 65
STD. VOLUME UNIT p. 65
DENSITY UNIT p. 66
STD. DENSITY UNIT p. 66
TEMPERATURE UNIT p. 66
NOM. DIAM. UNIT p. 66
CURRENT OUTPUT 1
CURRENT OUTPUT 2
ASSIGN OUTPUT p. 67
ZERO SCALE p. 67
FULL SCALE 1 p. 68
DUAL RANGE MODE p. 69
FULL SCALE 2 p. 70
ACTIVE RANGE p. 70
TIME CONSTANT p. 70
CURRENT SPAN p. 70
FAILSAFE MODE p. 71
SIMULATION CURR. p. 71
NOMINAL CURRENT p. 71
PULS/FREQ. OUTPUT
ASSIGN OUTPUT p. 72
OPERATION MODE p. 72
PULSE VALUE p. 72
PULSE WIDTH p. 73
FULL SCALE FREQ. p. 74
ZERO SCALE p. 75
FULL SCALE p. 75
OUTPUT SIGNAL p. 76
FAILSAFE MODE p. 77
BALANCE p. 77
SIMULATION FREQ. p. 77
NOMINAL FREQ. p. 77
RELAYS
RELAY 1 FUNCTION p. 78
RELAY 1 ON-VALUE p. 79
RELAY 1 OFF-VALUE p. 79
PICKUP DELAY 1 p. 80
DROPOUT DELAY 1 p. 80
RELAY 2 FUNCTION p. 81
RELAY 2 ON-VALUE p. 81
RELAY 2 OFF-VALUE p. 81
PICKUP DELAY 2 p. 81
DROPOUT DELAY 2 p. 81
BATCHING
BATCH VARIABLE p. 84
BATCH PRESET p. 84
UNIT FINE DOSING p. 84
FINE DOSING QTY. p. 84
COMPENS. QUANTITY p. 85
BATCH COMP. MODE p. 85
AVERAGING DRIP p. 85
BATCHING p. 86
MAX. BATCH TIME p.86
BATCH CYCLE p. 86
RESET BATCH CYC. p. 86
DENSITY FUNCTION
DENS. ADJ. VALUE p. 87
DENSITY ADJUST p. 87
CALC. DENSITY p. 88
VOLUME FLOW MEAS p. 88
STD.VOL.CALC. p. 88
REFERENCE TEMP. p. 88
EXP. COEF. p. 89
FIXED STD. DENS. p. 89
CARRIER DENSITY p. 89
EXP. COEF. CARRIER p. 89
TARGET MAT. DENS. p. 90
EXP. COEF. TARGET p. 90
DISPLAY
ASSIGN LINE 1 p. 91
ASSIGN LINE 2 p. 91
DISPLAY DAMPING p. 91
FORMAT FLOW p. 91
LCD CONTRAST p. 91
LANGUAGE p. 92
COMMUNICATION
PROTOCOL p. 93
BUS ADDRESS p. 93
TAG NUMBER p. 93
ASSIGN AUX. INPUT p. 93
START PULSE WIDTH p. 95
SYSTEM CONFIG. p. 95
PROCESSING PARA.
LOW FLOW CUTOFF p. 96
NOISE SUPPRESS. p. 96
MEASURING MODE p. 96
FLOW DIRECTION p. 97
EPD THRESHOLD p. 97
DENSITY FILTER p. 97
SELF CHECKING p. 97
PRES. PULSE SUPPR p. 98
SYSTEM PARAMETER
SELECT ZEROPOINT p. 99
ZEROPOINT ADJUST p. 99
POS. ZERO RETURN p. 100
DEF. PRIVATE CODE p. 100
ACCESS CODE p. 101
PRESENT SYSTEM CONDITION p. 101
PREVIOUS SYSTEM CONDITIONS p. 101
SOFTWARE VER. COM p. 102
SYSTEM RESET p. 102
ALARM DELAY p. 102
SENSOR DATA
K-FACTOR p. 103
ZEROPOINT p. 103
NOMINAL DIAMETER p. 103
SENSOR COEF. p. 103
SERIAL NUMBER p. 104
SOFTWARE VERSION p. 104
The Promass 63 electronics are fitted with various electronics moduls depending on the specifications when ordering (communication module: RS 485, HART, 2 CUR). Depending on the module, these functions and function groups are not available.
p. 57
Cross reference to detailed function description.
These functions are only displayed if other functions have been configured accordingly.
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Further information to programming
For the Promass 63 measuring system there is a wide choise of functions available which the user can set individually and adapt to the conditions of the process.

Please remark the following important programming notes:
- If the power supply cuts out, then all calibrated and set values are safely stored in the EEPROM (without requiring batteries).
- Functions which are not required, e.g. current or pulse/frequency output, can be set to “OFF”. The appropriate functions in other function groups then no longer appear on the display.
- If, when programming, you wish to undo a setting carried out with +/− then select “CANCEL”. This is only possible for settings which have not yet been stored 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 stored 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 91). An arrow is therefore shown between the measured value and engineering unit (e.g. 1.2 → kg/h).

Enable programming (entering the code number)
Normally programming is locked. Any unauthorised changes to the instrument functions, values or factory settings are therefore not possible. Only when 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 unauthorised personnel from gaining access to data (see page 100). An exception to this is the function group “BATCHING”. In this group only the function “BATCH VARIABLE” is protected by the code number. All other functions in this group can be changed without the code number.

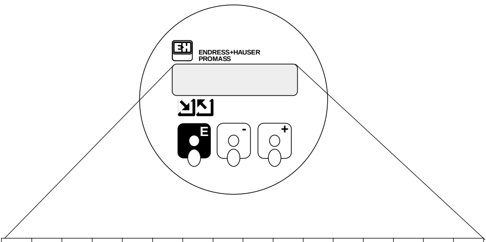
Caution!

Caution!
- If programming is locked and the +/− keys are pressed in a given function, then a prompt to enter the code automatically appears on the display.
- With code “0” (zero) the programming is **always** enabled!
- If the personal code number is no longer available, then please contact the Endress+Hauser service organisation which will pleased to help you.

Locking programming
- 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 (not the customer code number) in the function “ACCESS CODE”.

5.3 Example of programming

If you want to change the current range set in the factory at 4–20 mA to 0–20 mA then proceed as follows:



E	Entering the E+H operating matrix.	PROCESS VARIABLE > GROUP SELECT.<
+ / -	Selecting the desired function group "CURRENT OUTPUT"	CURRENT OUTPUT > GROUP SELECT.<
E	Select function "CURRENT SPAN"	4–20 mA CURRENT SPAN
+ / -	On pressing + or - the entry of the code is automatically prompt.	0 ACCESS CODE
+ / -	Enter the code number Factory setting = 63	63 ACCESS CODE
E	Programming is now enabled.	 EDITING ENABLED
	The programmable value flashes.	4–20 mA CURRENT SPAN
+ / -	Select the desired current span. The display stops flashing.	0–20 mA CURRENT SPAN
E	Save the input.	 INPUT STORED
	The display flashes and the value can be changed once again.	0–20 mA CURRENT SPAN

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 is pressed.

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

5.4 Operation with the HART protocol

Besides local operation, the Promass 63 mass flowmeter can also be calibrated and measured values called up using the HART protocol. Two procedures can be used:

- Operation using the “HART Communicator DXR 275” universal handheld terminal.
- Operation using a personal computer with specific software, e.g. “Commuwin II”, and the “Commubox FXA 191” HART modem.

Operating using the “HART Communicator DXR 275”
Promass 63 functions are selected with the HART communicator over a number of menu levels as well as with the aid of a special E+H programming menu (see Fig. 23).

Note!

Notes!

- The HART protocol requires a 4...20 mA setting on the current output (see page 70). The 4...20 mA setting is only selectable if the setting “HART” is switched off in the function “PROTOCOL” (see page 93).
- All functions are accessible at all times with the HART handheld terminal i.e. programming is not locked.
  The HART operating matrix can, however, be locked by entering the value “–1” in the function “ACCESS CODE”. Data can then no longer be changed. This status remains even after a power failure. The operating matrix can again be enabled by entering the personal code number.
- Further information on the HART Communicator is given in the appropriate operating manual in the carrying case.

Procedure

1. Switch on handheld terminal:
   a. The transmitter is not yet connected → The HART main menu is displayed → Continue with “Online”
   b. The transmitter is already connected → The menue level “Online” is immediately shown.

2. “Online” menu level:
   → Actual measurement data including flow, totaliser sum, etc. are continually shown
   → Via “Matrix group sel.” you have access to the HART operating matrix (see page 33), then to the function group (e.g. current output) and finally to the desired function, e.g. “Full scale 1”.
3. Enter values or change the setting.
4. The field “SEND” is shown by pressing the “F2” function key. By pressing the “F2” key, all values and settings entered with the handheld terminal are registered by the Promass measuring system. Confirm with the “F4” key.
5. Press “F3” HOME function key to return to the “Online” menu level. The actual values measured by the Promass flowmeter with the new settings can now be read off.

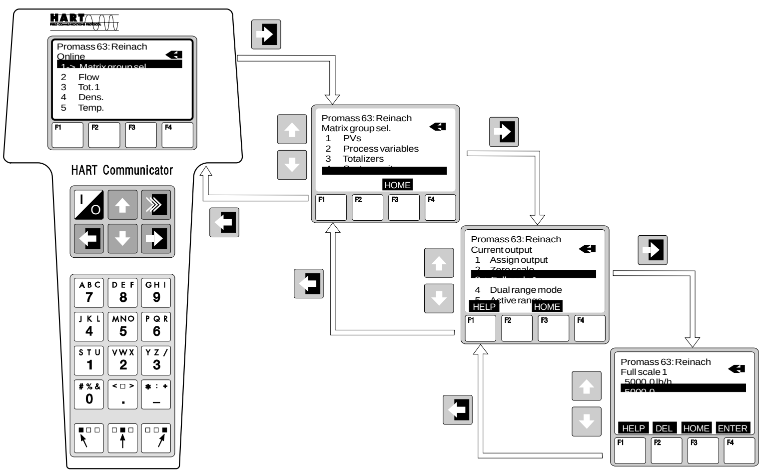


Fig. 22
Operating the HART handheld terminal

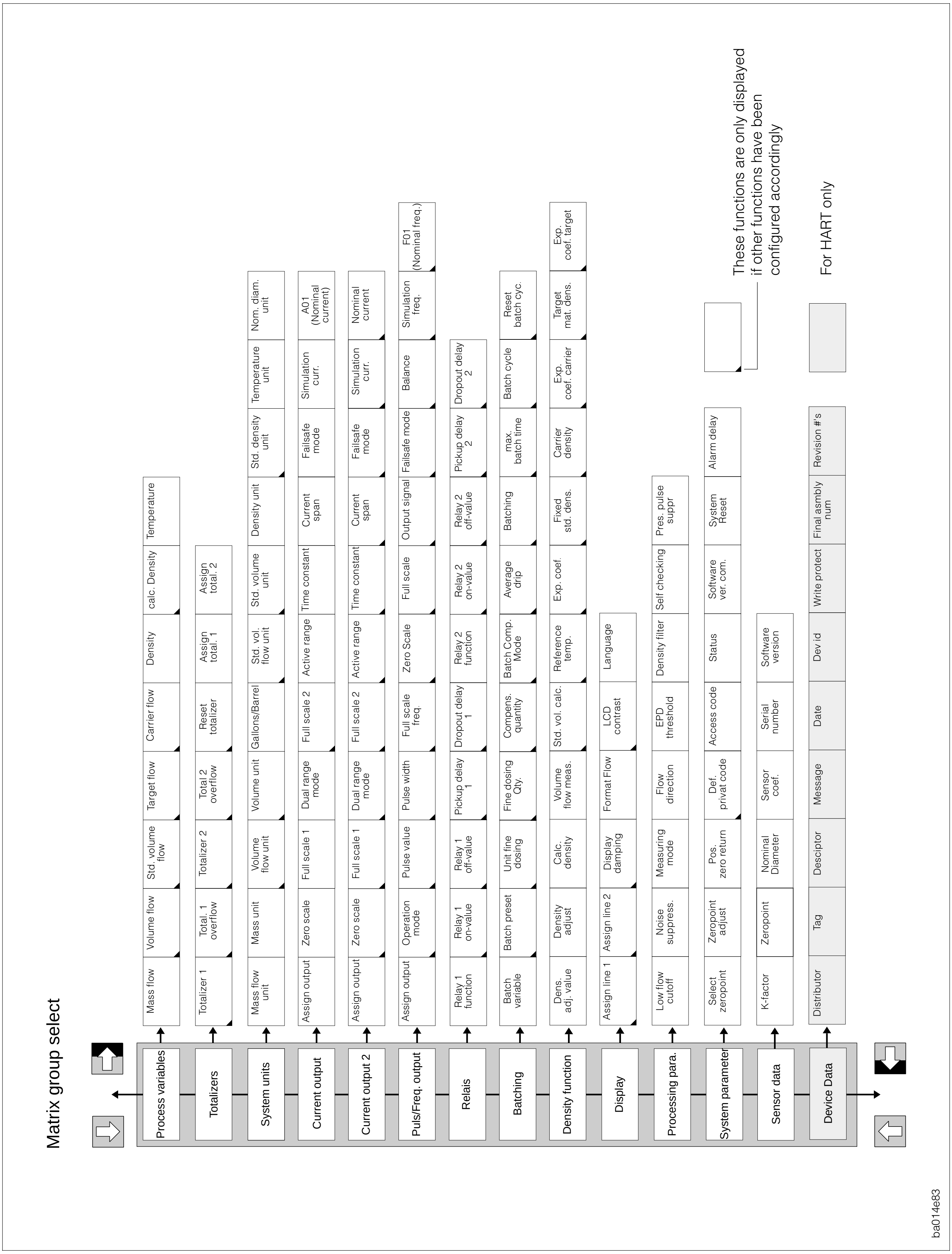


Fig. 23
HART operating matrix Promass 63

Operating using “Commuwin II” software

Commuwin II is a universal program for remote operation of field and control-room devices. Use of Commuwin II operating program is possible independent of the type of instrument or communication (HART, PROFIBUS, Rackbus RS 485, etc.) chosen.
The Promass 63 transmitter can be connected to the RS 232 C serial interface of a personal computer via the Commubox FXA 191.

Commuwin II offers following functions:
- parameterization of functions
- visualization of measuring values
- saving of instrument parameters
- device diagnostics
- measuring-point documentation

Commuwin II may also be combined with other software packages to visualize processes.

Note!
For additional information on Commuwin II, see the following E+H documentation:
- System Information: SI018F/00/en “Commuwin II”
- Operating Manual: BA124F/00/en “Commuwin II Operating Program”

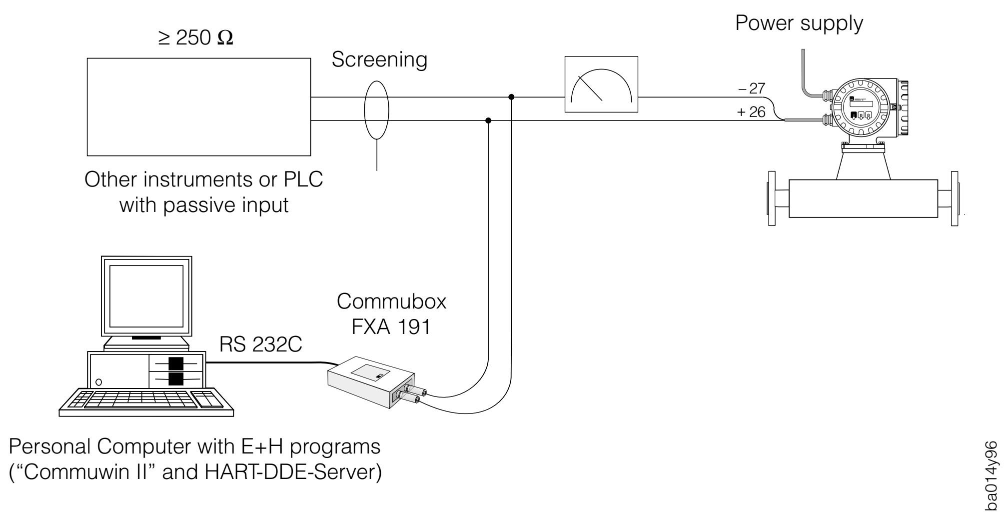


Fig. 24
Operating with “Commuwin II”

5.5 Operating Rackbus RS 485

When programming via a Rackbus interface, all Promass instrument functions are arranged and displayed in an E+H operating matrix (see page 36 ff).

Using the function “EVALUATION MODE” (V2H0), *two different parts* of the complete matrix can be called up as required showing the various function groups and functions.

Note!
Transmitters can be configured and operated and their measured values shown on a PC using the E+H programs “Commuwin II” and ZA 672-DDE-Server (therefore see page 22).

Operating matrix for Rackbus RS 485 – Evaluation mode 1 (V2H0 → Setting "0")

		H0	H1	H2
V0	MEASURED VALUE	MASS FLOW	TOTALIZER 1	TOTAL. 1 OVERFLOW
V1	MEASURED VALUE	DENSITY	TEMPERATURE	CALC. DENSITY
V2	COMMUNICATION	EVALUATION MODE 0: 1 1: 2 2: CANCEL	ACCESS CODE	DIAGNOSTIC CODE
V3	SYSTEM-UNITS	MASS FLOW UNIT 0: not used 1: g/min 2: g/h 3: kg/s 4: kg/min 5: kg/h 6: t/min 7: t/h 8: t/d 9: lb/s 10: lb/min 11: lb/h 12: ton/min 13: ton/h 14: ton/day 15: CANCEL	MASS UNIT 0: g 1: kg 2: t 3: lb. 4: ton 5: CANCEL	FLOWRATE UNITS 0: cm3/min 1: cm3/h 2: dm3/s 3: dm3/min 4: dm3/h 5: l/s 6: l/min 7: l/h 8: hl/min 9: hl/h 10: NOT USED 11: m3/min 12: m3/h 13: cc/min 14: cc/h 15: gal/min 16: gal/h 17: gal/day 18: gpm 19: gph 20: gpd 21: mgd 22: bbl/min 23: bbl/h 24: bbl/d 25: CANCEL
V4	DISPLAY	RESET TOTALIZER 0: CANCEL 1: RESET TOTAL 1 2: RESET TOTAL 2 3: RES. TOTAL 1&2	ASSIGN TOTAL 1 0: OFF 1: MASS 2: MASS (+) 3: NOT USED 4: VOLUME 5: STD. VOLUME 6: VOLUME (+) 7: NOT USED 8: STD. VOL. (+) 9: NOT USED 10: TARGET MAT. 11: TARGET M. (+) 12: NOT USED 13: CARRIER MAT. 14: CARRIER M. (+) 15: NOT USED 16: NOT USED 17: CANCEL	ASSIGN TOTAL 2 0: OFF 1: MASS 2: NOT USED 3: MASS (–) 4: VOLUME 5: STD. VOLUME 6: NOT USED 7: VOLUME (–) 8: NOT USED 9: STD. VOL. (–) 10: TARGET MAT. 11: NOT USED 12: TARGET M. (–) 13: CARRIER MAT. 14: NOT USED 15: CARRIER M. (–) 16: NOT USED 17: CANCEL
V5	CURRENT OUTPUT	ASSIGN OUTPUT 0: OFF 1: MASS 2: FLOWRATE 3: STD. VOL. FLOW 4: TARGET FLOW 5: CARRIER FLOW 6: DENSITY 7: CALC. DENSITY 8: TEMPERATURE 9: NOT USED 10: NOT USED 11: NOT USED 12: CANCEL	VALUE FOR 0/4 mA	FULL SCALE 1
V6	PULS/FREQ. OUTPUT	ASSIGN PULS/FREQ 0: OFF 1: MASS 2: VOLUME 3: STD. VOLUME 4: TARGET FLOW 5: CARRIER FLOW 6: DENSITY 7: CALC. DENSITY 8: TEMPERATURE 9–13: NOT USED 14: CANCEL	OPERATION MODE 0: PULSE 1: FREQUENCY 2: CANCEL	PULSE VALUE
V7	PROZESSING PARA.	LOW FLOW CUTOFF	NOISE SUPPRESSION	DEVICE MODE 0: UNIDIRECTIONAL 1: BIDIRECTIONAL 2: CANCEL
V8	SYSTEM PARAMETER	SELECT ZEROPOINT 0: ZEROPOINT 1 1: ZEROPOINT 2 2: CANCEL	ZERO ADUST 0: CANCEL 1: EXECUTE	
V9	SENSOR DATA	CALIBR. FACTOR	ZERO POINT	NOMINAL SIZE

H3	H4	H5	H6	H7	H8	H9
TOTALIZER 2	**TOTAL. 2 OVERFLOW**	**VOLUME FLOW**	**STD. VOLUME FLOW**			
TARGET FLOW	**CARRIER FLOW**	**ACTUAL CURRENT**	**ACTUAL FREQUENCY**	**BATCH CYCLE**	**ACT. BATCH VALUE**	
INTERFACE RS 485	**RACKBUS ADRESS**	SYSTEM CONFIG. 0: RS485/4–20 mA 1: RS485/FREQ.	**SW-VERSION COM**			
VOLUME UNITS 0: cm3 1: dm3 2: l (Liter) 3: hl 4: m3 5: cc 6: gal 7: bbl 8: CANCEL	**GALLON/BARREL** 0: 31 gal 1: 31.5 gal 2: 42 gal 3: 55 gal 4: 36 ImpGal 5: 42 ImpGal 6: CANCEL	**STD. FLOW UNIT** 0: Nl/s 1: Nl/min 2: Nl/h 3: Nl/d 4: Nm3/s 5: Nm3/min 6: Nm3/h 7: Nm3/d 8: scm/s 9: scm/min 10: scm/h 11: scm/day 12: scf/s 13: scf/min 14: scf/h 15: scf/day 16: CANCEL	**STD. VOLUME UNIT** 0: Nm3 1: Nl 2: scm 3: scf 4: CANCEL	**PIPE SIZE UNIT** 0: mm 1: inch 2: CANCEL		
LCD CONTRAST	**LANGUAGE** 0: ENGLISH 1: DEUTSCH 2: FRANCAIS 3: ESPANOL 4: ITALIANO 5: NEDERLANDS 6: DANSK 7: NORSK 8: SVENSK 9: SUOMI 10: BAHASA 11: JAPANESE 12: CANCEL	**DISPLAY DAMPING**	**DISPLAY LINE 1** 0: NOT USED 1: MASS FLOW 2: FLOW RATE 3: STD. VOL. FLOW 4: TARGET FLOW 5: CARRIER FLOW 6: DENSITY 7: CALC. DENSITY 8: TEMPERATURE 9: NOT USED 10: NOT USED 11: NOT USED 12: TOTALIZER 1 13: TOTAL.1 OVERFLOW 14: TOTALIZER 2 15: TOTAL. 2 OVERFLOW 16: BATCH QUANTITY 17: BATCH UPWARDS 18: BATCH DOWNWARDS 19: BATCH COUNTER 20: CANCEL	**DISPLAY LINE 2** 0: OFF 1: MASS FLOW 2: FLOW RATE 3: STD. VOL. FLOW 4: TARGET FLOW 5: CARRIER FLOW 6: DENSITY 7: CALC. DENSITY 8: TEMPERATURE 9: NOT USED 10: NOT USED 11: NOT USED 12: TOTALIZER 1 13: TOTAL.1 OVERFLOW 14: TOTALIZER 2 15: TOTAL. 2 OVERFLOW 16: BATCH QUANTITY 17: BATCH UPWARDS 18: BATCH DOWNWARDS 19: BATCH COUNTER 20: CANCEL	**FORMAT FLOW** 0: xxxxx. 1: xxxx.x 2: xxx.xx 3: xx.xxx 4: x.xxxx 5: CANCEL	
DUAL RANGE MODE 0: RANGE 1 1: RANGE 2 2: AUTOMATIC 3: NOT USED 4: CANCEL	**FULL SCALE 2**	**ACTIVE RANGE** 0: RANGE 1 1: RANGE 2	**TIME CONSTANT**	**CURRENT RANGE** 0: 0...20 mA 1: 4...20 mA 2: 0...20 mA NAMUR 3: 4...20 mA NAMUR 4: CANCEL	**FAILSAFE MODE** 0: MINIMUM 1: MAXIMUM 2: HOLD 3: GO 4: CANCEL	**SIMULATION CURR.** 0: OFF 1: 0 mA 2: 2 mA 3: 4 mA 4: 10 mA 5: 12 mA 6: 20 mA 7: 22 mA 8: 25 mA 9: CANCEL
PULSE WIDTH	**FULL SCALE FREQ.**	**FULL SCALE FLOW**	**OUTPUT SIGNAL** 0: PASSIVE POS. 1: PASSIVE NEG. 2: ACTIVE POS. 3: ACTIVE NEG. 4: CANCEL	**FAILSAFE MODE** 0: LOGIC VALUE 0 1: HOLD 2: GO 3: CANCEL	**BALANCE** 0: OFF 1: NOT USED 2: ON 3: CANCEL	**ZERO SCALE**
FLOW DIRECTION 0: FORWARD 1: REVERSE 2: CANCEL	**EPD THRESHOLD**	**DENSITY FILTER** 0: OFF 1: MODERATE 2: MEDIUM 3: HIGH 4: CANCEL	**SELF CHECKING** 0: NOT USED 1: CYCLIC 2: SMART 3: CANCEL	**PRESS. PULSE SUPPR**	**SIMULATION FREQ.** 0: OFF 1: 0 Hz 2: 2 Hz 3: 10 Hz 4: 1 kHz 5: 10 kHz 6: CANCEL	
	POS. ZERO RETURN 0: OFF 1: ON 2: NOT USED	**SOFTWARE VER COM**		**ALARM DELAY**		
SENSOR DATA 0: CANCEL 1: DENS. COEF. C0 2: DENS. COEF. C1 3: DENS. COEF. C2 4: DENS. COEF. C3 5: DENS. COEF. C4 6: DENS. COEF. C5 7: TEMP. COEF. KM 8: TEMP. COEF. KT 9: CAL. COEF. KD1 10: CAL. COEF. KD2 11: MIN. TEMPERAT. 12: MAX. TEMP.	**SENSOR DATA VALUE**	**SERIAL NUMBER**	**SOFTWARE VERSION**			

Operating matrix for Rackbus RS 485 – Evaluation mode 2 (V2H0 → Setting "1")				
		H0	**H1**	**H2**
V0	**MEASURED VALUE**	**MASS FLOW**	**TOTALIZER 1**	**TOTAL. 1 OVERFLOW**
V1	**MEASURED VALUE**	**DENSITY**	**TEMPERATURE**	**CALC. DENSITY**
V2	**COMMUNICATION**	**EVALUATION MODE** **0: 1** **1: 2** **2: CANCEL**	**ACCESS CODE**	**DIAGNOSTIC CODE**
V3	**SYSTEM-UNITS**	**DENSITY UNIT** 0: g/cm3 1: kg/dm3 2: kg/l 3: kg/m3 4: SD_4C 5: SD_15C 6: SD_20C 7: g/cc 8: lb/cf 9: lb/gal 10: lb/bbl 11: SG_59F 12: SG_60F 13: SG_68F 14: SG_4C 15: SG_15C 16: SG_20C 17: lb/USgal 18: CANCEL	**STD. DENSITY UNIT** 0: kg/Nm3 1: kg/Nl 2: g/scc 3: kg/scm 4: lb/scf 5: CANCEL	**TEMPERATURE UNIT** 0: C 1: K 2: F 3: R 4: CANCEL
V4	**RELAYS**	**RELAY 1 FUNCTION** 0: ERROR 1: EPD 2: ERROR+EPD 3: DUAL RANGE 4: NOT USED 5: NOT USED 6: BATCH PREWARN 7: FLOW DIRECT. 8: MASS FLOW 9: FLOWRATE 10: STD. VOL. FLOW 11: TARGET FLOW 12: CARRIER FLOW 13: DENSITY 14: CALC. DENSITY 15: TEMPERATURE 16: NOT USED 17: NOT USED 18: CANCEL	**SWITCH-ON** **PT. RE1**	**SWITCH-OFF** **PT. RE1**
V5	**BATCHING**	**BATCH MODUS** 0: OFF 1: MASS 2: VOLUME 3: STD. VOLUME 4: TARGET MATERIAL 5: CARRIER FLUID 6: CANCEL	**BATCH PRESET**	**FINE DOSING QTY.**
V6	**DENSITY FUNCTION**	**DENSITY OPTION** 0: OFF 1: %-MASS 2: %-VOLUME 3: STD. DENSITY 4: BRIX 5: BAUME (>1 kg/dm3) 6: BAUME (<1 kg/dm3) 7: API 8: %-BLACK LIQUOR 9: %-ALCOHOL 10: PLATO 11: BALLING 12: CANCEL	**VOLUME FLOW MEAS.** 0: OFF 1: FLOWRATE 2: STD. VOLUME FL. 3: VOLUME & STD.VOL. 4: CANCEL	**STD. VOL. CALC.** 0: CALC. STD. DENS 1: FIXED STD. DENS 2: CANCEL
V7	**DENSITY FUNCTION**	**DENS. ADJ. VALUE**	**CALIBR. MODE** 0: LIQUID 1 1: LIQUID 2 2: DENSITY ADJUST 3: CANCEL	
V8	**BATCHING**	**UNIT FINE DOSING** 0: % 1: ABSOLUT 2: CANCEL	**AVERAGING DRIP**	
V9				
V10	**SETUP**	**TAG NUMBER**		

H3	H4	H5	H6	H7	H8	H9
TOTALIZER 2	**TOTAL. 2 OVERFLOW**	**VOLUME FLOW**	**STD. VOLUME FLOW**			
TARGET FLOW	**CARRIER FLOW**	**ACTUAL CURRENT**	**ACTUAL FREQUENCY**	**BATCH CYCLE**	**ACT. BATCH VALUE**	
INTERFACE RS 485	**RACKBUS ADDRESS**	**SYSTEM CONFIG.** 0: RS485/4–20 mA 1: RS485/FREQ.	**SW-VERSION COM**			
PICKUP DELAY 1	DROPOUT DELAY 1	**RELAY 2 FUNCTION** 0: NOT USED 1: EPD 2: NOT USED 3: DUAL RANGE 4: NOT USED 5: BATCHING 6: NOT USED 7: FLOW DIRECT. 8: MASS FLOW 9: FLOWRATE 10: STD. VOL. FLOW 11: TARGETFLOW 12: CARRIER FLOW 13: DENSITY 14: CALC. DENSITY 15: TEMPERATURE 16: NOT USED 17: NOT USED 18: CANCEL	**SWITCH-ON PT. RE2**	SWITCH-OFF PT. RE2	**PICKUP DELAY 2**	**DROPOUT DELAY 2**
COMPENS. QUANTITY	**BATCHING** 0: CANCEL 1: START 2: STOP	**MAX. BATCH TIME**	**RESET BAT. CYCLES** 0: CANCEL 1: YES	**DISPLAY BATCH** 0: BATCH UPWARDS 1: BATCH DOWNWARDS 2: CANCEL	**BATCH COMP. MODE** 0: OFF 1: MODE 1 2: MODE 2 3: CANCEL	**RESET TOTALIZER** 0: CANCEL 1: RESET TOTAL.1 2: RESET TOTAL.2 3: RES. TOTAL.1&2
STD. TEMPERATURE	**STD. EXPANSION**	**FIXED STD. DENS.**	**DENSITY PHASE 1**	**EXPANS. PHASE 1**	**DENSITY PHASE 2**	**EXPANS. PHASE 2**

6 Commissioning

This section gives detailed descriptions and specifications on the commissioning procedure of the individual Promass 63 functions:

Caution!

Caution!

Important when programming

- The Promass 63 electronics are fitted with various electronic modules depending on the specifications when ordering (communications module "RS 485", "HART", "2 CUR."). Certain functions and function groups are **not** available depending on the module used.

- Many functions and options are shown on the display only when other functions have been configured adequately.

- Functions not required, e.g. current or pulse/frquency output, can be switched "OFF". Corresponding functions in other function groups will then not appear on the display. Functions can only be switched off if the appropriate settings in other functions have been **previously** reconfigured.

  Example:
  If the function "BATCHING → BATCH COMP. MODE" is set to "OFF", the function "BATCHING → AVERAGING DRIP" do not appear on the display.

- If, when programming, you wish to undo a setting carried out with +/- then select "CANCEL". This is only possible for settings which have not yet been stored 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 stored 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. An arrow is therefore shown between the measured value and engineering unit (e.g. 1.2 → kg/h).

6.1 Applications with pulsating flow

Introductory remarks

When using pumps for moving liquids in pulsating flow such as piston, hose or eccentric pumps, etc., there is a very strong variation in flow (see Fig. 25 *a-d*). These pumps can also have a negative flow component due to the closing or leakage of valves and fluid movement.

Using specific settings of the various functions in the Promass 63 operating matrix (see Fig. 26 resp. 27), such variations can be compensated for over the entire flow range and pulsating flows can be correctly determined

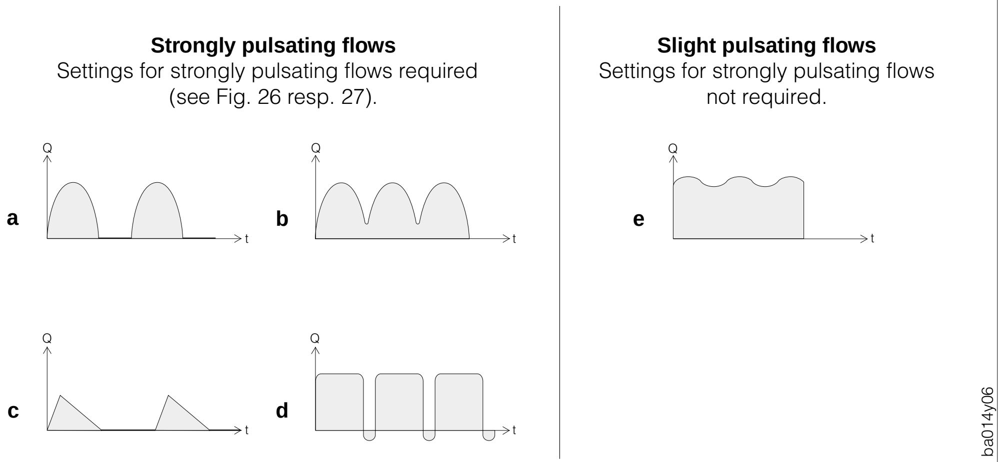


Fig. 25
Flow characteristic of various types of pump

a *1-cylinder eccentric pump*
b *2-cylinder eccentric pump*
c *magnetic pump*
d *peristaltic pump*

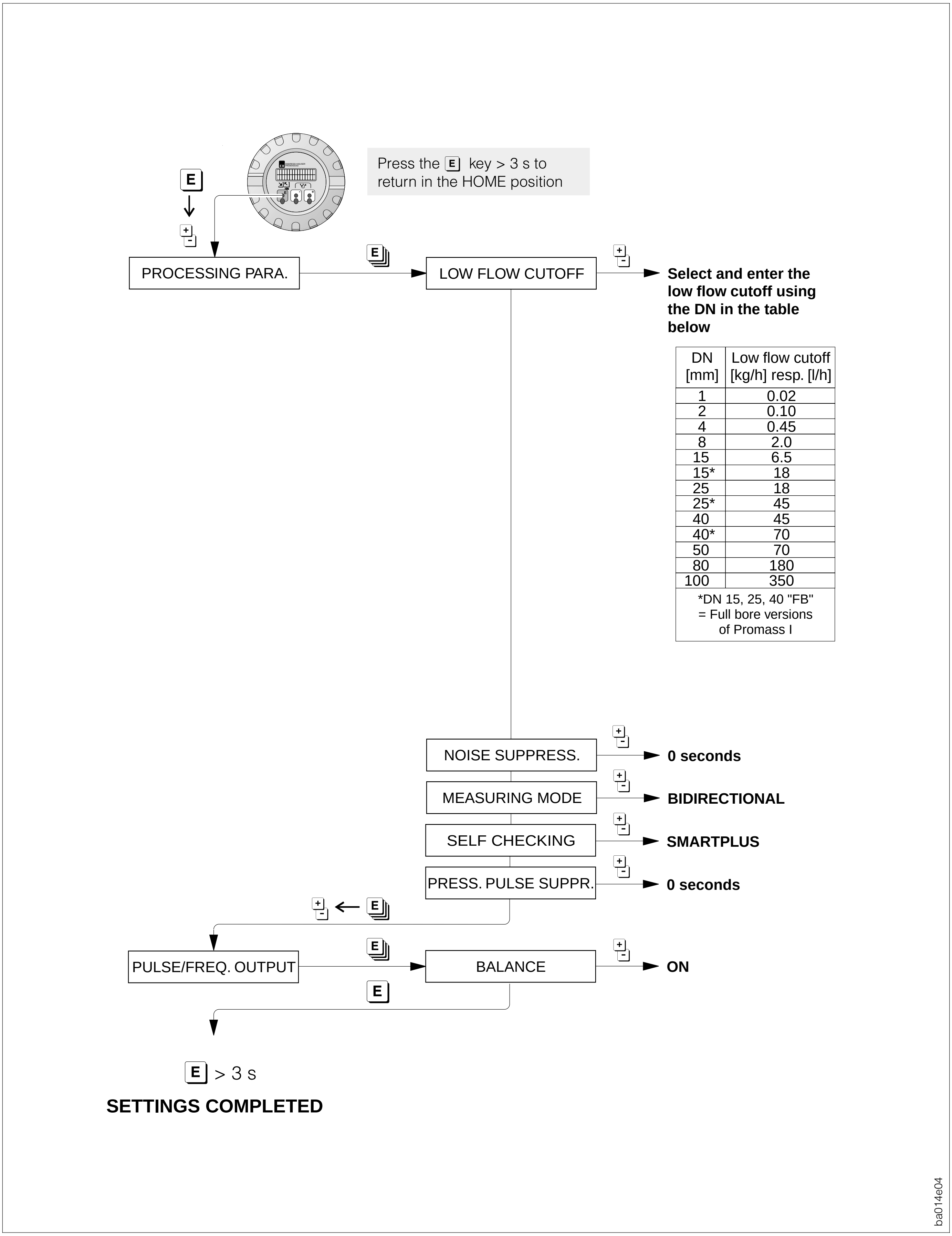
e *multi-cylinder piston pump*

Note!

Note!
- If there are only slight variations in the flowrate (see Fig. 25 e) when using gear wheel, three or multi-cylinder piston pumps, then settings for strongly pulsating flows are not required.
- If in doubt about the exact flow characteristics, then these settings (see below) are to be recommended in every case.

Setting functions with strongly pulsating flow

Two different procedures can be carried out for setting functions:
- Process cannot be interrupted during the setting procedure → see Fig. 26, page 43.
- Process can be interrupted during the setting procedure → see Fig. 27, page 44.



DN [mm]	Low flow cutoff [kg/h] resp. [l/h]
1	0.02
2	0.10
4	0.45
8	2.0
15	6.5
15*	18
25	18
25*	45
40	45
40*	70
50	70
80	180
100	350

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

Fig. 26
Setting functions with strongly pulsating flows when the process cannot be interrupted during the procedure.

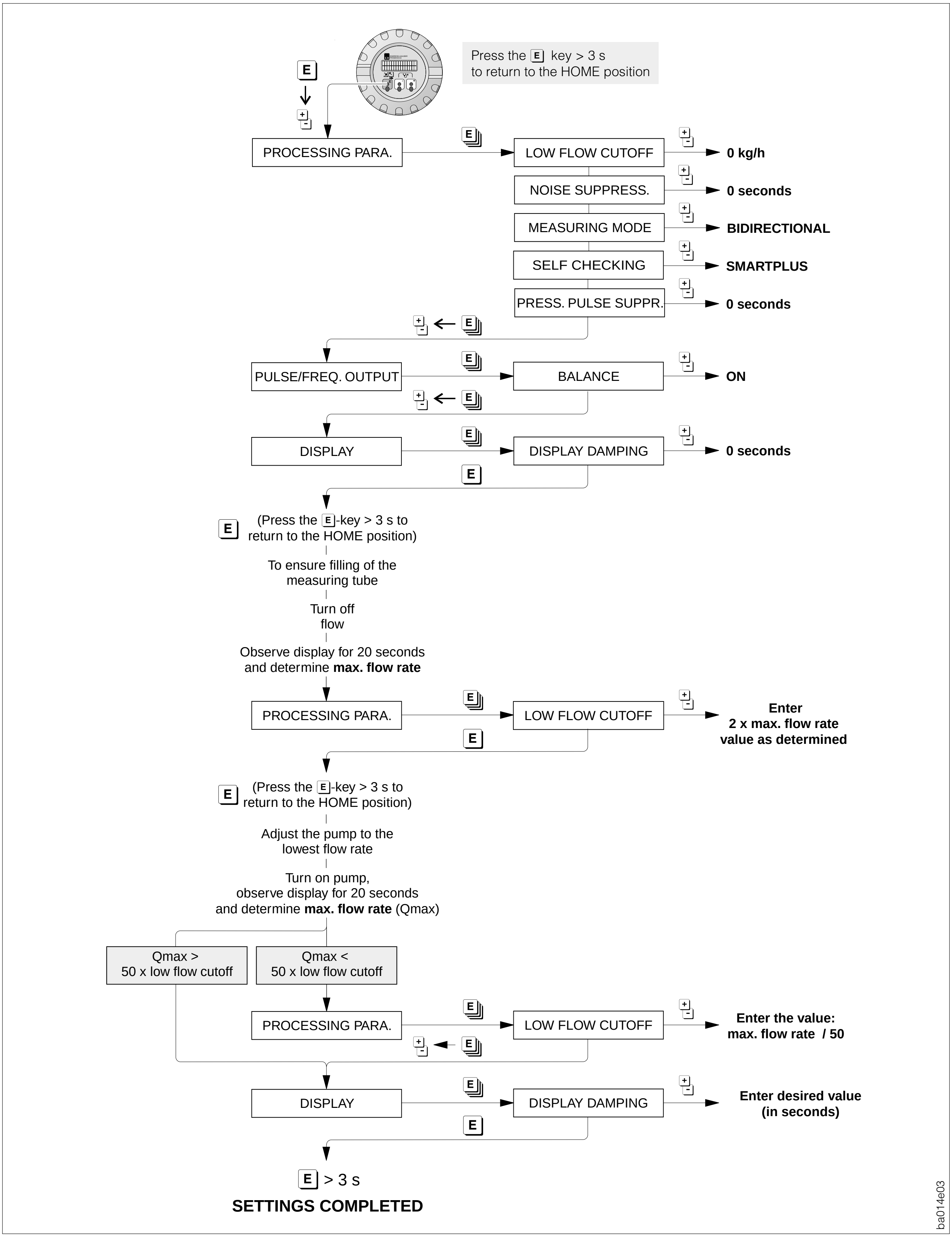


Fig. 27
Setting functions with strongly pulsating flows when the process can be interrupted during the procedure.

Description and information continued

Following there are effects on the various outputs of the PROMASS 63 described
when setting the functions for strongly pulsating flow and other possible settings:

- **Totalizer:** Freely selectable
  With the following setting,all mass flow can be monitored with *MASS*, and the returning mass flow can be monitored with *MASS (-)*.

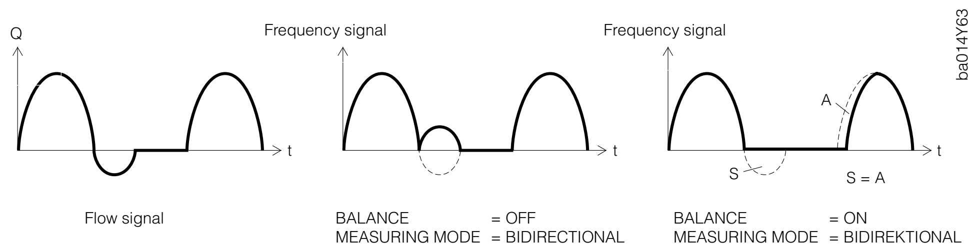
  TOTALIZER → ASSIGN TOTAL. 1 → MASS
  TOTALIZER → ASSIGN TOTAL. 2 → MASS (-)

- **Current output:** Freely selectable

- **Pulse / Freq. output:**
  With the following setting, negative flow rates are stored in a buffer and subtracted from the positive flow rate which follows.

  PULSE/FREQ. OUTPUT → BALANCE → ON

  The setting BALANCE → ON can be activated with all possible flow rates of the PROMASS 63 (e.g. volumetric or standard volumetric measurement, etc.)

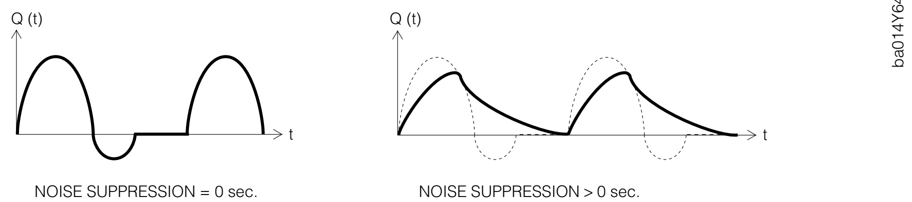


The area *S* is equal to area *A*, which is subtracted from the positive flow rate which follows (see fig. above).

Under certain operating conditions negative flow rates can also be totalled in the buffer, e.g. for undesired return flows over a long time period. This buffer, however, is reset with every programming which affects the frequency output. This buffer can also be reset using the function TOTALIZER → RESET TOTALIZER (see page 63).

- **Noise suppression:**
  Under normal circumstances the noise suppression function should be set at 0 seconds (= OFF) for strongly pulsating flows (see Fig. 26, 27).

  However, a setting of > 0 seconds enables an extra, very effective damping which affects all outputs of the Promass 63.



- **Display damping:** Freely selectable

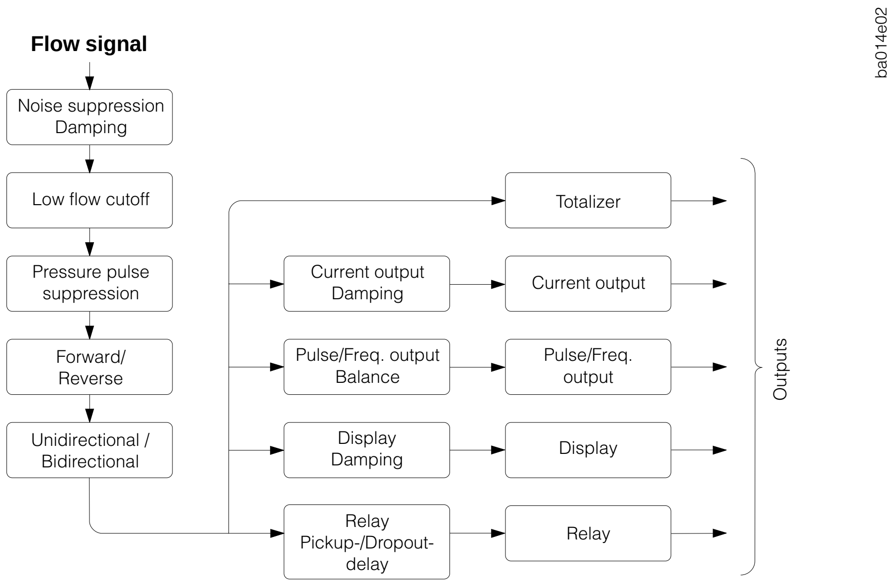
  The actual flow, including return flow, can be monitored when set at 0 seconds.
  The average flow rate is displayed when a higher time constant is set.

Internal signal processing

There is a relationship between the settings entered or selected and the output signals. Every change to a setting also changes the internal signal processing of the instrument. One or more output signals are affected depending on which settings are changed (see Fig. 0).

Examples :

- Changing the “DAMPING CURRENT OUTPUT” only affects the “CURRENT OUTPUT”.
- Changing the "LOW FLOW CUTOFF" affects the outputs “TOTALIZER”, “CURRENT OUTPUT”, “PULSE/FREQ. OUTPUT”, “DISPLAY” AND “RELAY”.



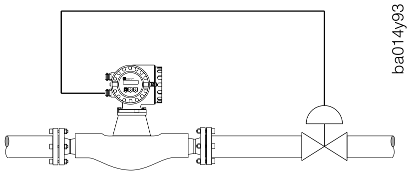
6.2 Batching

General information

The Promass 63 can be used for two different types of batching:

Batching with the internal batching function

Together with an integrated preseting counter in the Promass 63, this internal function allows simple batching processes to be controlled.
The transmitter of the Promass 63 has two relays for controlling one or two-step batching processes and activating a metering valve.
A detailed description of the corresponding functions and settings are given on pages 48, 49 and 84 to 86.



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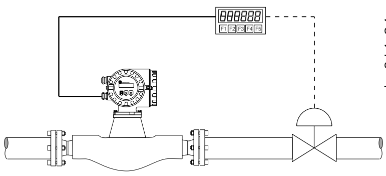
External batching

With external batching, the flow is determinded by the Promass 63 and is sent to an external counter, PLC, etc., via the pulse output.
The batching process is controlled by the external presetting device, PLC, etc. which activates a metering valve.
A more detailed desciption of the functions and settings are given on pages 50 and 51.



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Starting / Stopping a Batching Cycle

The batching cycle can be started and stopped in four different ways:
- via the HART interface or Rackbus 485
- via the auxiliary input (with the “RS 485” communications module only)
- via the “BATCHING” function
- from the HOME position (starting the batching cycle from the HOME position is always possible if a batching variable is selected in the “BATCH VARIABLE” function)

+/− START – STOP – CANCEL
(E confirms selection)

Note!
If a batching variable is activated, the “BATCHING” function group is first shown on the display when entering the operating matrix. The “BATCH PRESET” function then moves into first position within this group. This makes using the matrix much easier for the user. In addition all batching functions can be changed without entering a code number.

Note!

Internal batching with automatic compensation for after runs

By setting various functions (see Fig. 29) after-runs and errors in batching amounts due to the plant process can be determined and compensated for. This ensures high accuracy over the entire batching range.
Three different settings can be selected in the function *BATCHING* → *BATCH COMP. MODE* :

- **“OFF”**
  Batching is completed as soon as the filling amount has been reached.
  No after-runs are registered or included in the next batching cycle. For after-runs caused by the process, the effective fill quantity is thus greater than the preset batching amount.

- **“MODE 1”**
  For short batching processes and for short batching cycles in rapid succession.
  Batching is completed before the preset batching amount is reached and the after-runs are determined. The exact switch-off point for batching is calculated based on the amount of after-runs occurring.
  Using the function *BATCHING* → *AVERAGING DRIP*, the number of previous after-runs can be entered which are to be included in the calculation.
  The amount of after-runs in MODE 1 is defined as the amount running out between the switch-off time and when it first falls below the low flow cutoff value (see Fig. 28). Any further flow is then no longer included.

- **“MODE 2”**
  For batching processes requiring high levels of accuracy despite the different amounts of after-runs due to process conditions.
  Batching is completed before the preset batching amount is reached and the after-runs are determined. The exact switch-off point for batching is calculated based on the amount of after-runs occurring.
  Using the function *BATCHING* → *AVERAGING DRIP*, the number of previous after-runs can be entered which are to be included in the calculation.
  The amount of after-runs in MODE 2 is defined as the amount running out between the switch-off time and when it continuously falls below the low flow cutoff value (see Fig. 28).
  This means that the lower the low flow cutoff is set, then the longer the time needed to determine the after-runs. This form of batching is thus highly accurate.

Note!

Note!
The pressure pulse suppression must be set to 0 ms (factory setting) when using the batch compensation mode (MODE 1 or 2), see page 98.

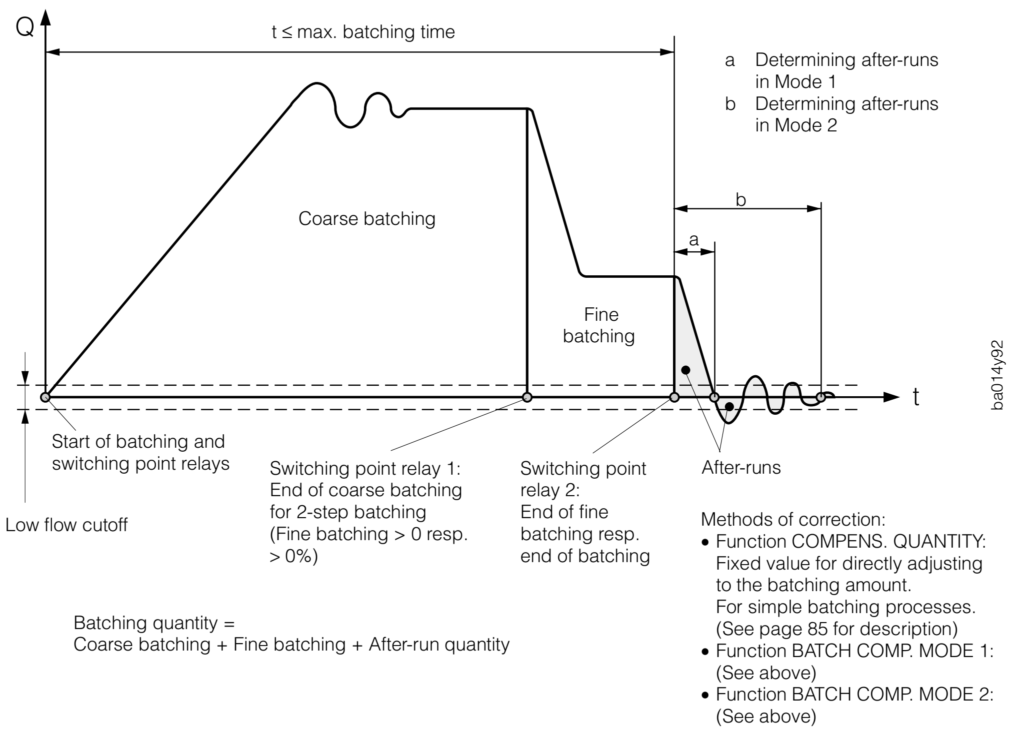
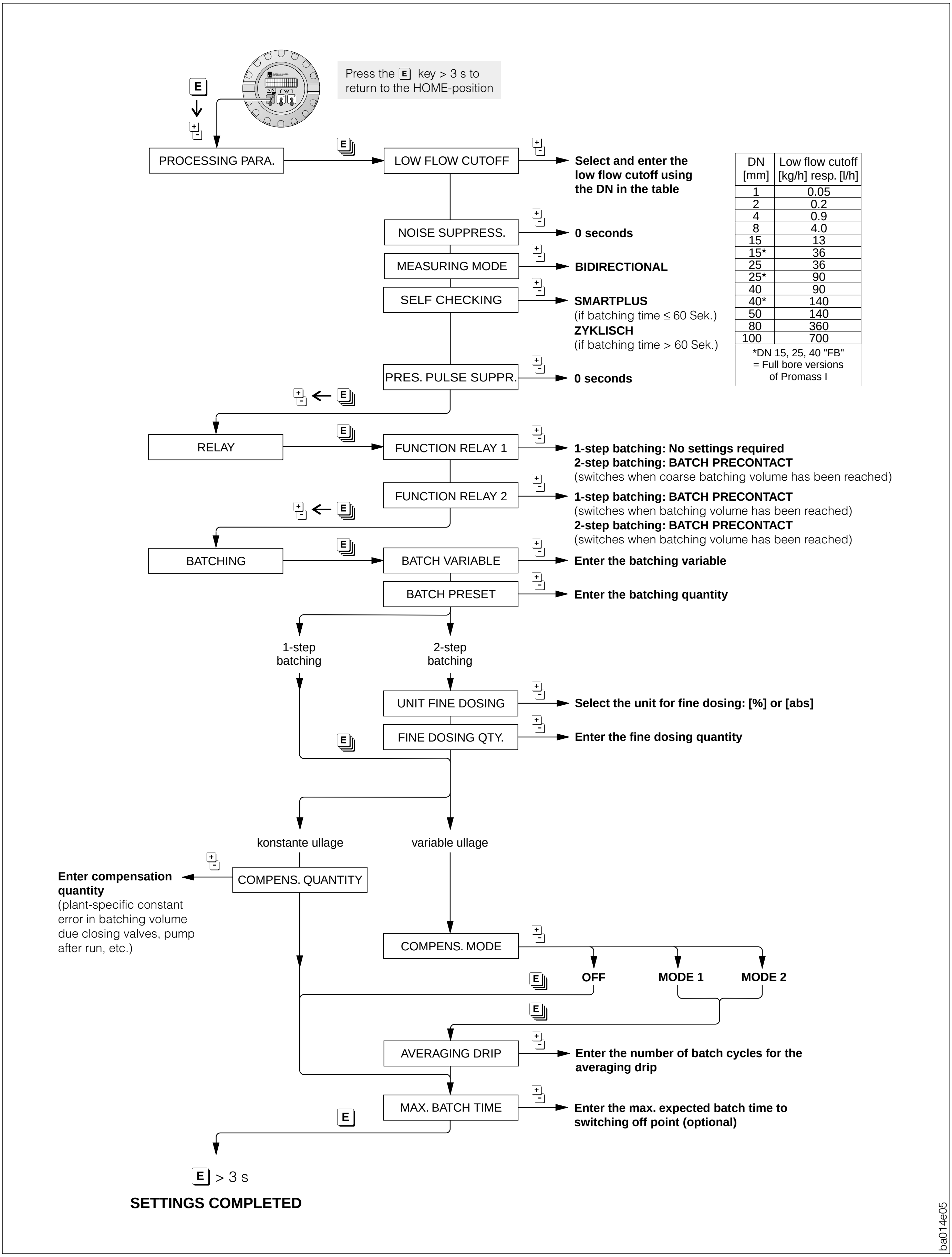


Fig. 28
Different stages of a batching cycle



DN [mm]	Low flow cutoff [kg/h] resp. [l/h]
1	0.05
2	0.2
4	0.9
8	4.0
15	13
15*	36
25	36
25*	90
40	90
40*	140
50	140
80	360
100	700

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

Fig. 29
Setting functions when using the internal batch function

External batching using the pulse output

“External batching” is controlled by an external presetting counter, PLC, etc.
The flow is determined by the Promass 63. The flow signal is supplied using the pulse/frequency output of the Promass 63 and is then sent to the presetting device.
The start of the batching cycle as well entering the target value are carried out directly on the presetting counter.
After starting the batching cycle the pulses are totalled in the presetting counter.
If the preset target value is reached then the metering valve is closed by the presetting counter.

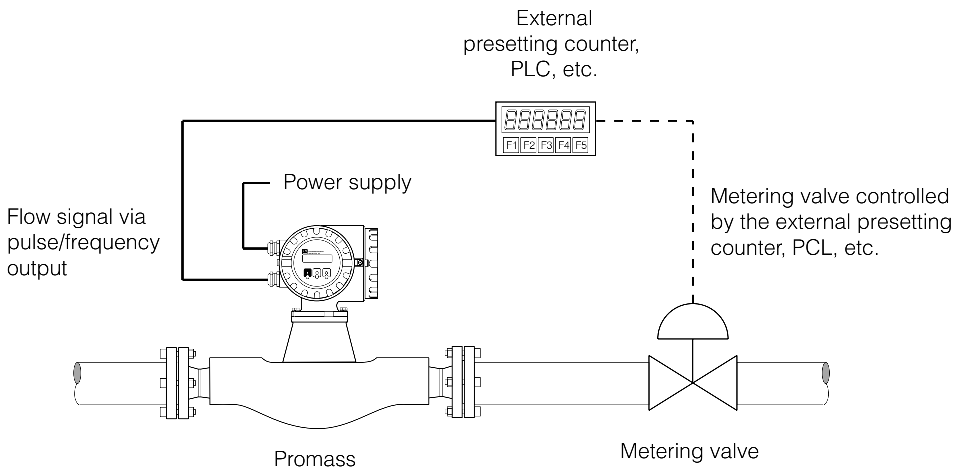
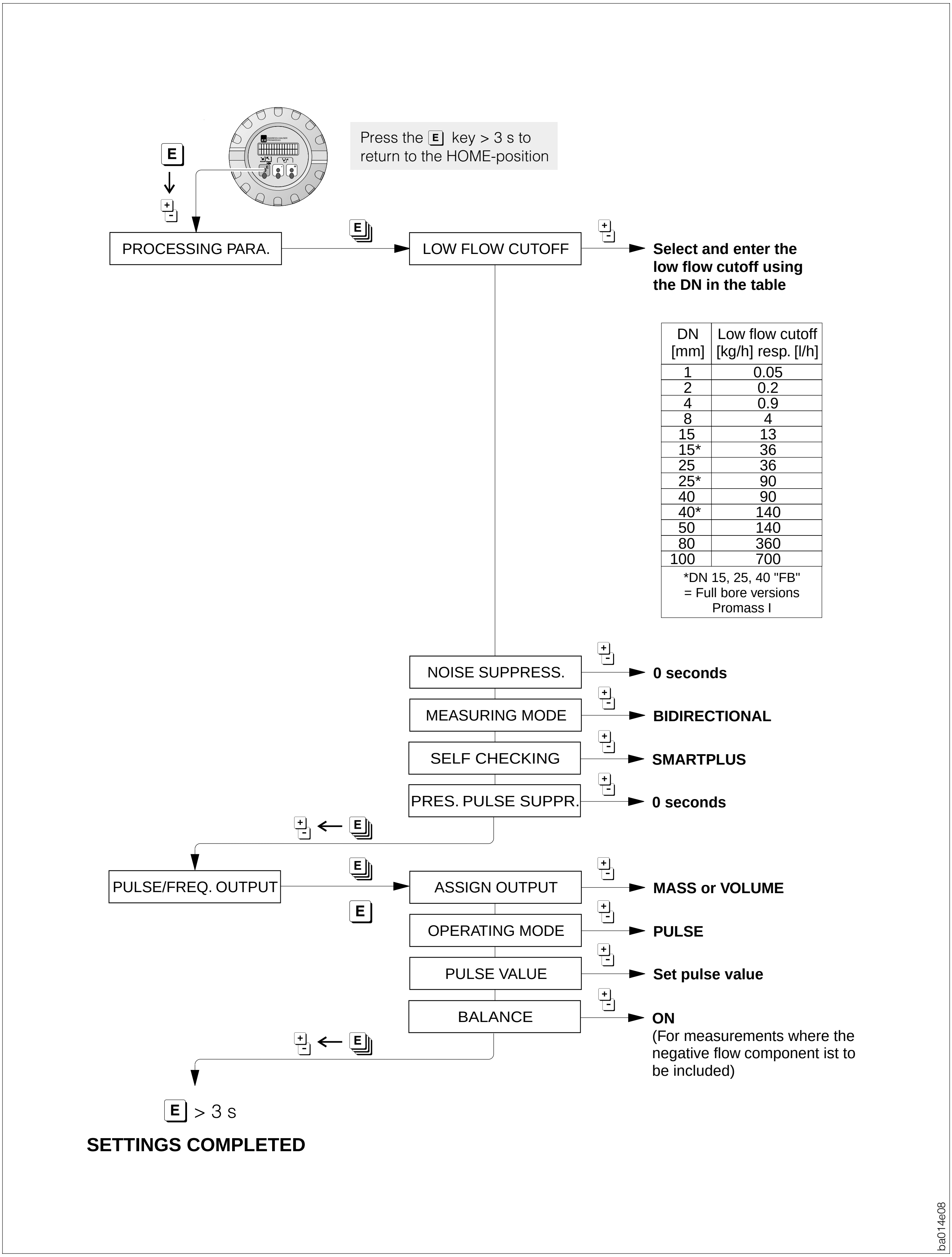


Fig. 30
Example for a batching with an external presetting counter, PLC, etc.



DN [mm]	Low flow cutoff [kg/h] resp. [l/h]
1	0.05
2	0.2
4	0.9
8	4
15	13
15*	36
25	36
25*	90
40	90
40*	140
50	140
80	360
100	700

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

Fig. 31
Possible settings with an external presetting device

6.3 Density Function

General information

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 medium)
- converting density of the medium 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 density of medium (measured value Promass 63)
t = actual measured temperature of medium (measured value Promass 63)
t_N = standard temperature for calculating standard density (e.g. 15 °C)
α = volumetric expansion coefficient of the medium. 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 140 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 medium.
The basic formulae (without temperature compensation) are:

$$\text{Mass}\left[\%\right] = \frac{D2 \cdot (\rho - D1)}{\rho \cdot (D2 - D1)} \cdot 100\,\% \qquad \text{Volume}\left[\%\right] = \frac{(\rho - D1)}{(D2 - D1)} \cdot 100\,\%$$

D1 = density of carrier fluid → transporting liquid, e.g. water
D2 = density of target medium → 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 %-VOLUMEN, however **does not** allow for a possible volume concentration.

°BALLING, °PLATO
A commonly used basis for calculating the fluid density in the brewery industry. A fluid with a value of 1° BALLING (Plato) has the same density as a water/cane sugar solution consisting of 1 kg cane sugar dissolved in 99 kg of water. 1° Balling (Plato) is thus 1% of the liquid weight.

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 87.

Caution!

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.

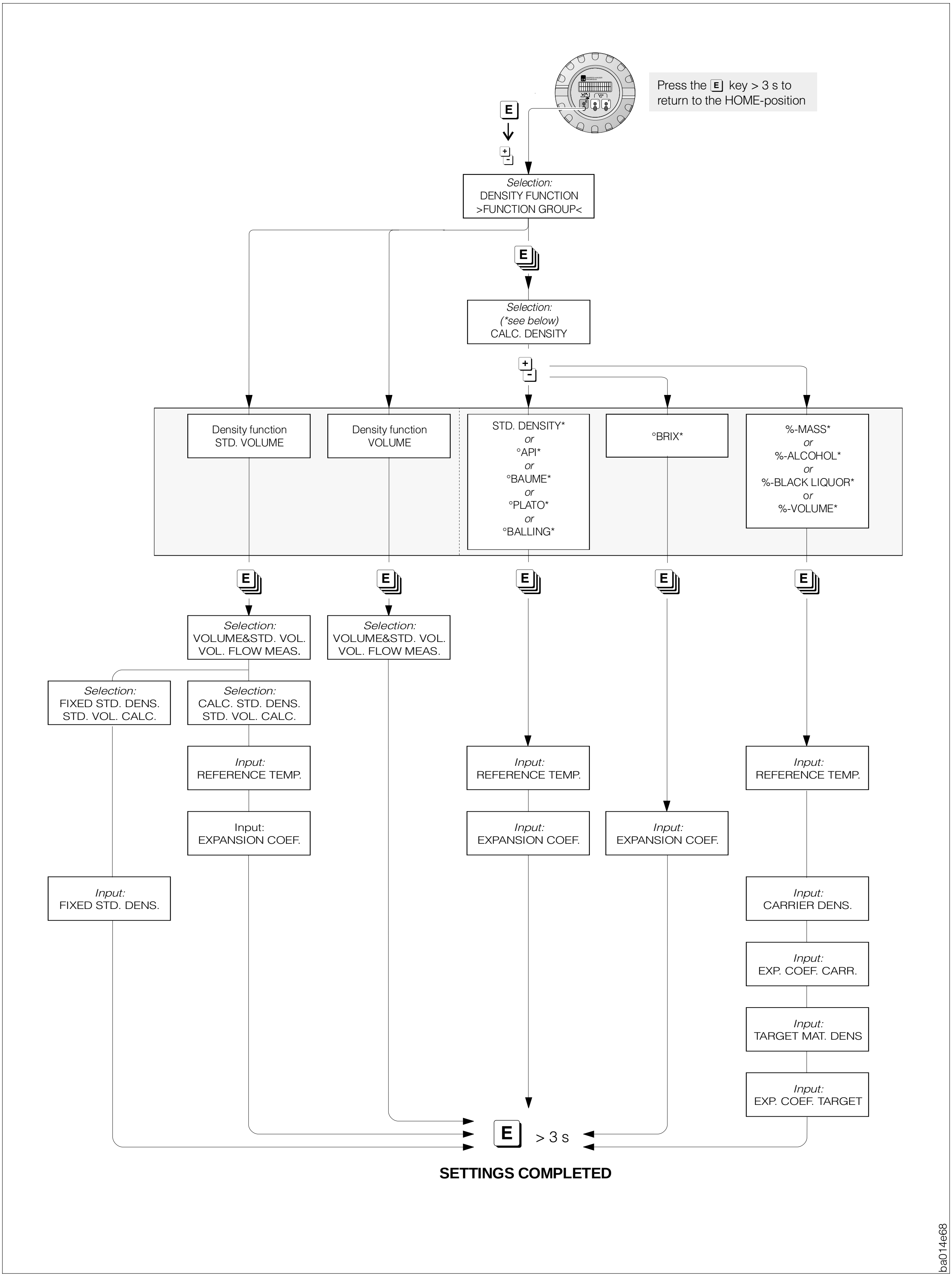


Fig. 32
Procedure for setting density functions

6.4 Density adjustment

Carrying out density adjustment (see page 55, Fig. 38)

Caution!

Caution!
- Density adjustment on site always demands that the operator accurately knows the density of the medium, 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 medium. Ensure that the measuring tubes are completely filled and that the medium is free of gas bubbles.
2. Wait until the temperature between the medium 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 87).
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 medium.

   Note!

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

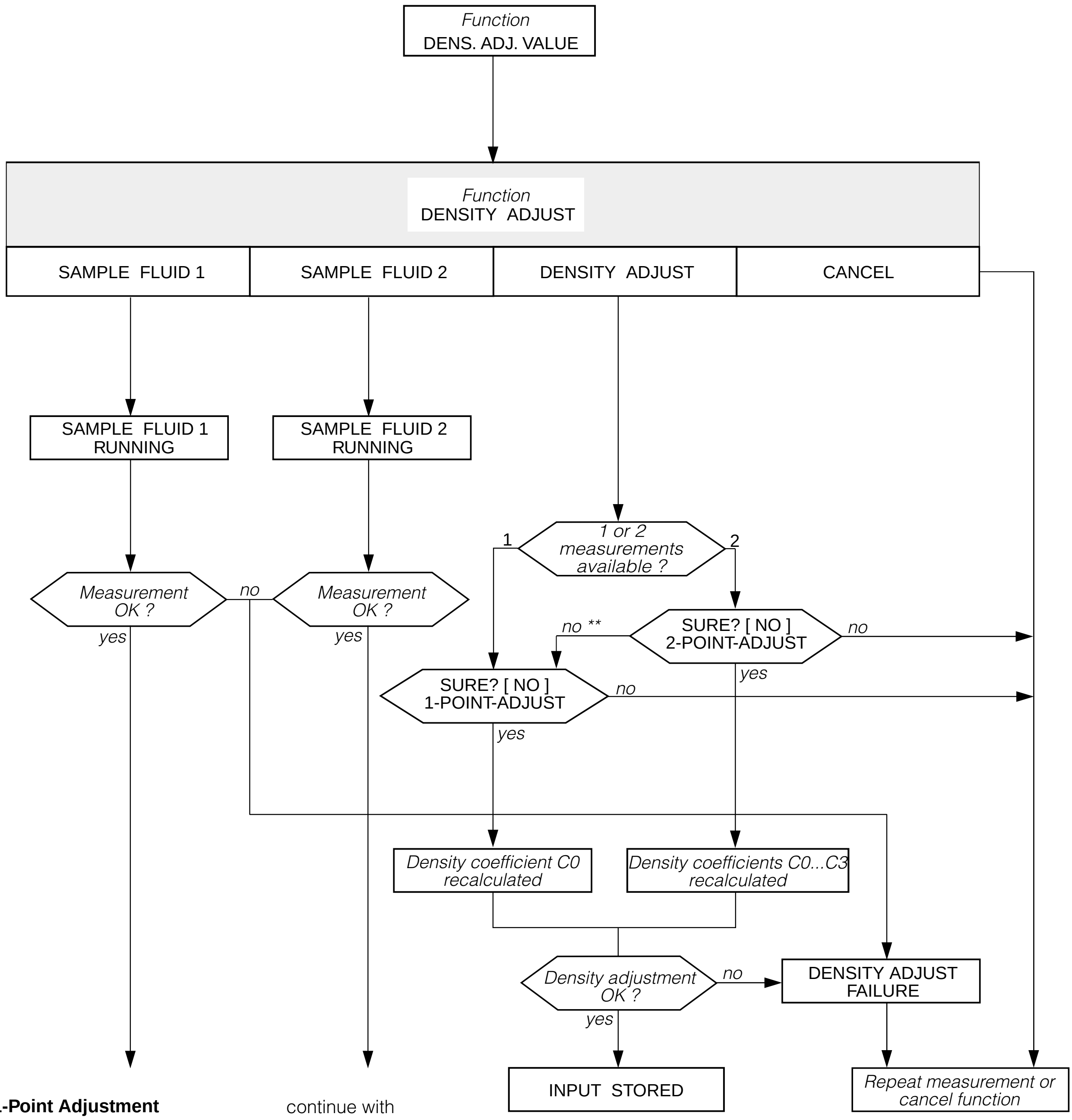
Note!

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.

1. Fill the sensor with the medium. Ensure that the measuring tubes are completely filled and that the medium is free of gas bubbles.
2. Wait until the temperature between the medium and the measuring pipe 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 87).
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!

   Note!
   Repeat the procedure if an error message is displayed.
   Check the plant and process conditions if necessary.
5. Repeat step 1 to 4 for a second medium. 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].



1-Point Adjustment
→ continue with
"DENSITY ADJUST"

continue with
"DENSITY ADJUST"
(2-point adjustment)

2-Point Adjustment
→ enter density adjustment value for Medium 2
→ continue with "SAMPLE FLUID 2"

** For the 1-point adjustment the measuring value for fluid 1 is used.

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Fig. 33
Carrying out density adjustment (flow diagram) 1-point and 2-point density adjustment

6.5 Zero Point adjustment

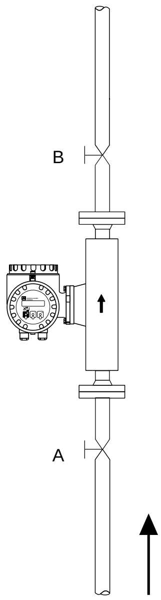
General information

All Promass 63 transmitters are calibrated using the most up-to-date technology available with the zero point stated on the nameplate. Calibration is carried out according to the reference conditions (see page 132). Therefore a zero point calibration for Promass is generally **not** necessary!

Practical experience has shown that a zero point calibration is only required in special cases:
- to achieve highest measuring accuracy, also with very slow flow rates.
- with extreme process conditions (e.g with very high fluid temperature or very high viscosity of the liquid).

Requirements for zero point adjustment

- For fluids **without** gas or solids.
- Zero point calibration is carried out using completely filled measuring pipes and at no-flow ($v_{meas.tube}$ = 0 m/s) 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 adjustment **with** pumping*
- Open valve A
- Close valve B

*Zero point adjustment **without** pumping*
- Close valve A
- Open valve B


Caution!

Caution!
With difficult fluids (out-gassing fluids or fluids with solids content) it is possible that no stable zero point can 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 function “ZEROPOINT” (page 103).

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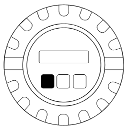
Carrying out a zero point adjustment

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 calibration with use of the local display as follows:

Display / Operating keys



E	PROCESS VARIABLE > GROUP SELECT. <	Entering the operating matrix
+ -	SYSTEM PARAMETER > GROUP SELECT. <	Select function group “SYSTEM PARAMETER”
+	CANCEL ZEROPOINT ADJUST	Select function “ZEROPOINT ADJUST”
+ -	0 ACCESS CODE	On pressing + - the entry of a code is automatically prompted if the matrix is still locked.
+ -	63 ACCESS CODE	Enter access code (63 = factory setting, access code can be changed)
E	EDITING ENABLE	Press “ENTER”
	CANCEL ZEROPOINT ADJUST	Display flashes
+ -	START ZEROPOINT ADJUST	Select “START”
E	SURE? [NO] ZEROPOINT ADJUST	Safety query on the Display
+ -	SURE? [YES] ZEROPOINT ADJUST	Select “YES” and press “ENTER”
E	S: ZERO ADJUST RUNNING	This message is shown on the display during zero point adjustment for approx. 30...60 sec. If the velocity of the fluid is > 0.1 m/s, then an error message is shown on the display.
	CANCEL ZEROPOINT 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 “ZEROPOINT” is overwritten.
E	Back to HOME position (= display during normal measuring operation)	

6.6 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 97)*
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 96)*
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 88) → Select “STD. VOLUME FLOW”
- Function “STD. VOL. CALC. (see page 88) → Select “FIXED STD. DENSITY”
- Function “FIXED STD. DENSITY” (see page 89) → 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 66) → Select the desired unit
- Function “STD. VOLUME UNIT” (see page 65) → Select the desired unit

- Normal volume flow can now be assigned to
  → a display line (see page 91)
  → the current output (see page 67)
  → the pulse/freq. output (see page 72)

7 Function Description

This section lists in detail a description as well as all the 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 cases, values/settings may differ from the factory settings shown here.

Function group
PROCESS VARIABLE

Note!

Notes!
- The engineering units of all variables shown here can be set in the Function group “SYSTEM-UNITS”.
- If the medium in the piping flows backwards, then the flowrate value is indicated by a negative sign on the display independent of the setting in the function “MEASURING MODE” (see page 96).

MASS FLOW	Selecting this function automatically displays the current flow rate. Display: 5-digit number with floating decimal point, incl. units and arithmetical sign (e.g. 462.87 kg/h; -731.63 lb/min; etc.)
VOLUME FLOW	After selecting this function, the display automatically shows the currently measured volumetric flowrate. The volumetric flowrate is derived from the measured mass flowrate and the measured density of the medium. 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 standardised volumetric flowrate. The volumetric flowrate is derived from the measured mass flowrate and the standard (or fixed entry) density of the medium measured. 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 standardised density value used for calculating the standardised volumetric flowrate is a fixed entry value or derived from process data (see page 88). 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”.
TARGET FLOW	After selecting this function, the display automatically shows the currently measured flowrate of the target medium as a mass or volumetric flowrate. *Target medium* = material transported, e.g. lime powder (see page 52). 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 “%-VOLUMEN” is selected in the function “CALC. DENSITY” within the function group “DENSITY FUNCTION”.

Note!

Note!

Note!

Function group **PROCESS VARIABLE**	
CARRIER FLOW	After selecting this function, the display automatically shows the currently measured flowrate of the carrier fluid as a mass or volumetric flowrate. *Carrier fluid* = transporting material, e.g. water (see page 52). 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 “%-VOLUMEN” is selected in the function “CALC. DENSITY” within the function group “DENSITY FUNCTION”.
DENSITY	Selecting this function automatically displays the current density of the medium 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 87). 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 automatically displays the current temperature of the medium. 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! • An overrun is shown by an optically inverted sign on the display. 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 96), then the totaliser only registers flow in the positive direction. • In cases of error the totaliser is coupled to the error response of the pulse/frequency output (see page 77). For transmitters with an RS 485 communications module, this is only the case if the function “SYSTEM CONFIG.” is set to “AUX.INPUT/FREQ. or RS485 / FREQ.” (see page 95). With the setting “........../CURRENT”, the totaliser does not change on error in case of a failure. 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 totaliser 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”

Function group **TOTALIZER**	
RESET TOTALIZER	The totalisers can be reset to 'Zero' in this function (= Reset). Note! • The OVERFLOW as well as the value shown in the function "TOTALIZER 1" are reset to zero. • If the Promass 63 measuring electronics are fitted with a communications module RS 485, then the totaliser reset can also be carried out with the auxiliary input (see page 93). +/- ***CANCEL*** – TOTALIZER 1 – TOTALIZER 2 – TOTALIZERS 1&2
ASSIGN TOTAL. 1	In this function, any measuring variable required can be assigned to Totaliser 1. Note! The totaliser 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 totaliser 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 Function "MEASURING MODE", page 96).
ASSIGN TOTAL. 2	In this function, any measuring variable required can be assigned to Totaliser 2. Note! The totaliser 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 totaliser 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 Function "MEASURING MODE", page 96).

Note!

Note!

Note!

Function group **SYSTEM-UNITS**	
MASS FLOW UNIT	In this function, select the engineering units required from those displayed for mass flowrate (mass/time). The engineering units selected here also define those for: • Zero and full scale value for current • Frequency end value • Relay switching points (limit value for mass flow; flow direction) • Creep rate • Flowrate 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 flowrate. The total flowrate is always displayed, also with two-phase media.
MASS UNIT	In this function, select the engineering units from those displayed for mass. The engineering units selected here also define those for: • Pulse weighting (e.g. kg/p). • Totaliser • Batch preset, Batch prewarn, Compensation quantity g – ***kg*** – t – lb – ton – CANCEL
VOLUME FLOW UNIT	In this function, the units required for flowrate (volume/time) can be selected from those displayed. The volumetric flowrate is derived from the measured density of the medium and the mass flowrate. The units selected here also define those for: • Zero and full scale value for current • Frequency end value • Relay switching points (limit value for volumetric flowrate) • Flowrate 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 flowrate. The total flowrate 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 flowrate is derived from the measured density of the medium and the mass flowrate. The engineering units selected here also define those for: • Pulse weighting (e.g. $m^3 \rightarrow m^3$/pulse) • Totaliser • Batch preset, Batch prewarn, Compensation quantity 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 USA and 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, then 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	In this function, the units required for standard volumetric flowrate (standardised volume/time) are selected from those displayed. The standard volumetric flowrate is derived from the measured standard density of the medium (see page 52) and the mass flowrate. The units selected here also define those for: • Zero and full scale value for current • Frequency end value • Relay switching points (limit value for standardised volumetric flowrate) 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 standardised volumetric flowrate. 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 UNIT	In this function, the units required for standardised volume are selected from those displayed. The standardised volume is derived from the standardised density (see page 52) and the mass flowrate. The units selected here also define those for: • Pulse weighting (e.g. Nm^3 → Nm^3/pulse) • Batch preset, Batch prewarn, Compensation quantity ***Nm^3*** – Nl – scm – scf – 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!

Note!

Function group
SYSTEM-UNITS

Function	Description
DENSITY UNIT	In 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 • Relay switching points (limit value for density) • Density response value for Empty Pipe Detection • Density adjustment value 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 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 function “GALLON/BARREL”, page 65 SD = Specific Density, SG = Specific Gravity The specific gravity is the ratio between the density of the medium 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	In this function, the units required for standardised density of the medium are selected from those displayed.The units selected here also define those for: • Zero and full scale value for current • Relay switching points (limit of standardised density) • Fixed standard density (for measuring standard volume flow) ***kg/Nm^3*** – 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	In 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 • Relay switching points (limit value for temperature) • 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	In 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 1 / CURRENT OUTPUT 2

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
* Factory setting for current output 2

Diagnosis (for flowrate variables only):

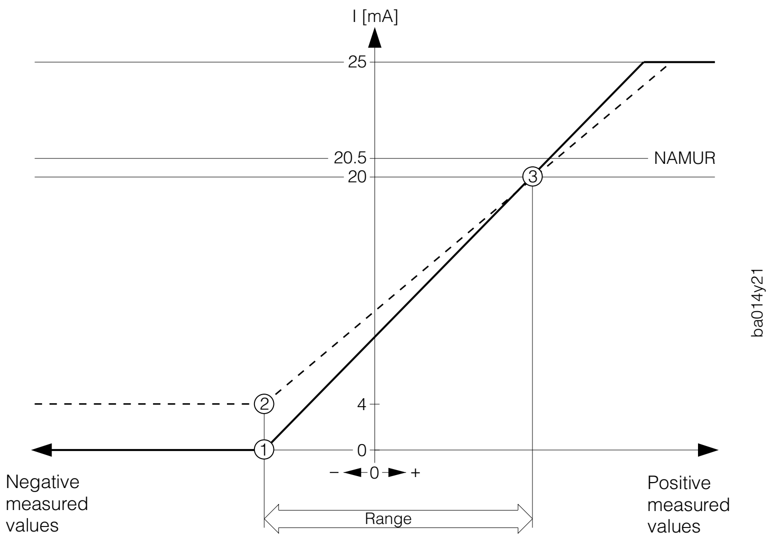
UNIDIRECTIONAL or BIDIRECTIONAL:
Display showing if the flowmeter is measuring in one or both flow directions. With unidirectional measurement a 0/4...20 mA current signal is only produced for the positive flow direction (forward); the current stays at 0 or 4 mA for the negative direction.

ZERO SCALE

In this function, assign the 0/4 quiescent current to the required zero value.
This value applies for both flow directions (bidirectional).
The flow direction can be given at the relay outputs when appropriately configured.

Note!

Notes!
- The zero value can be larger or smaller than the “full scale value”. (see function “FULL SCALE”, page 68)
- The range between the zero and full scale value should not fall below a minimum value (see Figure):



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/dm^3	ρ = 0.1 kg/dm^3	ρ = 5.999 kg/dm^3
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

* depent on density
** depentent on nominal diameter

5-digit number with floating decimal point
(e.g. –1.500 kg/h; 245.92 kg/m^3; 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.

Function group

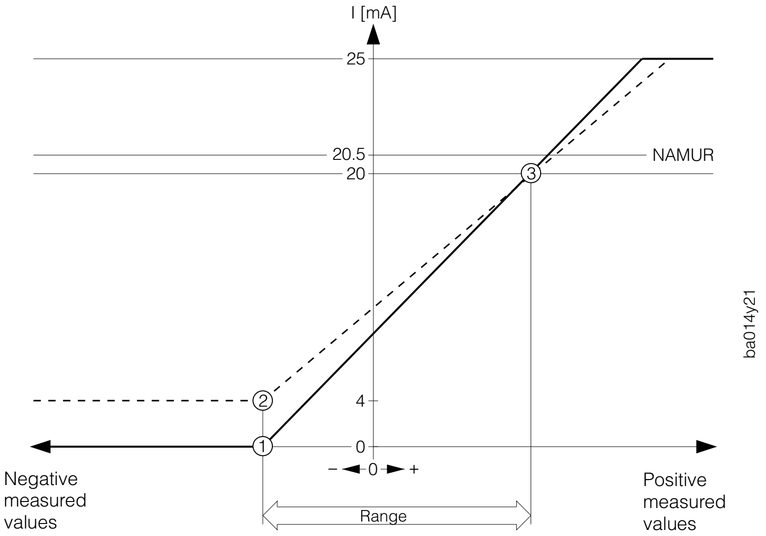
CURRENT OUTPUT 1 / CURRENT OUTPUT 2

FULL SCALE 1

In this function, assign the full scale value required to the 20 mA current (= scaling the full scale value) especially for that variable selected in function "ASSIGN OUTPUT".
With flow variables the scaling is always for both flow directions (bidirectional). The direction of flow can be given at the relay outputs when appropriately configured.

Note!

Note!
- The full scale value can be larger or smaller than the zero value (see function "ZERO SCALE", page 67).
- The range between the zero and full scale value should not fall below a minimum value:



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/dm^3	ρ = 0.1 kg/dm^3	ρ = 5.999 kg/dm^3
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, depending on the variable (e.g. –566.00 kg/min; 0.9956 kg/dm^3; 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 1 / CURRENT OUTPUT 2

DUAL RANGE MODE

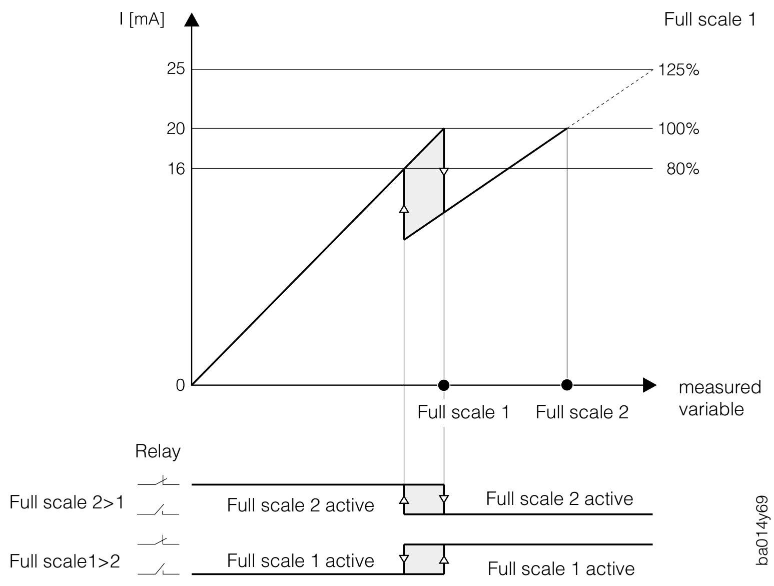
For specific applications the scaling of a second end value is useful or possibly required expecially with flowrate variables. In this function one of the two end values is selected with which the measuring system operates. The setting "AUTOMATIC" allows the measuring system to switch between two end values (see diagram below).

Applications:
- Frequent measurement of two different media with widely differing flow velocities. The operator defines an end value for each of these two media which can be activated in this function as required.
- Higher resolution of the measuring signal with very small flow velocities. The setting "AUTOMATIC" allows the Promass measuring system to switch automatically between two end values depending on the flow velocity.

Note!
- The appropriate configuration enables the actual end value to be supplied or displayed by both relays (see following figure as well as pages 82, 83).
- If the Promass 63 measuring electronics are fitted with a communication module, then the end values can also be activated using the auxiliary input (see page 93).
- In bidirectional operation, the dual range mode acts in both the positive and negative direction of flow.

Note!

Example (0...20 mA; full scale 1< full scale 2)



FULL SCALE 1	Promass operates with end value 1 only
FULL SCALE 2	Promass operates with end value 2 only
AUTOMATIC	Promass operates with end value 1 and 2 (see Figure)
AUXILIARY INPUT	Selecting the end value is carried out using the auxilliary input, see page 93
CANCEL	

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

Function group **CURRENT OUTPUT 1 / CURRENT OUTPUT 2**	
FULL SCALE 2	For description of function → see "FULL SCALE 1" function, page 68 Notes! • This function is only available if "FULL SCALE 2" has been activated in the function "DUAL RANGE MODE" (see page 69). • Full scale 2 may be larger or smaller than full scale 1 resp. zero scale.
ACTIVE RANGE	After selecting this function the actual end value is automatically displayed (***FULL SCALE 1*** – FULL SCALE 2). Note! The appropriate configuration enables the actual end value to be supplied or displayed by both relays (see pages 69, 83). Display showing which process variable is assigned to the current output.
TIME CONSTANT	Selecting the time constant determines whether the current output signal reacts quickly (small time constant) to rapidly fluctuating variables e.g. flowrate or delayed (long time constant). The time constant does not influence the behaviour of the display. 3- to 5-digit number with fixed 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	In 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 maximum 25 mA. Note! The 0...20 mA current output can only be selected if the HART protocol is inactivated (see page 93). 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.

Note!

Note!

Note!

Function group **CURRENT OUTPUT 1 / CURRENT OUTPUT 2**	
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. totaliser) 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.
SIMULATION CURR.	In this function, the output current can be simulated to correspond to 0%, 50% or 100% of the set current range. The ‘error values’ 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 adjustment of the internal 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. totaliser, 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 100). • 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	In this function, the current and calculated target value of the output current is shown. The effective current can vary slightly due to external effects such as temperature. Display showing the current measured value for the process variable assigned to the current output.

Note!

Function group **PULSE / FREQ. OUTPUT**	
ASSIGN OUTPUT	In this function, a particular variable can be assigned to the pulse/frequency output. OFF – ***MASS*** – VOLUME – STD. VOLUME – TARGET FLOW – CARRIER FLOW – DENSITY * – CALC. DENSITY * – TEMPERATURE * – CANCEL * only selectable with operation mode "FREQUENCY" UNIDIRECTIONAL oder BIDIRECTIONAL: Display showing if the flowmeter is measuring in one or both flow directions. With unidirectional measurement pulse or frequency signals are only produced for the positive flow direction (forward); the frequency stays at 0 Hz for the negative direction.
OPERATION MODE	In this function, the output is configured as a pulse or frequency output. Various functions are available in this function group depending on the variable selected (pulse or frequency). ***PULSE **** – FREQUENCY – CANCEL (* Not selectable if the output was assigned for "DENSITY, CALC. DENSITY or TEMPERATURE") Display showing which flow variable is assigned to the pulse/frequency output.
PULSE VALUE	In this function, define the freely selectable flow quantity which the output pulse is to deliver. By means of an external counter the sum of these pulses can be totalised and the total quantity determined since the start of measurement. Note! "This function is only available if the setting "PULSE" is selected in the function "OPERATION MODE". 5-digit number with floating decimal point, incl. engineering units (e.g. 240.00 t/p; 0.6136 kg/p) Factory setting: ***dependent*** on the nominal diameter Display showing which flow variable is assigned to the pulse output.

Note!

Function group
PULSE / FREQ. OUTPUT

PULSE WIDTH

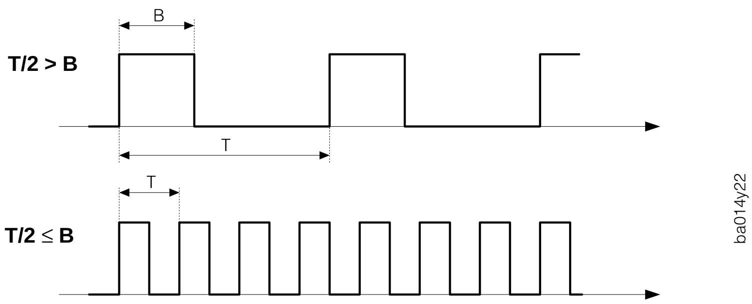
In this function, the maximum pulse width can be set for example for external counters with max. possible input frequency. The pulse width is limited to the set value.

Note!
This function is only available if the setting “PULSE” is selected in the function “OPERATION MODE” (see page 72).

Note!

3-digit number with fixed decimal point (0.05...10.00 s)
Factory setting: ***10 s***

T/2 < PULSE ==> PULSE/PAUSE = 1:1
If the frequency resulting from the selected pulse weighting and current flowrate is too high (T/2 < selected pulse width B), the pulses emitted are automatically reduced to half a cycle. The pulse/pause ratio is then 1:1 (see figure below).



B = Pulse width
The above figure applies to positive pulses.

Note!
The pulse width should not be reduced for strongly pulsating flows or batching processes.

Note!

Function group
PULSE / FREQ. OUTPUT

FULL SCALE FREQ.

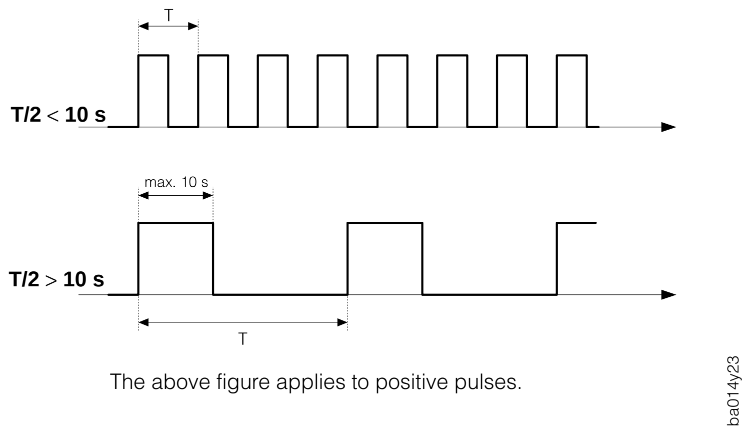
In this function, the full scale frequency (2...10000 Hz) can be set for the max. flowrate required. This flowrate value is defined in the function “FULL SCALE” (see page 75).

Note!

Note!
- This function is only available if the setting “FREQUENCY” is selected in the function “OPERATION MODE” (see page 72).
- An extension up to 163% of the selected full scale frequency is possible.

max. 5-digit number (2...10000 Hz)
Factory setting: ***10000 Hz***

T/2 < 10 s ==> PULSE/PAUSE = 1:1
In the mode “FREQUENCY” the output signal is symmetrical (pulse/pause ratio = 1:1). At low frequencies the pulse duration is limited max. 10 seconds (see figure below), i.e. the pulse/pause ratio is no longer symmetrical.



The above figure applies to positive pulses.

Function group
PULSE / FREQ. OUTPUT

ZERO SCALE

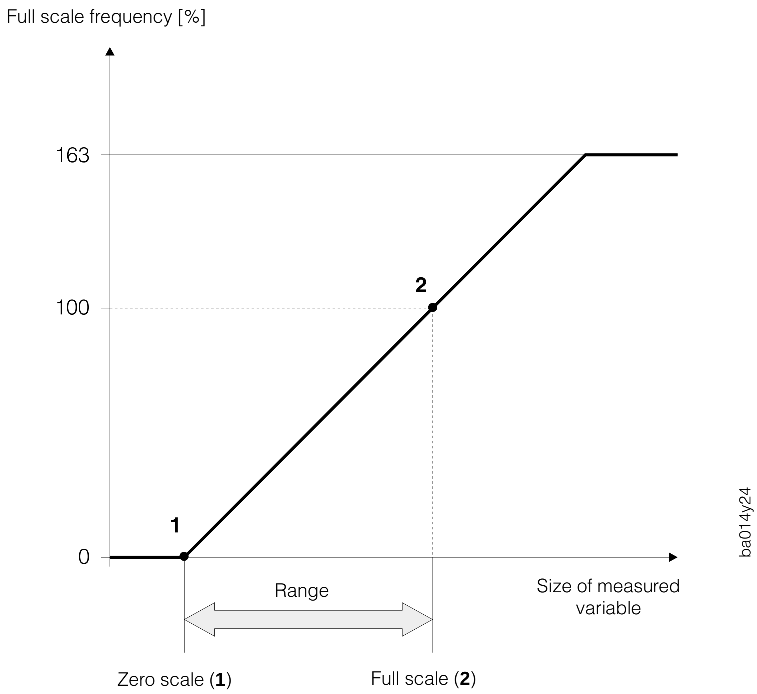
FULL SCALE

Define the following values for the measured variable required in these two functions (see function “ASSIGN OUTPUT”, page 72):
- 0 Hz → zero scale value of the measured variable
- End frequency → full scale value of measured variable

The measuring range required is defined by the zero scale value and full scale value.

Notes!
- This function is only available, if “FREQUENCY” has been set in the function “OPERATION MODE” (see page 72).
- The zero scale value cannot be larger than the full scale value.
- The full scale value cannot be smaller than the zero scale value.
- The range between the zero and full scale value should not fall below a minimum value (Q → min. 0.5 m/s; ρ → min. 0.1 kg/dm^3; T → min. 10K):

Note!



Zero scale

5-digit number with floating decimal point
(e.g. 0.0000 kg/h; 245.92 kg/m^3; 105.60 °C)
Factory setting: ***0.0000 kg/h*** resp. ***0.0000 kg/l*** resp. ***–50.000 °C***

Full scale

5-digit number with floating decimal point, according to measured variable (e.g. 566.00 kg/h; 0.9956 kg/m^3; 105.60 °C)

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

Display showing which variable is assigned to the frequency output.

Function group

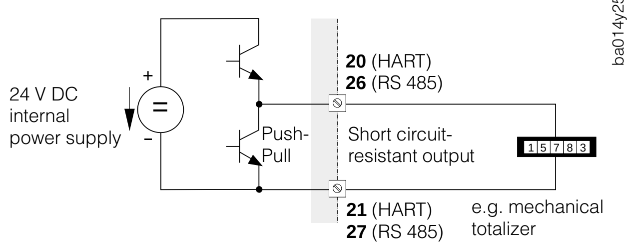
PULSE / FREQ. OUTPUT

OUTPUT SIGNAL

In this function the pulse/frequency output can be configured as required, for example for an external counter.

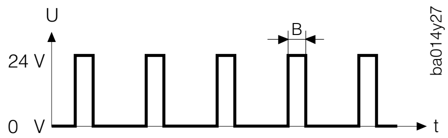
ACTIVE: Internal power supply used (+24 V)
PASSIVE: External power supply required

ACTIVE

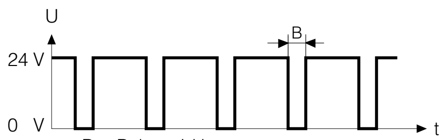


Recommended:
– for high output frequencies
– continuous flow up to 25 mA (I_{max} = 250 mA for 20 ms)

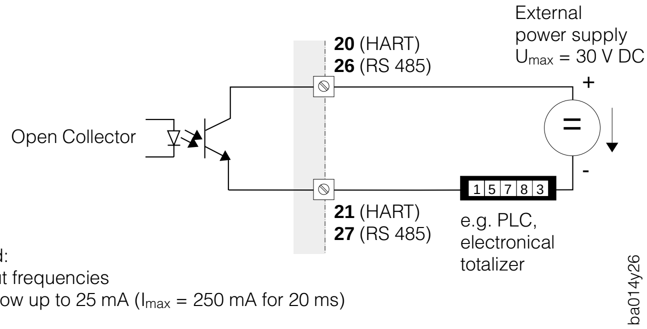
ACTIVE-POSITIVE
pulses



ACTIVE-NEGATIVE
pulses

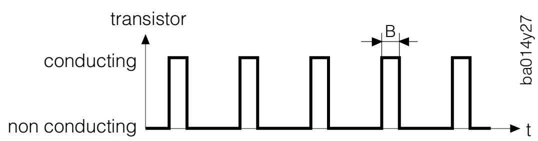


PASSIVE

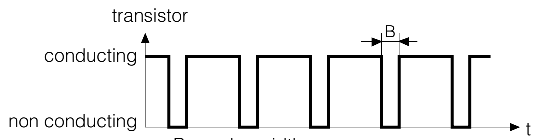


Recommended:
– for low output frequencies
– continuous flow up to 25 mA (I_{max} = 250 mA for 20 ms)

PASSIVE-NEGATIVE
pulses



PASSIVE-POSITIVE
pulses



PASSIVE-POSITIVE
PASSIVE-NEGATIVE
ACTIVE-POSITIVE
ACTIVE-NEGATIVE
CANCEL

PASSIVE = OPEN-COLL or ACTIVE = PUSH-PULL
(see above figure for details)

Function group
PULSE / FREQ. OUTPUT

FAILSAFE MODE

In cases of an instrument error it is advisable for safety reasons that the pulse/frequency output assumes a previously defined status which can be set in this function.

Notes!
- The setting chosen only affects the pulse/frequency output and the totaliser*. Other outputs or displays, e.g. current output, are not affected. (* For flowmeters with a communications module RS 485, this only applies if the function “SYSTEM CONFIGURATION” is set to “....../FREQ.”).
- With unidirectional measuring mode and flow in negative direction (reverse) the measuring system is not able to give a failsafe response.

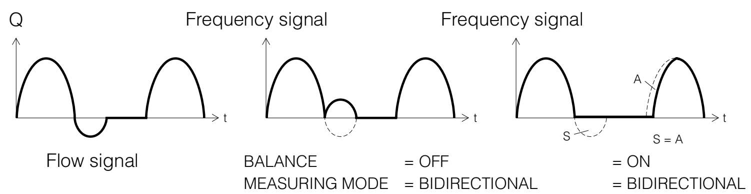
Note!

FALL-BACK VALUE	In event of fault, the signal is set to the fall-back value = 0 Hz. The totaliser stops operating.
HOLD VALUE	Last valid measured value is held an the totaliser operates with this value.
ACTUAL VALUE	Normal measured value given despite fault, also with totaliser.
CANCEL	

Display showing which flow variable is assigned to the pulse/frequency output.

BALANCE

With this function negative flow components (pulses) are stored in a buffer and then subtracted from the positive flow which follows.



OFF – ON – CANCEL

Note!
- This function is only effective with the following setting: *PROCESS PARAMETER → MEASURING MODE → BIDIRECTIONAL*
- This is specially for flow profiles with negative flow components (see page 42)
- RESET of the buffer memory for all relevant settings which affect the frequency output or using function: *TOTALIZER → RESET TOTAL.* (see page 63)

Note!

SIMULATION FREQ.

With this function preset frequency signals can be simulated in order to check, for example, any instruments connected. The simulated signals are always symmetrical (pulse/pause ratio = 1:1).
After activating the simulation mode, the display shows the message “S: FREQ. OUTPUT SIMUL. ACTIVE”.

Notes!
- The flowmeter is fully capable of measuring during simulation, i.e. totaliser, flow display etc. continue to operate normally.
- Positive zero return (see page 100) interrupts a simulation in progress and sets the output signal to the fall-back value.

Note!

OFF – 0 Hz – 2 Hz – 10 Hz – 1 kHz – 10 kHz – CANCEL

NOMINAL FREQ.

In this function, is shown the calculated target value of the output frequency (0.00...16383 Hz).

Display showing the current measured value for the flow variable assigned to the frequency output.

Function group
RELAY

RELAY 1 FUNCTION

Various functions can be assigned to Relay output 1.

Note!

- Note pages 82 and 83 for the switching response of Relay 1.
- For safety reasons we recommend configuring relay output 1 as the alarm output and to define the failsafe mode of the outputs (see page 71 and 77).
- As standard the normally open contact of relay 1 is brought out. However, the normally closed contact is also available by plugging a jumper on the communications board (see Figure below).

FAILURE	Error messages → error message list see page 107
EEMPTY PIPE DET.	Empty pipe detection → falling below a defined density response value, e.g. with empty measuring pipes (see page 97)
FAILURE & EPD	Error messages (system fault) or Empty pipe detection response
DUAL RANGE MODE	Registering active End value 1 or 2 (Current output 1)
DUAL RANGE MODE 2	Registering active End value 1 or 2 (Current output 2 with communications module “2 CUR.” only)
BATCH PRECONTACT	Message indicating pre batch quantity reached (see also page 84).
FLOW DIRECTION	Flow direction message (forward/revers). On unidirectional measurement Relay 1 also switches in the negative flow direction.

LIMIT MASS FLOW
LIMIT VOLUME FLOW
LIMIT STD.VOL. FLOW
LIMIT TARGET FLOW
LIMIT CARRIER FLOW
LIMIT DENSITY
LIMIT CALC. DENSITY
LIMIT TEMPERATURE
} Registrating if preset limit value is outside range.

CANCEL

With selection “EPD” or “FAILURE & EPD”
Display showing EPD THRESHOLD (see page 97).

With selection “LIM. CALC. DENSITY”
Display of current set density function (see page 88).

Relay ❶ (V5):
Factory setting:
normally open contact is brought out

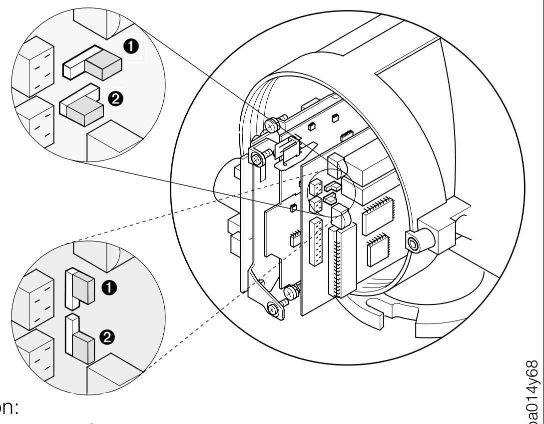
Relay ❷ (V6):
Factory setting:
normally closed contact is brought out

Relay configuration

	Normally open brought out	Normally closed brought out
2 CUR..	V5 V6	V5 V6
HART, RS 485	V5 V6	V5 V6

ba014e07

Version:
“2 CUR” (2 current outputs)



Version:
“HART” and “RS 485”

ba014y68

Function group
RELAY

RELAY 1 ON-VALUE

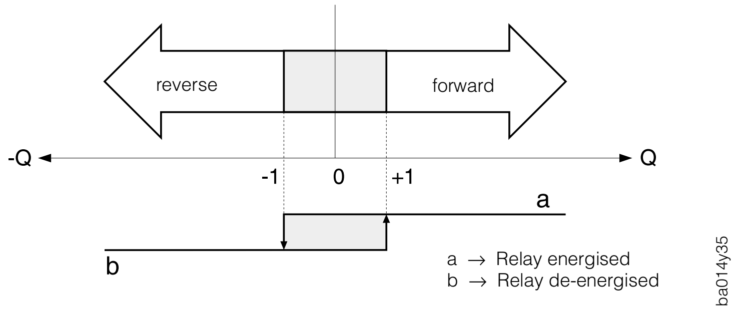
If you have configured relay 1 for “LIMIT.......” or “FLOW DIRECTION”, you may determine the necessary switching points in these functions. If the respective measured value reaches these preset values, relay 1 will switch as shown in the figures below.

RELAY 1 OFF-VALUE

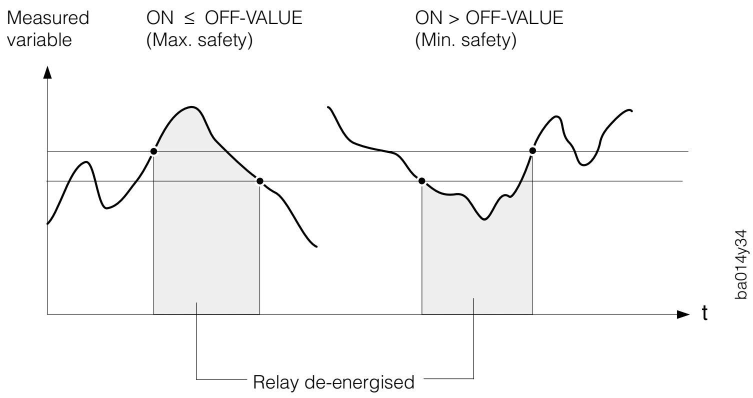
Note!
The value for the switch-on point can be larger or smaller than for the switch-off point.

Note!

Relay 1 → FLOW DIRECTION
The value entered in this function also defines the switch-on point for the positive and negative flow direction. If the switching point entered is for example = 1 kg/s, then the relay de-energises at -1 kg/s and energises again at +1 kg/s. If a direct switchover is required (no hysteresis), then set the switching point to the value = 0. If creep suppression is activated (see page 96), then it is recommended that the hysteresis is set to a value larger or the same as the low flow cutoff.



Relay 1 → LIMIT (Mass or volumetric flowrate, Density, Temperature, etc.)
Relay 1 switches over as soon as the current variable moves outside the limits of a specific switching point.
Applications: monitoring flow, density, temperature and thus also the product quality; monitoring process conditions (process control).



Density/flow variables: 5-digit number with floating or fixed decimal point, incl. units (e.g. 0.0037 t/min; 900.00 kg/m^3, etc.)
Temperature: max. 4-digit number with fixed decimal point, incl. units and arithmetical sign (e.g. -22.50 °C)
Density function: 5-digit number with floating decimal point (e.g. 76.409 °Brix, etc.)

Display showing which function is assigned to Relay 1.

Function group
RELAY

PICKUP DELAY 1

Note!
This function is only available if one of the following parameters has been selected in the function “RELAY 1 FUNCTION” within the function group “RELAY”:

- LIMIT MASS FLOW
- LIMIT STD. VOL. FLOW
- LIMIT CARRIER FLOW
- LIMIT DENSUTY
- LIMIT VOLUME FLOW
- LIMIT TARGET FLOW
- LIMIT TEMPERATURE
- LIMIT CALC. DENSITY

In this function, a delay time for a relay can be set (0...100 s). The delay time is first activated on reaching a preset limit value. The relay then only switches when this time has elapsed. Energising of the relay is delayed when a pickup operating time delay is used (i.e. the signal status changes from 0 to 1).

Range: 0...100 seconds (in second-steps)
Factory setting: ***0 s***

DROPOUT DELAY 1

Note!
This function is only available if one of the following parameters has been selected in the function “RELAY 1 FUNCTION” within the function group “RELAY”.

- LIMIT MASS FLOW
- LIMIT STD. VOL. FLOW
- LIMIT CARRIER FLOW
- LIMIT DENSUTY
- LIMIT VOLUME FLOW
- LIMIT TARGET FLOW
- LIMIT TEMPERATURE
- LIMIT CALC. DENSITY

In this function, a delay time for a relay can be set (0...100 s). The delay time is first activated on reaching a preset limit value. The relay then only switches when this time has elapsed. De-energising of the relay is delayed when a dropout time delay is used (i.e. the signal status changes from 1 to 0).

Range: 0...100 seconds (in second-steps)
Factory setting: ***0 s***

Function group
RELAY

RELAY 2 FUNCTION	Various functions can be assigned to Relay 2 output. Caution! • Note page 82 and 83 for the switching response of Relay 2. • As standard the normally closed contact of Relay 2 is brought out. However the normally open contact is also available by plugging a jumper on the communications board (see page 78). EMPTY PIPE DET. — Empty pipe detection → falling below a defined density response value e.g. with empty measuring tubes (see page 97) FAILURE & EPD — Registering failures (system failures) or response of the EPD DUAL RANGE MODE — Registering active full scale value value 1 or 2 (Current output 1) DUAL RANGE MODE 2 — Registering active full scale value 1 or 2 (Current output 2 with communications module “2 CUR.” only) BATCH CONTACT — Message indicating filling quantity (batch reached) FLOW DIRECTION — Flow direction message (forward/reverse). On unidirectional measurement Relay 1 also switches in the negative flow direction. ***LIMIT MASS FLOW*** LIMIT VOLUME FLOW LIMIT STD.VOL. FLOW LIMIT TARGET FLOW LIMIT CARRIER FLOW LIMIT DENSITY LIMIT CALC. DENSITY LIMIT TEMPERATURE } Registerating if preset limit value is outside range. CANCEL *With selection “EPD” or “FAILURE & EPD”* Display showing EPD THRESHOLD (see page 97). *With selection “LIM. CALC. DENSITY”* Display of current set density function (see page 88).
RELAY 2 ON-VALUE	Description of function → corresponds to “RELAY 1 ON-VALUE” (see page 79)
RELAY 2 OFF-VALUE	Description of function → corresponds to “RELAY 1 OFF-VALUE” (see page 79)
PICKUP DELAY 2	Description of function → corresponds to “PICKUP DELAY 1” (see page 80)
DROPOUT DELAY 2	Description of function → corresponds to “DROPOUT DELAY 1” (see page 80)

Caution!

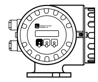
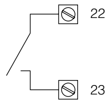
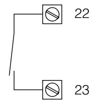
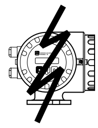
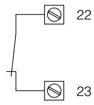
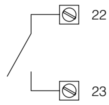
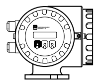
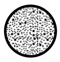
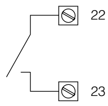
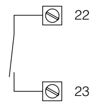
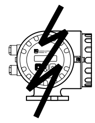
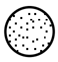
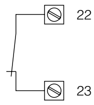
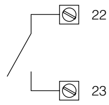
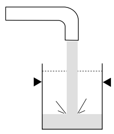
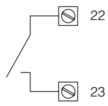
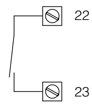
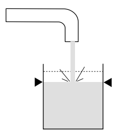
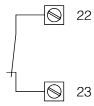
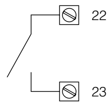
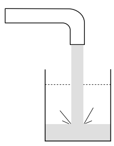
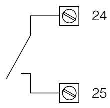
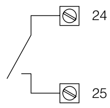
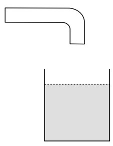
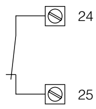
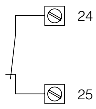
Functions Relay 1	Status	Relay	Relay contact NC contact *	NO contact *
FAILURE	System OK 	energised		
	Failure (System error) 	de- energised		
FAILURE & EPD	System OK  and Measuring tube(s) filled 	energised		
	Failure (System error)  or Falling below density response level e.g. with empty measuring tube(s) 	de- energised		
BATCH PRECONTACT	Batching cycle running and pre-batch quantity *not* reached 	energised		
	Batching cycle running and pre-batch quantity *reached* 	de- energised		
Relay 2				
BATCH CONTACT	Batch cycle running; batch quantity *not* reached yet. 	energised		
	Batch quantity reached (batch cycle stopped) 	de- energised		

Fig. 34
Relay 1 and 2: functions and switching responses

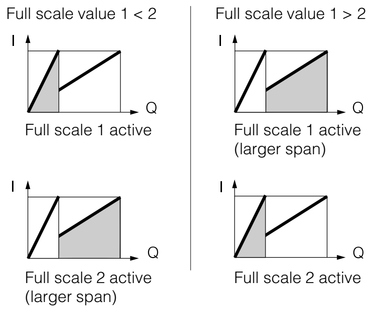
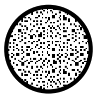
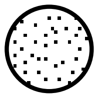
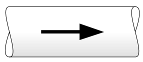
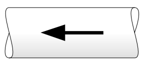
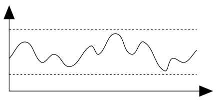
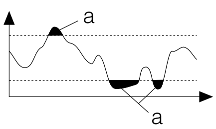
Common functions Relay 1 und 2	Status	Relay	Relay contact NC contact *	Relay contact NO contact *
DUAL RANGE MODE *(only with "HART" or "RS 485" board)* **DUAL RANGE MODE DUAL RANGE MODE 2** *(only with "2 CUR." board)*		energised	22 / 24, 23 / 25	22 / 24, 23 / 25
		de-energised	22 / 24, 23 / 25	22 / 24, 23 / 25
EPD (Empty pipe detection)	Measuring tube(s) filled 	energised	22 / 24, 23 / 25	22 / 24, 23 / 25
	Empty measuring tube(s) (e.g. when falling below the density response value) 	de-energised	22 / 24, 23 / 25	22 / 24, 23 / 25
FLOW DIRECTION	forward 	energised	22 / 24, 23 / 25	22 / 24, 23 / 25
	reverse 	de-energised	22 / 24, 23 / 25	22 / 24, 23 / 25
LIMIT MASS FLOW LIMIT VOL. FLOW LIMIT STD.VOL. FL. LIMIT TARGET FL. LIMIT CARRIER FL. LIMIT DENSITY LIM. CALC. DENSITY LIMIT TEMPERAT.	Limit values *not* outside range limits 	energised	22 / 24, 23 / 25	22 / 24, 23 / 25
	Limit values outside range limits  a = de-energised	de-energised	22 / 24, 23 / 25	22 / 24, 23 / 25
	Power supply failure	de-energised	22 / 24, 23 / 25	22 / 24, 23 / 25
	* Factory setting Relay 1 → Normally open contact (NO) Factory setting Relay 2 → Normally closed contact (NC) A jumper on the communications board allows either the normally closed contact or the normally open contact to be selected (see page 78).			

Fig. 35
Relay 1 and 2:
functions and switching responses

Function group **BATCHING**	
BATCH VARIABLE	In this function, the batching function required can be activated and defined. Note! If a batching variable is activated, the “BATCHING” function group is first shown on the display when entering the operating matrix. The “BATCH VARIABLE” function then moves into last position within this group. ***OFF*** – MASS – VOLUME – STD. VOLUME – TARGET MATERIAL – CARRIERFLUID – CANCEL
BATCH PRESET	This function is used to set the filling quantity. Note! • Relay 2 can be assigned as a batching contact (see “RELAY 2 FUNCTION”, page 81) • If a batching variable is activated, this function moves into the first position within the function group. 4-digit number with floating decimal point (e.g. 5.010 kg; 0.120 m^3; 0.110 Nm^3) Factory setting: ***1.000 kg*** Display showing which function is assigned to Relay 2
UNIT FINE DOSING	In this function the unit for fine batching can be defined. ***abs*** The fine batching amount is entered as an absolute value. % The fine batching amount is entered as an percent value. CANCEL
FINE DOSING QTY.	In this function the fine batching amount is defined. Entry is as percent or an absolute value depending on the selection in the function "UNIT FINE DOSING". Note! • Relay 1 can be assigned as a pre-batch contact (see “RELAY 1 FUNCTION, page 78) • For more information about fine dosing, see page 48, Fig. 28. 4-digit number with floating decimal point (e.g. 2.000 kg; 1.234 m^3; 1.234 Nm^3) Factory setting: ***0.000*** *Example:* With a batching amount of 1000 kg and a fine batching amount of 200 kg, the following values are to be entered: • Input in % = 20 % • Input in abs = 200 kg Display showing which function is assigned to Relay 1.

Function group
BATCHING

COMPENS. QUANTITY

In this function a positive or negative compensation quantity is defined. This quantity compensates for a ***consistent*** error in batching amounts due to plant operation. This can be caused, e.g. due to after running of a pump or the closing time of a valve. The compensation quantity is determined by the operator of the plant. The compensation quantity only affects the batching quantity.

- Overfilling → a negative correction factor is to be set
- Underfilling → a positive correction factor is to be set

Note!
If no sufficiently large negative correction factor can be set then the initial switch-off quantity may have to be lowered.

Note!

4-digit number with floating decimal point and arithmetical sign (e.g. – 0.102 kg; 0.002 m^3), Factory setting: ***0.000*** [unit]

Example:
Batching quantity = 100 kg
Pre-batch quantity = 90 kg
Fine batching quantity = 10 kg

→ maximum positive correction factor = +100 kg
→ maximum negative correction factor = –10 kg

Display showing which function is assigned to Relay 2.

BATCH COMP. MODE

In this function the after-runs of a batch cycle can be determined and the amount included in the next batch (see page 48).

OFF No determination of the after-runs

MODE 1 The amount running out between the switch-off time and when it first falls below the low flow cutoff value.

MODE 2 The amount running out between the switch-off time and when it continuously falls below the low flow cutoff value.

CANCEL

AVERAGING DRIP

In this function the number of after-runs (cycles) are defined which are included in calculating the batching compensation mode MODE 1 + 2.

As the batching amount is recalculated only after the number of defined after-runs (cycles) has been carried out, then, by entering:
- a low value → the measuring system reacts rapidly to differing amounts of after-runs
- a large value → the measuring system reacts slowly to differing amounts of after-runs.

max. 3-digit number (0...100)
Factory setting: ***0*** [cycles]

Note!
This function is only available in the setting “MODE 1” or “MODE 2” if selected in the function “BATCH COMP. MODE” (see above).

Note!

Function group
BATCHING

BATCHING	This function is used to manually start a batching cycle or to stop a batching cycle already running. Starting and stopping activate relay 2 or relay 1&2. The batching cycle can be stopped at any time. START – STOP – ***CANCEL*** (E activates START or STOP) Display showing which batching variable is set.
MAX. BATCH TIME	With this function a maximum filling interval can be set after Relay 2 (batching contact) has been de-energised, for example, due to safety reasons with a plant fault. Note! If the batching time is set to zero seconds, then batching time monitoring is inactivated. max. 5-digit number (0...30000 s) Factory setting: ***0 s*** Display showing which batching variable is set.
BATCH CYCLE	With this function the number of batching cycles completed is shown. max. 7-digit number (0...9999999) Factory setting: ***0*** Display showing which batching variable is set.
RESET BATCH CYC.	With this function the batching totaliser can be reset. ***CANCEL*** – YES Display showing how many batching cycles have been successfully completed.

Note!

Function group
DENSITY FUNCTION

DENS. ADJ. VALUE

In this function, enter the “target density” (= density adjust value) of the particular medium 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%.

Note!

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.

Note!
The procedure for carrying out a density adjustment and more details are given on page 54 ff.

Note!

Two types of adjustment are to be distinguished:

1-point density adjustment (with *one* medium)
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 medium 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 medium whose density is to be determined very accurately under constant conditions.
  Examples: Brix density measurement for apple juice.

2-point density adjustment (with *two* media)
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”)

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 medium 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] (For details: see page 52) CANCEL [ ] → 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 89 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 66) Note! This function is only available if a density function is selected in the function "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 an expansion coefficient specific to the medium is required and can be entered in this function.

Note!
This function is only displayed if you configure other functions, accordingly:
- CALC. DENSITY → °API, °BAUME, °BRIX, °PLATO, °BALLING or STD. DENSITY
- STD. VOL. CALC. → CALC. STD. DENS.

Note!

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 flowrate 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 88).

Note!

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 66)

CARRIER DENSITY

In this function, the density for the carrier fluid is entered. This density value is required for calculating the target medium contained in a two-phase medium. (calculation formula → see page 52).

Carrier fluid = transporting liquid (e.g. water)
Target medium = 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 66)

Note!
This function is only available if the setting “%-MASS”, “%-ALCOHOL”, “%-BLACK LIQUOR”, or “%-VOLUMEN” is selected in the function “CALC. DENSITY” / function group “DENSITY FUNCTION”.

Note!

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 medium contents in a two-phase medium.

Carrier fluid = transporting liquid (e.g. water)
Target medium = 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 “%-VOLUMEN” is selected in the function “CALC. DENSITY” / function group “DENSITY FUNCTION”.

Note!

Function group **DENSITY FUNCTION**	
TARGET MAT. DENS.	In this function, the density for the target medium is entered. This density value is required for calculating the target medium contents in a two-phase medium. (calculation formula → see page 52). *Carrier fluid* = transporting liquid (e.g. water) *Target medium* = 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 66) Note! This function is only available if the setting "%-MASS", "%-ALCOHOL", "%-BLACK LIQUOR", or "%-VOLUMEN" is selected in the function "CALC. DENSITY" / function group "DENSITY FUNCTION".
EXP. COEF. TARGET	In this function, the expansion coefficient of the target medium is entered. This value is required for the *temperature-compensated* calculation of the target medium contents in a two-phase medium. *Carrier fluid* = transporting liquid (e.g. water) *Target medium* = 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 "%-VOLUMEN" is selected in the function "CALC. DENSITY" / 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 – BATCH PRESET – BATCH UPWARDS – BATCH DOWNWARDS – BATCH CYCLES – 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 – BATCH UPWARDS – BATCH DOWNWARDS – BATCH CYCLES – 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 response 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 affect the display only. They do not affect the accuracy of the calculation within the system itself. • The decimal places calculated by the Promass cannot always be shown as they depend on the settings and the engineering unit selected. An arrow is therefore shown between the measured value and the engineering unit (e.g. 1.2 → kg/h). This means that the measuring system calculates 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! At minus temperatures (<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!

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

Note!

Function group
COMMUNICATION

In this function group, the interfaces provided by the Promass 63 can be appropriately configured and/or activated (Rackbus RS 485, HART protocol).

Note!
- The Promass 63 electronics are fitted either with the communications module “HART”, “2 CUR.” (also with HART) or “RS 485” according to the order specifications.
- Further information on the Rackbus RS 485 is found on → page 22, 34
- Further information on the HART protocol is found on → page 25, 32

Note!

PROTOCOL	For communication via a serial interface, various data transmission protocols are available which can be activated or switched off in this function. Promass 63 is fitted either with the communications module “HART”, “2 CUR.” (also with HART) or “RS 485” according to the order specifications. Note! For instruments with no local operation (blind version), the appropriate protocol is always switched on. +/- *With communication modul “HART” resp. “2 CUR”.* *OFF* – ***HART*** – CANCEL *With communication modul “RS 485”:* ***OFF*** – RACKBUS RS 485 – CANCEL
BUS ADDRESS	In this function, the bus address can be set for carrying out data transfer via the HART protocol or RS 485. Note! With an address ≠ “0” the current output is set to 4 mA +/- 2-digit number (HART: 0...15; RS 485: 0...63) Factory setting: ***0***
TAG NUMBER	In this function, the actual measuring point tag (name with max. 8 characters) is displayed which can only be entered over the serial interface. Note! This function is only available if the function “PROTOCOL” is set to “HART” or “RACKBUS RS 485” (see page 93).
ASSIGN AUX. INPUT	In this function, various functions can be assigned to the auxiliary input. This is only possible if: • the transmitter is fitted with an RS 485 communications module, • the function SYSTEM CONFIG. is set to AUX. INPUT/.....(see page 95). The functions of the auxiliary input are started or activated by applying an external voltage. Note! Please refer to the table on page 94. This gives a summary of *all* possible functions of the auxiliary input. +/- ***OFF*** – RESET TOTAL. 1 – RESET TOTAL. 2 – RESET TOTAL. 1&2 – BATCHING – ADJUST ZEROPOINT – DUAL RANGE MODE – POS. ZERO RETURN – SELECT ZEROPOINT – CANCEL

Note!

Note!

Note!

Note!

Functions of the auxiliary input

Pulsed mode

Assignment	Pulse at auxiliary input	Function	Remarks
RESET TOTAL 1 RESET TOTAL 2 RESET TOTAL 1 & 2	• Pulse between 3...30 V DC, at least for the duration of the start pulse width which has been set.	Totaliser(s) reset	See function group "TOTALIZERS" (page 62)
BATCHING	• Pulse between 3...30 V DC, at least for the duration of the start pulse width which has been set.	Batching cycle is started or stopped	See function group "BATCHING" (page 86). Interrupting a batching cycle by repeating a pulse.
ADJUST ZEROPOINT	• Pulse between 3...30 V DC, at least for the duration of the start pulse width which has been set.	Zero point calibration is started	—

Level mode

Assignment	Voltage at auxiliary input	Function	Remarks
DUAL RANGE MODE	• No voltage • Voltage between 3...30 V DC	Current output operates with FULL SCALE 1 Current output operates with FULL SCALE 2	This parameter is only available if the current output is available and the function "DUAL RANGE MODE" is set to "AUXILIARY INPUT". As long as the auxiliary input is set to "DUAL RANGE MODE", neither the current output can be switched off nor is dual range changed.
POSITIVE ZERO RETURN	• No voltage • Voltage between 3...30 V DC	Instrument operates normally All output signals are set to "zero" *(corresponds to no flow)*	See function group "SYSTEM PARAMETER" (page 99)
ZEROPOINT SELECT	• No voltage • Voltage between 3...30 V DC	Instrument operates with ZEROPOINT 1 Instrument operates with ZEROPOINT 2	See function group "SYSTEM PARAMETER" (page 99)

Function group
COMMUNICATION

START PULSE WIDTH	Certain functions of the auxiliary input are only started via a pulsed voltage (see page 94). In this function, you enter the minimum pulse width to be reached by the input pulse in order that the appropriate function is activated. Note! This function is only available if the Promass electronics are fitted with the communications module “RS 485” and if the auxiliary input is activated as well as appropriately configured. Max. 3-digit number, incl. units (20...100 ms) Factory setting: ***20 ms***
SYSTEM CONFIG.	In this function, the actual configuration of the communications module “RS 485” is shown: AUX.INP./CURRENT – AUX. INPUT/FREQ. – RS485/CURRENT – RS485/FREQ. Note! This function is only available if the Promass electronics are fitted with the communications module “RS 485” and can be altered only by E+H service personnel.

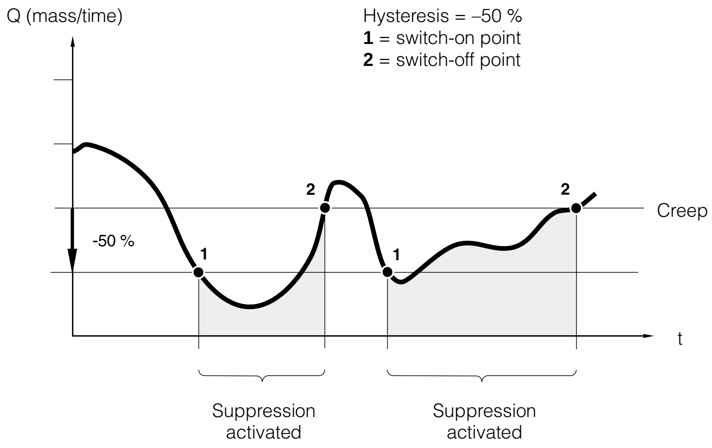
Note!

Note!

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 flowrate being registered in the lowest 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 can be reduced with respect to transient flows and interference peaks; e.g. with media containing solids or gas bubbles.

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. This function enables you to switch the signal outputs (incl. totaliser) to uni- or bidirectional mode as required:

- 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 density of the medium 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 EPS 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 "SMARTPLUS". Note! • Select "CYCLIC" for batching times > 60 s resp. for continuous measuring mode. • For further information see also on page 42 "Applications with pulsating flow" and on page 47 "Batching". ***CYCLIC*** – SMARTPLUS – CANCEL

Function group
PROCESSING PARA.

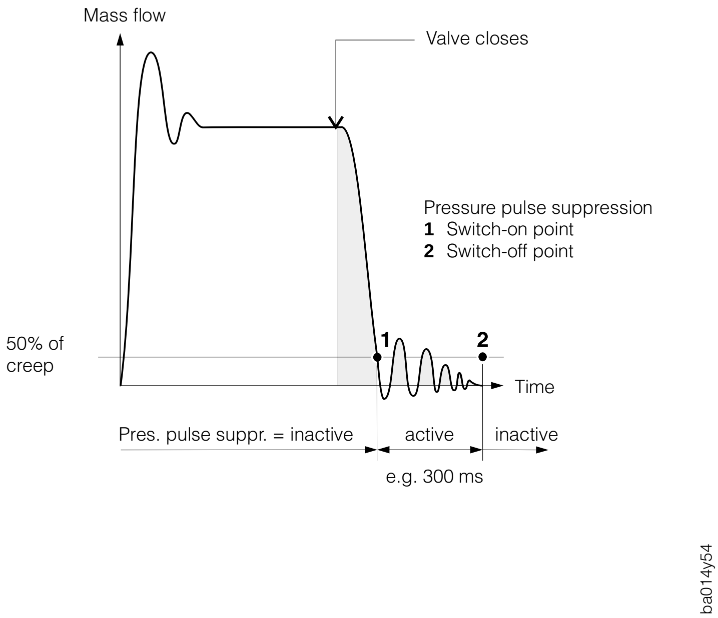
PRES. PULSE SUPPR.

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:

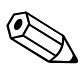
Switch-on point
Pressure pulse suppression is activated after the flow velocity falls below 50% of the creepage value (see page 96). The following applies during the pressure pulse suppression:

- Current output → is set to 0 mA or 4 mA
- Pulse/frequency output → at the fall back value
- 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.

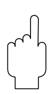


Max. 4-digit number, incl. units (0.00...10.00 seconds)
Factory setting: ***0.00 s***



Note!

Note!
- When using the pressure pulse suppression, the low flow cutoff must be set to a value > 0.
- When using the batch compensation mode (see page 48), the pressure pulse suppression function must be set to 0 ms.
  The two functions cannot be used in combination with each other.



Caution!

Caution!
For batching applications, always select the time interval for pressure pulse suppression to be smaller than the set time interval between batching cycles. This ensures that there is no positive zero return in the start phase of a filling cycle.

Function group
SYSTEM PARAMETER

SELECT ZEROPOINT

According to the application (medium characteristics) the zero point of Coriolis mass flowmeters can be shifted slightly. This function enables you to select two different (previously calibrated) zero points.
Additionally you can determine for which zero point (1 or 2) a new calibration is to be done.

Note!
- Zero point calibration is described in detail on page 56.
- If the Promass 63 measuring electronics are fitted with a communications module "RS 485", then both zero points can also be activated using the auxiliary input as required (see page 93).
  The auxiliary input has priority over the input in this function.

ZEROPOINT 1 – ZEROPOINT 2 – CANCEL

Display showing the current zero point used by the measuring system.

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 page 56 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.
- If the Promass 63 measuring electronics are fitted with a communications module "RS 485", then the zero point can also be activated using the auxiliary input as required (see page 93).

CANCEL – START

Display showing the current zero point value used by the measuring system.

Function group

SYSTEM PARAMETER

POS. ZERO RETURN	This function enables signals to be set from the current and pulse/frequency output to the fallback value, e.g. for interrupting the measurement for cleaning the piping. • Current output → set to 0 mA or 4 mA • Pulse/frequency output → at the fallback value • Display flow = 0 • Both totalisers remain at the last applicable value. • Temperature and density values are still shown. Note! • This function has top priority above 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". • During positive zero return both relays (1 and 2) are live, i.e. energised. Any error messages occurring (fault, alarm) can then only be called up using the diagnosis function or in the function "PRESENT SYSTEM CONDITION". These do not, however, affect the outputs. • If the Promass 63 measuring electronics are fitted with a communications module "RS 485", then positive zero return can also be activated using the auxiliary input (see page 93). ***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***

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 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 100) 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 107 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 107 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 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.

Note!

Note!

Note!

Function group
SYSTEM PARAMETER

SW–VERION 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. 00 HART / 2 CUR. / RS 485

- HART / 2 CUR. / RS 485: Type of communication board
  - – HART interface
  - – 2 current outputs (2 CUR.)
  - – RS 485 interface
- 00: Number changes if minor alterations are made to the new software. This also applies to special versions of software.
- 02: Number changes if the new software contains additional functions.
- 3: Number changes if basic alterations have to be made to the software, e.g. owing to technical modifications to the instrument.

SYSTEM RESET

With this function the Promass 63 can be restarted without the power supply being switched off and on again.

Note!

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
- relay output
- current output
- frequency output

+/- Range: 0...100 seconds (in one second steps)
Factory setting: ***0 s***

Caution!

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.

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 on page 56. +/- 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 87) can alter the calibration values C0, C1, C2, C3, C4 and C5. +/- CANCEL — By selecting “CANCEL” and confirming with E you jumb 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 jumb back to the options by pressing E.

Caution!

Note!

Caution!

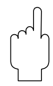
Function group **SENSOR DATA**	
SERIAL NUMBER	In this function the serial number of the sensor is shown: 6-digit number (100000...999999).
SW–VERSION	In this function, the current software is shown which is installed on the amplifier board. The numbers of the software version have the following meaning: V 4 . 00 . 00 A / M / I / F A / M / I / F: Type of Promass sensor (see page 9) Last "00": Number changes if minor alterations are made to the new software. This also applies to special versions of software. Middle "00": Number changes if the new software contains additional functions. "4": Number changes if basic alterations have to be made to the software, e.g. owing to technical modifications to the instrument.

8 Diagnosis and Trouble-shooting

8.1 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 107). • Relay 1 → de-energised if configured for "FAILURE" (see page 82). • Signal outputs respond according to set failure mode (see pages 71 and 77).
Alarm (process errors) Errors due to process conditions	• An appropriate alarm message is shown on the display (see page 111). • Response of relay 1 and 2 → according to configuration, see page 82 and 83.


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".
- During positive zero return both relays (1 and 2) are live, i.e. energised. Any error messages occurring (fault, alarm) can then only be called up using the diagnosis function or in the function "PRESENT SYSTEM CONDITION". These do not, however, affect the outputs.

Simulation
- This function has the second highest priority. Specific status messages can still only be called up and shown using the diagnosis function.
- Normal output of system errors if Relay 1 is configured for "FAILURE".
- Normal function also from Relay 2 (according to configuration).

8.2 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 description below to identify possible causes.

Error type	Remedy
• No indication on the display • No output signal	1. Check the power supply at 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 113)
• Poor contrast on the display, output signals functioning correctly	1. Check connector No. 3b (see p. 113) 2. Replace display 3. Replace electronics module (see page 113)
• No understandable language on the display	a) Switch off the power supply of the instrument 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 or pulse output despite a message on the display	1. Check connector No. 8 (see p. 113) 2. Replace electronics module (see page 113)
• Flow and density display unsteady with continuous flow	See Note on page 112
• Error, alarm or status messages shown which are not described in Section 8.3	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 information is required.

- Short description of the error
- Order code as stated on the nameplate

When returning the instrument, the following information is required.

- Delivery note
- Description of the error

When ordering an electronic module, the following information is required.

- Order code for electronic 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

8.3 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.
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. 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. 36, page 113) 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.

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.
F: SYSTEM ERROR AMPLIFIER	**10**	**: TEMP. CIRCUIT FAILURE** Temperature switching of the amplifier is defective.	1. Check Connection No. 5 (see Fig. 36, on Page 113). 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 (siehe Abb. 36, Seite 113) 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.
F: NO AMPLIFIER RESPONSE	**24**	**: NO DIAGNOSIS** Data transfer between amplifier and communications module is not possible.	1. Check Connection No. 5 (see Fig. 36, page 113) 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
F: SYSTEM ERROR AMPLIFIER	**35**	**: HW-VERSION INCOMPATIBLE**	Replace the electronics module
F: SYSTEM ERROR AMPLIFIER	**36**	**: SW-VERSION INCOMPATIBLE**	Replace the electronics module
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.

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.
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.
F: SYSTEM ERROR COM-MODULE	**27**	**: RAM FAILURE** Error on access to working memory (RAM).	Replace the electronics module.
F: SYSTEM ERROR COM-MODULE	**28**	**: ROM FAILURE** Error on access to program memory (ROM).	Replace the electronics module.
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.
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.
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.

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.
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.
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.
F: SYSTEM ERROR COM-MODULE	**40**	**: SW-TYPE REPLACED**	Replace the electronics module.
F: SYSTEM ERROR COM-MODULE	**41**	**: SW-DOWNGRADE NOT POSSIBLE**	Replace the electronics module.

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. 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 down-stream 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 down-stream 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 (see p. 97, 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, see page 97.
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 (see page 56)
A: **CURRENT OUTPUT OVERFLOW**	**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 67, 68 ff.) or change measured variable. 2. Refer to notes on trouble-shooting.
A: **CURRENT OUTPUT 2 OVERFLOW** (with COM-Modul "2 CUR")	**73**	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 67, 68 ff.) or change measured variable. 2. Refer to notes on trouble-shooting.

Alarm message A: (Processor error)	**Alarm code**	**Cause**	**Remedy**
A: FREQ. OUTPUT OVERFLOW	**74**	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 page 75 ff.) 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
A: BATCH TIME EXCEEDED	**76**	The maximum time for a batch cycle has been exceeded.	1. Identify the cause for exceeding the time provide (see page 86). 2. Possible plant error (defective or blocked valve).
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 p. 100). 2. For instruments with "RS 485" interface configurated for auxiliary input (see page 19), switch off the power supply at Terminals 20 / 21 (see page 94).
S: FREQ. OUTPUT SIMUL. ACTIVE	**98**	Frequency output simulation is activated.	Switch off the frequency output simulation (see p. 77).
S: CURRENT OUTPUT SIMUL. ACTIVE	**101 or 102**	Current output simulation is activated. 101 = current output 1 102 = current output 2 (only with COM-Modul "2 CUR")	Switch off the current output simulation (see page 71).
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).

8.4 Replacing the transmitter electronics

Warning!
- Danger from electric shock! Switch off the power supply before opening the electronics 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 grip (3 mm Allen key).

❷ Unscrew the cover of the electronics area of the transmitter housing.

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 catch 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.

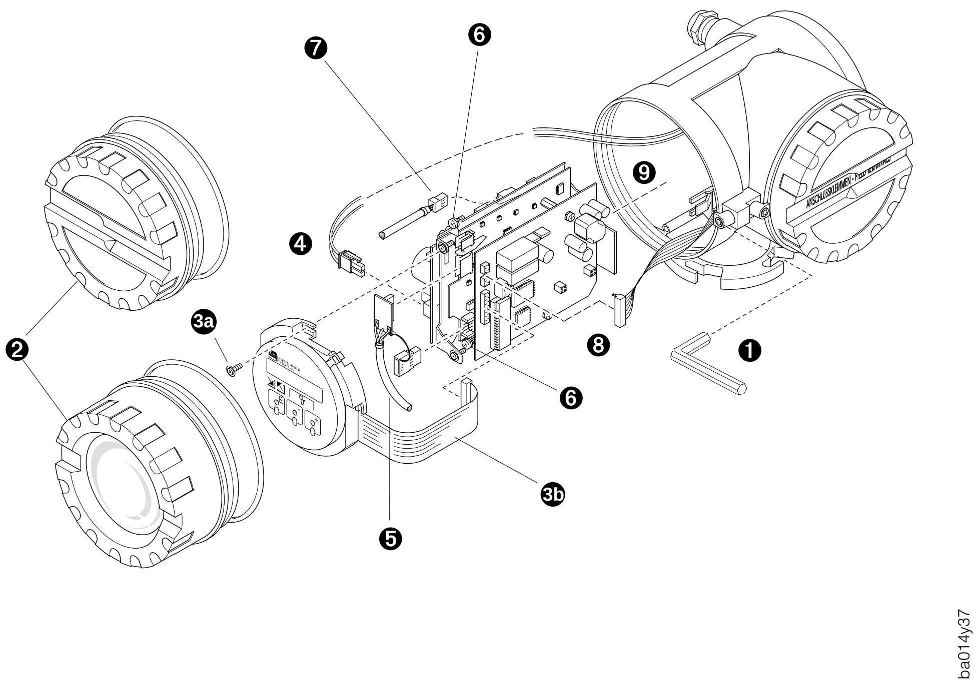


Fig. 36
Replacing the Promass 63 transmitter electronics

8.5 Replacing the fuse


Warning!

Warning!
- Danger from 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 inthe terminal compartment (see page 18 ff.).
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 x 20 mm

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

9 Dimensions

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

Note!

9.1 Dimensions Promass 63 A

Compact version

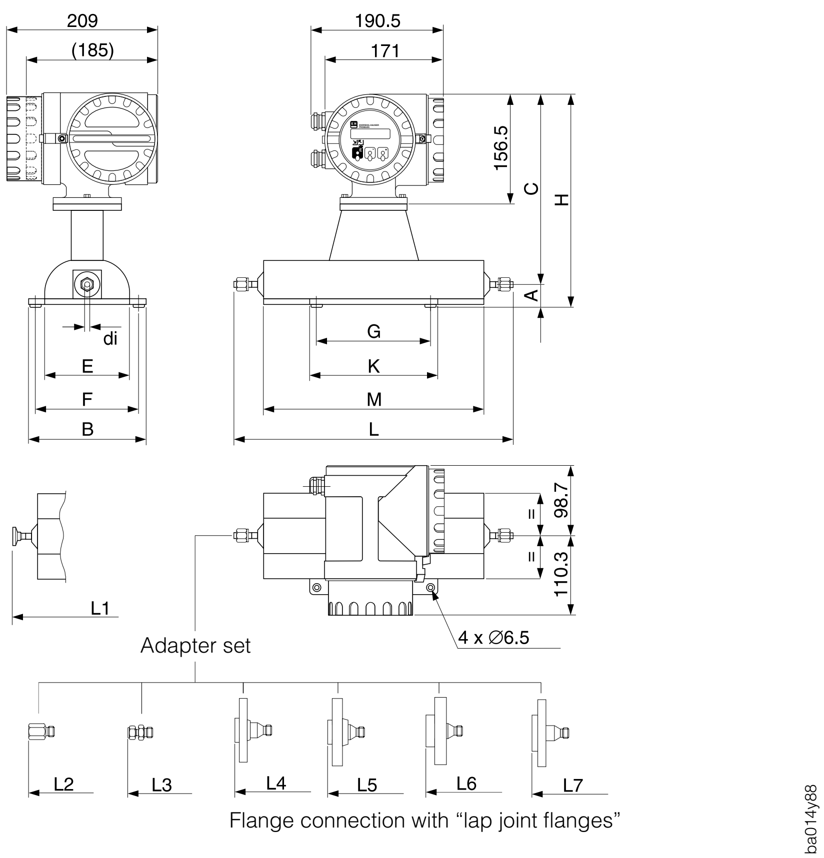


Fig. 37
Dimensions Promass 63 A
Compact version

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: 1/8"	L4 1/2" flange (ANSI) Cl 150	L5 Cl 300	L6 DN 15 flange (DIN, JIS) PN 40	L7 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

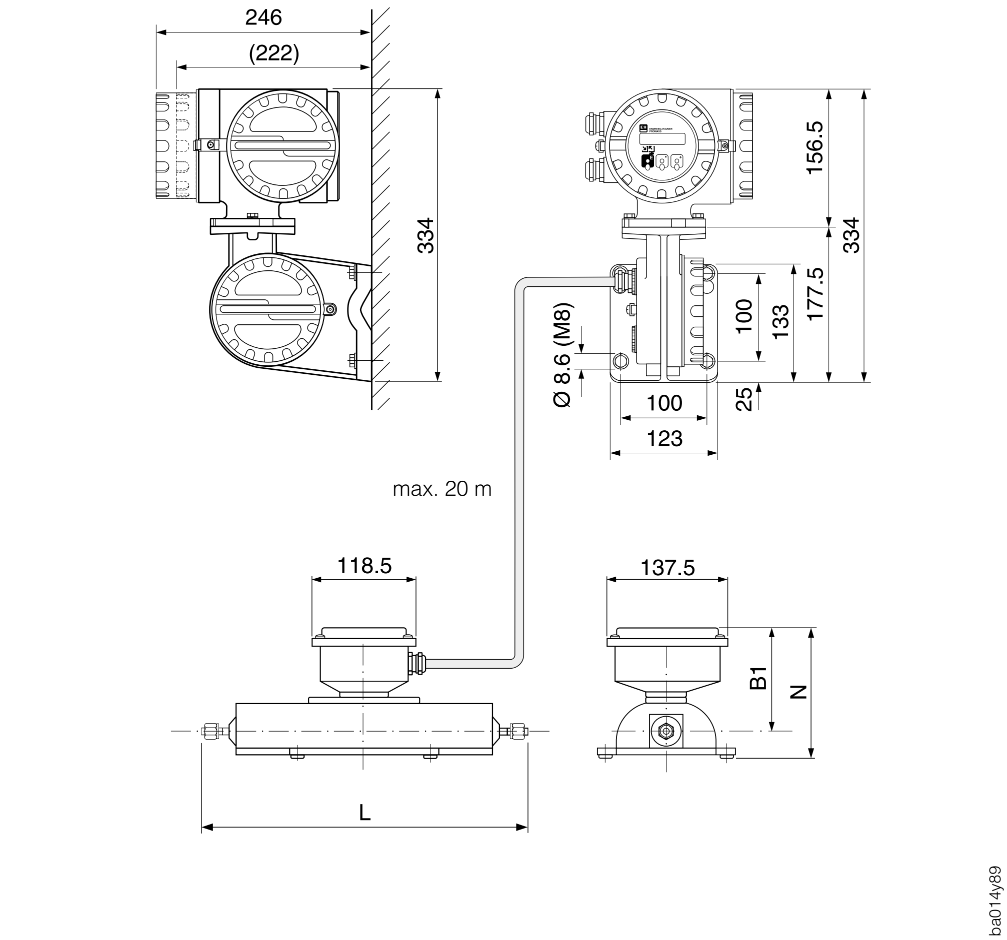


Fig. 38
Dimensions Promass 63 A
Remote version

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

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), EPDM (–40...+160 °C), Silicone (–60...+200 °C), Kalrez (–30...+210 °C)

9.2 Dimensions Promass 63 I

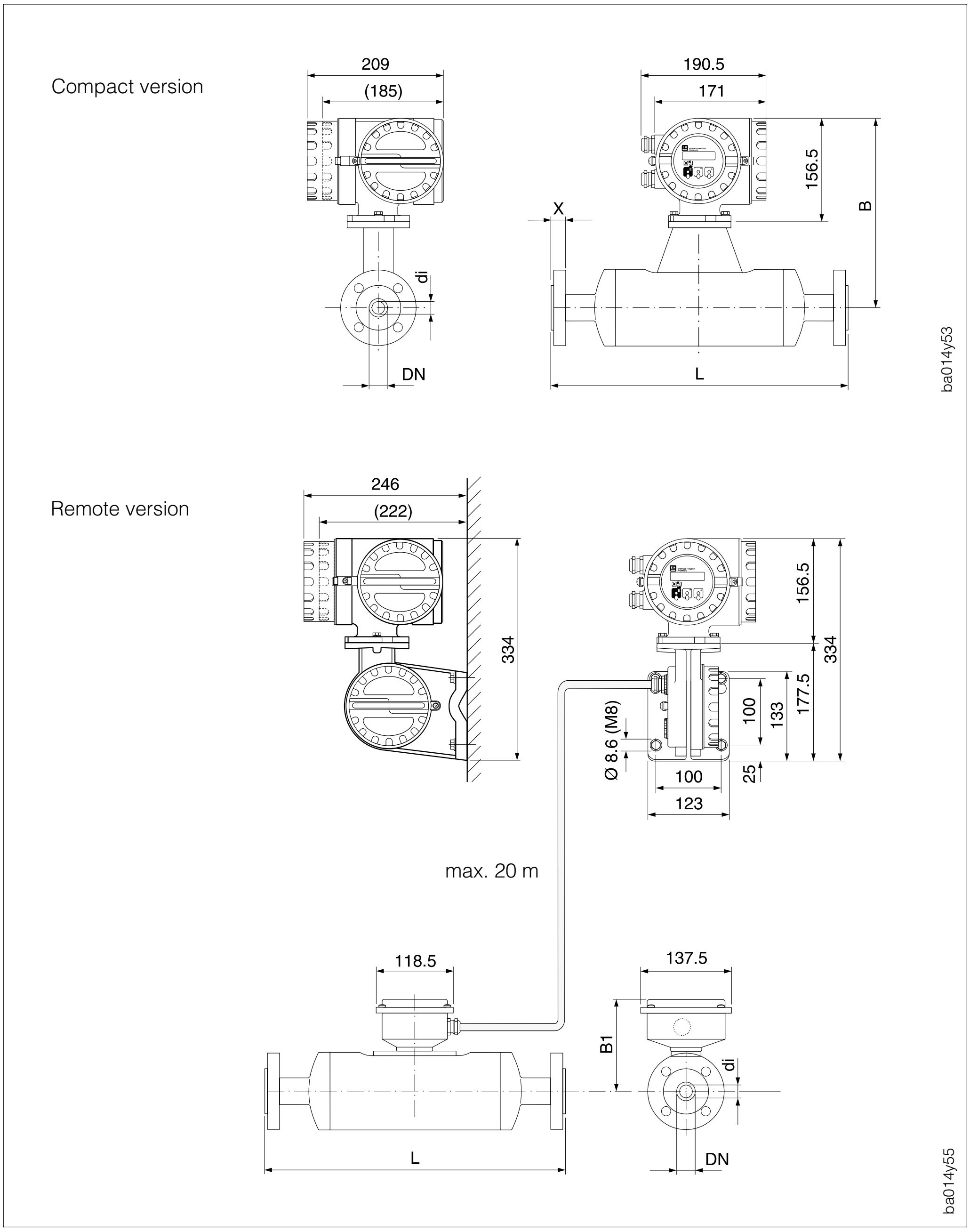


Fig. 39
Dimensions Promass 63 I

Diameter DIN	ANSI	L	x	B [mm]	B1 [mm]	di [mm]	Weight [kg]
DN 8	3/8"	Dimensions dependent on process connections (see page 122 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 15, 25, 40 “FB” = Full bore versions of Promass I;
DN 8: with DN 15 flanges as standard;
All weights stated are those for the compact version

9.3 Dimensions Promass 63 M

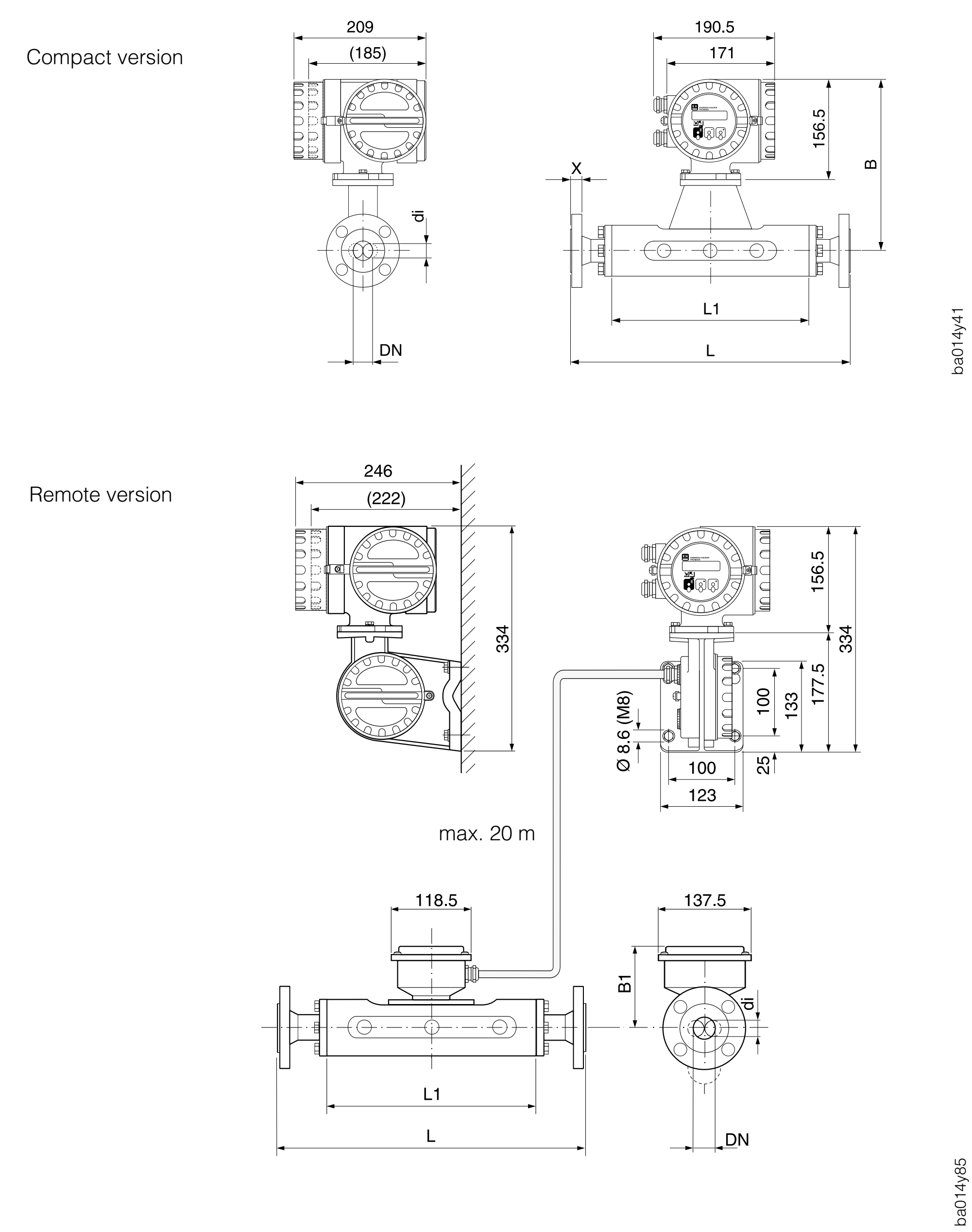


Fig. 40
Dimensions Promass 63 M

Diameter DIN	ANSI	L	x	L1	B [mm]	B1 [mm]	di [mm]	Weight [kg]
DN 8	3/8"	Dimensions dependent on process connections (see page 122 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

9.4 Dimension Promass 63 M (high pressure)

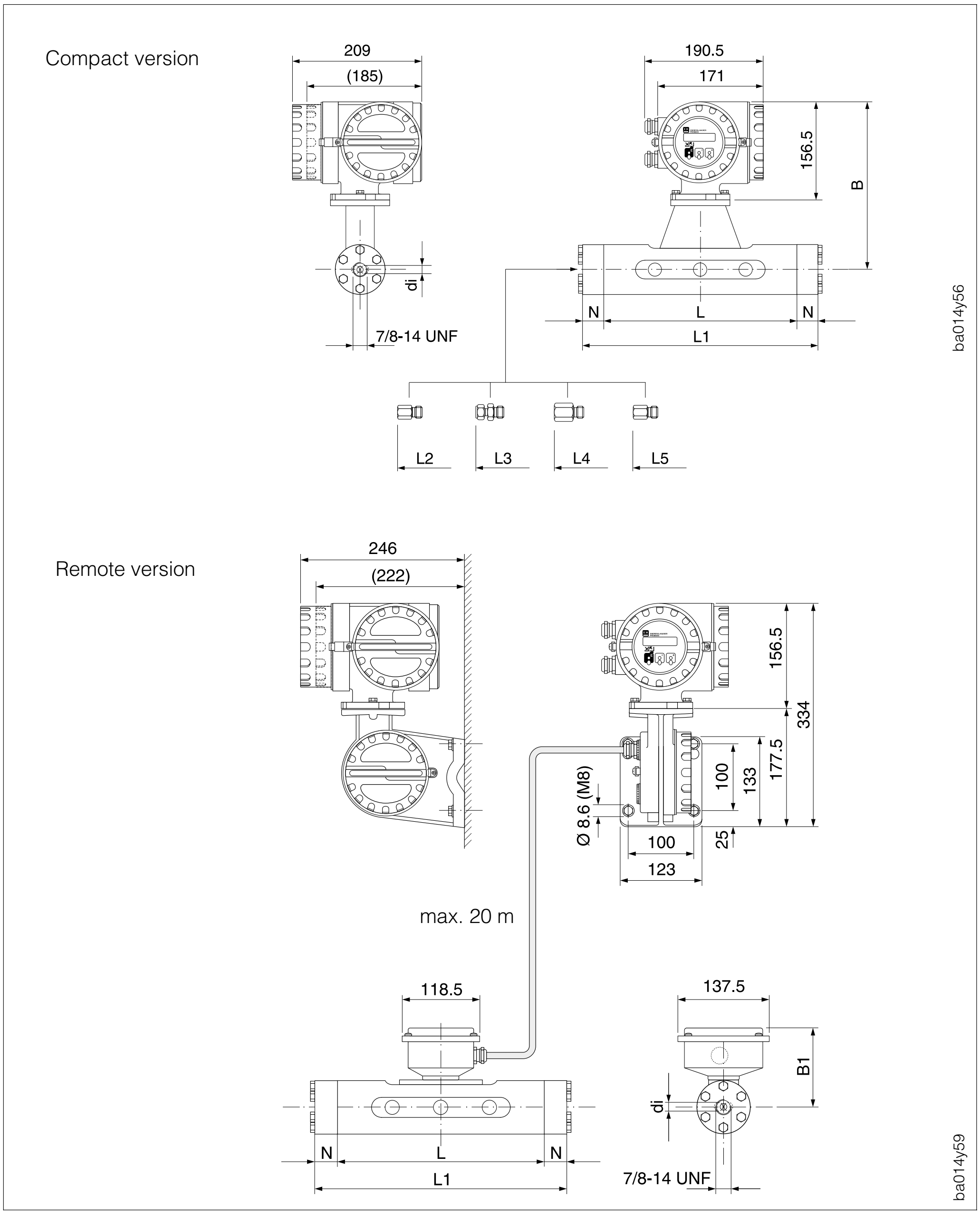


Fig. 41
Dimensions Promass 63 M (High pressure version)

Process connection	N	L	L1	L2	L3	L4	L5
		without	with	G $^{3}/_{8}$"	VCO with $^{1}/_{2}$" SWAGELOK	$^{1}/_{2}$" NPT	$^{3}/_{8}$" NPT
		connector		[mm]	[mm]	[mm]	[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	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

9.5 Dimensions Promass 63 M (without process connection)

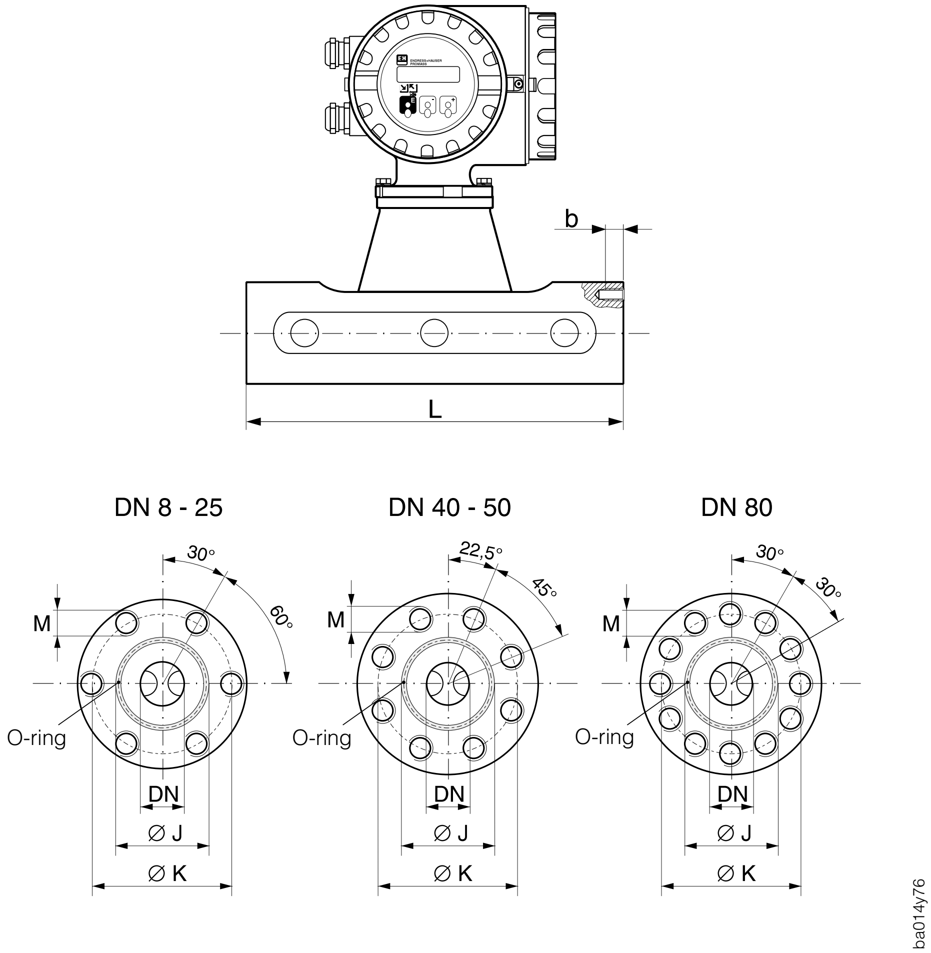


Fig. 42
Dimensions Promass 63 M without process connections

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

9.6 Dimensions Promass 63 F

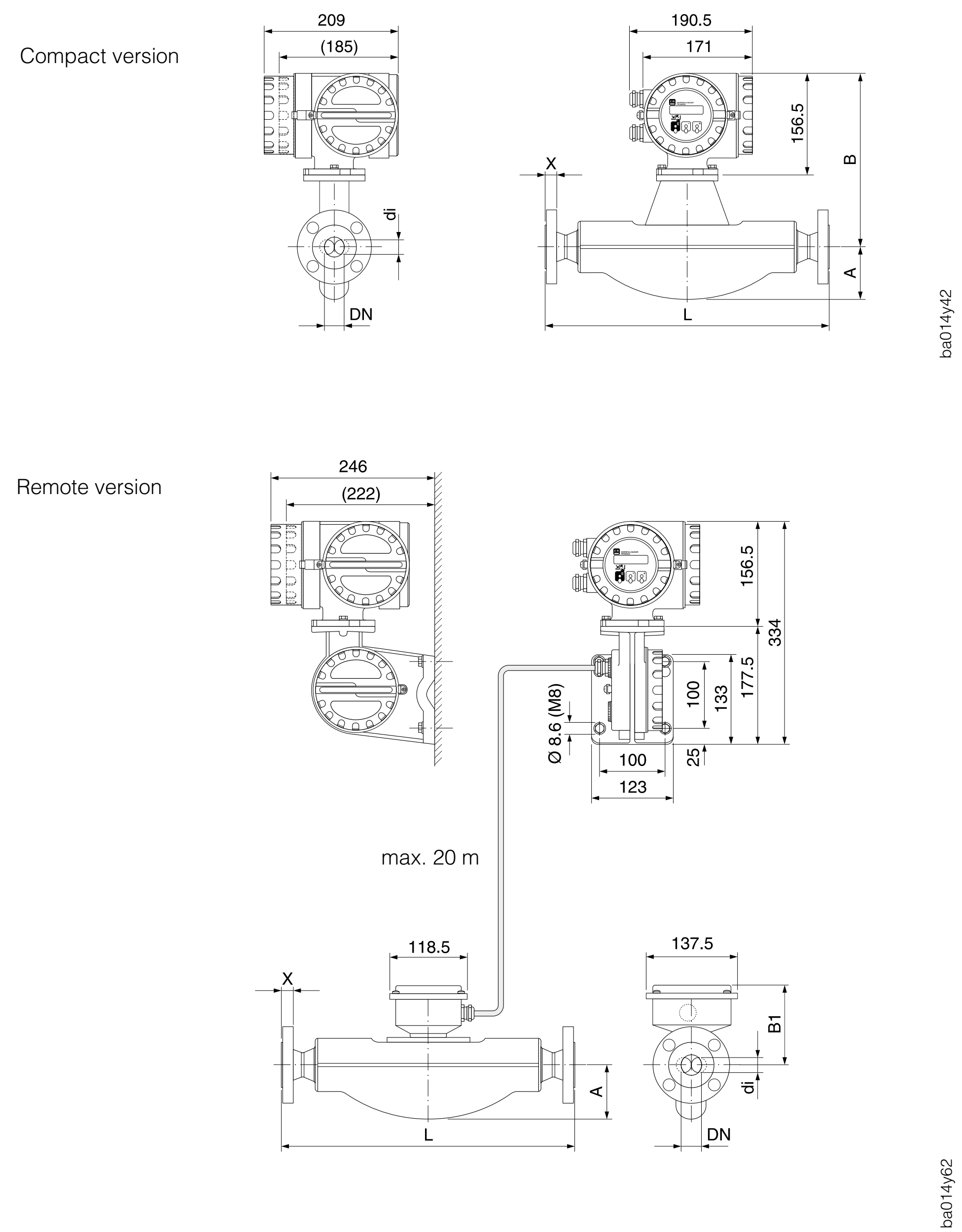


Fig. 43
Dimensions Promass 63 F

Diameter DIN	Diameter ANSI	L	x	A [mm]	B [mm]	B1 [mm]	di [mm]	Weight [kg]
DN 8	$^3/_8$"			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	$1^1/_2$"	Dimensions dependent on process connections (see page 122 ff.)		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 150 **	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

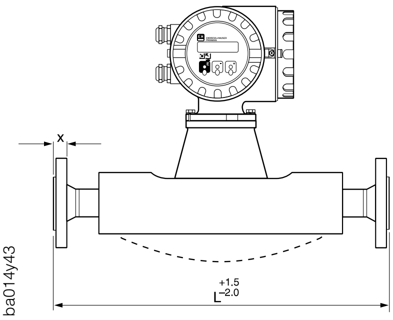
9.7 Dimensions: process connections Promass 63 I, M, F

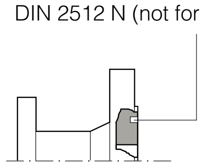
DIN 2501 process connections

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





Promass I

Nennweite	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 versions of Promass I

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 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: nominal diameter DN 80 with DN 100 flanges;
**** DN 150: nominal diameter DN 100 with DN 150 flanges

Fig. 44
Dimensions
DIN process connections

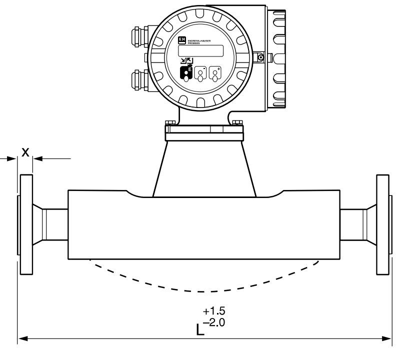
ANSI B 16.5 process connections

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

ba014y45



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

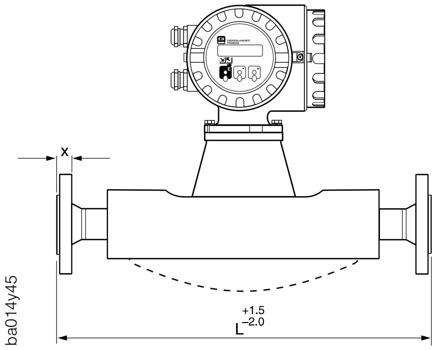
Fig. 45
Dimensions
ANSI process connections

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	402	25	402	28
DN 15	–	–	438	20	438	25	438	28
DN 15 *	–	–	572	19	578	26	578	29
DN 25	–	–	578	23	578	27	578	30
DN 25 *	–	–	700	22	706	29	706	32
DN 40	–	–	708	26	708	30	708	36
DN 40 *	–	–	819	24	825	31	825	37
DN 50	827	28	827	28	827	32	832	40

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

Promass M, F

	10K		20K		40K		63K	
Diameter	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	–	–	–	–	–	–

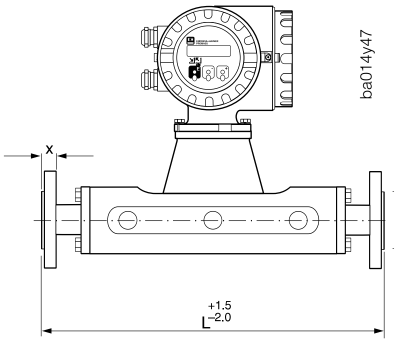
DN 8: with DN 15 flanges as standard; Nominal diameter DN 100: only for Promass F available;
** DN 100: nominal diameter DN 80 with DN 100 flanges;
*** DN 150: nominal diameter DN 100 with DN 150 flanges;

Fig. 46
Dimensions
JIS process connections

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

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

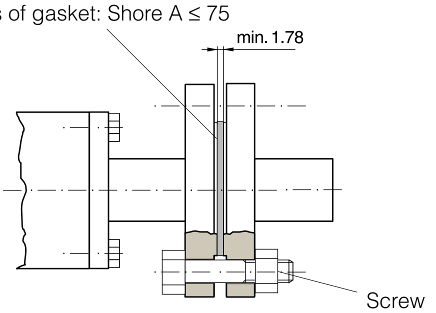
Flange material: PVDF
Gasket material: O-rings in Viton (–15...+200 °C), Kalrez (–30...+210 °C), Silicone (–60...+200 °C), EPDM (–40...+160 °C)



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!

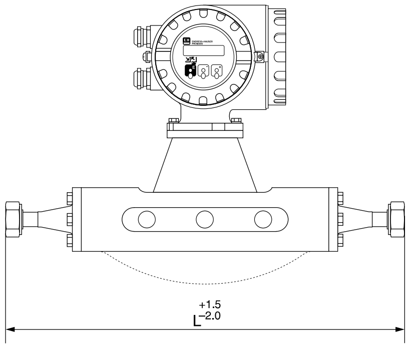
Fig. 47
Dimensions and screw tightening torques PVDF process connections

Dimensions Process Connections according to VCO

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

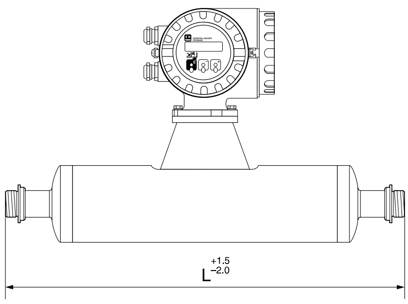
Promass M
Process connection materials: SS 1.4404 (316L)
Gasket materials: O-rings in Viton (–15...+200 °C), Kalrez (–30...+210 °C), Silicone (–60...+200 °C), EPDM (–40...+160 °C)

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



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. 48
Dimensions
VCO-process connection
(Promass M, F)



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

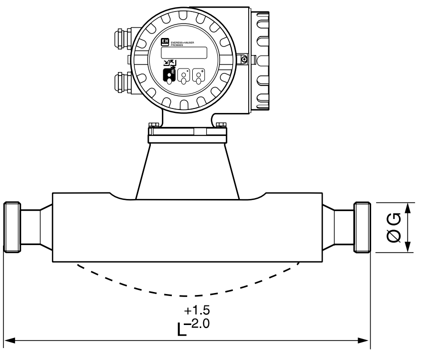
Fig. 49
Dimensions
VCO-process connection
(Promass I)

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)



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;
* 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

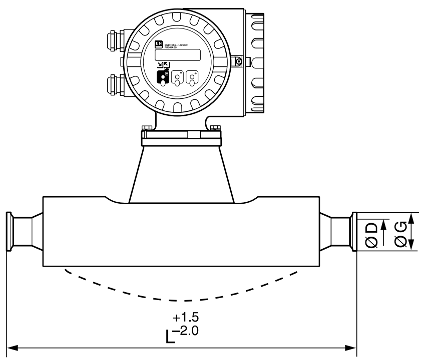
Fig. 50
Dimensions
Hygienic coupling
DIN 11851 / SMS 1145

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)



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;
* DN 100 / 4": 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. 51
Dimensions Tri-Clamp

9.8 Dimensions of purge connections (pressure vessel monitoring)

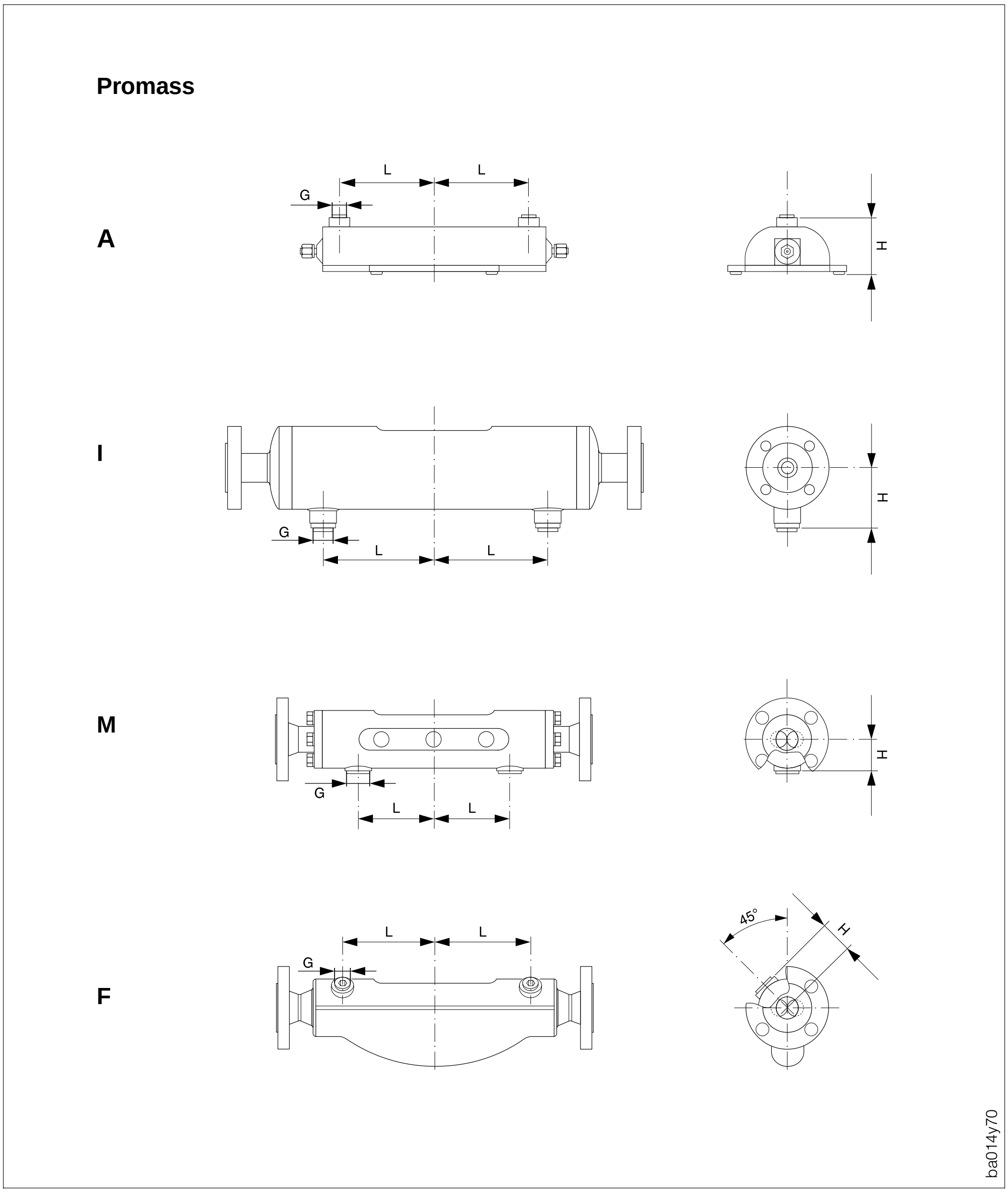


Fig. 52
Dimensions of purge connections (pressure vessel monitoring)

Diameter		Promass A		Promass I		Promass M		Promass F		Connec-tion
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;

10 Technical Data

Application	
Instrument name	Flow measuring system “Promass 63”
Instrument function	Mass and volumetric flow measurement of liquids and gases in closed pipings.
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, 80 (completely welded version) Straight single tube system in titanium DN 15 “FB”, DN 25 “FB”, DN 40 “FB”: Full bore versions of Promass I 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, see p. 7) • Fluid density (is proportional to the resonance frequency of the measuring tubes) • Fluid temperature (is measured with temperature sensors)
Measuring range	(see table below)

Measuring range

DN [mm]	Range for full scale values: Liquid $\dot{m}_{min(L)} \ldots \dot{m}_{max(L)}$	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:
2	0...100.0 kg/h	
4	0...450.0 kg/h	$\dot{m}_{max(G)} = \frac{\dot{m}_{max(L)} \cdot \rho_{(G)}}{x \cdot 1.6}$
8	0... 2.0 t/h	
15	0... 6.5 t/h	$\dot{m}_{max(G)}$ = Full scale value gas [t/h]
15 *	0... 18.0 t/h	
25	0... 18.0 t/h	$\dot{m}_{max(L)}$ = Full scale value liquid [t/h] (value from table)
25 *	0... 45.0 t/h	
40	0... 45.0 t/h	$\rho_{(G)}$ = gas density [kg/m^3] (at operating condition)
40 *	0... 70.0 t/h	
50	0... 70.0 t/h	x = constant [kg/m^3]
80	0...180.0 t/h	Promass A x = 20
100	0...350.0 t/h	Promass I, M, F x = 100

* 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 131) Gas: Air with a density of 60.3 kg/m³ (at 20°C and 50 bar) $\dot{m}_{max(G)} = \frac{\dot{m}_{max(L)} \cdot \rho}{x \cdot 1.6} = \frac{70.0 \cdot 60.3}{100 \cdot 1.6} = 26.4$ 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.
Auxiliary input (with RS 485 board only)	U = 3...30 V DC, R_i = 1.8 kΩ, pulsed or level mode Configurable for: totaliser reset, batching, zero point adjustment, zero point selection, positive zero return or full scale switching (see p. 94).
Output variables	
Output signal	• *Relay output 1* max. 60 V AC / 0.5 A or max. 30 V DC / 0.1 A Either NC or NO via a jumper available (factory setting: NO) Configurable for: error message (failure), empty pipe detection, full scale switching, batch precontact, flow direction, limit value • *Relay output 2* max. 60 V AC / 0.5 A or max. 30 V DC / 0.1 A Either NC or NO via a jumper available (factory setting: NC) Configurable like relay 1 except "failure" and "batch contact" • *Current output 1/2* 0/4...20 mA (also acc. to NAMUR recommendations); R_L < 700 Ω freely assignable to different measured values, time constant freely selectable (0.01...100.00 s), full scale value selectable, temperature coefficient typ. 0.005% o.f.s./°C, HART protocol via current output 1 only (o.f.s. = of full scale) • *Pulse/Frequency output* freely assignable to one flow variable, active/passive selectable, active: 24 V DC, 25 mA (250 mA during 20 ms), R_L > 100 Ω, passive: 30 V DC, 25 mA (250 mA during 20 ms) – *Frequency output:* f_{End} selectable up to 10 kHz, On/off ratio 1:1, pulse width max. 10 s – *Pulse output:* pulse weighting adjustable, pulse polarity adjustable, pulse width adjustable (50 ms...10 s) above a frequency of $^1/_{(2 \times \text{pulse width})}$ the on/off ratio is 1:1
Signal on alarm	The following applies until the fault has been cleared: • Current output → failure mode selectable • Pulse/frequency output → failure mode selectable • Relay 1 → de-energised if configured to "FAILURE" • Relay 1 / 2 → de-energised on power supply failure
Load	R_L < 700 Ω (current output)
Low flow cutoff (Creep supression)	Switch points for low flow selectable (see page 96). 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 (or special density calibration)

Accuracy (continued)

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 pulse/frequency output.
- 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	0.100	0.200
15	6500	0.325	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 density 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 on page 133)

Example for calculating the 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 ± 0.0005 g/cc (1 g/cc = 1 kg/l)
  Promass I ± 0.001 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 on installation 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 fluid 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 to be 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)
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...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 030 D/06/en for Promass 63.
Pressure loss	dependent on nominal diameter and sensor type (see page 138 ff.)

Caution!

Mechanical construction	
Design / Dimensions	see page 115 ff.
Weights	see page 115, 117-121
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 (304) 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 (304) • *Process connections:* Promass A – see page 115 Promass M (high pressure) – see page 119 Promass I, M, F – see page 122–128 • *Measuring tubes* Promass A: SS 1.4539 (904L), Alloy C-22 2.4602 (N 06022) Promass I: titanium Grade 9 Promass M: (DN 8...50) titanium Grade 9, (DN 80) titanium Grade 2 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 122 - 128 Promass M: Silicone, Viton (for high pressure version)
Process connections	Promass A: *Welded process connections:* 4-VCO-4 fittings, $^{1}/_{2}$" Tri-Clamp *Screw-on process connections:* Flanges (DIN 2501, ANSI B16.5, 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:* Hygienic coupling DIN 11851 / SMS 1145, Tri-Clamp Promass M: *Screw-on process connections:* 8-VCO-4 fittings, 12-VCO-4 fittings, Flanges (DIN 2501, ANSI B16.5, JIS B2238) *Sanitary connections:* Hygienic coupling DIN 11851 / SMS 1145, Tri-Clamp 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:* Hygienic coupling DIN 11851 / SMS 1145, Tri-Clamp
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. Is the instrument equipped with identical outputs (e.g. 2 current outputs), then these outputs are not galvanically isolated from each other. – DoS version: The connecting cable between the Promass sensor and the “Procom DZL 363” transmitter is galvanically connected to its power supply. • *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 29)
Display	LC-display, illuminated, double-spaced with 16 characters each
Communication	• Rackbus RS 485 interface (Rackbus protocol) • SMART protocol (HART protocol via current output 1) • PROFIBUS PA; direct or via Commuwin II • DoS and Dx interface for connecting to the “Procom DZL 363” transmitter (see page 20)
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 or • power supplied by the multifunctional “Procom DZL 363” transmitter (DoS version), 40...55 V DC, galvanically connected to the power supply of Procom DZL 363.
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	Information on presently available Ex versions (e.g. CENELEC, SEV, 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 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. 50077972 DN 4: Order No. 50079218 • Post mounting set for remote transmitter housing: Order No. 50076905
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 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 flowrate. 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 flowrate [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

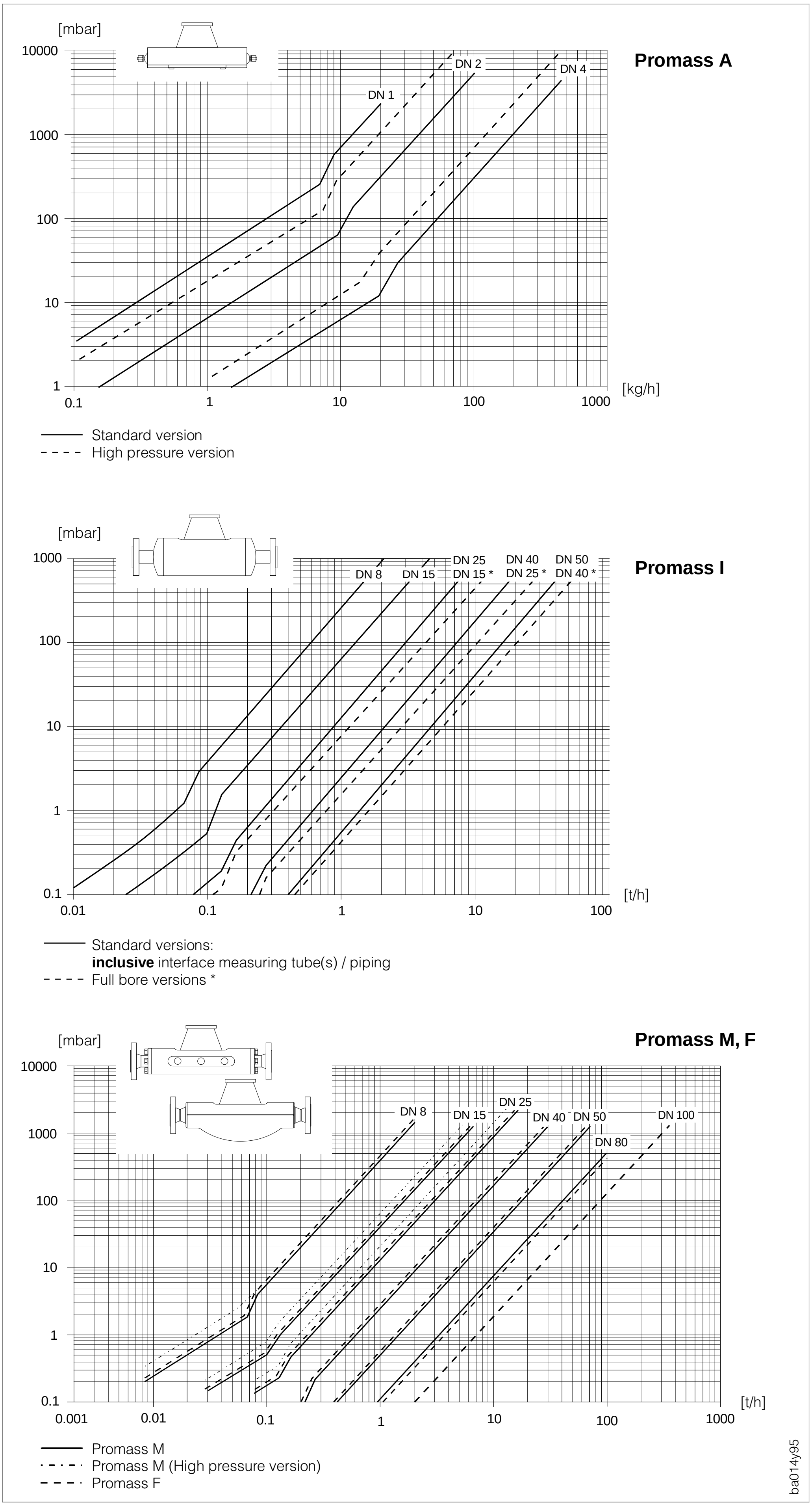


Fig. 53
Pressure loss with water

Density Calculation / °Brix

Density of hydrous saccharose solution in kg/m³								
°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.

11 Functions at a glance

PROCESS VARIABLE	
MASS FLOW (p. 60)	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 (p. 60)	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.)
STD. VOLUME FLOW (p. 60)	Display: 5-digit number with floating decimal point, incl. units and arithmetical sign (e.g. 1.3459 Nm^3/h; 7.9846 scm/day; etc.)
TARGET FLOW (p. 60)	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.)
CARRIER FLOW (p. 61)	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.)
DENSITY (p. 61)	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 (p. 61)	Display: 5-digit number with fixed decimal point, incl. units (e.g. 76.409 °Brix; 39.170 %v; 1391.7 kg/Nm^3; etc.)
TEMPERATURE (p. 61)	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.)

TOTALIZER	
TOTALIZER 1 (p. 62)	Display: max. 7-digit number with floating decimal point, incl. engineering units (e.g. 1.546704 t; -4925.631 kg)
TOTALIZER 1 OVERFLOW (p. 62)	Display: Integer to a decimal power (e.g. 10 e7 kg)
TOTALIZER 2 (p. 62)	Display: max. 7-digit number with floating decimal point, incl. engineering units (e.g. 1.546704 t; -4925.631 kg)
TOTALIZER 2 OVERFLOW (p. 62)	Display: Integer to a decimal power (e.g. 10 e7 kg
RESET TOTALIZER (p. 63)	***CANCEL*** – TOTALIZER 1 – TOTALIZER 2 – TOTALIZERS 1&2 Your setting: ....
ASSIGN TOTAL. 1 (p. 63)	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. Your setting: ....
ASSIGN TOTAL. 2 (p. 63)	***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. Your setting: ....

SYSTEM-UNITS	
MASS FLOW UNIT (p. 64)	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. 64)	g – ***kg*** – t – lb – ton – CANCEL Your setting: ....
VOLUME FLOW UNIT (p. 64)	cm^3/min – cm^3/h – dm^3/s – dm^3/min – ***dm³/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. 64)	cm^3 – ***dm³*** – l – hl – m^3 – cc – gal – bbl – CANCEL Your setting: ....
GALLONS / BARREL (p. 65)	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. 65)	Nl/s – Nl/min – Nl/h – Nl/d – Nm^3/s – ***Nm³/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. 65)	***Nm³*** – Nl – scm – scf – CANCEL Your setting: ....
DENSITY UNIT (p. 66)	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 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 “GALLONS / BARREL” funktion Your setting: ....
STD. DENSITY UNIT (p. 66)	***kg/Nm³*** – kg/Nl – g/scc – kg/scm – lb/scf – CANCEL Your setting: ....
TEMPERATURE UNIT (p. 66)	***°C (CELSIUS)*** – K (KELVIN) – °F (FAHRENHEIT) – °R (RANKINE) – CANCEL Your setting: ....
NOM. DIAM. UNIT (p. 66)	***mm*** – inch – CANCEL Your setting: ....

CURRENT OUTPUT 1 / CURRENT OUTPUT 2	
ASSIGN OUTPUT (p. 67)	OFF – ***MASS FLOW*** – VOLUME FLOW – STD. VOLUME FLOW – TARGET FLOW – CARRIER FLOW – ***DENSITY **** – CALC. DENSITY – TEMPERATURE – CANCEL * Factory setting for current output 2 Your setting: ....
ZERO SCALE (p. 67)	5-digit number with floating decimal point (e.g. 0.000 kg/h; 245.92 kg/m^3; 105.60 °C) Massflow: ***0.0000 kg/h*** Density: ***0.0000 kg/l*** Temperature: ***–50.000 °C*** Your setting: ....
FULL SCALE 1 (p. 68)	5-digit number with floating decimal point, depending on the variable (e.g. 566.00 kg/min; 0.9956 kg/dm^3; 105.60 °C; etc.) Massflow: ***dependent*** on the diameter Density: ***2.0000 kg/l*** Temperature: ***200.00 °C*** Your setting: ....
DUAL RANGE MODE (p. 69)	***FULL SCALE 1*** – FULL SCALE 2 – AUTOMATIC – AUXILIARY INPUT – CANCEL Your setting: ....
FULL SCALE 2 (p. 70)	5-digit number with floating decimal point, depending on the variable (e.g. 566.00 kg/min; 0.9956 kg/dm^3; 105.60 °C; etc.) Massflow: ***dependent*** on the nominal Density: ***2.0000 kg/l*** Temperature: ***200.00 °C*** Your setting: ....
ACTIVE RANGE (p. 70)	Display: ***FULL SCALE 1*** – FULL SCALE 2
TIME CONSTANT (p. 70)	3- to 5-digit number with fixed decimal point (0.01...100.00 s) Factory setting: ***1.00 s*** Your setting: ....
CURRENT SPAN (p. 70)	0–20 mA (25 mA) – 4–20 mA (25 mA) – 0–20 mA – ***4–20 mA*** – CANCEL Your setting: ....

CURRENT OUTPUT 1 / CURRENT OUTPUT 2	
FAILSAFE MODE (p. 71)	***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 Your setting: ....
SIMULATION CURR. (p. 71)	***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 Your setting: ....
NOMINAL CURRENT (p. 71)	Display: 3-digit number with floating decimal point (0.00...25.0 mA)

PULSE / FREQ. OUTPUT	
ASSIGN OUTPUT (p. 72)	OFF – ***MASS*** – VOLUME – STD. VOLUME – TARGET FLOW – CARRIER FLOW – DENSITY * – CALC. DENSITY * – TEMPERATURE * – CANCEL * Only selectable if operation mode is set to “FREQUENCY” Your setting: ....
OPERATION MODE (p. 72)	***PULSE **** – FREQUENCY – CANCEL * Not selectable if the output was assigned for “DENSITY, CALC. DENSITY or TEMPERATURE”) Your setting: ....
PULSE VALUE (p. 72)	5digit number with floating decimal point, incl. engineering units (e.g. 240.00 t/p; 0.6136 kg/p) Factory setting: ***dependent*** on the nominal diameter Your setting: ....
PULSE WIDTH (p. 73)	3-digit number with fixed decimal point (0.05...10.00 s) Factory setting: ***10 s*** Your setting: ....
FULL SCALE FREQ. (p. 74)	max. 5-digit number (2...10000 Hz) Factory setting: ***10000 Hz*** Your setting: ....
ZERO SCALE (p. 75)	5-digit number with floating decimal point (e.g. 0.0000 kg/h; 245.92 kg/m^3; 105.60 °C) Factory setting: - Mass flow ***0.0000 kg/h*** resp. - Density ***0.0000 kg/l*** resp. - Temperature ***–50.000 °C*** Your setting: ....
FULL SCALE (p. 75)	5-digit number with floating decimal point, according to measured variable (e.g. 566.00 kg/h; 0.9956 kg/m^3; 105.60 °C) Factory setting: - Mass flow ***dependent*** on the nominal diameter - Density ***2.0000 kg/l*** - Temperature ***200.00 °C*** Your setting: ....

PULSE / FREQ. OUTPUT	
OUTPUT SIGNAL (p. 76)	***PASSIVE-POSITIVE*** – PASSIVE-NEGATIVE – ACTIVE-POSITIVE – ACTIVE-NEGATIVE – CANCEL Your setting: ....
FAILSAFE MODE (p. 77)	***FALL-BACK VALUE*** (In event of fault, the signal is set to the fall-back value = o Hz. The totalizer stops operating) HOLD VALUE – (Last valid measured value is held and the totalizer operates with this value) ACTUAL VALUE – (Normal measured value given despite fault, also with totalizer) CANCEL Your setting: .... Note! The setting chosen only affects the pulse/ freq. output and the totalizer.
BALANCE (p. 77)	***OFF*** – ON – CANCEL Your setting: ....
SIMULATION FREQ. (p. 77)	***OFF*** – 0 Hz – 2 Hz – 10 Hz – 1 kHz – 10 kHz – CANCEL Your setting: ....
NOMINAL FREQ. (p. 77)	Display: nominal frequency (0.00...16383 Hz)

RELAY	
RELAY 1 FUNCTION (p. 78)	***FAILURE*** EMPTY PIPE DET. – FAILURE & EPD – DUAL RANGE MODE – DUAL RANGE MODE 2 – BATCH PRECONTACT – FLOW DIRECTION – LIMIT MASS FLOW – LIT VOLUME FLOW – LIMIT STD.VOL. FLOW – LIMIT TARGET FLOW – LIMIT CARRIER FLOW – LIMIT DENSITY – LIMIT CALC. DENSITY – LIMIT TEMPERATURE – CANCEL Your setting: ....
RELAY 1 ON-VALUE (p. 79)	Limit switch (ON) 5-digit number with floating or fixed decimal point, incl. units (e.g. 0.0037 t/min; 900.00 kg/m^3, etc.) Temperature: max. 4-digit number with fixed decimal point, incl. units and arithmetical sign (e.g. -22.50 °C) Density function: 5-digit number with floating decimal point (e.g. 76.409 °Brix, etc) Your setting: ....
RELAY 1 OFF-VALUE (p. 79)	Limit switch (OFF) 5-digit number with floating or fixed decimal point, incl. units (e.g. 0.0037 t/min; 900.00 kg/m^3, etc.) Your setting: ....
PICKUP DELAY 1 (p. 80)	Max. 3digit number ***0***...100 seconds Your setting: ....
DROPOUT DELAY 1 (p. 80)	Max. 3digit number ***0***...100 seconds Your setting: ....
RELAY 2 FUNCTION (p. 81)	EMPTY PIPE DET. – DUAL RANGE MODE – DUAL RANGE MODE 2 – BATCH CONTACT – FLOW DIRECTION – ***LIMIT MASS FLOW*** – LIMIT VOLUME FLOW – LIMIT STD.VOL. FLOW – LIMIT TARGET FLOW – LIMIT CARRIER FLOW – LIMIT DENSITY – LIMIT CALC. DENSITY – LIMIT TEMPERATURE – CANCEL Your setting: ....

RELAY	
RELAY 2 ON-VALUE (p. 81)	Selectable parameters correspond to those in “RELAY 1 ON-VALUE” funktion. Your setting: ....
RELAY 2 OFF-VALUE (p. 81)	Selectable parameters correspond to those in “RELAY 1 OFF-VALUE” funktion. Your setting: ....
PICKUP DELAY 2 (p. 81)	Selectable parameters correspond to those in “PICKUP DELAY 1” funktion. Your setting: ....
DROPOUT DELAY 2 (p. 81)	Selectable parameters correspond to those in “DROPOUT DELAY 1” funktion. Your setting: ....

BATCHING	
BATCH VARIABLE (p. 84)	***OFF*** – MASS – VOLUME – STD. VOLUME – TARGET MATERIAL– CARRIERFLUID – CANCEL Your setting: ....
BATCH PRESET (p. 84)	4-digit number with floating decimal point (e.g. 5.010 kg; 0.120 m^3; 0.110 Nm^3) Factory setting: ***1.000 kg*** Your setting: ....
UNIT FINE DOSING (p. 84)	***abs*** – % – CANCEL Your setting: ....
FINE DOSING QTY. (p. 84)	4-digit number with floating decimal point (e.g. 2.000 kg; 1.234 m^3; 1.234 Nm^3) Factory setting: ***0.000 %*** Your setting: ....
COMPENS. QUANTITY (p. 85)	4-digit number with floating decimal point (e.g. 0.232 kg) Factory setting: ***0.000*** [unit] Your setting: ....
BATCH COMP. MODE (p. 85)	***OFF*** – MODE 1 – MODE 2 – CANCEL Your setting: ....
AVERAGING DRIP (p. 85)	3-digit number, (0...100 Cycles) Factory setting: ***0 cycles*** Your setting: ....
BATCHING (p. 86)	START – STOP – ***CANCEL*** (E activates START or STOP) Your setting: ....
MAX. BATCH TIME (p. 86)	max. 5-digit number (0...3000 s) Factory setting: ***0 s*** Your setting: ....
BATCH CYCLE (p. 86)	max. 7-digit number (0...9999999) Factory setting: ***0*** Your setting: ....
RESET BATCH CYC. (p. 86)	***CANCEL*** – YES Your setting: ....

DENSITY FUNCTION	
DENS. ADJ. VALUE (p.87)	5-digit number with floating decimal point, incl. units corresponding to 0.1...5.9999 kg/l Factory setting: ***0.0000 kg/l*** Your setting: ....
DENSITY ADJUST (p.87)	***CANCEL*** – SAMPLE FLUID 1 – SAMPLE FLUID 2 – DENSITY ADJUST Your setting: ....
CALC. DENSITY (p. 88)	***OFF*** – %MASS – %-VOLUME – STD. DENSITY – °BRIX – °BAUME >1.0 SG – °BAUME <1.0 SG – °API – %-BLACK LIQUOR – %-ALCOHOL – °PLATO – °BALLING – CANCEL Your setting: ....
VOLUME FLOW MEAS (p.88)	***OFF*** – VOLUME FLOW – STD. VOLUME FLOW – VOLUME & STD. VOL. – CANCEL Your setting: ....
ST. VOL. CALC. (p.88)	***CALC. STD.DENSITY*** – FIXED STD.DENSTTY – CANCEL Your setting: ....
REFERENCE TEMP. (p.88)	5-digit number with fixed decimal point, units and arithmetical sign (e.g. 25.000 °C; -10.500 °C; 60.000 °F) Factory setting: ***15.000 °C*** Your setting: ....
EXP. COEF. (p.89)	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*** Your setting: ....
FIXED STD. DENSITY (p.89)	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*** Your setting: ....

DENSITY FUNCTION	
CARRIER DENSITY (p.89)	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*** Your setting: ....
EXP. COEF. CARRIER (p.89)	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*** Your setting: ....
TARGET MAT. DENS. (p.90)	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*** Your setting: ....
EXP. COEF. TARGET (p. 90)	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*** Your setting: ....

DISPLAY	
ASSIGN LINE 1 (p. 91)	***MASS FLOW*** – VOLUME FLOW – STD. VOLUME FLOW –TARGET FLOW – CARRIER FLOW – DENSITY – CALC. DENSITY – TEMPERATURE – TOTAL. 1 OVERFLOW – TOTALIZER 2 – TOTAL. 2 OVERFLOW – BATCH PRESET – BATCH UPWARDS – BATCH DOWNWARDS – BATCH CYCLES – CANCEL Your setting: ....
ASSIGN LINE 2 (p. 91)	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 – BATCH UPWARDS – BATCH DOWNWARDS – BATCH CYCLES – CANCEL Your setting: ....
DISPLAY DAMPING (p. 91)	Max. 2-digit number: 0...99 seconds Factory setting: ***1 s*** Your setting: ....
FORMAT FLOW (p. 91)	xxxxx. – xxxx.x – xxx.xx – xx.xxx – ***x.xxxx*** – CANCEL Your setting: ....
LCD CONTRAST (p. 91)	**IIIIIIIIIII**........... Any change in contrast is immediately seen with the adjustable bar graph. Your setting: ....
LANGUAGE (p. 92)	ENGLISH – DEUTSCH – FRANCAIS – ESPANOL – ITALIANO – NEDERLANDS – DANSK – NORSK – SVENSKA – SUOMI – BAHASA INDONESIA – JAPANESE (in original alphabet) – CANCEL Your setting: ....

COMMUNICATION	
PROTOCOL (p. 93)	*With communication modul "HART" resp. "2 CUR":* *OFF* – ***HART*** – CANCEL *With communication modul "RS 485":* ***OFF*** – RACKBUS RS 485 – CANCEL Your setting: ....
BUS-ADDRESS (p. 93)	2-digit number HART: 0...15 RS 485: 0...63 Factory setting: ***0*** Your setting: ....
TAG NUMBER (p. 93)	In this function, the actual measuring point tag (name with max. 8 characters) is displayed which can only be entered over the serial interface. This function is only available if the function "PROTOCOL" is set to "HART" or "RACKBUS RS 485" (see page 93).
ASSIGN AUX. INPUT (p. 93)	***OFF*** – RESET TOTAL. 1 – RESET TOTAL. 2 – RESET TOTAL. 1&2 – BATCHING – ADJUST ZEROPOINT – DUAL RANGE MODE – POS. ZERO RETURN – SELECT ZEROPOINT – CANCEL Your setting: ....
START PULSE WIDTH (p. 95)	Max. 3-digit number, incl. units (20...100 ms) Factory setting: ***20 ms*** Your setting: ....
SYSTEM CONFIG. (p. 95)	Display only with communication module "RS 485". AUX. INP. / CURRENT – AUX. INPUT / FREQ. – RS 485 / CURRENT – RS 485 / FREQ.

PROCESSING PARAMETER	
LOW FLOW CUTOFF (p. 96)	5-digit number with floating decimal point (e.g. 25.000 kg/min) Factory setting: ***dependent*** on the nominal diameter Your setting: ....
NOISE SUPPRESS. (p. 96)	3-digit number with floating decimal point 0,00 seconds = OFF 2,00 seconds = high damping factory setting: ***0,00*** s Your setting: ....
MEASURING MODE (p. 96)	***UNIDIRECTIONAL*** – BIDIRECTIONAL – CANCEL Your setting: ....
FLOW DIRECTION (p. 97)	***FORWARD*** – REVERSE – CANCEL Your setting: ....
EPD THRESHOLD (p. 97)	5-digit number with fixed decimal point, incl. engineering units corresponding to 0.0000...5.9999 kg/l Factory setting: ***0.2000 kg/l*** Your setting: ....
DENSITY FILTER (p. 97)	OFF – LOW – ***MEDIUM*** – HIGH – CANCEL Your setting: ....
SELF CHECKING (p. 97)	***CYCLIC*** – SMARTPLUS – CANCEL Your setting: ....
PRES. PULSE SUPPR. (p. 98)	Max. 4-digit number, incl. units (0.00...10.00 s) Factory setting: ***0.00 s*** Your setting: ....

SYSTEM PARAMETER	
SELECT ZEROPOINT (p. 99)	***ZEROPOINT 1*** – ZEROPOINT 2 – CANCEL Your setting: ....
ZEROPOINT ADJUST (p. 99)	***CANCEL*** – START Your setting: ....
POS. ZERO RETURN (p. 100)	***OFF*** – ON Your setting: ....
DEF. PRIVATE CODE (p. 100)	Max. 4-digit number (0...9999) Factory setting: ***63*** Your setting: ....
ACCESS CODE (p. 101)	Max. 4-digit number (0...9999) Factory setting: ***0*** Your setting: ....
PRESENT SYSTEM CONDITION (p. 101)	Display (listed in priority) F: ...= Error message (System error) A: ...= Alarm message (Processor error) S: ...= Status message
PREVIOUS SYSTEM CONDITION (p. 101)	Display (listed in chronological) F: ...= Error message (System error) A: ...= Alarm message (Processor error) S: ...= Status message
SOFTWARE VER. COM (p. 102)	Display e.g. 3.02.00 HART
SYSTEM RESET (p. 102)	***CANCEL*** – RESTART SYSTEM Your setting: ....
ALARM DELAY (p. 102)	Max. 3-digit number, ***0***...100 seconds Your setting: ....

SENSOR DATA	
K-FACTOR (p. 103)	Max. 5-digit number with fixed decimal point (0.1000...5.9999) Factory setting: ***dependent*** on the nominal diameter of sensor and its calibration Your setting: ....
ZEROPOINT (p. 103)	Max. 5-digit number (-10000...+10000) Factory setting: ***dependent*** on the nominal diameter of sensor and its calibration Your setting: ....
NOMINAL DIAMETER (p. 103)	[Actual nominal diameter of the sensor] – CANCEL
SENSOR COEF. (p. 103)	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. 104)	Display: serial number of the sensor 6-digit number (100000...999999)
SOFTWARE VERSION (p. 104)	Display: e.g. V 4.00.00 F

*) If a batching variable is activated, the "BATCHING" Function Group is first shown on the display when entering the operating matrix. The "BATCH PRESET" function then moves into first position within this group.

- **PROCESS VARIABLE**: MASS FLOW p. 60 · VOLUME FLOW p. 60 · STD. VOLUME FLOW p. 60 · TARGET FLOW p. 60 · CARRIER FLOW p. 61 · DENSITY p. 61 · CALC. DENSITY p. 61 · TEMPERATURE p. 61
- **TOTALIZERS**: TOTALIZER 1 p. 62 · TOTALIZER 1 OVERFLOW p. 62 · TOTALIZER 2 p. 62 · TOTALIZER 2 OVERFLOW p. 62 · RESET TOTALIZER p. 63 · ASSIGN TOTAL. 1 p. 63 · ASSIGN TOTAL. 2 p. 63
- **SYSTEM-UNITS**: MASS FLOW UNIT p. 64 · MASS UNIT p. 64 · VOLUME FLOW UNIT p. 64 · VOLUME UNIT p. 64 · GALLONS/ BARREL p. 65 · STDVOL. FLOW UNIT p. 65 · STD. VOLUME UNIT p. 65 · DENSITY UNIT p. 66 · STD. DENSITY UNIT p. 66 · TEMPERATURE UNIT p. 66 · NOM. DIAM. UNIT p. 66
- **CURRENT OUTPUT 1 / CURRENT OUTPUT 2** ●: ASSIGN OUTPUT p. 67 · ZERO SCALE p. 67 · FULL SCALE 1 p. 68 · DUAL RANGE MODE p. 69 · FULL SCALE 2 p. 70 · ACTIVE RANGE p. 70 · TIME CONSTANT p. 70 · CURRENT SPAN p. 70 · FAILSAFE MODE p. 71 · SIMULATION CURR. p. 71 · NOMINAL CURRENT p. 71
- **PULS/FREQ. OUTPUT** ●: ASSIGN OUTPUT p. 72 · OPERATION MODE p. 72 · PULSE VALUE p. 72 · PULSE WIDTH p. 73 · FULL SCALE FREQ. p. 74 · ZERO SCALE p. 75 · FULL SCALE p. 75 · OUTPUT SIGNAL p. 76 · FAILSAFE MODE p. 77 · BALANCE p. 77 · SIMULATION FREQ. p. 77 · NOMINAL FREQ. p. 77
- **RELAYS**: RELAY 1 FUNCTION p. 78 · RELAY 1 ON-VALUE p. 79 · RELAY 1 OFF-VALUE p. 79 · PICKUP DELAY 1 p. 80 · DROPOUT DELAY 1 p. 80 · RELAY 2 FUNCTION p. 81 · RELAY 2 ON-VALUE p. 81 · RELAY 2 OFF-VALUE p. 81 · PICKUP DELAY 2 p. 81 · DROPOUT DELAY 2 p. 81
- **BATCHING** *): BATCH VARIABLE p. 84 · BATCH PRESET p. 84 · UNIT FINE DOSING p. 84 · FINE DOSING QTY. p. 84 · COMPENS. QUANTITY p. 85 · BATCH COMP. MODE p. 85 · AVERAGING DRIP p. 85 · BATCHING p. 86 · MAX. BATCH TIME p. 86 · BATCH CYCLE p. 86 · RESET BATCH CYC. p. 86
- **DENSITY FUNCTION**: DENS. ADJ. VALUE p. 87 · DENSITY ADJUST p. 87 · CALC. DENSITY p. 88 · VOLUME FLOW MEAS p. 88 · STD.VOL.CALC. p. 88 · REFERENCE TEMP. p. 88 · EXP. COEF. p. 89 · FIXED STD. DENS. p. 89 · CARRIER DENSITY p. 89 · EXP. COEF. CARRIER p. 89 · TARGET MAT. DENS. p. 90 · EXP. COEF. TARGET p. 90
- **DISPLAY**: ASSIGN LINE 1 p. 91 · ASSIGN LINE 2 p. 91 · DISPLAY DAMPING p. 91 · FORMAT FLOW p. 91 · LCD CONTRAST p. 91 · LANGUAGE p. 92
- **COMMUNICATION**: PROTOCOL p. 93 · BUS ADDRESS p. 93 · TAG NUMBER p. 93 · ● ASSIGN AUX. INPUT p. 93 · ● START PULSE WIDTH p. 95 · ● SYSTEM CONFIG. p. 95
- **PROCESSING PARA.**: LOW FLOW CUTOFF p. 96 · NOISE SUPPRESS. p. 96 · MEASURING MODE p. 96 · FLOW DIRECTION p. 97 · EPD THRESHOLD p. 97 · DENSITY FILTER p. 97 · SELF CHECKING p. 97 · PRES. PULSE SUPPR p. 98
- **SYSTEM PARAMETER**: SELECT ZEROPOINT p. 99 · ZEROPOINT ADJUST p. 99 · POS. ZERO RETURN p. 100 · DEF. PRIVATE CODE p. 100 · ACCESS CODE p. 101 · PRESENT SYSTEM CONDITION p. 101 · PREVIOUS SYSTEM CONDITIONS p. 101 · SOFTWARE VER. COM p. 102 · SYSTEM RESET p. 102 · ALARM DELAY p. 102
- **SENSOR DATA**: K-FACTOR p. 103 · ZEROPOINT p. 103 · NOMINAL DIAMETER p. 103 · SENSOR COEF. p. 103 · SERIAL NUMBER p. 104 · SOFTWARE VERSION p. 104

Legend (example box "p. 57"):

- ● The Promass 63 electronics are fitted with various electronics moduls depending on the specifications when ordering (communication module: RS 485, HART, 2 CUR.). Depending on the module, these functions and function groups are not available.
- p. 57: Cross reference to detailed function description.
- ◢ These functions are only displayed if other functions have been configured accordingly.

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Index

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