Data Sheet DS/FEM300-EN Rev. B

# ProcessMaster Wafer FEM300 Minimag Electromagnetic Flowmeter

## The process industry's first choice

### Intuitive operation
— Softkey-based functionality
— “Easy Set-up” function

### Non-contact buttons
— Parameterization of the device without the need to open the housing

### Diagnostics for real-life situations
— Status messages in accordance with NAMUR
— Help texts in the display

### Maximum measuring accuracy
— Maximum measuring error: 0.4 % of rate

### Universal transmitter
— Reduces spare parts inventory costs and storage costs

### Flowmeter sensor featuring state-of-the-art memory technology
— Prevents errors and enables quick and reliable commissioning

### Approvals for explosion protection
— In accordance with FM, cFM Cl. I Div 1, Div2

### HART Communication standard
— Access to all status information

Power and productivity for a better world™

## ABB

ABB is an established world force in the design and manufacture of instrumentation for industrial process control.
Worldwide presence, comprehensive service and application-oriented know-how make ABB a leading supplier of flow measurement products.

## Introduction

### The industrial standard

ProcessMaster Wafer is designed specifically to meet the increased requirements on advanced flowmeters. The modular design concept offers flexibility, cost-saving operation and reliability while providing a long service life and exceptionally low maintenance.
Integration into ABB asset management systems and usage of the self-monitoring and diagnostic functions increase the plant capacity and reduce downtimes.

### Advanced diagnostic functions

Using its advanced diagnostic functions, the unit monitors both its own condition and the process.
Limit values for the diagnostic parameters can be set locally. When these limits are exceeded, an alarm is tripped.
For further analysis, the diagnostic data can be read out via an advanced DTM. Critical states can, therefore, be recognized early and appropriate measures can be taken.
As a result, productivity is increased and downtimes are avoided.
The status messages are classified in accordance with the NAMUR recommendations.
In the event of an error, a diagnostic-dependent help text appears on the display which considerably simplifies and accelerates the troubleshooting procedure. This provides maximum safety for the process.

### Superior and reliable new flowmeter sensor design

Using a higher excitation frequency for the transmitter, ProcessMaster Wafer is a flowmeter with an especially short response time. With its advanced filtering methods, the device improves accuracy even under difficult conditions by separating the noise from the measuring signal.

### Easy and quick commissioning

Advanced data storage inside the sensor eliminates the need to match sensor and transmitter in the field. The on-board sensor memory automatically identifies the transmitter. On power-on, the transmitter self-configuration function is run. and replicates all sensor data and TAG-specific parameters into the transmitter. This eliminates the opportunity for errors and leads to an increased startup speed and reliability.

### Intuitive, convenient navigation

The factory-set parameters can be modified quickly and easily via the user-friendly display and the non-contact buttons, without opening the housing. The "Easy Set-up" function reliably guides unpracticed users through the menu step by step.
The softkey-based functionality makes handling a breeze - it's just like using a cell phone. During the configuration, the permissible range of each parameter is indicated on the display and invalid entries are rejected.

### Universal transmitter - powerful and flexible

The backlit display can be easily rotated without the need for any tools. The contrast is adjustable and the display fully configurable. The character size, number of lines and display resolution (number of decimals) can be set as required. In multiplex mode, several different display options can be pre-configured and invoked one after the other.
The smart modular design of the transmitter unit allows for easy disassembly without the need to unscrew cables or unplug connectors.
Whether pulse ouput, 20 mA signals or the status output are active or passive, the universal transmitter always delivers the correct signal. HART is used as the standard protocol.
Optionally, the transmitter is available with PROFIBUS PA or FOUNDATION Fieldbus communication.

The universal transmitter simplifies the spare parts inventory and reduces the inventory costs.

### ScanMaster - the diagnostic tool

Can I rely on the measured values?
How can I determine the technical condition of my device?
ScanMaster can answer these frequently asked questions.
And ScanMaster allows you to easily check the device for proper functioning.

### ProcessMaster Wafer- always the first choice

ProcessMaster Wafer sets the standard for the process industry. It meets the various requirements of NAMUR. In compliance with the requirements of NAMUR, the devices are categorized under category III for pipelines. As a result, ProcessMaster can be used universally. This reduces costs and increases safety.

Data Sheet DS/FEM300-EN Rev. B

# ProcessMaster Wafer FEM300 Minimag Electromagnetic Flowmeter

## Contents



Power and productivity for a better world™

# 1 ProcessMaster Wafer FEM300 - Overview of technology

| Model overview (integral design) |
|---|
| **FEM315 (Explosion protection Div. 1)** |
|   |
| **FM / FMc Cl I,II,III Div 1, Cl I,II,III Div 2** |

| **Model number** | **FEM315** |
|---|---|
| Measured value error | 0.4 % of rate |
| Nominal size range | 1/10“ ... 4" (DN3 ... 100) |
| Process connection | Wafer style connection |
| Nominal pressure | ASME CL 150, 300 |
| Lining | ETFE (Tefzel) |
| Conductivity | > 5 µS/cm (20 µS/cm for demineralized water) |
| Electrodes | Hastelloy C, Platinum-iridium, Tantalum |
| Degree of protection | IP 65, IP 67 |
| Medium temperature | -13 ... 266 °F (-25 ... 130 °C) |
| **Approvals** | |
| Explosion protection approvals | FM / FMc Cl I,II,III Div 1, Cl I,II,III Div 2 |
| CRN (Canadian Reg. Number) | Pending |
| **Transmitter** | |
| Power supply | AC 100 ... 230 V (-15 / +10%), AC 24 V (-30 / +10%), DC 24 V (-30 / +30%) |
| Current output | 4 ... 20 mA, active or passive |
| Pulse output | Can be configured locally as active or passive using software |
| Switch output | Optocoupler, programmable function |
| Contact input | Optocoupler, programmable function |
| Display | Graphical display, configurable |
| Housing | Integral mount design |
| Communication | HART protocol (standard), Profibus PA, Foundation Fieldbus (Option) |

| Model overview (remote mount design) | |
|---|---|
| **Flowmeter sensor** | |
| **FEM325**<br>**(Explosion Protection DIV II)**<br>  | DIV I<br>  |
| **FM / FMc Cl I,II,III Div 1, Cl I,II,III Div** **Div 2 still needs to be in here for the Div. 2 remote version** | |

| Transmitter |
|---|
| **FET325**<br>**(explosion protection Div. 2)**<br>  |
| **FM / cFM**<br>CL I Div 2 (NI, DIP) |

| **Flowmeter sensor** | **FEM325** |
|---|---|
| Measured value error | 0.4 % of rate |
| Nominal size range | 1/10 " ... 4 " (DN3 ... 100) |
| Process connection | Wafer style connection |
| Nominal pressure | ASME CL 150, 300 |
| Lining | ETFE (Tefzel) |
| Conductivity | > 5 µS/cm (20 µS/cm for demineralized water) |
| Electrodes | Hastelloy C, Platinum-iridium, Tantalum |
| Degree of protection | IP 67, IP 68, (NEMA 4X) |
| Medium temperature | -13 ...266 °F (-25 ...130 °C) |
| **Approvals** | |
| Explosion protection approvals | FM / FMc Cl I,II,III Div 1, Cl I,II,III Div 2 |
| CRN (Canadian Reg. Number) | Pending |
| **Transmitter** | **FET325** |
| Power supply | AC 100 ... 230 V (-15 / +10%), AC 24 V (-30 / +10%), DC 24 V (-30 / +30%) |
| Current output | 4 ... 20 mA, active or passive |
| Pulse output | Can be configured locally as active or passive using software |
| Switch output | Optocoupler, programmable function |
| Contact input | Optocoupler, programmable function |
| Display | Graphical display, configurable |
| Housing | Field-mount housing |
| Communication | HART protocol (standard), Profibus PA, Foundation Fieldbus (Option) |

# 2 Performance specifications

## 2.1 General

### 2.1.1 Maximum measuring error

**Pulse output**

- Standard calibration:

± 0.4 % of measured value, ± 0.02 % $Qmax_{DN}$

$Qmax_{DN}$: See table in Section 2.4, "Flowmeter sizes, flow range".

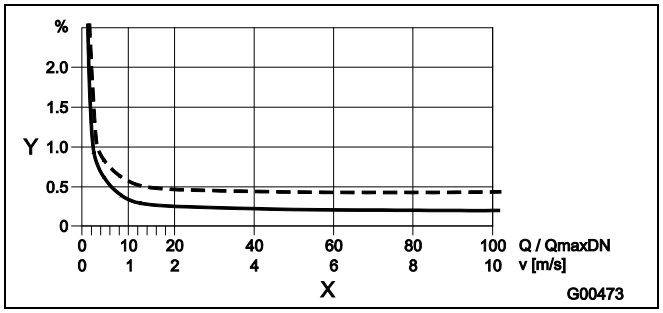


Fig. 1

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Y Accuracy ± of measured value in [%]

X Flow velocity v in [m/s], Q / QmaxDN [%]

**Analog output effects**

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

## 2.2 Reproducibility, response time

| | |
|---|---|
| Reproducibility | ≤ 0.11 % of measured value, $t_{meas}$ = 100 s, v = 0.5 ... 10 m/s |
| Response time of current output with damping of 0.02 seconds | As step function 0 ... 99 %<br>5 τ ≥ 200 ms at 25 Hz excitation frequency<br>5 τ ≥ 400 ms at 12.5 Hz excitation frequency |

## 2.3 Transmitter

### 2.3.1 Electrical properties

| | | |
|---|---|---|
| Supply power | AC | 100 ... 230 V (-15 % / +10 %) |
| | **AC** | 24 V (-30 % / +10 %) |
| | **DC** | 24 V (-30 % / +30 %), ripple: < 5 % |
| **Line frequency** | 47 ... 64 Hz | |
| **Excitation frequency** | 12 1/2 Hz, 15 Hz, 25 Hz, 30 Hz (50 / 60 Hz power supply) | |
| **Power consumption** | (flowmeter sensor including transmitter) | |
| | **AC** | S ≤ 20 VA |
| | **DC** | P ≤ 12 W (switch-on current 5.6 A) |
| **Electrical connection** | Screw terminals | |

#### 2.3.1.1 Isolation of input/outputs

The current output, digital outputs DO1 and DO2, and digital input are electrically isolated from the flowmeter sensor input circuit and from each other. The same is valid for the signal outputs of the versions with PROFIBUS PA and FOUNDATION Fieldbus.

#### 2.3.1.2 Empty pipe detection

The "empty pipe detection" function requires:

A conductivity of the measured fluid ≥ 20 µS/cm, a signal cable length ≤ 50 m (164 ft), a nominal diameter DN ≥ 3/8" (DN 10).

### 2.3.2 Mechanical properties

| | |
|---|---|
| **Integral mount design (transmitter mounted directly on the flowmeter sensor)** | |
| **Housing** | Cast aluminum, painted |
| **Paint** | Paint coat ≥ 80 µm thick, RAL 9002 (light gray) |
| **Cable gland** | Polyamide |
| | Stainless steel |
| **Remote mount design** | |
| **Housing** | Cast aluminum, painted |
| **Paint** | Paint coat ≥ 80 µm thick, mid-section RAL 7012 (dark gray), front cover / rear cover RAL 9002 (light gray) |
| **Cable gland** | Polyamide |
| | Stainless steel |
| **Weight** | 9.92 lb (4.5 kg) |

#### 2.3.2.1 Storage temperature, ambient temperature

**Ambient temperature**

-4 ... 149 °F (-20 ... 65 °C)

**Storage temperature**

-4 ... 149 °F (-20 ... 65 °C)

#### 2.3.2.2 Protection class for transmitter housing

IP 65, IP 67, NEMA 4X

#### 2.3.2.3 Vibration according to EN 60068-2

Transmitter

- In the range 10 ... 58 Hz with max. 0.15 mm (0.006 inch) deflection*
- In the range 58 ... 150 Hz max. 2 g acceleration*

* = Peak load

## 2.4 Flowmeter sizes, flow range

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

| Nominal diameter | | Min. flow range end value | $Qmax_{DN}$ | Max. flow range end value |
|---|---|---|---|---|
| DN | " | 0.02 x $Q_{max}$DN (≈ 0.2 m/s) | 0 … ≈ 10 m/s | 2 x $Q_{max}$DN (≈ 20 m/s) |
| 3 | 1/10 | 0.02 US gal/min (0.08 l/min) | 1.06 US gal/min (4 l/min) | 2.11 US gal/min (8 l/min) |
| 4 | 5/32 | 0.04 US gal/min (0.16 l/min) | 2.11 US gal/min (8 l/min) | 4.23 US gal/min (16 l/min) |
| 6 | 1/4 | 0.11 US gal/min (0.4 l/min) | 5.28 US gal/min (20 l/min) | 10.57 US gal/min (40 l/min) |
| 10 | 3/8 | 0.24 US gal/min (0.9 l/min) | 11.9 US gal/min (45 l/min) | 23.78 US gal/min (90 l/min) |
| 15 | 1/2 | 0.53 US gal/min (2 l/min) | 26.4 US gal/min (100 l/min) | 52.8 US gal/min (200 l/min) |
| 25 | 1 | 1.06 US gal/min (4 l/min) | 52.8 US gal/min (200 l/min) | 106 US gal/min (400 l/min) |
| 40 | 1 1/2 | 3.17 US gal/min (12 l/min) | 159 US gal/min (600 l/min) | 317 US gal/min (1200 l/min) |
| 50 | 2 | 5.28 US gal/min (1.2 $m^3$/h) | 264 US gal/min (60 $m^3$/h) | 528 US gal/min (120 $m^3$/h) |
| 80 | 3 | 15.9 US gal/min (3.6 $m^3$/h) | 793 US gal/min (180 $m^3$/h) | 1585 US gal/min (360 $m^3$/h) |
| 100 | 4 | 21.1 US gal/min (4.8 $m^3$/h) | 1057 US gal/min (240 $m^3$/h) | 2113 US gal/min (480 $m^3$/h) |

# 3 Functional specifications

## 3.1 Flowmeter sensor

### 3.1.1 Protection type

IP 67, NEMA 4X
IP 68 (for external flowmeter sensors only)

### 3.1.2 Pipeline vibration

The following applies to compact devices:
(transmitter mounted directly on the flowmeter sensor)

- In the 10 ... 58 Hz range with max. 0.15 mm (0.006 inch) deflection
- In the 58 ... 150 Hz range with max. 2 g acceleration

The following applies to devices with a separate transmitter:
Transmitter

- In the 10 ... 58 Hz range with max. 0.15 mm (0.006 inch) deflection
- In the 58 ... 150 Hz range with max. 2 g acceleration

Flowmeter sensor

- In the 10 ... 58 Hz range with max. 0.15 mm (0.006 inch) deflection
- In the 58 ... 150 Hz range with max. 2 g acceleration

**Cable length**

Max. signal cable length between flowmeter sensor and transmitter is 164 ft (50 m) for conductivity ≥ 5 µS/cm

### 3.1.3 Temperature range

**Storage temperature**

-4 ... 149 °F (-20 ... 65 °C)

**Min. permissible pressure as a function of fluid temperature**

| Lining | Nominal diameter | $P_{Operating}$ at mbar abs. | $T_{Operating}$ |
|---|---|---|---|
| ETFE | 1/10 ... 4“ (DN3 ... 100) | 100 | @ 130 °C (266 °F) |

**Maximum ambient temperature as a function of fluid temperature**

**Models FEM315**

| Lining | Ambient temperature | | Fluid temperature | |
|---|---|---|---|---|
| | Minimum temperature | Max. temperature | Minimum temperature | Max. temperature |
| ETFE | -4 °F (-20 °C) | 149 °F (65 °C) | -13 °F (-25 °C) | 266 °F (130 °C) |

**Models FEM325**

| Lining | Ambient temperature | | Fluid temperature | |
|---|---|---|---|---|
| | Minimum temperature | Max. temperature | Minimum temperature | Max. temperature |
| ETFE | -4 °F (-20°C) | 149 °F (65 °C) | -13 °F (-25 °C) | 266 °F (130 °C) |

### 3.1.4 Flowmeter sensor

**Parts that come into contact with fluid**

| Part | Standard | Option |
|---|---|---|
| **Lining** | ETFE (Tefzel) | |
| **Measurement electrode for:**<br>-ETFE (Tefzel) | Hastelloy C-4 (2.4610) | Tantalum, platinum-iridium |
| **Grounding plate** | Stainless steel | **On request** |

**Flowmeter sensor housing**

| | Standard |
|---|---|
| **Housing**<br>1/10“ ... 4“<br>(DN 3 ... 100) | Cast aluminum, painted, paint coat, ≥ 80 µm thick, RAL 9002 |
| **Terminal box** | Aluminum alloy, painted, ≥ 80 µm thick, light gray, RAL 9002 |
| **Meter tube** | 304 Stainless steel |
| **Cable gland** | Polyamide |
| | Stainless steel |

## 4 Ex-relevant specifications for operation in Div. 2

### 4.1 General

Devices with dual-compartment transmitter housing (model names FEP315 and FEP325) are approved for operation in the following potentially explosive areas:

- FM Div.2
- cFM Div.2

**Important (Note)**

For detailed information on the individual approvals, refer to Section1 „ProcessMaster Wafer FEM300 - Overview of technology“.

A temperature of 158 °F (70 °C) at the cable entry is assumed for the Ex calculations. Therefore, the cables used for the supply power and the signal inputs and outputs must have a minimum specification of 158 °F (70 °C).

## 4.2 Electrical connection

### 4.2.1 Model FEM315, FET325 in Zone 2 / Div. 2 with HART protocol

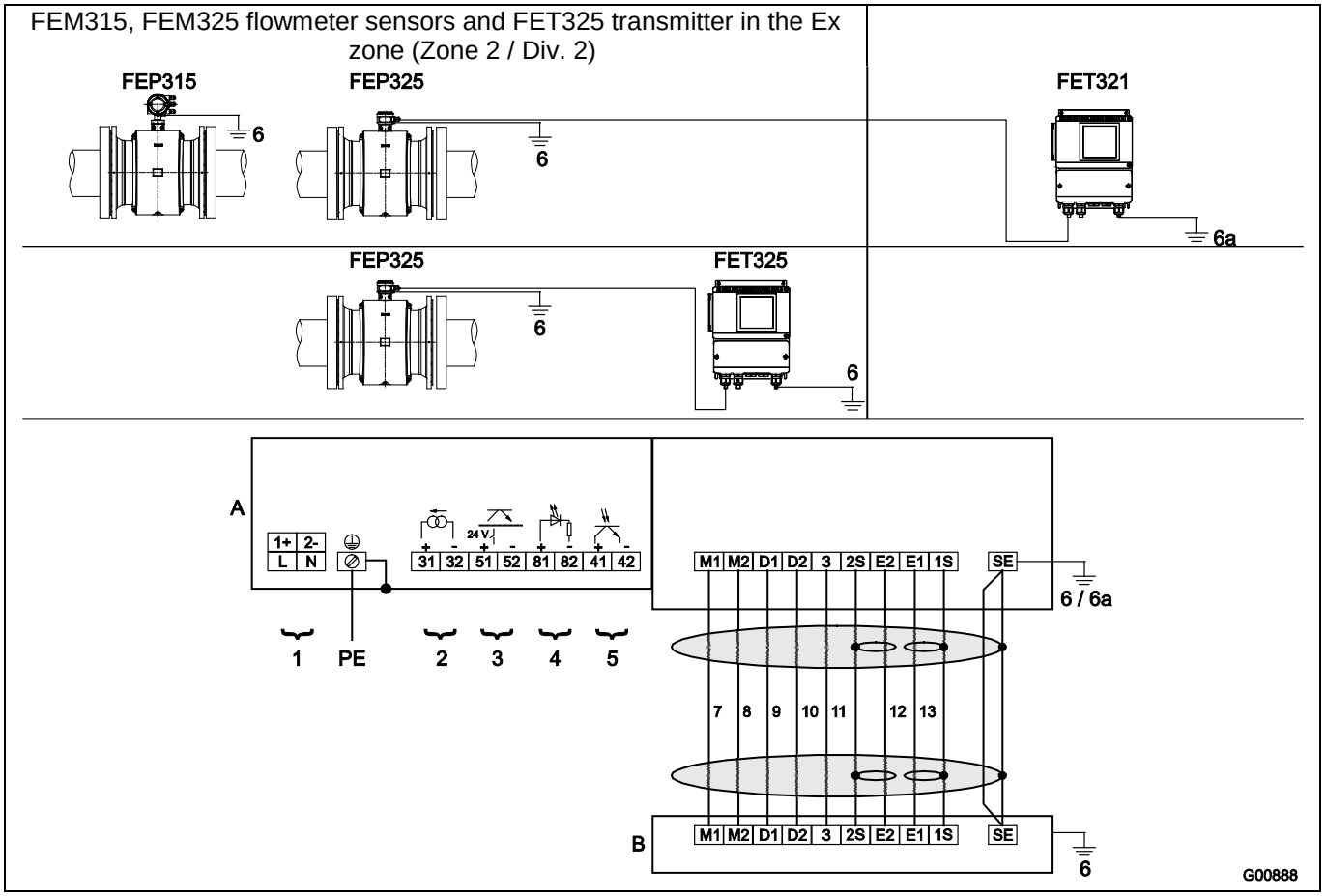



Fig. 2

A **Transmitter**

B **Flowmeter sensor**

1 **Supply power**:

See name plate

2 **Current output (terminals 31 / 32)**

The current output can be configured locally as an "active" or "passive" output.

- Active: 4 ... 20 mA, HART protocol (standard), load: 250 Ω ≤ R ≤ 650 Ω
- Passive: 4 ... 20 mA, HART protocol (standard), load: 250 Ω ≤ R ≤ 650 Ω
  Supply voltage for the current output: minimum 11 V, maximum 30 V at terminals 31 / 32.

3 **Digital output DO1 (terminal 51 / 52)**

The digital output can be configured locally as an "active" or "passive" output (in the case of the transmitter with the dual-compartment housing, the output is configured using the software; in the case of the transmitter with the single-compartment housing, it is configured by means of jumpers on the transmitter backplane).

- Active: U = 19 ... 21 V. $I_{max}$ = 220 mA, $f_{max}$ ≤ 5250 Hz
- Passive: $U_{max}$ = 30 V, $I_{max}$ = 220 mA, $f_{max}$ ≤ 5250 Hz

Function can be configured locally as "Pulse Output" or "Digital Output" using software. Factory setting is "Pulse Output".

- Configuration as pulse output. Maximum pulse frequency: 5250 Hz, pulse width: 0.1 … 2000 ms. The pulse factor and pulse width are interdependent and are calculated dynamically.
- Configuration as contact output. Function: System alarm, empty pipe alarm, max. / min. alarm, flow direction signaling, other

4 **Digital input: (terminal 81 / 82)**

Function can be configured locally using software: External output switch-off, external totalizer reset, external totalizer stop, other
Data for the optocoupler: 16 V ≤ U ≤ 30 V, Ri = 2 kΩ

5 **Digital output DO2 (terminal 41 / 42)**

The output is always a "passive" output (optocoupler).
Data for the optocoupler: $U_{max}$ = 30 V, $I_{max}$ = 220 mA, $f_{max}$ ≤ 5250 Hz
Function can be configured locally as "Pulse Output" or "Digital Output" using software. Factory setting is "Digital Output", flow direction signaling.

6 **Equipotential bonding**

All inputs and outputs are electrically isolated from each other and from the supply power. The electrical specifications given are operating values.

### 4.2.2 Model FEM315 DIV PROFIBUS PA or FOUNDATION fieldbus

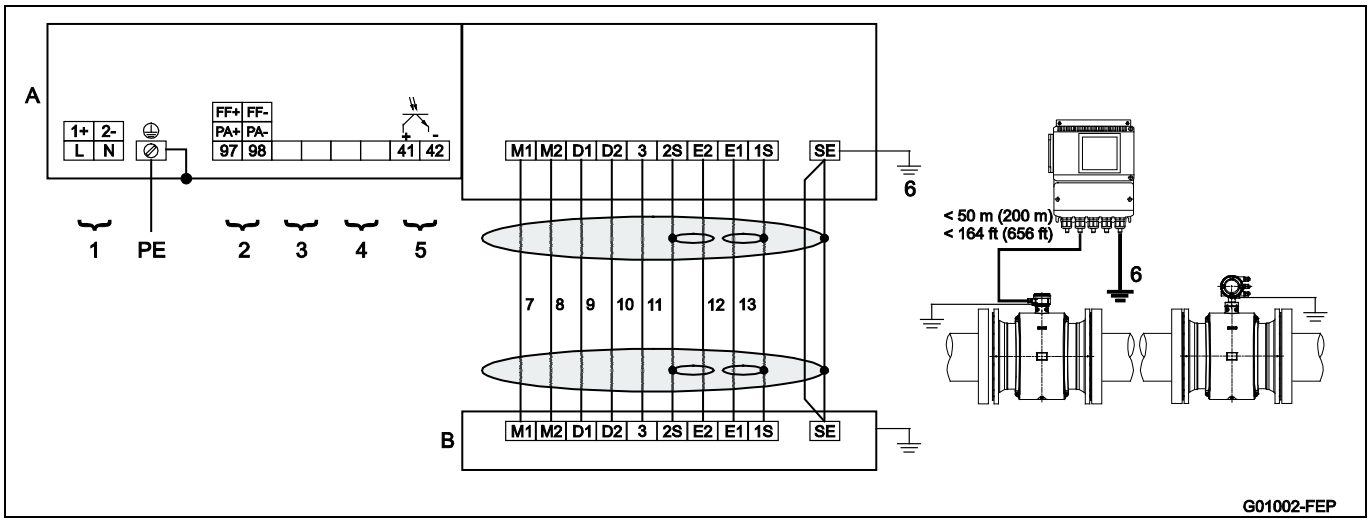



Fig. 3

A **Transmitter**
B **Flowmeter sensor**
1 **Supply power**
See name plate
2 **Digital communication (terminal 97 / 98)**
- **PROFIBUS PA in acc. with IEC 61158-2 (PA+ / PA-)**
U = 9 ... 32 v, I = 10 mA (normal operation), I = 13 mA (in the event of an error / FDE)
Bus connection with integrated protection against polarity reversal
The bus address can be set via the DIP switches in the device, the transmitter display or the fieldbus.

**or**

- **FOUNDATION Fieldbus in acc. with IEC 61158-2 (FF+ / FF-)**
U = 9 ... 32 v, I = 10 mA (normal operation), I = 13 mA (in the event of an error / FDE)
Bus connection with integrated protection against polarity reversal

3 Not assigned
4 Not assigned
5 **Digital output DO2 (terminals 41/42) (pulse output or digital output)**
Function can be configured locally as "Pulse Output" or "Digital Output" using software.
Factory setting is "Digital Output", flow direction signaling.
The output is always a "passive" output (optocoupler).
Data for the optocoupler: $U_{max}$ = 30 V, $I_{max}$ = 220 mA, $f_{max}$ ≤ 5250 Hz
6 Functional ground
7 Brown
8 Red
9 Orange
10 Yellow
11 Green
12 Blue
13 Violet

## 4.3 Electrical data for operation in Div. 2

### 4.3.1 Devices with HART protocol

When operating in potentially explosive areas, observe the following electrical data for the signal inputs and outputs of the transmitter. For the correct current output design (active/passive), see the marking contained in the device's terminal box.

**Model: FEM315 or FET325**

| | Ex data | | Operating values | |
|---|---|---|---|---|
| | Ex n/NI | | | |
| **Signal inputs and outputs** | **$U_i$ [V]** | **$I_i$ [mA]** | **$U_i$ [V]** | **$I_i$ [mA]** |
| **Current output** Active/passive Terminal 31/32 | 30 | 30 | 30 | 30 |
| **Digital output DO1** | 30 | 220 | 30 | 220 |

| | | | | | |
|---|---|---|---|---|---|
| Active/passive | Terminal 51/52 | | | | |
| **Digital output DO2** passive | Terminal 41/42 | 30 | 220 | 30 | 220 |
| **Digital input DI** | Terminal 81/82 | 30 | 10 | 30 | 10 |

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

## 4.4 Electrical data for operation in Zone 1 / Div. 1

### 4.4.1 Devices with HART protocol

When operating in potentially explosive areas, observe the following electrical data for the signal inputs and outputs of the transmitter. For the correct current output design (active/passive), see the marking contained in the device's terminal box.

**Model: FEM315 or FET325**

| | Operating values | | Ex data Explosion protection type Ex i, IS | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Inputs and outputs** | **$U_N$ [V]** | **$I_N$ [mA]** | **$U_O$ [V]** | **$I_O$ [mA]** | **$P_O$ [mW]** | **$C_O$ [nF]** | **$C_{OPA}$ [nF]** | **$L_O$ [mH]** |
| **Active current output** Terminal 31/32 | 30 | 30 | 20 | 100 | 500 | 210 | 195 | 6 |
| | | | **$U_I$ [V]** | **$I_I$ [mA]** | **$P_I$ [mW]** | **$C_I$ [nF]** | **$C_{IPA}$ [nF]** | **$L_I$ [mH]** |
| | | | 60 | 425 4) | 2000 4) | 8,4 | 24 | 0,065 |
| **Passive current output** Terminal 31/32 | 30 | 30 | **$U_I$ [V]** | **$I_I$ [mA]** | **$P_I$ [mW]** | **$C_I$ [nF]** | **$C_{IPA}$ [nF]** | **$L_I$ [nH]** |
| | | | 60 | 500 4) | 2000 4) | 8,4 | 24 | 170 |
| **Passive digital output DO2** Terminal 41/42 | 30 | 220 | **$U_I$ [V]** | **$I_I$ [mA]** | **$P_I$ [mW]** | **$C_I$ [nF]** | **$C_{IPA}$ [nF]** | **$L_I$ [nH]** |
| | | | 60 | 425 1) 4)<br>500 2) 4) | 2000 4) | 3,6 | 3,6 | 170 |
| **Passive digital output DO1** Terminal 51/52 | 30 | 220 | 60 | 425 1) 4)<br>500 2) 4) | 2000 4) | 3,6 | 3,6 | 170 |
| **Passive digital input DI** 3) Terminal 81/82 | 30 | 10 | 60 | 500 4) | 2000 4) | 3,6 | 3,6 | 170 |

1) For "active" current output

2) For "passive" current output

3) Only available in conjunction with passive current output

4) Intrinsically safe single-channel or multi-channel barriers (supply isolators) with resistance characteristic must be used.

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

**Special connection conditions:**

The output circuits are designed in such a way that they can be connected to both intrinsically-safe and non-intrinsically-safe circuits. It is not permitted to combine intrinsically safe and non-intrinsically safe circuits. On intrinsically safe circuits, equipotential bonding must be in place along the entire length of the cable used for the current outputs.

The rated voltage of the non-intrinsically safe circuits is $U_M$ = 60 V.

Provided that rated voltage $U_M$ = 60 V is not exceeded if connections are established to non-intrinsically safe external circuits, intrinsic safety is still guaranteed.

### 4.4.2 Devices with PROFIBUS PA or FOUNDATION Fieldbus

When operating in potentially explosive areas, observe the following electrical data for the signal inputs and outputs of the transmitter. For the correct design (PROFIBUS PA or FOUNDATION Fieldbus), see the marking contained in the device's terminal box.

**Model: FEM315 or FET325**

The fieldbus (terminal 97 / 98) and the digital output (terminal 41 / 42) can be connected in Zone 1 / Div. 1 in three different variants.

**Variant 1 Intrinsically safe fieldbus connection in acc. with FISCO, intrinsically safe connection of the digital output**

| | Operating values | | Ex data<br>Explosion protection type Ex i, IS and FISCO | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Inputs and outputs** | **$U_N$ [V]** | **$I_N$ [mA]** | **$U_i$ [V]** | **$I_i$ [mA]** | **$P_i$ [mW]** | **$C_i$ [nF]** | **$C_{iPA}$ [nF]** | **$L_i$ [µH]** |
| **Passive digital output DO2**<br>Terminal 41/42 | 30 | 220 | 60 | 200 1) | 5000 1) | 3,6 | 3,6 | 0,17 |
| **Fieldbus**<br>Terminal 97/98 | 32 | 30 | 17 | 380 | 5320 | 1 | 1 | 5 |

1) Intrinsically safe single-channel or multi-channel barriers (supply isolators) with resistance characteristic must be used.

**Variant 2 Intrinsically safe fieldbus connection (not in acc. with FISCO!), intrinsically safe connection of the digital output**

| | Operating values | | Ex data<br>Explosion protection type Ex i, IS | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Inputs and outputs** | **$U_N$ [V]** | **$I_N$ [mA]** | **$U_i$ [V]** | **$I_i$ [mA]** | **$P_i$ [mW]** | **$C_i$ [nF]** | **$C_{iPA}$ [nF]** | **$L_i$ [µH]** |
| **Passive digital output DO2**<br>Terminal 41/42 | 30 | 220 | 60 | 200 1) | 5000 1) | 3,6 | 3,6 | 0,17 |
| **Fieldbus**<br>Terminal 97/98 | 32 | 30 | 60 | 500 | 5000 | 1 | 1 | 5 |

1) Intrinsically safe single-channel or multi-channel barriers (supply isolators) with resistance characteristic must be used.

**Variant 3 Fieldbus connection in acc. with FNICO (Zone 2, Div. 2), connection of digital output (Zone 2, Div. 2)**

| | Operating values | | Ex data<br>Explosion protection type Ex n, NI and FNICO | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Inputs and outputs** | **$U_N$ [V]** | **$I_N$ [mA]** | **$U_i$ [V]** | **$I_i$ [mA]** | **$P_i$ [mW]** | **$C_i$ [nF]** | **$C_{iPA}$ [nF]** | **$L_i$ [µH]** |
| **Passive digital output DO2**<br>Terminal 41/42 | 30 | 220 | - | - | - | - | - | - |
| **Fieldbus**<br>Terminal 97/98 | 32 | 30 | 60 | 500 1) | 5000 1) | 1 | 1 | 5 |

1) Single-channel or multi-channel barriers (supply isolators) with resistance characteristic must be used.

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

**Special connection conditions:**

The output circuits are designed in such a way that they can be connected to both intrinsically-safe and non-intrinsically-safe circuits. It is not permitted to combine intrinsically safe and non-intrinsically safe circuits. On intrinsically safe circuits, equipotential bonding must be in place along the entire length of the cable used for the signal outputs.

The rated voltage of the non-intrinsically safe circuits is UM = 60 V.

Provided that rated voltage UM = 60 V is not exceeded if connections are established to non-intrinsically safe external circuits, intrinsic safety is still given.

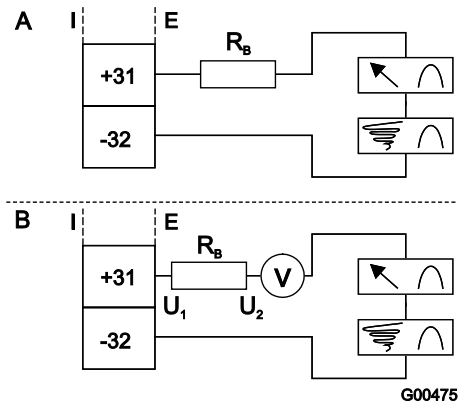
## 4.5 Temperature values

| Model name | Surface temperature |
|---|---|
| FEM315 | 158 °F (70 °C) |
| FEM325 | 185 °F (85 °C) |
| FET325 | 158 °F (70 °C) |

The surface temperature depends on the fluid temperature.
With increasing fluid temperature > 158 °F (> 70 °C) or > 185 °F (> 85 °C) the surface temperature also increases to the level of the fluid temperature.

## 4.6 Connection examples for the peripherals

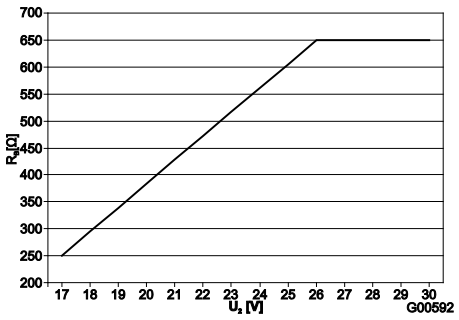
**Current output**




A = "Active" configuration:
4 ... 20 mA, HART
Load: 0 =R = 650 Ω (300 Ω for Ex zone 1 / Div. 1)
Min. load with HART: 250 Ω

B = "Passive" configuration:
4 ... 20 mA, HART
Load: 0 =R = 650 Ω
Min. load with HART: 250 Ω
Supply voltage for the current output, terminals 31/32:
U1: Min. 11 V, max. 30 V

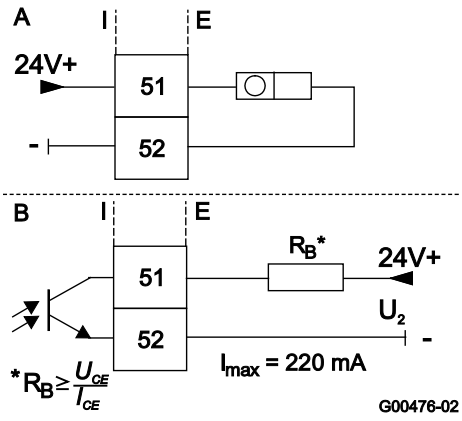
Max. permissible load ($R_B$) as a function of the source voltage ($U_2$)




**I = internal, E = external**

Fig. 4

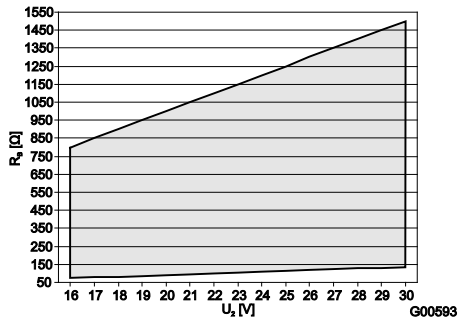
**Digital output DO1**




A = "Active" configuration

B = "Passive" configuration

Max. permissible load ($R_B$) as a function of the source voltage ($U_2$)

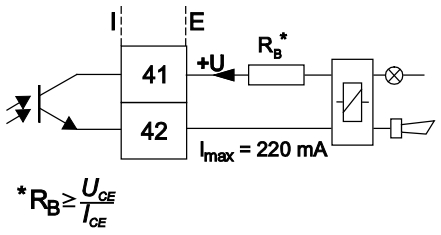



**I = internal, E = external**

= Permissible range

Fig. 5

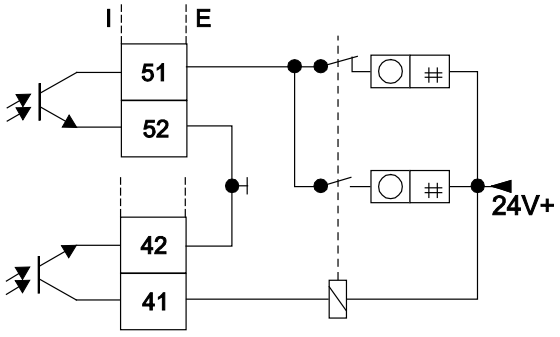
**Digital output DO2, e.g., for system monitoring, max./min. alarm, empty meter tube or forward/reverse signal, or counting pulses (function can be configured using software)**



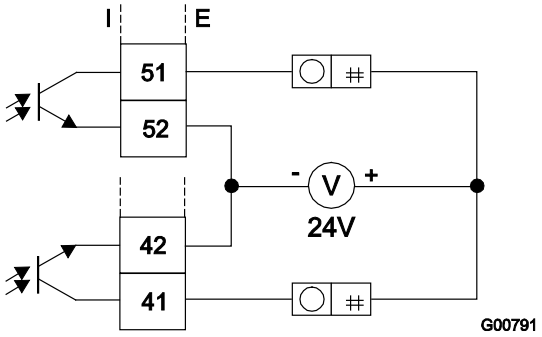

**I = internal, E = external**

Fig. 6

**Digital outputs DO1 and DO2, separate forward and reverse pulses**



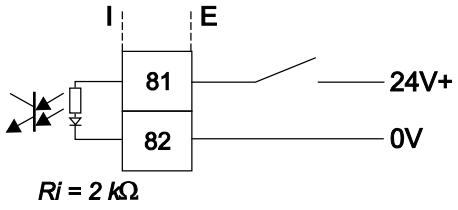

**Digital outputs DO1 and DO2, separate forward and reverse pulses (alternative connection)**




**I = internal, E = external**

Fig. 7

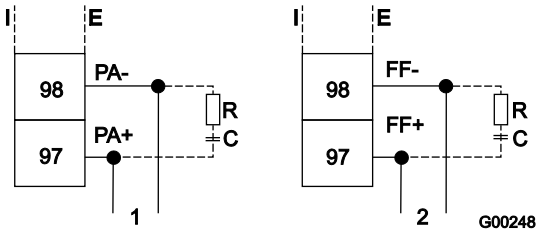
**Digital input for external output switch-off or external totalizer reset**




**I = internal, E = external**

Fig. 8

**PROFIBUS PA and FOUNDATION Fieldbus**




The resistance R and condenser C form the bus termination. They must be installed when the device is connected to the end of the entire bus cable.

R = 100 Ω; C = 1 µF

1 PROFIBUS PA

2 FOUNDATION Fieldbus

**I = internal, E = external**

Fig. 9

**PROFIBUS PA – Connection via M12 Plug**

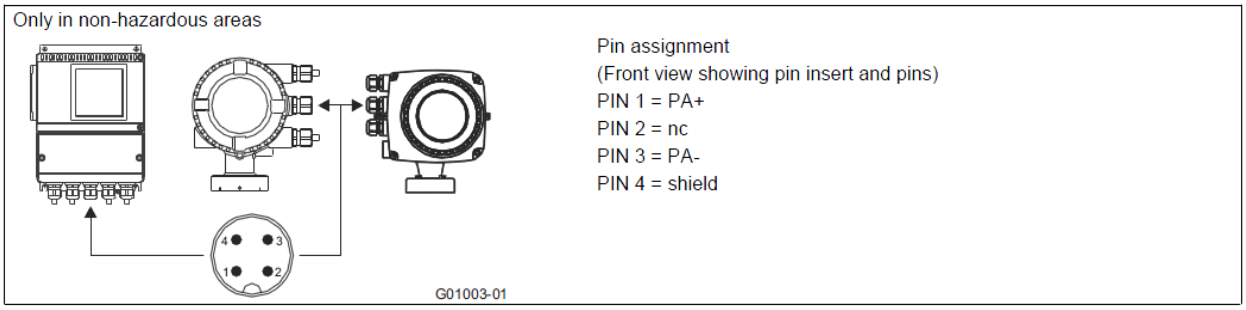



Fig. 10

### Digital communication

The transmitter has the following options for digital communication:

### HART protocol

The unit is registered with the HART Communication Foundation.

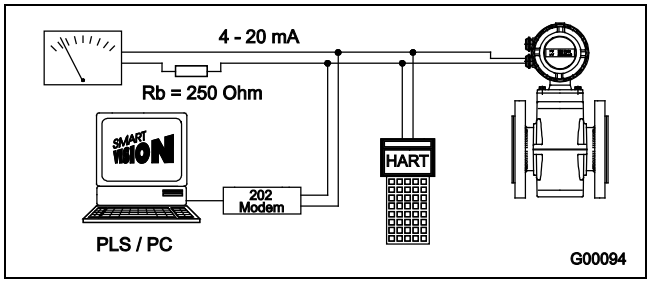



Fig. 11

| HART protocol | |
|---|---|
| Configuration | Directly on the device<br>Software DAT200 Asset Vision Basic (+ HART-DTM) |
| Transmission | FSK modulation on current output<br>4 ... 20 mA acc. to Bell 202 standard |
| Max. signal amplitude | 1.2 $mA_{ss}$ |
| Current output load | Min. 250 Ω, max. = 560 Ω |
| Cable | AWG 24 twisted |
| Max. cable length | 1500 m |
| Baud rate | 1,200 baud |
| Display | Log. 1: 1200 Hz<br>Log. 0: 2200 Hz |

For additional information, see the separate interface description.

### System integration

In conjunction with the DTM (Device Type Manager) available for the device, communication (configuration, parameterization) can occur with the corresponding framework applications according to FDT 1.21 (DAT200 Asset Vision Basic).

Other tool/system integrations (e.g., Emerson AMS/Siemens PCS7) are available upon request.

A free of charge version of the DAT200 Asset Vision Basic framework application for HART® or PROFIBUS is available upon request.

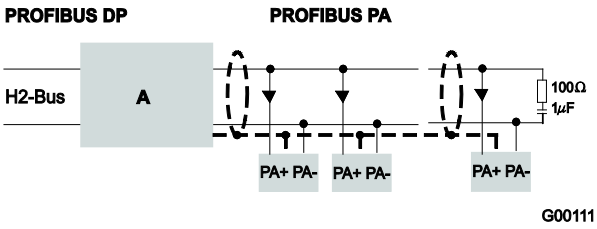
The required DTMs are contained on the DAT200 Asset Vision Basic DVD or in the DTM Library.

They can also be downloaded from www.abb.com/flow.

### PROFIBUS PA protocol

The interface conforms to profile 3.01 (PROFIBUS standard, EN 50170, DIN 19245 [PRO91]).

| | |
|---|---|
| PROFIBUS PA ID no.: | 0x3430 |
| Alternative standard ID no.: | 0x9700 or 0x9740 |
| Configuration | Directly on the device<br>Software DAT200 Asset Vision Basic (+ PROFIBUS PA-DTM) |
| Transmission signal | Acc. to IEC 61158-2 |
| Cable | Shielded, twisted cable (acc. to IEC 61158-2, types A or B are preferred) |




A = Segment coupler (incl. bus supply and termination)

Fig. 12: Example for PROFIBUS PA interface connection

### Bus topology

- Tree and/or line structure
- Bus termination: passive at both ends of the main bus line (RC element R = 100 Ω, C = 1 µF)

### Voltage / current consumption

- Average current consumption: 10 mA
- In the event of an error, the integrated FDE function (=Fault Disconnection Electronic) integrated in the device is ensures that the current consumption can rise to a maximum of 13 mA.
- The upper current limit is restricted electronically.
- The voltage on the bus line must lie in the range of 9 ... 32 V DC.

For additional information, see the separate interface description.

### System integration

ABB provides three different GSD files (equipment master data) which can be integrated in the system.

Users decide at system integration whether to install the full range of functions or only part.

The change-over is done using the “ID-number selector” parameter.

ID number 0x9700, GSD file name: PA139700.gsd

ID number 0x9740, GSD file name: PA139740.gsd

ID number 0x3430, GSD file name: ABB_3430.gsd

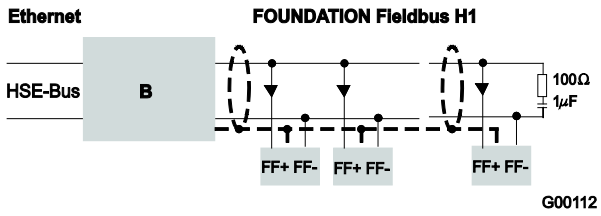
The interface description appears on the CD included in the scope of supply.

The GSD files can also be downloaded from www.abb.com/flow.

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

### FOUNDATION Fieldbus (FF)

| | |
|---|---|
| Interoperability test campaign no. | ITK 5.20 |
| Manufacturer ID | 0x000320 |
| Device ID | 0x0124 |
| Configuration | • Directly on the device<br>• Via services integrated in the system<br>• National configurator |
| Transmission signal | Acc. to IEC 61158-2 |




B = Linking device (incl. bus supply and termination)

Fig. 13: Example for FOUNDATION Fieldbus interface connection

### Bus topology

- Tree and/or line structure
- Bus termination: passive at both ends of the main bus line (RC element R = 100 Ω, C = 1 µF)

### Voltage / current consumption

- Average current consumption: 10 mA
- In the event of an error, the integrated FDE function (=Fault Disconnection Electronic) integrated in the device is ensures that the current consumption can rise to a maximum of 13 mA.
- Upper current limit: electronically restricted.
- The voltage on the bus line must lie in the range of 9 ... 32 V DC.

### Bus address

The bus address is automatically assigned or can be set in the system manually.

The identifier (ID) is formed using a unique combination of manufacturer ID, device ID, and device serial number.

### System integration

The following are required:

- DD (Device Description) file, which includes the device description.
- The CFF (Common File Format) file is required for engineering the segment. Engineering can be performed online or offline.

The interface description appears on the CD included in the scope of supply.

The files can also be downloaded from www.abb.com/flow.

The files required for operation can also be downloaded from http://www.fieldbus.org.

# 5 Installation requirements

## 5.1 Grounding

The flowmeter sensor must be connected to ground potential. For technical reasons, this potential should be identical to the potential of the metering fluid.

For plastic or insulated lined pipelines, the fluid 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 meter sensor.

## 5.2 Mounting

The following points must be observed for the installation:

- The meter tube must always be completely full during operation.
- The flow direction must correspond to the identification if present.
- The maximum torque for all flange connections must be complied with. The max torque depends on the temperature, pressure, material of the flange bolts and gaskets and has to be choosen accordingly.
- The devices must be installed without mechanical tension (torsion, bending).
- Flowmeters with coplanar counter flanges may only be installed with suitable seals.
- Use flange seals made from a compatible material for the fluid and fluid temperatures.
- Seals must not extend into the flow area since possible turbulence could influence the device accuracy.
- The pipeline may not exert any unallowable forces and torques on the device.
- Do not remove the plugs in the cable connectors until you are ready to install the electrical cable.
- Install the separate converter at a largely vibration-free location.
- Do not expose the converter to direct sunlight or provide for appropriate sun protection where necessary.

### 5.2.1 Flow direction

The device measures the flowrate in both directions. Forward flow is the factory setting, as shown in Fig. 14.

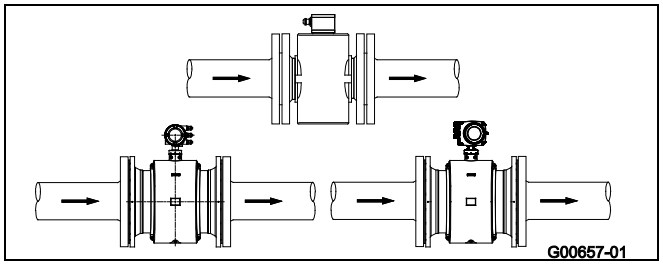



Fig. 14

### 5.2.2 Electrode axis

Electrode axis (1) should be horizontal if at all possible or no more that 45° from horizontal.

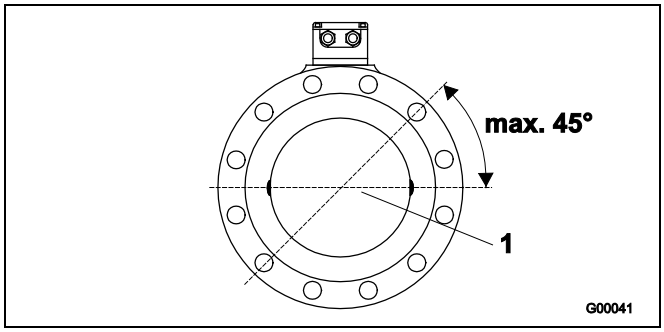



Fig. 15

### 5.2.3 In- and outlet pipe sections

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 (1), 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 (1).
- Butterfly valves must be installed so that the valve plate does not extend into the flowmeter sensor.
- Valves or other turn-off components should be installed in the outlet pipe section (2).

Experience has shown that, in most installations, straight inlet sections 3 x DN long and straight outlet sections 2 x DN long are sufficient (DN = nominal diameter of the sensor Fig. 16 ).

For test stands, the reference conditions of 10 x DN straight inlet and 5 x DN straight outlet must be provided.

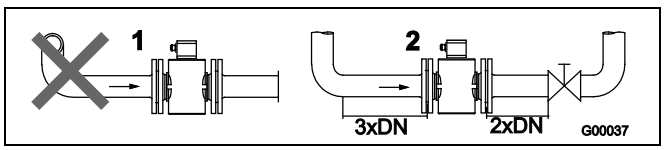



Fig. 16

### 5.2.4 Vertical connections

- Vertical installation for measuring abrasive fluids, preferably with flow in upward direction.

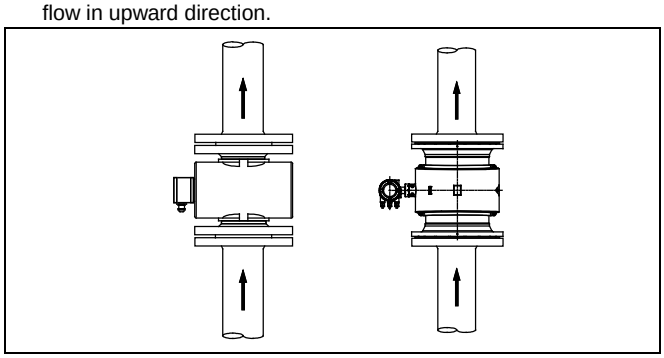


Fig. 17

### 5.2.5 Horizontal connections

- Meter tube must always be completely full.
- Provide for a slight incline of the connection for degassing.

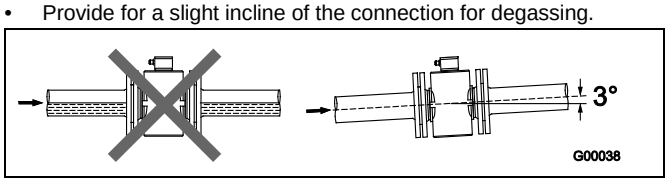



Fig. 18

### 5.2.6 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 (1).
- Provide for a siphon fluid intake for free inlets or outlets so that the pipeline is always full (2).

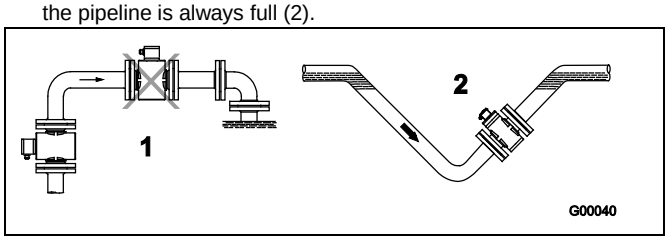



Fig. 19

### 5.2.7 Strongly contaminated fluids

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

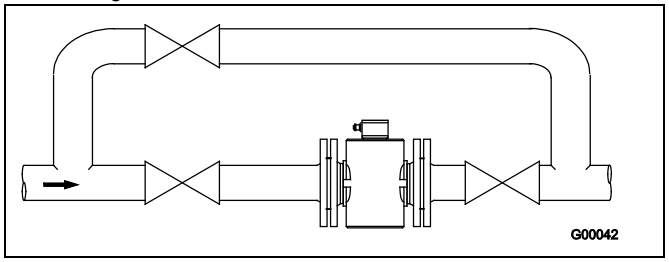



Fig. 20

### 5.2.8 Installation in the vicinity of pumps

- For flowmeter primaries which are to be installed in the vicinity of pumps or other vibration generating equipment, the utilization of mechanical snubbers is advantageous.

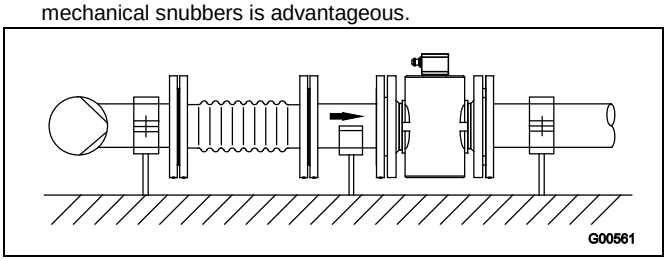



Fig. 21

### 5.2.9 Installation in pipelines with larger nominal diameters

Determine the resulting pressure loss when using reduction pieces (1):

1. Calculate the diameter ratio d/D.
2. Determine the flow velocity based on the flow range nomograph (Fig. 23).
3. Read the pressure drop on the Y-axis in Fig. 23.

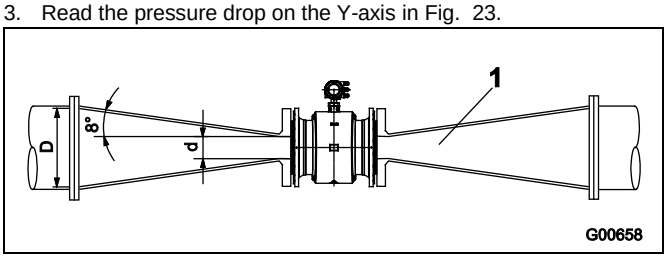



Fig. 22

1 = Flange transition piece
d = Inside diameter of the flowmeter
V = flow velocity [m/s]
$\Delta p$ = pressure loss [mbar]
D = Inside diameter of the pipeline

**Nomograph for pressure drop calculations**

For flange transition piece with $\alpha/2 = 8°$

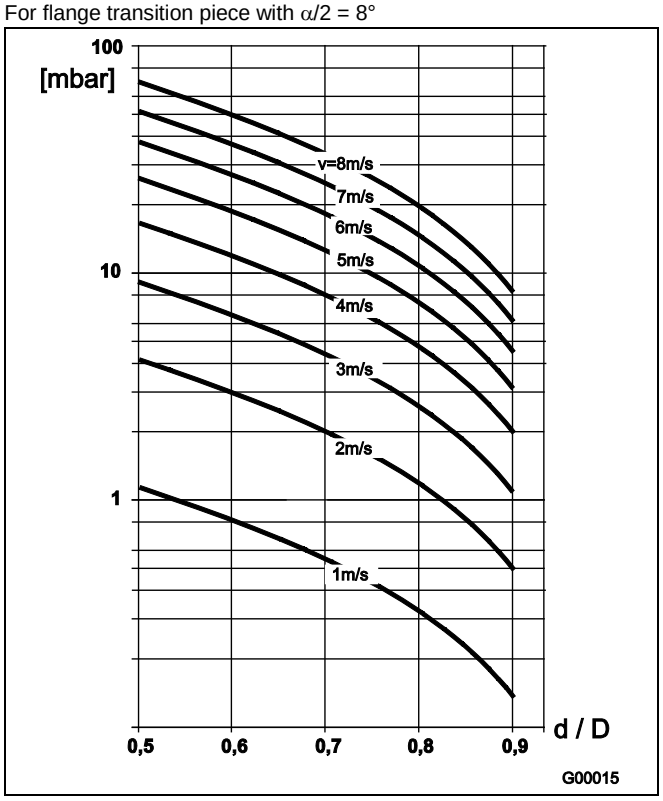



Fig. 23

# 6 Dimensions

## 6.1 Wafer, 1/10“ ... 3/8“ (DN 3 ... 10)

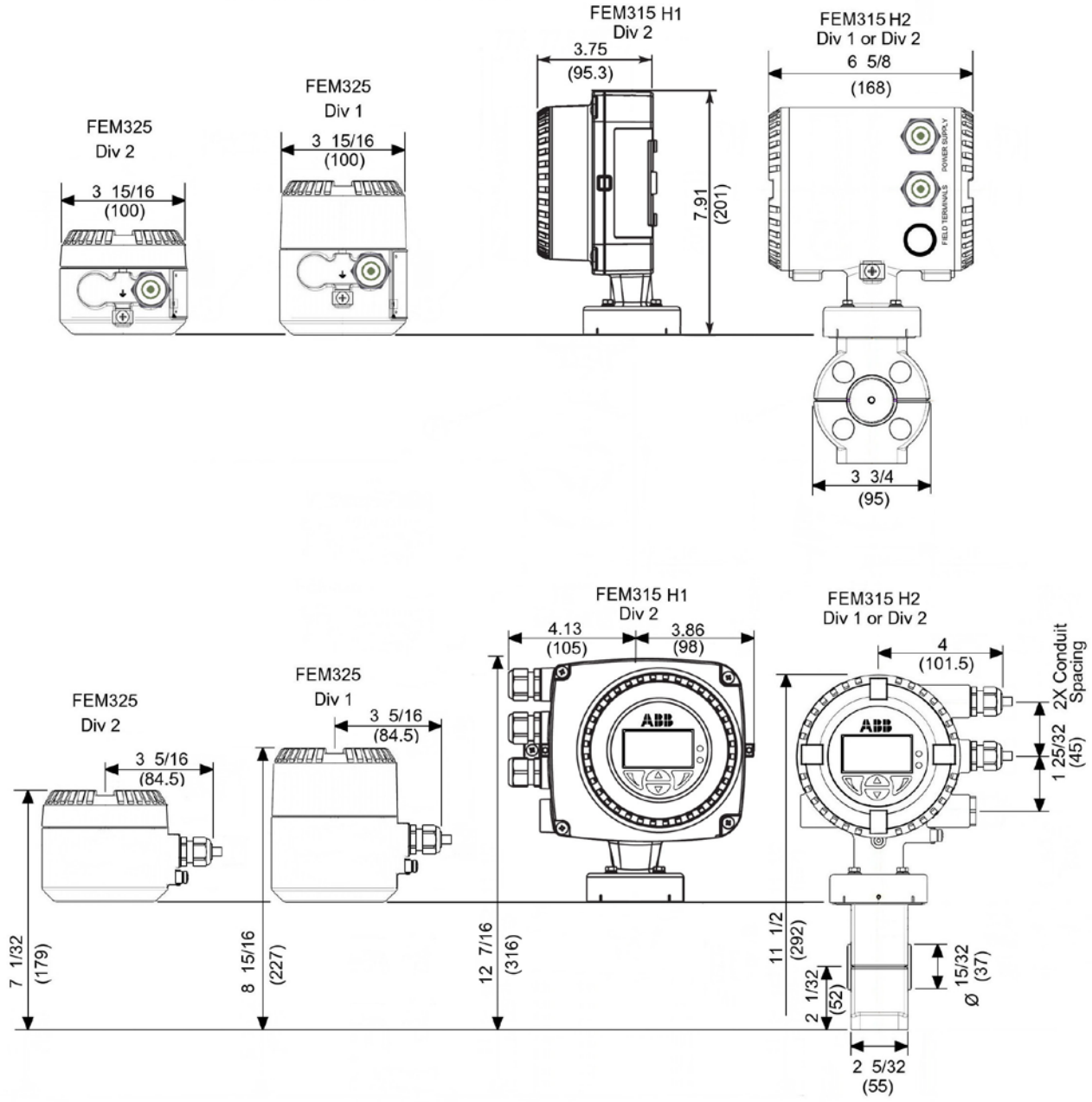



Fig. 24: Dimensions in inch (mm)

## 6.2 Wafer, 1/2“ ... 4“ (DN 15 ... 200)

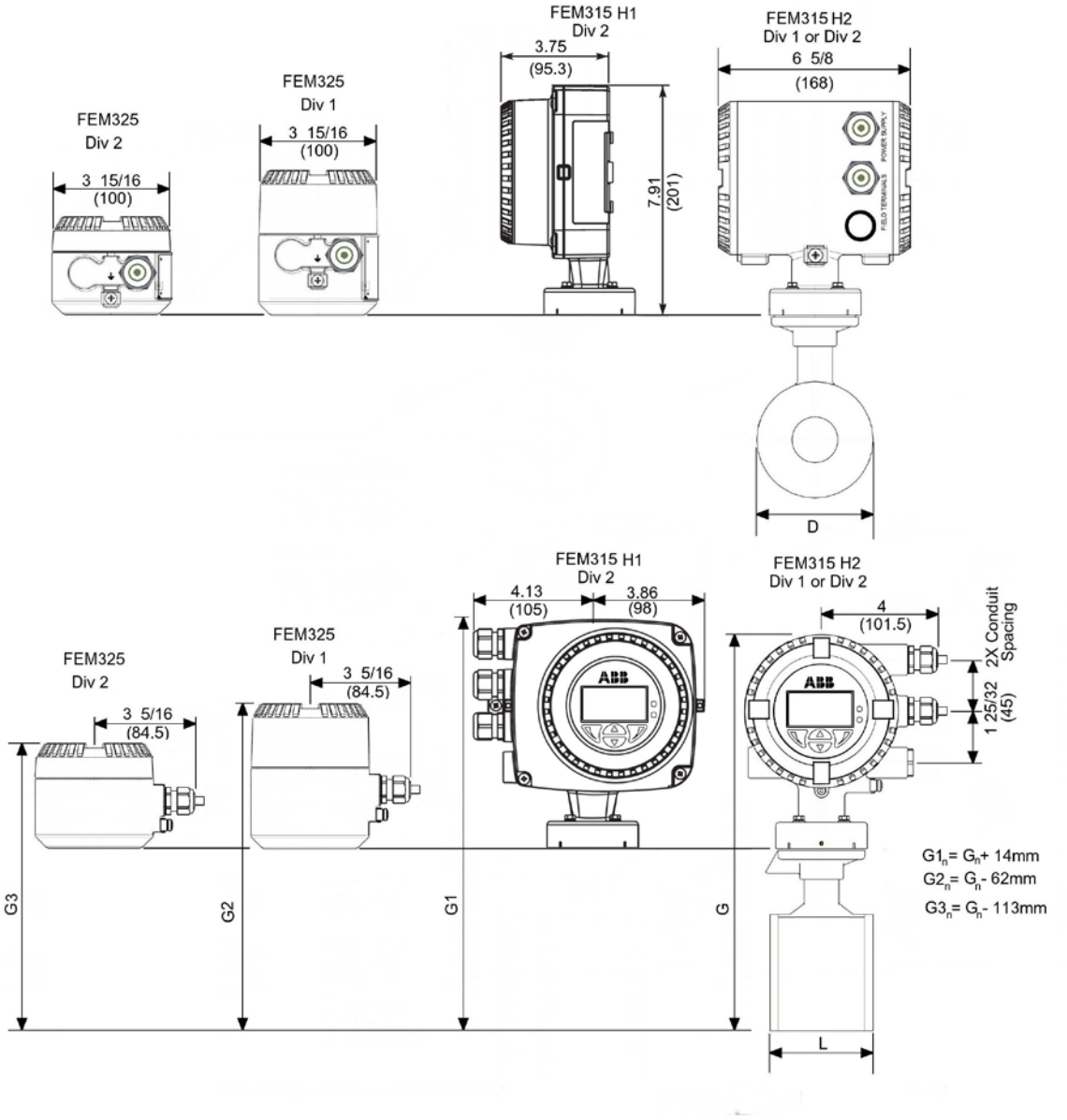



Fig. 25: Dimensions in inch (mm)

| | Dimensions inches/(mm) | | | | | | Approx. weight [lb] | |
|---|---|---|---|---|---|---|---|---|
| Inch (DN) | D | L | G3 | G2 | G1 | G | Integral mount design | Remote mount design |
| ½ (15) | 1-7/8 (48) | 2-5/32 (55) | 7-1/32 (179) | 9-1/16 (230) | 12-1/16 (306) | 11-1/2 (292) | 10.5 | 6 |
| 1 (25) | 2 5/8 (67) | 2-5/32 (55) | 7-27/32 (199) | 7-27/32 (250) | 12-27/32 (326 | 12-9/32 (312) | 11.5 | 6 |
| 1-1/2 (40) | 3-3/8 (86) | 2-3/4 (70) | 8-9/16 (217) | 10-1/2 (268) | 13 9/16 (344) | 13 (330) | 12.5 | 7 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2 (50) | 4 (102) | 3-11/32 (85) | 9-3/16 (233) | 11-3/16 (284) | 14-3/16 (360) | 13-5/8 (346) | 13.5 | 9 |
| | 3 (80) | 5-1/4 (133) | 4-23/32 (120) | 10-13/32 (264) | 12-13/32 (315) | 15 7/16 (391) | 14-27/32 (377) | 17.5 | 12 |
| | 4 (100) | 6-1/2 (165) | 5-29/32 (150) | 11-21/32 (296) | 13-21/32 (347) | 16 11/16 (423) | 16-1/8 (409) | 23.5 | 18 |

**Tolerance : +/- 1/8 inch (3mm)**

## 6.3 Transmitter housing (dual-compartment housing) model FET325 Cl. I Div 2

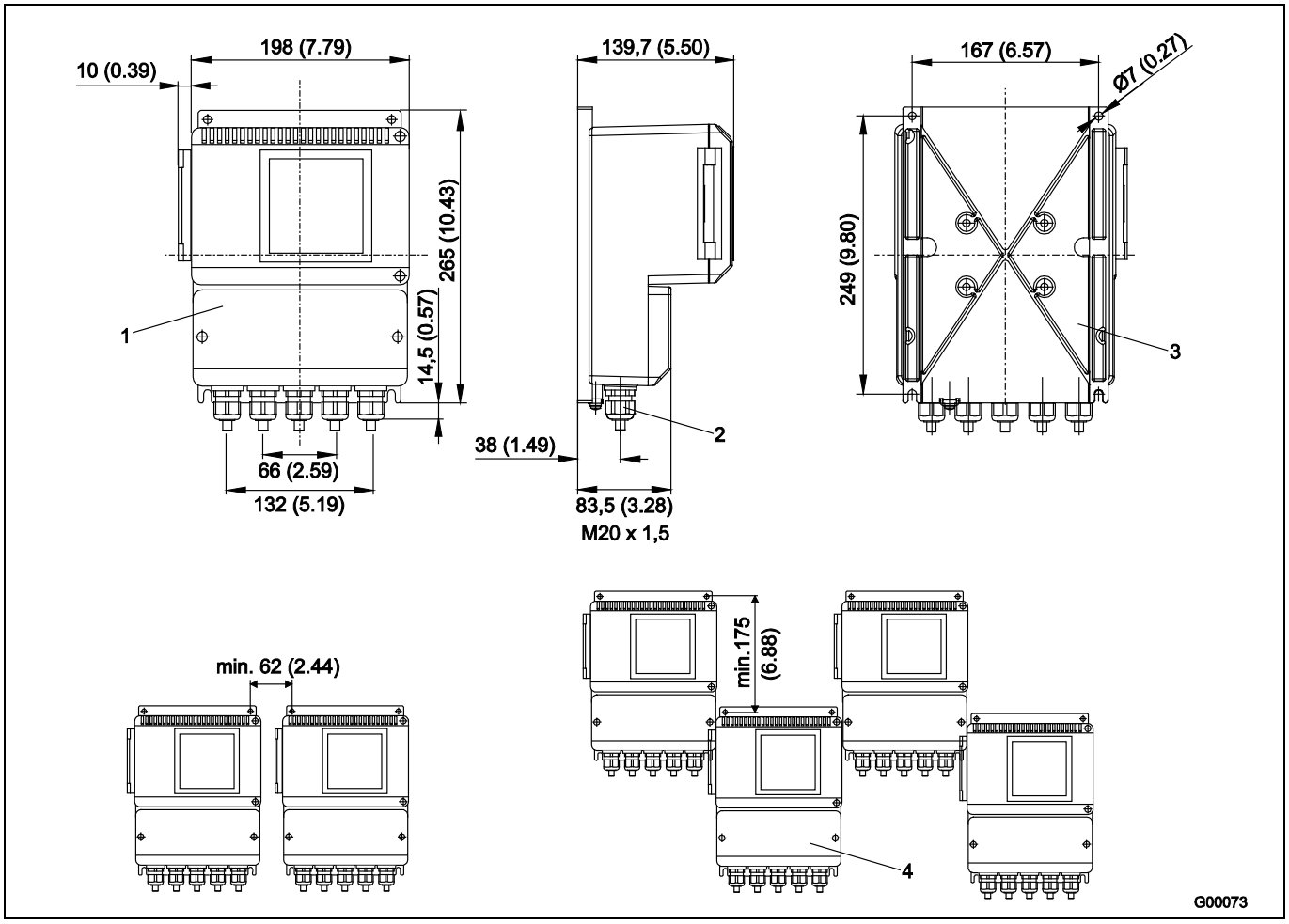



Fig. 26: Dimensions in mm (inch)

1 Field-mount housing with window

2 Cable gland M20 x 1.5

3 Installation holes for pipe mounting set, for 2" pipe installation; mounting set available on request (order no. 3KXF081100L0001)

4 Protection class IP 67

# 7 Ordering information

## 7.1 ProcessMaster Wafer FEM315 electromagnetic flowmeter, integral design

| | Main order number | | | | | | | | | | | | | | | | | | | | | Add. order no. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Version number | 1 – 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | |
| **With explosion protection** | **FEM315** | **X** | **X** | **X** | **X** | **X** | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | XX |
| **Nominal diameter** | | | | | | | | | | | | | | | | | | | | | | | |
| DN 3 (1/10 in.) | | 0 | 0 | 3 | | | | | | | | | | | | | | | | | | | |
| DN 4 (5/32 in.) | | 0 | 0 | 4 | | | | | | | | | | | | | | | | | | | |
| DN 6 (1/4 in.) | | 0 | 0 | 6 | | | | | | | | | | | | | | | | | | | |
| DN 10 (3/8 in.) | | 0 | 1 | 0 | | | | | | | | | | | | | | | | | | | |
| DN 15 (1/2 in.) | | 0 | 1 | 5 | | | | | | | | | | | | | | | | | | | |
| DN 25 (1 in.) | | 0 | 2 | 5 | | | | | | | | | | | | | | | | | | | |
| DN 40 (1-1/2 in.) | | 0 | 4 | 0 | | | | | | | | | | | | | | | | | | | |
| DN 50 (2 in.) | | 0 | 5 | 0 | | | | | | | | | | | | | | | | | | | |
| DN 80 (3 in.) | | 0 | 8 | 0 | | | | | | | | | | | | | | | | | | | |
| DN 100 (4 in.) | | 1 | 0 | 0 | | | | | | | | | | | | | | | | | | | |
| **Lining material** | | | | | | | | | | | | | | | | | | | | | | | |
| ETFE | | | | | E | | | | | | | | | | | | | | | | | | |
| **Electrode design** | | | | | | | | | | | | | | | | | | | | | | | |
| Standard | | | | | | 1 | | | | | | | | | | | | | | | | | |
| **Signal electrode material** | | | | | | | | | | | | | | | | | | | | | | | |
| Hastelloy C-4 (2.4610) | | | | | | | D | | | | | | | | | | | | | | | | |
| Tantalum | | | | | | | G | | | | | | | | | | | | | | | | |
| Platinum-iridium | | | | | | | J | | | | | | | | | | | | | | | | |
| **Grounding accessories** | | | | | | | | | | | | | | | | | | | | | | | |
| Without | | | | | | | | 0 | | | | | | | | | | | | | | | |
| Grounding plates | | | | | | | | 4 | | | | | | | | | | | | | | | |
| **Process connection** | | | | | | | | | | | | | | | | | | | | | | | |
| Wafer | | | | | | | | | W | 1 | | | | | | | | | | | | | |
| **Process connection material** | | | | | | | | | | | | | | | | | | | | | | | |
| Without process connection, without gasket without mounting bracket | | | | | | | | | | | Y | | | | | | | | | | | | |
| **Certificates** | | | | | | | | | | | | | | | | | | | | | | | |
| Standard without PED approval | | | | | | | | | | | | 1 | | | | | | | | | | | |
| **Calibration** | | | | | | | | | | | | | | | | | | | | | | | |
| Standard factory calibration – Without ScanMaster | | | | | | | | | | | 1) | | A | | | | | | | | | | |
| Standard factory calibration – With ScanMaster | | | | | | | | | | | 1) | | K | | | | | | | | | | |
| **Sensor temperature range / Ambient temperature range** | | | | | | | | | | | | | | | | | | | | | | | |
| Standard sensor design / -4 ... 145 °F (-20 ... 62 °C) | | | | | | | | | | | | | | 1 | | | | | | | | | |
| **Name plate** | | | | | | | | | | | | | | | | | | | | | | | |
| Sticker | | | | | | | | | | | | | | | A | | | | | | | | |
| Stainless steel | | | | | | | | | | | | | | | B | | | | | | | | |
| **Signal cable length** | | | | | | | | | | | | | | | | | | | | | | | |
| No cable | | | | | | | | | | | | | | | | 0 | | | | | | | |
| **Explosion protection** | | | | | | | | | | | | | | | | | | | | | | | |
| usFMc XP-IS; CL I/DIV I/GP ABCD/T6<br>DIP: CLII, III/DIV 1 / GP EFG/T6 | | | | | | | | | | | | | | | | | P | | | | | | |
| FM / FMc XP-IS; CL I/DIV I/GP BCD/T6<br>DIP: CLII, III/DIV 1 / GP EFG/T6 | | | | | | | | | | | | | | | | | R | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Protection type for transmitter / sensor** | | | | | | |
| Standard / IP67 (NEMA 4X) | 1 | | | | | |
| Other | 9 | | | | | |
| **Cable gland** | | | | | | |
| 1/2 in. NPT | | B | | | | |
| **Power supply** | | | | | | |
| 100 ... 230 V AC, 50 Hz | | | 1 | | | |
| 24 V AC / DC, 50 Hz | | | 2 | | | |
| 100 ... 230 V AC, 60 Hz | | | 3 | | | |
| 24 V AC / DC, 60 Hz | | | 4 | | | |
| **Signal inputs and outputs** | | | | | | |
| HART + 20 mA passive + pulses + contact input / output | | | | B | | |
| HART + 20 mA active + pulses + contact input / output | | | | C | | |
| PROFIBUS PA + contact output | | | | E | | |
| FOUNDATION fieldbus + contact output | | | | F | | |
| **Default settings / Diagnostics** | | | | | | |
| Parameters are at factory settings / Standard | | | | | 1 | |

1) Standard accuracy (0.4% of rate) assumes 2 calibration points. If more than 2 calibration points are required, please specify 3 or 5 points under "Number of test points".

**Additional ordering codes (optional):**

| | Main order number | | | | | | | | | | | | | | | | | | | | | | Add. order no. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Version number | 1 – 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | |
| **With explosion protection** | **FEM315** | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | **XX** |
| **Number of test points** | | | | | | | | | | | | | | | | | | | | | | | |
| 3 points | | | | | | | | | | | | | | | | | | | | | | | T3 |
| 5 points | | | | | | | | | | | | | | | | | | | | | | | T5 |
| **Hardware Kit (ANSI 150 only)** [2] | | | | | | | | | | | | | | | | | | | | | | | AH |
| **Language of documentation** | | | | | | | | | | | | | | | | | | | | | | | |
| English | | | | | | | | | | | | | | | | | | | | | | | M5 |

2) Meters are wafer style and clamp between customer's pipeline flanges. Mounting hardware kits are available and include studs, nuts, Klinger Sil gaskets and adaptor.

## 7.2 ProcessMaster Wafer FEM325 electromagnetic flowmeter, remote mount design

| | Main order number | | | | | | | | | | | | | | | | | | | | | Add. order no. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Version number | 1 – 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | |
| **With explosion protection** | **FEM325** | **X** | **X** | **X** | **X** | **X** | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | XX |
| **Nominal diameter** | | | | | | | | | | | | | | | | | | | | | | | |
| DN 3 (1/10 in.) | | 0 | 0 | 3 | | | | | | | | | | | | | | | | | | | |
| DN 4 (5/32 in.) | | 0 | 0 | 4 | | | | | | | | | | | | | | | | | | | |
| DN 6 (1/4 in.) | | 0 | 0 | 6 | | | | | | | | | | | | | | | | | | | |
| DN 10 (3/8 in.) | | 0 | 1 | 0 | | | | | | | | | | | | | | | | | | | |
| DN 15 (1/2 in.) | | 0 | 1 | 5 | | | | | | | | | | | | | | | | | | | |
| DN 25 (1 in.) | | 0 | 2 | 5 | | | | | | | | | | | | | | | | | | | |
| DN 40 (1-1/2 in.) | | 0 | 4 | 0 | | | | | | | | | | | | | | | | | | | |
| DN 50 (2 in.) | | 0 | 5 | 0 | | | | | | | | | | | | | | | | | | | |
| DN 80 (3 in.) | | 0 | 8 | 0 | | | | | | | | | | | | | | | | | | | |
| DN 100 (4 in.) | | 1 | 0 | 0 | | | | | | | | | | | | | | | | | | | |
| **Lining material** | | | | | | | | | | | | | | | | | | | | | | | |
| ETFE | | | | | E | | | | | | | | | | | | | | | | | | |
| **Electrode design** | | | | | | | | | | | | | | | | | | | | | | | |
| Standard | | | | | | 1 | | | | | | | | | | | | | | | | | |
| **Signal electrode material** | | | | | | | | | | | | | | | | | | | | | | | |
| Hastelloy C-4 (2.4610) | | | | | | | D | | | | | | | | | | | | | | | | |
| Tantalum | | | | | | | G | | | | | | | | | | | | | | | | |
| Platinum-iridium | | | | | | | J | | | | | | | | | | | | | | | | |
| **Grounding accessories** | | | | | | | | | | | | | | | | | | | | | | | |
| Standard | | | | | | | | 1 | | | | | | | | | | | | | | | |
| **Process connection** | | | | | | | | | | | | | | | | | | | | | | | |
| Wafer | | | | | | | | | W | 1 | | | | | | | | | | | | | |
| **Process connection material** | | | | | | | | | | | | | | | | | | | | | | | |
| Without process connection, without gasket without mounting bracket | | | | | | | | | | | Y | | | | | | | | | | | | |
| **Certificates** | | | | | | | | | | | | | | | | | | | | | | | |
| Standard without PED approval | | | | | | | | | | | | 1 | | | | | | | | | | | |
| **Calibration** | | | | | | | | | | | | | | | | | | | | | | | |
| Standard factory calibration – Without ScanMaster 1) | | | | | | | | | | | | | A | | | | | | | | | | |
| Standard factory calibration – With ScanMaster 1) | | | | | | | | | | | | | K | | | | | | | | | | |
| **Sensor temperature range / Ambient temperature range** | | | | | | | | | | | | | | | | | | | | | | | |
| Standard sensor design / -4 ... 145 °F (-20 ... 62 °C) | | | | | | | | | | | | | | 1 | | | | | | | | | |
| **Name plate** | | | | | | | | | | | | | | | | | | | | | | | |
| Sticker | | | | | | | | | | | | | | | A | | | | | | | | |
| Stainless steel | | | | | | | | | | | | | | | B | | | | | | | | |
| **Signal cable length** | | | | | | | | | | | | | | | | | | | | | | | |
| No cable | | | | | | | | | | | | | | | | 0 | | | | | | | |
| 5 m (approx. 15 ft.) standard cable | | | | | | | | | | | | | | | | 1 | | | | | | | |
| 10 m (approx. 30 ft.) standard cable | | | | | | | | | | | | | | | | 2 | | | | | | | |
| 20 m (approx. 60 ft.) standard cable | | | | | | | | | | | | | | | | 3 | | | | | | | |
| 30 m (approx. 100 ft.) standard cable | | | | | | | | | | | | | | | | 4 | | | | | | | |
| 50 m (approx. 165 ft.) standard cable | | | | | | | | | | | | | | | | 5 | | | | | | | |
| **Explosion protection** | | | | | | | | | | | | | | | | | | | | | | | |
| usFMc XP-IS; CL I/DIV I/GP ABCD/T6<br>DIP: CLII, III/DIV 1 / GP EFG/T6<br>FM / FMc XP-IS; CL I/DIV I/GP BCD/T6 | | | | | | | | | | | | | | | | | P<br><br>R | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| DIP: CLII, III/DIV 1 / GP EFG/T6 | | | | | | |
| **Protection type for transmitter / sensor** | | | | | | |
| Standard / IP 67 (NEMA 4X) | 1 | | | | | |
| Standard / IP 68 (NEMA 6P) | 2 | | | | | |
| Standard / IP 68 (NEMA 6P), signal cable fitted and potted | 3 | | | | | |
| **Cable gland** | | | | | | |
| 1/2 in. NPT | | B | | | | |
| **Power supply** | | | | | | |
| None | | | 0 | | | |
| **Signal inputs and outputs** | | | | | | |
| None | | | | Y | | |
| **Default settings / Diagnostics** | | | | | | |
| Parameters set to factory defaults/Standard diagnostic functions activated | | | | | 1 | |

**Continued**

1) Standard accuracy (0.4% of rate) assumes 2 calibration points. If more than 2 calibration points are required, please specify 3 or 5 points under "Number of test points".

**Additional ordering codes (optional):**

| | Main order number | | | | | | | | | | | | | | | | | | | | | | Add. order no. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Version number | 1 – 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | |
| **With explosion protection** | **FEM325** | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | **XX** |
| **Accessories** | | | | | | | | | | | | | | | | | | | | | | | |
| None | | | | | | | | | | | | | | | | | | | | | | | AY |
| **Line frequency** | | | | | | | | | | | | | | | | | | | | | | | |
| 60 Hz (When ordering the sensor without a transmitter, specify the mains frequency.) | | | | | | | | | | | | | | | | | | | | | | | F6 |
| **Number of test points** | | | | | | | | | | | | | | | | | | | | | | | |
| 3 points | | | | | | | | | | | | | | | | | | | | | | | T3 |
| 5 points | | | | | | | | | | | | | | | | | | | | | | | T5 |
| **Hardware Kit (ANSI 150 only)[2)]** | | | | | | | | | | | | | | | | | | | | | | | AH |
| **Language of documentation** | | | | | | | | | | | | | | | | | | | | | | | |
| English | | | | | | | | | | | | | | | | | | | | | | | M5 |
| **Transmitter housing design** | | | | | | | | | | | | | | | | | | | | | | | |
| Single-compartment housing | | | | | | | | | | | | | | | | | | | | | | | H1 |
| Dual-compartment housing | | | | | | | | | | | | | | | | | | | | | | | H2 |

2) Meters are wafer style and clamp between customer's pipeline flanges. Mounting hardware kits are available and include studs, nuts, Klinger Sil gaskets and adaptor.

## 7.3 FET325 external transmitter for ProcessMaster

| | Main order number | | | | | | | | | Add. order no. |
|---|---|---|---|---|---|---|---|---|---|---|
| Version number | 1 – 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | XX |
| **With explosion protection** | FET325 | X | X | X | X | X | X | X | X | X | XX |
| **Sensor temperature range / Ambient temperature range** | | | | | | | | | | | |
| Standard sensor design / -20 ... 60 °C (-4 ... 140 °F) | | 1 | | | | | | | | | |
| Standard sensor design / -40 ... 60 °C (-4 ... 140 °F) | | 2 | | | | | | | | | |
| High-temperature sensor design / -20 ... 60 °C (-4 ... 140 °F) | | 3 | | | | | | | | | |
| High-temperature sensor design / -40 ... 60 °C (-4 ... 140 °F) | | 4 | | | | | | | | | |
| **Name plate** | | | | | | | | | | | |
| Sticker | | | A | | | | | | | | |
| Stainless steel | | | B | | | | | | | | |
| Stainless steel, and TAG label stainless steel | | | C | | | | | | | | |
| **Signal cable length** | | | | | | | | | | | |
| No cable | | | | 0 | | | | | | | |
| **Explosion protection** | | | | | | | | | | | |
| None | | | | | A | | | | | | |
| usFMc Div 2 Zone 2 | | | | | P | | | | | | |
| **Protection type for transmitter / sensor** | | | | | | | | | | | |
| Standard / IP 67 (NEMA 4X) | | | | | | 1 | | | | | |
| **Cable gland** | | | | | | | | | | | |
| 1/2 in. NPT | | | | | | | B | | | | |
| **Power supply** | | | | | | | | | | | |
| 100 ... 230 V AC, 50 Hz | | | | | | | | 1 | | | |
| 24 V AC / DC, 50 Hz | | | | | | | | 2 | | | |
| 100 ... 230 V AC, 60 Hz | | | | | | | | 3 | | | |
| 24 V AC / DC, 60 Hz | | | | | | | | 4 | | | |
| **Signal inputs / outputs** | | | | | | | | | | | |
| HART + 20 mA passive + pulses + contact input / output | | | | | | | | | B | | |
| HART + 20 mA active + pulses + contact input / output | | | | | | | | | C | | |
| PROFIBUS PA + contact output | | | | | | | | | E | | |
| FOUNDATION fieldbus + contact output | | | | | | | | | F | | |
| **Default settings / Diagnostics** | | | | | | | | | | | |
| Without / standard diagnostic functions | | | | | | | | | | 0 | |
| Parameters are at factory settings / Standard diagnostic functions activated | | | | | | | | | | 1 | |
| Parameters are set according to customer specifications / Standard diagnostic functions activated | | | | | | | | | | 3 | |
| **Language of documentation** | | | | | | | | | | | |
| English | | | | | | | | | | | M5 |
| **Transmitter housing design** | | | | | | | | | | | |
| Single-compartment housing | | | | | | | | | | | H1 |
| Dual-compartment housing | | | | | | | | | | | H2 |

## 7.4 Diagnostic and verification software - ScanMaster FZC500


ScanMaster allows you to easily check the installed device for proper functioning. The determined test and verification results are stored in a database and can be printed if required.

ScanMaster is based on DTM technology and can be run on Asset Vision Basic or other frame applications (as of FDT 1.2).

There are two ways to communicate with the device.

- Via a HART modem
- Via FZA100 infrared service port adapter

### 7.4.1 Communication via HART protocol on the 20 mA line

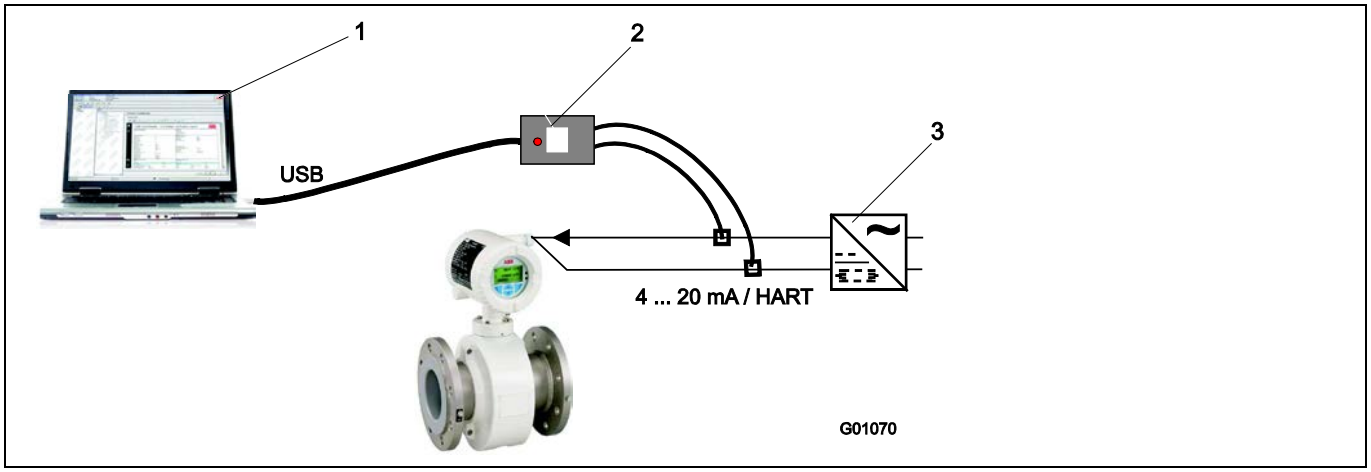



Fig. 27

1 Frame application,
e.g., DAT200 Asset Vision Basic
- Communication DTM: "is HRT USB"
- ScanMaster DTM

2 USB HART FSK / PC modem, electrical isolation,
e.g., NHA121Nx (Ex)
or NHA121No (Std.)

3 Power supply unit

### 7.4.2 Communication via FZA100 infrared adapter


Fig. 28

1 Frame application,
e.g., DAT200 Asset Vision Basic
- Communication DTM:
DTM HART Communication ServicePort
- ScanMaster DTM
- Service Port Splitter software

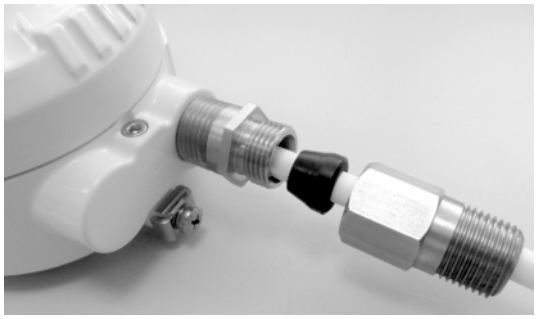
2 FZA100 infrared adapter

## 7.5 Infrared service port adapter type FZA100


## 7.6 Installation set for 2" pipe installation in dual-compartment field-mount housing


Part number: 612B091U07

## 7.7 Installation set for NPT 1/2" cable gland




Installation set for sealing the cable conduit during outdoor installation.

Part number: 699B390U01 (Water tight fitting),
368B071U01 (Grommet for remote mount cable)

**Notes**

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DS/FEM300-EN Rev. B 06.2013


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