

# ProcessMaster wafer FEM630

## Electromagnetic flowmeter



Safety instructions  
FM/cFM Div. 1, Div. 2

**Measurement made easy**

—  
ProcessMaster FEM630

### Introduction

This document forms an integral part of the following manuals:

- Operating Instruction  
OI/FEM630

### For more information

Additional documentation on ProcessMaster FEM630 is available for download free of charge at [www.abb.com/flow](http://www.abb.com/flow).

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# 1 Safety

## General information and instructions

These instructions are an important part of the product and must be retained for future reference.

Installation, commissioning, and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the plant operator accordingly. The specialist personnel must have read and understood the manual and must comply with its instructions.

For additional information or if specific problems occur that are not discussed in these instructions, contact the manufacturer.

The content of these instructions is neither part of nor an amendment to any previous or existing agreement, promise or legal relationship.

Modifications and repairs to the product may only be performed if expressly permitted by these instructions.

Information and symbols on the product must be observed.

These may not be removed and must be fully legible at all times.

The operating company must strictly observe the applicable national regulations relating to the installation, function testing, repair and maintenance of electrical products.

## Warnings

The warnings in these instructions are structured as follows:

### **DANGER**

The signal word '**DANGER**' indicates an imminent danger. Failure to observe this information will result in death or severe injury.

### **WARNING**

The signal word '**WARNING**' indicates an imminent danger. Failure to observe this information may result in death or severe injury.

### **CAUTION**

The signal word '**CAUTION**' indicates an imminent danger. Failure to observe this information may result in minor or moderate injury.

### **NOTICE**

The signal word '**NOTICE**' indicates potential material damage.

#### Note

'**Note**' indicates useful or important information about the product.

## ...1 Safety

### ...Warnings

The device has been designed for use exclusively within the technical limit values indicated on the identification plate and in the data sheets.

When using measuring media, the following points must be observed:

- Wetted parts such as measuring electrodes, liner, grounding electrodes, grounding plates or protection plates must not be damaged by the chemical and physical properties of the measuring medium during the operating time.
- Measuring media with unknown properties or abrasive measuring media may only be used if the operator is able to perform regular and suitable tests to ensure the safe condition of the device
- The indications on the name plate must be observed
- Before use of corrosive or abrasive measuring media, the operator must clarify the level of resistance of wetted parts.
- ABB will gladly support you in the selection, but cannot accept any liability in doing so.

### Improper use

The following are considered to be instances of improper use of the device:

- Operation as a flexible compensating adapter in piping, for example for compensating pipe offsets, pipe vibrations, pipe expansions, etc.
- For use as a climbing aid, for example for mounting purposes.
- For use as a bracket for external loads, for example as a support for piping, etc.
- Material application, for example by painting over the housing, name plate or welding/soldering on parts.
- Material removal, for example by spot drilling the housing.

### Notes on data safety

This product is designed to be connected to and to communicate information and data via a network interface. It is operator's sole responsibility to provide and continuously ensure a secure connection between the product and your network or any other network (as the case may be).

Operator shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.

ABB Automation Products GmbH and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

### Warranty provisions

Using the device in a manner that does not fall within the scope of its intended use, disregarding this manual, using underqualified personnel, or making unauthorized alterations releases the manufacturer from liability for any resulting damage. This renders the manufacturer's warranty null and void.



## 2 Device designs

Two designs (integral mount/remote mount) are available

This results in the following variants:

- ProcessMaster FEM631 integral mount device
- ProcessMaster FEM632 flow sensor remote mount design

Devices suitable for use in potentially explosive atmospheres feature the corresponding Ex mark on their name plates.

Moreover, each device design has a specific model number.

The parts of the model number relating to explosion protection are listed in the following table. The complete key to model numbers is described in the device data sheet.

ProcessMaster FEM631 integral mount device	<b>FEM631</b>	<b>XX</b>	<b>XX</b>
ProcessMaster FEM632 flow sensor remote mount	<b>FEM632</b>		
<b>Explosion protection</b>			
Without		Y0	
cFMus Class I, II, III Div. 1		F1	
cFMus Class I, II, III Div. 2		F2	
<b>Design/terminal box material/cable glands</b>			
Single-compartment/aluminum/M20 x 1.5			S1
Single-compartment/Aluminum/NPT ½ in			S2
Dual-compartment/aluminum/M20 x 1.5			D1
Dual-compartment/aluminum/NPT ½ in.			D2
Dual-compartment/stainless steel/M20 x 1.5			D3
Dual-compartment/stainless steel/NPT ½ in			D4
Dual-compartment/aluminum/M20 x 1.5 (Ex 'd' cable gland)			D6
Dual-compartment/stainless steel/M20 x 1.5 (Ex 'd' cable gland)			D8
Remote mount/aluminum/M20 x 1.5			A1
Remote mount/Aluminum/NPT ½ in			A2
Remote/stainless steel/M20 x 1.5			U1
Remote/stainless steel/NPT ½ in			U2

**Table 1 Excerpt from ordering information**

### Remote Transmitter

#### FET632 Series

For additional information on FET632 Series transmitter please refer to:

Operating Instruction  
OI/FEP630/FEH630-EN

## ...2 Device designs

### Version in 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 CI I 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 CI I Div. 1 and CI I Div. 2.  
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](http://www.abb.com/flow).

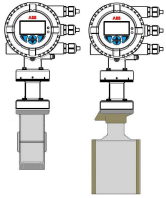
### DIV. 1

#### Sensor

#### ProcessMaster FEM630

#### FEM631-F1

#### Div 1



#### USA, FM approval

Certificate: FM19US0061X  
S-XP-IS : CL I, Div 1, GPS ABCD T6...T1  
DIP: CL II,III, Div 1, GPS EFG T6...T3B  
Type 4X, IP65/67

#### Canada, cFM approval Certificate:

FM19CA0033X  
S-XP-IS : CL I, Div 1, GPS BCD T6...T1  
DIP: CL II,III, Div 1, GPS EFG T6...T3B  
Type 4X, IP65/67

#### Note

The Plug-in card for Ethernet communication (model code DR6) is not available with Div. 1.

## ...2 Device designs

### Version in integral mount design

#### DIV. 2

Flowmeter either not equipped with any plug-in card or equipped with cards other than the Ethernet IP communication card (model code DR6).

##### Sensor

**ProcessMaster FEM630**  
**FEM631-F2**  
 Div. 2



##### USA, FM approval

Certificate: FM19US0061X  
 NI: CL I, Div 2, GPS ABCD T6...T1  
 DIP: CL II,III, Div 2, GPS EFG T6...T3B  
 Type 4X, IP65/67

##### Canada, cFM approval

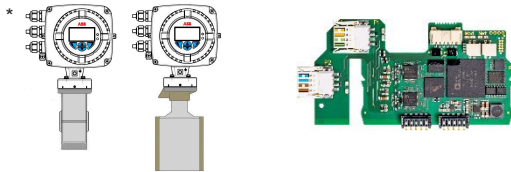
Certificate: FM19CA0033X  
 NI: CL I, Div 2, GPS ABCD T6...T1  
 DIP: CL II,III, Div 2, GPS EFG T6...T3B  
 Type 4X, IP65/67

\* Single-compartment housing  
 \*\* Dual-compartment housing

Flowmeter equipped with the plug-in card for Ethernet communication (model code DR6).

##### Sensor

**ProcessMaster FEM630**  
**FEM631-F2**  
 Div. 2



##### USA, FM approval

Certificate: FM19US0061X  
 NI: CL I, Div 2, GPS ABCD T4  
 DIP: CL II,III, Div 2, GPS EFG T4  
 Type 4X, IP65/67

##### Canada, cFM approval

Certificate: FM19CA0033X  
 NI: CL I, Div 2, GPS ABCD T4  
 DIP: CL II,III, Div 2, GPS EFG T4  
 Type 4X, IP65/67

\* Single-compartment housing

#### Note

The Plug-in card for Ethernet communication (model code DR6) is not available with the dual compartment electronics housing. (D1, D2, D3, D4, D6, & D8) - Div 2

## ...2 Device designs

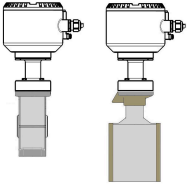
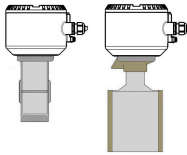
### Version with remote mount design

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](http://www.abb.com/flow).

DIV. 1	DIV. 2
<b>Sensor</b>	
<b>ProcessMaster FEM630</b> <b>FEM632-F1</b> <b>Div. 1</b>	<b>ProcessMaster FEM630</b> <b>FEM632-F2</b> <b>Div. 2</b>
	
<b>USA, FM approval</b> Certificate: FM19US0061X S-XP: CL I, Div 1, GPS ABCD T6...T1 DIP: CL II,III, Div 1, GPS EFG T6...T3B Type 4X, IP65/67/68	<b>USA, FM approval</b> Certificate: FM17US0061X NI: CL I, Div 2, GPS ABCD T6...T1 DIP: CL II,III, Div 2, GPS EFG T6...T3B Type 4X, IP65/67/68
<b>Canada, cFM approval</b> Certificate: FM19CA0033X S-XP: CL I, Div 1, GPS BCD T6...T1 DIP: CL II,III, Div 1, GPS EFG T6...T3B Type 4X, IP65/67/68	<b>Canada, cFM approval</b> Certificate: FM19CA0033X NI: CL I, Div 2, GPS ABCD T6...T1 DIP: CL II,III, Div 2, GPS EFG T6...T3B Type 4X, IP65/67/68

#### Transmitter

##### FET632 Series

For additional information on FET632 Series transmitter please refer to:

Ex Safety Instruction  
 SI/FEP630/FEH630/FM/CSA-EN

Operating Instruction  
 OI/FEP630/FEH630-EN

## 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
FMus Div 1 (USA)	FM19US0061X
FMus Div 2 (USA)	FM19US0061X
cFM Div 1 (Canada)	FM19CA0033X
cFM Div 2 (Canada)	FM19CA0033X

**Table 2** Validity range

Model	Operation in zone	Electrical connection and explosion protection data
		Chapter
FEM630	FEM631-F1	Div. 1
	FEM631-F2	Div. 2
	FEM632-F1	Div. 1
	FEM632-F2	Div. 2

**Table 3** Overview

### Note

All documentation, declarations of conformity, and certificates are available in ABB's download area.

[www.abb.com/flow](http://www.abb.com/flow)

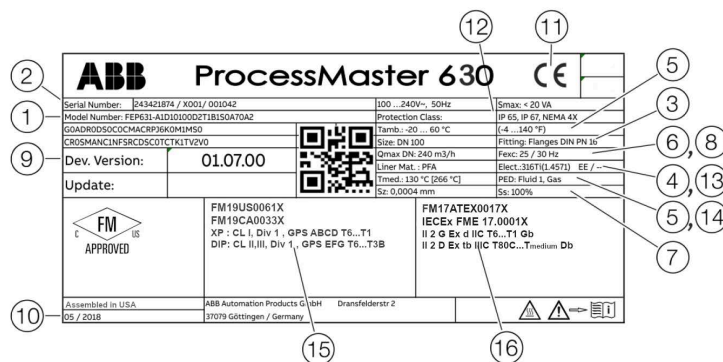
## 3 Name plate

### Device identification – name plate

#### Note

The name plate shown is an example.

The name plate attached to the device can differ from this representation.



- ① Model number (for more detailed information about the technical design, refer to the data sheet or the order confirmation)
- ② Order number/serial number for identification by the manufacturer
- ③ Meter size and nominal pressure rating
- ④ Material: Flange/liner/electrode
- ⑤  $T_{med}$  = maximum permissible measuring medium temperature  
 $T_{amb}$  = maximum permissible ambient temperature
- ⑥ Calibration value  $Q_{max}$ , DN
- ⑦ Calibration value  $S_s$  (span)  
Calibration value  $S_z$  (zero point)
- ⑧ Excitation frequency of the sensor
- ⑨ Software version
- ⑩ Year of manufacture
- ⑪ CE mark (Pending)
- ⑫ IP rating in accordance with EN 60529
- ⑬ Supplementary information:  
EE = grounding electrodes,  
TFE = partial filling electrode
- ⑭ Marking indicating whether the pressure equipment is in the scope of the Pressure Equipment Directive.
- ⑮ Ex marking in accordance with FM (example)
- ⑯ Ex marking in accordance with ATEX/IECEx (example - pending)

**Figure 1** Name plate (example)

## 4 Housing

### Opening and closing the housing

#### **⚠ DANGER**

**Danger of explosion if the device is operated with the transmitter housing or terminal box open!**

Before opening the transmitter housing or the terminal box, note the following points:

- A valid fire permit must be present.
- Make sure that there is no explosion hazard.
- Switch off the power supply and wait for  $t > 20$  minutes before opening.

#### **⚠ WARNING**

**Risk of injury due to live parts!**

When the housing is open, explosion protection and contact protection is not provided and EMC protection is limited.

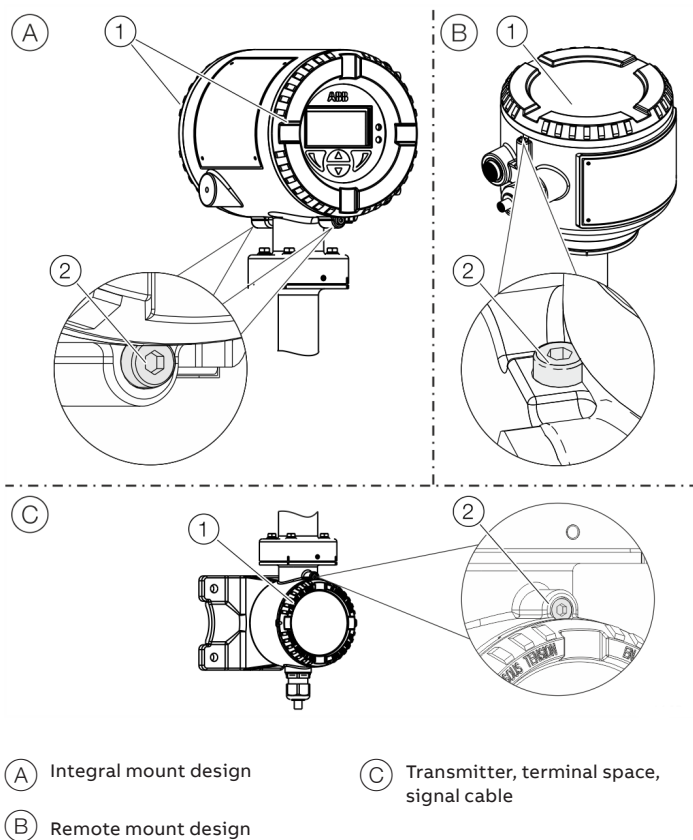
- Before opening the housing, switch off the power supply.

#### Dual- compartment housing

#### **NOTICE**

**Potential adverse effect on the IP rating**

- Check the O-ring gasket for damage and replace it if necessary before closing the housing cover.
- Check that the O-ring gasket is properly seated when closing the housing cover.



**Figure 2 Cover lock (example)**

#### **Open the housing:**

- 1 Release the cover lock by screwing in the Allen screw (2).
- 2 Unscrew cover (1).

#### **Close the housing:**

- 1 Screw on the cover (1).
- 2 After closing the housing, lock the cover by unscrewing the Allen screw (2).

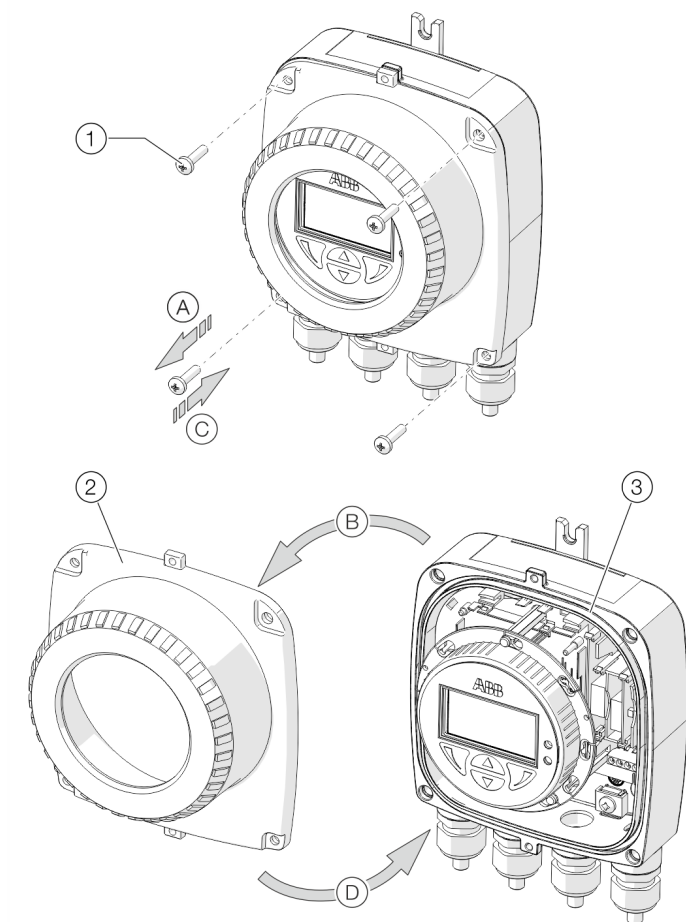
## ...4 Housing

### Single-compartment housing

#### NOTICE

##### Potential adverse effect on the IP rating

- Check the gasket for damage and replace it if necessary before closing the housing cover.
- Check that the gaskets are properly seated when closing the housing cover.



① Cover screws

③ Gasket

② Transmitter housing cover

Figure 3 Open/close single-compartment housing

Open transmitter housing: Perform steps (A) and (B).

Close transmitter housing: Perform steps (C) and (D).

### Rotating the transmitter housing and LCD display

Depending on the installation position, the transmitter housing or LCD display can be rotated to enable horizontal readings.

#### Transmitter housing

#### ⚠ DANGER

##### Damaging the device carries a risk of explosion!

When the screws for the transmitter housing are loosened, the explosion protection is suspended.

Tighten all screws prior to commissioning.

Never disconnect the transmitter housing from the sensor.

Only loosen the screws shown when rotating the transmitter housing!

Rotate transmitter housing: Perform steps (A) to (C).

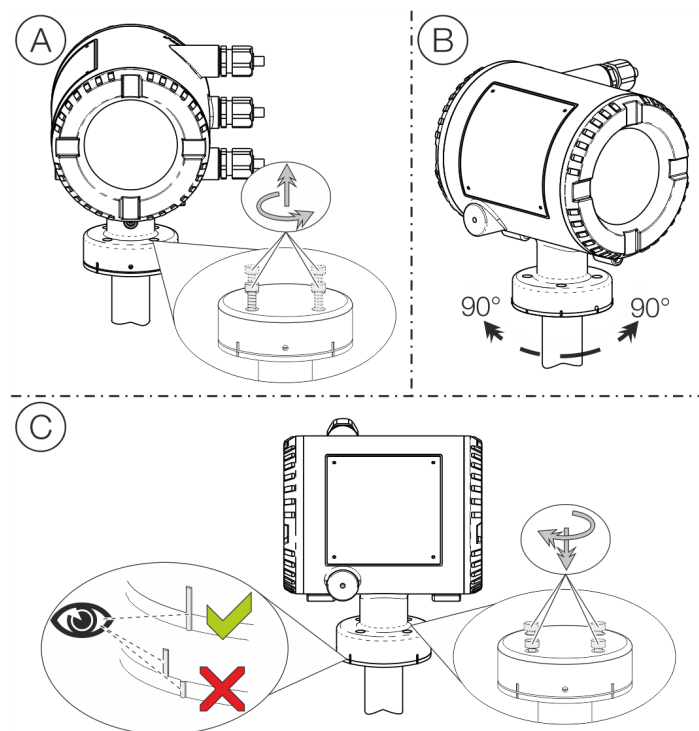


Figure 4 Rotate transmitter housing

## ...4 Housing

### Installation instructions

#### cFMus

The installation, commissioning, maintenance and repair of devices in areas with explosion hazard must only be carried out by appropriately trained personnel.

The operator must strictly observe the applicable national regulations with regard to installation, function tests, repairs, and maintenance of electrical devices. (for example, NEC, CEC).

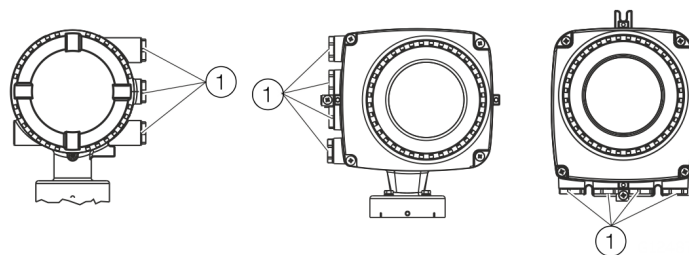
#### Use in areas exposed to combustible dust

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.
 

FEM631	80 °C (176 °F)
FEM632	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 Class II, Class III.
- In potentially explosive atmospheres, the signal cable must measure at least 5 m (16.40 ft).

### Cable entry



① Transport protection plugs

**Figure 5 Cable entry**

The devices are delivered with ½ in NPT or PF ½ in threads with transport protection plugs.

Unused cable entries must be sealed off prior to commissioning using either approved pipe fittings or cable glands in accordance with national regulations (NEC, CEC). Make sure that the pipe fittings, cable glands and, if applicable, sealing plugs are installed properly and tight.

If the device is to be operated in areas with combustible dusts, a threaded pipe connection or cable gland with suitable approval must be used.

The use of standard cable glands and seals is prohibited.

Any unused cable entries must be sealed before commissioning in accordance with the applicable standards.

#### Note

Devices which are certified for use in North America are supplied with a ½ in NPT thread only and without cable glands.



## ...4 Housing

### Electrical connections

#### Temperature resistance for the connecting cable

The temperature at the cable entries of the device is dependent on the measuring medium temperature  $T_{\text{medium}}$  and the ambient temperature  $T_{\text{amb}}$ .

For the electrical connection of the device, use only cables with sufficient temperature resistance in accordance with the following table.

Device in integral mount design	
$T_{\text{amb}}$	Temperature resistance
$\leq 50\text{ °C}$ ( $\leq 122\text{ °F}$ )	$\geq 60\text{ °C}$ ( $\geq 140\text{ °F}$ )
$\leq 60\text{ °C}$ ( $\leq 140\text{ °F}$ )	$\geq 70\text{ °C}$ ( $\geq 158\text{ °F}$ )
Model in remote mount design	
$T_{\text{amb}}$	Temperature resistance
$\leq 50\text{ °C}$ ( $\leq 122\text{ °F}$ )	$\geq 70\text{ °C}$ ( $\geq 158\text{ °F}$ )
$\leq 60\text{ °C}$ ( $\leq 140\text{ °F}$ )	$\geq 80\text{ °C}$ ( $\geq 176\text{ °F}$ )

#### Grounding

The sensor must be grounded in accordance with the applicable international standards.

Perform grounding of the device in accordance with **Electrical connections** on page 16.

In accordance with NEC standards, an internal ground connection is present in the device between the sensor and the transmitter.

Perform grounding of the device in accordance with **Electrical connections** on page 16.

#### Ethernet

The output circuits allow for different topologies:

- Daisy Chain
- Star
- Ring

### Process sealing

In accordance with the 'North American Requirements for Process Sealing between Electrical Systems and Flammable or Combustible Process Fluids'.

#### Note

The device is suitable for use in Canada.

A maximum surface temperature of 165 °C (329 °F) must not be up-scaled when used in Class II, Groups E, F and G.

All cable conduits should be sealed from the device within a distance of 18 in (457 mm).

Among other things, devices with cable conduits are connected to the electrical installation which makes it possible for measuring media to reach the electric system.

To prevent process media from seeping into the electrical installation, the instruments are equipped with process seals which meet the requirements of ANSI / ISA 12.27.01.

The flow measurement devices are designed as 'single seal devices' and are suited for the measurement of non-flammable fluids.

In accordance with the requirements of standard ANSI/ISA 12.27.01, the existing operating limits of temperature, pressure and pressure bearing parts must be reduced to the following limit values:

### NOTICE

- It is not permitted to combine different network topologies.
- The Plug-in Card for Ethernet is available for installations in Div2.
- The rated voltage of the non-intrinsically safe circuits is  $U_M = 57\text{ V}$ .

...4    **Housing**

...**Process sealing**

Max. permissible operating temperature in acc.  
with ISA12.27.01

Liner material	Nominal diameter	Max .operating temperature in acc. with ISA12.27.01
ETFE	DN03 to 100	-25°C to 130 °C (-13 °F to 266 °F)

The operating temperature of the devices is determined by the  
fluid temperature and the ambient temperature

Max. permissible nominal pressure rating in acc.  
with ISA12.27.01

Model	Nominal diameter	Max .nominal pressure
FEM	DN03 to DN100	ASME CL 150, CL 300

## 5 Installing the plug-in cards

### WARNING

#### Loss of Ex Approval!

Loss of Ex Approval due to retrofitting of plug-in cards on devices for use in potentially explosive atmospheres.




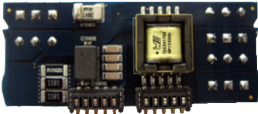
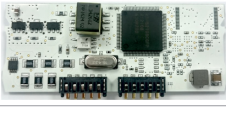
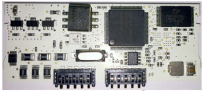
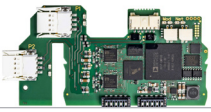

- Devices for use in potentially explosive atmospheres may not be retrofitted with plug-in cards.
- If devices are to be used in potentially explosive atmospheres, the required plug-in cards must be specified when the order is placed.

#### 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!

#### Optional plug-in cards

The transmitter has two slots (OC1, OC2) into which plug-in cards can be inserted to extend 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	Number*
	Current output, 4 to 20 mA passive (red) Order no.: 3KQZ400029U0100	Maximum of two plug-in cards
	Passive digital output (green) Order no.: 3KQZ400030U0100	Maximum of one plug-in card
	Passive digital input (yellow) Order no.: 3KQZ400032U0100	Maximum of one plug-in card
	Loop power supply 24 V DC (blue) Order no.: 3KQZ400031U0100	Maximum of one plug-in card
	Modbus RTU RS485 (white) Order no.: 3KQZ400028U0100	Maximum of one plug-in card
	PROFIBUS DP (white) Order no.: 3KQZ400027U0100	Maximum of one plug-in card
	Ethernet Order no.: 3KQZ400037U0100	Maximum of one plug-in card
	Power over Ethernet (POE) Order no.: 3KQZ400039U0100	Maximum of one plug-in card

\* The 'Number' column indicates the maximum number of plug-in cards of the same type that can be used.

6 Operation in Div.1

Electrical connections

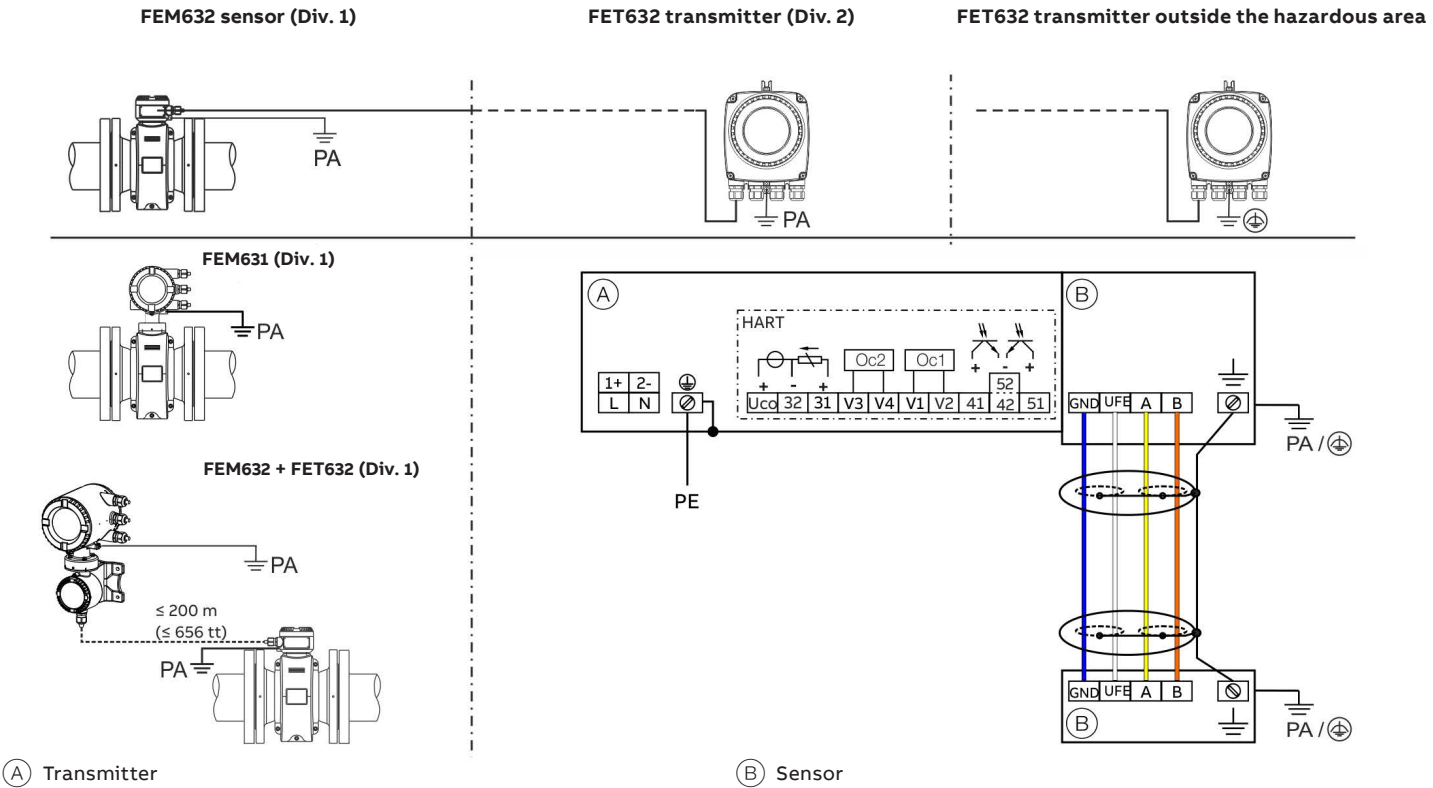


Figure 7 Electrical connections

**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 Current output 4 to 20 mA/HART output, passive
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 V3/V4	Plug-in card, slot OC1 Plug-in card, slot OC2 Plug-in cards may not be retrofitted in devices with explosion protection on-site – loss of Ex Approval.


## ...6 Operation in Div.1

### ...Electrical connections

Connections for inputs and outputs

#### 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 <sub>FE</sub>	Sensor power supply
GND	Ground
A	Data line
B	Data line
	Functional earth/shielding

### Electric data for operation in Div. 1

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<sub>co</sub> can be operated on-site in active or passive mode through appropriate switching.

Model: FEM631	Type of protection													
Outputs on basic device	'XP'		'IS'											
	U <sub>M</sub> [V]	I <sub>M</sub> [A]	U <sub>o</sub>	U <sub>i</sub> [V]	I <sub>o</sub> [mA]	I <sub>i</sub> [mA]	P <sub>o</sub> [mW]	P <sub>i</sub> [mW]	C <sub>o</sub> [nF]	C <sub>i</sub> [nF]	C <sub>OPA</sub> [nF]	C <sub>IPA</sub> [nF]	L <sub>o</sub> [mH]	L <sub>i</sub> [mH]
<b>Current/HART output 31/U<sub>co</sub>, active</b> Terminals 31/U <sub>co</sub>	30	0.2	30	30	115	115	815	815	10	10	5	5	0.08	0.08
<b>Current/HART output 31/32, passive</b> Terminals 31/32	30	0.2	—	30	—	115	—	815	—	27	—	5	0.08	0.08
<b>Digital output 41/42, active*</b> Terminals 41/42	30	0.1	27.8	30	119	30	826	225	20	20	29	29	0.22	0.22
<b>Digital output 41/42, passive</b> Terminals 41/42	30	0.1	—	30	—	30	—	225	—	27	—	5	—	0.08
<b>Digital output 51/52, active*</b> Terminals 51/52	30	0.1	27.8	30	119	30	826	225	20	20	29	29	0.22	0.22
<b>Digital output 51/52, passive</b> Terminals 51/52	30	0.1	—	30	—	30	—	225	—	27	—	5	—	0.08

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

...6    Operation in Div. 1

...Electric data for operation in Div. 1

Plug-in cards

Model: FEM631	Type of protection														
Plug-in cards	‘XP’		‘IS’												
	U <sub>M</sub> [V]	I <sub>M</sub> [A]	U <sub>O</sub> [V]	U <sub>I</sub> [V]	I <sub>O</sub> [mA]	I <sub>I</sub> [mA]	P <sub>O</sub> [mW]	P <sub>I</sub> [mW]	C <sub>O</sub> [nF]	C <sub>I</sub> [nF]	C <sub>OPA</sub> [nF]	C <sub>IPA</sub> [nF]	L <sub>O</sub> [mH]	L <sub>I</sub> [mH]	
Current output V3/V4, active* Terminals V3/V4 and V1/V2*	30	0.1	27.8	30	119	30	826	225	29	29	117	117	0.4	0.4	
Current output V1/V2, passive** Current output V3/V4, passive** Terminals V1/V2** or V3/V4**	30	0.1	—	30	—	68	—	510	—	45	—	59	—	0.27	
Digital output V3/V4, active* Terminals V3/V4 and V1/V2*	30	0.1	27.8	30	119	68	826	225	17	17	31	31	0.4	0.4	
Digital output V1/V2, passive** Digital output V3/V4, passive** Terminals V1/V2** or V3/V4**	30	0.1	—	30	—	30	—	225	—	13	—	16	—	0.27	
Digital input V3/V4, active* Terminals V3/V4 and V1/V2	30	0.1	27.8	30	119	3.45	826	25.8	17	17	31	31	0.4	0.4	
Digital input V1/V2, passive* Digital input V3/V4, passive* Terminals V1/V2** or V3/V4**	30	0.1	—	30	—	3.45	—	25.8	—	13	—	16	—	0.27	
Modbus card (RTU) Terminals V1/V2	30	0.1	4.2	4.2	150	150	150	150	5300	5300	0.06	0.06	0.09	0.09	
Profibus DP card Terminals V1/V2	30	0.1	4.2	4.2	150	150	150	150	5300	5300	0.06	0.06	0.09	0.09	

\*    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.

## ...6 Operation in Div.1

### 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.

Devices connected to the relevant equipment must not be operated at over 250 Vrms AC or 250 V DC to ground.

Installation in the USA or Canada must comply with the relevant requirements of the National Electrical Code® (ANSI/NFPA-70 (NEC®) and the installations in Canada shall comply with the relevant requirements of the Canadian Electrical Code (CSA C22.1).

### Specific Conditions of use:

The painted surface of the FEM6, ProcessMaster may store electrostatic charge and become a source of ignition in applications with a low relative humidity <~30% relative humidity where the painted surface is relatively free of surface contamination such as dirt, dust, or oil.

- Guidance on protection against the risk of ignition due to electrostatic discharge can be found in IEC TR60079-32-2.
- Cleaning of the painted surface should only be done with a damp cloth.

For installations in flammable dust, the cable entries shall be fitted with an appropriate cable entry device meeting the requirements of IP6x fitted with a gasket or seal between the cable entry device and the wall of the enclosure.

For Integral and Remote versions having exposed electrodes in the process shall be used in a nonflammable liquid process only.

The flamepaths of the equipment are not intended to be repaired. Consult the manufacturer if repair of the flamepath joints is necessary.

Refer to manufacturer's instructions for ambient temperature, process temperature and temperature classification details.

For the installation of FEM631F2 Models where Model code item r = E2, E3 or E4 the temperature code is limited to a minimum of T4.

## ...6    Operation in Div .1

### Temperature data

#### Surface temperature

Model name	Surface temperature
FEM632	T 80 °C (176 °F)
FEM631	T 80 °C (176 °F)

The surface temperature depends on the fluid temperature.  
With increasing measuring medium temperature >60 °C (140 °F) or >80 °C (176 °F), the surface temperature also increases to the level of the measuring medium temperature.

#### Note

The maximum permissible measuring medium temperature depends on the liner material, and is limited by the operating values in the following tables.

#### Measuring medium temperature as a function of liner material

Model	Process connection	Lining Material	Fluid temperature (operating values)	
			Minimum	Maximum
FEM630	Wafer type	ETFE	−25 °C (−13 °F)	130 °C (266 °F)



## ...6 Operation in Div.1

### Temperature data

Measuring medium temperature (Ex Data) for ProcessMaster Model FEM631 / FEM632



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
NT	T1	130 °C	130 °C	130 °C
NT	T2	130 °C	130 °C	130 °C
NT	T3	130 °C	130 °C	130 °C
NT	T4	130 °C	130 °C	130 °C
NT	T5	95 °C	95 °C	95 °C
NT	T6	80 °C	80 °C	40 °C

\* Low-temperature version (option)

NT standard version,  $T_{\text{medium}}$  maximum 130 °C (266 °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  $\leq 50$  °C the cable must be suited for at least 60 °C
- At an ambient temperature  $\leq 60$  °C the cable must be suited for at least 70 °C

7    Operation in Div.2

Electrical connections

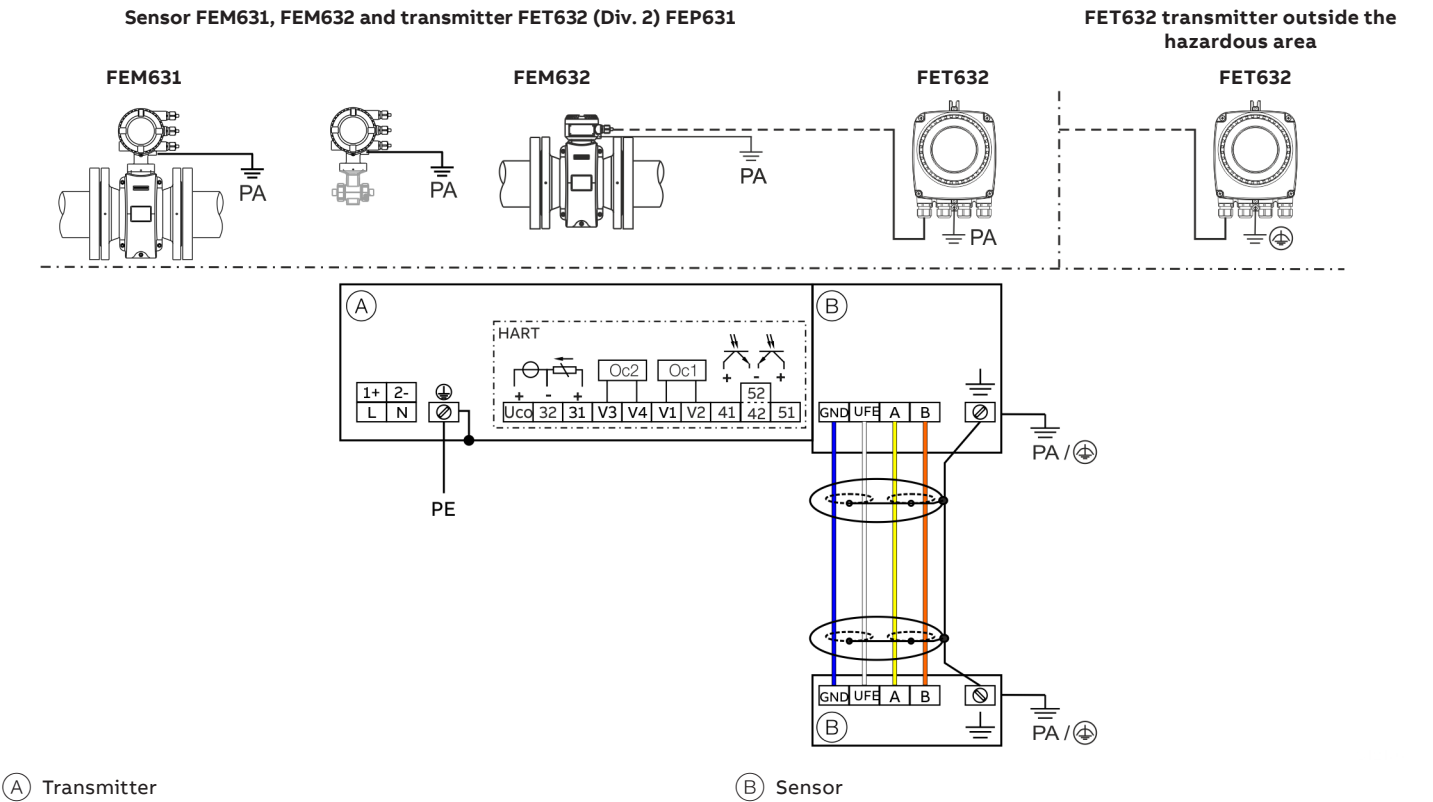


Figure 8    Electrical connections

**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

## ...7 Operation in Div .2

### ...Electrical connections


#### 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.

#### 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 <sub>FE</sub>	Sensor power supply
GND	Ground
A	Data line
B	Data line
	Functional earth/shielding

## ...7 Operation in Div .2

### Electric data for operation in 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: FEM631**

Outputs on basic device	Operating values (general)		Type of protection Nonincendive	
	U <sub>N</sub>	I <sub>N</sub>	U <sub>N</sub>	I <sub>N</sub>
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: FEM631**

Plug-in cards	Operating values (general)		Type of protection Nonincendive	
	U <sub>N</sub>	I <sub>N</sub>	U <sub>N</sub>	I <sub>N</sub>
<b>Current output, active*</b> Terminals V1/V2 or V3/V4**	30 V	30 mA	30 V	30 mA
<b>Current output, passive</b> Terminals V1/V2 or V3/V4**	30 V	30 mA	30 V	30 mA
<b>Digital output, active*</b> Terminals V1/V2 or V3/V4**	30 V	30 mA	30 V	30 mA
<b>Digital output, passive</b> Terminals V1/V2 or V3/V4**	30 V	30 mA	30 V	30 mA
<b>Digital input, active*</b> Terminals V1/V2 or V3/V4**	30 V	3.45 mA	30 V	3.45 mA
<b>Digital input, passive</b> Terminals V1/V2 or V3/V4**	30 V	3.45 mA	30 V	3.45 mA
<b>Modbus Card (RTU)</b> Terminals V1/V2	30 V	30 mA	30 V	30 mA
<b>Profibus DP card</b> Terminals V1/V2	30 V	30 mA	30 V	30 mA
<b>Ethernet card</b> Port 1: Pin X1...X4 Port 2: Pin X5...X8	57 V	417 mA	57 V	417 mA
<b>Ethernet Card in conjunction with Power over Ethernet (POE Card)</b> 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.

## ...7 Operation in Div .2

### ...Electrical data for operation in Div .2

#### 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.

Installations in the US shall comply with the relevant requirements of the National Electrical Code® (ANSI/NFPA-70 (NEC®) and, Installations in Canada shall comply with the relevant requirements of the Canadian Electrical Code (CSA C22.1).

#### Specific Conditions of use:

The painted surface of the FEM6, ProcessMaster may store electrostatic charge and become a source of ignition in applications with a low relative humidity <~30% relative humidity where the painted surface is relatively free of surface contamination such as dirt, dust, or oil.

- Guidance on protection against the risk of ignition due to electrostatic discharge can be found in IEC TR60079-32-2.
- Cleaning of the painted surface should only be done with a damp cloth.

For installations in flammable dust, the cable entries shall be fitted with an appropriate cable entry device meeting the requirements of IP6x fitted with a gasket or seal between the cable entry device and the wall of the enclosure.

For Integral and Remote versions having exposed electrodes in the process shall be used in a nonflammable liquid process only.

The flamepaths of the equipment are not intended to be repaired. Consult the manufacturer if repair of the flamepath joints is necessary.

Refer to manufacturer's instructions for ambient temperature, process temperature and temperature classification details.

For the installation of FEM631F2 Models where Model code item r = E2, E3 or E4 the temperature code is limited to a minimum of T4.

## Temperature data

### WARNING

#### T-Class for Dust US and Canada information according NEC2017

The maximum temperature cannot exceed 165 °C (329 °F) under any circumstances where a carbonaceous dust or dust likely to carbonize is present.

- **For combustible dusts**, less than the lower of either the layer or cloud ignition temperature of the specific combustible dust. For organic dusts that may dehydrate or carbonize, the temperature marking shall not exceed the lower of either the ignition temperature or 165 °C (329 °F).
- **For ignitable fibers/flyings**, less than 165 °C (329 °F) for equipment that is not subject to overloading, or 120 °C (248 °F) for equipment that may be overloaded (such as motors or power transformers).

## ...7    Operation in Div .2

### Temperature data

#### Surface temperature

Model name	Surface temperature
FEM632	T 80 °C (176 °F)
FEM631	T 80 °C (176 °F)

The surface temperature depends on the fluid temperature.  
With increasing measuring medium temperature >60 °C (140 °F) or >80 °C (176 °F), the surface temperature also increases to the level of the measuring medium temperature.

#### Note

The maximum permissible measuring medium temperature depends on the liner material, and is limited by the operating values in the following tables.

#### Measuring medium temperature as a function of liner material

Model	Process connection	Lining Material	Fluid temperature (operating values)	
			Minimum	Maximum
FEM630	Wafer type	ETFE	-25 °C (-13 °F)	130 °C (266 °F)

## ...7 Operation in Div .2

### ...Temperature data

Measuring medium temperature (Ex Data) for ProcessMaster Model FEM631

Single-compartment housing



Dual-compartment housing



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
NT	T1	130 °C	130 °C	130 °C
NT	T2	130 °C	130 °C	130 °C
NT	T3	130 °C	130 °C	130 °C
NT	T4	130 °C	130 °C	130 °C
<b>Note:</b> 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** —***
NT	T6	80 °C	—	—

\* Low-temperature version (option)

\*\* Single-compartment housing

\*\*\* Dual-compartment housing

NT standard version,  $T_{\text{medium}}$  maximum 130 °C (266 °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 of 50 °C the cable must be suited for at least 80 °C
- At an ambient temperature of 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

...7    Operation in Div .2

...Temperature data

Measuring medium temperature (Ex Data) for ProcessMaster Model FEM632



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
NT	T1	130 °C	130 °C	130 °C
NT	T2	130 °C	130 °C	130 °C
NT	T3	130 °C	130 °C	130 °C
NT	T4	130 °C	130 °C	130 °C
NT	T5	95 °C	95 °C	95 °C
NT	T6	80 °C	80 °C	40 °C

\* Low-temperature version (option)

NT standard version, T<sub>medium</sub> maximum 130 °C (266 °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



## 8 Commissioning

### Checks before commissioning

The following items must be checked before commissioning:

- The power supply must be switched off.
- The power supply used must match the information on the name plate.
- The connection assignment must be set up in accordance with the electrical connection.
- Sensor and transmitter must be grounded properly.
- The temperature limit values must be observed.
- The transmitter must be installed at a location largely free of vibrations.
- The housing cover and cover lock must be sealed before powering-up the power supply.
- For devices with a remote mount design and a measuring accuracy of 0.2 % of the measured value, make sure that the sensor and the transmitter have been correctly assigned.
- For this purpose, the final characters X1, X2, etc. are printed on the name plates of the sensors. The final characters Y1, Y2, etc. are printed on the transmitters.
- Devices with final characters X1/Y1 or X2/Y2 belong together.
- Any unused glands should be sealed in accordance with IEC 60079 prior to commissioning using the plugs supplied. Also refer to Cable glands

#### Note

Commissioning and operation should be performed in accordance with ATEX 137 or BetrSichV - German Industrial Safety Regulation (EN60079-14). Only properly trained personnel are authorized to carry out commissioning in Ex areas.

### Output configuration for NAMUR switching amplifier

#### 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

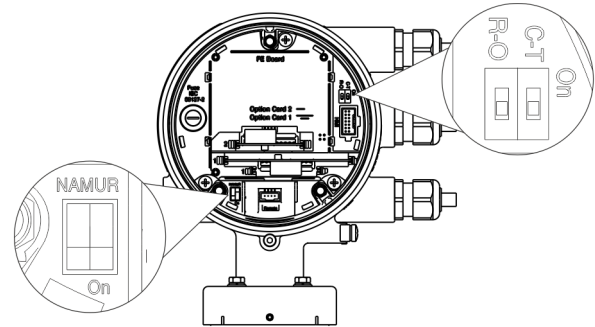
#### Configuring the digital outputs

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).

#### Note

The outputs' type of protection remains unaffected by this. The devices connected to these outputs must conform to the applicable regulations for explosion protection.



① NAMUR DIP switch

② Write protection DIP switch

**Figure 9 Position of the DIP switches**

#### Configuration of digital outputs 41/42 and 51/52

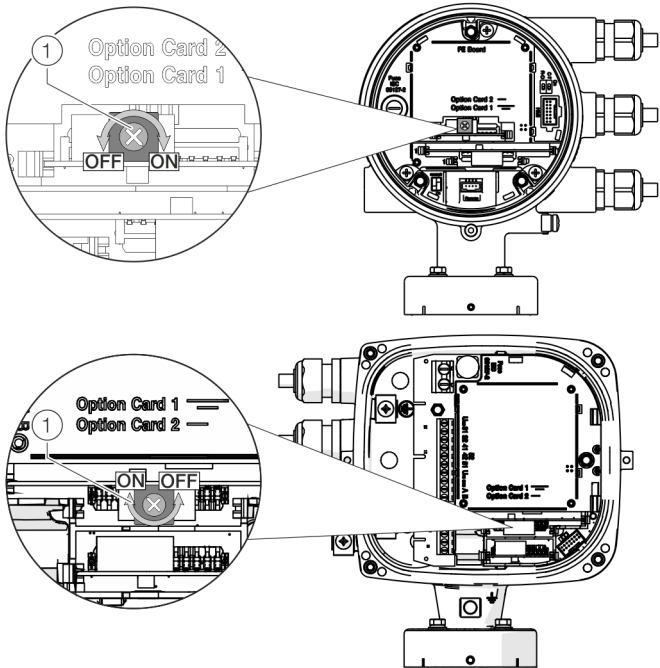
The configuration (NAMUR, optoelectronic coupler) for the digital outputs on the basic device is set via DIP switches in the transmitter.

Number	Function
On	Digital output 41/42 and 51/52 as NAMUR output
Off	Digital output 41/42 and 51/52 as optoelectronic coupler output

## ...8 Commissioning

### ...Output configuration for NAMUR switching amplifier

Configuration of digital outputs V1/V2 or V3/V4



① NAMUR rotary switch

**Figure 10** Position of rotary switch on the plug-in card

The configuration (NAMUR, optoelectronic coupler) for the digital output on the plug-in card is set via a rotary switch on the plug-in card.

Number	Function
On	Digital output V1/V2 or V3/V4 as NAMUR output
Off	Digital output V1/V2 or V3/V4 as optoelectronic coupler output

Configure the digital outputs as described:

- 1 Switch off the supply power and wait at least 20 minutes before the next step.
- 2 Loosen the cover lock, open the housing cover and move the switch to the desired position.
- 3 Close the housing cover lock by unscrewing the screw.

## 10 Maintenance

### WARNING

#### Loss of Ex-approval!

Loss of Ex approval due to replacement of components in devices for use in potentially explosive atmospheres.

- Devices for use in potentially explosive atmospheres may be serviced and repaired by qualified ABB personnel only.
- For measuring devices for potentially explosive atmospheres, observe the relevant operator guidelines.

### CAUTION

#### Risk of burns due to hot measuring media

The device surface temperature may exceed 70 °C (158 °F), depending on the measuring medium temperature!

- Before starting work on the device, make sure that it has cooled sufficiently.

## Sensor

The flowmeter essentially requires no maintenance.

The following items should be checked annually:

- Ambient conditions (air circulation, humidity),
- Tightness of the process connections,
- Cable entries and cover screws,
- Operational reliability of the power supply, lightning protection, and station ground.

## Cleaning

When cleaning the exterior of meters, make sure that the cleaning agent used does not corrode the housing surface and the seals.

To avoid static charge, a damp cloth must be used for cleaning.

## 11 Repair

### Safety instructions

### DANGER

#### Danger of explosion if the device is operated with the transmitter housing or terminal box open!

While using the device in potentially explosive atmospheres before opening the transmitter housing or the terminal box, note the following points:

- A valid fire permit must be present.
- Make sure that no flammable or hazardous atmospheres are present.

### WARNING

#### Risk of injury due to live parts!

When the housing is open, contact protection is not provided and EMC protection is limited.

- Before opening the housing, switch off the power supply.

### WARNING

#### Loss of Ex-approval!

Loss of Ex approval due to replacement of components in devices for use in potentially explosive atmospheres.

- Devices for use in potentially explosive atmospheres may be serviced and repaired by qualified ABB personnel only.
- For measuring devices for potentially explosive atmospheres, observe the relevant operator guidelines.

### CAUTION

#### Risk of burns due to hot measuring media

The device surface temperature may exceed 70 °C (158 °F), depending on the measuring medium temperature!

- Before starting work on the device, make sure that it has cooled sufficiently.

### NOTICE

#### Damage to components!

The electronic components of the printed circuit board can be damaged by static electricity (observe ESD guidelines).

- Make sure that the static electricity in your body is discharged before touching electronic components.

### Spare parts

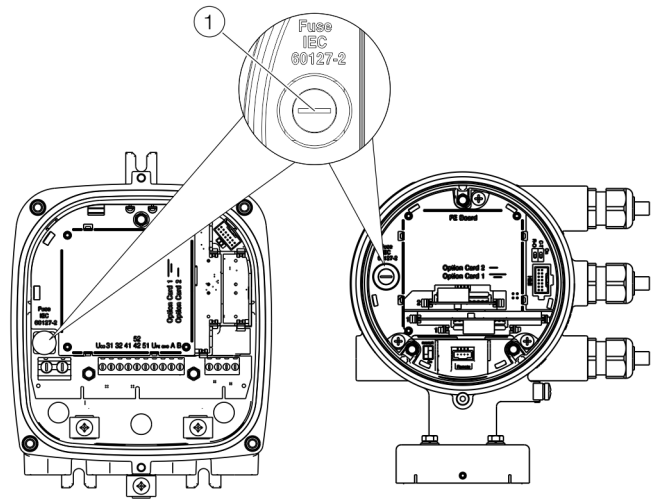
Repair and maintenance activities may only be performed by authorized customer service personnel.  
When replacing or repairing individual components, use original spare parts.

**Note**  
Spare parts can be ordered from ABB Service.  
[www.abb.com/contacts](http://www.abb.com/contacts)

### Replacing the fuse

NOTICE

If the O-ring gasket is seated incorrectly or damaged, this may have an adverse effect on the housing protection class .  
Follow the instructions in **Opening and closing the housing** on page 12 to open and close the housing safely.



1 Fuse holder

Figure 11 Fuse holder position

There is a fuse in the transmitter housing.

Power supply transmitter	16 to 30 V DC	100 to 240 V AC
Rated current of fuse	1.25 A	0.8 A
Nominal voltage of fuse	250 V AC	250 V AC
Design	Device fuse 5 x 20 mm	
Breaking capacity	1500 A at 250 V AC	
Ordering number	3KQR000757U0100	3KQR000757U0200

Perform the following steps to replace the fuse:

- 1 Switch off the power supply.
- 2 Open the transmitter housing.
- 3 Pull out the defective fuse and insert a new fuse.
- 4 Closing the transmitter housing.
- 5 Switch on the power supply.
- 6 Check that the device is working correctly.

If the fuse blows again on activation, the device is defective and must be replaced.

## ...11 Repair

### Replacing the frontend board

Integral mount design

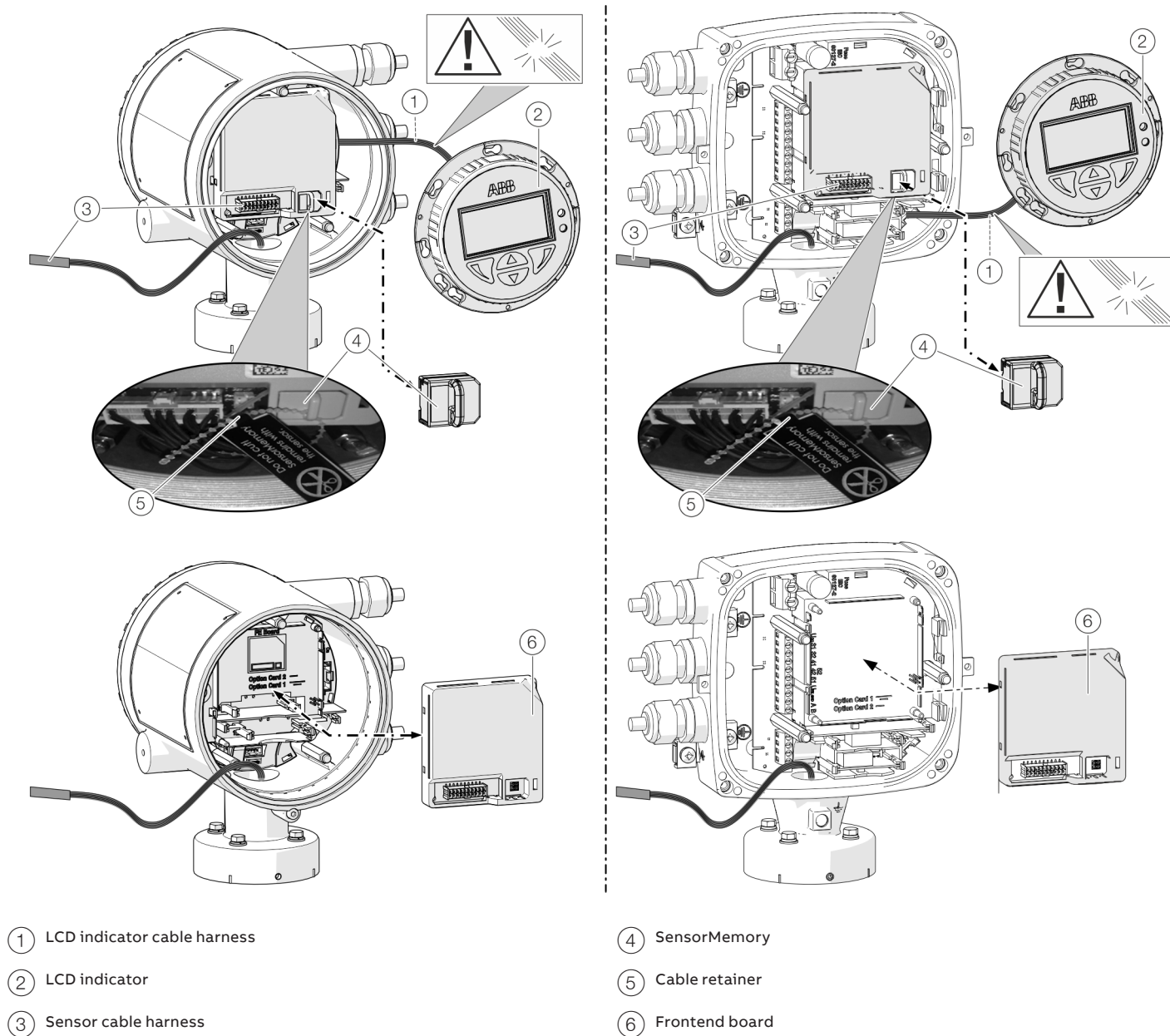


Figure 12 Replacing LCD indicator and frontend board (example)

### NOTICE

If the O-ring gasket is seated incorrectly or damaged, this may have an adverse effect on the housing protection class .

Follow the instructions in **Opening and closing the housing** on page 12 to open and close the housing safely.

## ...11 Repair

### Replacing the frontend board

#### Integral mount design

In the event of a fault, the frontend board can be replaced on flowmeters with an integral mount design.

Replace the frontend board as follows:

- 1** Switch off the power supply.
- 2** Unscrew/remove the cover.
- 3** Remove the LCD indicator. Ensure that the cable harness is not damaged.
- 4** Pull the connector out of the sensor cable harness.
- 5** Pull out the SensorMemory.

#### **Note**

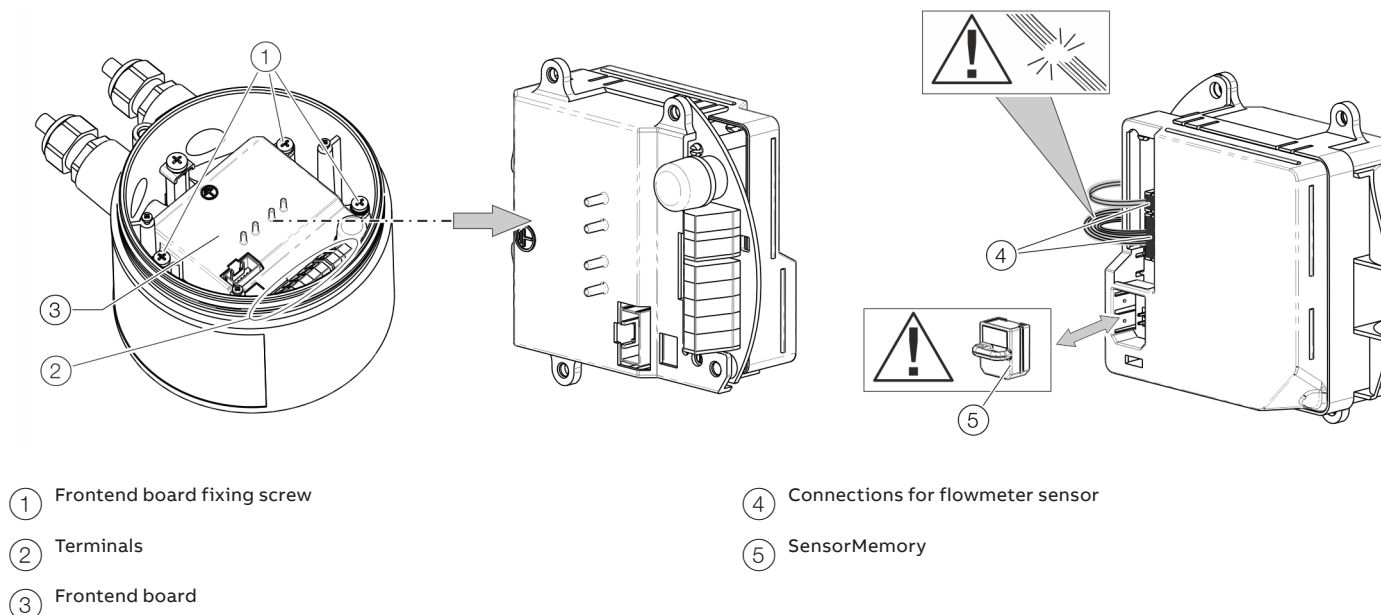
The SensorMemory is assigned to the sensor. The SensorMemory is therefore fastened to the sensor cable harness with a cable retainer. Ensure that the SensorMemory remains with the sensor and cannot be lost!

- 6** Pull the faulty frontend board out forwards.
- 7** Insert new frontend board.
- 8** Attach connector from the sensor cable harness.
- 9** Attach the SensorMemory.
- 10** Insert the LCD indicator and screw on/replace the cover.
- 11** Once the power supply is switched on, load the system data from the SensorMemory.

## ...11 Repair

### ...Replacing the frontend board

Remote mount design



**Figure 13** Replacing the frontend board (flowmeter sensor)

#### NOTICE

**If the O-ring gasket is seated incorrectly or damaged, this may have an adverse effect on the housing protection class .**

Follow the instructions in **Opening and closing the housing** on page 12 to open and close the housing safely.

The frontend board can be replaced in the event of a malfunction.

Replace the frontend board as follows:

- 1 Switch off the power supply.
- 2 Unscrew/remove the cover.
- 3 Loosen the fixing screws (3x) at the frontend board.
- 4 Remove the faulty frontend board.
- 5 Pull the connector out of the sensor cable harness. Ensure that the cable harness is not damaged.
- 6 Pull out the SensorMemory.

#### Note

The SensorMemory is assigned to the sensor. Ensure that the SensorMemory remains with the sensor and cannot be lost!

- 7 Insert the SensorMemory into the new frontend board.
- 8 Connect the plug of the sensor cable harness.
- 9 Insert the new frontend board and secure it with the fixing screws (3x).
- 10 After powering up the power supply, the transmitter automatically replicates the system data from the SensorMemory.

## Replacing the sensor

### WARNING

#### **Risk of injury due to process conditions .**

The process conditions, for example high pressures and temperatures, toxic and aggressive measuring media, can give rise to hazards when working on the device.

- Before working on the device, make sure that the process conditions do not pose any hazards.
- If necessary, wear suited personal protective equipment when working on the device.
- Depressurize and empty the device/piping, allow to cool and purge if necessary.

### NOTICE

**If the O-ring gasket is seated incorrectly or damaged, this may have an adverse effect on the housing protection class .**

Follow the instructions in **Opening and closing the housing** on page 12 to open and close the housing safely.

- 6 Unscrew/set down the cover once again
- 7 After powering-up the power supply, the transmitter automatically replicates the system data from the SensorMemory.

#### **Note**

The frontend board of the replacement sensor has a SensorMemory module.

The calibration and system data of the sensor is stored in the SensorMemory.

After powering-up the power supply, the transmitter automatically replicates the system data from the SensorMemory.

Replace the sensor as described below:

- 1 Switch off the power supply.
- 2 Unscrew/remove the cover.
- 3 Disconnect the signal cable (if necessary, remove the potting compound).
- 4 Install the new sensor in accordance with **Installation** in der Betriebsanleitung.
- 5 Complete the electrical connection in accordance with the **Electrical connections** in der Betriebsanleitung.

## Returning devices

Use the original packaging or a secure transport container of an appropriate type if you need to return the device for repair or recalibration purposes.

Fill out the return form (see **Return form** on page 47) and include this with the device.

In accordance with the EU Directive governing hazardous materials, the owner of hazardous waste is responsible for its disposal or must observe the following regulations for shipping purposes:

All devices delivered to ABB must be free from any hazardous materials (acids, alkalis, solvents, etc.).



## 12 Recycling and disposal

### Dismounting

#### **WARNING**

##### **Risk of injury due to process conditions .**

The process conditions, for example high pressures and temperatures, toxic and aggressive measuring media, can give rise to hazards when dismantling the device.

- If necessary, wear suited personal protective equipment during disassembly.
- Before disassembly, make sure that the process conditions do not pose any safety risks.
- Depressurize and empty the device/piping, allow to cool and purge if necessary.

Bear the following points in mind when dismantling the device:

- Switch off the power supply.
- Disconnect electrical connections.
- Allow the device/piping to cool and depressurize and empty. Collect any escaping medium and dispose of it in accordance with environmental guidelines.
- Use suited tools to disassemble the device, taking the weight of the device into consideration.
- If the device is to be used at another location, the device should preferably be packaged in its original packing so that it cannot be damaged.
- Observe the notices in **Returning devices** on page 45.

### Disposal

#### **Note**



Products that are marked with the adjacent symbol may **not** be disposed of as unsorted municipal waste (domestic waste).

They should be disposed of through separate collection of electric and electronic devices.

This product and its packaging are manufactured from materials that can be recycled by specialist recycling companies.

Bear the following points in mind when disposing of them:

- As of 8/15/2018, this product will be under the open scope of the WEEE Directive 2012/19/EU and relevant national laws (for example, ElektroG - Electrical Equipment Act - in Germany).
- The product must be supplied to a specialist recycling company. Do not use municipal waste collection points. These may be used for privately used products only in accordance with WEEE Directive 2012/19/EU.
- If there is no possibility to dispose of the old equipment properly, our Service can take care of its pick-up and disposal for a fee.

To find your local ABB service contact visit:

[www.abb.com/contacts](http://www.abb.com/contacts)

or call +49 180 5 222 580

## 13 Additional documents

#### **Note**

All documentation, declarations of conformity, and certificates are available in ABB's download area.

[www.abb.com/flow](http://www.abb.com/flow)

## 13 Appendix

### Return form

#### Statement on the contamination of devices and components

Repair and/or maintenance work will only be performed on devices and components if a statement form has been completed and submitted.

Otherwise, the device/component returned may be rejected. This statement form may only be completed and signed by authorized specialist personnel employed by the operator.

#### Customer details:

Company:

Address:

Contact person:

Telephone:

Fax:

Email:

#### Device details:

Type:

Serial no.:

Reason for the return/description of the defect:

#### Was this device used in conjunction with substances which pose a threat or risk to health?

☐ Yes ☐ No

#### If yes, which type of contamination (please place an X next to the applicable items):

<input type="checkbox"/> biological	<input type="checkbox"/> corrosive/irritating	<input type="checkbox"/> combustible (highly/extremely combustible)
<input type="checkbox"/> toxic	<input type="checkbox"/> explosive	<input type="checkbox"/> other toxic substances
<input type="checkbox"/> radioactive		

#### Which substances have come into contact with the device?

1

2

3

We hereby state that the devices/components shipped have been cleaned and are free from any dangerous or poisonous substances.

Town/city, date

Signature and company stamp

Installation diagram FEM63\_

ORDINARY LOCATION  
GENERAL PURPOSE

ATEX: - Not Available  
IECEX: - Not Available

US: - Not Available  
CDN: - Not Available

HAZARDOUS LOCATION  
Division 2

ATEX: Not Available  
IECEX: Not Available

US: NI / I / 2 / ABCD & DIP / II, III / 1 / EFG  
CDN: I / 2 / ABCD & II, III / 1 / EFG

HAZARDOUS LOCATION  
Division 1

ATEX: Not Available  
IECEX: Not Available

US: XP-1S / I / 1 / ABCD & DIP / II, III / 1 / EFG  
CDN: XP-1S I / 1 / ABCD & DIP / II, III / 1 / EFG

**a**

**POWER SUPPLY**  
Non IS  
Terminals  
max 250Vrms

(1+) (L)  
(2) (N)  
(PE) (GND)

**b**

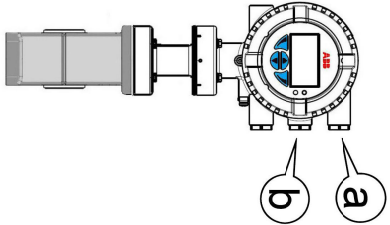
**SIGNAL DATA INPUT/OUTPUT**  
"IS" or "ia" if installed in Zone 1 or Division 1.  
In Zone 1 or Division 1 intrinsically safe supply required

(31) (32) (33) (34) (35) (36) (37) (38) (39) (40) (41) (42) (43) (44) (45) (46) (47) (48) (49) (50) (51)

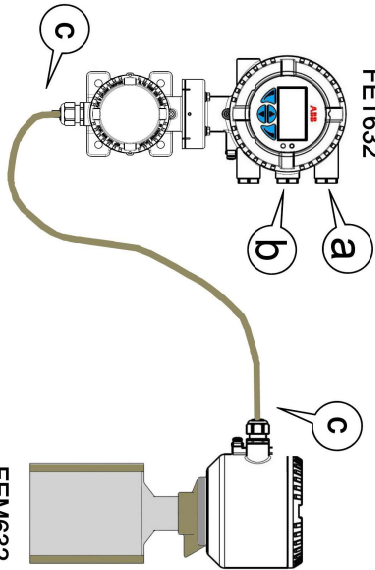
**c**

**SENSOR SIGNALS**  
Connection between sensor and associated FET63\_transmitter

(A) (B)  
(UPE) (GRN)



FEM631



FEM632

Reference: 3KXF000061G0009

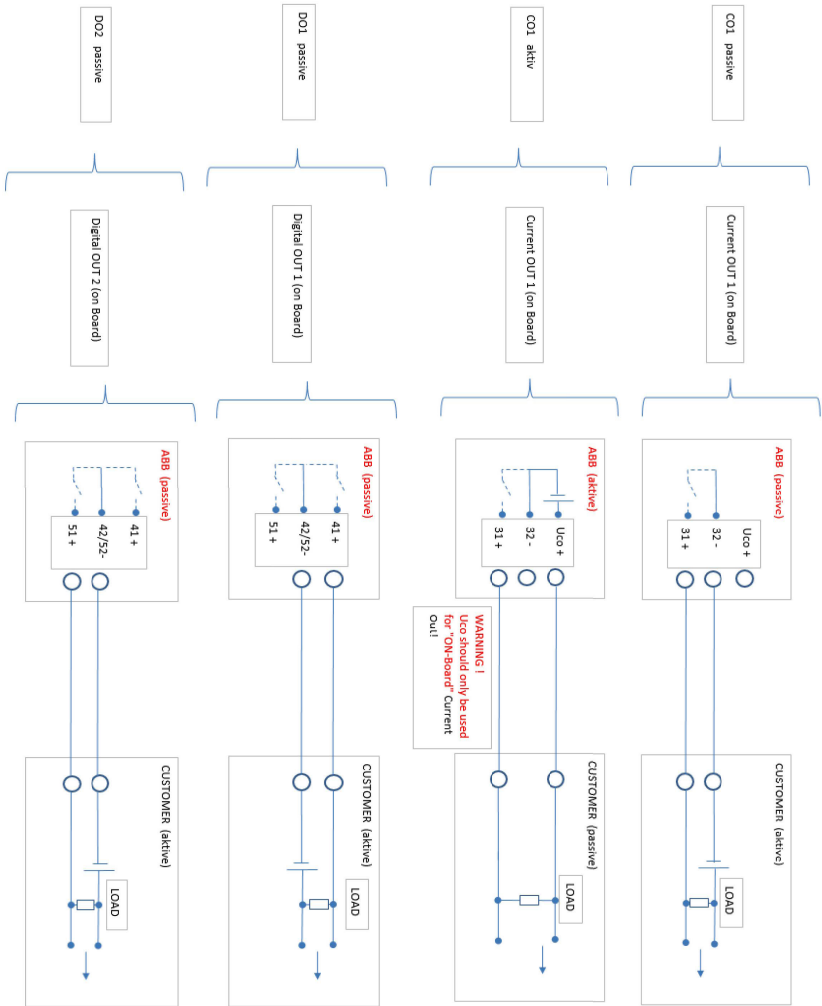
Revision				Date				ECR #				Initial Issue				Description			
0				3/22/19				1314											
DRAWN				S. Chiehdn				DATE				3/22/2019				APPROVED			
				D. Madden															
Title				FEM630 Flowmeter				Installation Diagram				No.				WIDM-10-0630ID			

Notes: US and Canadian application

- 1. THE INTRINSIC SAFETY ENTITY CONCEPT ALLOWS THE INTERCONNECTION OF TWO FM AND/OR CSA APPROVED INTRINSICALLY SAFE DEVICES WITH ENTITY PARAMETERS NOT SPECIALLY EXAMINED IN COMBINATION AS A SYSTEM WHEN:  $U_o \text{ OR } V_{oc} \text{ OR } V_t < V_{MAX}$ ,  $I_{sc} \text{ OR } I_t < I_{MAX}$ ,  $C_a \text{ OR } C_o > C_t + C_{cable}$ ,  $I_a \text{ OR } L_o > L_t + L_{cable}$ ,  $P_o < P_t$ .
- 2. DUST-TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND III ENVIRONMENTS.
- 3. CONTROL EQUIPMENT CONNECTED TO THE ASSOCIATED APPARATUS MUST NOT USE OR GENERATE MORE THAN 250 Vrms OR Vdc WITH RESPECT TO EARTH.
- 4. INSTALLATION FOR U.S. AND CANADIAN APPROVED EQUIPMENT SHOULD BE IN ACCORDANCE WITH ANSI/ISA RP12.6 „INSTALLATION OF INTRINSICALLY SAFE SYSTEMS FOR HAZARDOUS (CLASSIFIED) LOCATIONS“, THE NATIONAL ELECTRICAL CODE (ANSI/NFPA 70) SECTIONS 504, 505 AND THE CANADIAN ELECTRICAL CODE (C22.1-02).
- 5. THE CONFIGURATION OF ASSOCIATED APPARATUS MUST BE FM AND/OR CSA APPROVED UNDER ENTITY CONCEPT.
- 6. ASSOCIATED APPARATUS MANUFACTURER'S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS EQUIPMENT.
- 7. THE ASSOCIATED APPARATUS MUST BE INSTALLED IN ACCORDANCE WITH BARRIER MANUFACTURE'S INSTALLATION DIAGRAM
- 8. SELECTED ASSOCIATED APPARATUS MUST BE THIRD PARTY LISTED AS PROVIDING INTRINSICALLY SAFE CIRCUITS FOR THE APPLICATION. IT MUST MEET THE REQUIREMENTS LISTED IN TABLE OF THIS INSTALLATION DIAGRAM:

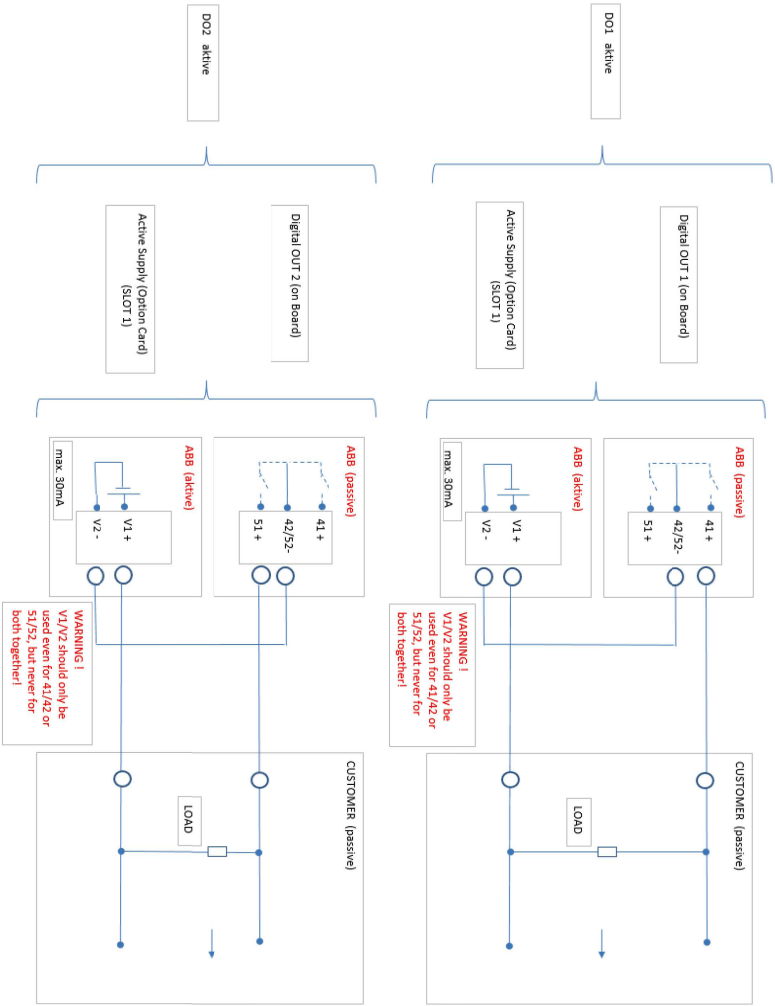
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S. Chiehdra		2019 All Rights reserved. Reproduction or distribution of the document is forbidden without permission	
Date		Title	
3/22/2019		FEM630 Flowmeter Installation Diagram	
Approved		No.	Sheet
D. Madden		WIDM-10-0630ID	2 of 10

Allowed I/O connections and OPTION CARD handling:



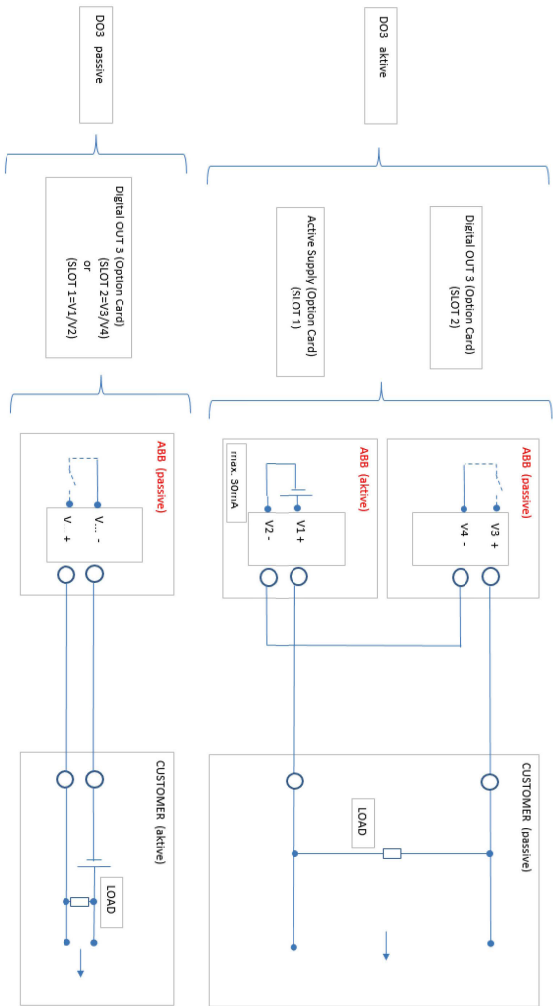
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Date	3/22/2019	2019 All Rights reserved. Reproduction or distribution of the document is forbidden without permission	
Title	FEM630 Flowmeter Installation Diagram	No.	WIDM-10-0630ID
Approved	D. Madden	Sheet	3 of 10

Allowed I/O connections and OPTION CARD handling:



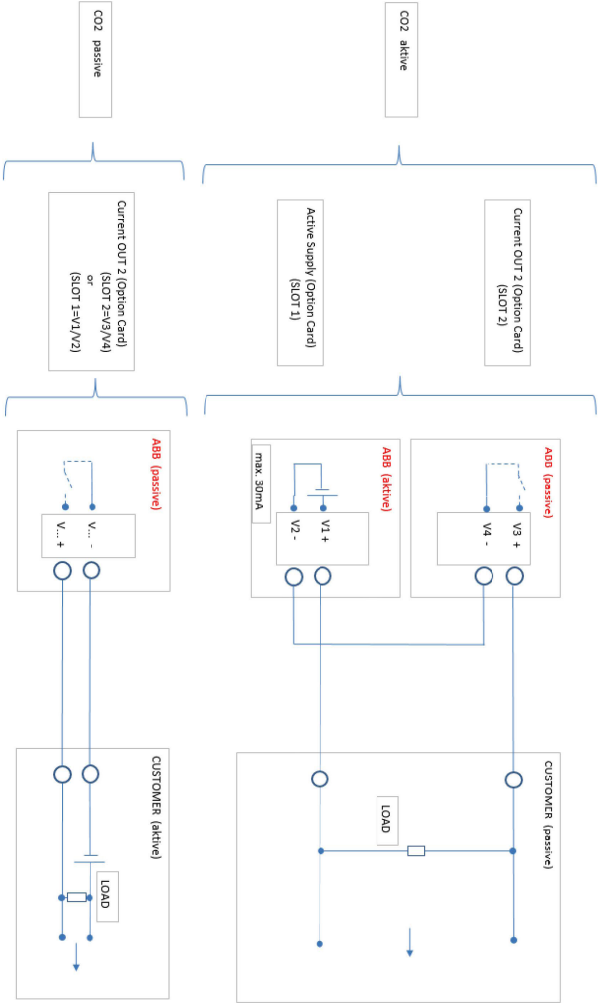
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Approved	D. Madden		
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No.			
WIDM-10-0630ID			

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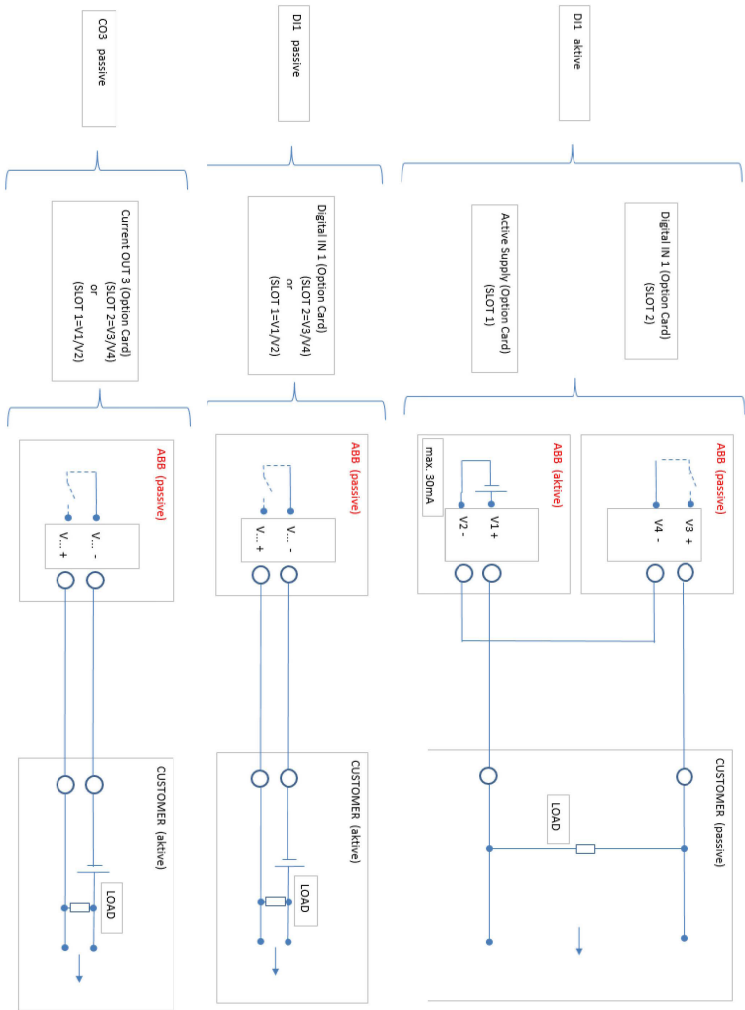
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No.	WIDM-10-0630ID	Sheet 6 of 10	



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Approved	D. Madden	Sheet	7 of 10

# Division 2

Model code FEM63df2

## HART Communication

Indication	Abbr.	Status	Option	Terminal	Operating Value			
		Active or Passive	Chooosen Option depending on Model Number (MN)	If "g" occurs Terminal depends on MN	GP		Ex nA / NI	
					U <sub>nom</sub> [V]	I <sub>nom</sub> [mA]	U <sub>nom</sub> [V]	I <sub>nom</sub> [mA]
On board								
Current Ouput 1	CO1	A	On board Power Supply	31/U <sub>Co</sub>	30	30	30	30
Current Ouput 1	CO1	P		31/32	30	30	30	30
Digital Output 1	DO1	A	With OC Active Supply	41/42 and V1/V2	30	30	30	30
Digital Output 1	DO1	P		41/42	30	30	30	30
Digital Output 2	DO2	A	With OC Active Supply	51/52 and V1/V2	30	30	30	30
Digital Output 2	DO2	P		51/52	30	30	30	30
Option Cards (OC)								
Current Ouput 2	CO2	A	With OC Active Supply	V1/V2 and V3/V4	30	30	30	30
Current Ouput 2	CO2	P		V1/V2 or V3/V4	30	30	30	30
Current Ouput 3	CO3	P		V1/V2 or V3/V4	30	30	30	30
Digital Output 3	DO3	A	With OC Active Supply	V1/V2 and V3/V4	30	30	30	30
Digital Output 3	DO3	P		V1/V2 or V3/V4	30	30	30	30
Digital Input 1	DI1	A	With OC Active Supply	V3/V4	30	3,45	30	3,45
Digital Input 1	DI1	P		V1/V2 or V3/V4	30	3,45	30	3,45

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Date	S. Chlebidis							
Approved	3/22/2019 D. Madden							

Division 1

Model code FEM63dF1

HART Communication

Indication	Abbr.	Status	Option	Terminal	Operating Value															
		Active or Passive	Choo sen Option depending on Model Number (MN)	If "o" occurs Terminal depends on MN	On board															
					Ex e / XP	U <sub>M</sub>	I <sub>M</sub>	U <sub>o</sub>	U <sub>i</sub>	I <sub>o</sub>	I <sub>i</sub>	P <sub>o</sub>	P <sub>i</sub>	Co	C <sub>i</sub>	CoPA	C <sub>iPA</sub>	L <sub>o</sub>	L <sub>i</sub>	
					[V]	[A]	[V]	[V]	[mA]	[mA]	[mW]	[mW]	[nF]	[nF]	[nF]	[nF]	[nF]	[mH]	[mH]	
Current Output 1	CO1	A	On board Power Supply	31/U <sub>Co</sub>	30	0,2	30	30	115	115	815	815	10	10	5	5	0,08	0,08		
Current Output 1	CO1	P		31/32	30	0,2	-	30	-	115	-	815	-	27	-	5	0,08	0,08		
Digital Output 1	DO1	A	With OC Active Supply	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 1	DO1	P		41/42	30	0,1	-	30	-	30	-	225	-	27	-	5	-	0,08		
Digital Output 2	DO2	A	With OC Active Supply	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 2	DO2	P		51/52	30	0,1	-	30	-	30	-	225	-	27	-	5	-	0,08		
Option Cards (OC)																				
Current Output 2	CO2	A	With OC Active Supply	V1/V2 and V3/V4	30	0,1	27,8	30	119	30	826	225	29	29	117	117	0,4	0,4		
Current Output 2	CO2	P		V1/V2 or V3/V4	30	0,1	-	30	-	68	-	510	-	45	-	59	-	0,27		
Current Output 3	CO3	P		V1/V2 or V3/V4	30	0,1	-	30	-	68	-	510	-	45	-	59	-	0,27		
Digital Output 3	DO3	A	With OC Active Supply	V1/V2 and V3/V4	30	0,1	27,8	30	119	68	826	225	17	17	31	31	0,4	0,4		
Digital Output 3	DO3	P		V1/V2 or V3/V4	30	0,1	-	30	-	30	-	225	-	13	-	16	-	0,27		
Digital Input 1	DI1	A	With OC Active Supply	V1/V2 and V3/V4	30	0,1	27,8	30	119	3,45	826	25,8	17	17	31	31	0,4	0,4		
Digital Input 1	DI1	P		V1/V2 or V3/V4	30	0,1	-	30	-	3,45	-	25,8	-	13	-	16	-	0,27		


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Model number			On Board Input-/Output			Slot1		Slot2	
Output	Optional Add1	Optional Add2	Current Output CO1 Terminal	Digital Output DO1 Terminal	Digital Output DO2 Terminal	Option Card	Terminal	Option Card	Terminal
G0	---	---	31/ 32 U <sub>CO</sub>	41/ 42	51/ 52	---	---	---	---
G1	---	---	31/ 32 U <sub>CO</sub>	41/ 42	51/ 52	AS *	V1/ V2	---	---
G2	---	---	31/ 32 U <sub>CO</sub>	41/ 42	51/ 52	---	---	CO2	V3/ V4
G3	---	---	31/ 32 U <sub>CO</sub>	41/ 42	51/ 52	CO2	V1/ V2	CO3	V3/ V4
G0	DRT	---	31/ 32 U <sub>CO</sub>	41/ 42	51/ 52	AS	V1/ V2	---	---
G0	DRT	DSN	31/ 32 U <sub>CO</sub>	41/ 42	51/ 52	AS	V1/ V2	D11	V3/ V4
G0	DRT	DSG	31/ 32 U <sub>CO</sub>	41/ 42	51/ 52	AS	V1/ V2	DO3	V3/ V4
G0	DRT	DSA	31/ 32 U <sub>CO</sub>	41/ 42	51/ 52	AS	V1/ V2	CO2	V3/ V4
G0	DRN	---	31/ 32 U <sub>CO</sub>	41/ 42	51/ 52	D11	V1/ V2	---	V3/ V4
G0	DRN	DSG	31/ 32 U <sub>CO</sub>	41/ 42	51/ 52	D11	V1/ V2	DO3	V3/ V4
G0	DRN	DSA	31/ 32 U <sub>CO</sub>	41/ 42	51/ 52	D11	V1/ V2	CO3	V3/ V4
G0	DRG	DSN	31/ 32 U <sub>CO</sub>	41/ 42	51/ 52	DO3	V1/ V2	D11	V3/ V4
G0	DRG	DSA	31/ 32 U <sub>CO</sub>	41/ 42	51/ 52	DO3	V1/ V2	CO3	V3/ V4
G0	DRA	DSA	31/ 32 U <sub>CO</sub>	41/ 42	51/ 52	CO2	V1/ V2	CO3	V3/ V4
G0	DRA	DSG	31/ 32 U <sub>CO</sub>	41/ 42	51/ 52	CO2	V1/ V2	DO3	V3/ V4
G0	DRA	DSN	31/ 32 U <sub>CO</sub>	41/ 42	51/ 52	CO2	V1/ V2	D11	V3/ V4

Summary of model numbers, option cards and the corresponding customer connections / terminals

**Safety Warning:**  
The option card AS (Active Supply) is only suitable for use with internal option cards. The use of external circuits is not allowed.

**Sicherheitshinweis:** Die Optionskarte AS (Active Supply) ist nur für die Verwendung mit internen Optionskarten geeignet. Der Einsatz mit externen Schaltkreisen ist nicht erlaubt.

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Approved	D. Madden	Title	FEM630 Flowmeter Installation Diagram
		No.	WIDM-10-0630ID
		Sheet	10 of 10

## Trademarks

HART is a registered trademark of FieldComm Group, Austin, Texas, USA

Notes

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For your local ABB contact, visit:  
**[www.abb.com/contacts](http://www.abb.com/contacts)**

For more product information, visit:  
**[www.abb.com/measurement](http://www.abb.com/measurement)**

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