



hmi

high-accuracy
measurement
instruments

FICHA TÉCNICA DE PRODUTO

PRODUCT DATASHEET

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ABB MEASUREMENT & ANALYTICS | DATA SHEET

HygienicMaster FEH630

Electromagnetic flowmeter



Measurement made easy

The clean choice for all hygienic applications

EtherNet/IP

- Minimize commissioning and start-up
- Configure the device remotely
- The in-built device driver reduces integration cost
- Monitor your process and the flowmeter status
- Verify the flowmeter remotely

Diagnostics for real-life situations

- To keep your process up and running
- Gas bubble, electrode impedance, conductivity and sensor temperature monitoring
- Clear text Messages for simplified trouble shooting

On board Health Check

- Flowmeter sensor and transmitter integrity check utilizing fingerprint technology

Noise / Grounding Check

- Verify the installation is correct from day one

Service Interval Monitoring

- Receive timed notifications

Backwards Compatibility

- Protect your Investment in ABB flowmetering

HygienicMaster series

HygienicMaster is available in two series – HygienicMaster FEH610 the good fit for everyday applications and HygienicMaster FEH630 the clean choice for all hygienic applications delivering best in class functionality and options.

Applicability	FEH610 series	FEH630 series
	Good fit for everyday applications	The clean choice for all hygienic applications
Food & Beverage Hygienic applications	✓	✓
CIP / SIP Cleaning	✓	✓
Filling	–	Yes, (> 3 sec)
Measuring medium minimum conductivity	20 µS/cm	5 µS/cm
Measuring medium temperature	25 ... 130 °C (-13 ... 266 °F)	Flange devices: -25 ... 180 °C (-13 ... 356 °F) Devices with variable process connections: -25 ... 130 °C (-13 ... 266 °F)
Pressure	≤ PN 40 / CI 300 depending on process connection and sensor size	≤ PN 40 / CI 300 depending on process connection and sensor size
Hazardous area	–	Yes
Features	FEH610 series	FEH630 series
Accuracy	0.5 %	0.4 %, Option up to 0.2 %
Nominal diameter	DN 3 ... 100 (1/10 ... 4")	DN 1 ... 100 (1/25 ... 4")
Liner material	PFA (vacuum-tight)	PFA (vacuum-tight, from DN 3 (1/10")) PEEK (DN 1 ... 2 (1/25 ... 1/12"))
I/O's	1 x analog, 2 x digital	1 x analog, 2 x digital, Option for add-in modules
Communication	High Speed Infrared Port Communication based on HART DTM	HART, PROFIBUS, PROFIBUS DP, Modbus RTU, Modbus TCP, EtherNet/IP
Process diagnostics	Empty pipe	Empty pipe, Gas bubbles, Electrode Impedance, Conductivity, Sensor temperature
Backwards compatibility	–	Yes

... HygienicMaster series

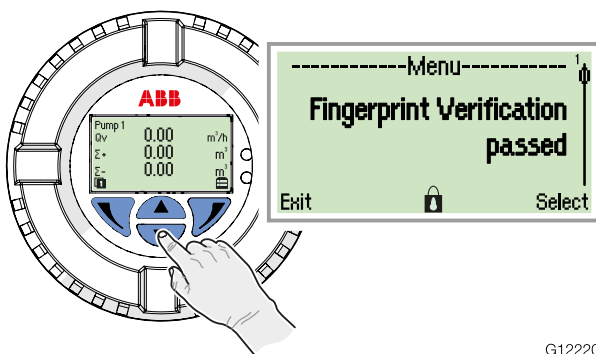
Features and Functions

On-board Health Check

HygienicMaster's in-built fingerprint technology helps to ensure Sensor and Transmitter Integrity without the need to remove the flowmeter from the process. The Check provides a pass / failed result based on a comparison of the current flowmeter status to a set of reference data.

Benefits:

- Easy to operate
- No additional equipment required
- No training necessary
- Quick check of flowmeter integrity



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Backwards Compatibility saves your Investment in ABB Flowmetering

Take advantage of new features and improved performance. Switch to the new product at your own timeline. Minimize the cost of change in stock keeping, documentation and change of internal processes.

Benefits:

- Drop in replacement
- Same terminal designation I/O's, sensor connections
- No need to change wiring documentation
- Sensor cable stays unchanged
- Identical operating philosophy:
- Easy Set-up and Sensor Set-up
- Common user experience, less training
- Less inventory, less cost

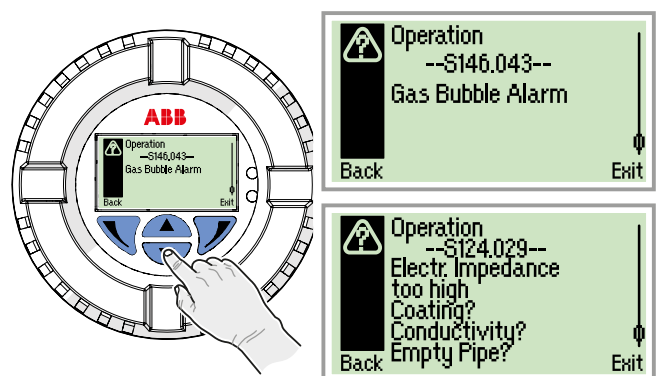
Diagnostics for real-life situations

Detecting critical process conditions at an early stage helps reducing unscheduled downtime and maintenance. Clear text messages simplify troubleshooting.

Device diagnostic information can be accessed without any intervention – either through the HMI or bus communication.

Benefits:

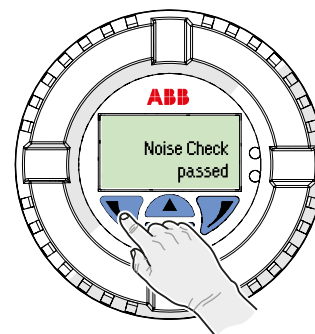
- Peace-of-mind that flowmeter is operating within its specification
- Prioritized alarms to correct most important alarm first
- Through-the-glass operation without the need to open the housing



G12221

Verify the Installation is correct - from day one

Improving quality and reducing cost can be a challenge if the flow measurement is unstable. A proper grounding is fundamental to an accurate electromagnetic flow measurement. HygienicMaster's in-built noise / grounding check helps getting the wiring / grounding right from day one without the Need for further Tools.



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Diagnostic functions

Standard functionality

Flowmeter sensor coil inductance

A measurement of the flowmeter sensor coil inductance can be triggered.

This enables to check for the flowmeter sensor coil integrity.

Noise check / Grounding check

This function allows checking for noise and proper electrical grounding of the device. While the check is in progress, no flow measurement can take place.

Pre-requisites using the functionality:

- Flowmeter sensor must be completely filled
- No flow must occur in the flowmeter sensor

Fingerprint

The "fingerprint" database integrated in the transmitter allows for comparison of the values at the time of factory calibration or commissioning with the currently recorded values.

A quick "on-board health check" resulting in a pass / fail information can be performed.

For an in-depth verification, an external tool is available from ABB (in preparation).

Verification

There is an Option for an in-depth verification of the device using an external Tool from ABB.

This Tool provides a brief documentation of the Verification results allowing for a print out.

Optional diagnostic functions

The extended diagnostics functionality package contains the following functions.

Gasbubble detection

Gas bubbles in the fluid effect the flowmeter reading and the accuracy.

Enhanced diagnostics feature the option for gas bubble detection to make the flow measurement most reliable. There is the option for a gas bubble alarm triggered once the actual gas bubble value exceeds the threshold configured.

This alarm is shown in the HMI. The digital output flags an alarm if configured accordingly.

Pre-requisites using the functionality:

- Nominal diameter: DN 10 ... 300 (3/8 ... 12").
- Conductivity of the measuring medium: 20 ... 20000 $\mu\text{S}/\text{cm}$.

Installation conditions:

- The flowmeter sensor can be installed either horizontally or vertically. Vertical installation is preferred.

Conductivity monitoring

The conductivity of the fluid can be monitored setting minimum / maximum alarm limits.

Once alarm limits are exceeded, the digital output flags an alarm if configured accordingly.

Conductivity is available as a 4 ... 20 mA output (Option card).

Pre-requisites using the functionality:

- Conductivity of the measuring medium: 20 ... 20000 $\mu\text{S}/\text{cm}$.

Electrode impedance

An Impedance measurement between the electrode and ground can be triggered.

This enables to check for the electrode integrity.

Flowmeter sensor temperature

A flowmeter sensor temperature measurement can be triggered.

This enables to check for the flowmeter sensor temperature. With flowmeter sensor temperature out of spec, the digital output flags an alarm if configured accordingly.

Transmitter in-house temperature

An in-house temperature measurement can be triggered.

This enables to check for the temperature inside the transmitter housing.

With the temperature out of spec, the digital output flags an alarm if configured accordingly.

... HygienicMaster series

Batching function

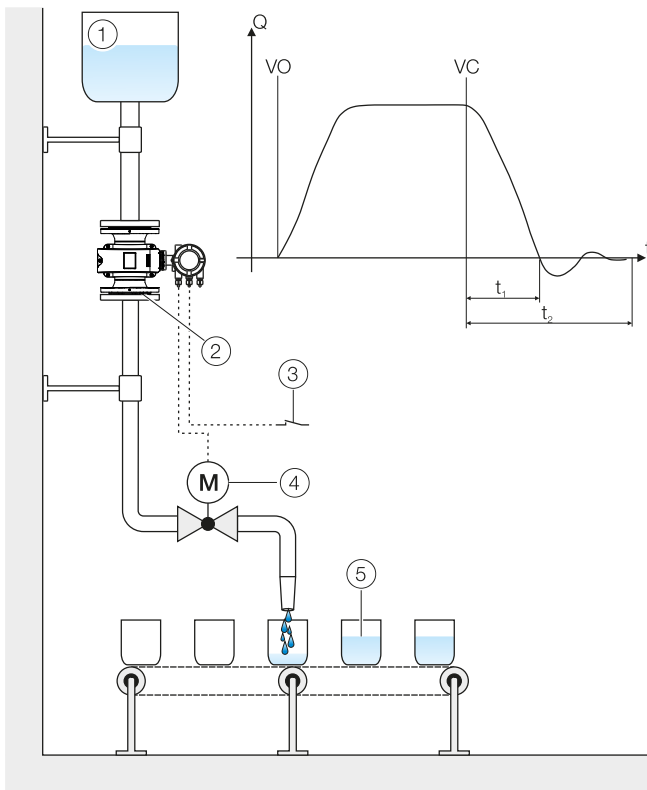


Fig. 1: Fill function (batch)

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Pos.	Description
①	Supply tank
②	Flowmeter sensor
③	Start / stop fill operation (digital input with plug-in card)
④	Filling valve
⑤	Container to be filled
VO	Valve open (filling started)
VC	Valve closed (fill quantity reached)
t ₁	Valve closing time
t ₂	Overrun time

Table 1: Legend

The optional batching functionality allowing for batches with filling times >3 seconds.

Batch quantity is configurable and batch process can be started using the digital input (Option card).

Once batch quantity is reached closing the valve can be triggered using the digital output.

Batch quantity correction is calculated measuring the overrun quantity.

Low flow cut-off can be configured, if required.

Overview – models without hazardous area approval

Flowmeter sensor

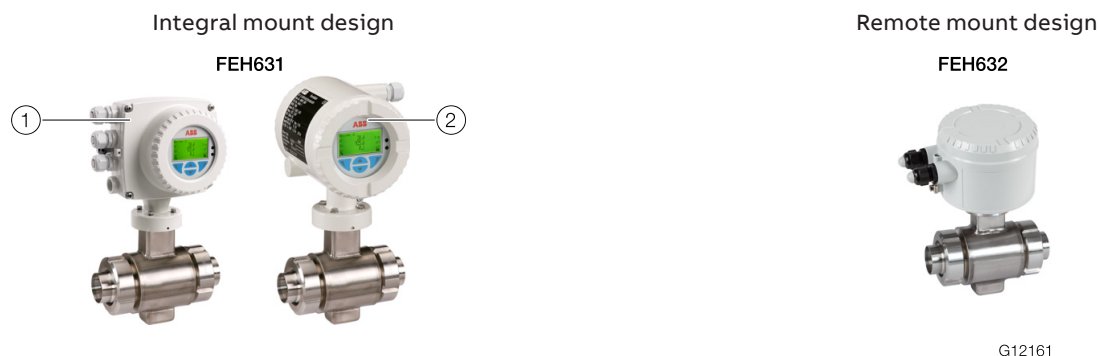


Fig. 2: Designs (example, devices with variable process connections)

Pos.	Description	Pos.	Description
①	Single-compartment transmitter housing	②	Dual-compartment transmitter housing

Table 2: Legend

Model	HygienicMaster FEH631, FEH632, FET632	
Housing	Integral mount design, remote mount design	
Measuring accuracy for liquids	0.4 % of measured value, option for 0.3 % and 0.2 % of measured value	
Permissible measuring medium temperature T_{medium}	Standard: -25 ... 130 °C (-13 ... 266 °F), DN 1 ... 2 limited to maximum 120 °C (248 °F) Option: -25 ... 180 °C (-13 ... 356 °F), flange devices only	
Minimum conductivity	> 5 µS/cm (> 20 µS/cm for demineralized water), > 20 µS/cm for nominal diameter DN 1 ... 2 (1/25 ... 1/12")	
Nominal pressure	PN 10 ... 40, ASME CL 150, 300, JIS 10K	
Nominal diameter	DN 1 ... 100 (1/25 ... 4 ")	
Process connection	Wafer type design: Flange in acc. with DIN, ASME or JIS: Food Industry Fittings acc. with DIN 11851: Welded spuds: Tri-Clamp in acc. with DIN 32676: Tri-Clamp in acc. with ASME BPE: External thread in acc. with ISO 228 / DIN 2999:	DN 3 ... 100 (1/10 ... 4") DN 3 ... 100 (1/10 ... 4"), PN 10 ... 40 DN 3 ... 100 (1/10 ... 4"), PN 10 ... 40 DN 3 ... 100 (1/10 ... 4"), PN 10 ... 40 DN 3 ... 100 (1/10 ... 4"), PN 10 ... 16 DN 3 ... 100 (1/10 ... 4"), PN 10 DN 3 ... 25 (1/10 ... 1"), PN 16
Process connection material	Flange design: Stainless steel; Variable process connections: 1.4404; Devices with nominal diameter DN 1 ... 2 (1/25 ... 1/12"): Stainless steel 1.4571 (AISI 316 Ti), PVC, POM	
Liner material	PFA (vakuum tight, from DN 3 (1/10")), PEEK (DN 1 ... 2 (1/25 ... 1/12"))	
Electrode material	Stainless steel 1.4571 (AISI 316Ti), 1.4539 [904L], Hastelloy B, Hastelloy C, platinum-iridium, tantalum, titanium	
IP rating	Integral mount design: IP 65 / IP 67 / NEMA 4X Remote mount design: IP 65 / IP 67 / IP 68 (sensor only) / NEMA 4X	

Table 3: Overview flowmeter sensor

Pressure Equipment Directive 2014/68/EU	Conformity assessment in accordance with category III, fluid group 1
CRN (Canadian Reg.Number)	On request
Hygienic design approvals	3A, FDA-approved materials
Explosion protection (in preparation)	ATEX / IECEx zone 1, 2, 21, 22; FM / cFM Cl 1 Div. 1 (≤ DN 100), Cl 1 Div. 2
Further approvals	At www.abb.com/flow or on request.

Table 4: Approvals

... Overview – models without hazardous area approval

Transmitter



Fig. 3: Designs

Model	FET632
Housing	Integral mount design, remote mount design.
IP rating	IP 65 / IP 67 / NEMA 4X
Cable length	Maximum 200 m (656 ft), remote mount design only
Power supply	100 ... 240 V AC (-15 / +10 %) 50 / 60 Hz, 16,8 ... 30 V DC
Outputs	Current output: 4 ... 20 mA, active or passive (configurable on site) Digital output 1: passive, configurable as pulse, frequency or switch output Digital output 2: passive, configurable as pulse or switch output
Additional outputs	The transmitter has two slots in the plug-in cards that can be used to extend the outputs. The following plug-in cards are available: <ul style="list-style-type: none"> • Current output (passive) • Digital output (passive) • Digital input (passive) • 24 V DC power supply for active outputs
Communication	Standard: HART 7.1 Option: PROFIBUS DP, Modbus RTU, Modbus TCP, EtherNet/IP

Table 5: Overview Transmitter

Explosion protection (in preparation)	ATEX / IECEx Zone 1, 2, 21, 22 FM / cFM Cl 1 Div 1, Cl 1 Div 2
Further approvals	At www.abb.com/flow or on request.

Table 6: Approvals

Overview – models with Ex protection

Version with integral mount design

The transmitter and the flowmeter sensor form a single mechanical entity.

The transmitter is available in two housing designs

- Single-compartment housing

This is suited for use in ATEX/IEC Ex Zone 2, 22, FM Cl1 Div 2.

In the single-compartment housing, the electronics chamber and the connection chamber in the transmitter are not separated from each other.

- Dual-compartment housing:

This is suited for use in ATEX/IEC Ex Zone 1, 21 und 2, 22, FM Cl1 Div 1.

In the dual-compartment housing, the electronics chamber and the connection chamber in the transmitter are separated from each other.

Note

Further information on the Ex Approval of devices can be found in the type examination certificates or the relevant certificates at www.abb.com/flow.

ATEX / IEC Zone 1, FM Cl1 Div 1

Sensor

HygienicMaster 630
FEH631-A1 (Zone 1, 21)
FEH631-F1, (Cl1, Div 1)



ATEX

Certificate: FM17ATEX0016X
DN3-2000:
II 2 (1) G Ex db eb ib mb [ia Ga] IIC T6...T1 Gb
II 2 (1) D Ex tb [ia Da] IIIC T80°C...T_{medium} Db

IEC

Certificate: IECEx FME 17.0001X
DN3-2000:
II 2 (1) G Ex db eb ib mb [ia Ga] IIC T6...T1 Gb
II 2 (1) D Ex tb [ia Da] IIIC T80°C...T_{medium} Db

USA, FM approval

Certificate: FM17US0062X
DN3-300:
S-XP-IS: CL I, Div 1, GPS ABCD T6...T1
DIP: CL II,III, Div 1, GPS EFG T6...T3B
>DN300:
CL I, ZN 1, AEx db eb mb [ia Ga] IIC T6...T1 Gb
ZN 21, AEx tb [ia Da] IIIC T80°C...T165°C Db

Canada, FM approval

Certificate: FM17CA0033X
DN3-300:
S-XP-IS: CL I, Div 1, GPS BCD T6...T1
DIP: CL II,III, Div 1, GPS EFG T6...T3B
>DN300:
CL I, ZN 1, Ex db eb mb [ia Ga] IIC T6...T1 Gb
Ex tb [ia Da] IIIC T80°C...T165°C Db

ATEX / IEC Zone 2, FM Cl1 Div 2

Sensor

HygienicMaster 630
FEH631-A2 (Zone 2, 22)
FEH631-F2 (Cl1, Div 2)



ATEX

Certificate: FM17ATEX 0017X
II 3G Ex ec IIC T6...T1 Gc³⁾
II 3D Ex tc IIIC T80°C...T_{medium} Dc

IEC

Certificate: IECEx FME 17.0001X
II 3G Ex ec IIC T6...T1 Gc³⁾
II 3D Ex tc IIIC T80°C...T_{medium} Dc

USA, FM approval

Certificate: FM17US0062X
NI: CL I, Div 2, GPS ABCD T6...T1³⁾
DIP: CL II,III, Div 2, GPS EFG T6...T3B
CL I, ZN 2, AEx ec IIC T6...T1³⁾
ZN 21, AEx tb IIIC T80°C...T165°C

Canada, FM approval

Certificate: FM17CA0033X
NI: CL I, Div 2, GPS ABCD T6...T1³⁾
DIP: CL II,III, Div 2, GPS EFG T6...T3B³⁾
CL I, ZN 2, Ex ec IIC T6...T1 Gc³⁾
Ex tb IIIC T80°C...T165°C Db⁴⁾

- 1) Single-compartment housing
- 2) Dual-compartment housing

When the flowmeter is equipped with the Ethernet card, the notes that follow apply:

- 3) T4 instead of T6
- 4) T80°C instead of T80°C...T165°C

...Overview – models with Ex protection

...Version with remote design

...ATEX / IEC Zone 1, FM Cl1 Div 1

Version with remote design

The transmitter is mounted in a separate location from the flowmeter sensor. The electrical connection between the transmitter and flowmeter sensor may only be established using the signal cable supplied.

A maximum signal cable length of 200 m (656 ft) is possible.

Note

Further information on the Ex Approval of devices can be found in the type examination certificates or the relevant certificates at www.abb.com/flow.

ATEX / IEC Zone 1, FM Cl1 Div1

The following tables present the combination of the FEH632 sensor in explosion-proof design with the FET632 transmitter.

Sensor

HygienicMaster 630
FEH632-A1 (Zone 1, 21)
FEH632-F1 (Cl1, Div 1)



ATEX

Certificate: FM17ATEX0016X
DN3-100: II 2 G Ex eb ib mb IIC T6...T1 Gb
II 2 D Ex tb IIIC T80°C...T_{medium} Db

IEC

Certificate: IECEx FME 17.0001X
DN3-100: II 2 G Ex eb ib mb IIC T6...T1 Gb
II 2 D Ex tb IIIC T80°C...T_{medium} Db




USA, FM approval

Certificate: FM17US0062X
DN3-100:
S-XP-IS: CL I, Div 1, GPS BCD T6...T1
DIP: CL II,III, Div 1, GPS EFG T6...T3B

Canada, FM approval

Certificate: FM17CA0033X
DN3-100:
S-XP: CL I, Div 1, GPS BCD T6...T1
DIP: CL II,III, Div 1, GPS EFG T6...T3B

The following table presents the combination of the FEH632 sensor in explosion-proof design with the FET632 transmitter.

Transmitter		
FET632-A1, FET632-F1 in Ex-area, Zone 1, 21, Div 1	FET632-A2, FET632-F2 in Ex-area, Zone 2, 22, Div 2	FET632-Y0 Outside Ex-area
 2)	 1)	 1)
ATEX Certificate: FM17ATEX0016X II 2 (1) G Ex db eb mb [ia Ga] IIC T6 Gb II 2 (1) D Ex tb [ia Da] IIIC T80°C Db	ATEX Certificate: FM17ATEX 0017 X II 3G Ex ec IIC T6 Gc ³⁾ II 3D Ex tc IIIC T80°C Dc	No Ex approval
IEC Certificate: IECEx FME 17.0001X II 2 (1) G Ex db eb mb [ia Ga] IIC T6 Gb II 2 (1) D Ex tb [ia Da] IIIC T80°C Db	IEC Certificate: IECEx FME 17.0001 X II 3G Ex ec IIC T6 Gc ³⁾ II 3D Ex tc IIIC T80°C Dc	
USA, FM approval Certificate: FM17US0062X XP-IS: CL I, Div 1, GPS BCD T6 DIP: CL II,III, Div 1, GPS EFG T	USA, FM approval Certificate: FM17US0062X NI: CL I, Div 2, GPS ABCD T6 ³⁾ DIP: CL II,III, Div 2, GPS EFG T6 ³⁾	
Canada, FM approval Certificate: FM17CA0033X XP-IS: CL I, Div 1, GPS BCD T6 DIP: CL II,III, Div 1, GPS EFG T	Canada, FM approval Certificate: FM17CA0033X NI: CL I, Div 2, GPS ABCD T6 ³⁾ DIP: CL II,III, Div 2, GPS EFG T6 ³⁾	

- 1) Single-compartment housing
- 2) Dual-compartment housing

When the flowmeter is equipped with the Ethernet card, the note that follows applies:

- 3) T4 instead of T6




Ethernet card is only available with Zone 2, Div 2

...Overview – models with Ex protection

...Version with remote design

...ATEX / IEC Zone 2, FM Cl1 Div 2

The following table presents the combination of the FEH632 sensor in explosion-proof design with the FET632 transmitter.

Sensor	
HygienicMaster 630 FEH632-A2 (Zone 2, 22) FEH632-F2 (Cl1, Div 2)	
	
ATEX	
Certificate: FM17ATEX 0017X II 3G Ex ec IIC T6...T1 Gc II 3D Ex tc IIIC T80°C...T _{medium} Dc	
IEC	
Certificate: IECEx FME 17.0001X II 3G Ex ec IIC T6...T1 Gc II 3D Ex tc IIIC T80°C...T _{medium} Dc	
USA, FM approval	
Certificate: FM17US0062X NI: CL I, Div 2, GPS ABCD T6...T1 DIP: CL II,III, Div 2, GPS EFG T6...T6...T3B CL I, ZN 2, AEx ec IIC T6...T1 ZN 21, AEx tb IIIC T80°C...T165°C	
Canada, FM approval	
Certificate: FM17CA0033X NI: CL I, Div 2, GPS ABCD T6...T1 DIP: CL II,III, Div 2, GPS EFG T6...T3B CL I, ZN 2, Ex ec IIC T6...T1 Gc Ex tb IIIC T80°C...T165°C Db	
Transmitter	
FET632-A2, FET632-F2 in Ex-area, Zone 2, 22, Div 2	FET632-Y0 Outside Ex-area
 1)	 1)
ATEX	No Ex approval
Certificate: FM17ATEX 0017 X II 3G Ex ec IIC T6 Gc ²⁾ II 3D Ex tc IIIC T80°C Dc	
IEC	
Certificate: IECEx FME 17.0001 X II 3G Ex ec IIC T6 Gc ²⁾ II 3D Ex tc IIIC T80°C Dc	
USA, FM approval	
Certificate: FM17US0062X NI: CL I, Div 2, GPS ABCD T6 ²⁾ DIP: CL II,III, Div 2, GPS EFG T6 ²⁾ CL I, ZN 2, AEx ec IIC T6 ²⁾ ZN 21, AEx tb IIIC T80°C	
Canada, FM approval	
Certificate: FM17CA0033X Certificate: FM17US0062X NI: CL I, Div 2, GPS ABCD T6 ²⁾ DIP: CL II,III, Div 2, GPS EFG T6 ²⁾ CL I, ZN 2, AEx ec IIC T6 ²⁾ ZN 21, AEx tb IIIC T80°C	

1) Single-compartment housing

2) When the flowmeter is equipped with the Ethernet card, T4 instead of T6

Device designs

Overview: The fast track to explosion protection device data

These safety instructions related to explosion protection are valid in conjunction with the following test documentation and certificates:

Scope	Certificate
ATEX Zone 1 / 21	FM17ATEX0016X
ATEX Zone 2 / 22	FM17ATEX 0017X
IEC Ex Zone 1 / 21	IECEX FME 17.0001X
IEC Ex Zone 2 / 22	IECEX FME 17.0001X
FMus Div 1 (USA)	FM17US0062X
FMus Div 2 (USA)	FM17US0062X
cFM Div 1 (Canada)	FM17CA0033X
cFM Div 2 (Canada)	FM17CA0033X

Table 2: Validity range

Model: HygienicMaster 630	Operation in zone	Electrical connection and explosion protection data from chapter
FEH631-A1	Zone1, 21	Operation in Zone 1, 21
FEH631-A2	Zones 2, 22	Operation in Zone 2, 22
FEH632-A1 and FET632-A1	Zone1, 21	Operation in Zone 1, 21
FEH632-A1 and FET632-Y0	Zone1, 21	Operation in Zone 1, 21
FEH632-A2 and FET632-A2	Zones 2, 22	Operation in Zone 2, 22
FEH632-A2 and FET632-Y0	Zones 2, 22	Operation in Zone 2, 22

Table 3: Operational zones

Measuring principle

Measurements performed by the electromagnetic flowmeter are based on Faraday's law of induction. A voltage is generated in a conductor when it moves through a magnetic field.

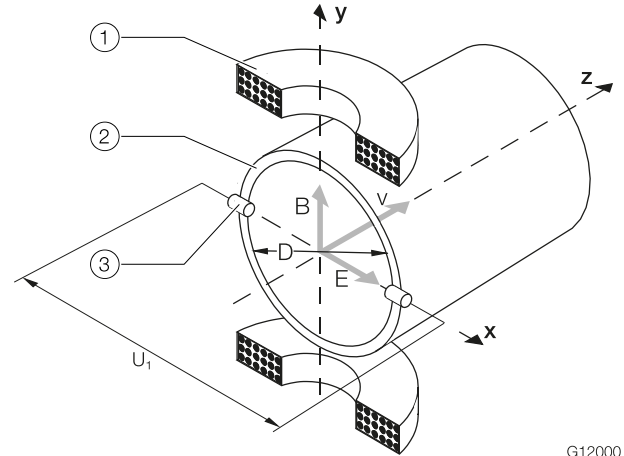


Fig. 4: Electromagnetic flowmeter schematic

Pos.	Description
①	Magnet coil
②	Meter tube in electrode plane
③	Signal electrode

Table 7: Legend

$U_1 \sim B \times D \times v$	$qv = \frac{D^2 \times \pi}{4} \times v$	$U_1 \sim qv$
U_1 – Signal voltage	v – Average flow velocity	
B – Magnetic induction	qv – Volume flow	
D – Electrode spacing		

This principle is applied to a conductive fluid in the meter tube through which a magnetic field is generated perpendicular to the flow direction (see Fig. 4). The voltage induced in the fluid is measured by two electrodes located diametrically opposite each other. This signal voltage is proportional to the magnetic induction, the electrode spacing and the average flow velocity. Considering that the magnetic induction and the electrode spacing are constant values, a proportionality exists between the signal voltage U_1 and the average flow velocity. From the equation for calculating the volume flowrate, it follows that the signal voltage is linearly proportional to the volume flowrate. The induced voltage is converted by the transmitter to standardized, analog and digital signals.

Flowmeter sensor

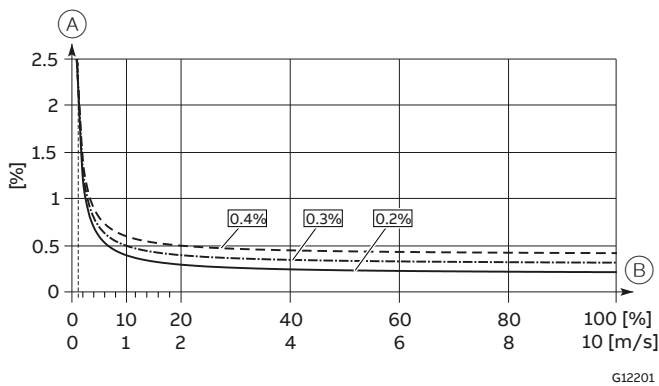
Measuring accuracy

Reference conditions

According to EN 29104	
Measuring medium temperature	20 °C (68 °F) ±2 K
Ambient temperature	20 °C (68 °F) ±2 K
Power supply	Nominal voltage acc. to name plate U = ±1 %, Frequency f = ±1 %
Installation condition	• Upstream >10 x DN, straight section — Downstream >5 x DN, straight section
Warm-up phase	30 min

Measuring error and repeatability

Measuring error



G12201

Pos.	Description
(A)	Accuracy ± of measured value in %
(B)	Flow velocity v in m/s, Q / Q _{max} DN in %

Table 8: Legend

Impulse output

Standard calibration

DN 3 ... 100: ±0.4 % of measured value, ±0.02 % Q_{max} DN¹⁾

DN 1 ... 2: ±0.7 % of measured value, ±0.02 % Q_{max} DN¹⁾

Optional calibration

DN 10 ... 100: ±0.3 % of measured value, ±0.02 % Q_{max} DN¹⁾

Or

DN 10 ... 100: ±0.2 % of measured value, ±0.02 % Q_{max} DN¹⁾

Table 9: Measuring error impulse output

1) Q_{max} DN: See table in chapter "Measuring range table" on page 16.

Current output

Same as pulse output plus ±0.1 % of measured value ±0.01 mA

Table 10: Measuring error current output

Repeatability, response time

Repeatability	Response time ¹⁾
≤ 0.11 % of measured value, t _{meas} = 100 s, v = 0.5 ... 10 m/s	As step function 0 ... 99 % 5 τ ≥ 200 ms at 25 Hz excitation frequency 5 τ ≥ 400 ms at 12.5 Hz excitation frequency 5 τ ≥ 500 ms at 6.25 Hz excitation frequency

Table 11: Repeatability, response time

1) Of current output with damping of 0.04 seconds

Permitted pipe vibration

In accordance with EN 60068-2-6.

Applicable to sensors in remote mount design and sensors in integral mount design.

- Maximum deflection: 0.15 mm (0.006 inch) in the 10 ... 58 Hz range
- Maximum acceleration: 2 g, in the 58 ... 150 Hz range

IP rating

- IP 65 / IP 67 in accordance with EN 60529
- IP 68 in accordance with EN 60529 (for remote mount design only)
- NEMA 4X

Signal cables

For remote mount design only.

The maximum signal cable length between flowmeter sensor and transmitter is 200 m (656 ft).

A 5 m (16.4 ft) cable is included in the scope of delivery.

If more than 5 m (16.4 ft) is required, the cable can be ordered separately (Part no. 3KQZ407123U0100).

For marine applications, a certified signal cable is available.

Temperature data

Storage temperature range

-40 ... 70 °C (-40 ... 158 °F)

The temperature range offered depends on a number of different factors.

These factors include the measuring medium temperature T_{medium} , the ambient temperature T_{amb} , the operating pressure P_{medium} , the liner material and the approvals for the explosion protection.

Maximum permissible cleaning temperature

CIP medium	Liner material	Cleaning temperature
Steam	PTFE, PFA	150 °C (302 °F)
Cleaning fluid	PTFE, PFA	140 °C (284 °F)

- The specified cleaning temperature applies for a maximum ambient temperature of 25 °C (77 °F).
- If the ambient temperature is > 25 °C (> 77 °F), the difference to the actual ambient temperature must be subtracted from the maximum cleaning temperature.
- The specified cleaning temperature may be applied for a maximum of 60 minutes.

Maximum permissible temperature shock

- Maximum temperature shock temperature difference in °C: Any
- Temperature gradient °C/min: Any

... Flowmeter sensor

Ambient temperature as a function of measuring medium temperature
Integral and remote mount design.

Standard flowmeter sensor design				
Process connection	Ambient temperature range ($T_{amb.}$)		Measuring medium temperature range (T_{medium})	
	Minimum ¹⁾	Maximum	Minimum	Maximum ²⁾
Flange	-20 °C (-4 °F)	60 °C (140 °F)	-25 °C (-13 °F)	100 °C (112 °F)
	-20 °C (-4 °F)	40 °C (104 °F)	-25 °C (-13 °F)	130 °C (266 °F) ³⁾
Variable process connections	-20 °C (-4 °F)	60 °C (140 °F)	-25 °C (-13 °F)	100 °C (112 °F)
	-20 °C (-4 °F)	40 °C (104 °F)	-25 °C (-13 °F)	130 °C (266 °F) ³⁾

High temperature design – from size DN 10 (3/8")				
Process connection	Ambient temperature range ($T_{amb.}$)		Measuring medium temperature range (T_{medium})	
	Minimum ¹⁾	Maximum	Minimum	Maximum
Flange	-20 °C (-4 °F)	60 °C (140 °F)	-25 °C (-13 °F)	180 °C (356 °F)

1) There is an option for a low temperature design with minimum ambient temperature -40°C (-40°F).

2) For CIP/SIP cleaning, higher temperatures are permitted for limited time periods; refer to chapter "Maximum permissible cleaning temperature" on page 15.

3) For devices with nominal diameter of DN 1 ... 2 the maximum measuring medium temperature is limited to 120 °C (248 °F).

Measuring range table

The flow range end value can be set between $0.02 \times Q_{max, DN}$ and $2 \times Q_{max, DN}$.

Nominal diameter		Minimum flow range end value	QmaxDN	Maximum flow range end value
DN	inch	$0.02 \times Q_{max, DN}$ (≈ 0.2 m/s)	0 ... ≈ 10 m/s	$2 \times Q_{max, DN}$ (≈ 20 m/s)
1	1/25	0.012 l/min (0.00032 US gal/min)	0.6 l/min (0.16 US gal/min)	1.2 l/min (0.32 US gal/min)
1.5	1/16	0.024 l/min (0.0063 US gal/min)	1.2 l/min (0.32 US gal/min)	2.4 l/min (0.63 US gal/min)
2	1/12	0.04 l/min (0.0106 US gal/min)	2 l/min (0.53 US gal/min)	4 l/min (1.06 US gal/min)
3	1/10	0.08 l/min (0.02 US gal/min)	4 l/min (1.06 US gal/min)	8 l/min (2.11 US gal/min)
4	5/32	0.16 l/min (0.04 US gal/min)	8 l/min (2.11 US gal/min)	16 l/min (4.23 US gal/min)
6	1/4	0.4 l/min (0.11 US gal/min)	20 l/min (5.28 US gal/min)	40 l/min (10.57 US gal/min)
8	5/16	0.6 l/min (0.16 US gal/min)	30 l/min (7.93 US gal/min)	60 l/min (15.85 US gal/min)
10	3/8	0.9 l/min (0.24 US gal/min)	45 l/min (11.9 US gal/min)	90 l/min (23.78 US gal/min)
15	1/2	2 l/min (0.53 US gal/min)	100 l/min (26.4 US gal/min)	200 l/min (52.8 US gal/min)
20	3/4	3 l/min (0.79 US gal/min)	150 l/min (39.6 US gal/min)	300 l/min (79.3 US gal/min)
25	1	4 l/min (1.06 US gal/min)	200 l/min (52.8 US gal/min)	400 l/min (106 US gal/min)
32	1 1/4	8 l/min (2.11 US gal/min)	400 l/min (106 US gal/min)	800 l/min (211 US gal/min)
40	1 1/2	12 l/min (3.17 US gal/min)	600 l/min (159 US gal/min)	1200 l/min (317 US gal/min)
50	2	1.2 m ³ /h (5.28 US gal/min)	60 m ³ /h (264 US gal/min)	120 m ³ /h (528 US gal/min)
65	2 1/2	2.4 m ³ /h (10.57 US gal/min)	120 m ³ /h (528 US gal/min)	240 m ³ /h (1057 US gal/min)
80	3	3.6 m ³ /h (15.9 US gal/min)	180 m ³ /h (793 US gal/min)	360 m ³ /h (1585 US gal/min)
100	4	4.8 m ³ /h (21.1 US gal/min)	240 m ³ /h (1057 US gal/min)	480 m ³ /h (2113 US gal/min)

Process connections

For an overview of the available process connection variants, see the chapter entitled "Overview – models" on page 7.

Materials

Wetted parts		
Part	Standard	Option
Liner material	PFA, from DN 3 (1/10") PEEK, for DN 1 ... 2 (1/25 ... 1/12")	
Measurement and grounding electrode	SST 1.4539 (AISI 904L)	SST 1.4571 (AISI 316Ti), Hastelloy C-4 (2.4610), Hastelloy B-3 (2.4600), titanium, tantalum, platinum-iridium
Gaskets for welded spuds, threaded connection, Tri-Clamp, external threads	EPDM (Ethylene-Propylene) with FDA approval, silicone with FDA approval (CIPresistant, no oils or grease)	Silicone with FDA approval (option, oil or grease resistant) PTFE with FDA approval (DN 3 ... 8)
Gaskets for 1/8" sanitary connector	PTFE	Viton (only in combination with PVC process connection)
Process connection		
Welded spuds, Tri-Clamp, etc.	SST 1.4404 (AISI 316L)	–
OD tubing	SST 1.4435 (AISI 316L)	–
1/8" sanitary connector	SST 1.4571 (AISI 316Ti)	PVC, POM
Non-wetted parts (process connection)		
Part	Standard	Option
Process connection	SST 1.4571 (AISI 316Ti)	–

Sensor housing	
Part	Material
Housing	Deep-drawn housing SST 1.4301 (AISI 304), 1.4308
Meter tube	Stainless steel
Terminal box	Aluminum alloy, painted, $\geq 80 \mu\text{m}$ thick, light gray, RAL 9002 Option: Plastic, gray white, RAL 9002
Cable gland¹⁾	Polyamide ²⁾ , stainless steel ³⁾

- 1) Cable gland with M 20 x 1.5 or NPT thread, to be selected via the order number.
- 2) Cable gland with M20 x 1.5 or NPT thread, to be selected via the order number.
- 3) In case of explosion-proof design or for ambient temperature of $-40 \text{ }^\circ\text{C}$ ($-40 \text{ }^\circ\text{F}$)

Material loads for process connections

The limits for the permissible measuring medium temperature (T_{medium}) and permissible pressure (P_{medium}) are calculated on the basis of the lining and flange material used in the device (refer to the name plate on the device).

Minimum permissible operating pressure

The following tables show the minimum permissible operating pressure (P_{medium}) depending on measuring medium temperature (T_{medium}) and the liner material.

Liner material	Nominal diameter	P_{medium} [mbar abs]	T_{medium} ¹⁾
PFA	DN 3 ... 100 (1/10 ... 4")	0	< 130 °C (266 °F)
PEEK	DN 1 ... 2 (1/25 ... 1/2")	0	< 120 °C (248 °F)

- 1) For CIP/SIP cleaning, higher temperatures are permitted for limited time periods; refer to the chapter "Maximum permissible cleaning temperature" on page 15.

Liner approvals on request, please contact ABB.

... Flowmeter sensor

Material load

Overview – Material load

Process connection	DN	P _{medium} max.	T _{medium}
Wafer type	DN 3 ... 50 (1/10 ... 2")	40 bar (580 psi)	-25 ... 130 °C (-13 ... 266 °F)
	DN 65 ... 100 (2 1/2 ... 4")	16 bar (232 psi)	
Welded spuds DIN 2463, ISO 1127, DIN 11850	DN 3 ... 40 (1/10 ... 1 1/2")	40 bar (580 psi)	-25 ... 130 °C (-13 ... 266 °F)
	DN 50, DN 80 (2", 3")	16 bar (232 psi)	
	DN 65, DN 100 (2 1/2", 4")	10 bar (145 psi)	
Welded spuds SMS 1145	DN 25, DN 40 ... 100 (1", 1.5 ... 4")	6 bar (87 psi)	-25 ... 130 °C (-13 ... 266 °F)
Threaded pipe connection DIN 11851	DN 3 ... 40 (1/10 ... 1 1/2")	40 bar (580 psi)	-25 ... 130 °C (-13 ... 266 °F)
	DN 50, DN 80 (2", 3")	16 bar (232 psi)	
	DN 65, DN 100 (2 1/2", 4")	10 bar (145 psi)	
Tri-Clamp DIN 32676	DN 3 ... 50 (1/10 ... 2")	16 bar (232 psi)	-25 ... 130 °C (-13 ... 266 °F)
	DN 65 ... 100 (2 1/2 ... 4")	10 bar (145 psi)	
Tri-Clamp ASME BPE	DN 3 ... 80 (1/10 ... 3") DN 100 (4")	10 bar (145 psi) 8,6 bar (124,7 psi)	-25 ... 121 °C (-13 ... 250 °F)
External thread ISO 228, DIN 2999	DN 3 ... 25 (1/10 ... 1")	16 bar (232 psi)	-25 ... 130 °C (-13 ... 266 °F)
Welded spuds OD tubing	DN 3 ... 50 (1/10 ... 2")	10 bar (145 psi)	-25 ... 130 °C (-13 ... 266 °F)
1/8" sanitary connector	DN 1 ... 2 (1/25 ... 1/12")	10 bar (145 psi)	-10 ... 120 °C (-14 ... 248 °F)

Table 12: Overview – Material load

Flange devices

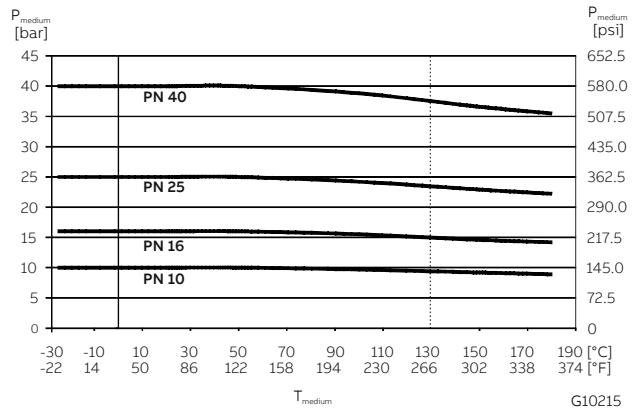


Fig. 6: DIN flange stainless steel to DN 100 (4")

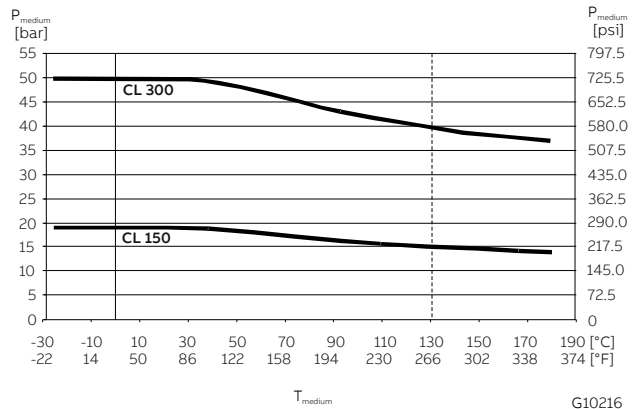


Fig. 7: ASME flange, stainless steel, up to DN 100 (4") (CL 150 / CL 300)

DN	Material	PN	T _{medium}	P _{medium}
DN 25 ... 100 (1 ... 4")	Stainless steel	10	-25 ... 130 °C (-13 ... 266 °F)	10 bar (145 psi)

Table 13: JIS 10K-B2210 flange

Wafer type devices

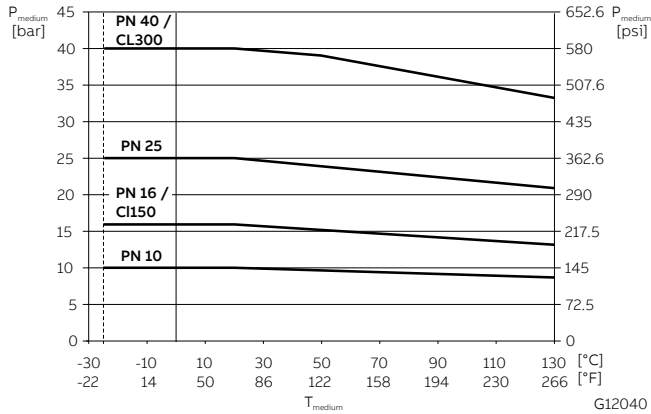


Fig. 8: Wafer type design

DN	Material	PN	T _{medium}	P _{medium}
DN 32 ... 100 (1 1/4 ... 4")	1.4404 1.4435 1.4301	10	25 ... 130 °C (-13 ... 266 °F)	10 bar (145 psi)

Table 14: JIS 10K-B2210 wafer type design

Installation conditions

General information

The following points must be observed during installation:

- The flow direction must correspond to the marking, if present.
- The maximum torque for all flange screws must be complied with.
- Secure the flange screws and nuts against pipe vibration.
- The devices must be installed without mechanical tension (torsion, bending).
- Install flange devices / wafer-type devices with plane parallel counterflanges and use appropriate gaskets only.
- Only gaskets made from a material that is compatible with the measuring medium and measuring medium temperature may be used.
- Gaskets must not extend into the flow area, since possible turbulence could influence the accuracy of the device.
- The piping may not exert any inadmissible forces or torques on the device.
- Make sure temperature limits are not exceeded operating the device.
- Do not remove the sealing plugs in the cable glands until you are ready to install the electrical cable.
- Make sure the gaskets for the housing cover are seated correctly. Carefully gasket the cover. Tighten the cover fittings.
- The transmitter with a remote mount design must be installed at a largely vibration-free location.
- Do not expose the transmitter and sensor to direct sunlight. Provide appropriate sun protection as necessary.
- When installing the transmitter in a control cabinet, make sure adequate cooling is provided.

Devices with extended diagnostic functions

For devices with extended diagnostic functions different installation conditions may be valid.

For further information read and observe chapter "Diagnostic functions" on page 5.

... Flowmeter sensor

Gaskets

The following points must be observed when installing gaskets:

- For achieve the best results, ensure the gaskets fit concentrically with the meter tube
- To ensure that the flow profile is not distorted, the gaskets must not protrude into the piping.
- The use of graphite with the flange or process connection gaskets is prohibited, because an electrically conductive coating may form on the inside of the meter tube.

Devices with a PFA liner

- In principle, devices with a PFA liner do not require additional gaskets.

Devices with a wafer-type design

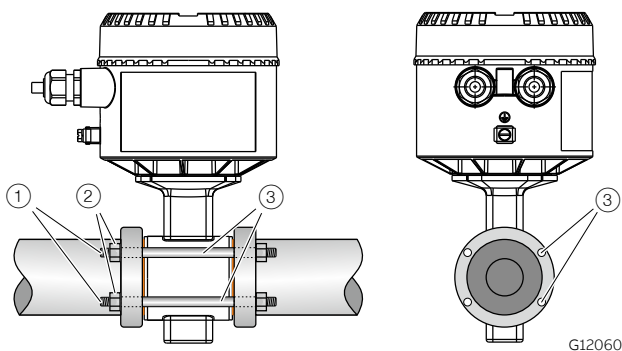


Fig. 9: Installation set for wafer-type installation (example)

For devices with a wafer-type design, ABB offers an installation set as an accessory that comprises threaded rods ①, nuts with washers ② and centering sleeves ③ for installation.

Flow direction

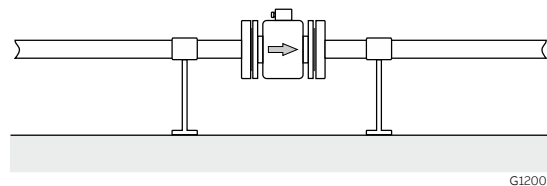


Fig. 1: Flow direction

The device measures the flowrate in both directions. Forward flow is the factory setting, as shown in Fig. 1.

Electrode axis

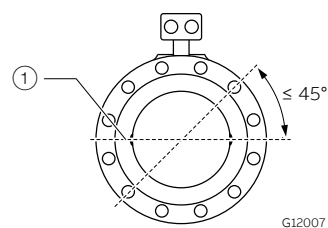


Fig. 10: Orientation of the electrode axis

The electrode axis ① should be horizontal if at all possible or no more than 45° from horizontal.

Mounting position

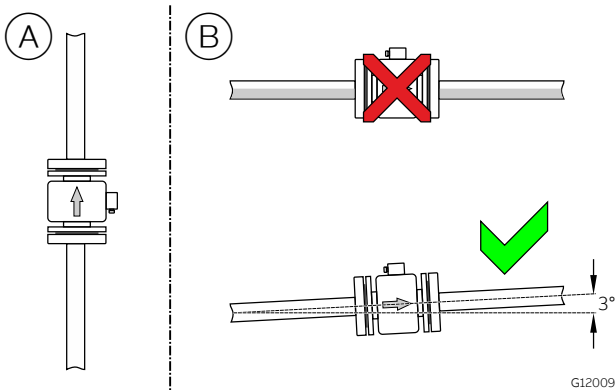


Fig. 11: Mounting position

- Ⓐ Vertical installation for measuring abrasive fluids, preferably with flow in upward direction.
- Ⓑ In case of horizontal installation, the Meter tube must always be completely full. Provide for a slight incline of the connection for degassing.

NOTICE

Prefer vertical installation in hygienic applications! With horizontal installation assure the sensor is self-drainable.

Minimum distance

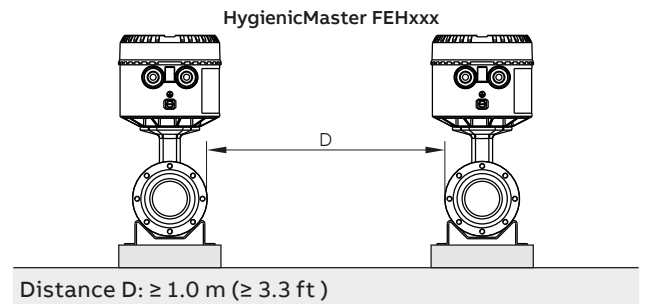


Fig. 2: Minimum distance

- In order to prevent the devices from interfering with each other, a minimum distance as shown in Fig. 2 must be maintained between the devices.
- The flowmeter sensor may not be operated in the vicinity of powerful electromagnetic fields, e.g., motors, pumps, transformers, etc. A minimum spacing of approx. 1 m (3.28 ft) should be maintained.
- For installation on or to steel parts (e.g. steel brackets), a minimum spacing of approx. 100 mm (3.94 inch) should be maintained (based on IEC801-2 and IECTC77B).

Grounding

The flowmeter sensor must be connected to ground potential. For technical reasons, this potential should be identical to the potential of the measuring medium. For plastic or insulated lined pipelines, the measuring medium is grounded by installing ground plates. When there are stray potentials present in the pipeline, a ground plate is recommended on both ends of the flowmeter sensor.

... Flowmeter sensor

Inlet and outlet sections

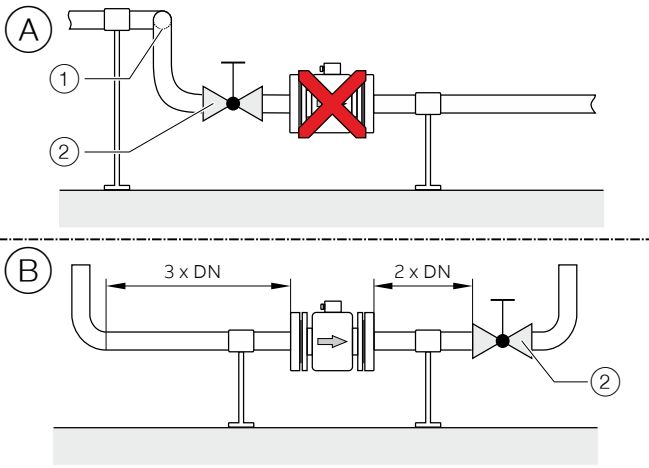


Fig. 14: In- and outlet section, turn-off component

Pos.	Description
①	Double elbow
②	Turn-off device

Table 15: Legend

The metering principle is independent of the flow profile as long as standing eddies do not extend into the metering section, such as may occur after double elbows, in the event of tangential inflow, or where half-open gate valves are located upstream of the flowmeter sensor. In such cases, measures must be put in place to normalize the flow profile.

- Ⓐ Do not install fittings, manifolds, valves, etc., directly in front of the flowmeter sensor.
- Ⓑ Inlet and outlet section: Length of straight inlet and outlet section of the flowmeter sensor.
Experience has shown that, in most installations, inlet sections 3 x DN long and outlet sections 2 x DN long are sufficient (DN = nominal diameter of the flowmeter sensor). For test stands, the reference conditions of 10 x DN inlet section and 5 x DN outlet section must be provided, in accordance with EN 29104 / ISO 9104. Valves or other turn-off components should be installed in the outlet section. Butterfly valves must be installed so that the valve plate does not extend into the flowmeter sensor.

Free inlet or outlet

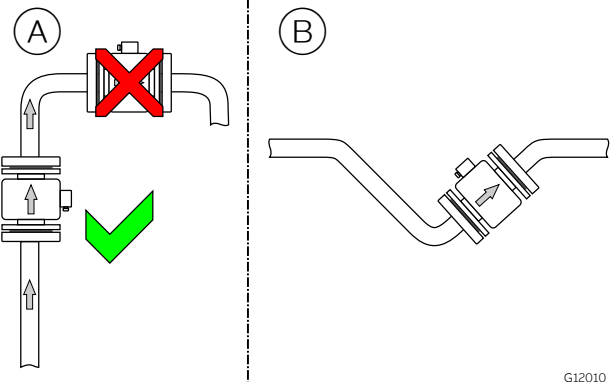


Fig. 15: Free inlet or outlet

- Ⓐ Do not install the flowmeter at the highest point or in the draining off side of the pipeline, flowmeter runs empty, air bubbles can form.
- Ⓑ Provide for a siphon fluid intake for free inlets or outlets so that the pipeline is always full.

Strongly contaminated measuring media

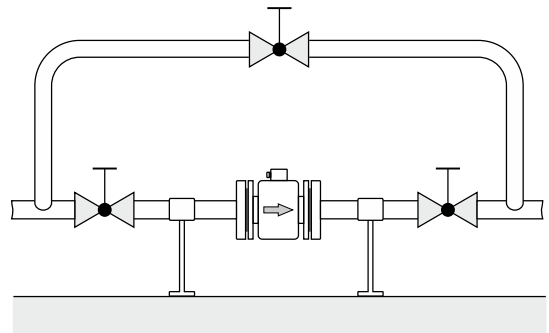


Fig. 16: Bypass connection

For strongly contaminated measuring media, a bypass connection according to the figure is recommended so that operation of the system can continue to run without interruption during the mechanical cleaning.

Installation in the vicinity of pumps

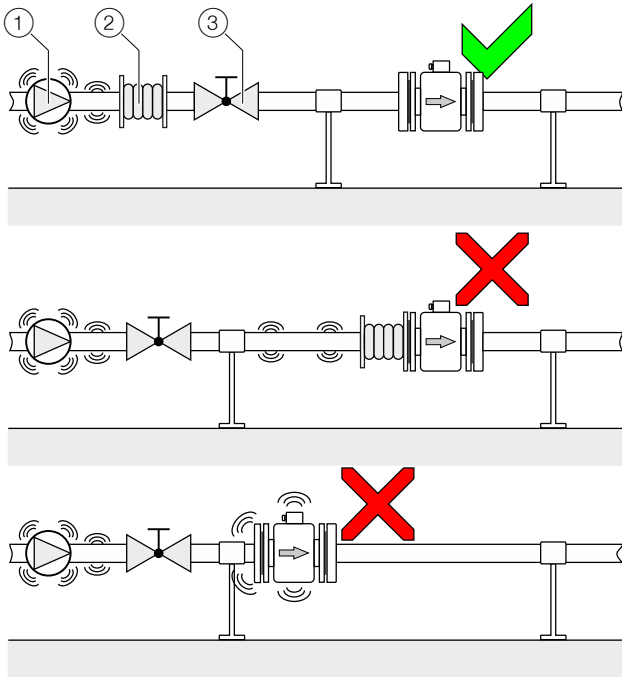


Fig. 14: Vibration damping

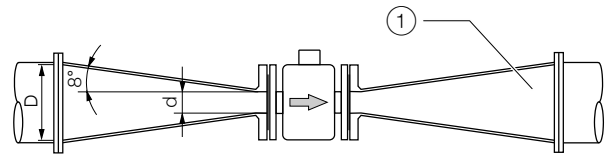
G12012

Pos.	Description
①	Pump
②	Damping device
③	Shut-off device

Table 16: Legend

Strong vibrations in the pipeline must be damped using flexible damping devices. The damping devices must be installed beyond the supported flowmeter section and outside of the section between the shut-off devices. Do not connect flexible damping devices directly to the flowmeter sensor.

Installation in pipelines with larger nominal diameters

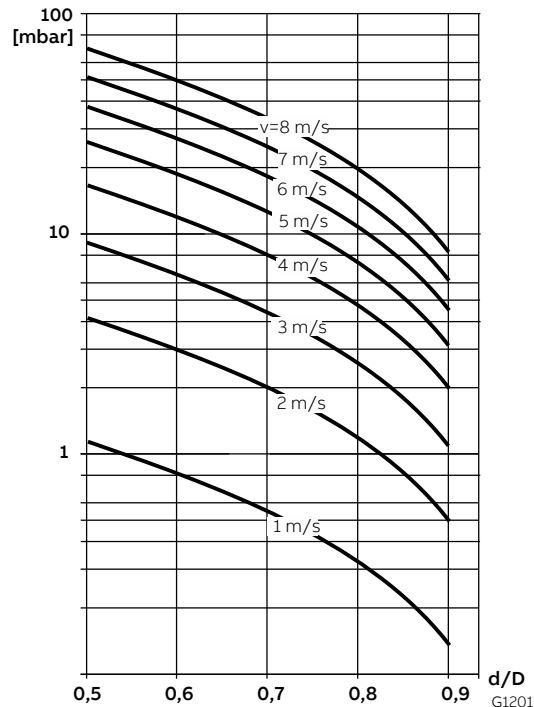


G12014

Fig. 15: Using reduction pieces

Determine the resulting pressure loss when using transition pieces ①:

1. Calculate the diameter ratio d/D .
2. Determine the flow velocity based on the flow rate nomogram (Fig. 4).
3. Read the pressure drop on the Y-axis in Fig. 4.



G12015

Fig. 4: Flow rate nomogram for pressure drop calculations for flange transition piece with $\alpha/2 = 8^\circ$

... Flowmeter sensor

Installation in 3A-compliant installations

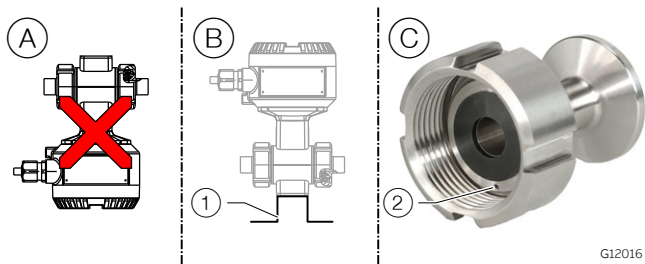


Fig. 16: 3A-compliant installation

Please observe the following points:

- Ⓐ Do not install the device horizontally with the terminal box or transmitter housing pointing downward.
 - Ⓑ The "mounting bracket ①" option is not 3A-compliant.
 - Ⓒ Please ensure that the leakage hole ② of the process connection is located at the deepest point of the installed device.
- Prefer vertical installation. With horizontal installation make sure the sensor is self-drainable
 - Make sure the sensor terminal compartment cover and / or the transmitter housing cover is tightened properly to ensure there is no gap between the base of the housing and the cover.

Only devices with following process connections are 3A-compliant:

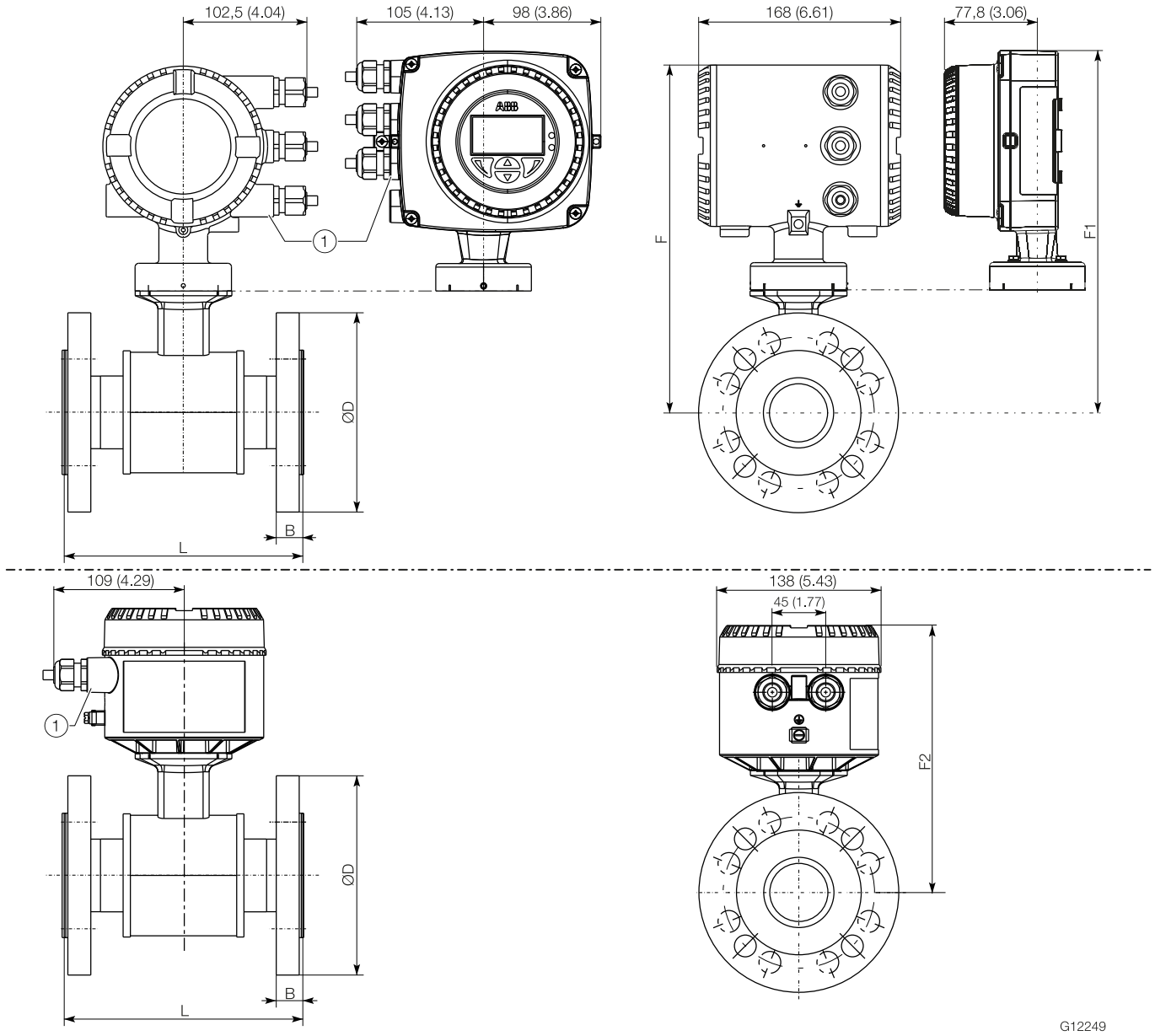
- Welded spuds
- Tri-Clamp

Dimensions

Flange DN 3 ... 100 (1/10 ... 4")

All specified dimensions and weights are in mm (in.) or kg (lb). The stated weights are approximate; the maximum weight is always stated.

Integral mount design



G12249

Integral mount design

① Female thread (either 1/2" NPT or M20 x 1,5) refer to model coding. With 1/2" NPT there will be a plug instead of the PG cable inlet.

Fig. 17

... Flowmeter sensor

Dimensions – Flange DN 3 ... 100 (1/10 ... 4")								
Nominal diameter	Process connection	D	B	L ³⁾	F	F1	F2	Weight
DN 3 ... 8 ¹⁾ (1/8 ... 5/16 ^{1/2)})	EN 1092-1 PN 40	90 (3.54)	19 (0.75)	130 (5.12)	254 (10.0)	268 (10.55)	190 (7.56)	5 (11.02)
	ASME B16.5, CL 150	90 (3.54)	14.2 (0.56)					
	ASME B16.5, CL 300	95 (3.74)	17.3 (0.68)					
	JIS 10K	90 (3.54)	15 (0.59)					
DN 10 ¹⁾ (1/8 ... 3/8 ^{1/2)})	EN 1092-1 PN 40	90 (3.54)	19 (0.75)	200 (7.84)	254 (10.0)	268 (10.55)	190 (7.56)	5 (11.02)
	ASME B16.5, CL 150	90 (3.54)	14.2 (0.56)					
	ASME B16.5, CL 300	95 (3.74)	17.3 (0.68)					
	JIS 10K	90 (3.54)	15 (0.59)					
DN 15 (1/2")	EN 1092-1 PN 40	95 (3.74)	19 (0.75)	200 (7.84)	254 (10.0)	268 (10.55)	190 (7.56)	8 (17.64)
	ASME B16.5, CL 150	90 (3.54)	14.2 (0.56)					
	ASME B16.5, CL 300	95 (3.74)	17.3 (0.68)					
	JIS 10K	95 (3.74)	15 (0.59)					
DN 20 (3/4")	EN 1092-1 PN 40	105 (4.13)	21 (0.83)	200 (7.84)	263 (10.35)	277 (10.91)	199 (7.83)	8 (17.64)
	ASME B16.5, CL 150	98.6 (3.88)	15.7 (0.62)					
	ASME B16.5, CL 300	117.3 (4.62)	18.7 (0.74)					
	JIS 10K	100 (3.94)	17 (0.67)					
DN 25 (1")	EN 1092-1 PN 40	115 (4.53)	21 (0.83)	200 (7.84)	269 (10.59)	283 (11.14)	205 (8.07)	9 (19.84)
	ASME B16.5, CL 150	108 (4.25)	17.2 (0.68)					
	ASME B16.5, CL 300	124 (4.88)	20.5 (0.81)					
	JIS 10K	125 (4.92)	17 (0.67)					
DN 32 (1 1/4")	EN 1092-1 PN 40	140 (5.51)	21 (0.83)	200 (7.84)	274 (10.79)	288 (11.34)	210 (8.27)	11 (24.25)
	ASME B16.5, CL 150	117.3 (4.62)	18.7 (0.74)					
	ASME B16.5, CL 300	133.4 (5.25)	22.1 (0.87)					
	JIS 10K	135 (5.31)	19 (0.75)					
DN 40 (1 1/2")	EN 1092-1 PN 40	150 (5.91)	21 (0.83)	200 (7.84)	279 (10.98)	293 (11.54)	215 (8.46)	11 (24.25)
	ASME B16.5, CL 150	127 (5.00)	20.5 (0.81)					
	ASME B16.5, CL 300	155.4 (6.12)	23.6 (0.93)					
	JIS 10K	140 (5.51)	19 (0.75)					
DN 50 (2")	EN 1092-1 PN 40	165 (6.50)	23 (0.91)	200 (7.84)	289 (11.38)	303 (11.93)	225 (8.86)	11 (24.25)
	ASME B16.5, CL 150	152.4 (6.00)	22.1 (0.87)					
	ASME B16.5, CL 300	165.1 (6.50)	25.4 (1.00)					
	JIS 10K	155 (6.10)	19 (0.75)					

1) Connection flange DN 10

2) Connection flange 1/2"

3) Toleranz für L: +0 / -3 mm (+0 / -0,018 in.)

Dimensions – Flange DN 3 ... 100 (1/10 ... 4")

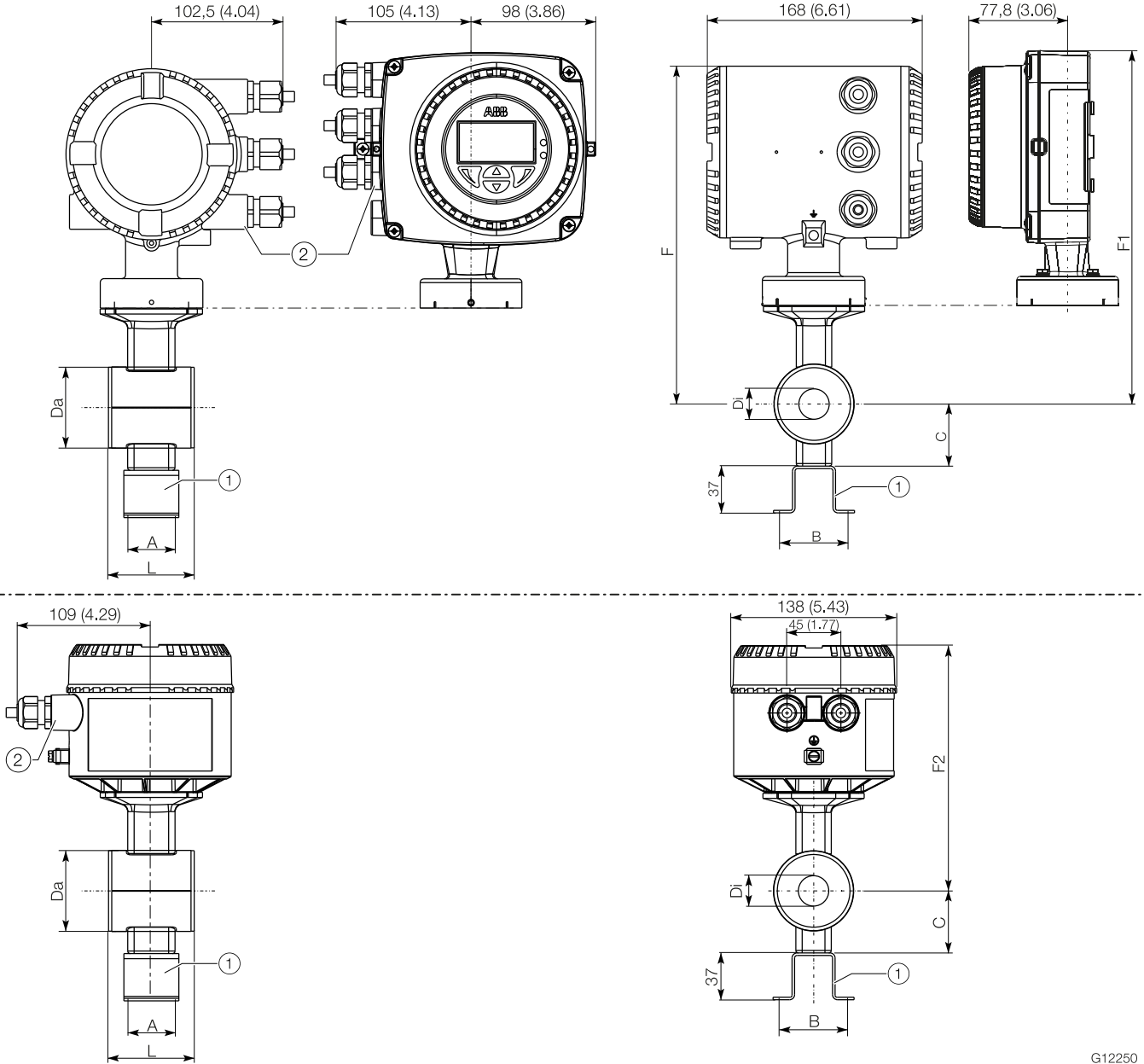
Nominal diameter	Process connection	D	B	L ³⁾	F	F1	F2	Weight
DN 65 (2 1/2")	EN 1092-1 PN 40	185 (7.28)	22 (0.87)	200 (7.84)	297 (11.69)	311 (12.24)	233 (9.17)	15 (33.07)
	EN 1092-1 PN 40	185 (7.28)	26 (1.02)					
	ASME B16.5, CL 150	177.8 (7.00)	25.4 (1.00)					
	ASME B16.5, CL 300	190.5 (7.50)	28.4 (1.12)					
	JIS 10K	175 (6.89)	21 (0.83)					
DN 80 (3")	EN 1092-1 PN 40	200 (7.87)	28 (1.10)	200 (7.84)	306 (12.05)	320 (12.60)	242 (9.53)	18 (39.68)
	ASME B16.5, CL 150	190.5 (7.50)	26.9 (1.06)					
	ASME B16.5, CL 300	209.6 (8.25)	31.4 (1.24)					
	JIS 10K	185 (7.28)	21 (0.83)					
DN 100 (4")	EN 1092-1 PN 40	220 (8.66)	24 (0.94)	200 (7.84)	320 (12.60)	334 (13.15)	256 (10.08)	21 (46.30)
	EN 1092-1 PN 40	235 (9.25)	28 (1.10)					
	ASME B16.5, CL 150	228.6 (9.00)	27.4 (1.08)					
	ASME B16.5, CL 300	254 (10.00)	35.8 (1.41)					
	JIS 10K	210 (8.27)	21 (0.83)					

3) Tolerance for L: +0 / -3 mm (+0 / -0.018 in.)

... Flowmeter sensor

Wafer type, DN 3 ... 40 (1/10 ... 1 1/2")

All specified dimensions and weights are in mm (in.) or kg (lb). The stated weights are approximate; the maximum weight is always stated.



G12250

- ① Bracket (optional), not available for 3A approval; For dimensions see Table: "Installation hole spacing for angle bracket"
- ② Female thread (either 1/2" NPT or M20 x 1,5) refer to model coding. With 1/2" NPT there will be a plug instead of the PG cable inlet.

Fig. 18

Dimensions – Wafer type DN 3 ... 40 (1/10 ... 1 1/2")

Nominal diameter	Nominal pressure	Da	Di	C	L	F	F1	F2	Weight
DN 3 ... 8 (1/8" ... 5/16")	See chapter "Material load" on page 18	45 (1.77)	3 ... 8 (0.12 ... 0.31)	39 (1.54)	68 (2.68)	254 (10.0)	268 (10.55)	190 (7.48)	3.5 (7.72)
DN 10 (3/8")			10 (0.39)						
DN 15 (1/2")				13 (0.51)					
DN 20 (3/4")		54 (2.13)	18 (0.71)	44 (1.73)	78 (3.07)	263 (10.35)	277 (10.91)	199 (7.83)	4 (8.82)
DN 25 (1")		63.4 (2.50)	24 (0.94)	48 (1.89)	90 (3.54)	269 (10.59)	283 (11.14)	205 (8.07)	4.5 (9.92)
DN 32 (1 1/4")		73 (2.87)	30 (1.18)	53 (2.09)	98 (3.86)	274 (10.79)	288 (11.34)	210 (8.27)	4.5 (9.92)
DN 40 (1 1/2")		82 (3.23)	36 (1.42)	57 (2.24)	103 (4.06)	279 (10.98)	293 (11.54)	215 (8.46)	5 (11.02)

Tolerance for L: +0 / -3 mm (+0 / -0.018 in.)

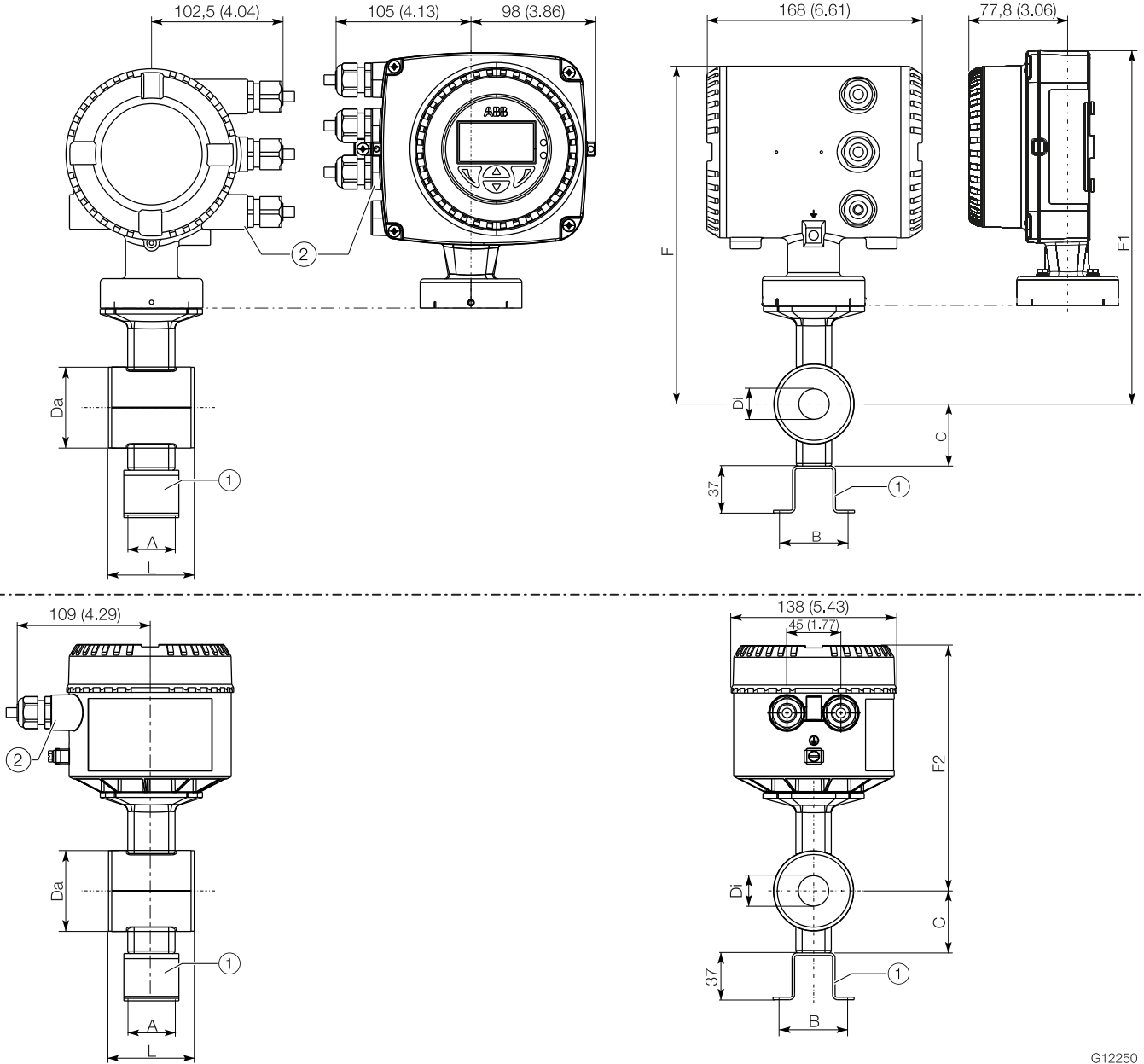
Installation hole spacing for angle bracket

Nominal diameter	A	B
DN 3 ... 20 (1/8" ... 3/4")	37 (1.46)	50 (1.97)
DN 25 ... 40 (1" ... 1 1/2")	42 (1.65)	70 (2.76)

... Flowmeter sensor

Wafer type. DN 50 ... 100 (2 ... 4")

All specified dimensions and weights are in mm (in.) or kg (lb). The stated weights are approximate; the maximum weight is always stated.



G12250

- ① Bracket (optional), not available for 3A approval
- ② Female thread (either 1/2" NPT or M20 x 1.5) refer to model coding, With 1/2" NPT there will be a plug instead of the PG cable inlet.

Fig. 19

Dimensions – Wafer type DN 50 ... 100 (2 ... 4")										
Nominal diameter	Nominal pressure	Da	Di	C	L	L¹⁾	F	F1	F2	Weight
DN 50 (2")	See chapter "Material load" on page 18	99.6 (3.92)	47 (1.85)	62 (2.44)	117 (4.61)	117 (4.61)	289 (11.38)	303 (11.93)	225 (8.86)	5.5 (12.13)
DN 65 (2 1/2")		116 (4.57)	62 (2.44)	74 (2.91)	103 (4.06)	200 (7.87)	297 (11.69)	311 (12.24)	233 (9.17)	6 (13.23)
DN 80 (3")		133 (5.24)	74 (2.91)	86 (3.39)	103 (4.06)	200 (7.87)	306 (12.05)	320 (12.60)	242 (9.53)	7 (15.43)
DN 100 (4")		160.4 (6.31)	96 (3.78)	105 (4.13)	133 (5.24)	250 (9.84)	320 (12.60)	334 (13.15)	256 (10.08)	9 (19.84)

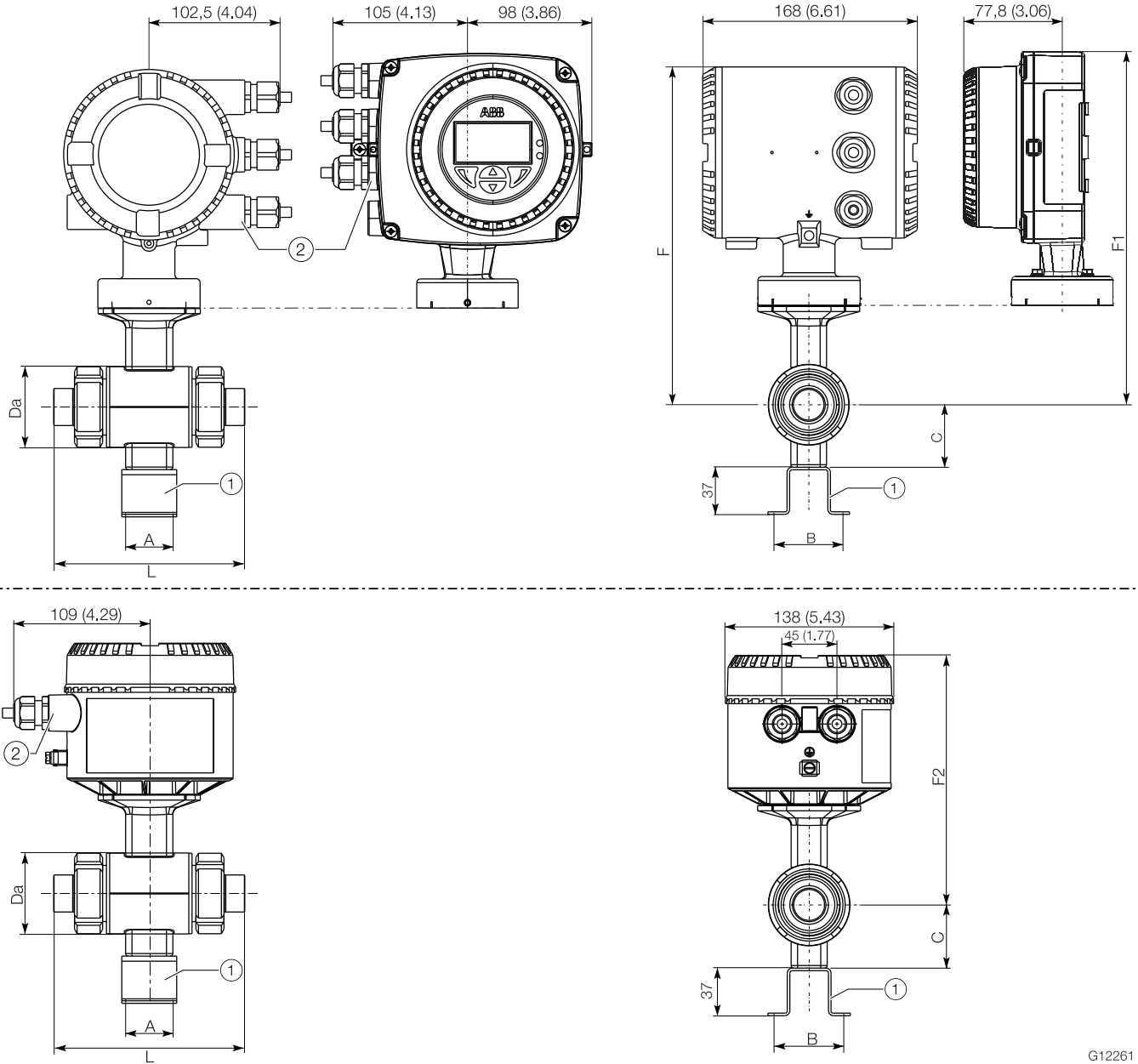
1) New Lay Length

Tolerance for L: +0 / -3 mm (+0 / -0.018 in.)

... Flowmeter sensor

Variable process connections, DN 3 ... 40 (1/10 ... 1 1/2")

All specified dimensions and weights are in mm (in.) or kg (lb).



G12261

- ① Bracket (optional), not available for 3A approval; For dimensions see Table: "Installation hole spacing for angle bracket"
- ② Female thread (either 1/2" NPT or M20 x 1,5) refer to model coding. With 1/2" NPT there will be a plug instead of the PG cable inlet.

Fig. 20

Dimensions – Variable process connections DN 3 ... 40 (1/10 ... 1 1/2")								
Nominal diameter	Nominal pressure	Da	C	L	F	F1	F2	Weight¹⁾
DN 3 ... 8 (1/8" ... 5/16")	See chapter "Material load" on page 18	45 (1.77)	39 (1.54)	Installation length including adapter for process connection see chapter "Adapter for variable process connections DN 3 ... 100 (1/8" ... 4")" on page 36.	254 (10.0)	268 (10.55)	190 (7.48)	3.5 (7.72)
DN 10 (3/8")		54 (2.13)	44 (1.73)		263 (10.35)	277 (10.91)	199 (7.83)	4 (8.82)
DN 15 (1/2")		63.4 (2.50)	48 (1.89)		269 (10.59)	283 (11.14)	205 (8.07)	4.5 (9.92)
DN 20 (3/4")		73 (2.87)	53 (2.09)		274 (10.79)	288 (11.34)	210 (8.27)	4.5 (9.92)
DN 25 (1")		82 (3.23)	57 (2.24)		279 (10.98)	293 (11.54)	215 (8.46)	5 (11.02)

1) Plus process connection weight: See chapter "Adapter for variable process connections DN 3 ... 100 (1/8" ... 4")" on page 36.

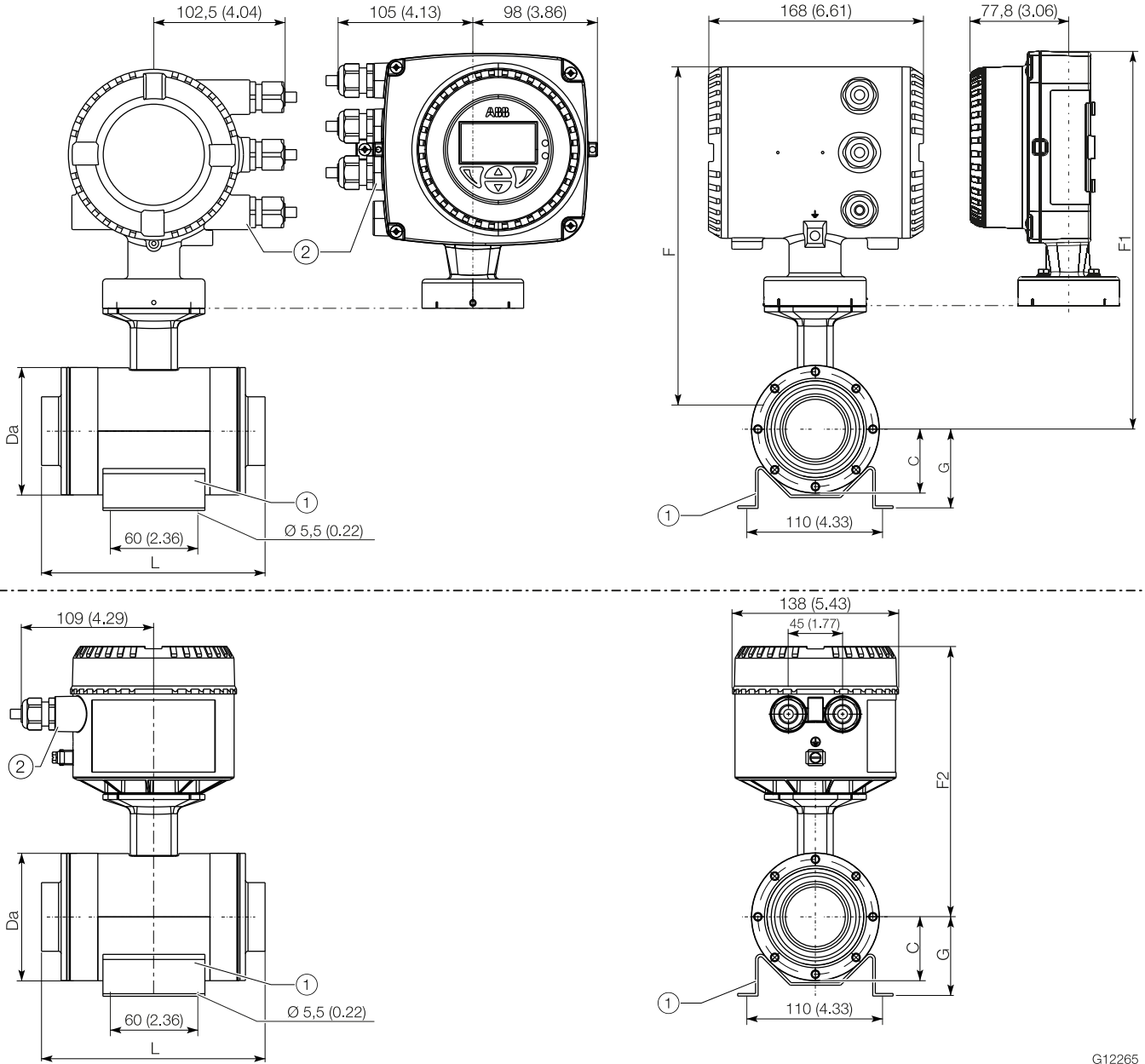
Tolerance for L: +0 / -3 mm (+0 / -0.018 in.)

Installation hole spacing for angle bracket		
Nominal diameter	A	B
DN 3 ... 20 (1/8" ... 3/4")	28 (1.1)	50 (1.97)
DN 25 ... 40 (1" ... 1 1/2")	46 (1.81)	70 (2.76)

... Flowmeter sensor

Variable process connections, DN 50 ... 100 (2 ... 4")

All specified dimensions and weights are in mm (in.) or kg (lb). The stated weights are approximate; the maximum weight is always stated.



G12265

- ① Bracket (optional), not available for 3A approval
- ② Female thread (either 1/2" NPT or M20 x 1,5) refer to model coding. With 1/2" NPT there will be a plug instead of the PG cable inlet.

Fig. 21

Dimensions – Variable process connections DN 50 ... 100 (2 ... 4")									
Nominal diameter	Nominal pressure	Da	C	G	L	F	F1	F2	Weight¹⁾
DN 50 (2")	See chapter "Material load" on page 18	99.6 (3.92)	62 (2.44)	62 (2.44)	Installation length including adapter for process connection see chapter "Adapter for variable process connections DN 3 ... 100 (1/8" ... 4")" on page 36.	289 (11.38)	303 (11.93)	225 (8.86)	5.5 (12.13)
DN 65 (2 1/2")		116 (4.57)	74 (2.91)	74 (2.91)		297 (11.69)	311 (12.24)	233 (9.17)	6 (13.23)
DN 80 (3")		133 (5.24)	86 (3.39)	86 (3.39)		306 (12.05)	320 (12.60)	242 (9.53)	7 (15.43)
DN 100 (4")		160.4 (6.31)	105 (4.13)	105 (4.13)		320 (12.60)	334 (13.15)	256 (10.08)	9 (19.84)

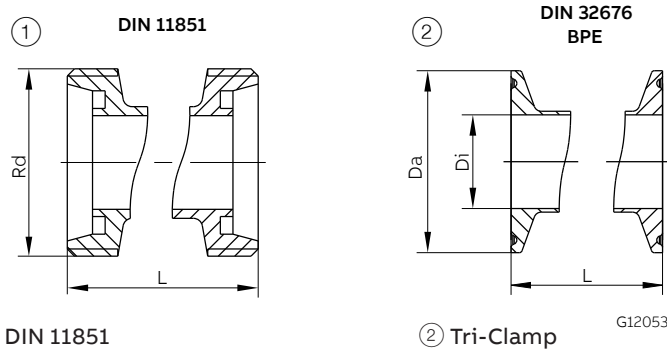
1) Plus process connection weight: See chapter "Adapter for variable process connections DN 3 ... 100 (1/8" ... 4")" on page 36.

Tolerance for L: +0 / -3 mm (+0 / -0.018 in.)

... Flowmeter sensor

Adapter for variable process connections DN 3 ... 100 (1/8" ... 4")

All specified dimensions and weights are in mm (in.) or kg (lb).



① Food industry fitting acc. to DIN 11851

② Tri-Clamp

G12053

Fig. 22

Food industry fitting acc. to DIN 11851						
Nominal diameter	Nominal pressure	L (old ¹⁾)	L (new ²⁾)	Thread	Ø Di	Weight
DN 3 ... 10 (1/8 ... 3/8")	See chapter "Overview – Material load" on page 18	169 (6.65)	–	28 x 1/8"	10 (0.39)	0.5 (1.1)
DN 15 (1/2")				34 x 1/8"	16 (0.63)	
DN 20 (3/4")		180 (7.09)	–	44 x 1/6"	20 (0.79)	0.9 (2.0)
DN 25 (1")		207 (8.15)	–	52 x 1/6"	26 (1.02)	
DN 32 (1 1/4")		230 (9.06)	–	58 x 1/6"	32 (1.26)	1.4 (3.1)
DN 40 (1 1/2")		237 (9.33)	–	65 x 1/6"	38 (1.50)	
DN 50 (2")		243 (9.57)	–	78 x 1/6"	50 (1.97)	
DN 65 (2 1/2")		245 (9.65)	330.5 (13.01)	96 x 1/6"	66 (2.60)	2.2 (4.9)
DN 80 (3")		259 (10.20)	344.5 (13.56)	110 x 1/4"	81 (3.19)	3.2 (7.1)
DN 100 (4")		307 (12.09)	412.5 (16.24)	130 x 1/4"	100 (3.94)	4.4 (9.7)

1) Old Lay Length for replacement purposes only. Please refer to the model coding.
2) New Lay Length.

Tri-clamp		Acc. to DIN 32676					Acc. to ASME BPE				
		L	Ø Da	Ø Di	Series	Weight	Process size	L	Ø Da	Ø Di	Weight
DN 3 ... 10 (1/8 ... 3/8")	See chapter "Overview – Material load" on page 18	163 (6.42)	34 (1.34)	10 (0.39)	3	0.5 (1.1)	1/2"	143 (5.63)	25 (0.98)	9.4 (0.37)	0.5 (1.1)
DN 15 (1/2")			16 (0.63)				3/4"				
DN 20 (3/4")		168 (6.61)		20 (0.79)	3	0.7 (1.5)	1"		50.4 (1.98)	22.1 (0.87)	0.7 (1.5)
DN 25 (1")		192 (7.56)	50.5 (1.99)	26 (1.02)	3	0.8 (1.8)	1 1/2"	277 (34.8)		22.1 (0.87)	1.2 (2.7)
DN 32 (1 1/4")			32 (1.26)	3	1.5 (3.3)	–	–	–	–	–	–
DN 40 (1 1/2")			38 (1.50)	3	1.4 (3.1)	1 1/2"	277 (34.8)	50.4 (1.98)	34.8 (1.37)	1.8 (4.0)	
DN 50 (2")		64 (2.52)	50 (1.97)	3	1.2 (2.7)	2"		63.9 (2.52)	47.5 (1.87)		
DN 65 (2 1/2")		221 (8.70) ¹⁾	91 (3.58)	66 (2.60)	1	1.6 (3.5)	2 1/2"	77.4 (3.05)	60.2 (2.37)	2.0 (4.4)	
		306.5 (12.07) ²⁾									
DN 80 (3")		225 (8.86) ¹⁾	106 (4.17)	81 (3.19)	1	2.4 (5.3)	3"	337 (13.27)	90.9 (3.58)	72.9 (2.87)	3.6 (8.0)
		310.5 (12.22) ²⁾									
DN 100 (4")		255 (8.86) ¹⁾	119 (4.69)	100 (3.94)	1	3.1 (6.8)	4"		118.8 (4.68)	97.4 (3.83)	4.1 (9.1)
		360.5 (14.19) ²⁾									

1) Old Lay Length for replacement purposes only. Please refer to the model coding.
 2) New Lay Length.

... Flowmeter sensor

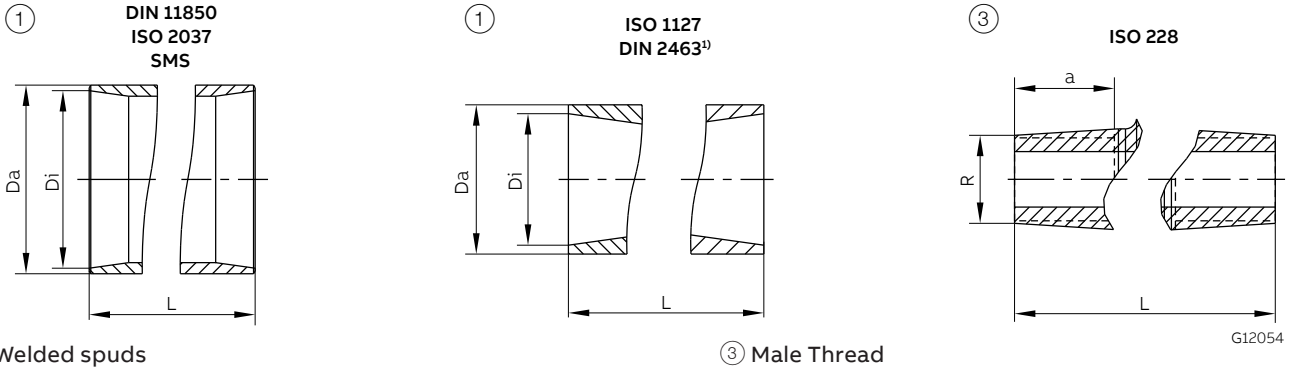


Fig. 23

Welded spuds											
Nominal diameter	Nominal pressure	L	Acc. to DIN 11850			Acc. to ISO 1127			Acc. to SMS		Weight
			Ø Da	Ø Di	Series	Ø Da	Ø Di	Series	Ø Da	Ø Di	
DN 3 ... 10 (1/8 ... 3/8")	See chapter "Overview - Material load" on page 18	127 (5.0)	13 (0.51)	10 (0.39)	2	13.5 (0.53)	10.3 (0.41)	1	•	—	0.4 (0.9)
DN 15 (1/2")			19 (0.75)	16 (0.63)		21.3 (0.84)	18.1 (0.71)		•	—	0.4 (0.9)
DN 20 (3/4")		132 (5.2)	23 (0.91)	20 (0.79)		26.9 (1.06)	23.7 (0.93)		•	—	0.7 (1.5)
DN 25 (1")		149 (5.87)	29 (1.14)	26 (1.02)		26.9 (1.06)	23.7 (0.93)		25 (0.98)	22.6 (0.89)	0.7 (1.5)
DN 32 (1 1/4")		166 (6.54)	34 (1.34)	32 (1.26)	1	33.7 (1.33)	30.5 (1.20)		•	—	1.0 (2.2)
DN 40 (1 1/2")		171 (6.73)	41 (1.61)	38 (1.50)	2	42.2 (1.66)	39 (1.54)	1	38 (1.50)	35.6 (1.40)	1.0 (2.2)
DN 50 (2")		173 (6.81)	54 (2.13)	50 (1.97)	3	51 (2.01)	47.8 (1.88)	2	51 (2.01)	48.6 (1.91)	1.0 (2.2)
DN 65 (2 1/2")		165 (6.50) ¹⁾	70 (2.76)	66 (2.60)	2	70 (2.76)	66 (2.60)	2	63.5 (2.50)	60.3 (2.37)	1.4 (3.1)
		250.5 (9.86) ²⁾									
DN 80 (3")		169 (6.65) ¹⁾	85 (3.35)	81 (3.19)		76.1 (3.00)	72.9 (2.87)	1	76.1 (3.00)	72.9 (2.87)	2.0 (4.4)
		254.5 (10.02) ²⁾									
DN 100 (4")		199 (7.83) ¹⁾	104 (4.09)	100 (3.94)		101.6 (4.00)	97.6 (3.84)	2	104 (4.09)	100 (3.94)	2.6 (5.7)
		304.5 (11.99) ²⁾									

1) Old Lay Length for replacement purposes only. Please refer to the model coding.

2) New Lay Length.

Welded spuds							
Nominal diameter	Nominal pressure	L	Acc. to DIN EN ISO 2037		Acc. to DIN 2463		Weight
			Ø Da	Ø Di	Ø Da	Ø Di	
DN 3 ... 10 (1/8 ... 3/8")	See chapter "Overview – Material load" on page 18	127 (5.0)	12 (0.47)	10 (0.39)	13.5 (0.53)	10.3 (0.41)	0.4 (0.9)
DN 15 (1/2")		17.2 (0.68)	15.2 (0.60)	21.3 (0.84)	18.1 (0.71)	0.4 (0.9)	
DN 20 (3/4")		132 (5.2)	21.3 (0.84)	19.3 (0.76)	26.9 (1.06)	23.7 (0.93)	0.7 (1.5)
DN 25 (1")		149 (5.87)	25 (0.98)	22.6 (0.89)	28 (1.10)	25 (0.98)	0.7 (1.5)
DN 32 (1 1/4")		166 (6.54)	33.7 (1.33)	31.3 (1.23)	35 (1.38)	32 (1.26)	1.0 (2.2)
DN 40 (1 1/2")		171 (6.73)	38 (1.5)	35.6 (1.40)	40 (1.57)	36.8 (1.45)	1.0 (2.2)
DN 50 (2")		173 (6.81)	51 (2.01)	48.6 (1.91)	52 (2.05)	49 (1.93)	1.0 (2.2)
DN 65 (2 1/2")		165 (6.50) ¹⁾	63.5 (2.50)	60.3 (2.37)	70 (2.76)	66 (2.60)	1.4 (3.1)
		250.5 (9.86) ²⁾					
DN 80 (3")		169 (6.65) ¹⁾	76.1 (3.00)	72.9 (2.87)	85 (3.35)	81 (3.19)	2.0 (4.4)
	254.5 (10.02) ²⁾						
DN 100 (4")	199 (7.83) ¹⁾	101.6 (4.00)	97.6 (3.84)	104 (4.09)	100 (3.94)	3.0 (6.6)	
	304.5 (11.99) ²⁾						

1) Old Lay Length. Please refer to the model coding to specify the lay length (old lay length / new lay length). Old Lay Length for replacement purposes only.

2) New Lay Length.

Male Thread ccc. to ISO 228 / DIN 2999						
Nominal diameter	Nominal pressure	L	R	a	Weight	
DN 3 ... 10 (1/8 ... 3/8")	See chapter "Overview – Material load" on page 18	139 (5.47)	3/8"	18 (0.71)	0.4 (0.9)	
DN 15 (1/2")		139 (5.47)	1/2"	18 (0.71)	0.4 (0.9)	
DN 20 (3/4")		164 (6.46)	3/4"	25 (0.98)	0.8 (1.8)	
DN 25 (1")		179 (7.05)	1"	25 (0.98)	0.8 (1.8)	

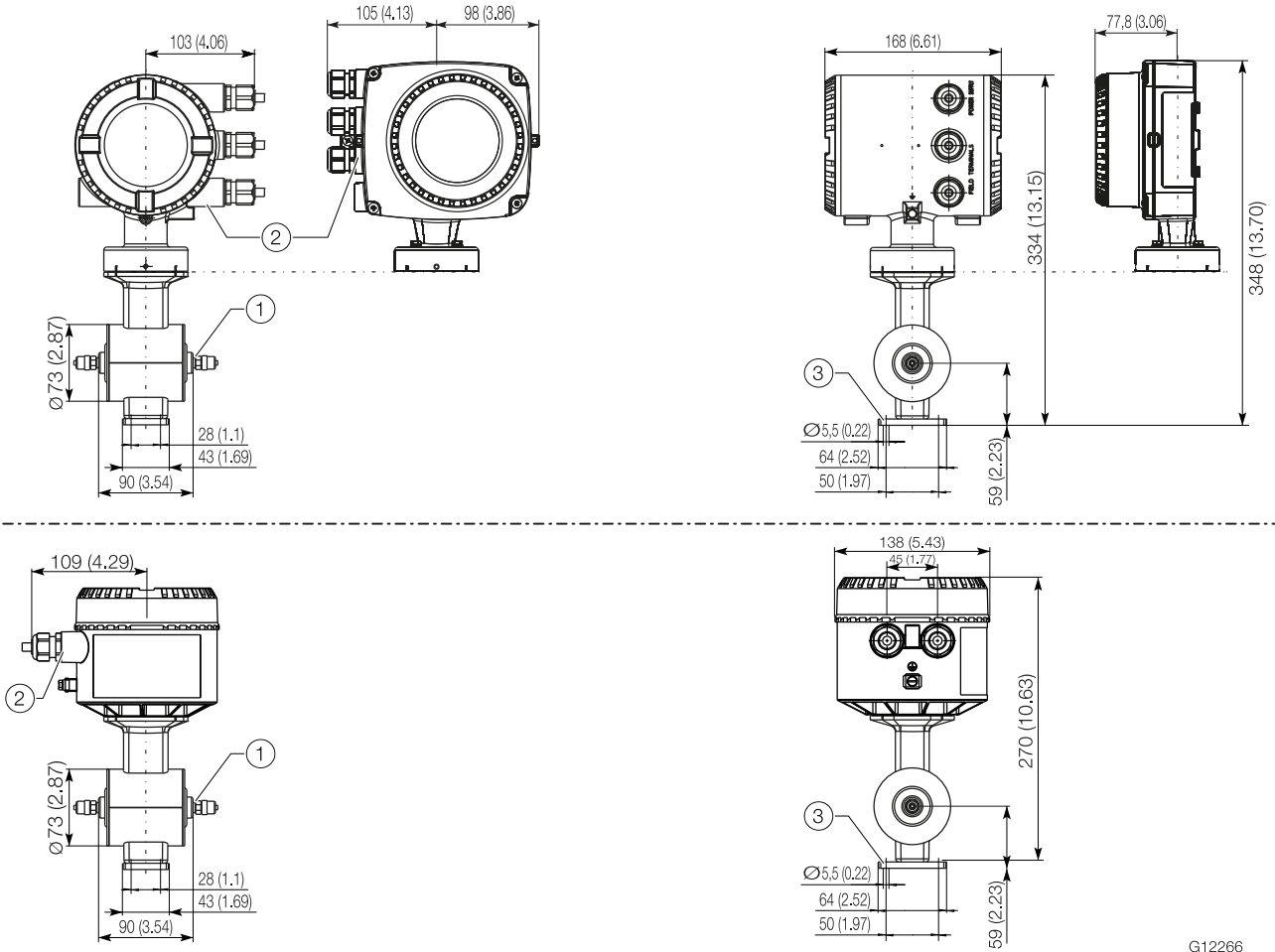
Welded spuds suitable for OD tubing						
Nominal diameter	Nominal pressure	Weld spud size	Di	Da	L	Weight
10 (3/8")	See chapter "Overview – Material load" on page 18	1/2"	9.40 (0.37)	12.70 (0.70)	127 (5.00)	0.4 (0.9)
15 (1/2")		3/4"	15.75 (0.62)	19.05 (0.75)	127 (5.00)	0.4 (0.9)
20 (1")		1"	22.10 (0.87)	25.40 (1.00)	132 (5.20)	0.7 (1.5)
25 (1")		1"	22.10 (0.87)	25.40 (1.00)	149 (5.87)	1.0 (2.2)
40 (1 1/2")		1 1/2"	34.80 (1.37)	38.10 (1.50)	171 (6.73)	
50 (2")		2"	47.50 (1.87)	50.80 (2.00)	173 (6.81)	

... Flowmeter sensor

1/8" sanitary connections DN 1 ... 2 (1/25 ... 3/32")

All specified dimensions and weights are in mm (in.) or kg (lb). The stated weights are approximate; the maximum weight is always stated.

Integral mount design



Integral mount design

- ① Connecting dimensions for gland: G 1/8" female thread
- ② Female thread (either 1/2" NPT or M20 x 1,5) refer to model coding. With 1/2" NPT there will be a plug instead of the PG cable inlet.
- ③ Mounting bracket (standard)

Fig. 24

Process connection	PN	Weight
1/8" sanitary connectors – for hose 6 x 4 mm (0.24 x 0.16 in.)	10	5 (11.02)

G12266

Transmitter

Features

- 4 ... 20 mA current output
- Current output in the event of an alarm can be configured to 21 ... 22.6 mA (NAMUR NE43)
- Measuring range: Can be configured between 0.02 ... 2 x Q_{maxDN}
- Operating mode for flow measurement can be configured
- Programmable digital output. Can be configured as frequency output, pulse output or binary output.
- Two slots for optional plug-in cards for retrofitting additional current / digital outputs or a digital input.
- Damping: 0.04 ... 100 s configurable (1 τ)
- Low flow cut-off: 0 ... 20 % for current and pulse output
- Parameterization by means of HART communication
- Empty pipe detection¹⁾
- Simulation of current and binary output (manual process execution)

1) Requirements for Empty Pipe detector function:
The conductivity of the fluid must be $\geq 20 \mu\text{S/cm}$
Nominal diameter must be $\geq \text{DN } 10$

LCD indicator (option)

- High-contrast LCD indicator
- Display of the current flow rate as well as the total flow rate
- Application-specific visualizations which the user can select. Two operator pages can be configured to display multiple values in parallel.
- Plain text fault diagnostics
- Menu-guided parameterization with four buttons
- "Easy Set-up" function for fast commissioning
- Parameterization of the device through the front glass with the housing closed

Isolation of outputs


The digital output terminals 41 / 42 and 51 / 52 have a common ground.

The current output and the digital outputs are electrically isolated from each other.

Optional plug-in cards

The transmitter has two slots (OC1, OC2) in which plug-in cards can be inserted to provide additional inputs and outputs.

The slots are located on the transmitter motherboard and can be accessed after removing the front housing cover.

Plug-in card	Description
	Current output, 4 to 20 mA passive (red) Order no.: 3KQZ400029U0100
	Passive digital output (green) Order no.: 3KQZ400030U0100
	Passive digital input (yellow) Order no.: 3KQZ400032U0100
	Loop power supply 24 V DC (blue) Order no.: 3KQZ400031U0100
	Modbus RTU RS485 (white) Order no.: 3KQZ400028U0100
	PROFIBUS DP (white) Order no.: 3KQZ400027U0100
	Ethernet IP, Modbus TCP Order no.: 3KQZ400037U0100
	Power over Ethernet (POE) Order no.: 3KQZ400039U0100

... Transmitter

IP rating

In accordance with EN60529: IP 65 / IP 67, NEMA 4X

Vibration

In accordance with EN 60068-2

- In the 10 ... 58 Hz range, max. deflection 0.15 mm (0.006 inch)¹⁾
- In the range of 58 ... 150 Hz, max. acceleration 2 g¹⁾

1) Peak load

Temperature data

	Standard	Optional
Ambient temperature	-20 ... 70 °C (-4 ... 158 °F)	-40 ... 70 °C (-40 ... 158 °F)
Storage temperature	-40 ... 70 °C (-40 ... 158 °F)	•

NOTICE

When operating below -20 °C (-4 °F), the LCD display can no longer be read. Full functionality is assured at temperatures above -20 °C (-4 °F).

Housing design

Integral mount design

Housing	Cast aluminum, painted
Paint	≥ 80 µm thick, RAL 9002 (gray white)
Cable gland ¹⁾	Polyamide Stainless steel ²⁾

Remote mount design

Housing	Cast aluminum, painted
Paint	≥ 80 µm thick, RAL 9002 (gray white)
Cable gland ¹⁾	Polyamide Stainless steel ²⁾
Weight	4.5 kg (9.92 lb)

1) Cable gland with M 20 x 1.5 or NPT thread, to be selected via the order number.
2) On explosion-proof design for ambient temperature of -40 °C (-40 °F).

Dimensions

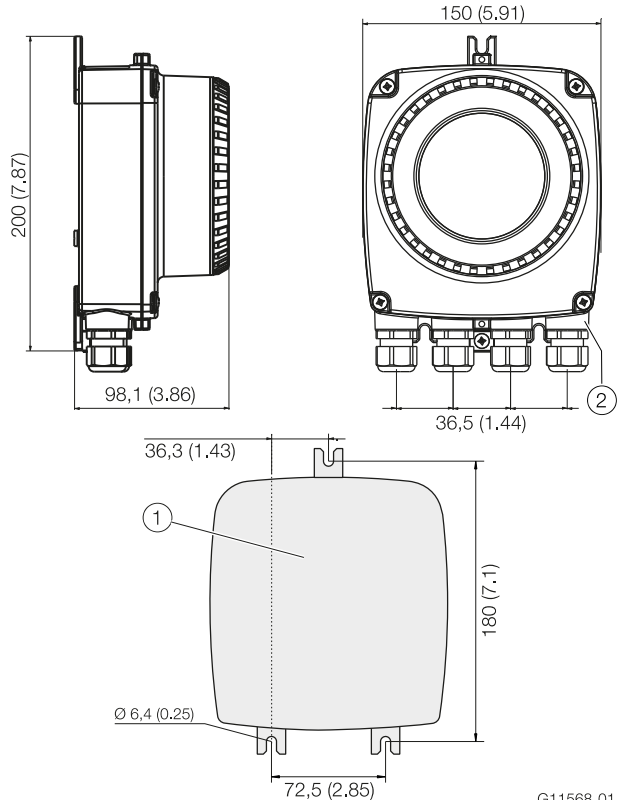


Fig. 26: Mounting dimensions single-compartment housing

Pos.	Description
①	Hole pattern for mounting holes
②	Female thread (either 1/2" NPT or M20 x 1,5) refer to model coding. With 1/2" NPT there will be a plug instead of the PG cable inlet

Table 18: Legend

Electrical connections

Connection diagram

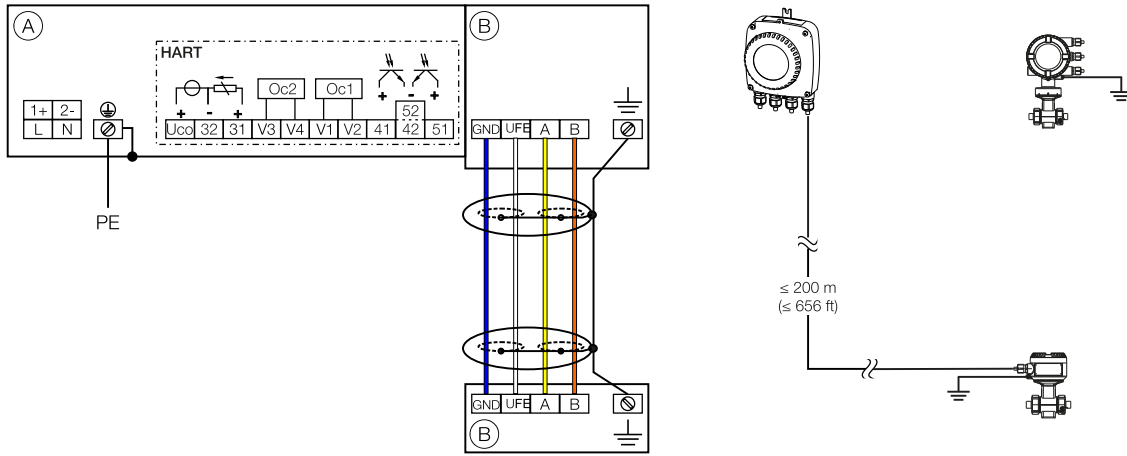


Fig. 27: Electrical connections

G12153

Pos.	Description
(A)	Connections for power supply and inputs / outputs
(B)	Connections for signal cable (remote mount design only)

Table 19: Legend

NOTICE

For detailed information about grounding the transmitter and the flowmeter sensor, please refer to chapter "Grounding" in the Commissioning instruction or the operating instruction.

Connections for the power supply

AC voltage	
Terminal	Function / comments
L	Phase
N	Neutral conductor
PE / ⊕	Protective earth (PE)
⏚	Potential equalization

AC voltage	
Terminal	Function / comments
1+	+
2-	-
PE / ⊕	Protective earth (PE)
⏚	Potential equalization

Connections for inputs and outputs

Terminal	Function / comments
Uco / 32	Active 4 ... 20 mA current output / HART
31 / 32	or Passive 4 ... 20 mA current output / HART
41 / 42	Passive digital output DO1
51 / 52	Passive digital output DO2
V1 / V2	Plug-in card, slot Oc1
V3 / V4	Plug-in card, slot Oc2 For details, see chapter "Optional plug-in cards" on page 41.

Connecting the signal cable

Only for remote mount design.

The sensor housing and transmitter housing must be connected to potential equalization.

Terminal	Function / comments
UFE	Sensor power supply
GND	Ground
A	Data line
B	Data line
⏚	Functional earth / Shielding

... Electrical connections

Electrical data for inputs and outputs

Power supply

AC power supply	
Terminals	L / N
Operating voltage	100 ... 240 V AC (-15 % / +10 %), 47 ... 64 Hz
Power consumption	S _{max} : < 20 VA
Switch-on current	18.4 A, t < 3 ms

DC voltage supply	
Terminals	1+ / 2-
Operating voltage	16.8 ... 30 V DC
Ripple	< 5 %
Power consumption	P _{max} : < 20 W
Switch-on current	21 A, t < 10 ms

HART communication

A HART DTM in accordance with FDT1.2 standards is available. HART protocol based Integrations in other Tools or systems (e.g., Emerson AMS/Siemens PCS7) are available on request. The DTM, the DD and EDD is available for download from www.abb.com/flow.

HART output	
Terminals	Active: U _{co} / 32 Passive: 31 / 32
Protocol	HART 7.1
Transmission	FSK modulation on current output 4 ... 20 mA in accordance with Bell 202 standard
Baud rate	1200 baud
Signal amplitude	Maximum 1.2 mAss
Current output load	Minimum 250 Ω
Cable	0,25 mm ² (AWG 24), twisted
Maximum cable length	1200 m (3937 ft)

Current output U_{co} / 32, 31 / 32

Can be configured for outputting mass flow and volume flow.

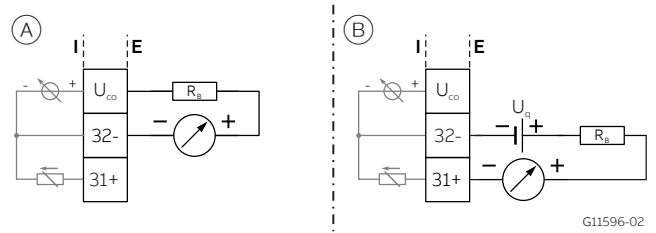
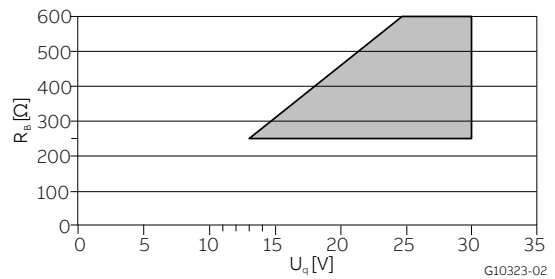


Fig. 28: (I = internal, E = external, R_b = load, U_q = Source voltage)

- (A) Active current output U_{co} / 32
- (B) Passive current output 31 / 32



Permissible source voltage U_q for passive outputs in relation to load resistance where I_{max} = 22 mA. ■ = Permissible range

Fig. 29: Source voltage for passive outputs

	Active	Passive
Terminals	U _{co} / 32	31 / 32
Output signal	4 ... 20 mA or 4 ... 12 ... 20 mA, switchable	4 ... 20 mA
Load R _b	250 Ω ≤ R _b ≤ 300 Ω	250 Ω ≤ R _b ≤ 600 Ω
Source voltage U _q ¹⁾	•	13 V ≤ U _q ≤ 30 V
Measuring error	< 0.1 % of measured value	
Isolation	The current output and the digital outputs are electrically isolated from each other.	

Table 20: Electrical data current output U_{co} / 32, 31 / 32

1) The source voltage U_q depends on the load R_b and must be within the permissible range.

Digital output 41 / 42, 51 / 52

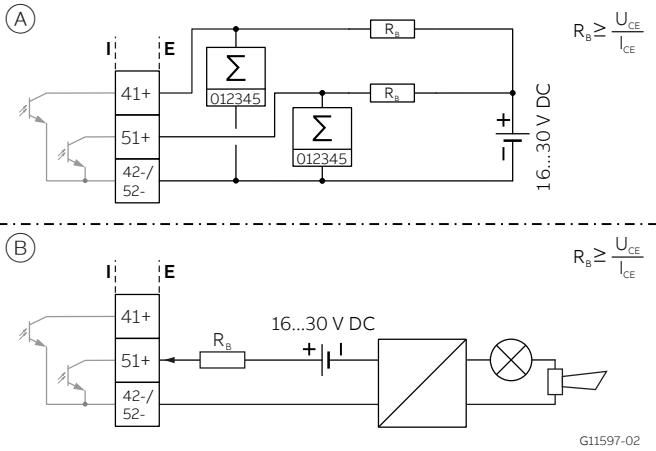


Fig. 30: (I = internal, E = external, R_b = load)

- (A) Passive digital output 41 / 42, 51 / 52 as pulse or frequency output
- (B) Passive digital output 51 / 52 as binary output

Pulse / frequency output (passive)	
Terminals	41 / 42, 51 / 52
Output "closed"	0 V ≤ U _{CEL} ≤ 3 V For f < 2.5 kHz: 2 mA < I _{CEL} < 30 mA For f > 2.5 kHz: 10 mA < I _{CEL} < 30 mA
Output "open"	16 V ≤ U _{CEH} ≤ 30 V DC 0 mA ≤ I _{CEH} ≤ 0.2 mA
f _{max}	10.5 kHz
Pulse width	0.1 ... 2000 ms

Binary output (passive)	
Terminals	41 / 42, 51 / 52
Output "closed"	0 V ≤ U _{CEL} ≤ 3 V 2 mA ≤ I _{CEL} ≤ 30 mA
Output "open"	16 V ≤ U _{CEH} ≤ 30 V DC 0 mA ≤ I _{CEH} ≤ 0.2 mA
Switching function	Configurable

Table 21: Electrical data digital output 41 / 42, 51 / 52

NOTICE

- The Terminals 42 / 52 have a common ground. The Digital outputs 41 / 42 and 51 / 52 are not electrically isolated from each other. An electrically isolated digital output can be realized using a plug-in card.
- For mechanical counters, we recommend setting the pulse width to ≥ 30 ms and a maximum frequency of f_{max} ≤ 3 kHz.

Current output V1 / V2, V3 / V4 (plug-in card)

Up to two additional current outputs can be implemented via the "Passive current output (red)" plug-in card. The plug-in card can be used in slot OC1 or in OC2.

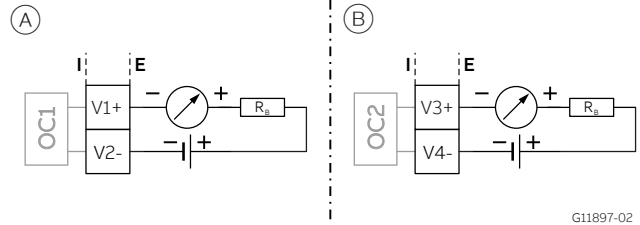
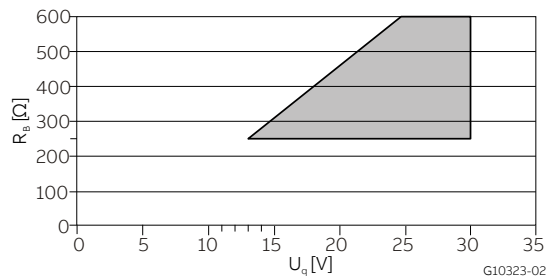


Fig. 31: (I = internal, E = external, R_b = load)

- (A) Passive current output V1 / V2
- (B) Passive current output V3 / V4



Permissible source voltage U_q for passive outputs in relation to load resistance where I_{max} = 22 mA. ■ = Permissible range

Fig. 32: Source voltage for passive outputs

Passive current output	
Terminals	V1 / V2, V3 / V4
Output signal	4 ... 20 mA
Load R _b	250 Ω ≤ R _b ≤ 600 Ω
Source voltage	13 V ≤ U _q ≤ 30 V
Measuring error	< 0.1 % of measured value

Table 22: Electrical data current output V1 / V2, V3 / V4

1) The source voltage U_q depends on the load R_b and must be within the permissible range.

... Electrical connections

Digital output V1 / V2, V3 / V4 (plug-in card)

An additional binary output can be implemented via the "Passive digital output (green)" plug-in card. The plug-in card can be used in slot OC1 or in OC2.

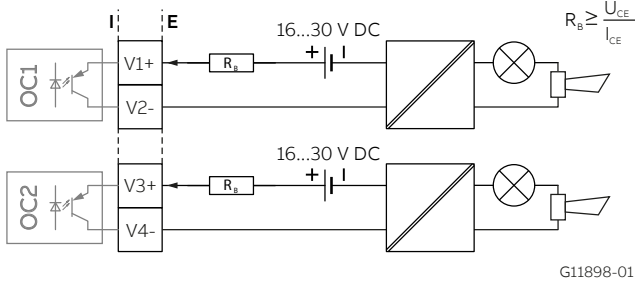


Fig. 33: Plug-in card as binary output (I = internal, E = external, R_b = load)

Binary output (passive)	
Terminals	V1 / V2, V3 / V4
Output "closed"	$0\text{ V} \leq U_{CEL} \leq 3\text{ V}$ $2\text{ mA} < I_{CEL} < 30\text{ mA}$
Output "open"	$16\text{ V} \leq U_{CEH} \leq 30\text{ V DC}$ $0\text{ mA} \leq I_{CEH} \leq 0.2\text{ mA}$
Switching function	Configurable

Table 23: Electrical data digital output V1 / V2, V3 / V4

Digital input V1 / V2, V3 / V4 (plug-in card)

A digital input can be implemented via the "Passive digital input (yellow)" plug-in card. The plug-in card can be used in slot OC1 or in OC2.

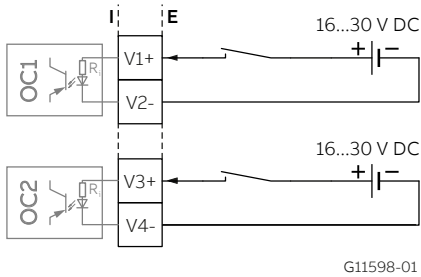


Fig. 34: Plug-in card as digital input (I = internal, E = external)

Digital input	
Terminals	V1 / V2, V3 / V4
Input "On"	$16\text{ V} \leq U_{KL} \leq 30\text{ V}$
Input "Off"	$0\text{ V} \leq U_{KL} \leq 3\text{ V}$
Internal resistance	$R_i = 6.5\text{ k}\Omega$
Function	Configurable

Table 24: Electrical data digital input V1 / V2, V3 / V4

24 V DC power supply V1 / V2 (plug-in card)

The power supply plug-in card allows a passive output on the transmitter to be used as an active output. See chapter. The plug-in card can only be used in slot OC1.

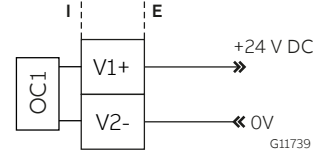


Fig. 35: (I = Internal, E = External)

24 V DC power supply	
Terminals	V1 / V2
Function	For active connection of passive outputs
Output voltage	24 V DC at 0 mA, 17 V DC at 25 mA
Load rating I_{max}	25 mA, permanently short circuitproof

Table 25: Electrical data plug-in card 24 V DC power supply V1 / V2

NOTICE

When using the device in potentially explosive atmospheres, the power supply plug-in card must only be used to power one passive output. It must not be connected to multiple passive outputs!

Connection examples

Input and output functions are configured via the device software in accordance with the desired application.

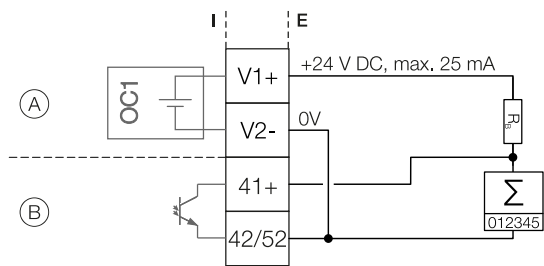
Active digital output 41 / 42, 51 / 52, V3 / V4

When the "24 V DC power supply (blue)" plug-in card is used, the digital outputs on the basic device and on the plug-in cards can also be wired as active digital outputs.

NOTICE

Each "power supply (blue)" plug-in card must only power one output.

It must not be connected to two outputs (e.g. digital output 41 / 42 and 51 / 52)!

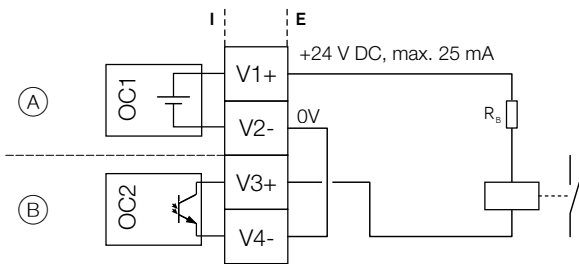


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Fig. 36: Active digital output 41 / 42 (example)

- (A) Plug-in card "Power supply (blue)" in slot 1
- (B) Digital output 41 / 42

The connection example shows usage for digital output 41 / 42; the same applies to usage for digital output 51 / 52.

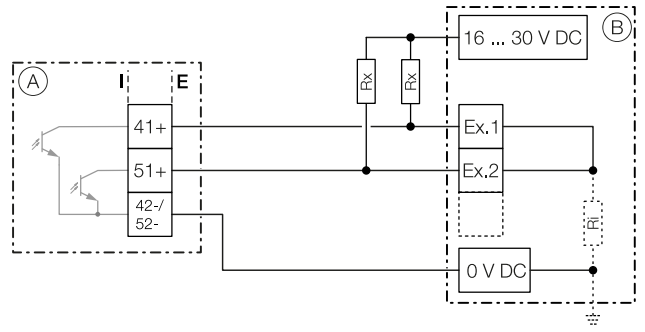


G11913

Fig. 37: Active digital output V3 / V4 (example)

- (A) Plug-in card "Power supply (blue)" in slot 1
- (B) Plug-in card "Digital output (green)" in slot 2

Digital output 41 / 42, 51 / 52 passive connected to a Process Control System



G12366

Fig. 38: Digital output 41 / 42, 51 / 52 passive connected to a Process Control System (Example)

Pos.	Description
(A)	Transmitter
(B)	Process Control System
Ex. 1	Input 1
Ex. 1	Input 2
R _x	Resistor limiting the current
R _i	Inner Resistor wit

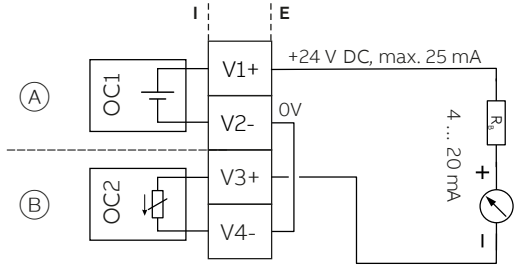
Table 26 Legend

Resistor R_x limits the current of the transmitter's Optocoupler output. The max. current is 25 mA. With 24 V DC voltage R_x should be 1000 Ω / 1 W. With „1“ (high state) at the digital output of the transmitter, the Input of the Process Control System will switch from 24 V DC to 0 V (low state).

... Electrical connections

Active current output V3 / V4

When the 'loop power supply 24 V DC, blue' plug-in card is used, the current output on the plug-in card can also be wired as the active current output.

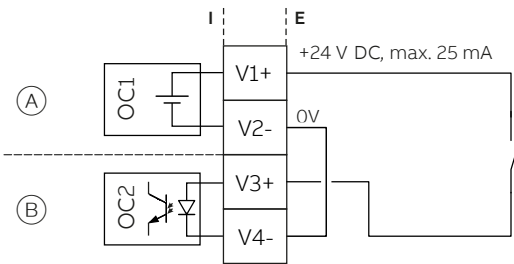


- Ⓐ 'Loop power supply (blue)' plug-in card in slot 1
- Ⓑ 'Passive current output (red)' plug-in card in slot 2

Figure 1 Active current output V3 / V4 (example)

Digital input V3 / V4 active

When the 'loop power supply 24 V DC, blue' plug-in card is used, the current output on the plug-in card can also be wired as the active current output.



- Ⓐ Plug-in card 'Power supply (blue)' in slot 1
- Ⓑ Plug-in card 'Passive digital input (yellow)' in slot 2

Figure 2 Active digital output V3 / V4 (example)

Connection versions digital output 41 / 42, 51 / 52

Depending on the wiring of digital outputs DO 41 / 42 and 51 / 52, they can be used parallel or only individually. The electrical isolation between the digital outputs also depends on the wiring.

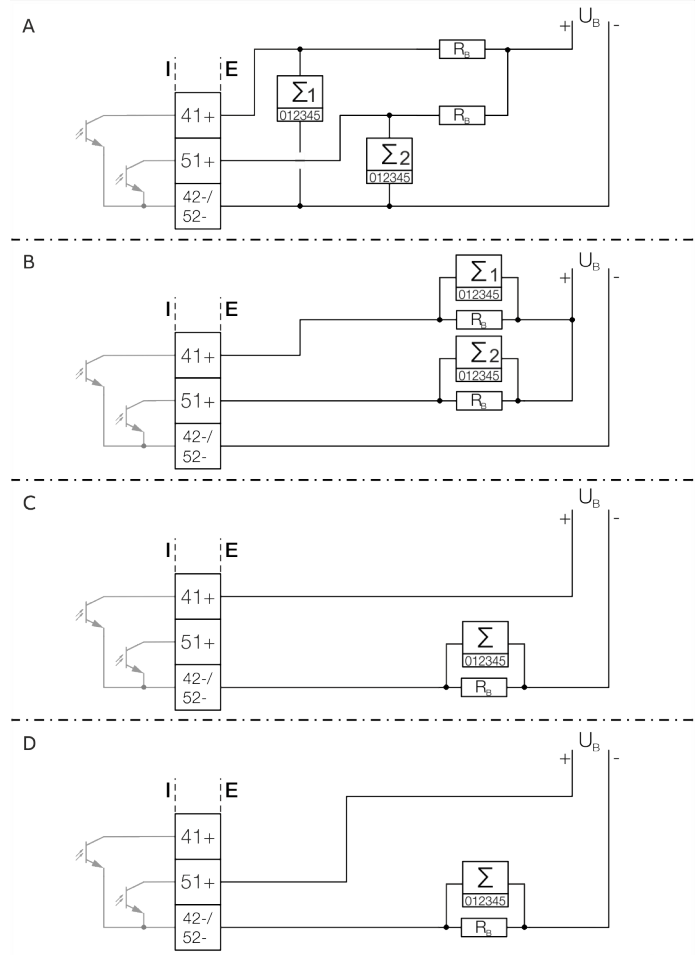


Figure 3 Connection versions digital output 41 / 42 and 51 / 52

	DO 41 / 42 and 51 / 52 can be used parallel	DO 41 / 42 and 51 / 52 electrically isolated
Ⓐ	Yes	No
Ⓑ	Yes	Yes
Ⓒ	No, only DO 41 / 42 can be used	No
Ⓓ	No, only DO 51 / 52 can be used	No

Table 1 Connection versions digital output

Digital communication

HART communication

Note

The HART® protocol is not secure, as such the intended application should be assessed to ensure that these protocols are suitable before implementation.

In connection with the DTM (Device Type Manager) available to the device, communication (configuration, parameterization) can be carried out FDT 0.98 or 1.2 (DSV401 R2).

Other tool or system integrations (e.g. Emerson AMS / Siemens PCS7) on request.

The necessary DTMs and other files can be downloaded from www.abb.com/flow.

HART output	
Terminals	Active: Uco / 32 Passive: 31 / 32
Protocol	HART 7.1
Transmission	FSK modulation on current output 4 to 20 mA in accordance with the Bell 202 standard
Baud rate	1200 baud
Signal amplitude	Maximum 1.2 mA

Factory setting of the HART process variables

HART process variable	Process value
Primary Value (PV)	Q_m – Mass flow
Secondary Value (SV)	Q_v – Volume flow rate
Tertiary Value (TV)	p – Density
Quaternary Value (QV)	T_m – Measuring medium temperature

The process values of the HART variables can be set in the device menu.

Modbus communication

Note

The Modbus® protocol is not secure, as such the intended application should be assessed to ensure that these protocols are suitable before implementation.

Modbus is an open standard owned and administrated by an independent group of device manufacturers styled the Modbus Organization (www.modbus.org).

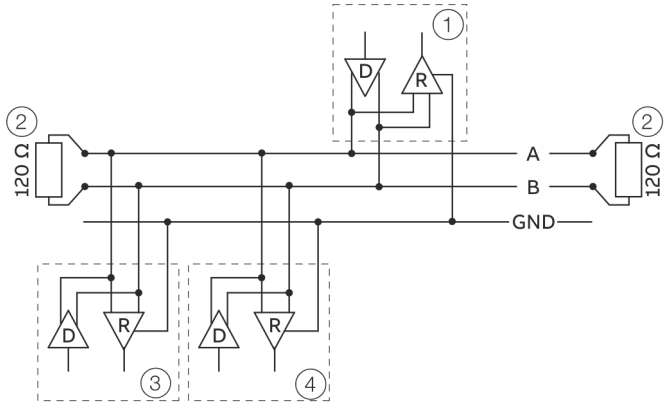
Using the Modbus protocol allows devices made by different manufacturers to exchange information via the same communication bus, without the need for any special interface devices to be used.

Modbus protocol	
Terminals	V1 / V2
Configuration	Via the Modbus interface or via the local operating interface in connection with Asset Vision Basic (DAT200) and a corresponding Device Type Manager (DTM)
Transmission	Modbus RTU - RS485 serial connection
Baud rate	2400, 4800, 9600, 19200, 38400, 56000, 57600, 115200 baud Factory setting: 9600 baud
Parity	None, even, odd Factory setting: odd
Stop bit	One, two Factory setting: One
IEEE format	Little endian, big endian Factory setting: Little endian
Typical response time	< 100 ms
Response delay time	0 to 200 milliseconds Factory setting: 10 milliseconds

... Electrical connections

...Digital communication

...Modbus communication



- ① Modbus master
- ② Terminating resistor
- ③ Modbus slave 1
- ④ Modbus slave n to 32

Figure 4 Communication with the Modbus protocol

Cable specification

The maximum permissible length is dependent on the baud rate, the cable (diameter, capacity and surge impedance), the number of loads in the device chain, and the network configuration (2 core or 4-core).

- At a baud rate of 9600 and with a conductor cross-section of at least 0.14 mm² (AWG 26), the maximum length is 1000 m (3280 ft).
- When using a 4-core cable as a 2-wire wiring system, the maximum length must be halved.
- The spur lines must be short, a maximum of 20 m (66 ft).
- When using a distributor with 'n' connections, each branch must have a maximum length of 40 m (131 ft) divided by 'n.'

The maximum cable length depends on the type of cable used. The following standard values apply:

- Up to 6 m (20 ft): cable with standard shielding or twisted-pair cable.
- Up to 300 m (984 ft): double twisted-pair cable with overall foil shielding and integrated earth cable.
- Up to 1200 m (3937 ft): double twisted-pair cable with individual foil shielding and integrated earth cables. Example: Belden 9729 or equivalent cable.

A category 5 cable can be used for Modbus RS485 up to a maximum length of 600 m (1968 ft). For the symmetrical pairs in RS485 systems, a surge impedance of more than 100 Ω is preferred, especially at a baud rate of 19200 and above.

PROFIBUS DP communication

Note

The PROFIBUS DP protocol are not secure, as such the intended application should be assessed to ensure that these protocols are suitable before implementation.

PROFIBUS DP interface	
Terminals	V1 / V2
Configuration	Via the PROFIBUS DP interface or via the local operating interface in connection with Asset Vision Basic (DAT200) and a corresponding Device Type Manager (DTM)
Transmission	In accordance with IEC 61158-2
Baud rate	9.6 kbps, 19.2 kbps, 45.45 kbps, 93.75 kbps, 187.5 kbps, 500 kbps, 1.5 Mbps
	The baud rate is automatically detected and does not need to be configured manually
Device profile	PA Profile 3.02
Bus address	Address range 0 to 126 Factory setting: 126

For commissioning purposes, you will need a device driver in EDD (Electronic Device Description) or DTM (Device Type Manager) format plus a GSD file.

You can download EDD, DTM and GSD from: www.abb.com/flow.

The files required for operation can also be downloaded from www.profibus.com.

ABB provides three different GSD files which can be integrated in the system.

ID number	GSD file name	
0x9740	PA139740.gsd	1xAI, 1xTOT
0x9700	PA139700.gsd	1AI
0x3432	ABB_3432.gsd	6xAI, 2xTOT, 1xAO, 1xDI, 1xDO

Users decide at system integration whether to install the full range of functions or only part. Switching is made using the 'Ident Nr. Selector' parameter.

See also **Ident Nr. Selector** in Operating Instruction OI/FEP630/FEH630-EN.

Limits and rules when using ABB Fieldbus accessories

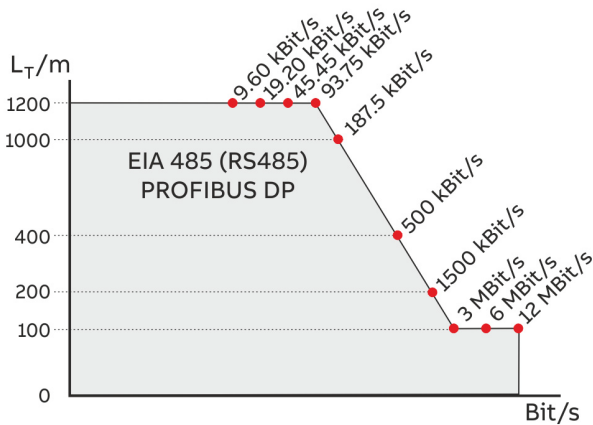


Figure 5 Bus cable length depends on the transmission rate

Pro PROFIBUS Line

(Line = Starts at DP Master and goes to last DP/PA Slave)

- Approximately 4 to 8 DP segments through the repeater (see repeater data sheets)
- Recommended DP transfer rate 500 to 1500 kBit/s
- The slowest DP node determines the transfer rate of the DP line
- Number of PROFIBUS DP and PA nodes ≤ 126 (addresses 0 to 125)

Per PROFIBUS DP segment

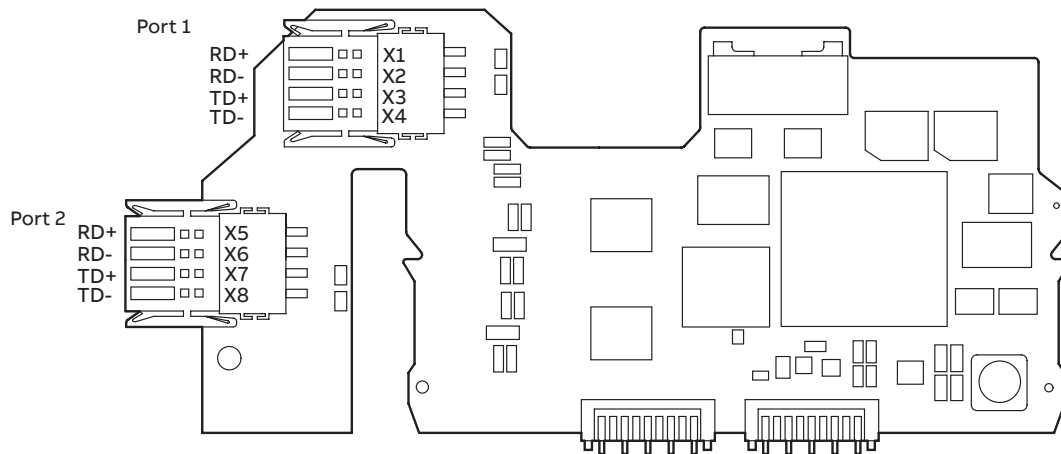
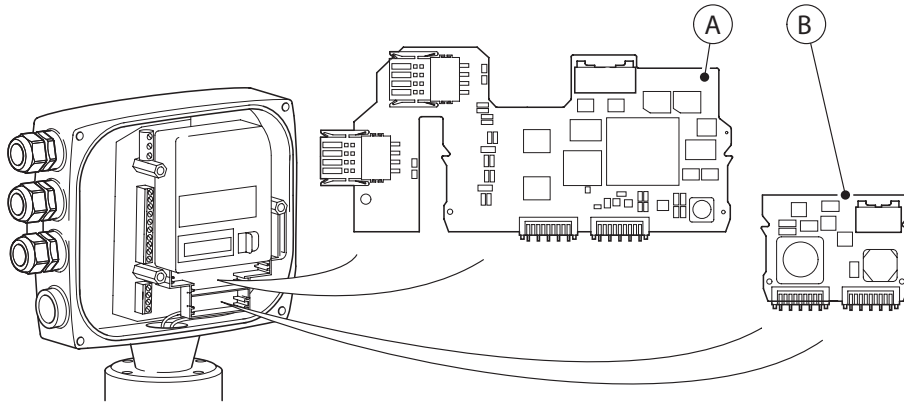
- Number of DP nodes ≤ 32 (Node = Devices with / without PROFIBUS address)
- Bus termination required at the beginning and end of each DP segment!
- Trunk cable length (L_T) see diagram (length dependent on transfer rate)
- Cable length of at least 1 m between two DP nodes at ≥ 1500 kBit/s
- Spur cable length (L_S), at ≤ 1500 kBit/s: $L_S \leq 0.25$ m, at > 1500 kBit/s: $L_S = 0.00$ m!
- At 1500 kBit/s and ABB DP cable type A:
 - Sum of all spur cable lengths (L_S) ≤ 6.60 m, trunk cable length (L_T) > 6.60 m, total length = $L_T + (\sum L_S) \leq 200$ m, maximum 22 DP nodes (= 6.60 m / (0.25 m + 0.05 m spare))

Connecting Ethernet to the flowmeter

Ethernet card – Port function assignment and color-coding

The Flowmeter has two slots for the components that follow:

- Slot (A): Ethernet card (part number 3KQZ400037U0100)
- Slot (B): Power over Ethernet (PoE) card (part number 3KQZ400039U0100)



Port/Pin	Color code on the Ethernet card plug
Port 1 X1	White/orange
Port 1 X2	Orange
Port 1 X3	White/green
Port 1 X4	Green
Port 2 X5	White/blue
Port 2 X6	Blue
Port 2 X7	White/brown
Port 2 X8	Brown

The color code is in accordance with EIA/TIA 568B.



For the functionality assigned to each pin of the Ethernet card ports, refer to the figure above..

The Ethernet card has two connection ports. These ports are not independent.

The internal switch allows for a daisy-chain or ring topology.

The Ethernet card supports one IP address (IPv4).

Power over Ethernet (PoE)

The PoE card  supplies power through the Ethernet connection, so that an external 24 V DC power supply for the flowmeter is not required. The PoE card  converts the 37 to 57 V supply from the Ethernet cable to 24 V DC. This 24 V DC is available from terminals V3 and V4 and connects to terminals 1+ and 2+, supplying power to the flowmeter. Each port supports PoE.

The specification is in accordance with IEEE 802.3at/af. PoE Class 0.

Dependent on how power is supplied over the Ethernet cable, there are four possible configurations for connecting to the ports of the PoE card.

Port/Pin	Version 1	Version 2	Version 3	Version 4
Port 1 X1	RD+ & Pwr+	Spare	RD+	Pwr+
Port 1 X2	RD- & Pwr+	Spare	RD-	Pwr+
Port 1 X3	TD+ & Pwr-	Spare	TD+	Pwr-
Port 1 X4	TD- & Pwr-	Spare	TD-	Pwr-
Port 2 X5	Spare	RD+ & Pwr+	Pwr+	RD+
Port 2 X6	Spare	RD- & Pwr+	Pwr+	RD-
Port 2 X7	Spare	TD+ & Pwr-	Pwr-	TD+
Port 2 X8	Spare	TD- & Pwr-	Pwr-	TD-

CAUTION

When using PoE, make sure that the PoE card and the red and blue wires within the transmitter's termination area are in place and connected correctly.

Terminal V3 connects to Terminal 1+ and Terminal V4 connects to terminal 2-.

When using PoE, do not connect any other external supply power to the transmitter's power supply Terminals 1+, 2-.

Ethernet communication

Equipped with an Ethernet Card, ProcessMaster/HygienicMaster 630 provides 2 Ethernet Ports supporting a Ring, Star and Daisy Chain Network configuration.

In addition to the Ethernet Card, a plug-in Card providing 'Power over Ethernet' is available. This Card allows to power the 24 V DC Version of the flowmeter through Ethernet without the need for additional power supply.

Ethernet/IP protocol

Note.

The Ethernet/IP protocol is not secure, as such. The application should be assessed before Implementation to ensure the protocol is suitable.

ProcessMaster and HygienicMaster's Ethernet IP protocol implemented, supports cyclic Communication. Process Variables, Diagnostic Data and Device Status Information can be accessed cyclically.

For Device Configuration a Webserver is available providing full access to all parameter and diagnostic data.

Further Ethernet communication protocols

Note

The device supports following security modes:

Secured Protocols:

Webserver https:

Security modes

Used ports by Webserver: TCP 443

Security is based on .x509 Certificates

Protocol could be deactivated via HMI.

Unsecured protocols:

EtherNet/IP and Modbus TCP

Used ports by EtherNet/IP: TCP 44818, UDP 2222

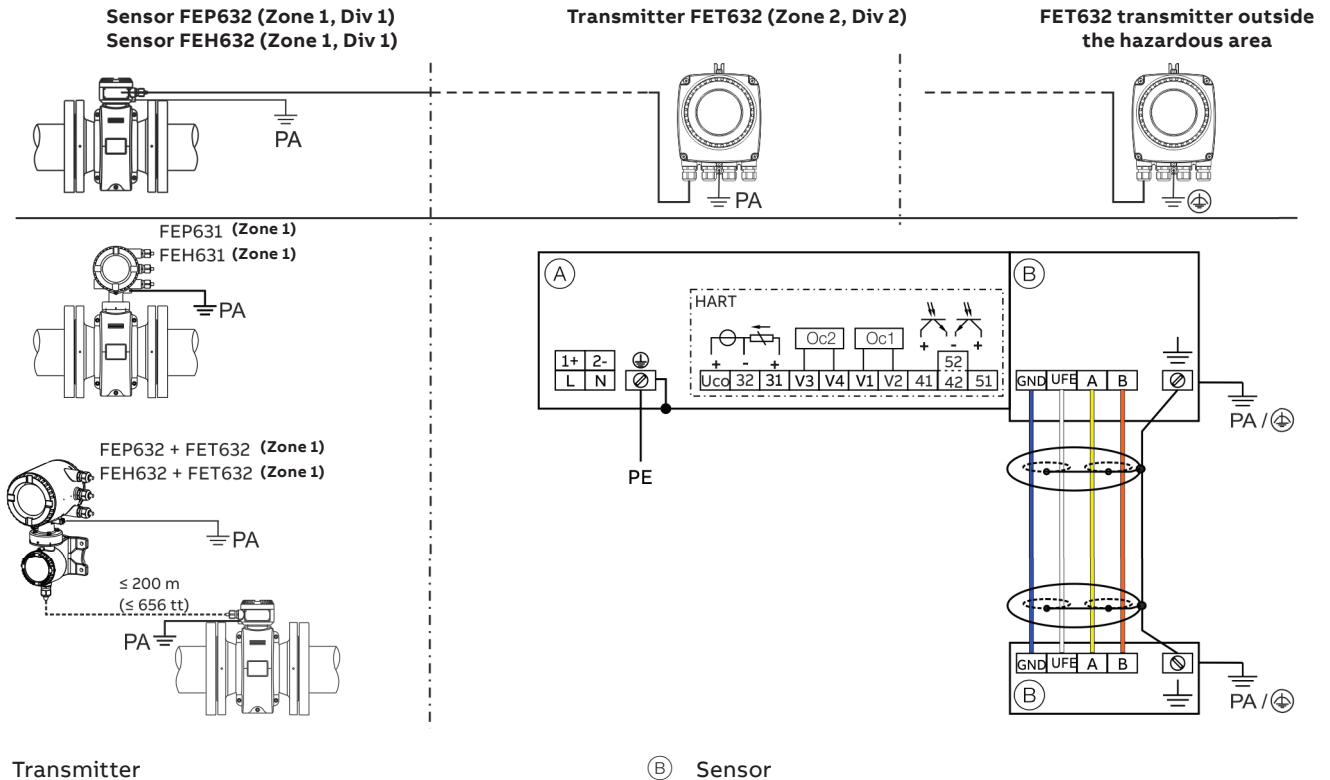
Used ports by Modbus/TCP: TCP 502

All protocols can be enabled / disabled in the HMI Menu.Ethernet

Ethernet IP Interface	
Configuration	Through the Webserver or the local operating Interface (Display).
EtherNet/IP ProductCode	5002
EDS file	FEW530_FEPFEH630_01_01.eds
Device profile	Profile 0x43, Generic Device, (keyable).
Supporte standards and protocols	Common Industrial Protocol (CIP™) Vol1, Ed 3.25 EtherNet/IP Adaptation of CIP™, Vol2, Ed 1.23
Cable	Cat 5

Operation in Zone 1, 21 / Div 1

Electrical connections



Ⓐ Transmitter

Ⓑ Sensor

Figure 6 Electrical connections

Note

For detailed information on grounding the transmitter and the sensor, please refer to the operating or commissioning instruction.

Connections for the power supply

AC power supply	
Terminal	Function / comments
L	Phase
N	Neutral conductor
PE / ⊕	Protective earth (PE)
▽ PA	Potential equalization

DC voltage supply	
Terminal	Function / comments
1+	+
2-	-
PE / ⊕	Protective earth (PE)
▽ PA	Potential equalization

Connections for inputs and outputs

Terminal	Function / comments
Uco / 32	Current output 4 to 20 mA- / HART output, active
31 / 32	Current output 4 to 20 mA- / HART output, passive
41 / 42	Passive digital output DO1
51 / 52	Passive digital output DO2
V1 / V2	Plug-in card, slot OC1
V3 / V4	Plug-in card, slot OC2

Plug-in cards may not be retrofitted in devices with explosion protection on-site – loss of Ex Approval.

Optional plug-in cards

See page 55.

Configuring the current output

Current output terminals 31 / 32 / Uco can be operated on-site in active or passive mode through appropriate switching.

Terminal Uco / 32	Current output 4 to 20 mA- / HART output, active
Terminal 31 / 32	Current output 4 to 20 mA- / HART output, passive

Configuring the digital outputs

In the case of the device version suited for operation in Ex Zone 1 (dual-compartment housing), digital outputs DO1 (41 / 42) and DO2 (51 / 52) can be configured for connection to a NAMUR switching amplifier.


On leaving the factory, the device is configured with the standard wiring (non-NAMUR).

...Operation in Zone 1, 21 / Div 1

...Electrical connections

Connecting the signal cable

Only for remote mount design. The sensor housing and transmitter housing must be connected to potential equalization.

Terminal	Function / comments
U _{FE}	Sensor power supply
GND	Ground
A	Data line
B	Data line
	Functional earth / Shielding

The output circuits are designed so that they can be connected to both intrinsically-safe and non-intrinsically-safe circuits.

- Combining intrinsically safe and non-intrinsically safe circuits is not permitted.
- On intrinsically safe circuits, potential equalization should be established along the entire length of the cable used for the signal outputs.
- The rated voltage of the non-intrinsically safe circuits is $U_M = 30$ V.
- Intrinsic safety is preserved If the rated voltage $U_M = 30$ V is not up-scaled when connections are established to non-intrinsically safe external circuits.

Electric data for operation in Zone 1, 21 / Div 1

Devices with HART protocol

When operating in potentially explosive areas, observe the following electrical data for the signal inputs and outputs of the transmitter.

Current output terminals 31 / 32 / U_{co} can be operated on-site in active or passive mode through appropriate switching.

Model: FEP631, FEH631 or FET632	Type of protection													
	'e' / 'XP'		'ia' / 'IS'											
	U _M [V]	I _M [A]	U _O	U _I [V]	I _O [mA]	I _I [mA]	P _O [mW]	P _I [mW]	C _O [nF]	C _I [nF]	C _{OPA} [nF]	C _{IPA} [nF]	L _O [mH]	L _I [mH]
Current / HART output 31 / U _{co} , active Terminals 31 / U _{co}	30	0.2	30	30	115	115	815	815	10	10	5	5	0.08	0.08
Current / HART output 31 / 32, passive Terminals 31 / 32	30	0.2	—	30	—	115	—	815	—	27	—	5	0.08	0.08
Digital output 41 / 42, active* Terminals 41 / 42 and V1 / V2*	30	0.1	27.8	30	119	30	826	225	20	20	29	29	0.22	0.22
Digital output 41 / 42, passive Terminals 41 / 42	30	0.1	—	30	—	30	—	225	—	27	—	5	—	0.08
Digital output 51 / 52, active* Terminals 51 / 52 and V1 / V2*	30	0.1	27.8	30	119	30	826	225	20	20	29	29	0.22	0.22
Digital output 51 / 52, passive Terminals 51 / 52	30	0.1	—	30	—	30	—	225	—	27	—	5	—	0.08

All outputs are electrically isolated from each other and from the power supply.

Digital outputs 41 / 42 and 51 / 52 are not electrically isolated from each other. Terminals 42 / 52 have the same potential.

...Electric data for operation in Zone 1, 21 / Div 1

Model: FEP631, FEH631 or FET632	Type of protection														
Inputs and outputs with optional plug-in cards	'e' / 'XP'		'ia' / 'IS'												
	U _M [V]	I _M [A]	U _O	U _I [V]	I _O [mA]	I _I [mA]	P _O [mW]	P _I [mW]	C _O [nF]	C _I [nF]	C _{OPA} [nF]	C _{IPA} [nF]	L _O [mH]	L _I [mH]	
Current output V3 / V4, active*	30	0.1	27.8	30	119	30	826	225	29	29	117	117	0.4	0.4	
Terminals V3 / V4 and V1 / V2*															
Current output V1 / V2, passive**			—	30	—	68	—	510	—	45	—	59	—	0.27	
Current output V3 / V4, passive**	30	0.1													
Terminals V1 / V2** or V3 / V4**															
Digital output V3 / V4, active*	30	0.1	27.8	30	119	68	826	225	17	17	31	31	0.4	0.4	
Terminals V3 / V4 and V1 / V2*															
Digital output V1 / V2, passive**			—	30	—	30	—	225	—	13	—	16	—	0.27	
Digital output V3 / V4, passive**	30	0.1													
Terminals V1 / V2** or V3 / V4**															
Digital input V3 / V4, active*	30	0.1	27.8	30	119	3.45	826	25.8	17	17	31	31	0.4	0.4	
Terminals V3 / V4 and V1 / V2															
Digital input V1 / V2, passive*			—	30	—	3.45	—	25.8	—	13	—	16	—	0.27	
Digital input V3 / V4, passive*	30	0.1													
Terminals V1 / V2** or V3 / V4**															
Modbus* / PROFIBUS DP*	30	0.1	4.2	4.2	150	150	150	150	1.5	1.5	6	6	0.14	0.14	
Terminals V1 / V2															

* Only in conjunction with additional '24 V DC loop power supply (blue)' plug-in card in slot OC1.

** The terminal assignment depends on the model number or the slot assignments. For connection examples, refer to **Installation** in the Operating Instruction ([OI/FEH630/FEH630-EN](#)).

...Operation in Zone 1, 21 / Div 1

Temperature data (surface temperature) for operation in Zone 1, 21 / Div 1 Measuring medium temperature (Ex Data) for HygienicMaster Model FEH631



Nominal diameter	Design	Temperature class	Ambient temperature (-40 °C)* -20 °C to +40 °C	Ambient temperature (-40 °C)* -20 °C to +50 °C	Ambient temperature (-40 °C)* -20 °C to +60 °C
			thermally uninsulated, thermally insulated	thermally uninsulated, thermally insulated	thermally uninsulated, thermally insulated
			Gas & dust	Gas & dust	Gas & dust
DN3-100	NT	T1	130 °C	130 °C	130 °C
	HT		180 °C	180 °C	180 °C
	NT	T2	130 °C	130 °C	130 °C
	HT		180 °C	180 °C	180 °C
	NT	T3	130 °C	130 °C	130 °C
	HT		180 °C	180 °C	180 °C
	NT	T4	130 °C	130 °C	130 °C
	HT		130 °C	130 °C	130 °C
	NT	T5	95 °C	95 °C	95 °C
	HT		95 °C	95 °C	95 °C
	NT	T6	80 °C	80 °C	80 °C
	HT		80 °C	80 °C	80 °C

* Low-temperature version (option)

NT standard version, T_{medium} maximum 130 °C (266 °F)

HT high-temperature version, T_{medium} maximum 180 °C (356 °F)

Thermally uninsulated: the sensor is not enclosed with pipe insulation material.

Thermally insulated: the sensor is enclosed with pipe insulation material.

Note

Cables for power supply, signal inputs and outputs must meet the following specifications:

- At an ambient temperature ≤ 50 °C the cable must be suited for at least 60 °C
- At an ambient temperature ≤ 60 °C the cable must be suited for at least 70 °C

Temperature data (surface temperature) for operation in Zone 1, 21 / Div 1
Measuring medium temperature (Ex Data) for HygienicMaster Model FEH632



Nominal diameter	Design	Temperature class	Ambient temperature (-40 °C)* -20 °C to +40 °C	Ambient temperature (-40 °C)* -20 °C to +50 °C	Ambient temperature (-40 °C)* -20 °C to +60 °C
			thermally uninsulated, thermally insulated	thermally uninsulated, thermally insulated	thermally uninsulated, thermally insulated
			Gas & dust	Gas & dust	Gas & dust
DN3-100	NT	T1	130 °C	130 °C	130 °C
	HT		180 °C	180 °C	180 °C
	NT	T2	130 °C	130 °C	130 °C
	HT		180 °C	180 °C	180 °C
	NT	T3	130 °C	130 °C	130 °C
	HT		180 °C	180 °C	180 °C
	NT	T4	130 °C	130 °C	130 °C
	HT		130 °C	130 °C	130 °C
	NT	T5	95 °C	95 °C	95 °C
	HT		95 °C	95 °C	95 °C
	NT	T6	80 °C	80 °C	80 °C
	HT		80 °C	80 °C	80 °C

* Low-temperature version (option)

NT standard version, T_{medium} maximum 130 °C (266 °F)

HT high-temperature version, T_{medium} maximum 180 °C (356 °F)

Thermally uninsulated: the sensor is not enclosed with pipe insulation material.

Thermally insulated: the sensor is enclosed with pipe insulation material.

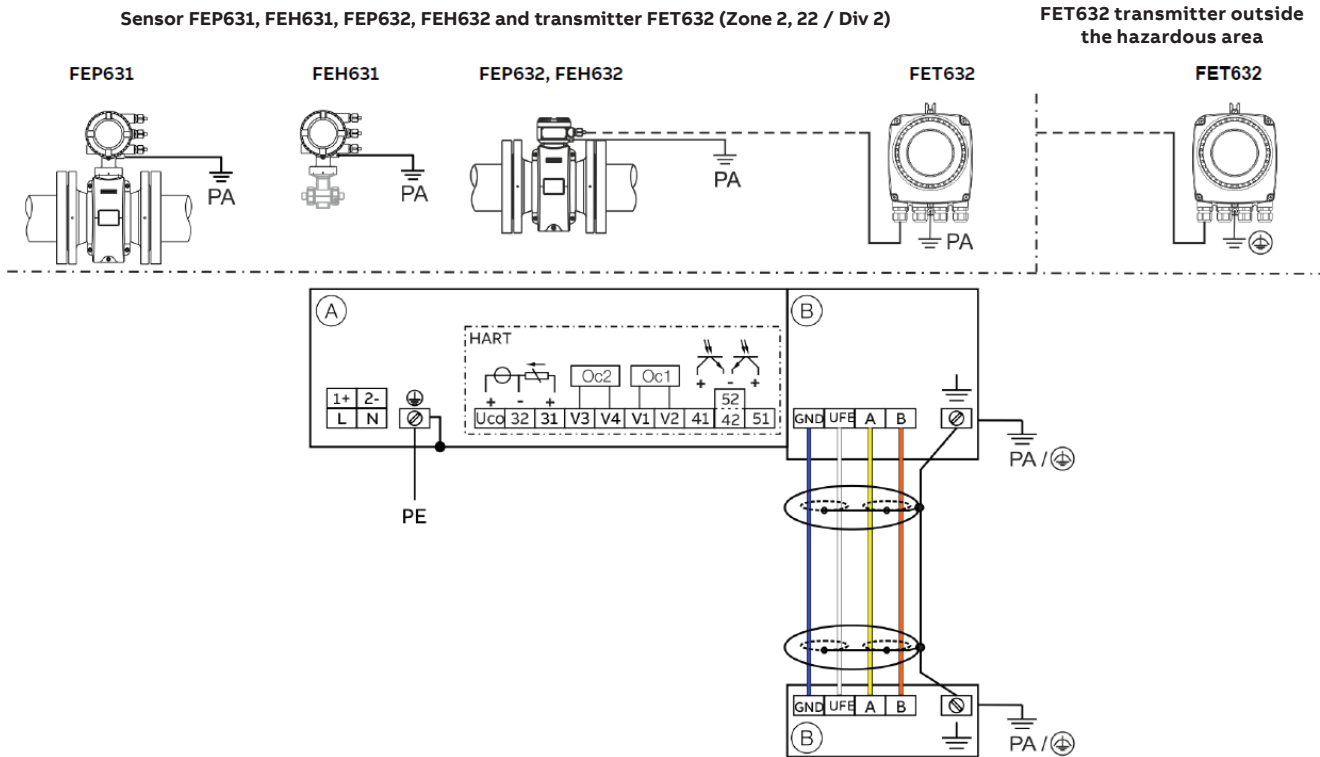
Note

Cables for power supply, signal inputs and outputs must meet the following specifications:

- At an ambient temperature ≤ 50 °C the cable must be suited for at least 60 °C
- At an ambient temperature ≤ 60 °C the cable must be suited for at least 70 °C

Electrical connections, devices in Zone 2, 22 / Div 2

Electrical connections



Ⓐ Transmitter

Figure 7 Electrical connections

Note

For detailed information on grounding the transmitter and the sensor, please refer to the operating or commissioning instruction.

Connections for the power supply

AC power supply	
Terminal	Function / comments
L	Phase
N	Neutral conductor
PE / ⊕	Protective earth (PE)
PA	Potential equalization

DC voltage supply	
Terminal	Function / comments
1+	+
2-	-
PE / ⊕	Protective earth (PE)
PA	Potential equalization

Connections for inputs and outputs

Terminal	Function / comments
Uco / 32	Current output 4 to 20 mA- / HART output, active or
31 / 32	Current output 4 to 20 mA- / HART output, passive
41 / 42	Passive digital output DO1
51 / 52	Passive digital output DO2
V1 / V2	Plug-in card, slot OC1
V3 / V4	Plug-in card, slot OC2

Plug-in cards may not be retrofitted in devices with explosion protection on-site – loss of Ex Approval.

Ⓑ Sensor

Connecting the signal cable

Only for remote mount design. The sensor housing and transmitter housing must be connected to potential equalization.

Terminal	Function / comments
U _{FE}	Sensor power supply
GND	Ground
A	Data line
B	Data line
⊕	Functional earth / Shielding

Special connection conditions

Note

The AS plug-in card (24 V DC loop power supply) may only be used to power the internal inputs and outputs on the device. It must not be used to power external circuits!

Note

If the protective earth (PE) is connected in the flowmeter's terminal box, you must ensure that no dangerous potential difference can arise between the protective earth (PE) and the potential equalization (PA) in areas with explosion risk.

Note

For devices with a power supply of 16 to 30 V DC, on-site external overvoltage protection must be provided. It must be ensured that the overvoltage is limited to 140 % (=42 V DC) of the maximum operating voltage.

Electric data for operation in Zone 2, 22 / Div 2

Devices with HART protocol

When operating in potentially explosive areas, observe the following electrical data for the signal inputs and outputs of the transmitter.

Current output terminals 31/32/Uco can be operated on-site in active or passive mode through appropriate switching.

Model: FEP631, FEH631 or FET632

Outputs on basic device	Operating values (general)		Type of protection	Ex 'nA' / 'NI' / ec
	U_N	I_N	U_N	I_N
Current output, active / HART Terminals 31/Uco	30 V	30 mA	30 V	30 mA
Current output, passive / HART Terminals 31/32	30 V	30 mA	30 V	30 mA
Digital output, passive Terminals 41/42	30 V	30 mA	30 V	30 mA
Digital output, passive Terminals 51/52	30 V	30 mA	30 V	30 mA
Digital output, active* Terminals 41/42	30 V	30 mA	30 V	30 mA
Digital output, active* Terminals 51/52	30 V	30 mA	30 V	30 mA

* Only in conjunction with additional '24 V DC loop power supply (blue)' plug-in card in slot OC1.

All outputs are electrically isolated from each other and from the power supply.

Digital outputs 41/42 and 51/52 are not electrically isolated from each other. Terminals 42/52 have the same potential.

Model: FEP631, FEH631 or FET632

Plug-in cards	Operating values (general)		Type of protection	Ex 'nA' / 'NI' / ec
	U_N	I_N	U_N	I_N
Current output, active* Terminals V1/V2 or V3/V4**	30 V	30 mA	30 V	30 mA
Current output, passive Terminals V1/V2 or V3/V4**	30 V	30 mA	30 V	30 mA
Digital output, active* Terminals V1/V2 or V3/V4**	30 V	30 mA	30 V	30 mA
Digital output, passive Terminals V1/V2 or V3/V4**	30 V	30 mA	30 V	30 mA
Digital input, active* Terminals V1/V2 or V3/V4**	30 V	3.45 mA	30 V	3.45 mA
Digital input, passive Terminals V1/V2 or V3/V4**	30 V	3.45 mA	30 V	3.45 mA
Modbus Card (RTU) Terminals V1/V2	30 V	30 mA	30 V	30 mA
PROFIBUS DP card Terminals V1/V2	30 V	30 mA	30 V	30 mA
Ethernet card Port 1: Pin X1...X4 Port 2: Pin X5...X8	57 V	417 mA	57 V	417 mA
Ethernet Card in conjunction with Power over Ethernet (POE Card) Port 1: Pin X1...X4 Port 2: Pin X5...X8	57 V	417 mA	57 V	417 mA

* Only in conjunction with additional '24 V DC loop power supply (blue)' plug-in card in slot OC1.

** The terminal assignment relates to the Option Card Slot. Slot 1 = Terminals V1/V2. Slot 2 = Terminal V3/V4. For more details, refer to Installation in the operating instruction.

...Electrical connections, devices in Zone 2, 22 / Div 2

...Temperature data surface temperature for operation in Zone 2, 22 / Div 2

Measuring medium temperature (Ex Data) for HygienicMaster Model FEH631

Single-compartment housing

Dual-compartment housing



Nominal diameter	Design	Temperature class	Ambient temperature (-40 °C)* -20 °C to +40 °C	Ambient temperature (-40 °C)* -20 °C to +50 °C	Ambient temperature (-40 °C)* -20 °C to +60 °C	
			thermally uninsulated, thermally insulated	thermally uninsulated, thermally insulated	thermally uninsulated, thermally insulated	
			Gas & dust	Gas & dust	Gas & dust	
DN3 -100	NT	T1	130 °C	130 °C	130 °C	
	HT		180 °C	180 °C	180 °C	
	NT	T2	130 °C	130 °C	130 °C	
	HT		180 °C	180 °C	180 °C	
	NT	T3	130 °C	130 °C	130 °C	
	HT		180 °C	180 °C	180 °C	
	NT	T4	130 °C	130 °C	130 °C	
	HT		130 °C	130 °C	130 °C	
	Note: The data below does not apply to Flowmeters equipped with the plug-in card for Ethernet communication (model code DR6)					
	NT	T5	95 °C	95 °C	40 °C**	
	HT		95 °C	95 °C	***	
	NT	T6	80 °C	-	-	
	HT		80 °C	-	-	

* Low-temperature version (option)

** Single-compartment housing

*** Dual-compartment housing

NT standard version, T_{medium} maximum 130 °C (266 °F)

HT high-temperature version, T_{medium} maximum 180 °C (356 °F)

Thermally uninsulated: the sensor is not enclosed with pipe insulation material.

Thermally insulated: the sensor is enclosed with pipe insulation material.

Note

Cables for power supply, signal inputs and outputs must meet the following specifications:

With single-compartment housing:

- At an ambient temperature ≤ 50 °C the cable must be suited for at least 80 °C
- At an ambient temperature ≤ 60 °C the cable must be suited for at least 90 °C

With dual-compartment housing:

- At an ambient temperature of 50 °C the cable must be suited for at least 70 °C
- At an ambient temperature of 60 °C the cable must be suited for at least 80 °C

Measuring medium temperature (Ex Data) for HygienicMaster Model FEH632



Nominal diameter	Design	Temperature class	Ambient temperature (-40 °C)* -20 °C to +40 °C thermally uninsulated, thermally insulated	Ambient temperature (-40 °C)* -20 °C to +50 °C thermally uninsulated, thermally insulated	Ambient temperature (-40 °C)* -20 °C to +60 °C thermally uninsulated, thermally insulated
			Gas & dust	Gas & dust	Gas & dust
DN3 -100	NT	T1	130 °C	130 °C	130 °C
	HT		180 °C	180 °C	180 °C
	NT	T2	130 °C	130 °C	130 °C
	HT		180 °C	180 °C	180 °C
	NT	T3	130 °C	130 °C	130 °C
	HT		180 °C	180 °C	180 °C
	NT	T4	130 °C	130 °C	130 °C
	HT		130 °C	130 °C	130 °C
	NT	T5	95 °C	95 °C	95 °C
	HT		95 °C	95 °C	95 °C
	NT	T6	80 °C	80 °C	40 °C
	HT		80 °C	80 °C	20 °C

* Low-temperature version (option)

NT standard version, T_{medium} maximum 130 °C (266 °F)

HT high-temperature version, T_{medium} maximum 180 °C (356 °F)

Thermally uninsulated: the sensor is not enclosed with pipe insulation material.

Thermally insulated: the sensor is enclosed with pipe insulation material.

Note

Cables for power supply, signal inputs and outputs must meet the following specifications:

- At an ambient temperature ≤ 50 °C the cable must be suited for at least 70 °C
- At an ambient temperature ≤ 60 °C the cable must be suited for at least 80 °C

...Electrical connections, devices in Zone 2, 22 / Div 2

Use in areas exposed to combustible dust

When using the device in areas exposed to combustible dusts (dust ignition), the following points must be observed:

- The maximum surface temperature of the device may not up-scale the following values.

FEP631, FEH631	80 °C (176 °F)
FEP632, FEH632	80 °C (176 °F)
FET632	80 °C (176 °F)
- The process temperature of the attached piping may up-scale 80 °C (176 °F).
- Approved dust-proof cable glands must be used when operating in Zone 21, 22 or in Class II, Class III.
- In potentially explosive atmospheres, the signal cable must measure at least 5 m (16.40 ft).

Ordering Information

HygienicMaster FEH631

Electromagnetic Flowmeter system, integral mount, sensor housing stainless steel

HygienicMaster FEH631	7,8	9,10	11,12,13,14	15,16	...	88,89
Explosion Protection Certification						
Without	Y0					
ATEX / IECEx (Zone 1 / 21)	1) A1					
ATEX / IECEx (Zone 2 / 22)	A2					
cFMus Class 1 Div. 1 (Zone 1 / 21)	1) F1					
cFMus Class 1 Div. 2 (Zone 2 / 22)	F2					
Housing Type / Housing Material / Thread for Cable Glands						
Single compartment / Aluminium / M20 x 1.5	4) S1					
Single compartment / Aluminium / NPT 1/2 in.	4) S2					
Dual compartment / Aluminium / M20 x 1.5	3) D1					
Dual compartment / Aluminium / NPT 1/2 in.	3) D2					
Meter size						
DN 1 (1/25 in.)		5)	0001			
DN 1.5 (1/16 in.)		5)	9015			
DN 2 (1/12 in.)		5)	0002			
DN 3 (1/10 in.)			0003			
DN 4 (5/32 in.)			0004			
DN 6 (1/4 in.)			0006			
DN 8 (5/16 in.)			0008			
DN 10 (3/8 in.)			0010			
DN 15 (1/2 in.)			0015			
DN 20 (3/4 in.)			0020			
DN 25 (1 in.)			0025			
DN 32 (1-1/4 in.)			0032			
DN 40 (1-1/2 in.)			0040			
DN 50 (2 in.)			0050			
DN 65 (2-1/2 in.)			0065			
DN 80 (3 in.)			0080			
DN 100 (4 in.)			0100			
Process Connection Type						
Flanges DIN PN 16				6) D2		
Flanges DIN PN 40				7) D4		
Flanges ASME CL150 B16.5				A1		
Flanges ASME CL300 B16.5				A3		
Flanges JIS 10K				J1		
Male Thread acc. to ISO 228				9) M1		
1/8 in. Sanitary Connection				10) M3		
Food industry fittings acc. DIN 11851				8) F1		

Continued on next page

...Ordering Information

	HygienicMaster FEH631	7,8	...	15,16	17,18	19	20	21	...	88,89
Process Connection Type										
Weld stubs acc. ISO 2037				8) R1						
Weld stubs acc. DIN 2463				8) R2						
Weld stubs acc. DIN 11850				8) R3						
Weld stubs acc. ISO 1127				8) R4						
Weld stubs acc. OD tubing				11) R5						
Weld stubs acc. SMS				12) R6						
Tri-Clamp acc. DIN 32676				8) T1						
Tri-Clamp acc. BPE				13) T3						
Wafer				8) W1						
Without adapter				14) Y0						
Liner Material										
PFA					P1					
PEEK				10) G1						
Others					Z9					
Process Connection Material										
Stainless steel					15) C					
316L (1.4404) stainless steel with EPDM gasket						E				
316L (1.4404) stainless steel with EPDM gasket + mounting bracket					16) F					
316L (1.4404) stainless steel with silicone gasket						G				
316L (1.4404) stainless steel with silicone gasket + mounting bracket					16) H					
PVC with PTFE gasket + mounting bracket					17) P					
POM with PTFE gasket + mounting bracket					17) M					
Without process connection, without gasket, with mounting bracket					18) W					
Without process connection, without gasket, without mounting bracket					19) Y					
Others						Z				
Electrode Design										
Standard							1			
Pointed head						20) 5				
Others							9			
Measuring Electrodes Material										
Stainless steel 904 (1.4539)								A		
Hast. C-4 (2.4610)								D		
Titanium								F		
Tantalum								G		
Hast. B-3 (2.4600)								H		
Platinum-Iridium								J		
Stainless steel 316Ti (1.4571)								S		
Others								Z		

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HygienicMaster FEH631	7,8	...	22	23	24,25	26	27	28,29	30, 31,32	33,34,35	36,37	39,40,41	42,43,44	...	88,89
Grounding Electrode / Full Pipe Detection															
No grounding electrode / No full pipe detection			0												
Grounding electrode / No full pipe detection		21)	2												
Others			9												
Grounding Accessories															
Without				A											
Protection Class Transmitter / Protection Class Sensor															
IP 67 / IP 67					70										
Power Supply															
100 ... 230 V AC, 50 Hz							A								
24 V DC, 50 Hz							D								
100 ... 230 V AC, 60 Hz							C								
24 V DC, 60 Hz							E								
Display															
Without								0							
Display with Keypad								2							
Outputs															
1 Current output (active or passive), 2 Digital Outputs (passive), HART							22)	G0							
Current output 1 (active), digital output 1 & 2 (passive). HART. MODBUS RTU							34)	M1							
Current output 1 (active). digital output 1 & 2 (passive). HART. PROFIBUS DP							35)	D1							
Current output 1 (active or passive), digital out 1 & 2 (passive), HART. 1 port Ethernet							36)	E2							
Current output 1 (active or passive), digital out 1 & 2 (passive), HART. 2 port Ethernet							36)	E3							
Current out 1 (active or passive), digital out 1 & 2 (passive), HART. 2 port Ethernet+POE							36)	E4							
Option Card 1															
Without												DR0			
1 x Digital Input												DRN			
1 x Digital Output												DRG			
24 V DC transmitter loop power supply												DRT			
1 x Analog Output passive (4...20mA)												DRA			
Modbus RTU												DRM			
PROFIBUS DP												DRD			
Card for EtherNet/IP, Modbus TCP							37)	DR6							
Option Card 2															
Without												DS0			
1 x Analog Output passive (4...20mA)												DSA			
1 x Digital Input												DSN			
1 x Digital Output												DSG			
Module Power over Ethernet/Modbus TCP (for Single Compartment Housing)									38)			DS8			
Usage Certifications															
Without														C0	
Inspection certificate 3.1 acc. EN 10204														C2	
Others														CZ	

Continued on next page

...Ordering Information

HygienicMaster FEH631	7,8	...						38,39	42,43,44	45,46,47	48,49,50	...	88,89
SIL Certificate													
SIL2 Certificate								33)	CS				
Calibration Certifications													
ABB Standard										CMA			
3rd Party witnessed calibration										CMW			
5-point calibration acc. ISO17025								24)		CMD			
Other Usage Certifications													
Meter tube with PED certificate											CRP		
Other Explosion Protection Certifications and other Approvals													
Russia metrological+EAC													ED1
Russia metrological+EAC+Ex											41)		ED2

Continued on next page

HygienicMaster FEH631	7,8	...	51,52,53	54,55	56,57	58,59	60,61,62	63,64,65	66,67,68	69,70,71	72,73,74	...	88,89
Potable Water and Food & Beverage Approvals													
3-A			CWG										
Without			CWY										
Sensor Length													
Old HygienicMaster Lay length for DN 65, DN 80, DN 100			25)	J4									
New HygienicMaster Lay length for DN 65, DN 80, DN 100			26)	J5									
Other Options													
Without					K0								
With Gore-tex membrane					KG								
Documentation Language													
German						M1							
English						M5							
Language Pack Western Europe (FR,ES,IT,NL,PT,SV,FI,DK)						MW							
Language Pack Eastern Europe (EL,CS,ET,HU,HR,LT,LV,PL,SK,SL,RO,BG)						ME							
Tests and Reports													
Without							CR0						
Pressure test acc. to DIN					>DN25		CPD						
Others							CRZ						
Configuration Type													
Parameters set to factory defaults								NC1					
Parameters set customer specific								NCC					
Transmitter Software Function Package													
Standard									NFS				
Enhanced diagnostics									NFE				
Batch Functionality									NFB				
Calibration Type													
0,4% Factory Calibration										28)	RCD		
0,3% Factory Calibration (Option)										29)	RCE		
0,2% Factory Calibration (Option)										27)	RCB		
Signal Cable													
Without												SC0	

Continued on next page

...Ordering Information

	HygienicMaster FEH631	7,8	...	75,76	77,78,79	80,81,82	83,84	85,86,87	88,89
Device Identification Plate									
Adhesive label				TC					
Stainless steel				T1					
Stainless steel and TAG plate (stainless steel)				TS					
Others				TZ					
Temperature Range of Installation / Ambient Temperature Range									
Standard design / -20 ... 60 °C (-4 ... 140 °F)				30)	TK1				
Standard design / -40 ... 60 °C (-40 ... 140 °F)				30)	TK4				
High temperature design / -20 ... 60 °C (-4 ... 140 °F)				31)	TKH				
High temperature design / -40 ... 60 °C (-40 ... 140 °F)				31)	TKK				
Number of Testpoints									
2 Points					32)	TV2			
3 Points					32)	TV3			
5 Points						TV5			
Verification Capability									
Disabled							V0		
Enabled							V1		
Communication Options Activated									
EtherNet/IP								GCE	
Modbus TCP								GCM	
Webserver								GCW	
Profinet							40)	GCP	
Connector Type									
Without							39)		U0
1 x M12 Plug for Ethernet 1 Port (4 Signal Leads)							39)		UE
2 x M12 Plug for Ethernet 2 Port (4 Signal Leads)							39)		UF
1 x M12 Plug for Ethernet 1 Port (8 Signal Leads)							39)		UG
1 x RJ45 connector with 5m (15ft) cable length fitted (4 Signal Leads)							39)		U5
2 x RJ45 connector with 5m (15ft) cable length fitted (4 Signal Leads)							39)		UB
1 x RJ45 connector with 5m (15ft) cable length fitted (8 Signal Leads)							39)		UC
1 x RJ45 connector with 10m (30ft) cable length fitted (4 Signal Leads)							39)		U6
2 x RJ45 connector with 10m (30ft) cable length fitted (4 Signal Leads)							39)		UD
1 x RJ45 connector with 10m (30ft) cable length fitted (8 Signal Leads)							39)		UH
1 x RJ45 connector with 15m (49ft) cable length fitted (4 Signal Leads)							39)		U7
2 x RJ45 connector with 15m (49ft) cable length fitted (4 Signal Leads)							39)		UJ
1 x RJ45 connector with 15m (49ft) cable length fitted (8 Signal Leads)							39)		UK
1 x RJ45 connector with 20m (66ft) cable length fitted (4 Signal Leads)							39)		U8
2 x RJ45 connector with 20m (66ft) cable length fitted (4 Signal Leads)							39)		UN
1 x RJ45 connector with 20m (66ft) cable length fitted (8 Signal Leads)							39)		UP

Notes for FEH631

- 1) Not available with Single Compartment Housing
- 2) Not available with -40°C. Not available with Single Compartment Housing
- 3) Not available with Div1 in conjunction with -40°C
- 4) Not available with Zone 1 / Div. 1
- 5) Available with 1/8 in. Sanitary Connection and PEEK Liner
- 6) Available with DN 100 (4 in.) only
- 7) Available with DN 3 ... 80 (1/10 ... 3 in.)
- 8) For sizes and pressure rating available, refer to data sheet
- 9) Available for DN 3 ... DN 25
- 10) Available for DN 1 ... DN 2
- 11) Available for DN 3 ... DN 50
- 12) Available for DN 25, DN 40 ... DN 100
- 13) Not available for DN 32
- 14) For replacement purposes only
- 15) To be specified in case of process connection "flange"
- 16) No 3-A conformity
- 17) Available with sensor size DN 1 ... 2
- 18) No 3-A conformity. To be specified in case of Process Connection "Wafer" or Process Connection "Without Adapter"
- 19) To be specified in case of Process Connection "Wafer" or Process Connection "Without Adapter"
- 20) Available from DN 10
- 21) Grounding electrodes, material same as measuring electrodes material
- 22) Current output (active or passive) can be configured on site
- 23) Will be specified by ABB
- 24) Available with sensor size DN 50 ... DN 600 (2 ... 24 in.) / DN 800 (32 in.) and 5points Calibration
- 25) For replacement purposes
- 26) Not available for flange type sensors
- 27) Not available with size DN 1 ... 8. 0,2% calibration assumes 3 calibration points. If more than 3 calibration points are required, specify 5 points under "Number of test points".
- 28) 2 points calibration is Standard. If more than 2 testpoints are required, please specify 3 or 5 points with option "Number of Testpoints". Accuracy = 0.7 % of rate with size DN 1 ... 2. Accuracy = 0.4 % of rate with size > DN 3
- 29) Not available with size DN 1 ... 2. 3 or 5 testpoints to be specified
- 30) Max. fluid temperature with standard sensor design: 130 °C (266 °F) with Liner Material PFA
- 31) Max. fluid temperature with high temperature sensor design: 180 °C (356 °F) with PFA. High temperature sensor design available with Process Connection Type "Flange" only
- 32) Not available with ISO17025 calibration
- 33) Available with Housing Type Code "D1" or "D2"
- 34) To be configured in conjunction with Option Card 1 = Mod bus RTU
- 35) To be configured in conjunction with Option Card 1 = PROFIBUS DP
- 36) To be configured in conjunction with Option Card 1 = Ethernet IP or Modbus TCP
- 36) To be configured in conjunction with Option Card 1 = Ethernet IP or Modbus TCP
- 36) To be configured in conjunction with Option Card 1 = Ethernet IP or Modbus TCP
- 37) Available with single compartment housing only, Non Ex or Zone 2, Div. 2 only
- 38) Available with single compartment housing only and with 24 V power supply unit
- 39) Available with single compartment housing, Ethernet Card, Non-Ex or ATEX Zone 2
- 40) Profinet in preparation
- 41) ATEX/IEC Ex to be specified

...Ordering Information

HygienicMaster FEH632

Electromagnetic Flowmeter system, remote mount, sensor housing stainless steel

	HygienicMaster FEH632	7,8	9,10	11,12,13,14	15,16	...	79,80
Explosion Protection Certification							
Without		Y0					
ATEX / IECEx (Zone 1 / 21)	32)	A1					
ATEX / IECEx (Zone 2 / 22)	32)	A2					
cFMus Class 1 Div. 1 (Zone 1 / 21)	32)	F1					
cFMus Class 1 Div. 2 (Zone 2 / 22)	32)	F2					
Housing Type / Housing Material / Thread for Cable Glands							
Remote / Plastic / M20 x 1.5		31)	P1				
Remote / Plastic / NPT 1/2 in.		31)	P2				
Remote / Aluminum / M20 x 1.5			A1				
Remote / Aluminum / NPT 1/2 in.			A2				
Meter size							
DN 1 (1/25 in.)			1)	0001			
DN 1.5 (1/16 in.)			1)	9015			
DN 2 (1/12 in.)			1)	0002			
DN 3 (1/10 in.)				0003			
DN 4 (5/32 in.)				0004			
DN 6 (1/4 in.)				0006			
DN 8 (5/16 in.)				0008			
DN 10 (3/8 in.)				0010			
DN 15 (1/2 in.)				0015			
DN 20 (3/4 in.)				0020			
DN 25 (1 in.)				0025			
DN 32 (1-1/4 in.)				0032			
DN 40 (1-1/2 in.)				0040			
DN 50 (2 in.)				0050			
DN 65 (2-1/2 in.)				0065			
DN 80 (3 in.)				0080			
DN 100 (4 in.)				0100			
Process Connection Type							
Flanges DIN PN 16					2)	D2	
Flanges DIN PN 40					3)	D4	
Flanges ASME CL150 B16.5						A1	
Flanges ASME CL300 B16.5						A3	
Flanges JIS 10K						J1	
Male Thread acc. to ISO 228					5)	M1	
1/8 in. Sanitary Connection					6)	M3	
Food industry fittings acc. DIN 11851					4)	F1	

Continued on next page

HygienicMaster FEH632	7,8	...	15,16	17,18	19	20	21	...	79,80
Process Connection Type									
Weld stubs acc. ISO 2037			4) R1						
Weld stubs acc. DIN 2463			4) R2						
Weld stubs acc. DIN 11850			4) R3						
Weld stubs acc. ISO 1127			4) R4						
Weld stubs acc. OD tubing			7) R5						
Weld stubs acc. SMS			8) R6						
Tri-Clamp acc. DIN 32676			4) T1						
Tri-Clamp acc. BPE			9) T3						
Wafer			4) W1						
Without adapter			10) Y0						
Liner Material									
PFA				P1					
PEEK			6) G1						
Others			Z9						
Process Connection Material									
Stainless steel				11) C					
316L (1.4404) stainless steel with EPDM gasket				E					
316L (1.4404) stainless steel with EPDM gasket + mounting bracket				12) F					
316L (1.4404) stainless steel with silicone gasket				G					
316L (1.4404) stainless steel with silicone gasket + mounting bracket				12) H					
PVC with PTFE gasket + mounting bracket				13) P					
POM with PTFE gasket + mounting bracket				13) M					
Without process connection, without gasket, with mounting bracket				14) W					
Without process connection, without gasket, without mounting bracket				15) Y					
Others				Z					
Electrode Design									
Standard						1			
Pointed head					16) 5				
Others						9			
Measuring Electrodes Material									
Stainless steel 904 (1.4539)							A		
Hast. C-4 (2.4610)							D		
Titanium							F		
Tantalum							G		
Hast. B-3 (2.4600)							H		
Platinum-Iridium							J		
Stainless steel 316Ti (1.4571)							S		
Others							Z		

Continued on next page

... Ordering Information

HygienicMaster FEH632	7,8	...	22	23	24,25	26	27	28,29	31,32,33	34,35,36	37,38	39,40,41	42,43,44	...	79,80
Grounding Electrode / Full Pipe Detection															
No grounding electrode / No full pipe detection			0												
Grounding electrode / No full pipe detection		17)	2												
Others			9												
Grounding Accessories															
Without				A											
Protection Class Transmitter / Protection Class Sensor															
IP 67 / IP 67					70										
IP 67 / IP 68				18)	76										
IP 67 / IP 68, signal cable fitted and potted				19)	77										
Power Supply															
Without						Y									
Display															
Without							0								
Outputs															
Without								Y0							
Option Card 1															
Without									DRO						
Option Card 2															
Without										DS0					
Usage Certifications															
Without												C0			
Inspection certificate 3.1 acc. EN 10204												C2			
Others												CZ			
SIL Certificate															
SIL2 Certificate													CS		
Calibration Certifications															
ABB Standard													CMA		
3rd party witnessed calibration													CMW		
5-point calibration acc. ISO 17025												21)	CMD		
Other Usage Certifications															
Meter tube with PED certificate														CRP	
Other Explosion Protection Certifications and other Approvals															
Russia metro+EAC														34)	ED1
Russia metro+EAC+Ex														34)	ED2

Continued on next page

HygienicMaster FEH632	7,8	...	45,46,47	48,49	50,51	52,53	54,55	56,57,58	59,60,61	62,63,64	65,66,67	...	79,80
Potable Water and Food & Beverage Approvals													
3-A			CWG										
Without			CWY										
Power Supply Line Frequency													
50 Hz			22)	F5									
60 Hz			23)	F6									
Sensor Length													
Old HygienicMaster Lay length for DN 65, DN 80, DN 100				25)	J4								
New HygienicMaster Lay length for DN 65, DN 80, DN 100				26)	J5								
Other Options													
Without													K0
With Gore-tex membrane													KG
Documentation Language													
German													M1
English													M5
Language Pack Western Europe (FR,ES,IT,NL,PT,SV,FI,DK)													MW
Language Pack Eastern Europe (EL,CS,ET,HU,HR,LT,LV,PL,SK,SL,RO,BG)													ME
Tests and Reports													
Without													CR0
Pressure test acc. to DIN							>DN25						CPD
Others													CRZ
Configuration Type													
Parameters set to factory defaults													NC1
Parameters set customer specific													NCC
Transmitter Software Function Package													
Standard													NFS
Enhanced diagnostics													NFE
Batch Functionality													NFB
Calibration Type													
0,4% Factory Calibration												28)	RCD
0,3% Factory Calibration (Option)												29)	RCE
0,2% Factory Calibration (Option)												27)	RCB

Continued on next page

... Ordering Information

HygienicMaster FEH632	7,8	...	68,69,70	71,72	73,74,75	76,77,78	79,80
Signal Cable							
Without SCO			SC0				
5 m (approx. 15 ft)			SC1				
10 m (approx. 30 ft)			SC2				
15 m (approx. 49 ft)			SC3				
20 m (approx. 66 ft)			SC4				
25 m (approx. 82 ft)			SC5				
30 m (approx. 98 ft)			SC6				
35 m (approx. 115 ft)			SC7				
40 m (approx. 131 ft)			SC8				
50 m (approx. 164 ft)			SCA				
60 m (approx. 197 ft)			SCB				
70 m (approx. 230 ft)			SCC				
80 m (approx. 262 ft)			SCD				
100 m (approx. 328 ft)			SCE				
125 m (approx. 410 ft)			SCF				
150 m (approx. 492 ft)			SCG				
175 m (approx. 574 ft)			SCH				
200 m (approx. 656 ft)			SCJ				
Device Identification Plate							
Adhesive label				TC			
Stainless steel				T1			
Stainless steel and TAG plate (stainless steel)				TS			
Others				TZ			
Temperature Range of Installation / Ambient Temperature Range							
Standard design / -20 ... 60 °C (-4 ... 140 °F)				29)	TK1		
Standard design / -40 ... 60 °C (-40 ... 140 °F)				29)	TK4		
High temperature design / -20 ... 60 °C (-4 ... 140 °F)				30)	TKH		
High temperature design / -40 ... 60 °C (-40 ... 140 °F)				30)	TKK		
Number of Testpoints							
2 Points					31)	TV2	
3 Points					31)	TV3	
5 Points						TV5	
Verification Capability							
Disabled							V0
Enabled							V1
Communication Options Activated							
EtherNet/IP							GCE
Modbus TCP							GCM
Webserver							GCW
Profinet				In preparation			GCP

Notes for FEH632

- 1) Available with 1/8 in. Sanitary Connection and PEEK Liner
- 2) Available with DN 100 (4 in.) only
- 3) Available with DN 3 ... 80 (1/10 ... 3 in.)
- 4) For sizes and pressure rating available, refer to data sheet
- 5) Available for DN 3 ... DN 25
- 6) Available for DN 1 ... DN 2
- 7) Available for DN 3 ... DN 50
- 8) Available for DN 25, DN 40 ... DN100
- 9) Not available for DN 32
- 10) For replacement purposes only
- 11) To be specified in case of process connection "flange"
- 12) No 3-A conformity
- 13) Available with sensor size DN 1 ... 2
- 14) No 3-A conformity. To be specified in case of Process Connection "Wafer" or Process Connection "Without Adapter"
- 15) To be specified in case of Process Connection "Wafer" or Process Connection "Without Adapter"
- 16) Available from DN10
- 17) Grounding electrodes, material same as measuring electrodes material
- 18) Only available with remote transmitter, sealing compound (optional) D141B038U01
- 19) Only available with remote transmitter
- 20) Will be specified by ABB
- 21) Available with sensor size DN 50 ... DN 600 (2 24 in.) / DN 800 (32 in.) and 5points Calibration
- 22) 50 Hz (to be specified in case no Tx is ordered)
- 23) 60 Hz (to be specified in case no Tx is ordered)
- 24) For replacement purposes
- 25) Not available for flange type sensors
- 26) Not available with size DN 1 ... 8. 0,2% calibration assumes 3 calibration points. If more than 3 calibration points are required, specify 5 points under "Number of test points".
- 27) 2 points calibration is Standard. If more than 2 testpoints are required, please specify 3 or 5 points with option "Number of Testpoints". Accuracy = 0.7 % of rate with size DN 1 ... 2. Accuracy = 0.4 % of rate with size > DN 3
- 28) Not available with size DN 1 ... 2; 3 or 5 testpoints to be specified
- 29) Max. fluid temperature with standard sensor design: 130 °C (266 °F) with Liner Material PFA
- 30) Max. fluid temperature with high temperature sensor design: 180 °C (356 °F) with PFA. High temperature sensor design available with Process Connection Type "Flange" only
- 31) Not available with ISO17025 calibration
- 32) available with Sensor Terminalbox made from Aluminum

...Ordering Information

Remote transmitter FET632

FET632 Electromagnetic Flowmeter, remote transmitter for HygienicMaster FEH630

Remote transmitter FET632	7,8	9,10	11,12	13	14	15,16	17,18,19	20,21,22	...	46,47
Explosion Protection Certification										
Without	Y0									
ATEX / IECEx (Zone 1 / 21)	A1									
ATEX / IECEx (Zone 2 / 22)	A2									
cFMus Class 1 Div. 1 (Zone 1 / 21)	F1									
cFMus Class 1 Div. 2 (Zone 2 / 21)	F2									
Housing Type / Housing Material / Thread for Cable Glands										
Field-mount / Single compartment / Aluminum / 4 x M20 x 1.5	3)	F1								
Field-mount / Single compartment / Aluminum / 4 x NPT 1/2 in.	3)	F2								
Field-mount / Dual compartment / Aluminum / M20 x 1.5	3a)	W1								
Field-mount / Dual compartment / Aluminum / NPT 1/2 in.	3a)	W2								
Protection Class Transmitter / Protection Class Sensor										
IP 67 / IP 67			70							
Power Supply										
100 ... 230 V AC, 50 Hz					A					
24 V DC, 50 Hz					D					
100 ... 230 V AC, 60 Hz					C					
24 V DC, 60 Hz					E					
Display										
Without						0				
Display with Keypad						2				
Outputs										
1 Current output (active or passive), 2 Digital Outputs (passive), HART					4)	G0				
Current output 1 (active), digital output 1 & 2 (passive), HART, MODBUS RTU					7)	M1				
Current output 1 (active). digital output 1 & 2 (passive). HART, PROFIBUS DP					8)	D1				
Current output 1 (active or passive). digital output 1 & 2 (passive). HART, 1 port Ethernet					9)	E2				
Current output 1 (active or passive), digital output 1 & 2 (passive), HART, 2 port Ethernet					9)	E3				
Current output 1 (active or passive), digital output 1 & 2 (passive), HART, 1 port Ethernet + POE					9)	E4				
Option Card 1										
Without									DR0	
1 x Digital Input									DRN	
1 x Digital Output									DRG	
24 V DC transmitter loop power supply									DRT	
1 x Analog Output passive (4 ... 20mA)									DRA	
Modbus RTU									DRM	
PROFIBUS DP									DRD	
Card for Ethernet IP, Modbus TCP						10)			DR6	
Option Card 2										
Without										DS0
1 x Analog Output passive (4 .. 20mA)										DSA
1 x Digital Input										DSN
1 x Digital Output										DSG
Modul Power over Ethernet / Modbus (for Single Comp Hsg)								11)		DS8

Continued on next page

Remote transmitter FET632	7,8	...	23,24	27,28	29,30	31,32	33,34	35,36,37	38,39	40,41,42	43,44,45	46,47
SIL Certificate												
SIL2 Certificate		6)	CS									
Potable Water and Food & Beverage Approvals												
Without				CWY								
Other Options												
Without					K0							
With Gore-tex membrane				5)	KG							
Documentation Language												
German						M1						
English						M5						
Russian						MB						
Language package Western Europe / Scandinavia						MW						
Language package Eastern Europe						ME						
Device Identification Plate												
Adhesive label									TC			
Stainless steel									T1			
Stainless steel and TAG plate (stainless steel)									TS			
Others									TZ			
Temperature Range of Installation / Ambient Temperature Range												
Standard design / -20... 60 °C (-4 ... 140 °F)										TK1		
Standard design / -40 ... 60 °C (-40 ... 140 °F)										TK4		
Remote Transmitter Mounting Kit												
Without										B0		
2" Pipe Mounting Kit for Field-mount / Dual compartment Housing										B1		
2" Pipe Mounting Kit for Field-mount / Single compartment Housing										B2		
Transmitter Software Function Package												
Standard											NFS	
Communication options activated												
Ethernet IP												GCE
Modbus TCP												GCM
Webserver												GCW
Profinet										13)		GCP
Connector type												
Without												U0
1 X M 12 Plug for Ethernet 1 Port (4 signal leads)											12)	UE
2 X M 12 Plug for Ethernet 2 Port (4 signal leads)											12)	UF
1 X M 12 Plug for Ethernet 1 Port (8 signal leads)											12)	UG
1 x RJ45 connector with 5 m (15 ft) cable length fitted (4 signal leads)											12)	U5
2 x RJ45 connector with 5 m (15 ft) cable length fitted (4 signal leads)											12)	UB
1 x RJ45 connector with 5 m (15 ft) cable length fitted (8 signal leads)											12)	UC
1 x RJ45 connector with 10 m (30 ft) cable length fitted (4 signal leads)											12)	U6
2 x RJ45 connector with 10 m (30 ft) cable length fitted (4 signal leads)											12)	UD
1 x RJ45 connector with 10 m 30 ft cable length fitted (8 signal leads)											12)	UH
1 x RJ45 connector with 15 m (49 ft) cable length fitted (4 signal leads)											12)	U7
2 x RJ45 connector with 15 m (49 ft) cable length fitted (4 signal leads)											12)	UJ
1 x RJ45 connector with 15 m 49 ft cable length fitted (8 signal leads)											12)	UK
1 x RJ45 connector with 20 m (66 ft) cable length fitted (4 signal leads)											12)	U8
2 x RJ45 connector with 20 m (66 ft) cable length fitted (4 signal leads)											12)	UN
1 x RJ45 connector with 20 m (66 ft) cable length fitted (8 signal leads)											12)	UP

1) Not available with Single Compartment Housing
 2) Not available with -40°C. Not available with Single Compartment Housing
 3) Not available with Zone 1 / Div. 1
 3a) Not available with Zone 2 / Div. 2
 4) Current output (active or passive) can be configured on site
 5) Not available with Ex
 6) Available with housing Type Code 'W1' or 'W2'
 7) To be configured in conjunction with Option Card 1 = Modbus RTU
 8) To be configured in conjunction with Option Card 1 = PROFIBUS DP
 9) To be configured in conjunction with Option Card 1 = Ethernet IP or Modbus TCP
 10) Available with single compartment housing only, Non Ex or Zone 2, Div. 2 only
 11) Available with single compartment housing only and with 24 V power supply unit
 12) Available with single compartment housing, Ethernet Card, Non-Ex or ATEX Zone 2
 13) Profinet in preparation

Ordering Information

Accessories

Wafer type accessories

Wafer type accessories is for mounting purposes and include Bolts, nuts, lockwashers.

Nominal size	Nominal pressure	Order code
DN 3 ... DN 10 (1/10 ... 3/8 in.)	PN 10 ... PN 40	D614L265U03
	ASME CL 150	D614L265U03
	ASME CL 300	D614L265U04
DN 15 (1/2 in.)	PN 10 ... PN 40	D614L265U03
	ASME CL 150	D614L266U05
	ASME CL 300	D614L266U06
DN 20 (3/4 in.)	PN 10 ... PN 40	D614L267U04
	ASME CL 150	D614L267U05
	ASME CL 300	D614L267U06
DN 25 (1 in.)	PN 10 ... PN 40	D614L268U04
	ASME CL 150	D614L268U05
	ASME CL 300	D614L268U06
DN 32 (1-1/4 in.)	PN 10 ... PN 40	D614L269U04
	ASME CL 150	D614L269U05
	ASME CL 300	D614L269U06
DN 40 (1-1/2 in.)	PN 10 ... PN 40	D614L270U04
	ASME CL 150	D614L270U05
	ASME CL 300	D614L270U06
DN 50 (2 in.)	PN 10 ... PN 40	D614L296U04
	ASME CL 150	D614L296U05
	ASME CL 300	D614L296U06
DN 65 (2-1/2 in.) Old lay length	PN 10 ... PN 16	D614L297U08
	PN 25 ... PN 40	D614L297U09
	ASME CL 150	D614L297U10
	ASME CL 300	D614L297U11
DN 65 (2-1/2 in.) New lay length	PN 10 ... PN 16	D614L297U15
	PN 25 ... PN 40	D614L297U16
	ASME CL 150	D614L297U17
	ASME CL 300	D614L297U18
DN 80 (3 in.) Old lay length	PN 10 ... PN 40	D614L298U08
	ASME CL 150	D614L298U09
	ASME CL 300	D614L298U10
DN 80 (3 in.) New lay length	PN 10 ... PN 40	D614L298U15
	ASME CL 150	D614L298U17
	ASME CL 300	D614L298U18
DN 100 (4 in.) Old lay length	PN 10 ... PN 16	D614L299U07
	PN 25 ... PN 40	D614L299U08
	ASME CL 150	D614L299U09
DN 100 (4 in.) New lay length	PN 10 ... PN 16	D614L299U15
	PN 25 ... PN 40	D614L299U16
	ASME CL 150	D614L299U17


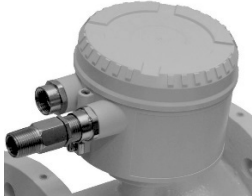


Welding adapter

The welding adapter is a tool for flowmeter sensors that feature welded spuds as the process connection type. It enables these welded spuds to be welded into the pipeline in a coplanar manner.

The welding adapter is made from stainless steel AISI 304 (1.4301)

Nominal size	Order code
DN 3 ... DN 10 (1/10 ... 3/8 in.)	D413C470U01
DN 15 (1/2 in.)	D413C471U01
DN 20 (3/4 in.)	D413C472U01
DN 25 (1 in.)	D413C473U01
DN 32 (1-1/4 in.)	D413C474U01
DN 40 (1-1/2 in.)	D413C475U01
DN 50 (2 in.)	D413C488U03
DN 65 (2-1/2 in.), old lay length	D413C461U09
DN 65 (2-1/2 in.), new lay length	D413C461U11
DN 80 (3 in.), old lay length	D413C496U03
DN 80 (3 in.), new lay length	D413C496U05
DN 100 (4 in.), old lay length	D413C498U03
DN 100 (4 in.), new lay length	D413C498U05

... Ordering Information

Description	Order code
Infrared service port adapter FZA100	D674A897U01
	
Installation set for NPT 1/2" cable gland. For sealing the cable conduit during outdoor installation.	3KXF081300L0001*
	
Adapter M20x1.5 to 1/2" NPT	D365B269U01*
	
Data link cable	3KXS360040L0003*
	
Signal cable	
3KQZ407123U0500	5 m (approx. 15 ft)
3KQZ407123U1000	10 m (approx. 30 ft)
3KQZ407123U1500	15 m (approx. 49 ft)
3KQZ407123U2000	20 m (approx. 66 ft)
3KQZ407123U2500	25 m (approx. 82 ft)
3KQZ407123U3000	30 m (approx. 98 ft)
3KQZ407123U3500	35 m (approx. 115 ft)
3KQZ407123U4000	40 m (approx. 131 ft)
3KQZ407123U5000	50 m (approx. 164 ft)
3KQZ407123U8000	80 m (approx. 262 ft)
3KQZ407123U1H00	100 m (approx. 328 ft)
3KQZ407123U1F00	150 m (approx. 492 ft)
3KQZ407123U2H00	200 m (approx. 656 ft)
ABB Ability Verification Tool	SRV500*

*Available from ABB Service



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