Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

# LPGmass

## Coriolis Mass Flow Measuring System
## For Fueling with Liquified Petroleum Gas (LPG) and filling in hazardous areas

**Applications**
The Coriolis measuring principle works independently of the physical fluid properties.

- Specially designed flowmeter for fueling vehicles with LPG (liquified petroleum gas) and filling in hazardous areas
- Fluid temperature up to +125 °C
- Process pressures up to 100 bar
- Mass flow measurement up to 750 kg/min
- Big range of process connections

Approvals for hazardous area:
- ATEX, FM, CSA
- Suitable for systems according MID

Connection to common control systems:
- MODBUS RS485

**Your benefits**
The Promass measuring devices allow you record multiple process variables (mass/density/temperature) simultaneously during operation for diverse process conditions. Incl. standard volume calculation according API table 53.

The **transmitter concept** comprises:
- FieldCare for onsite operation and diagnosis
- Very low energy consumption

The **Promass sensors**, tried and tested in over 100000 applications, offer:
- Space-saving and compact design
- Insensitivity to vibrations thanks to balanced twin-tube measuring system
- Easy installation without taking inlet or outlet runs into account

TI080D/06/en/05.08
71071015

Endress+Hauser
People for Process Automation

# Table of contents

# Function and system design

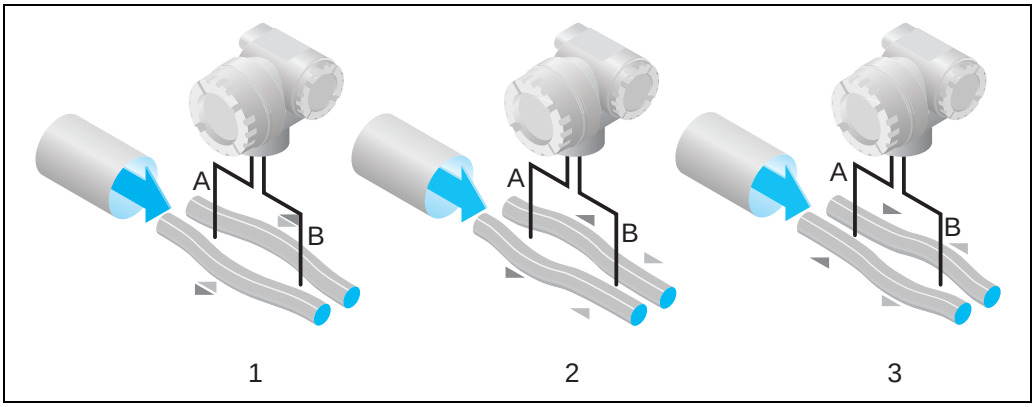
## Measuring principle

The measuring principle is based on the controlled generation of Coriolis forces. These forces always occur in a system where translational (linear) and rotational movements are superimposed simultaneously.

$F_C = 2 \cdot \Delta m\ (v \cdot \omega)$
$F_C$ = Coriolis force
$\Delta m$ = moving mass
$\omega$ = rotational velocity
v = radial velocity in rotating or oscillating system

The size of the Coriolis force depends on the moving mass $\Delta m$, its velocity v in the system, and thus the mass flow. Instead of a constant rotational velocity $\omega$, Promass uses oscillation.

In the sensor, two parallel measuring tubes containing flowing fluid oscillate in antiphase, acting like a tuning fork. The Coriolis forces produced at the measuring tubes cause a phase shift in the tube oscillations (see illustration):
- At zero flow, in other words when the fluid is at a standstill, the two tubes oscillate in phase (1).
- Mass flow causes deceleration of the tube oscillation at the inlet (2) and acceleration at the outlet (3).



A0006995

The phase difference (A-B) increases with increasing mass flow. Electrodynamic sensors register the tube oscillations at the inlet and outlet. System balance is ensured by the antiphase oscillation of the two measuring tubes. The measuring principle works independently of temperature, pressure, viscosity, conductivity and flow profile.

### Density measurement

The measuring tubes are always excited at their resonance frequency. A change in the mass and thus the density of the oscillating system (comprising measuring tubes and fluid) results in a corresponding, automatic adjustment in the exciter frequency. Resonance frequency is thus a function of fluid density. The microprocessor utilizes this relationship to obtain a density signal.

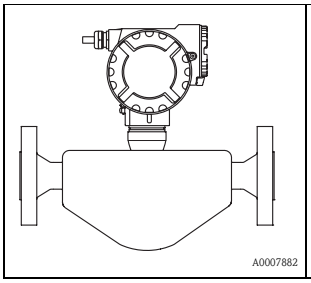
### Temperature measurement

To make calculations to compensate for temperature effects, the temperature of the measuring tubes is measured. This signal corresponds to the process temperature and is also available as an output signal.

## Measuring system

The measuring system consists of the transmitter and sensor which together form a mechanical unit.

### Measuring system LPGmass


A0007882

- Without onsite operation
- Configuration via MODBUS RS485 and “FieldCare”
- Limiting medium pressure range max. 100 bar (dependent on process connection)
- Ambient temperature range: –40 to +60 °C

# Input

**Measured variable**

- Mass flow (proportional to the phase difference between two sensors mounted on the measuring tube which record differences in the pipe oscillation geometry during flow)
- Volume flow (measured from the mass flow and density)
- Fluid density (proportional to the resonance frequency of the measuring tube)
- Fluid temperature (measured with temperature sensors)

**Measuring ranges**

**Measuring ranges for non-custody transfer operation.**

| DN | | $\dot{m}_{min}$ to $\dot{m}_{max}$ | |
|---|---|---|---|
| [mm] | [inch] | [kg/h] | [lb/min] |
| 8 | 3/8" | 0 to 2000 | 0 to 73.5 |
| 15 | ½" | 0 to 6500 | 0 to 238 |
| 25 | 1" | 0 to 18000 | 0 to 660 |
| 40 | 1½" | 0 to 45000 | 0 to 1650 |

Note!
The values of the corresponding custody transfer certificate apply for custody transfer operation.

**Operable flow range**

1:100

# Output

**Output signal**

**Pulse / frequency output:**

- Passive
- Galvanically isolated
- Open Collector
- Max. 30 V DC
- Max. 25 mA
- Frequency output: end frequency 100 to 5000 Hz, on/off ratio 1:1
- Pulse output: pulse value and pulse polarity selectable, pulse width configurable (0.1 to 1000 ms)

**Status output:**

- Passive
- Open Collector
- Max. 30 V DC
- Max. 25 mA

**MODBUS interface:**

- MODBUS device type: slave
- Address range: 1 to 247
- Functions codes supported: 03, 04, 06, 08, 16, 23
- Broadcast: supported with the function codes 06, 16, 23
- Physical interface: RS485 in accordance with standard EIA/TIA-485
- Baud rates supported: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud
- Transmission mode: RTU or ASCII
- Response time = typically 5 ms

**Signal on alarm**

*Pulse / frequency output:*
Behavior can be selected

*Status output:*
Behavior can be selected

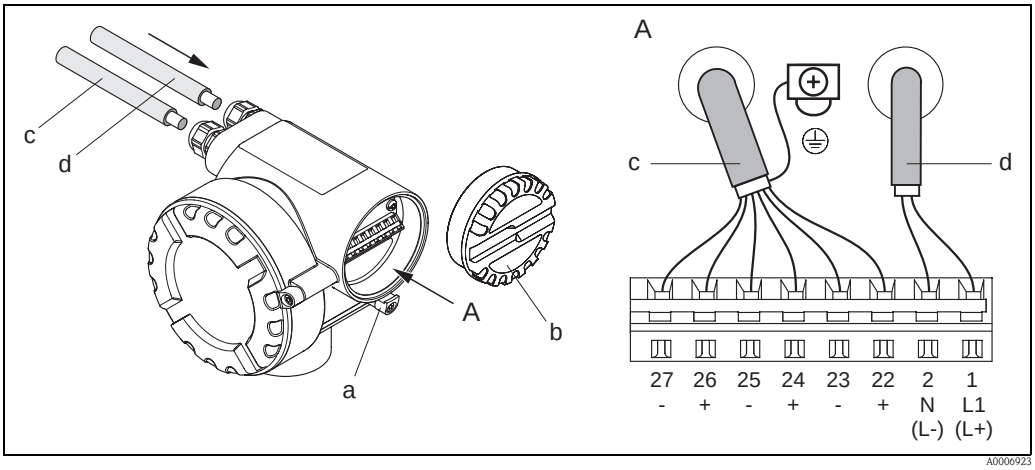
MODBUS RS485:
Behavior can be selected

**Galvanic isolation**

All circuits for outputs and power supply are galvanically isolated from each other.

# Power supply

**Electrical connection, measuring unit**




*Connecting the transmitter, cable cross-section: max. 2.5 mm²*

*A View A*
*a Safety claw*
*b Terminal compartment cover*
*c Signal cable: terminal Nos. 22-27*
*(shield for Modbus RS485 is mandatory; shield for pulse, frequency and status outputs is not required, but recommended)*
*d Cable for power supply: 20 to 28 V AC, 10 to 30 V DC*
*Terminal No. 1: L1 for AC, L+ for DC*
*Terminal No. 2: N for AC, L- for DC*

**Electrical connection, terminal assignment**

| | **Terminal No. (inputs/outputs)** | | |
|---|---|---|---|
| **Order version** | **22 (+) / 23 (-)** | **24 (+) / 25 (-)** | **26 (+) / 27 (–)** |
| 8FE**_**********N | Pulse/frequency/status output 2 | Pulse/frequency/status output 1 | MODBUS RS485 |

**Supply voltage**

24 V DC nominal voltage (10 to 30 V DC)
24 V AC nominal voltage (20 to 28 V AC)

**Cable entries**

*Power supply and signal cables (outputs):*
- Cable entry M20 × 1.5 (8 to 12 mm)
- Threads for cable entries, ½" NPT, G ½"

**Cable specifications**

Each compatible cable, with a temperature specification at least 20°C higher than the ambient temperature prevailing in the application. We recommend using a cable with a temperature specification of +80°C.

for MODBUS RS485:
Characteristic impedance = 120 W
Cable capacitance = < 30 pF/m
Core cross-section = > 0.34 mm², corresponds to AWG 22
Cable type = twisted pairs
Loop-resistance = ≤ 110 W/km
Shielding = copper braided shielding or braided shielding and foil shielding

**Power consumption**

AC: < 4 VA
DC: < 3.2 W

Typical switch-on current at 24 V DC nominal voltage at $R_i$ = 0.1 W of the source.

| t [ms] | I [A] |
|---|---|
| **0** | 10 |
| **0.1** | 8 |
| **0.2** | 7.5 |
| **0.5** | 7 |
| **1** | 6 |
| **2** | 4 |
| **5** | 1.5 |
| **10** | 0.125 (operating current) |

Note!
The internal resistance of the source may not exceed $R_i$ = 10 W.

**Power supply failure**

Bridging of at least 20 ms.
All measuring cell and measuring point data are maintained.

**Potential equalization**

This measuring instrument is suitable for potentially explosive atmospheres; refer to the correspondingly information in the specific Ex-specific supplementary documentation.

# Performance characteristics

**Reference operating conditions for factory calibration**

*Error limits following ISO/DIS 11631:*
- Fluid: water
- 15 to 45 °C; 2 to 6 bar
- Calibration rigs traced to national metrology standards.
- Zero point calibrated under operating conditions
- Density adjustment performed

**Maximum measured error**

**Mass flow:**

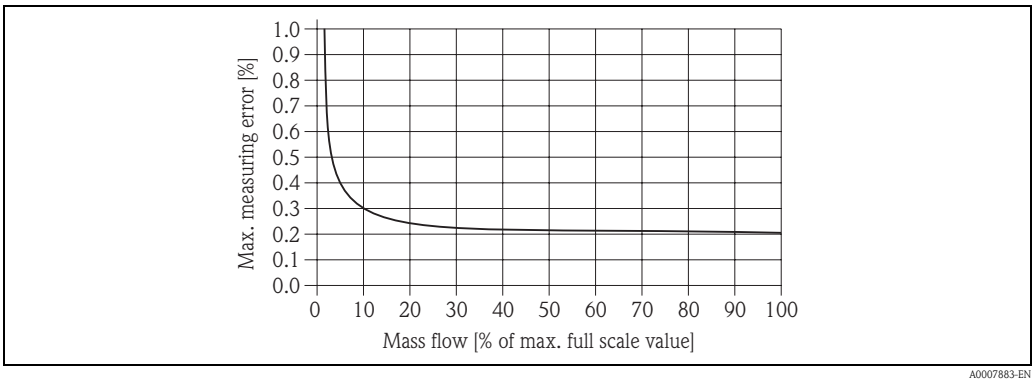
±0.2% ± [(zero point stability ÷ measured value) · 100]% o.r.

**Volume flow:**

±0.3% ± [(zero point stability ÷ measured value) · 100]% o.r.

**Zero point stability**

| DN | | Zero point stability | |
|---|---|---|---|
| | | [kg/h] | [lb/min] |
| 8 | 3/8" | 0.200 | 0.007 |
| 15 | ½" | 0.650 | 0.024 |
| 25 | 1" | 1.80 | 0.066 |
| 40 | 1 ½" | 4.50 | 0.165 |




A0007883-EN

Calculation example
Given: LPGmass DN 25, mass flow = 5000 kg/h
Max. measured error: ±0.2% ± [(zero point stability ÷ measured value) · 100]% o.r.
Max. measured error → ±0.2% ±1.80 kg/h ÷ 5000 kg/h · 100% = ±0.236%

**Repeatability**

**Mass flow:**

±0.10% ± [½ · (zero point stability ÷ measured value) · 100]% o.r.

**Volume flow:**

±0.15% ± [½ · (zero point stability ÷ measured value) · 100]% o.r.

**Influence of medium temperature**

When there is a difference between the temperature for zero point adjustment and the process temperature, the typical measured error is ±0.0003% of the full scale value/°C.

**Influence of medium pressure**

The following section shows the effect on accuracy of mass flow due to a difference between calibration pressure and process pressure is negligible.

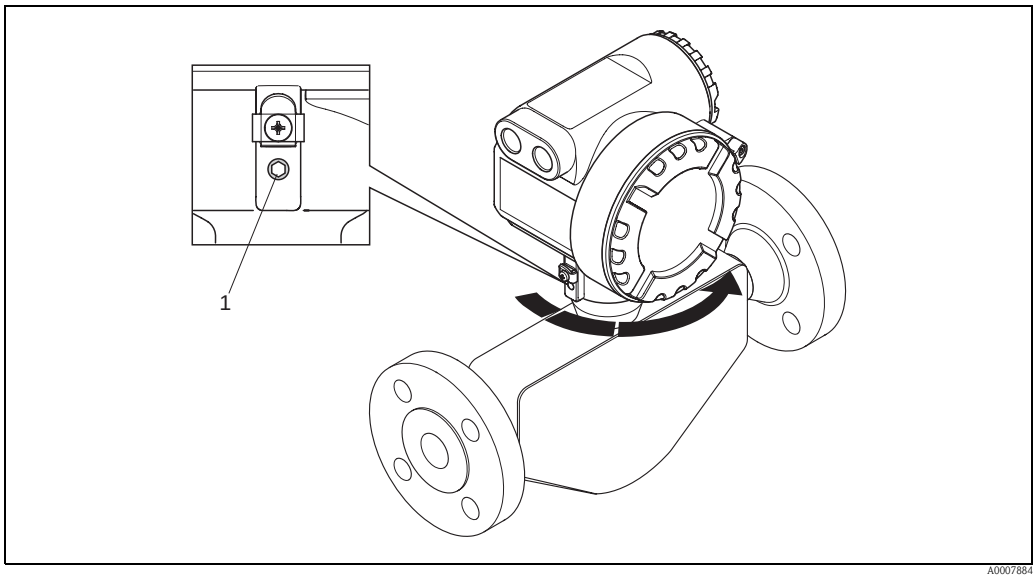
# Operating conditions: Installation

**Installation instructions**

Note the following points:
- No special measures such as supports are necessary. The housing absorbs external forces.
- The high oscillation frequency of the measuring tubes ensures that the correct operation of the measuring system is not influenced by pipe vibrations.
- No special precautions need to be taken for fittings which create turbulence (valves, elbows, T-pieces, etc.).

**Turning the transmitter housing**

The transmitter housing can be rotated counterclockwise continuously up to 360°.




*1 = Allen screw*

**Inlet and outlet runs**

There are no installation requirements regarding inlet and outlet runs.

# Operating conditions: Environment

**Ambient temperature range**

–40 to +60 °C (sensor, transmitter)

Note!
Install the device at a shady location. Avoid direct sunlight, particularly in warm climatic regions.

**Storage temperature**

–40 to +80 °C (preferably +20 °C)

**Degree of protection**

Standard: IP 67 (NEMA 4X) for transmitter and sensor

**Shock resistance**

In accordance with IEC 68-2-31 and EN 60721 (Class 2M3)

**Vibration resistance**

In accordance with IEC 68-2-31 and EN 60721 (Class 2M3)

**Electromagnetic compatibility (EMC)**

As per IEC/EN 61326 and NE 21

# Operating conditions: Process

**Medium temperature range**

–40 to +125 °C

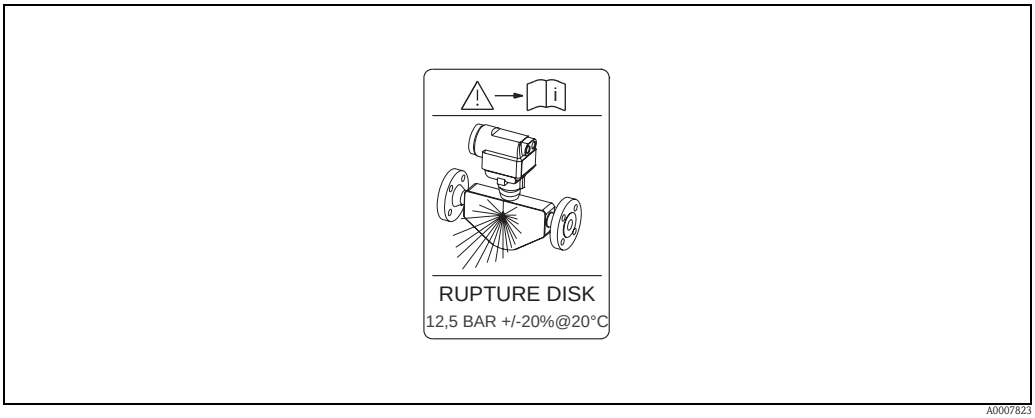
**Medium pressure range (nominal pressure)**

Measuring tubes, connector: max. 100 bar (dependent on process connection)

**Rupture disk in the sensor housing (optional)**

The sensor housing protects the inner electronics and mechanics and is filled with dry nitrogen. The housing of this sensor does not fulfill any additional secondary containment function. However, 15 bar can be specified as a reference value for the pressure loading capacity.
For increased safety, a version with rupture disk (triggering pressure 10 to 15 bar) can be used, which is available for order as a separate option.

The position of the rupture disk is indicated by an adhesive label on top of the disk. If the rupture disk is triggered, the adhesive label is damaged and can thus be visually monitored.




*Additional sign regarding the position of the rupture disk*

**Limiting flow**

See information in the “Measuring range” Section → Page 4

**Pressure loss**

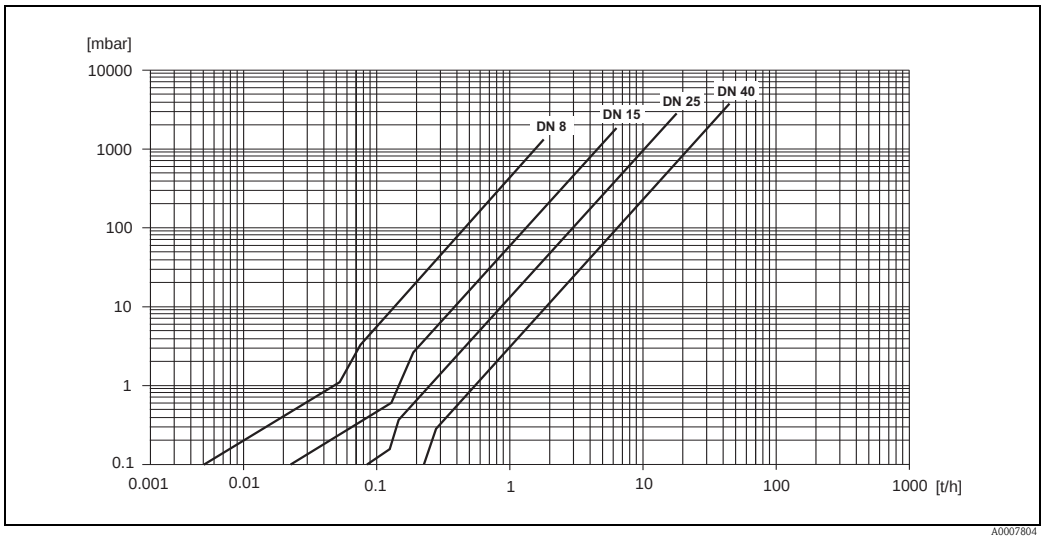
Pressure loss depends on the fluid properties and on the flow rate. The following formulae can be used to approximately calculate the pressure loss for liquids:

**Pressure loss formulae**

| | |
|---|---|
| Reynolds number | $Re = \frac{2 \cdot \dot{m}}{\pi \cdot d \cdot \nu \cdot \rho}$ a0004623 |
| $Re \geq 2300$ | $\Delta p = K \cdot \nu^{0.25} \cdot \dot{m}^{1.85} \cdot \rho^{-0.86}$ a0004626 |
| $Re < 2300$ | $\Delta p = K1 \cdot \nu \cdot \dot{m} + \frac{K2 \cdot \nu^{0.25} \cdot \dot{m}^2}{\rho}$ a0004628 |
| $\Delta p$ = pressure loss [mbar]<br>$\nu$ = kinematic viscosity [m²/s]<br>$\dot{m}$ = mass flow [kg/s] | $\rho$ = density [kg/m³]<br>d = internal diameter of measuring tubes [m]<br>K to K2 = constants (depending on nominal diameter) |

**Pressure loss coefficients**

| DN | d[m] | K | K1 | K2 |
|---|---|---|---|---|
| 8 | $5.35 \cdot 10^{-3}$ | $5.70 \cdot 10^{7}$ | $7.91 \cdot 10^{7}$ | $2.10 \cdot 10^{7}$ |
| 15 | $8.30 \cdot 10^{-3}$ | $7.62 \cdot 10^{6}$ | $1.73 \cdot 10^{7}$ | $2.13 \cdot 10^{6}$ |
| 25 | $12.00 \cdot 10^{-3}$ | $1.89 \cdot 10^{6}$ | $4.66 \cdot 10^{6}$ | $6.11 \cdot 10^{5}$ |
| 40 | $17.60 \cdot 10^{-3}$ | $4.42 \cdot 10^{5}$ | $1.35 \cdot 10^{6}$ | $1.38 \cdot 10^{5}$ |



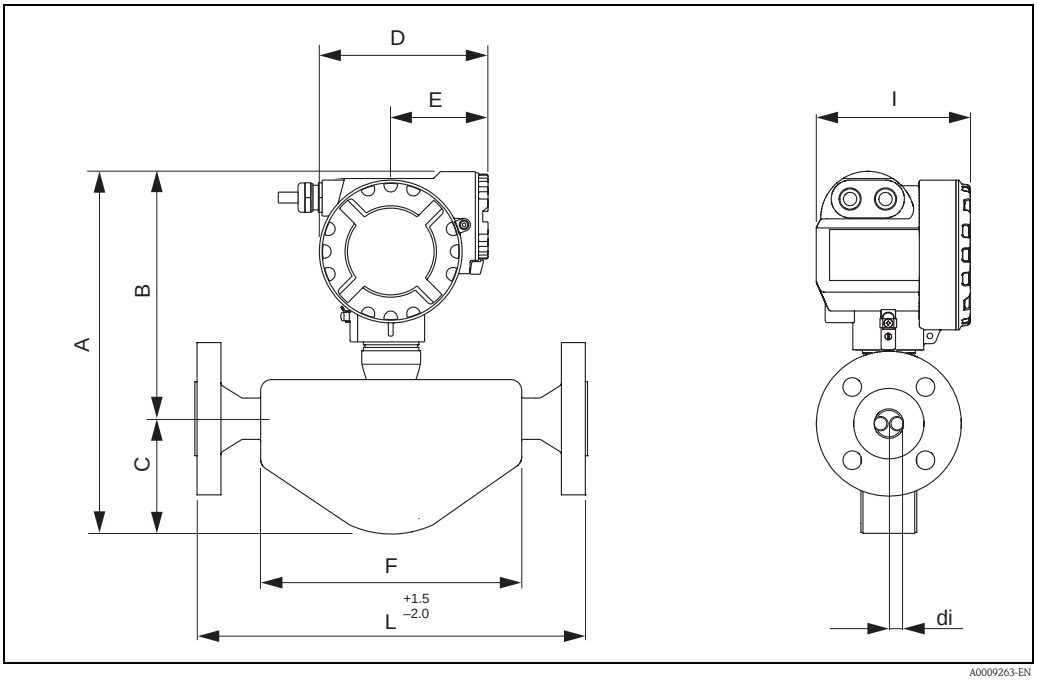

*Pressure loss diagram with water*

# Mechanical construction

## Design/dimensions

| Abmessungen: | |
|---|---|
| LPGmass dimensions | → Page 11 |
| Flange connections EN (DIN), ASME, JIS | → Page 12 |
| Tri-Clamp connections | → Page 14 |
| DIN 11851 (threaded hygienic connection) | → Page 15 |
| DIN 11864-1 Form A (threaded hygienic connection) | → Page 16 |
| VCO connections | → Page 17 |

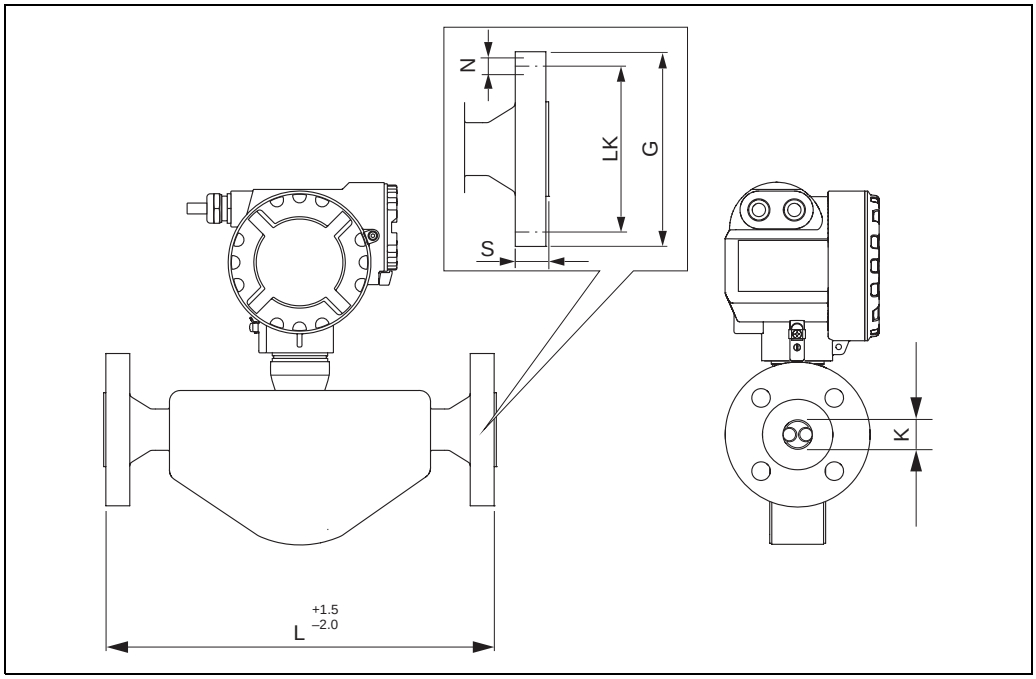
### LPGmass dimensions




| DN | A | B | C | D | E | F | L | I | 2 × di |
|---|---|---|---|---|---|---|---|---|---|
| 8 | 314 | 221 | 93 | 160 | 92 | 146 | * | 139 | 5.35 |
| 15 | 330 | 225 | 105 | 160 | 92 | 189 | * | 139 | 8.30 |
| 25 | 338 | 232 | 106 | 160 | 92 | 240 | * | 139 | 12.00 |
| 40 | 359 | 238 | 121 | 160 | 92 | 337 | * | 139 | 17.60 |

All dimensions in [mm]
* dependent on respective flange connection

**Flange connections EN (DIN), ASME, JIS**




| Flange EN 1092-1 (DIN 2501, DIN 2512 N[1]) / PN 40: 1.4404/316L | | | | | | |
|---|---|---|---|---|---|---|
| **DN** | **G** | **K** | **L** | **LK** | **N** | **S** |
| 8 | 95 | 17.3 | 232 | 65 | 4 × Ø14 | 16 |
| 15 | 95 | 17.3 | 279 | 65 | 4 × Ø14 | 16 |
| 25 | 115 | 28.5 | 329 | 85 | 4 × Ø14 | 18 |
| 40 | 150 | 43.1 | 445 | 110 | 4 × Ø18 | 18 |
| [1] Flange with groove to EN 1092-1 Form D (DIN 2512 N) available<br>All dimensions in [mm]; other dimensions → Page 11 | | | | | | |

| Flange according to ASME B16.5 / Cl 150: 1.4404/316L | | | | | | |
|---|---|---|---|---|---|---|
| **DN** | **G** | **K** | **L** | **LK** | **N** | **S** |
| 8 | 88.9 | 15.7 | 232 | 60.5 | 4 × Ø15.7 | 11.2 |
| 15 | 88.9 | 15.7 | 279 | 60.5 | 4 × Ø15.7 | 11.2 |
| 25 | 108.0 | 26.7 | 329 | 79.2 | 4 × Ø15.7 | 14.2 |
| 40 | 127.0 | 40.9 | 445 | 98.6 | 4 × Ø15.7 | 17.5 |
| All dimensions in [mm]; other dimensions → Page 11 | | | | | | |

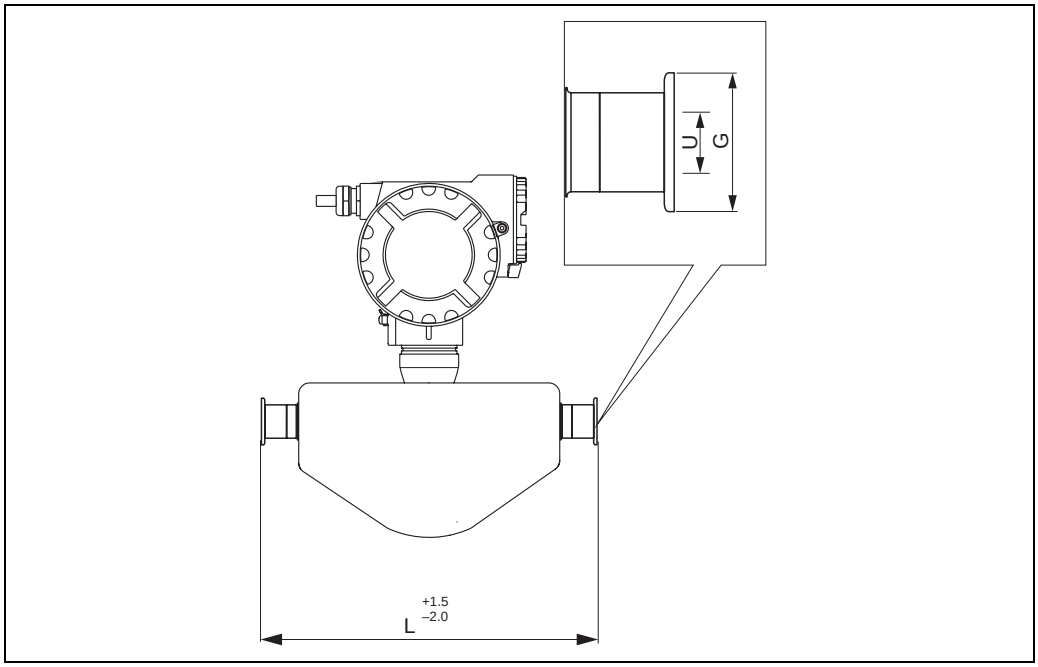
| Flange according to ASME B16.5 / Cl 300: 1.4404/316L | | | | | | |
|---|---|---|---|---|---|---|
| **DN** | **G** | **K** | **L** | **LK** | **N** | **S** |
| 8 | 95.2 | 15.7 | 232 | 66.5 | 4 × Ø15.7 | 14.2 |
| 15 | 95.2 | 15.7 | 279 | 66.5 | 4 × Ø15.7 | 14.2 |
| 25 | 123.9 | 26.7 | 329 | 88.9 | 4 × Ø19.0 | 17.5 |
| 40 | 155.4 | 40.9 | 445 | 114.3 | 4 × Ø22.3 | 20.6 |
| All dimensions in [mm]; other dimensions → Page 11 | | | | | | |

| Flange JIS B2220 / 20K: SUS316L | | | | | | |
|---|---|---|---|---|---|---|
| **DN** | **G** | **K** | **L** | **LK** | **N** | **S** |
| 8 | 95 | 15 | 232 | 70 | 4 × Ø15 | 14 |
| 15 | 95 | 15 | 279 | 70 | 4 × Ø15 | 14 |
| 25 | 125 | 25 | 329 | 90 | 4 × Ø19 | 16 |
| 40 | 140 | 40 | 445 | 105 | 4 × Ø19 | 18 |
| All dimensions in [mm]; other dimensions → Page 11 | | | | | | |

| Flange JIS B2220 / 40K: SUS316L | | | | | | |
|---|---|---|---|---|---|---|
| **DN** | **G** | **K** | **L** | **LK** | **N** | **S** |
| 8 | 115 | 15 | 261 | 80 | 4 × Ø19 | 20 |
| 15 | 115 | 15 | 300 | 80 | 4 × Ø19 | 20 |
| 25 | 130 | 25 | 375 | 95 | 4 × Ø19 | 22 |
| 40 | 160 | 38 | 496 | 120 | 4 × Ø23 | 24 |
| All dimensions in [mm]; other dimensions → Page 11 | | | | | | |

| Flange JIS B2220 / 63K: SUS316L | | | | | | |
|---|---|---|---|---|---|---|
| **DN** | **G** | **K** | **L** | **LK** | **N** | **S** |
| 8 | 120 | 12 | 282 | 85 | 4 × Ø19 | 23 |
| 15 | 120 | 12 | 315 | 85 | 4 × Ø19 | 23 |
| 25 | 140 | 22 | 383 | 100 | 4 × Ø23 | 27 |
| 40 | 175 | 35 | 515 | 130 | 4 × Ø25 | 32 |
| All dimensions in [mm]; other dimensions → Page 11 | | | | | | |

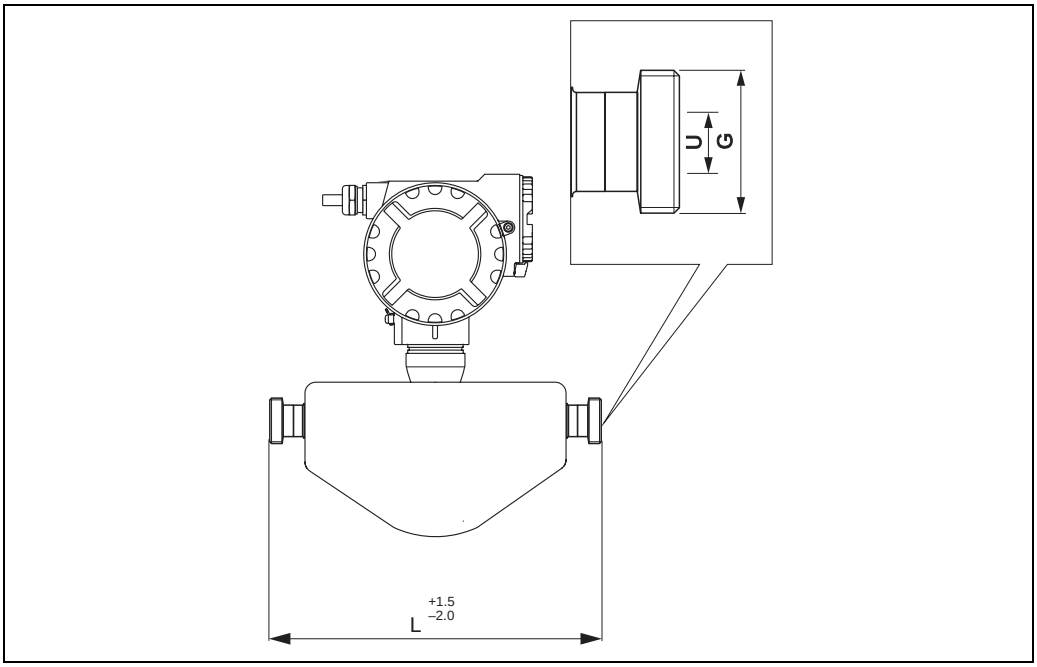
**Tri-Clamp connections**




A0009251-EN

| Tri-Clamp: 1.4404/316L | | | | |
|---|---|---|---|---|
| **DN** | **Clamp** | **G** | **L** | **U** |
| 8 | ½" | 25.0 | 229 | 9.5 |
| | ¾" | 25.0 | 229 | 16 |
| | 1" | 50.4 | 229 | 22.1 |
| 15 | ½" | 25.0 | 273 | 9.5 |
| | ¾" | 25.0 | 273 | 16 |
| | 1" | 50.4 | 273 | 22.1 |
| 25 | 1" | 50.4 | 324 | 22.1 |
| 40 | 1½" | 50.4 | 456 | 34.8 |
| All dimensions in [mm]; other dimensions → Page 11<br>3A-version also available (Ra ≤ 0.8 µm/150 grit) | | | | |

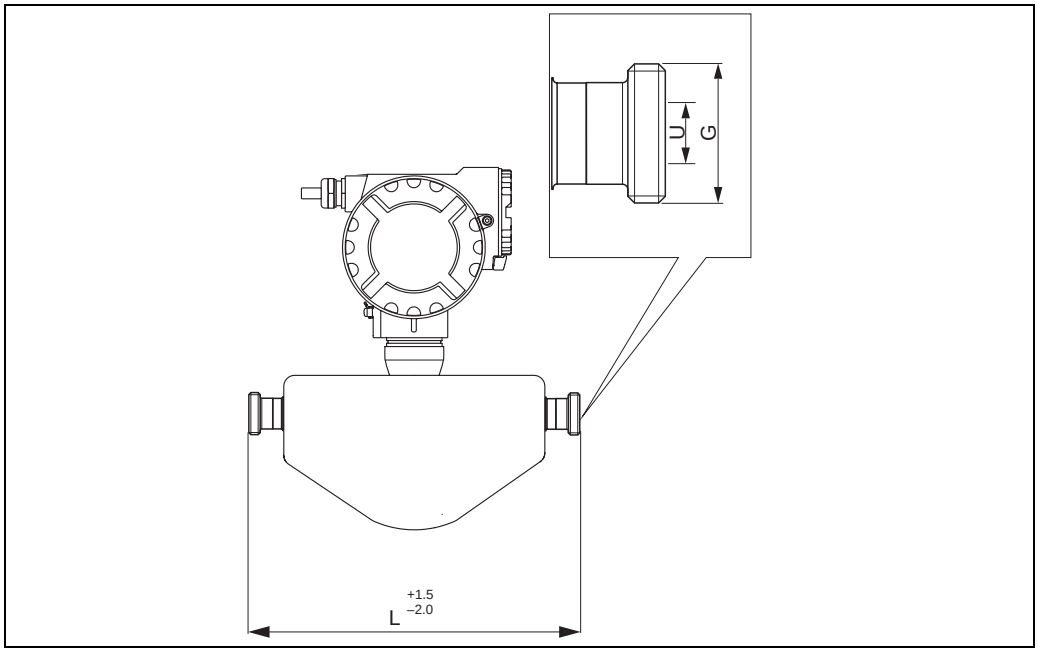
**DIN 11851 (threaded hygienic connection)**




A0009252-EN

| Sanitary connection DIN 11851: 1.4404/316L | | | |
|---|---|---|---|
| DN | G | L | U |
| 8 | Rd 34 × 1/8" | 229 | 16 |
| 15 | Rd 34 × 1/8" | 273 | 16 |
| 25 | Rd 52 × 1/6" | 324 | 26 |
| 40 | Rd 65× 1/6" | 456 | 38 |
| All dimensions in [mm]; other dimensions → Page 11<br>3A-version also available (Ra ≤ 0.8 µm/150 grit) | | | |

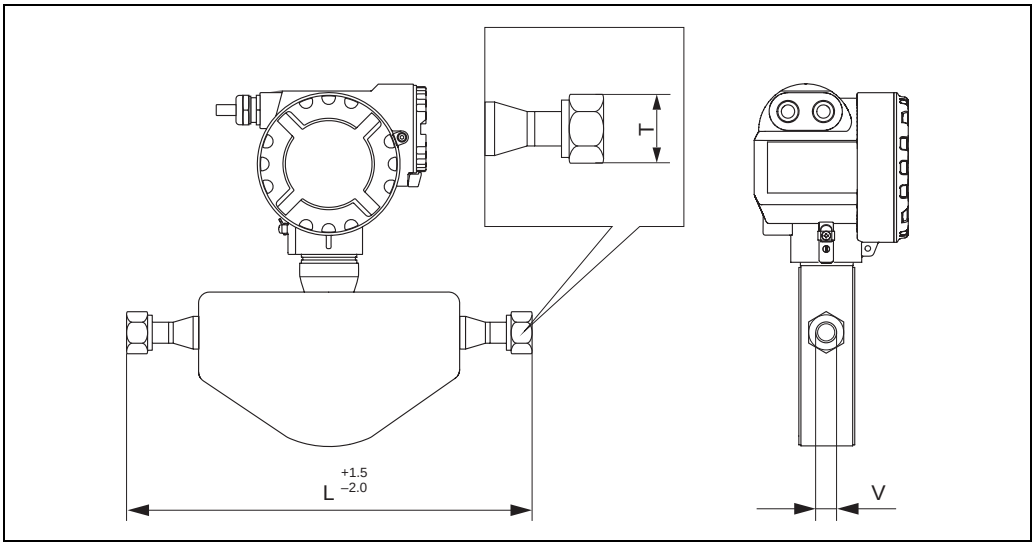
**DIN 11864-1 Form A (threaded hygienic connection)**




A0009253-EN

| Threaded joint DIN 11864-1 Form A: 1.4404/316L | | | |
|---|---|---|---|
| DN | G | L | U |
| 8 | Rd 28 × 1/8" | 229 | 10 |
| 15 | Rd 34 × 1/8" | 273 | 16 |
| 25 | Rd 52 × 1/6" | 324 | 26 |
| 40 | Rd 65× 1/6" | 456 | 38 |
| All dimensions in [mm]; other dimensions → Page 11<br>3A-version also available (Ra ≤ 0.8 µm/150 grit) | | | |

### VCO connections




A0009268-EN

| 8-VCO-4 (½"): 1.4404/316L | | | |
|---|---|---|---|
| **DN** | **L** | **T** | **V** |
| 8 | 252 | SW 1" | 10.2 |
| All dimensions in [mm]; other dimensions → Page 11 | | | |

| 12-VCO-4 (¾"): 1.4404/316L | | | |
|---|---|---|---|
| **DN** | **L** | **T** | **V** |
| 15 | 305 | SW 1 ½" | 15.7 |
| All dimensions in [mm]; other dimensions → Page 11 | | | |

## Weight

| DN in mm | 8 | 15 | 25 | 40 |
|---|---|---|---|---|
| Weight in kg | 6.7 | 7.2 | 8.8 | 13.7 |

The weights refer to devices with DIN flanges PN 40.

## Material

**Transmitter housing:**

Powder coated die-cast aluminum

**Housing of sensor/secondary containment:**

Acid-resistant and alkali-resistant external surface, stainless steel 1.4301/304

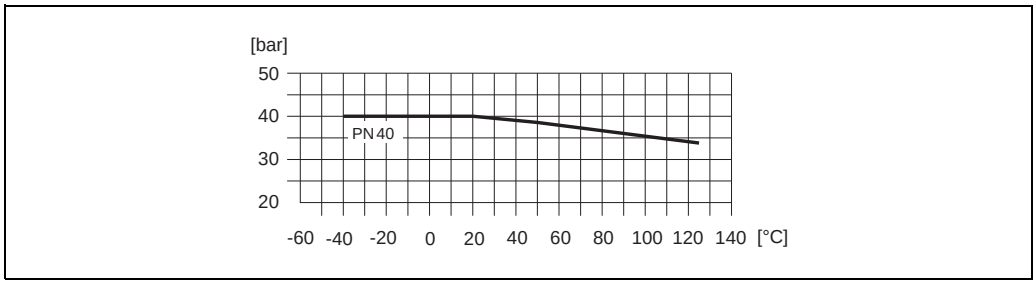
**Process connections**

Stainless steel 1.4404/316L:
- Flanges EN 1092-1 (DIN 2501, DIN 2512 N), ASME, JIS
- Tri-Clamp connections
- DIN 11851 (threaded hygienic connection)
- DIN 11864-1 Form A (threaded hygienic connection)
- VCO coupling

**Material load diagram**

**Flange connection to EN 1092-1 (DIN 2501, DIN 2512 N)**

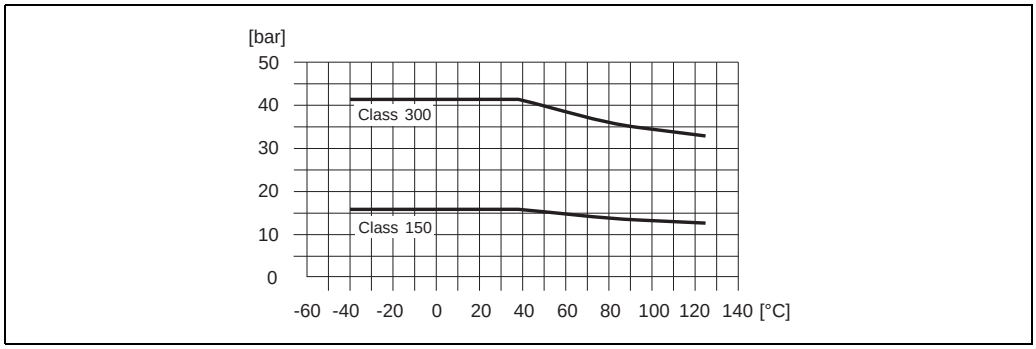
Connection material: 1.4404/316L




A0007885-EN

**Flange connection according to ASME B16.5**

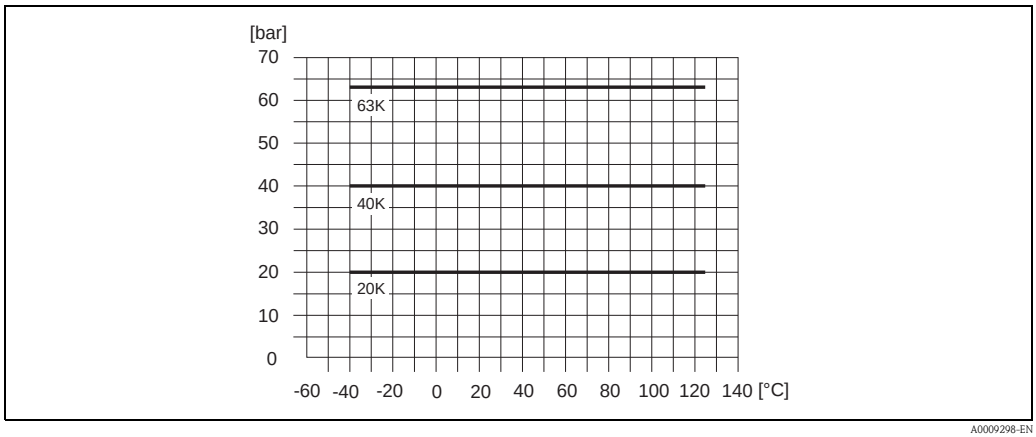
Connection material: 1.4404/316L




A0007886-EN

**Flange connection to JIS B2220**

Connection material: 1.4404/316L




A0009298-EN

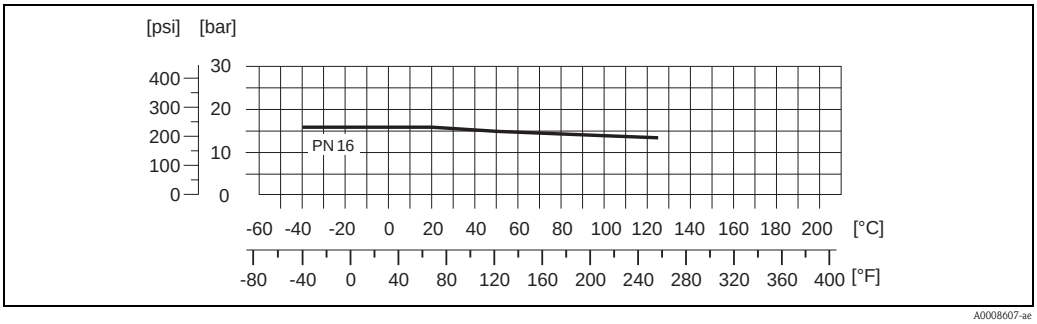
**Tri-Clamp process connection**

PS = 16 bar

The clamp connections are suitable up to a maximum pressure of 16 bar. Please observe the operating limits of the clamp and seal used as they could be under 16 bar. The clamp and seal do not form part of the scope of supply.

**DIN 11851 (threaded hygienic connection)**

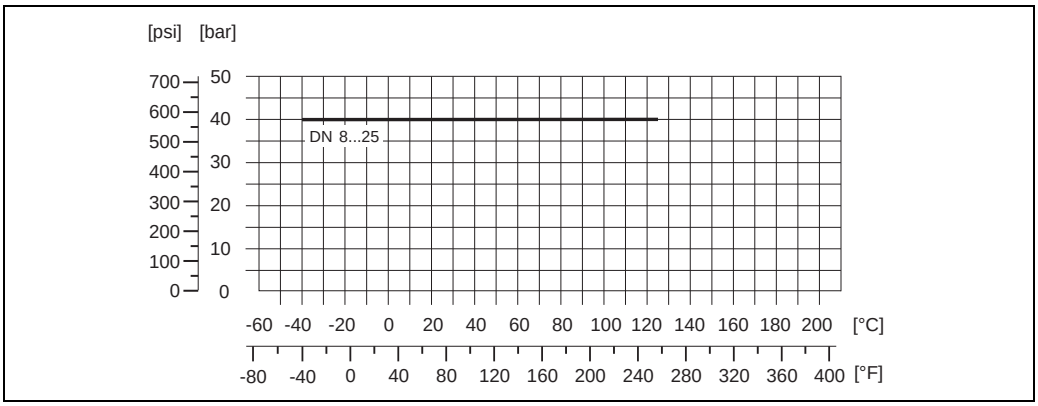
Connection material: 1.4404/316L




A0008607-ae

**DIN 11864-1(threaded hygienic connection)**

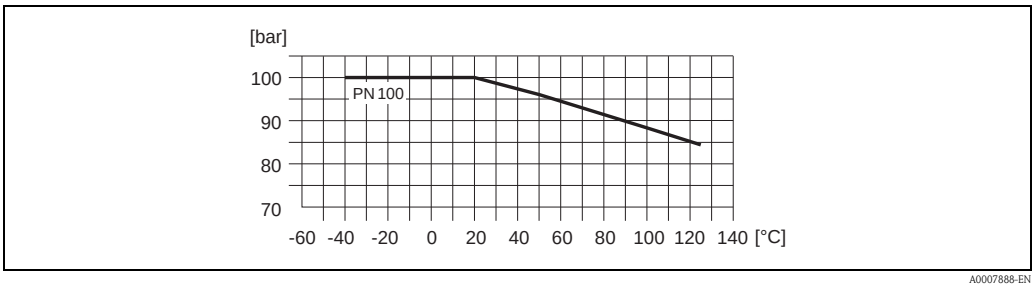
Connection material: 1.4404/316L




A0008564-ae

**VCO coupling**

Connection material: 1.4404/316L




A0007888-EN

**Process connections** → Page 17 → Material → Process connections

# Human interface

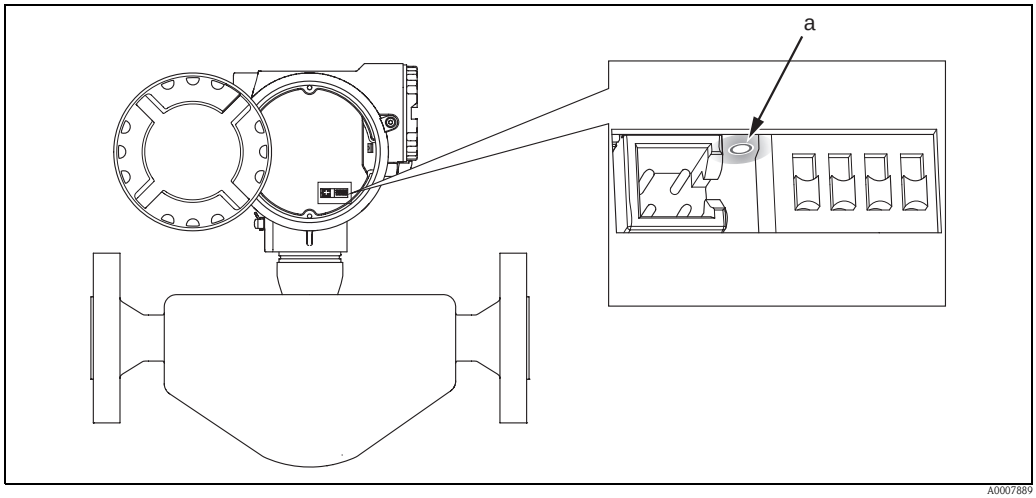
**Display elements**

Status LED

There is a Light Emitting Diode (LED) on the meter electronics board that allows simple fault diagnostics:

- If the status output was not configured to output errors or notes.
- If fault diagnostics are no longer possible via the Fieldtool operating program.

Warning!
Risk of explosion! The electronics compartment may not be opened while there is an explosive atmosphere.
This type of fault diagnostics can no longer be carried out in Ex-protected areas.

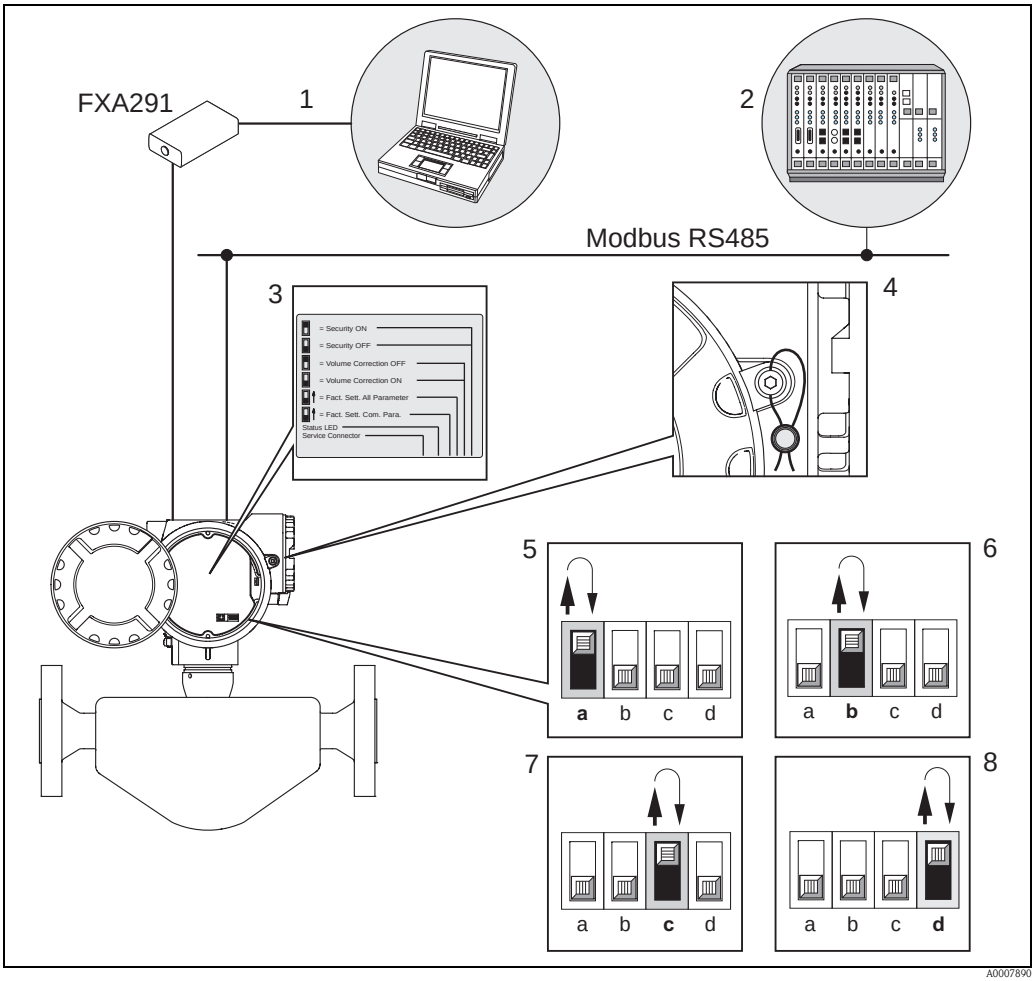



*Fault diagnostics using light emitting diode (a)*

| Status of light emitting diode (LED) | Status of measuring system |
|---|---|
| LED illuminated in green | Measuring system OK, creepage is active |
| LED flashes green (once per second) | Measuring system OK, operation |
| LED not illuminated | Measuring system no longer working |
| LED flashes red (three times per second) | ■ Operation not possible<br>■ Error (fault message) pending |
| LED flashes red/green (once per second) | ■ Operation possible, but may be limited by application conditions.<br>■ Notice message pending |
| LED flashes red/green (three times per second) | Zero point adjustment running |
| LED flashes green/orange (approx. 3 seconds long) | Secure, locked operation initiated |
| LED flashes red/orange (approx. 3 seconds long) | Secure, locked operation exited |
| LED flashes red/(pause)/green (approx. 3 seconds long) | SW update active |

**Remote operation**

You have the following option for configuring and commissioning the device:




*1 Configuration/operating program for operating via the FXA291 service interface (e.g. FieldCare)*

*2 Operation via process control system Modbus RS485*

*3 Situation sticker for the various DIP switch positions and their functions*

*4 Possibility for affixing a lead seal*

*5 Operation via device-internal DIP switch (**a**):*
*If the DIP switch (a) is switched upwards, the device restores the factory settings of the communication parameters of the Modbus RS485 (then return to the original position (downwards)).*

*6 Operation via device-internal DIP switch (**b**):*
*If the DIP switch (b) is switched upwards, the device restores the factory settings of all the parameters (then return to the original position (downwards)).*

*7 Operation via device-internal DIP switch (**c**):*
*If the DIP switch (c) is switched upwards, the volume flow is calculated with the density currently measured regardless of what is set under "VOLUME CALCULATION". If the DIP switch (c) is switched downwards again, the option selected under "VOLUME CALCULATION" applies again .*

*8 Operation via device-internal DIP switch (**d**):*
*If the DIP switch (d) is switched upwards, the device is in the secure measuring mode. Secure means that write access is not possible. If the DIP switch is switched downwards again, write access is possible again.*
*This secure/locked operating mode can be applied for use in measuring systems subject to legal metrology controls.*

Note!
Resetting the parameters can take several minutes. The device is then restarted.
The power supply should never be switched off when restoring the factory settings.

# Certificates and approvals

**CE mark**

The measuring system is in conformity with the statutory requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

**C-Tick symbol**

The measuring system complies with the EMC requirements of the "Australian Communications and Media Authority (ACMA)"

**Ex approval**

Information about currently available Ex versions (ATEX, FM, CSA) can be supplied by your E+H Sales Center on request. All explosion protection data are given in a separate Ex documentation, which is available upon request.

**MODBUS certification**

The measuring device meets all the requirements of the MODBUS/TCP conformity and integration test and has the "MODBUS/TCP Conformance Test Policy, Version 2.0". The measuring device has successfully passed all the test procedures carried out and is certified by the “MODBUS/TCP Conformance Test Laboratory” of the University of Michigan.

**Pressure device approval**

Measuring devices with a nominal diameter smaller than or equal to DN 25 correspond to Article 3(3) of the EC Directive 97/23/EC (Pressure Equipment Directive) and have been designed and manufactured according to good engineering practice. For larger nominal diameters, optional approvals according to Category II/III are available if required (depends on fluid and process pressure).

**Measuring instrument approval**

LPGmass is a flowmeter for volume measurement which is a suitable component in measuring systems for LPG (liquified petroleum gas) subject to legal metrology controls in accordance with Annex MI-005 of the European Measuring Instruments Directive 2004/22/EC (MID).
LPGmass is qualified to OIML R117-1 and has an MID Evaluation Certificate[1)] which confirms compliance with the fundamental requirements of the Measuring Instruments Directive.

Note!
According to the Measuring Instruments Directive, however, only the complete measuring system (e.g. LPG gasoline pump) is licensable, covered by an EC type-examination certificate and bears the conformity marking.

**Other standards and guidelines**

- EN 60529:
  Degrees of protection by housing (IP code)
- EN 61010-1:
  Safety requirements for electrical equipment for measurement, control and laboratory use
- IEC/EN 61326:
  “Emission in accordance with Class A requirements”.
  Electromagnetic compatibility (EMC requirements)
- EN 60721:
  Shock and vibration resistance
- OIML R117-1:
  Requirements for measuring systems for liquids apart from water.

# Ordering information

The Endress +Hauser service organization can provide detailed ordering information and information on the order code.

1) The Evaluation Certificate results from the WELMEC approach (cooperation between the legal metrology services of the member states of the European Union and EFTA) towards modular component certification for measuring systems in accordance with Annex MI-005 (measuring systems for the continuous and dynamic measurement of quantities of liquids other than water) of the Measuring Instruments Directive 2004/22/EC.

## Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the sensor.

Note!
Detailed information on the order codes in question can be obtained from your Endress+Hauser service organization.

## Documentation

- Operating Instructions (BA133D/06)
- Ex supplementary documentation ATEX (II2G): (XA117D/06)
- Ex supplementary documentation FM, CSA (Div. 1): (XA118D/06)
- Special documentation on Pressure Equipment Directive: (SD118D/06)
- Flow measuring technology (FA005D/06)

## Registered trademarks

HART®
Registered trademark of the HART Communication Foundation, Austin, USA

MODBUS®
Registered trademark of the MODBUS Organization

HistoROM™, S-DAT®, T-DAT™, F-CHIP®, FieldCare®, Fieldcheck®, Applicator®
Registered or registration-pending trademarks of Endress+Hauser Flowtec AG, Reinach, CH

**Instruments International**

Endress+Hauser
Instruments International AG
Kaegenstrasse 2
4153 Reinach
Switzerland

Tel. +41 61 715 81 00
Fax +41 61 715 25 00
www.endress.com
info@ii.endress.com

Endress+Hauser

People for Process Automation

TI080D/06/en/05.08
71071015
FM+SGML6.0 ProMoDo