Technical
Information
TI 030D/06/en
No. 50068989

Coriolis Mass Flow Measurement System
promass 63

Simultaneous measurement of mass, density and temperature for a broad range of applications For liquids and gases

Flexible system
- The system can be customised to each application
- Wide choice of materials for process connections and measuring tubes, compatible to the fluid
- Simple and cost-effective installation
- Transmitter housing can be rotated to fit the orientation

Easy to operate
- Menu-driven dialogue for all parameters
- Two-line illuminated display
- Touch Control: remote operation without special equipment (protection not violated)

Accurate measurement
- Measurement accuracy for liquids:
  – Mass flow ± 0.1%
  – Volume flow ± 0.15%
- Measurement accuracy for gases:
  – Mass flow ± 0.5%
- 1000:1 operable flow range
- Excellent repeatability

Safe operation
- Self-emptying measuring tubes
- Secondary containment vessel as standard
- High electromagnetic compatibility (EMC)
- Self-monitoring with alarm function
- EEPROM stores data on power failure (no batteries required)
- ISO 9001 manufacturer, quality assured

Install anywhere
- Compact design
- Insensitive to plant vibration
- Rugged and shock-proof surfaces resistant to acids and alkalis
- IP 67 protection for compact and remote versions
- Measurement independent of fluid characteristics
- High performance: simultaneous measurement of more than one process variable, special density evaluation functions, etc.

Endress+Hauser
The Power of Know How

Measuring System

Fields of application

The Promass 63 system measures the mass and volume flow of fluids having widely differing characteristics:

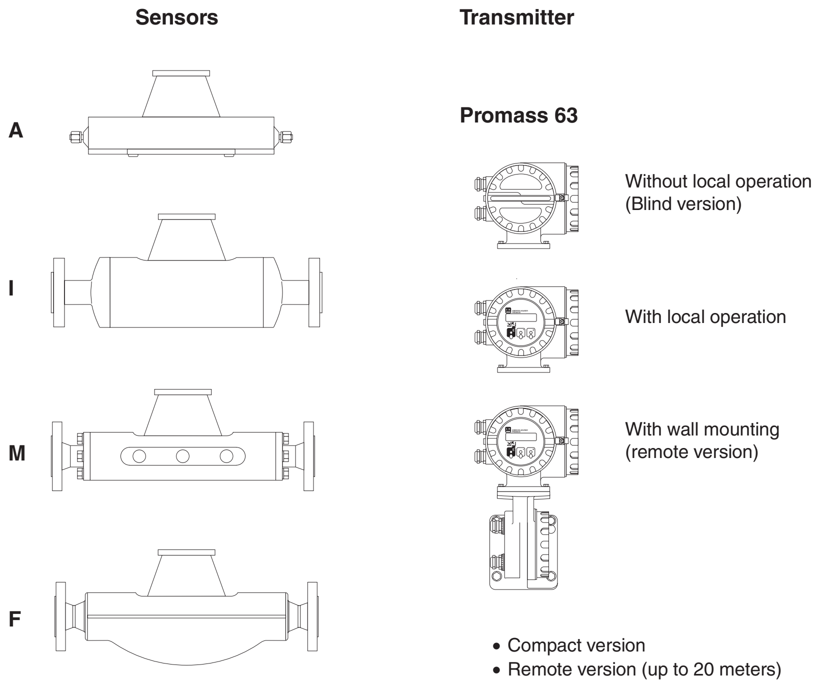
- Chocolate, condensed milk, syrup
- Oils, fats
- Acids, alkalis
- Varnishes, paints
- Suspensions
- Pharmaceuticals
- Catalytic converters, inhibitors
- Gases and gas mixtures

The system also measures the density and temperature of fluids in order to calculate other parameters such as volumetric flow, solids content or density units (standard density, °Brix, °Baumé, °API, °Plato, °Balling).

The Promass 63 is used in applications wherever mass flow measurement is of critical importance:

- Mixing and batching of various raw materials
- Controlling processes
- Measuring of 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 industries, waste disposal, energy production, gas applications, etc.



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 pages 26 – 34

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The modular Promass 63 measuring system

As blind versions, all Promass instruments can also be connected to the multifunctional ***"Procom DZL 363"*** transmitter.
Further information can be provided in a separate documentation (TI041D/06/en).

Information on all Ex versions is available on request from your E+H Sales Centre.

Measuring system

The measuring system consists of:

- Promass 63 transmitter
- Promass A, I, M or F sensor

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

The wide range of materials and process connections (fittings; flanges DIN, ANSI, JIS; Tri-Clamp) ensure that the measuring point can adjust to both plant and process conditions.
The transmitter housing can be rotated for ease of reading and operation in any orientation.

Sensor Function

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 rotational (revolving) movement occur simultaneously.

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

$\vec{F}_C$ = 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 $\vec{v}$ in the system and therefore its mass flow.

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

The Coriolis forces produced at the measuring tubes cause a phase shift in the tube oscillation (see Fig. on left):

- 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.
The measurement principle operates independent of temperature, pressure, viscosity, conductivity or flow profile.

Density measurement

The measuring tubes are continuously excited at their resonant frequency.
As the mass and therefore the density of the oscillating system changes (measuring tubes and fluid), the vibrating frequency is readjusted. The resonant frequency is thus a function of the density of the fluid and, because of this, a density signal can be obtained.

Temperature measurement

The temperature of the measuring tubes is determined in order to calculate the compensation factor due to temperature effects. This signal corresponds to the process temperature and is also available as an output.

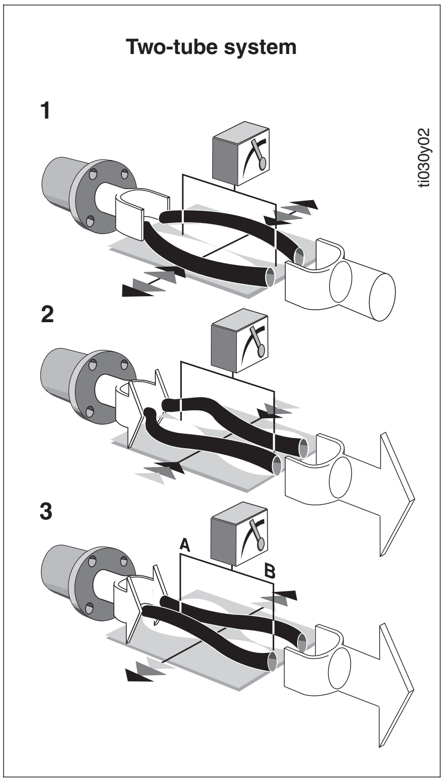
Balanced Measuring System

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

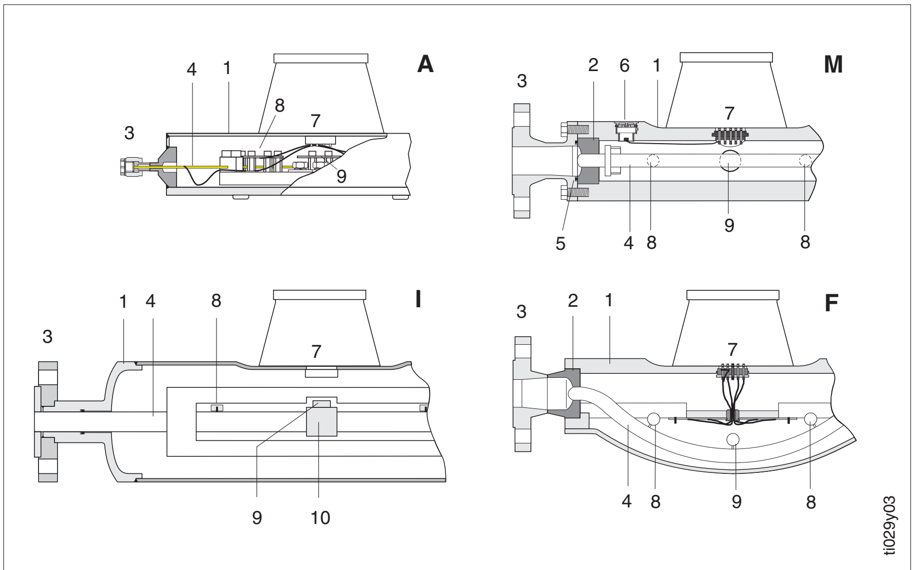
Single tube systems (Promass A, I)
For single tube systems, other design solutions are necessary for system balance than for two-tube systems.

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.



Sectional view of Promass A, I, M and F sensors



1 Housing/containment vessel
2 Manifold
3 Process connection
4 Measuring tube(s)
A: 1 curved tube
I: 1 straight tube
M: 2 straight tubes
F: 2 curved tubes
5 Gasket
6 Plug
7 Cable gland
8 Electrodynamic sensors
9 Excitation system
10 Pendulum mass TMB™ System (Promass I)

Transmitter Function

Function of the Promass 63

The Promass transmitter converts the measured values coming from the sensor into standardised output signals. According to their configuration, a number of outputs are therefore available:

- Current output with HART protocol
- Pulse/frequency output or 2nd current output
- Relay 1, e.g. fault
- Relay 2, e.g. limit value
- RS 485 interface

Display

Promass 63 has a two-line, illuminated LC display. This enables two of the following measured values to be read simultaneously:

- Actual mass, volume, standard volume as well as % content of target/carrier liquid with multiphase fluids.
- Density (e.g. kg/m^3, °Brix, °Baumé, °API, °Plato, °Balling, etc.)
- Temperature
- Totalised flows

The following are also displayed:

- Alarm messages (process faults)
- Error messages (instrument faults)
- Status messages
- Programming messages

Communication

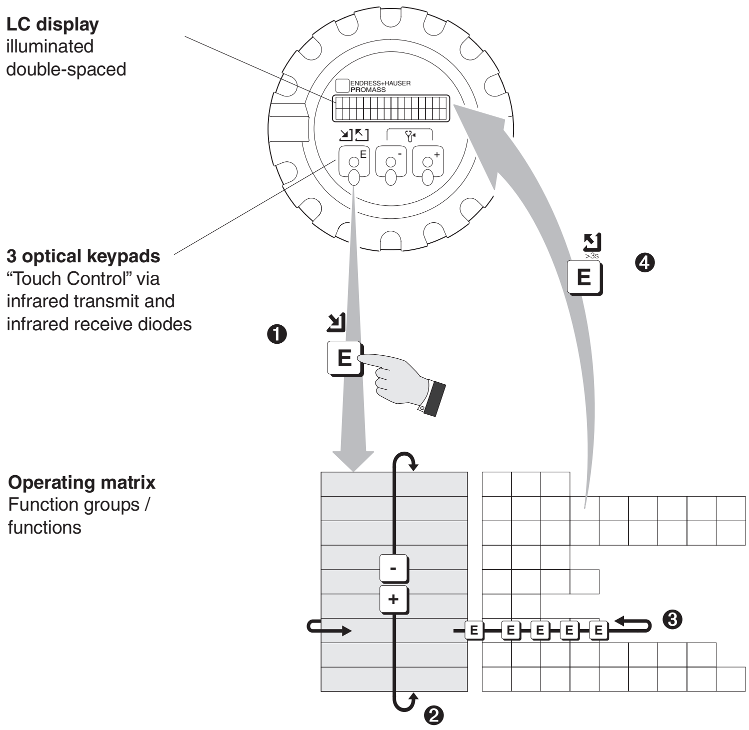
The Promass 63 can communicate with higher level control systems using an application-specific interface:

- Direct communication with personal computers and the E+H Rackbus environment (MODBUS, PROFIBUS, FIPBUS) is possible via a Rackbus RS 485 interface.
- The current output is available for the HART protocol using SMART technology.
- Promass 63 is also available as PROFIBUS-PA version for direct connection to process control systems, segment couplers or Commutec II.

Remote operation using these interfaces can also be carried out with the E+H programm Commuwin II. Detailed information on this is available from your local E+H Sales Centre.

Operational safety

- The Promass 63 measuring system fulfils the safety requirements according to EN 61010.
- The Promass 63 measuring system fulfils all general requirements for electromagnetic compatibility (EMC) according to EN 50081 Part 1 and 2 / EN 50082 Part 1 and 2 as well as to NAMUR recommendations.
- Extensive self-monitoring of the measuring system gives complete operational safety.



❶ Access to the operating matrix
❷ Select function group
❸ Select function (entering / setting data with -/+ and storing E with)
❹ Leave operating matrix

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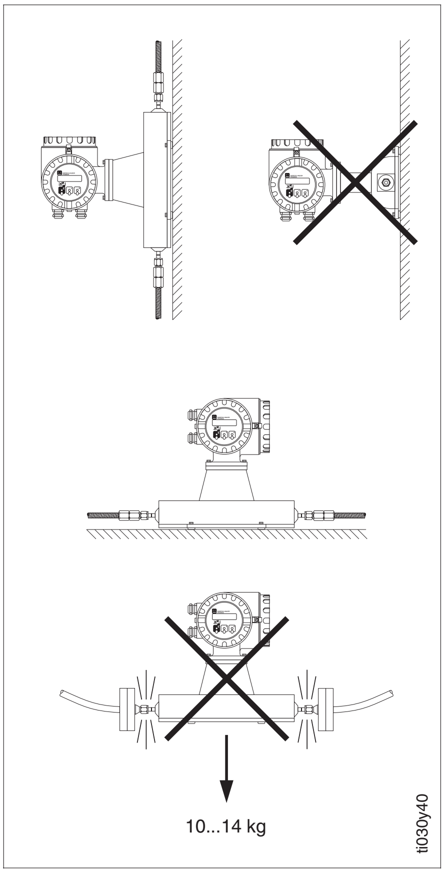
Selecting functions in the E+H operating matrix.

On power failure, all measuring system data are safely stored in the EEPROM (no batteries required).

Mounting

No special fittings such as brackets are needed. External forces are absorbed by the construction of the device, e.g. the secondary containment vessel. The high frequency oscillation of the measuring tubes ensures that correct operation of the 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.



Orientation
Promass A

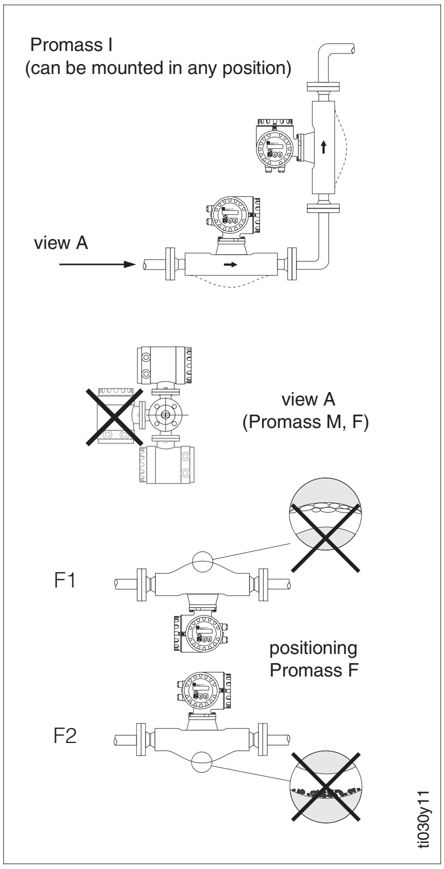
Orientation (Promass A)

Vertical
This is best with the flow direction upwards. Entrained solids sink downward and gases rise away from the measuring tube. This also allows the measuring tube to be completely drained and protects it from solids build-up.

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

Wall and post mounting
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 table, wall, or post mounting. The post mounting requires a special mounting set.



Orientation
Promass I, M, F

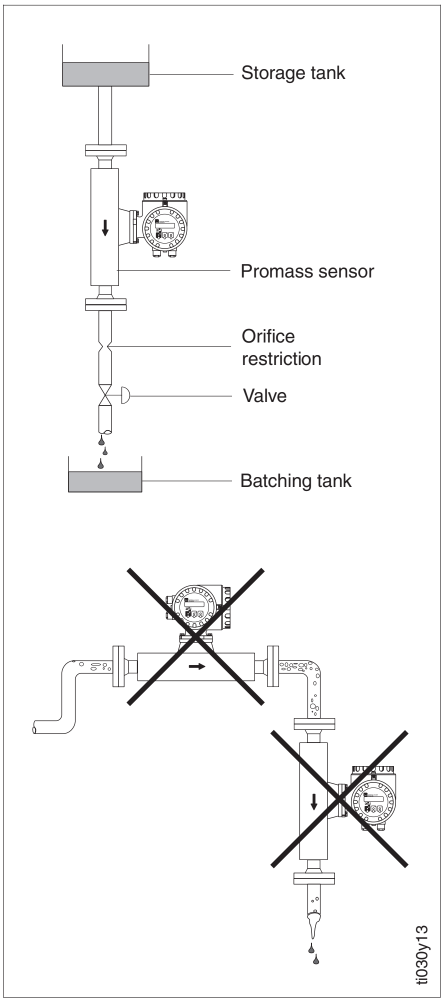
Orientation (Promass I, M, F)

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

Horizontal
- Promass I (single tube) can be mounted in any horizontal piping.
- Promass M, F measuring tubes must lie side by side. When correctly installed, the transmitter housing is either above or below the piping (see view A).
- Promass F measuring tubes 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

Mounting



Mounting location
(vertical piping)

Mounting location

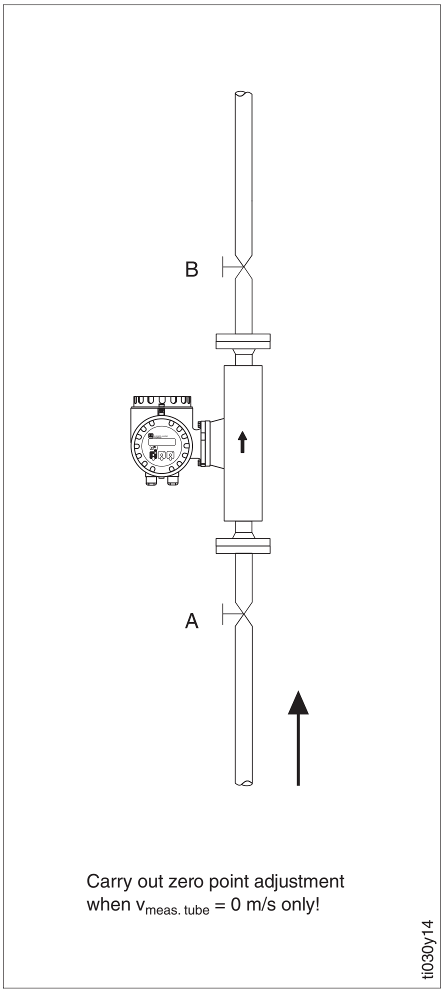
Air or entrained gases in the measuring tube may cause errors in measurement and therefore the following mounting installations are to be avoided:

- 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 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.

Nominal diameter	Ø Orifice/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	25.0 mm
DN 80	50.0 mm
DN 100	65.0 mm

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



Zero point adjustment
and shut-off valves

Zero point adjustment

To ensure accurate measurement also with very low flow rates, we recommend to carry out a zero point adjustment under process conditions.
The zero point adjustment should be carried out only with the measuring tubes full and with no flow. This can be achieved with shut-off valves both upstream and downstream of the sensor (or use existing valves if present).

Normal operation
- Open valves A and B

*Zero point adjustment **with** pumping pressure*
- Open valve A
- Close valve B

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

Planning and Installation

System pressure
It is important to avoid cavitation as this can affect tube oscillation.

No special measures need be taken for fluids which have properties similar to those of water under normal conditions.

With volatile liquids (hydrocarbons, solvents, liquefied gases) or liquids in suction lines, the vapour pressure of the liquid must not drop below a point where the liquid begins to boil.
It is also important not to release gases which are found naturally in many liquids. This can be prevented by ensuring that there is sufficient system pressure.
Ideally the sensor should be mounted
- on the discharge side of pumps (avoiding low pressure),
- at the lowest point of a vertical pipeline.

Corrosion resistance
With corrosive liquids, the chemical resistance of all wetted parts such as measuring tubes, gaskets and process connections must be thoroughly checked. This also applies to the liquids used for cleaning the Promass sensor.

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

Caution!
Ensure that the meter electronics are not overheated. The connector between the sensor and the transmitter housings as well as the connection housing of the remote version must therefore always be kept free.

Full scale value / Nominal diameter
The most suitable nominal diameter is selected by taking into account the measuring range required and the permitted pressure drop. The full scales values for each nominal diameter are defined on page 26.

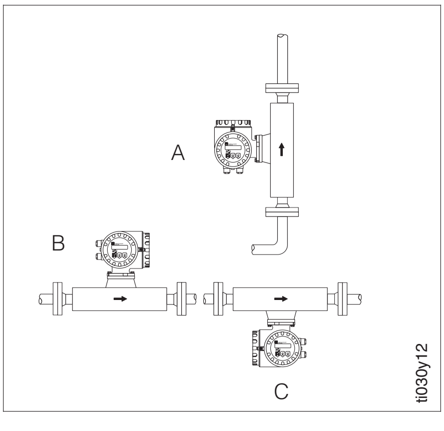
- The minimum recommended full scale value is about $^1/_{20}$ of the indicated maximum values above.
- With most applications, the optimum is considered to be between 20...50% of the maximum full scale value.
- With abrasive fluids, e.g. liquids containing solids, a lower full scale value should be used (v_{fluid} <1 m/s).
- For gas applications the following rules applies:
  – The flow velocity in the tubes should not exceed half of the sonic speed (mach 0.5).
  – The maximum massflow depends on the density of the gas and can be calculated from the formula on page 26.

“Applicator” design software
All important instrument data are contained in the E+H software in order to optimise the design of the measuring system. The Applicator software is used for the following calculations:
- Nominal diameter of the sensor with regard to the characteristics of the fluid such as viscosity, density, etc.
- Pressure loss downstream of the measuring point
- Converting mass flow to volumetric flow, etc.
- Simultaneous display of various nominal diameters

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



Pressure Loss

The pressure drop 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:

Note!
Calculations on pressure loss can be carried out using the Endress+Hauser "Applicator" software (see page 7).

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

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

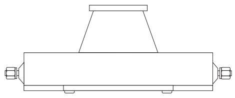
* For gases the pressure loss has always to be calculated by use of the formula for Re ≥ 2300.

	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.

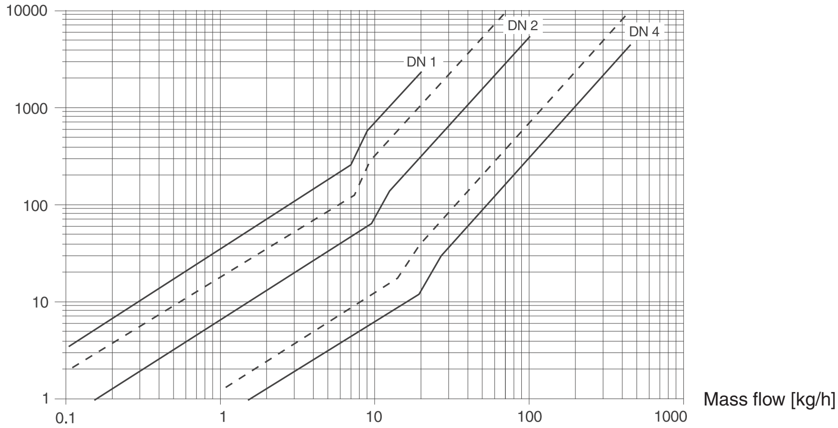
* DN 15, 25, 40 "FB" = Full bore versions of Promass I

Pressure Loss with water

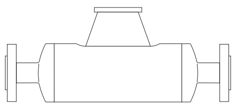


Pressure loss [mbar]

Promass A

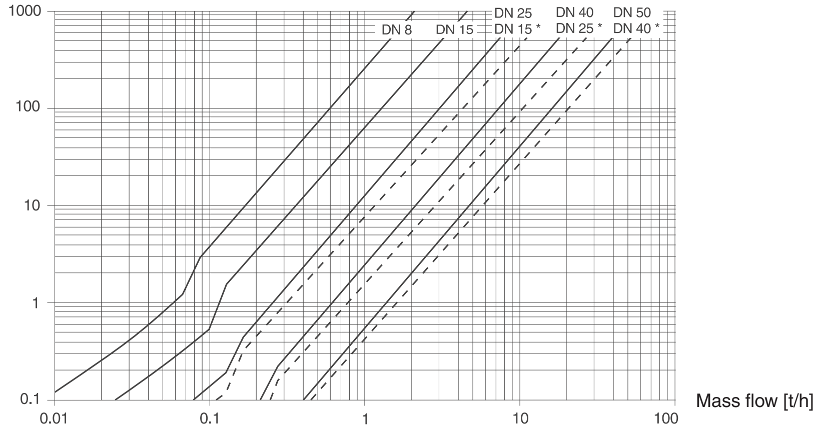


Standard version
High pressure version

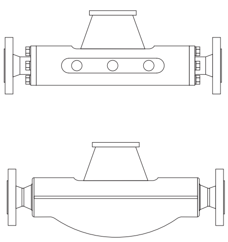


Pressure loss [mbar]

Promass I

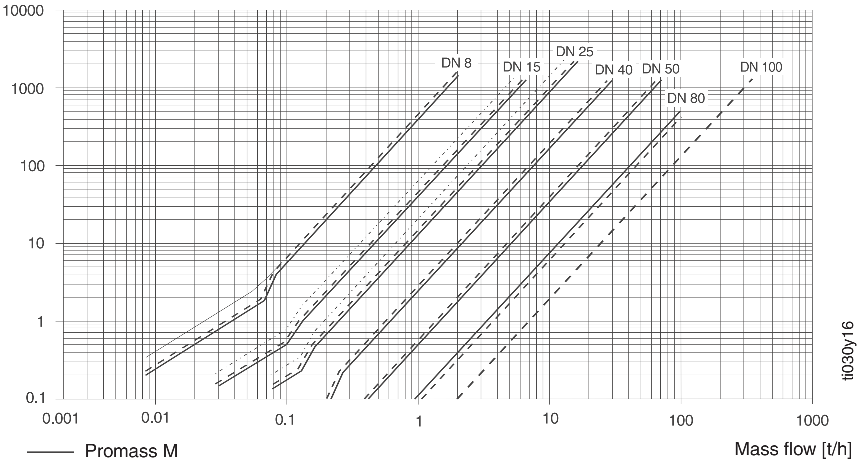


Standard versions:
inclusive interface measuring tube(s) / piping
Full bore versions *



Pressure loss [mbar]

Promass M, F

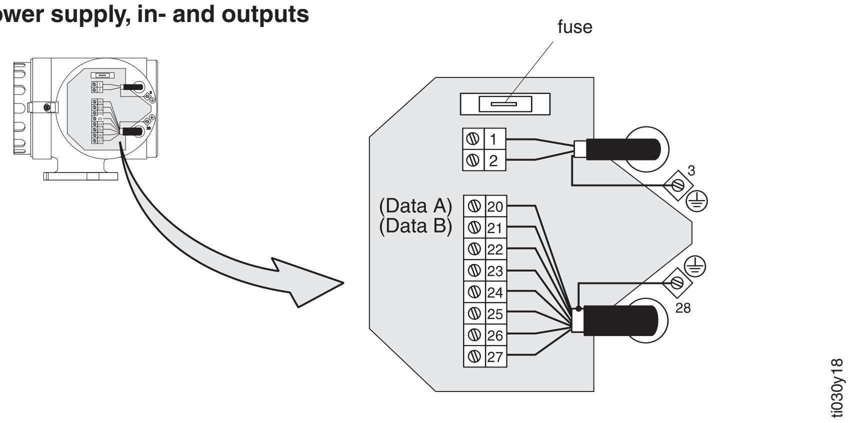


Promass M
Promass M (high pressure version)
Promass F

Electrical Connections

Note!
- Depending on the order information, the transmitter electronics contain different boards:
  – HART
  – RS 485
  – 2 CUR. (2 current outputs)
  – PROFIBUS-PA
  – Ex i
  – DZL (for connecting transmitter "Procom DZL 363")
- Technical data on instruments with Ex approvals are given in separate documentation available from E+H on request.

Power supply, in- and outputs



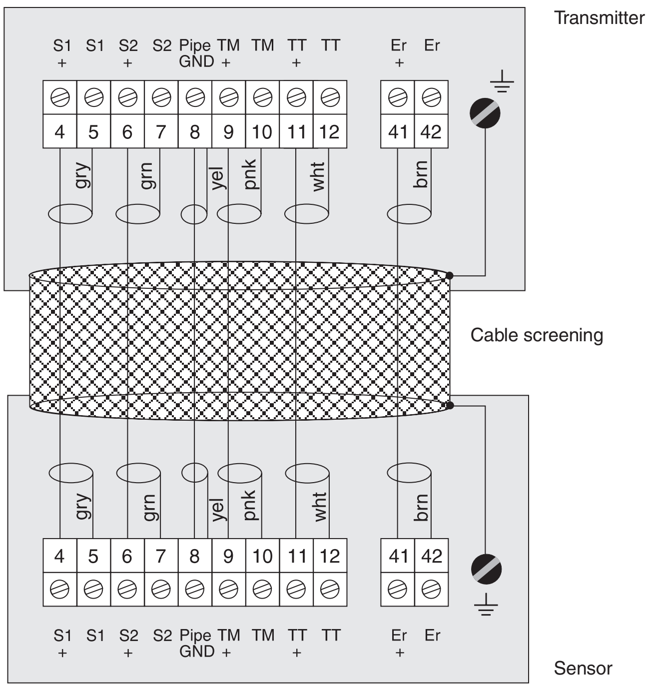
	HART – Current-loop output	RS 485	2 Current-loop outputs (2 CUR.)
3	Ground connection (ground wire)	Ground connection (ground wire)	Ground connection (ground wire)
1 2	L1 N for AC L+ L– for DC power supply	L1 N for AC L+ L– for DC power supply	L1 N for AC L+ L– for DC power supply
20 (+) 21 (–)	Pulse/frequency 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)	Input/output RS 485 or auxiliary input A +/– B –/+ 3...30 V DC	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	Relay 1 max. 60 V AC / 0.5 A max. 30 V DC / 0.1 A can be configured: e.g. for failure	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	Relay 2 max. 60 V AC / 0.5 A max. 30 V DC / 0.1 A can be configured: e.g. for limit value	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	Current output or Pulse/frequency output active, 0/4...20 mA, R_L <700 Ω active/passive, f = 2...10000 Hz active: 24 V DC, 25 mA (250 mA during 20 ms) passive: 30 V DC, 250 mA (250 mA during 20ms)	Current output 1 active, 0/4...20 mA, RL < 700 Ω with HART protocol: 4...20 mA, $R_L \geq 250$ Ω
28	Ground connection (screen of signal cable)	Ground connection (screen of signal cable)	Ground connection (screen of signal cable)

	PROFIBUS-PA	Intrinsically safe Ex i outputs	DZL 363	
3	Ground connection (ground wire)	Ground connection (ground wire)	Ground connection (ground wire)	
1 2	L1 N for AC L+ L– for DC power supply	L1 N for AC L+ L– for DC power supply	***DoS version**** 1 connected with 24 2 connected with 25	***Dx version***** L1 N for AC L+ L– for DC power supply
20 (+) 21 (–)	not used	not used	***DoS version*** DoS+ DoS–	***Dx version*** not used
22 (+) 23 (–)	Current output active, 0/4...20 mA, R_L <350 Ω	Current output active, 0/4...20 mA, R_L <350 Ω with HART protocol: 4...20 mA, $R_L \geq 250$ Ω	***DoS version*** not used	***Dx version*** Dx+ (A-data) Dx– (B-data)
24 (+) 25 (–)	not used	not used	***DoS version*** 24 connected with 1 25 connected with 2	***Dx version*** not used
26 (+) 27 (–)	Bus PROFIBUS-PA (EN 50170, Volume 2, IEC 1158-2)	Pulse/frequency output passive, f = 2...10000 Hz can be used as a NAMUR contact according to DIN 19234	not used	
28	Ground connection (screen of signal cable)	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 separate power supplies.

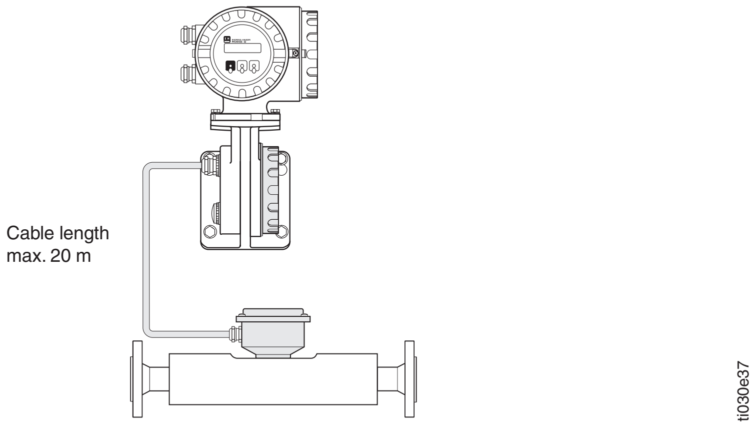
Electrical Connections

Remote version



gry = grey; grn = green; yel = yellow; pnk = pink; wht = white; brn = brown

Cable specifications for the remote version
6 x 0.38 mm^2 PVC cable with common screening and individually screened cores.
Conductor resistance: ≤ 50 Ω/km; Capacitance: core/screen ≤ 420 pF/m



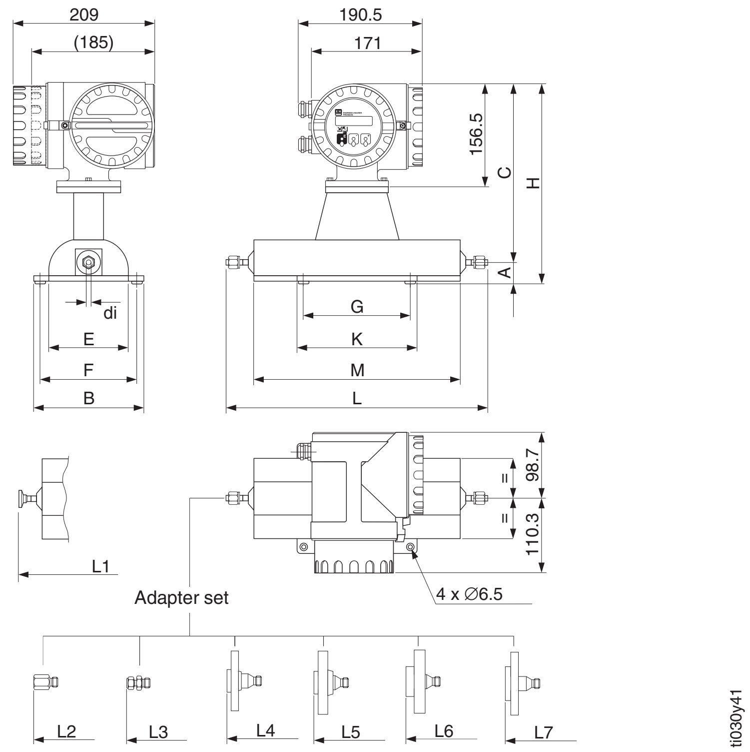
Connection to the "Procom DZL 363" transmitter

The terminal assignment of Procom DZL 363 is described in separate documentation (TI 041D/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.

Dimensions Promass 63 A

Compact version



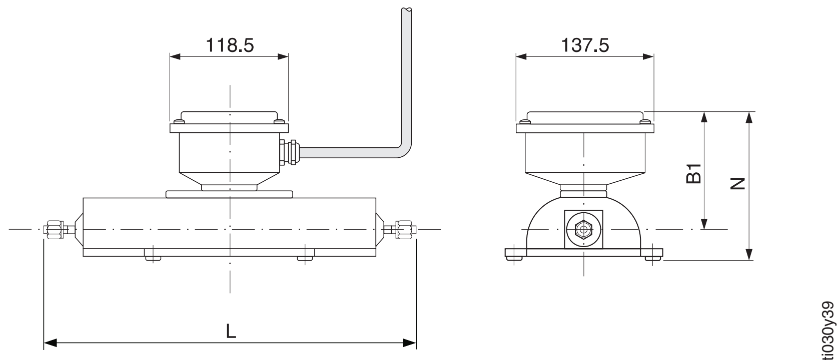
Flange connection with "lap joint flanges"

Process connection	L 4-VCO-4 fittings	L1 1/2" Tri-Clamp	L2 1/4" NPT-F	L3 SWAGELOK DN 1, 2: 1/8" or 1/4" DN 4: 1/4"	L4 1/2" flange (ANSI) Cl 150	L5 Cl 300	L6 DN 15 flange (DIN, JIS) PN 40	L7 10K
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

* High pressure version, All dimensions in mm

Remote version (dimensions of the transmitter: see page 14)



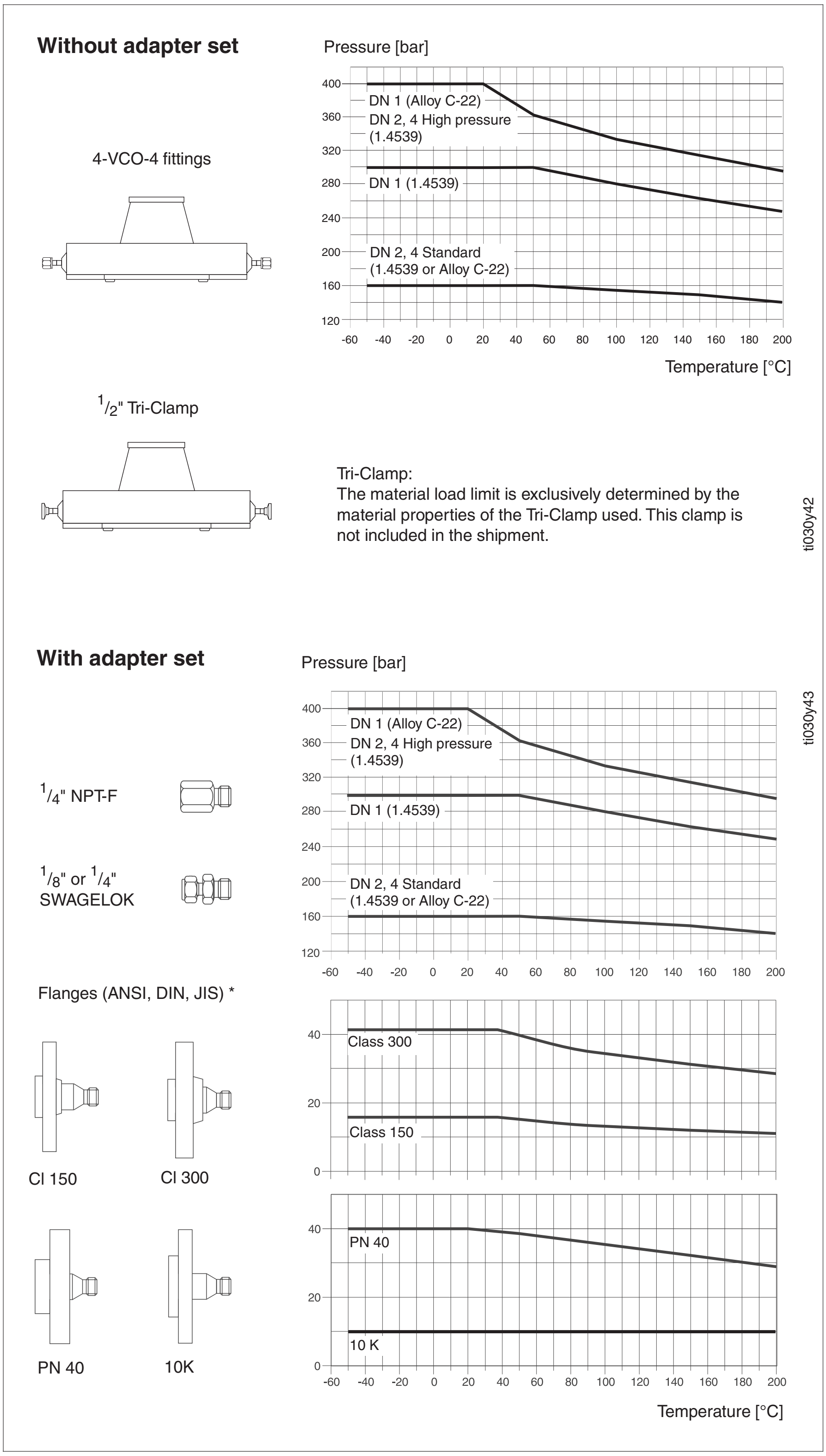
Diameter DIN	ANSI	B1 [mm]	N [mm]	L
DN 1	1/24"	122	154	Dimensions dependent on the process connections (see above)
DN 2	1/12"	122	154	
DN 4	1/8"	132	164	

Note!
Dimensions of Ex instruments are given in separate documentation available from E+H on request.

Process Connections Promass 63 A

Wetted parts materials

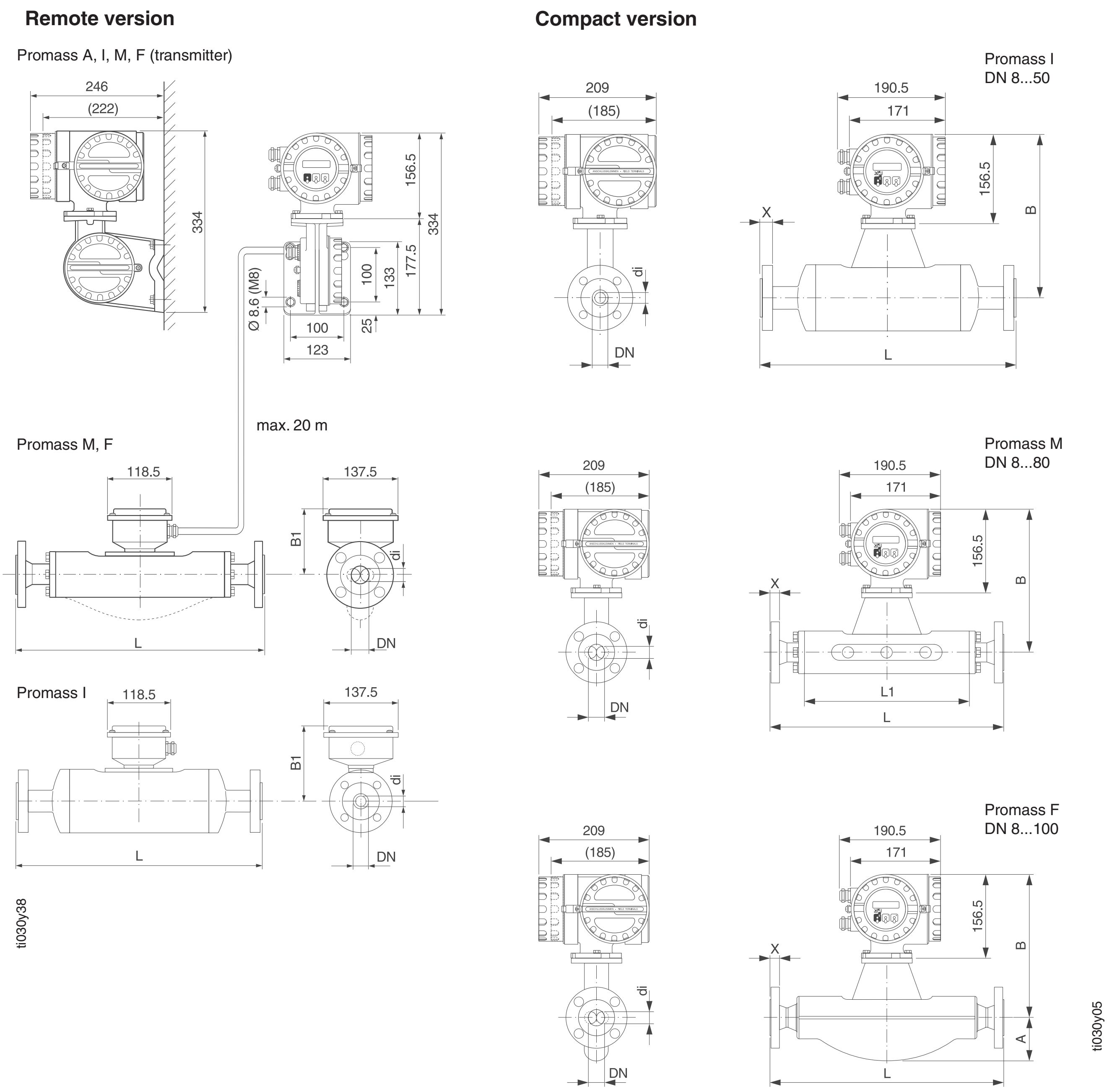
Measuring tube:	SS 1.4539 (904L), Alloy C-22 2.4602 (N 06022)
4-VCO-4 fittings	SS 1.4539 (904L), Alloy C-22 2.4602 (N 06022)
1/2" Tri-Clamp	SS 1.4539 (904L)
Adapter sets:	
1/8" or 1/4" SWAGELOK	SS 1.4401 (316)
1/4" NPT-F	SS 1.4539 (904L), Alloy C-22 2.4602 (N 06022)
Flange:	
DIN, ANSI, JIS	SS 1.4539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



Material load curves Promass A

* with 1/2" or DN 15 flanges as standard

Dimensions
Promass 63 I, M, F



Diameter		L	x	L1***	A [mm]	B [mm]			B1 [mm]			di [mm]			Weight [kg]		
DIN	ANSI			M	F	I	M	F	I	M	F	I	M	F	I	M	F
DN 8	3/8"			256	75	288.0	262.5	262.5	138.5	113.0	113.0	8.55	5.53	5.35	12	11	11
DN 15	1/2"			286	75	288.0	264.5	262.5	138.5	114.5	113.0	11.38	8.55	8.30	15	12	12
DN 15**	1/2"			–	–	288.0	–	–	138.5	–	–	17.07	–	–	20	–	–
DN 25	1"	Dimensions		310	75	288.0	268.5	262.5	138.5	119.0	113.0	17.07	11.38	12.00	20	15	14
DN 20**	1"	dependent on		–	–	301.5	–	–	152.0	–	–	25.60	–	–	41	–	–
DN 40	1 1/2"	the process		410	105	301.5	279.5	267.5	152.0	130.0	118.0	25.60	17.07	17.60	41	24	19
DN 40**	1 1/2"	connections		–	–	316.5	–	–	167.0	–	–	35.62	–	–	67	–	–
DN 50	2"	(see following		544	141	316.5	289.5	279.5	167.0	140.0	130.0	35.62	25.60	26.00	67	41	30
DN 80	3"	pages)		644	200	–	305.5	301.0	–	156.0	151.5	–	38.46	40.50	–	67	55
DN 100***	4"			–	200	–	305.5	301.0	–	156.0	151.5	–	38.46	40.50	–	71	61
DN 100	4"			–	247	–	–	320.0	–	–	163.0	–	–	51.20	–	–	96
DN 150****	6"			–	247	–	–	320.0	–	–	163.0	–	–	51.20	–	–	108

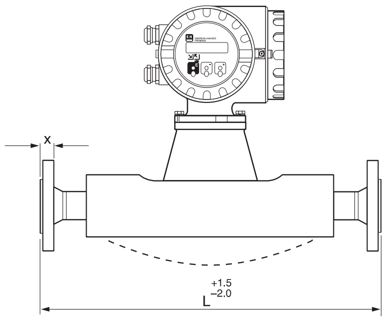
DN 8: with DN 15 flanges as standard; All weights stated are those for the compact version;
* Promass M, high pressure version (DN 8, 15, 25), same dimension as the standard version;
** DN 15, 25, 40 “FB” = Full bore versions of Promass I;
*** DN 100 / 4" : Nominal diameter DN 80 / 3" with DN 100 / 4" flanges;
**** DN 150 / 6" : Nominal diameter DN 100 / 4" with DN 150 / 6" flanges

Process Connections Promass 63 I, M, F DIN 2501

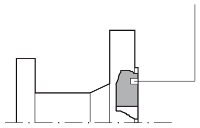
Promass I
Wetted parts: titanium Grade 9
No internal gaskets with welded process connections

Promass M
Flange material: SS 1.4404 (316L), titanium Grade 2
Gasket material: O-ring in Viton (–15...+200 °C), EPDM (–40...+160 °C), Silicone (–60...+200 °C), Kalrez (–30...+210 °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)
No internal gaskets with welded process connections



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



ti030y21

Promass I

	PN 40		PN 64		PN 100	
Diameter	L [mm]	x [mm]	L [mm]	x [mm]	L [mm]	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

Promass M, F

	PN 16		PN 40		PN 64		PN 100	
Diameter	L [mm]	x [mm]	L [mm]	x [mm]	L [mm]	x [mm]	L [mm]	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	–	–	–	–

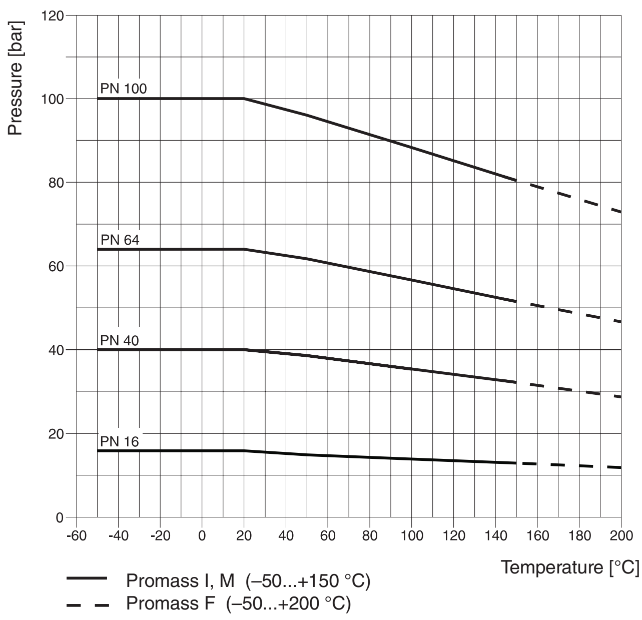
DN 8: with DN 15 flanges as standard; DN 100 only with Promass F available;
** DN 8, DN 15: also available with DN 25, PN 40 flanges (L = 440 mm, x = 18 mm);
*** DN 100: Diameter DN 80 with DN 100 flanges;
**** DN 150: Diameter DN 100 with DN 150 flanges

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

Pressure limitations due to fluid temperature



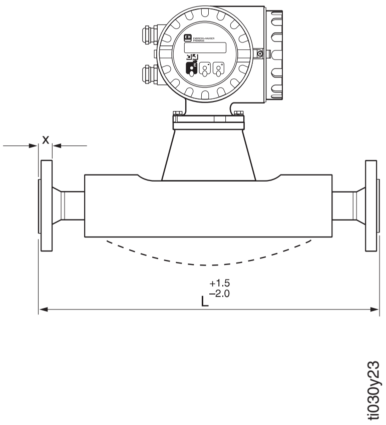
ti030y22

Process Connections Promass 63 I, M, F ANSI B16.5

Promass I
Wetted parts: titanium Grade 9
No internal gaskets with welded process connections

Promass M
Flange material: SS 1.4404 (316L), titanium Grade 2
Gasket material: O-ring in Viton (–15...+200 °C), EPDM (–40...+160 °C), Silicone (–60...+200 °C), Kalrez (–30...+210 °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)
No internal gaskets with welded process connections



Promass I							
Diameter		Cl 150		Cl 300		Cl 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
½"	DN 15	438	20	438	20	438	20
½" *	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
1½"	DN 40	708	26	708	26	708	28
1½" *	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

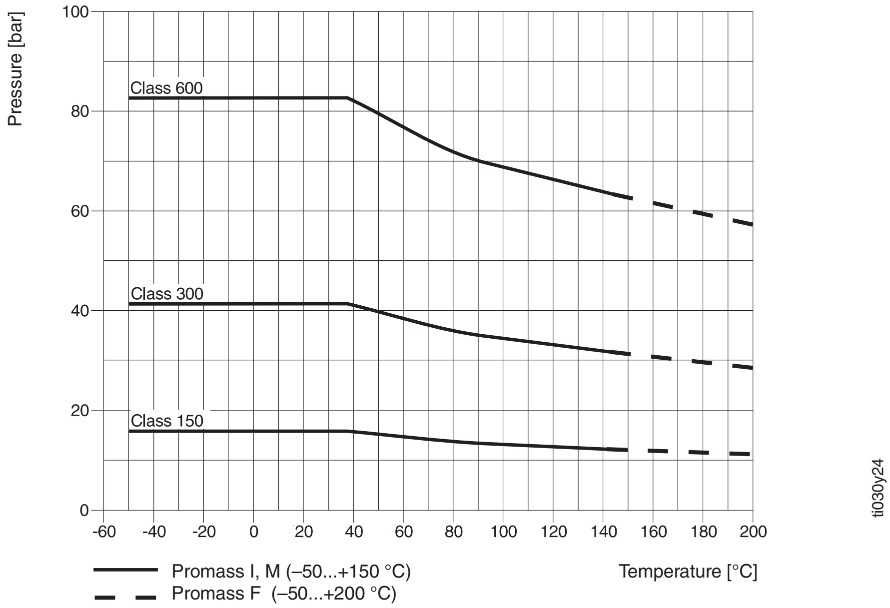
Promass M, F							
Nennweite		Cl 150		Cl 300		Cl 600	
ANSI	DIN	L [mm]	x [mm]	L [mm]	x [mm]	L [mm]	x [mm]
3/8"	DN 8	370	11.2	370	14.2	400	20.6
½"	DN 15	404	11.2	404	14.2	420	20.6
1"	DN 25	440	14.2	440	17.5	490	23.9
1½"	DN 40	550	17.5	550	20.6	600	28.7
2"	DN 50	715	19.1	715	22.3	742	31.8
3"	DN 80	840	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; 4" / DN 100: only for Promass F available;
** 4" / DN 100: Diameter 3"/DN 80 with 4"/DN 100 flanges;
*** 6" / DN 100: Diameter 4" / DN 100 with 6" / DN 150 flanges

Surface finish of the flanges

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

Pressure limitations due to fluid temperature

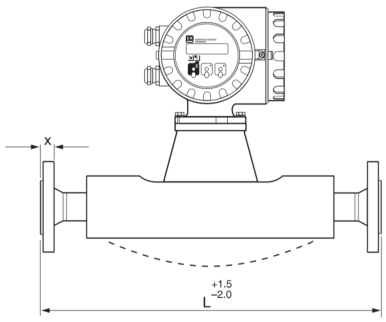


Process Connections Promass 63 I, M, F JIS B2238

Promass I
Wetted parts: titanium Grade 9
No internal gaskets with welded process connections

Promass M
Flange material: SS 1.4404 (316L), titanium Grade 2
Gasket material: O-ring in Viton (–15...+200 °C), EPDM (–40...+160 °C), Silicone (–60...+200 °C), Kalrez (–30...+210 °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)
No internal gaskets with welded process connections



Promass I

	10K		20K		40K		63K	
Diameter	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

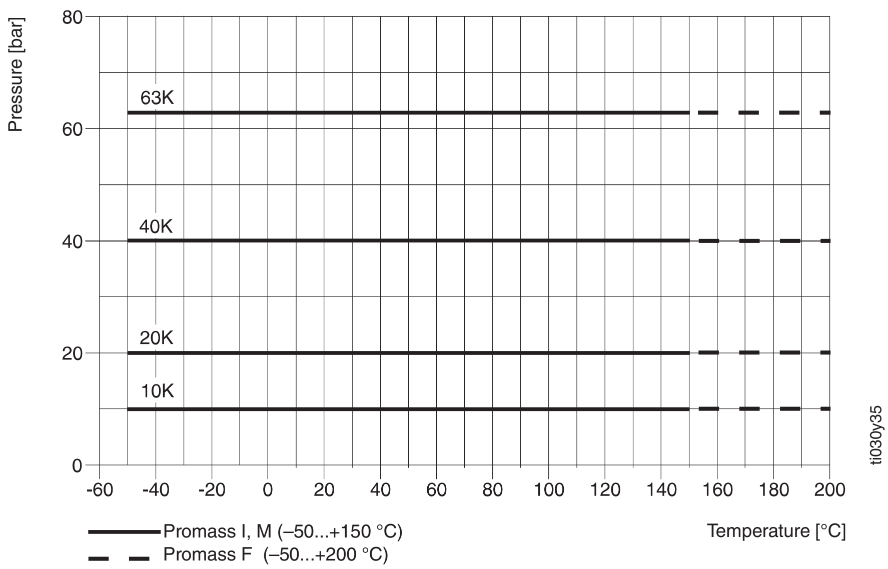
	10K		20K		40K		63K	
Diameter	L [mm]	x [mm]	L [mm]	x [mm]	L [mm]	x [mm]	L [mm]	x [mm]
DN 8	–	–	370	14	400	20	420	23
DN 15	–	–	404	14	425	20	440	23
DN 25	–	–	440	16	485	22	494	27
DN 40	–	–	550	18	600	24	620	32
DN 50	715	16	715	18	760	26	775	34
DN 80	832	18	832	22	890	32	915	40
DN 100 **	864	18	–	–	–	–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

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

Surface finish of the flanges

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

Pressure limitations due to fluid temperature

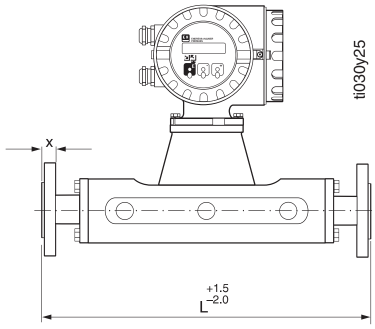


PVDF Process Connections Promass 63 M

Wetted parts materials (DIN 2501 / ANSI B16.5 / JIS B2238)

Flange material: PVDF

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

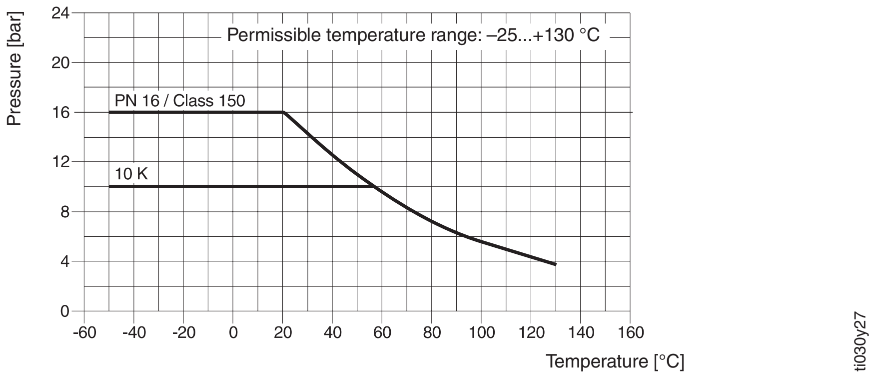


Diameter		PN 16 / Cl 150 / 10K	
DIN	ANSI	L [mm]	x [mm]
DN 8	3/8"	370	16
DN 15	1/2"	404	16
DN 25	1"	440	18
DN 40	1 1/2"	550	21
DN 50	2"	715	22

DN 8 resp. 3/8": instrument fitted with DN 15 resp. 1/2" flanges

Caution!
- When using PVDF process connections
  - Use only gaskets with a hardness Shore A ≤ 75
  - Use only the specified screw tightening torques (see Operating Manual)
- For large diameters and heavy dead weights: sensor must be supported

Pressure limitations due to fluid temperature



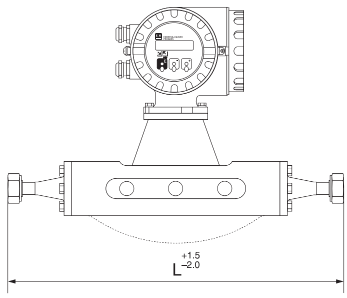
VCO Process Connections Promass 63 I, M, F

Wetted Parts Materials

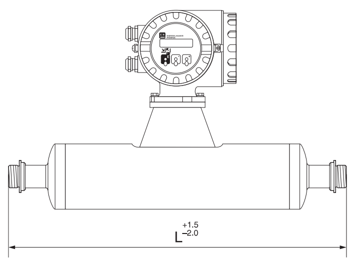
Promass I
Process connection materials: titanium Grade 2
No internal gaskets with welded process connections

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

Promass F
Process connection materials: SS 1.4404 (316L)
No internal gaskets with welded process connections

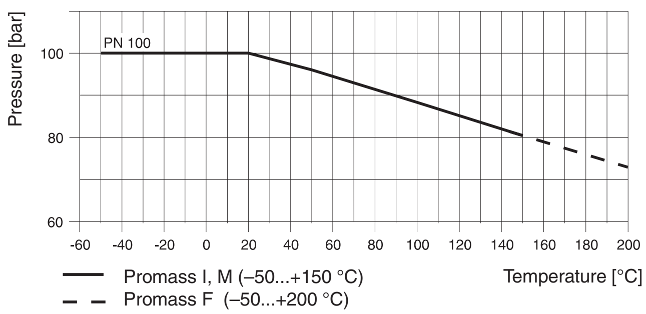


Diameter	**Promass M** L [mm]	**Promass F** L [mm]
DN 8 8-VCO-4 (1/2")	390	390
DN 15 12-VCO-4 (3/4")	430	430



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

Pressure limitations due fluid temperature



Sanitary Process Connections Promass 63 I, M, F

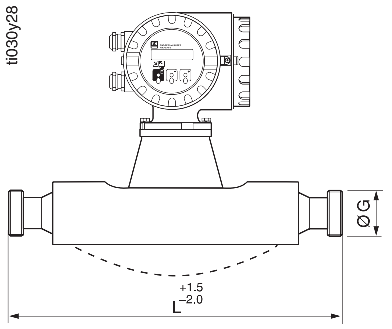
Wetted parts materials

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

Promass M (connections with internal gaskets)
Coupling / 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)
Coupling / Tri-Clamp: SS 1.4404 (316L)

Hygienic coupling
DIN 11851/SMS 1145



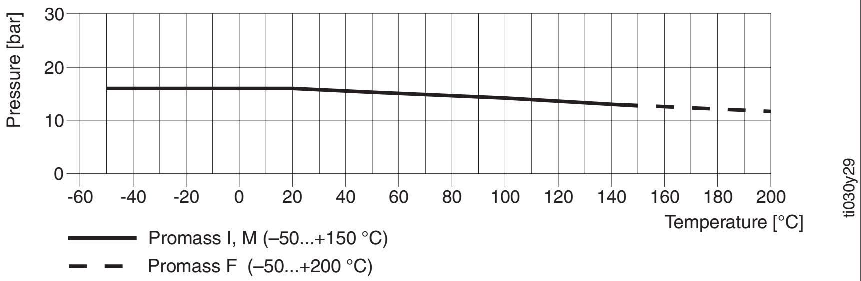
Promass M, F			
Diameter	L [mm]	Ø G DIN 11851	Ø G SMS 1145
DN 8	367	Rd 34 x 1/8"	Rd 40 x 1/6"
DN 15	398	Rd 34 x 1/8"	Rd 40 x 1/6"
DN 25	434	Rd 52 x 1/6"	Rd 40 x 1/6"
DN 40	560	Rd 65 x 1/6"	Rd 60 x 1/6"
DN 50	720	Rd 78 x 1/6"	Rd 70 x 1/6"
DN 80 M	815	Rd 110 x 1/4"	–
DN 80 M	792	–	Rd 98 x 1/6"
DN 80 F	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 connections as standard;
3A-version with $R_a \le 0.8$ µm available;
* DN 100: only for Promass F available

Promass I				
Diameter	DIN 11851 L [mm]	DIN 11851 Ø G	SMS 1145 L [mm]	SMS 1145 Ø G
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 version of Promass I;
3A-version with $R_a \le 0.8$ µm as standard

Pressure limitations due to fluid temperature



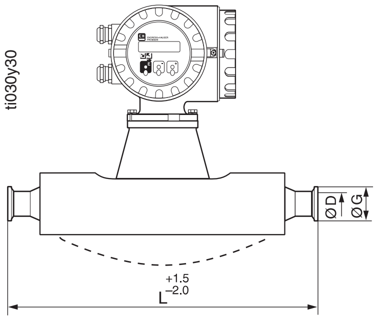
Wetted parts materials

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

Promass M (connections with internal gaskets)
Coupling / 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)
Coupling / Tri-Clamp: SS 1.4404 (316L)

Tri-Clamp



Promass M, F					
Diameter		Clamp	L	Ø G	Ø D
DIN	ANSI		[mm]	[mm]	[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" connections as standard;
3A-version with $R_a \leq 0.8$ µm available;
DN 100: only for Promass F available

Pressure limitations due to fluid temperature
The material load limit is exclusively determined by the material properties of the Tri-Clamp used. This clamp is not included in the shipment.

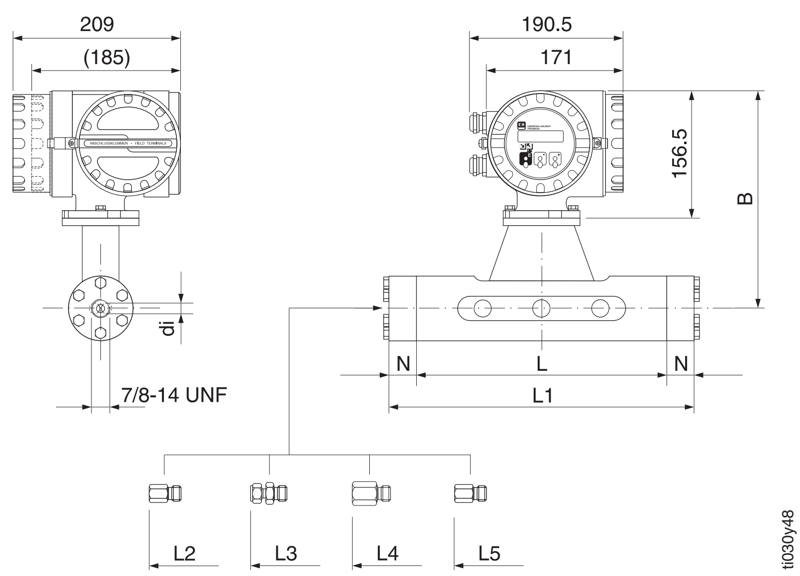
Promass I					
Diameter		Clamp	L	Ø G	Ø D
DIN	ANSI		[mm]	[mm]	[mm]
DN 8	3/8"	1/2"	426	25.0	9.5
DN 8	3/8"	3/4"	426	25.0	16.0
DN 8	3/8"	1"	427	50.4	22.1
DN 15	1/2"	1/2"	462	25.0	9.5
DN 15	1/2"	3/4"	462	25.0	16.0
DN 15	1/2"	1"	463	50.4	22.1
DN 15**	1/2"	3/4"	602	25.0	16.0
DN 25	1"	1"	603	50.4	22.1
DN 25**	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 version of Promass I;
3A-version with $R_a \leq 0.8$ or $R_a \leq 0.4$ µm as standard

Dimensions
Process Connections

Promass 63 M
(high pressure)

Compact version

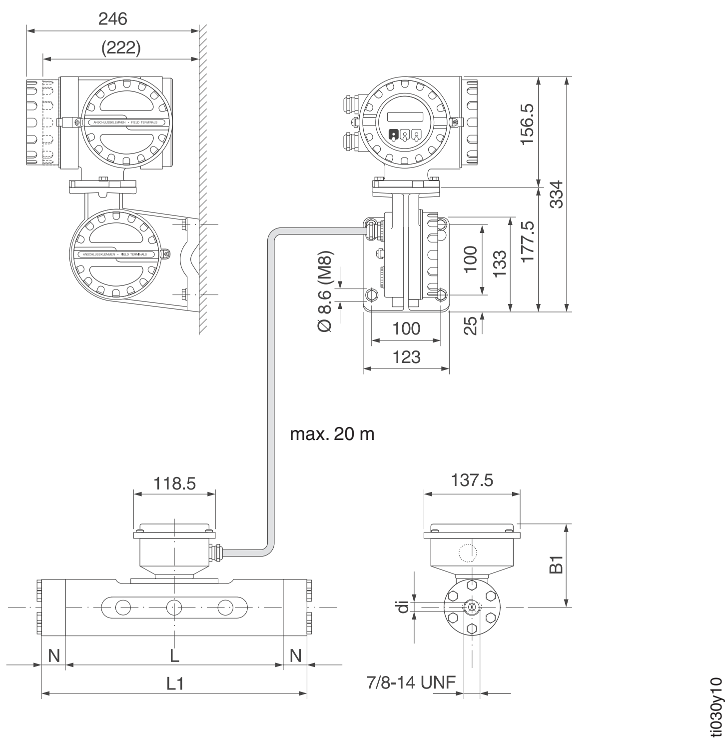


Process connection	N	L	L1	L2	L3	L4	L5
		without connectors	with connectors	G 3/8"	VCO with 1/2" SWAGELOK	1/2" NPT	3/8" NPT
DN 8	24	256	304	355.8	366.4	370	355.8
DN 15	24	286	334	385.8	396.4	400	385.8
DN 25	34	310	378	429.8	440.4	444	429.8

all dimensions in [mm]

Diameter		B	B1	di	Weight
DN	ANSI	[mm]	[mm]	[mm]	[mm]
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

Remote version



Pressure Limitations

Promass 63 M (high pressure)

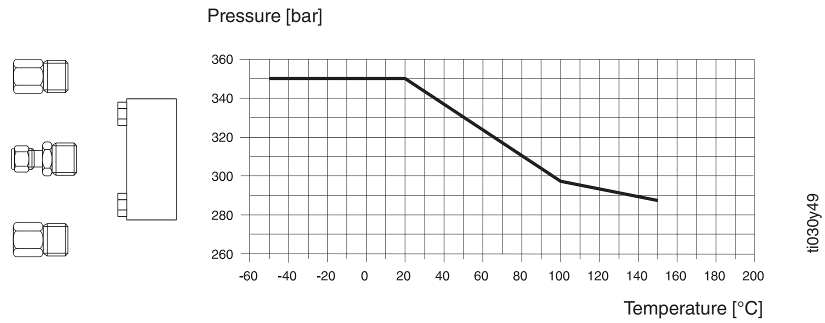
Wetted parts materials

Measuring tube:	titanium Grade 9
Connectors:	SS 1.4404 (316L)
Fittings:	SS 1.4401 (316)
Gaskets:	O-ring in Viton (–15...+200 °C), Silicone (–60...+200 °C)

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

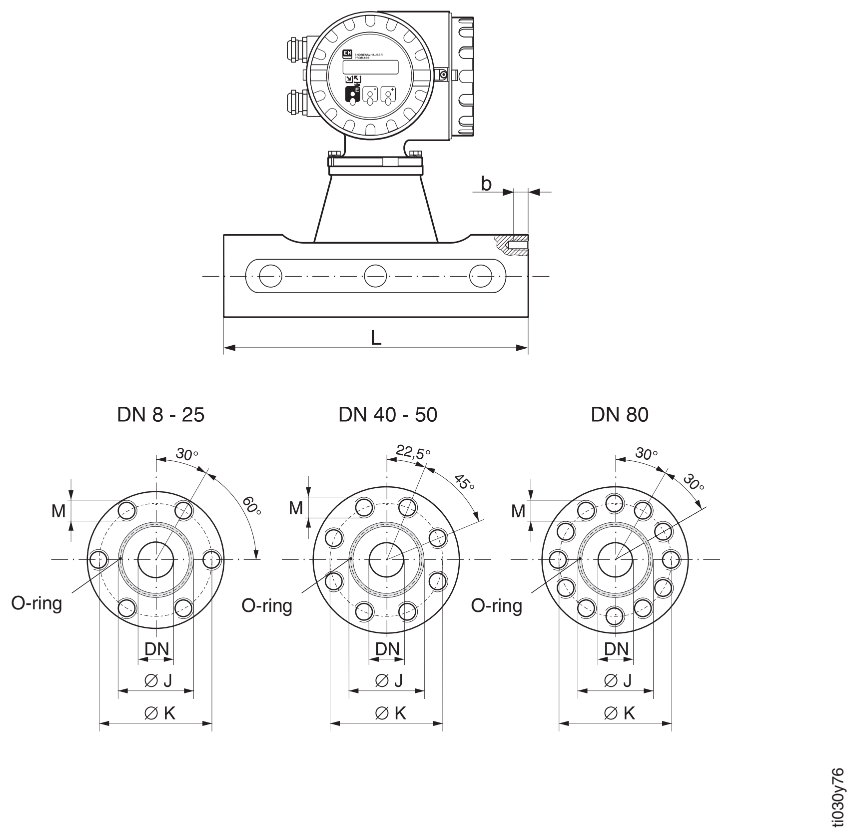
Pressure limitations due to fluid temperature

Connector, G 3/8", VCO with 1/2" SWAGELOK, 3/8" NPT



Dimensions

Promass 63 M (without Process Connections)



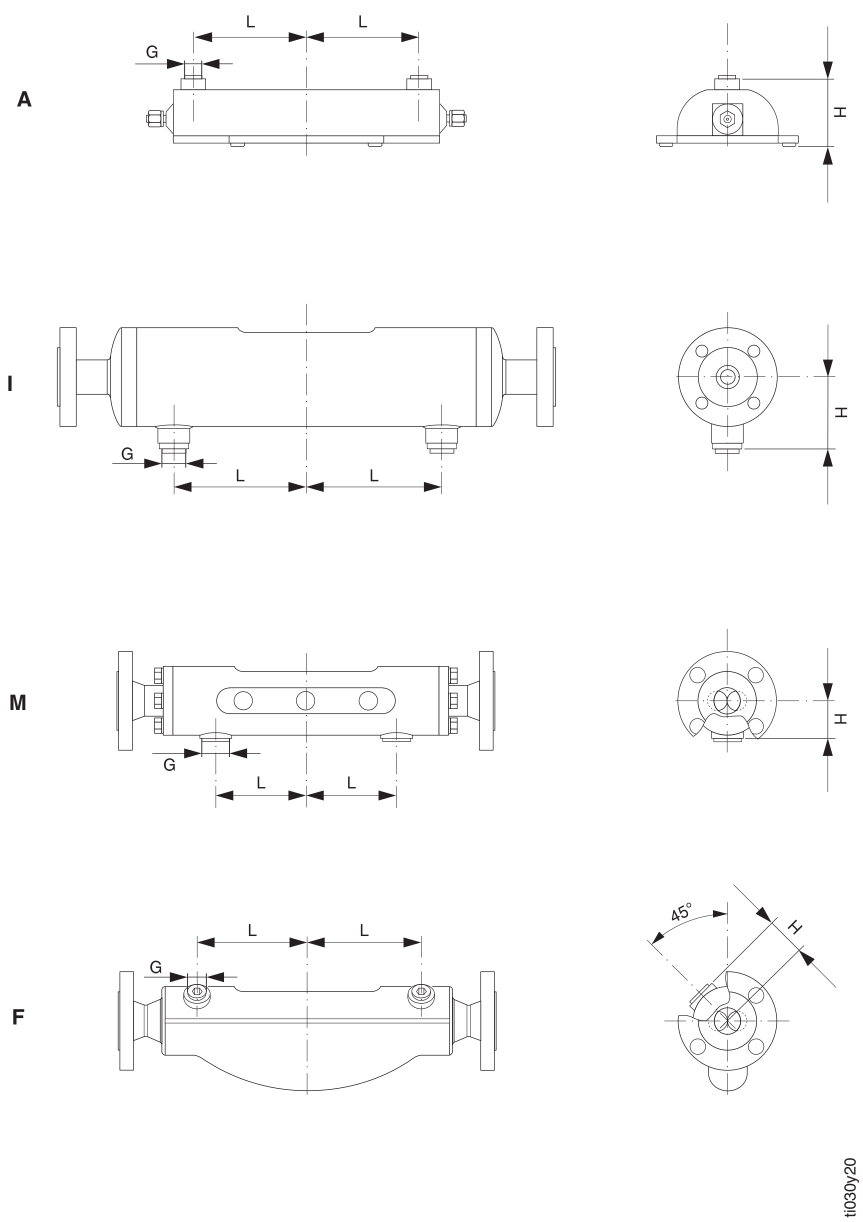
Diameter DN		Dimensions			Coupling		Minimum screw depth	Torque	Lubricated thread	O-ring	
DIN	ANSI	∅ L [mm]	∅ J [mm]	∅ K [mm]	Screws M	Depth b [mm]	[mm]	[Nm]	yes/no	Diam. [mm]	Inside ∅ [mm]
DN 8	⅜"	256	27	54	6 x M 8	12	10	30.0	no	2.62	21.89
DN 8*	⅜"	256	27	54	6 x M 8	12	10	19.3	yes	2.62	21.89
DN 15	½"	286	35	56	6 x M 8	12	10	30.0	no	2.62	29.82
DN 15*	½"	286	35	56	6 x M 8	12	10	19.3	yes	2.62	29.82
DN 25	1"	310	40	62	6 x M 8	12	10	30.0	no	2.62	34.60
DN 25*	1"	310	40	62	6 x M 8	12	10	19.3	yes	2.62	34.60
DN 40	1½"	410	53	80	8 x M 10	15	13	60.0	no	2.62	47.30
DN 50	2 "	544	73	94	8 x M 10	15	13	60.0	yes	2.62	67.95
DN 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

Dimensions

Purge Connection Pressure Vessel Control

Promass Sensor



Diameter		Promass A		Promass I		Promass M		Promass F		Connection
DIN	ANSI	L [mm]	H [mm]	L [mm]	H [mm]	L [mm]	H [mm]	L [mm]	H [mm]	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;
** DN 100: only for Promass F available

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 3)
Measuring system	Instrument family “Promass 63” consisting of: Transmitter: Promass 63 Sensors: Promass A, I, F and M • Promass A — DN 1, 2, 4 and DN 2, 4 (high pressure version) Single tube system in SS or Alloy C-22 • Promass I — DN 8, 15, 25, 40, 50 (completely welded version) Straight single tube system in titanium DN 15 “FB”, DN 25 “FB”, DN 40 “FB”: Full bore versions of Promass I with a higher full scale value (see table below) • Promass F — DN 8, 15, 25, 40, 50, 80, 100 (completely welded version) Two slightly curved measuring tubes in SS (DN 8...100) or Alloy C-22 (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 proportional to the phase difference between two sensors on the measuring tube which detect differences in its oscillation) • Fluid density (is proportional to the resonance frequency of the measuring tubes) • Fluid temperature (is measured with temperature sensors)

Measuring range

DN [mm]	Range of full scale values: Liquid $\dot{m}_{min\,(L)}...\dot{m}_{max\,(L)}$
1	0... 20.0 kg/h
2	0...100.0 kg/h
4	0...450.0 kg/h
8	0... 2.0 t/h
15	0... 6.5 t/h
15*	0... 18.0 t/h
25	0... 18.0 t/h
25*	0... 45.0 t/h
40	0... 45.0 t/h
40*	0... 70.0 t/h
50	0... 70.0 t/h
80	0...180.0 t/h
100	0...350.0 t/h

Gas $\dot{m}_{min\,(G)}...\dot{m}_{max\,(G)}$:

The full scale depends on the density of the gas. The full scale value can be determined with the following formula:

$$\dot{m}_{max(G)} = \frac{\dot{m}_{max(L)} \cdot \rho_{(G)}}{x \cdot 1.6}$$

$\dot{m}_{max(G)}$ = Full scale value gas [t/h]

$\dot{m}_{max(L)}$ = Full scale value liquid [t/h] (value from table)

$\rho_{(G)}$ = gas density [kg/m^3] (at operating conditions)

x = constant [kg/m^3]
Promass A: x = 20
Promass I, M, F: x = 100

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

(continued on next page)

Input variables (continued)	
Measuring range (continued)	Example for calculating a gas full scale value: Sensor: Promass F → x = 100 Nominal diameter DN 50 → 70.0 t/h (full scale value from table on page 26) Gas: Air with a density of 60.3 kg/m³ (at 20°C and 50 bar) $\dot{m}_{max(G)} = \frac{\dot{m}_{max(L)} \cdot \rho_{(G)}}{x \cdot 1.6} = \frac{70.0 \cdot 60.3}{100 \cdot 1.6} = 26.4$ t/h
Operable flow range	up to 1000 : 1 This enables totalizer values to be accurately determined even in pulsating systems e.g. with 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

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 error messages • *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 $^1/_{(2 \text{ x pulse width})}$ 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)
Creep suppression	Switch points for low flow selectable. 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)

Measured error

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

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

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

  zero stability → see table below

Note!
- The values above refer to the pulse/frequency output.
- Additional measuring error of the current output: ± 5 μA (typical)

Diameter DN	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 Promass I

Example for calculating the measured error:
Promass F ± 0.10% ± [(zero stability / flow rate) x 100]% of rate
DN 25; Flowrate = 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 g/cc, 5...80°C)
  Promass A, M ± 0.002 gccl
  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 x T (T = fluid temp. in °C)

Accuracy (continued)

Repeatability

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

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

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

  Zero stability → see table on page 28

Example for calculating the repeatability:
Promass F ± 0.05% ± [(zero stability / flow rate) x 100]% of rate
DN 25; Flowrate = 3.6 t/h = 3600 kg/h

Repeatabilitity → $\pm 0{,}05\% \pm {}^1/_2 \cdot \frac{0{,}9\ \text{kg/h}}{3600\ \text{kg/h}} \cdot 100\% = \pm 0{,}0625\%$

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

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

Process effects

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

- *Process pressure effect:*
  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).

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” = Promass I mit vollem Nennweitenquerschnitt
** o.r. = of rate

Technical Data

Operating conditions	
Installation conditions	
Installation instructions	Orientation: vertical or horizontal. Restrictions on installation and other recommendations: see page 5 – 7
Inlet and outlet sections	Installation site is independent of inlet and outlet sections.
Connection cable length	max. 20 m (remote version)
Ambient conditions	
Ambient temperature	Transmitter and Sensor: –25...+60 °C (Version with enhanced climate resitance: –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 7) • An all-weather cover should be used to protect the housing from direct sunlight when mounting in the open. This is especially important in warmer climates and with high ambient temperatures. • If the ambient temperature is below –25 °C, it is not recommended to use a version with display.
Storage temp.	–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
Vibration resistance	up to 1 g, 10...150 Hz according to IEC 68-2-6
Electromagnetic compatibility (EMC)	Acc. 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

Operating conditions (continued)	
Pressure *Material load diagrams: see page 13, 15 ff.*	• *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, connector, fittings: max. 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
Pressure loss	Dependent on nominal diameter and sensor type (see page 8, 9)

Technical Data

Mechanical construction	
Design, dimensions	see page 12 ff.
Weights	see page 12, 14, 22
Materials	• *Transmitter housing:* Powder-coated die-cast aluminium • *Sensor housing / containment vessel:* Promass A, I, F — Surfaces resistant to acids and alkalis, SS 1.4301 (304) Promass M — Surfaces resistant 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:* see page 13, 15 - 21, 23 • *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:* see page 13, 15 – 21, 23
Process connections	• *Promass A* — Welded process connections: 4-VCO-4 fittings, ½" Tri-Clamp Screw-on process connections: Flanges (DIN, ANSI, JIS B2238), NPT-F and SWAGELOK fittings • *Promass I* — Welded process connections: 12-VCO-4 fittings, Flanges (DIN 2501, ANSI B16.5, JIS B2238) Sanitary connections: Tri-Clamp, Hygienic coupling DIN 11851 / SMS 1145 • *Promass M* — Screw-on process connections: 8-VCO-4 fittings, 12-VCO-4 fittings, Flanges (DIN 2501, ANSI B16.5, JIS B2238) Sanitary connections: Tri-Clamp, Hygienic coupling DIN 11851 / SMS 1145 • *Promass M High pressure* — Screw-on process connections: G ⅜", ½" NPT, ⅜" NPT fittings and ½" SWAGELOK coupling, connector with 7/8 14UNF internal thread • *Promass F* — Welded process connections: 8-VCO-4 fittings, 12-VCO-4 fittings, Flanges (DIN 2501, ANSI B16.5, JIS B2238) Sanitary connections: Tri-Clamp, Hygienic coupling DIN 11851 / SMS 1145

Mechanical construction (continued)	
Electrical connection	*Wiring diagram:* see page 10, 11 *Cable glands (In-/outputs; remote version):* PG 13.5 cable glands (5…15 mm) or $^{1}/_{2}$" NPT, M 20 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 11
User interface	
Operation	On-site operation with 3 operating elements for setting all instrument functions in the E+H operating matrix (see page 4)
Display	LC-display, illuminated, double-spaced with 16 characters each
Communication	• Rackbus 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” (see page 10, 11)
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. 1 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 Operating Manual Promass 60 BA 013D/06/en Operating Manual Promass 63 BA 014D/06/en

Other standards and guidelines

EN 60529	Degree of protection (IP-Code)
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

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Subject to modification

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