

# Electromagnetic Flowmeter FXE4000

(COPA-XE/MAG-XE)



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■ **The Electromagnetic Flowmeter (EMF) can be used to accurately measure the flowrate of liquids which have an electrical conductivity greater than 5  $\mu\text{S}/\text{cm}$  (20  $\mu\text{S}/\text{cm}$  for deionized water). The COPA-XE is a flow measurement system in a Compact Design. The MAG-XE flow measurement system consists of a flowmeter primary and a separate converter in  $\mu\text{P}$  technology.**

■ **Flowmeter Primary in Stn. Stl. (Series 2000)**

- The basic flowmeter primary assembly can be mated to most existing process connections with threaded adapters. The available connections are:
  - Weld stubs
  - Pipe fittings per DIN 11851
  - Tri-Clamp
  - Fixed flange design
  - Certificate EHEDG, FML, 3A

■ **Flowmeter Primary in Alum. Housing (Series 4000)**

- Flanged design
- DVGW Test Certificate
- Certified design for Cold and Waste Water and for Liquids other than Water

■ **Converter**

- Communication: HART-Protocol, FOUNDATION Fieldbus, PROFIBUS PA
- Pulse output, passive
- Data stored in a plug-in EEPROM
- Graphic display
- Signal outputs Ex „i“ and Ex „e“
- Selectable 20 mA output, passive or active

■ **Ex-Design**

- In accord with ATEX
- Dust Ex-Approval
- FISCO-Model



**Intelligent, Compact  
and High Performance**

**ABB**



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**Overview of the Flowmeter Primary and Converter Designs:  
FXE4000 (COPA-XE), Compact Design**

	<p>DN 3-100 [1/10"-4"] DN 125-300 [5"-12"] DN 350-1000 [14"-40"]</p> <p>Fixed Flanges</p>	<p>DN 3-100 [1/10"-4"]</p> <p>Fixed Flanges</p>	<p>DN 3-40 [1/0"-1-1/2"] DN 50-100 [2"-4"]</p> <p>Wafer Design</p>	<p>DN 3-40 [1/10"-1 1/2"] DN 50-100 [2"-4"]</p> <p>Weld Stubs Tri-Clamp DIN 32676 Pipe Fitting DIN 11851 External Threads Others upon request</p> <p>Variable Connections</p>
Housing Material	Aluminum Housing Series 4000	Stainless Steel Housing Series 2000		

**Flowmeter Primary**

Model Number	DE47F		DE27F		DE27W		DE27-R,-S,-T,-E	
Accuracy	0.5% of rate (Optional: 0.25 % of rate)							
	DN	PN	DN	PN	DN	PN	DN	PN
Flanges DIN	3-1000	10-40	3-100	10 - 40	-		-	
Flanges ANSI	1/10" - 40"	CL 150-300	1/10"-4"	CL 150-300	-		-	
Pipe fittings DIN 11851	-		-		-		3-100[1/10"-4"] 10	
Weld stubs	-		-		-		3-100[1/10"-4"] 10	
Tri-Clamp per DIN 32676	-		-		-		3-100[1/10"-4"] 10	
External threads ISO 228/DIN 2999	-		-		-		3-25[1/10"-1"] 10	
Liner	hard / soft rubber PTFE, PFA		PFA (vacuum tight)		PFA (vacuum tight)		PFA (vacuum tight)	
Conductivity	> 5 µS/cm (20 µS/cm for deionized water)		> 5 µS/cm (20 µS/cm for deionized water)		> 5 µS/cm (20 µS/cm for deionized water)		> 5 µS/cm (20 µS/cm for deionized water)	
Electrodes	SS 1.4571 [316Ti], 1.4539, Hastelloy B2/C4, Platinum-Iridium, Tantalum, Titanium							
Process connection material	Steel or 1.4571 [316Ti]		1.4571 [316Ti]		-		1.4404 [316L]	
Protection Class	IP 67		IP 67		IP 67		IP 67	
Fluid temperatures *	-25 to +130 °C		-25 to +130 °C		-25 to +130 °C		-25 to +130 °C	

**Approvals**

EEx Designs TÜV 97 ATEX 1173X	Category II 2G (Zone 1) Category II 2D (Zone 21)
Certifiable	Cold and Waste Water, Liquids other than Water
Pressure Equipment Directive 97/23/EG	Conformity evaluation per Category III, Fluid Group 1

**Certificates**

	-	-	-	3A, FML, EHEDG (clean-able)
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**Converter**

Supply power	AC (100-230 V -15/+10 %) / AC 16.8-26.4 V / DC 16.8-31.2 V
Current output	active: 0/2-10mA, 0-5 mA, 0/4-20 mA, 0/4-10/12-20 mA; passive: 4-20 mA (Ex „i“ and Ex „e“ user selectable at converter)
Pulse output	passive, optocoupler (Ex „i“ and Ex „e“ user selectable at converter)
Contact output	passive, optocoupler (Ex „i“ and Ex „e“ user selectable at converter)
Contact input	passive, optocoupler (Ex „i“ and Ex „e“ user selectable at converter)
Local display / totalizer	yes, lighted display
Communication	HART-Protocol PROFIBUS PA, FOUNDATION Fieldbus per FISCO-Model

\*) -25 °C applies, for stainless steel process connections  
-10 °C applies, for steel process connections



**FXE4000 (COPA-XE), Separate Converter Installed Inside the Ex-Area**

	Fixed Flanges
Housing Material	Aluminum Housing Series 4000

**Flowmeter Primary**

Model Number	DE48F	
Accuracy	0.5 % of rate (Optional: 0.25 % of rate)	
	DN	PN
Flanges DIN	3-1000	10-40
Flanges ANSI	1/10" - 40"	CL 150-300
Liner	hard rubber, soft rubber, PTFE, PFA	
Conductivity	> 5 µS/cm (20 µS/cm for deionized water)	
Electrodes	SS 1.4571 [316Ti], 1.4539, Hastelloy B2/C4, Platinum-Iridium, Tantalum, Titanium	
Process connection material	Steel, 1.4571 [316Ti]	
Protection Class	IP 67, IP 68 (Option)	
Fluid temperatures *	-25 to +130 °C	

**Approvals**

EEx Designs	Category II 2G (Zone 1)
TÜV 97 ATEX 1173X	Category II 2D (Zone 21)
Certifiable	Cold and Waste Water, Liquids other than Water
Pressure Equipment Directive 97/23/EG	Conformity evaluation per Category III, Fluid Group 1, Gas

**Certificates**

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**Converter**

Supply power	AC 100-230 V (-15/+10 %) / AC 16.8-26.4 V / DC 16.8-31.2 V
Current output	active: 0/2-10mA, 0-5 mA, 0/4-20 mA, 0/4-10/12-20 mA; passive: 4-20 mA (Ex „i“ and Ex „e“ user selectable at converter)
Pulse output	passive, optocoupler (Ex „i“ and Ex „e“ user selectable at converter)
Contact output	passive, optocoupler (Ex „i“ and Ex „e“ user selectable at converter)
Contact input	passive, optocoupler (Ex „i“ and Ex „e“ user selectable at converter)
Local display / totalization	yes, lighted display
Communication	HART-Protocol, PROFIBUS PA, FOUNDATION Fieldbus, per FISCO Model

\*) -25 °C applies, for stainless steel process connections  
-10 °C applies, for steel process connections



**FXE4000 (MAG-XE), Separate Converter Installed Outside the Ex-Area**

	<p>DN 3-100 [1/10"-4"]</p> <p>DN 125-300 [5"-12"]</p> <p>DN 350-1000 [14"-40"]</p>
Fixed Flanges	Aluminum Housing Series 4000
Housing Material	Aluminum Housing Series 4000

**Flowmeter Primary**

Model Number	DE46F	
Accuracy	0.5 % of rate (Optional: 0.25 % of rate)	
	DN	PN
Flanges DIN	3-1000	10-40
Flanges ANSI	1/10"- 40"	CL 150-300
Liner	hard rubber, soft rubber, PTFE, PFA	
Conductivity	> 5 µS/cm (20 µS/cm at deionized water)	
Electrodes	SS 1.4571 [316Ti], 1.4539, Hastelloy B2/C4, Platinum-Iridium, Tantalum, Titanium	
Process connection material	Steel, 1.4571 [316Ti]	
Protection Class	IP 67, IP 68 (Option)	
Fluid temperatures *	-25 to +130 °C	

**Approvals**

EEx Designs	Category II 2G (Zone 1)
TÜV 97 ATEX 1173X	Category II 2D (Zone 21)
Certifiable	Cold and Waste Water, Liquids other than Water
Pressure Equipment Directive 97/23/EG	Conformity evaluation per Category III, Fluid Group 1

**Certificates**

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**Converter**

Supply power	AC 100-230 V (-15/+10 %) / AC 16.8-26.4 V / DC 16.8-31.2 V
Current output	active: 0/2-10mA, 0-5 mA, 0/4-20 mA, 0/4-10/12-20 mA
Pulse output	active: 24 V DC pulse or passive optocoupler
Ext. zero return	optocoupler input
Ext. totalizer reset	optocoupler input
Forward/reverse metering	signal over optocoupler output
Fluid monitor	from DN10 [3/8"], signal over optocoupler output
Self monitor	yes
Local display / totalization	yes
Housing	field mount hsg., 19"-Insert cassette, panel mount housing, rail mount housing
Communication	PROFIBUS PA, HART-Protocol, FOUNDATION Fieldbus

\*) -25 °C applies, for stainless steel process connections  
-10 °C applies, for steel process connections



## Accuracy, Reference Conditions and Principles of Operation

### Reference Conditions per EN 29104

**Fluid temperatures**

20 °C ± 2K

**Ambient temperatures**

20 °C ± 2K

**Supply power**

Nominal voltage per Type Plate  $U_N \pm 1\%$  and  
Frequency  $f \pm 1\%$

**Installation Conditions**

Upstream >10xD straight pipeline section  
Downstream >5xD straight pipeline section  
D = Size of the flowmeter primary.

**Warm Up Phase**

30 min

**Influence of Current Output**

Same as pulse plus ± 0.1 % of rate.

### Principle of Operation

Faraday's Laws of Induction, which state that a voltage is generated in a conductor when it moves through a magnetic field, form the basis for the electromagnetic flowmeter measurements.

This measurement principle is applied to a conductive fluid which flows in a pipe in which a magnetic field is generated perpendicular to the flow direction (see Schematic).

The voltage which is induced in the fluid is measured at two electrodes located diametrically opposite to each other. This signal voltage  $U_E$  is proportional to the magnetic induction  $B$ , the electrode spacing  $D$  and the average fluid velocity  $v$ .

Since the magnetic induction  $B$  and the electrode spacing  $D$  are constant values, the signal voltage  $U_E$  is proportional to the average flow velocity  $v$ . The equation for calculating the volumetric flowrate shows that the signal voltage  $U_E$  is linear and proportional to the volumetric flowrate.

The induced signal voltage is converted into scaled, analog and digital output signals in the converter.

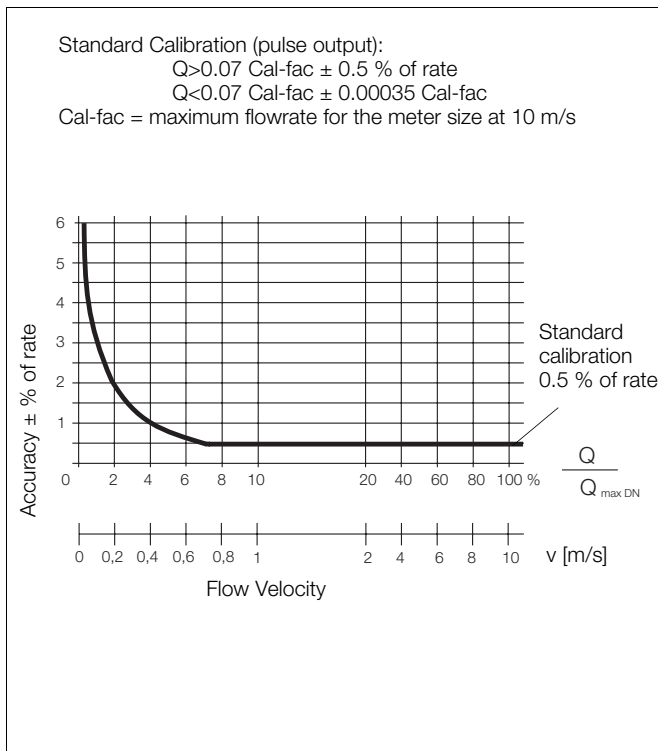


Fig. 1: Accuracy of the Flowmeter System FXE4000

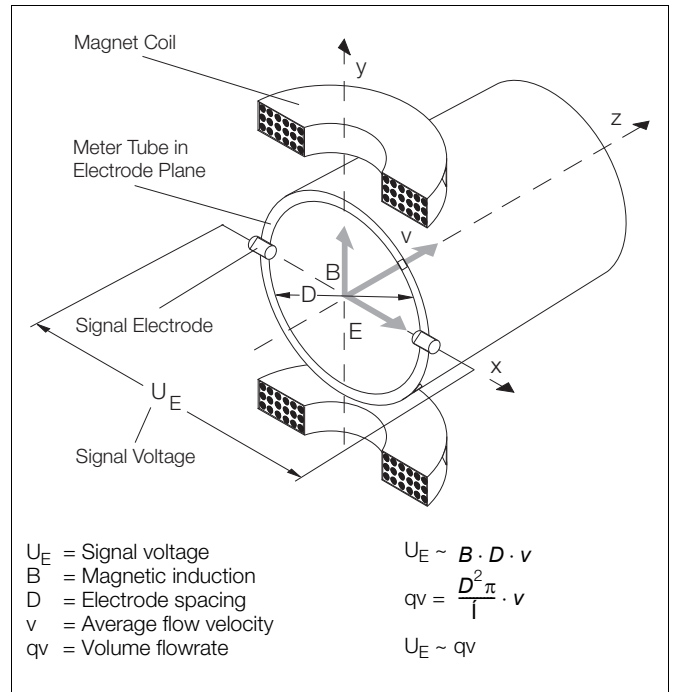


Fig. 2: Electromagnetic Flowmeter Schematic



### Flowmeter Sizes, Pressure Ratings, Flow Ranges and Flow Nomograph

Meter Size DN Inch	Standard Pressure Rating PN	Min. Flow Range Flow Velocity 0 to 0.5 m/s	Max. Flow Range Flow Velocity 0 to 10 m/s
3 1/10	40	0 to 0.2 l/min	0 to 4 l/min
4 5/32	40	0 to 0.4 l/min	0 to 8 l/min
6 1/4	40	0 to 1 l/min	0 to 20 l/min
8 5/16	40	0 to 1.5 l/min	0 to 30 l/min
10 3/8	40	0 to 2.25 l/min	0 to 45 l/min
15 1/2	40	0 to 5.0 l/min	0 to 100 l/min
20 3/4	40	0 to 7.5 l/min	0 to 150 l/min
25 1	40	0 to 10 l/min	0 to 200 l/min
32 1-1/4	40	0 to 20 l/min	0 to 400 l/min
40 1-1/2	40	0 to 30 l/min	0 to 600 l/min
50 2	40	0 to 3 m <sup>3</sup> /h	0 to 60 m <sup>3</sup> /h
65 2-1/2	40	0 to 6 m <sup>3</sup> /h	0 to 120 m <sup>3</sup> /h
80 3	40	0 to 9 m <sup>3</sup> /h	0 to 180 m <sup>3</sup> /h
100 4	16	0 to 12 m <sup>3</sup> /h	0 to 240 m <sup>3</sup> /h
125 5	16	0 to 21 m <sup>3</sup> /h	0 to 420 m <sup>3</sup> /h
150 6	16	0 to 30 m <sup>3</sup> /h	0 to 600 m <sup>3</sup> /h
200 8	10/16	0 to 54 m <sup>3</sup> /h	0 to 1080 m <sup>3</sup> /h
250 10	10/16	0 to 90 m <sup>3</sup> /h	0 to 1800 m <sup>3</sup> /h
300 12	10/16	0 to 120 m <sup>3</sup> /h	0 to 2400 m <sup>3</sup> /h
350 14	10/16	0 to 165 m <sup>3</sup> /h	0 to 3300 m <sup>3</sup> /h
400 16	10/16	0 to 225 m <sup>3</sup> /h	0 to 4500 m <sup>3</sup> /h
450 18	10/16	0 to 300 m <sup>3</sup> /h	0 to 6000 m <sup>3</sup> /h
500 20	10	0 to 330 m <sup>3</sup> /h	0 to 6600 m <sup>3</sup> /h
600 24	10	0 to 480 m <sup>3</sup> /h	0 to 9600 m <sup>3</sup> /h
700 28	10	0 to 660 m <sup>3</sup> /h	0 to 13200 m <sup>3</sup> /h
800 32	10	0 to 900 m <sup>3</sup> /h	0 to 18000 m <sup>3</sup> /h
900 36	10	0 to 1200 m <sup>3</sup> /h	0 to 24000 m <sup>3</sup> /h
1000 40	10	0 to 1350 m <sup>3</sup> /h	0 to 27000 m <sup>3</sup> /h

#### Flowrate Nomograph

The volumetric flowrate is a function of the flow velocity and the flowmeter size. The Flowrate Nomograph shows the flowrate range which can be metered with a specific flowmeter size as well as which flowmeter sizes are suitable for a specific flowrate.

#### Example:

Flowrate = 7 m<sup>3</sup>/h (maximum value = flow range end value). Suitable are flowmeter primary sizes DN 20 to DN 65 [3/4" to 2-1/2"] for flow velocities between 0.5 to 10 m/s.

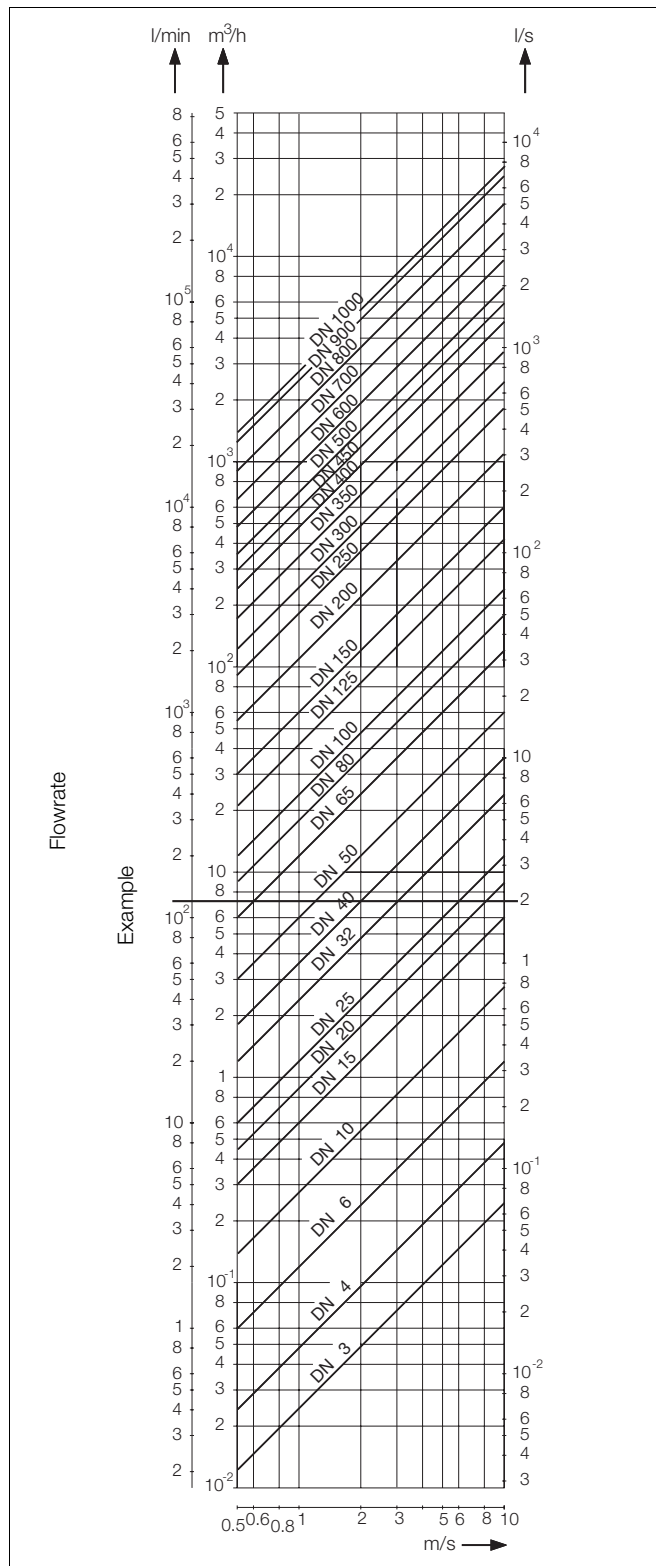


Fig. 3: Flowrate Nomograph DN 3 to DN 1000 [1/10" to 40"]





## Installation Requirements and Grounding

### In- and Outlet Pipeline 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 exist after double elbows, tangential inflow or partially open gate valves upstream of the flowmeter. It is recommended that the flow control devices be installed downstream from the flowmeter primary. It is essential to assure that the meter tube is always completely filled with fluid.

Our experience indicates, that in most cases, a straight inlet section 3 x D long and a straight outlet section 2 x D long is sufficient.

In test stands, the reference conditions defined in EN 29104 are to be maintained. For certified instruments, special in- and outlet section requirements apply (see Page 10).

### Electrode Axis

The flowmeter can be installed in vertical, horizontal or sloped pipelines. The electrode axis should be horizontal if at all possible. A vertical electrode axis orientation should be avoided. An ideal installation is shown in Fig. 4 .

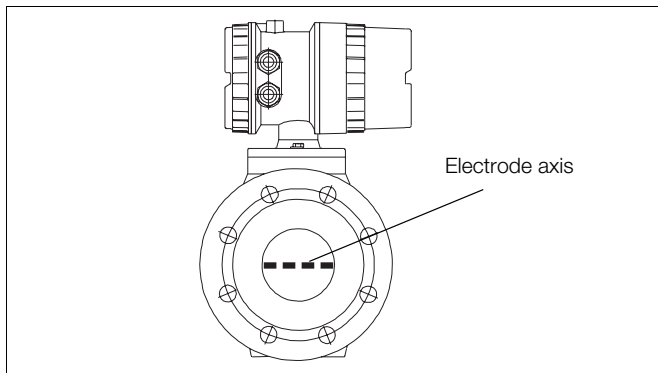


Fig. 4: Electrode Axis

### Flowmeter Primary DN 3-8 [1/10"-5/16"]

Flowmeter primary sizes DN 3 to DN 8 [1/10" to 5/16"] have a DN 10 connection flange in the DIN design. The reduction to DN 3, 4, 6 or 8 [1/10", 5/32", 1/4" or 5/16:] is made internally in the instrument. As an option, flowmeter primary sizes DN 3 to DN 8 [1/10" to 5/16"] are also available with DN 15 [1/2"] connection flanges.

### Grounding

The grounding of the flowmeter primary is not only essential for safety reasons but also of importance to assure trouble free operation of the electromagnetic flowmeter. The ground screws on the flowmeter primary are to be connected to the Potential Equalization (PE). For technical reasons this potential should be, if possible, the same as the potential of the metering fluid.

For plastic or insulated lined pipelines the fluid is grounded by installing grounding plates. When there are stray potentials present in the pipeline a grounding plate is recommended on both ends of the flowmeter primary

For flowmeters with hard- or soft rubber liners a conductive element is integrated in the liner beginning at meter size 5" / DN 125. This provides the ground for the fluid.

To comply with EMC and Low Voltage Guidelines not only must the meter pipe be grounded but also the connection box/converter, see the Interconnection Diagrams beginning on page 17.

### Installations in Larger Pipeline Sizes

The flowmeter primary can readily be installed in larger pipeline sizes using reducers. The pressure drop resulting from the size reduction can be determined from the Pressure Drop Nomograph Fig. 5 . The procedure for determining the pressure drop is as follows:

1. Calculate the diameter ratio  $d/D$ .
2. Determine the flow velocity from the Flowrate Nomograph Fig. 3 .
3. In Fig. 5 read the pressure drop on the Y-Axis.

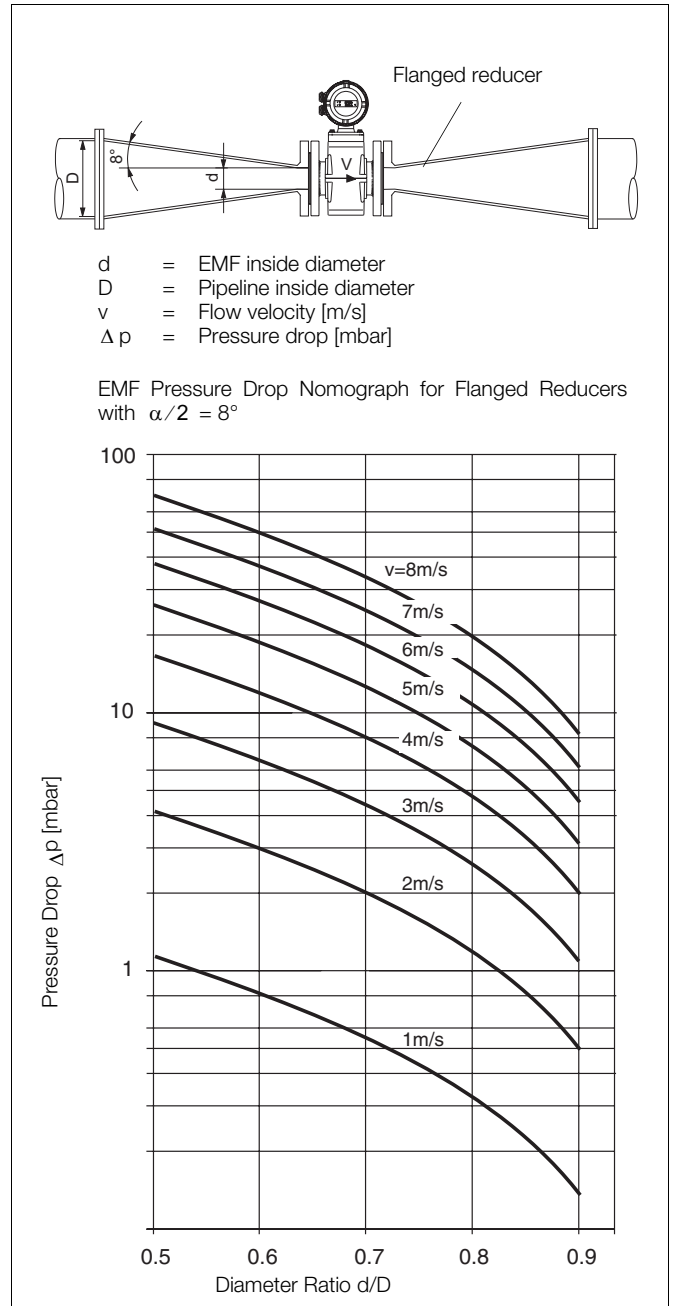


Fig. 5: Pressure Drop Nomograph for an EMF



## Agency Approved EMF

### Approvals

The design of the measurement instrument “Electromagnetic Volume Flowrate Totalizer with Electrical Counter” has been approved by the National Institute for Science and Technology (Physikalisch-Technischen Bundesanstalt) in Braunschweig, Germany. The following approvals have been granted for the Volume Flowrate Totalizer which consists of a flowmeter primary and a converter:

6.221	Electromagnetic Volume Flowrate Totalizer with a Class “B” Electrical Counter for Cold Water and Waste Water
87.12	
5.721	Electromagnetic Volume Flowrate Totalizer with an Electrical Counter for Liquids Other than Water
87.05	

Appendix (EO6) or Appendix 5 (EO5) of the Certification Regulations of 1988 apply to the Electromagnetic Volume Flowrate Totalizer with Electrical Counter.

### Certification

The Electromagnetic Volume Flowrate Totalizers are certified on the test stands in Göttingen, Germany which have been approved for certification calibrations. After the calibration has been completed, the parameters which impact the Certification Regulations can only be changed in the presence of a Certification Agent.

### Approved Flowmeter Sizes for “Cold Water and Waste Water”

DN	Inch	Smallest allow. Flow Range End Value (ca. 2 m/s)		Largest allow. Flow Range End Value (ca. 10 m/s)	
25	1	0 to	2.4 m <sup>3</sup> /h	0 to	12 m <sup>3</sup> /h
32	1-1/4	0 to	5 m <sup>3</sup> /h	0 to	25 m <sup>3</sup> /h
40	1-1/2	0 to	9 m <sup>3</sup> /h	0 to	45 m <sup>3</sup> /h
50	2	0 to	14 m <sup>3</sup> /h	0 to	70 m <sup>3</sup> /h
65	2-1/2	0 to	24 m <sup>3</sup> /h	0 to	120 m <sup>3</sup> /h
80	3	0 to	36 m <sup>3</sup> /h	0 to	180 m <sup>3</sup> /h
100	4	0 to	56 m <sup>3</sup> /h	0 to	280 m <sup>3</sup> /h
125	5	0 to	84 m <sup>3</sup> /h	0 to	420 m <sup>3</sup> /h
150	6	0 to	128 m <sup>3</sup> /h	0 to	640 m <sup>3</sup> /h
200	8	0 to	220 m <sup>3</sup> /h	0 to	1100 m <sup>3</sup> /h
250	10	0 to	360 m <sup>3</sup> /h	0 to	1800 m <sup>3</sup> /h
300	12	0 to	500 m <sup>3</sup> /h	0 to	2500 m <sup>3</sup> /h
350	14	0 to	700 m <sup>3</sup> /h	0 to	3500 m <sup>3</sup> /h
400	16	0 to	900 m <sup>3</sup> /h	0 to	4500 m <sup>3</sup> /h
500	20	0 to	1420 m <sup>3</sup> /h	0 to	7100 m <sup>3</sup> /h
600	24	0 to	2000 m <sup>3</sup> /h	0 to	10000 m <sup>3</sup> /h
700	28	0 to	2800 m <sup>3</sup> /h	0 to	14000 m <sup>3</sup> /h
800	32	0 to	3600 m <sup>3</sup> /h	0 to	18000 m <sup>3</sup> /h
900	36	0 to	4600 m <sup>3</sup> /h	0 to	23000 m <sup>3</sup> /h
1000	40	0 to	5600 m <sup>3</sup> /h	0 to	28000 m <sup>3</sup> /h

### Approved Flowmeter Sizes for “Liquids other than Water”

Meter Size and Largest Allowable Flowrate					
DN	Q <sub>max</sub> Liter/min				
25	selectable	60	to	200	in steps of 10
32	selectable	100	to	400	in steps of 10
40	selectable	150	to	750	in steps of 50
50	selectable	250	to	1000	in steps of 50
65	selectable	400	to	2000	in steps of 100
80	selectable	700	to	3000	in steps of 100
100	selectable	900	to	4500	in steps of 100
150	selectable	2000	to	10000	in steps of 500

Smallest Metered Flowrate and Fluid			
DN	Inch	Smallest Flowrate l/min	Fluid
25	1	8	beer, milk, syrup
32	1-1/4	5	beer, milk, syrup
40	1-1/2	20	beer, milk
50	2	200	beer, wort
65	2-1/2	500	milk, wort, beer
80	3	500	milk, wort, beer
100	4	2000	brine, wort
150	6	2000	brine

Min. flow range approx. 2.5 m/s.  
Max. flow range approx. 10 m/s.

The flow ranges are to be specified in accordance with the values listed in the tables. Subsequent flow range changes require a new calibration on an agency certified test stand.

### Installation Requirements for Volume Flow Integrators

The following installation requirements are to be observed:

For “Cold Water and Waste Water” a straight pipeline section with a length of at least 5 times the flowmeter size must be installed upstream of the flowmeter and a section 2 times the flowmeter size downstream. For “Liquids other than Water” (milk, beer, wort, brine) the values shown in parentheses in Fig. 6 apply.

For flow metering in both directions (forward and reverse) the straight pipeline sections installed on both sides of the flowmeter must be at least 5 times the flowmeter size for “Cold Water and Waste Water” approvals and at least 10 times the flowmeter size for “Liquids other than Water” approvals. The pipeline system must always be completely filled with fluid. The signal cable length may not exceed 50 m.

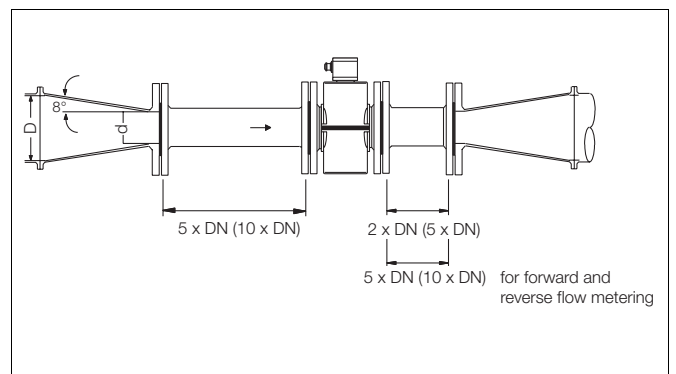


Fig. 6: Pipeline Installations, Reducers as Required



**Specifications: Models DE46F / DE47F / DE48F**

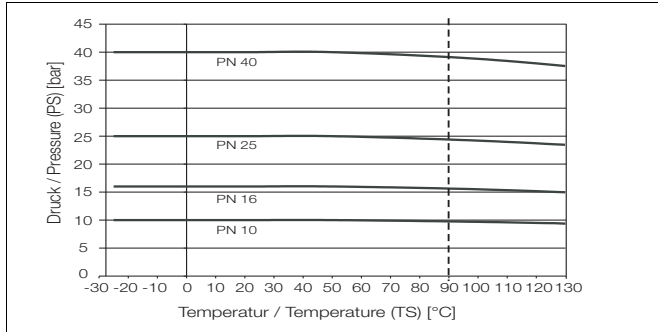


**Attention**

The limitations of the allowable fluid temperature (TS) and the allowable pressure (PS) are a function of the liner used and the instrument flange material (see Type and Factory Plates on the instrument).

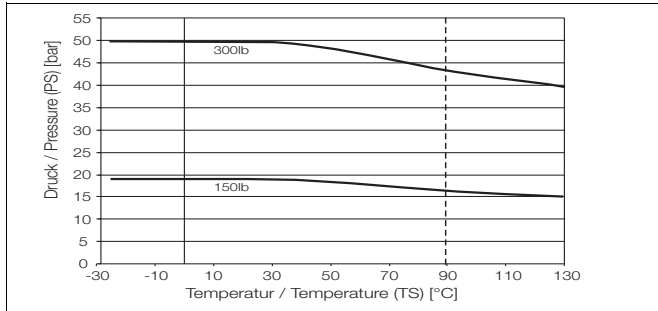
**Material loads curves for flanged designs  
Models DE46F / DE47F / DE48F**

Max. Temperature ≤ 90 °C for hard-/soft rubber liners  
Max. Temperature ≤ 130 °C at PTFE/PFA liners



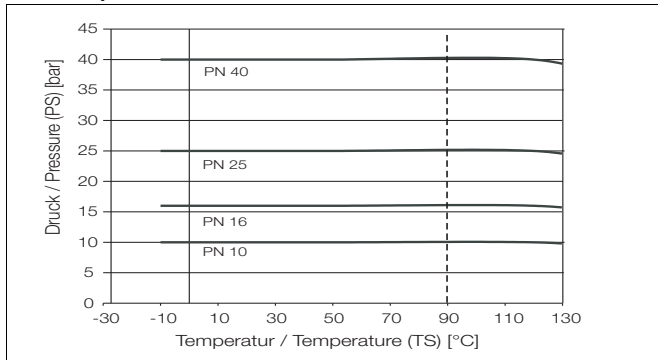
**Fig. 7:** DIN-Flanges SS 1.4751[316Ti] to DN 600 [24"]

Max. temperature ≤ 90 °C for hard-/soft rubber liners  
Max. temperature ≤ 130 °C at PTFE/PFA liners



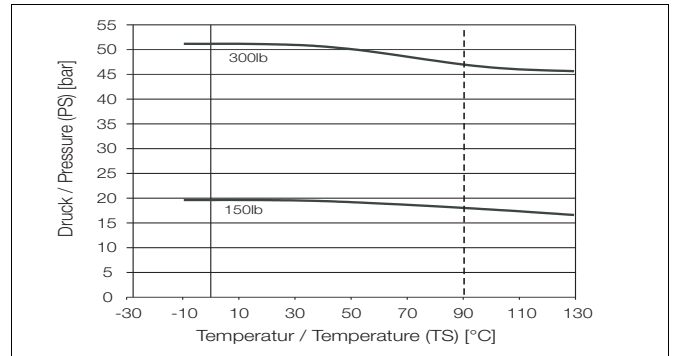
**Fig. 8:** ANSI-Flanges SS 1.4751[316Ti] to 12" (CL150/300) to 40" (CL 150)

Max. temperature ≤ 90 °C for hard-/soft rubber liners  
Max. temperature ≤ 130 °C at PTFE/PFA liners



**Fig. 9:** DIN-Flanges Steel to DN 600 [24"]

Max. temperature ≤ 90 °C for hard-/soft rubber liners  
Max. temperature ≤ 130 °C at PTFE/PFA liners



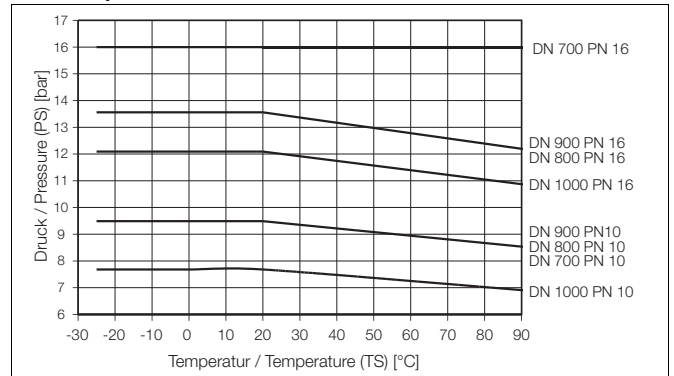
**Fig. 10:** ANSI-Flanges Steel to 12" (CL150/300) to 40" (CL 150)

**JIS 10K-B2210 Flanges SS 1.4751[316Ti] or Steel**

Meter Size DN	Material	PN	TS [°C]	PS [bar]
32-100	SS 1.4751[316Ti]	10	-25 to +130	10
32-100	Steel	10	-10 to +130	10

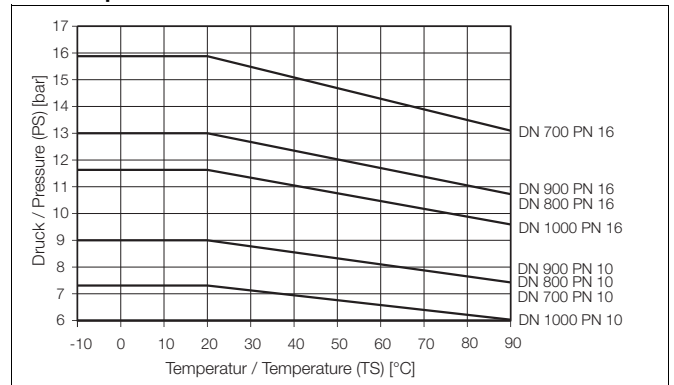
Liner: PTFE, Hard/soft rubber (limited to 90 °C)

Max. temperature ≤ 90 °C for hard-/soft rubber liners



**Fig. 11:** DIN-Flanges SS 1.4751[316Ti] DN 700 - 1000 [28" - 40"]

Max. temperature ≤ 90 °C for hard-/soft rubber liners



**Fig. 12:** DIN-Flanges Steel DN 700 - 1000 [28" - 40"]



**General Specifications for Models DE47F / DE46F / DE48F**

**Min. allow. Pressure as a Function of Fluid Temperature**

Liner	Meter Size DN Inch	P <sub>Operate</sub> mbar abs.	at	T <sub>Operate</sub> *) °C
Hard rubber	15 to 250 1/2 to 10	0		< 90
	300 to 1000 12 to 40	0		< 90
Soft rubber	50 to 250 2 to 10	0		< 90
	300 to 1000 12 to 40	0		< 90
PTFE	10 to 600 3/8 to 24	270		< 20
		500		< 130 <sup>1)</sup>
PFA	3 to 100 1/10 to 4	0		< 130 <sup>1)</sup>

\*) At 40°C ambient temperature and Temperature Class T3  
1) For Model DE47F meter sizes DN25 - DN32 [1" - 1-1/4"]  
T<sub>Operate</sub> ≤ 125 °C (Ex-Specifications) applies

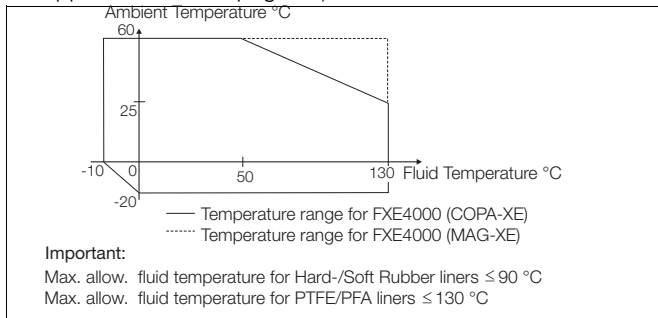
**Max. allow. Cleaning Temperature**

CIP-Cleaning Type	Flowmeter Primary Liner	T <sub>max</sub> °C	t <sub>max</sub> Minutes	T <sub>Amb.</sub> °C
Steam cleaning	PTFE, PFA	150	60	25
Liquid cleaning	PTFE, PFA	140	60	25

If the ambient temperature is > 25°C, the difference must be deducted from the max. cleaning temp., T<sub>max</sub> - Δ °C. Δ °C = T<sub>Amb.</sub> - 25 °C  
For steam or liquid cleaning the temperature specifications in the Ex-Approval must also be observed! See also Temperature Table page 15.

**Max. allow. Fluid Temperature as a Function of the Ambient Temperature for Meters with Steel Flanges**

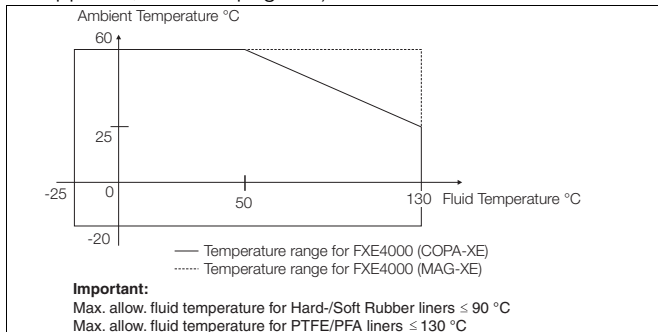
(Also observe the max. allowable temperatures per the Ex-Approval, see also page 15)



**Fig. 13:** Max. allow. Fluid Temperature as a Function of the Ambient Temperature for Instruments with Steel Flanges

**Max. allow. Fluid Temperature as a Function of the Ambient Temperature for Meters with Stn. Stl. Flanges**

(Also observe the max. allowable temperatures per the Ex-Approval, see also page 15)



**Fig. 14:** Max. allow. Fluid Temperatures as a Function of the Ambient Temperature for Meters with Stn. Stl. Flanges

**Ambient Conditions**

**Ambient Temperature**  
-20 °C to 60 °C

**Materials Flowmeter Primary**

Part	Standard	Others
Liner	PTFE, PFA, hard rubber, soft rubber	-
Signal and ground electrodes with - hard rubber, soft rubber	SS 1.4751[316Ti]	Hast. B-2 (2.4617), Hast. 2 C-4, Titanium, Tantalum, Platinum-Iridium
- PTFE PFA	Hast. C-4 (2.4610)	SS 1.4751[316Ti] Hast. B-2 (2.4617) Titanium, Tantalum Platinum-Iridium
Grounding plate for flanged instruments	SS 1.4751[316Ti]	upon request
Protection plate	SS 1.4751[316Ti]	upon request

**Process Connection Materials**

Part	Standard	Others
Flanges DN 3-15 1/10"-1/2"	SS 1.4571 [316Ti] (std.)	
DN 20-300 3/4"-12"	Steel (Zinc plated)	1.4751[316Ti]
DN 350-1000 14"-40"	Steel (painted)	1.4571 [316Ti]

Part	Standard	Others
Housing DN 3 - DN 300 [1/10" - 12"]	Two piece housing Cast Alum., painted, Paint coat, 60 µm thick RAL 9002	-
DN 350 - 1000 [14" - 40"]	Welded steel construction, painted Paint coat , 60 µm thick RAL 9002	
Connection box	Alum alloy, painted, 60 µm thick Center: dark gray, RAL 7012 Cover: light gray, RAL 9002	-
Meter pipe	SS 1.4301 [304]	-
Pg-Connector	Polyamide	

**Protection Class per EN 60529**

IP67  
IP68 (only MAG-XE Flowmeter Primary Model DE46F)

**Pipeline Vibrations Based on EN 60068-2-6 as a Guide**

**For Compact Design (COPA):**

In the range 10-55 Hz max. 0.15 mm amplitude  
In the range 55-150 Hz max. 2 g acceleration

**For instruments with separate converters:**

In the range 10-55 Hz max. 0.15 mm amplitude

**Designs**

The lay lengths of the flanged instruments correspond to those defined in VDI/VDE 2641, ISO 13359 or per DVGW (Working Paper W420, B Design WP, ISO 4064 short).



**Specifications: Stainless Steel Flowmeter, Model DE27, DN 3 to 100[1/10" to 4"]**

**Material Loads for Variable Process Connections Model DE27**

Process Connection Liner PFA	Meter Size DN Inch	PS <sub>max.</sub> [bar]	TS <sub>max.</sub> [°C]	TS <sub>min.</sub> [°C]
Wafer Design	3-50 1/10-2	40/CL300	130*	-25
	65-100 2-1/2-4	16/CL150	130*	-25
Weld stubs per ISO 2037	25-100 1-4	10	130*	-25
Weld stubs per DIN 2463	10-100 3/8-4	10	130*	-25
Weld stubs per DIN 11850	10-10 3/8-40	10	130*	-25
Pipe fittings per DN 11851	3-100 1/10-4	10	130	-25
Tri-Clamp per DIN 32676	3-100 1/10-4	10	121	-25
External threads ISO 228	3- 25 1/10-1	10	130*	-25

\*) Observe the max. allow. fluid temperatures (TS) per the Ex-Approval.

**Material Load Curves for Wafer Design Model DE27**

Liner: PFA

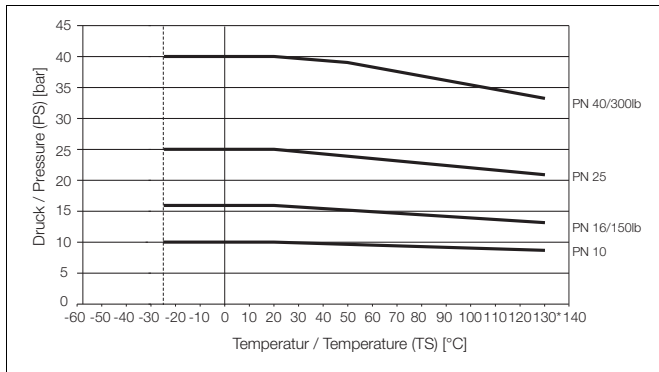


Fig. 15:

**JIS 10K-B2210 Wafer Design**

Meter Size DN	Material	PN	TS [°C]	PS [bar]
32-100 [1-1/4" - 4"]	SS. 1.4404 [316L] SS 1.4435 [316L] SS 1.4301 [304]	10	-25 to +130*)	10

\*) Observe the max. allow. Fluid temperatures (TS) per the Ex-Approval.

**Material Loads Curves for Flanged Connections Model DE27F**

Liner: PFA

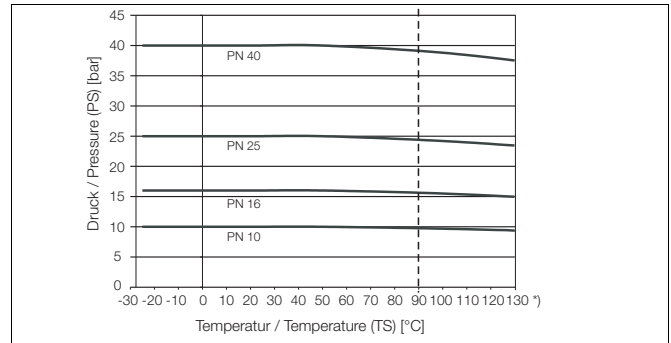


Fig. 16: DIN-Flanges SS 1.4751[316Ti] to DN 100

Liner: PFA

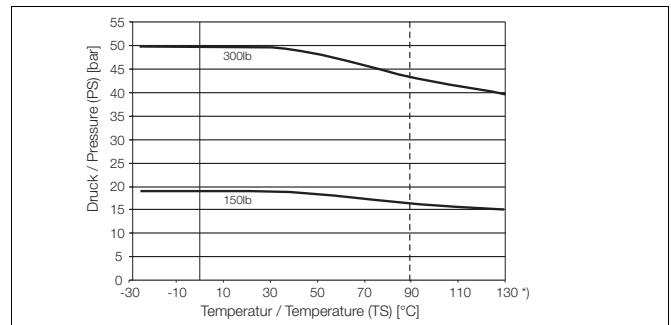


Fig. 17: ANSI Flanges SS 1.4751[316Ti] to 4"

**JIS 10K-B2210 Flanges SS 1.4751[316Ti] or Steel**

Meter Size DN	Material	PN	TS [°C]	PS [bar]
25-100 [1" - 4"]	SS 1.4751[316Ti]	10	-25 to +130*	10
25-100 [1" - 4"]	Steel	10	-10 to +130*	10

\*) Observe the max. allow. fluid temperatures (TS) per the Ex-Approval.



**General Specifications for Model DE27 / DE27F**

**Minimum allow. Absolute Pressure**

Liner	Meter Size DN Inch	P <sub>Operate</sub> mbar abs	at T <sub>Operate</sub> <sup>*)</sup> °C
PFA	3 – 100 1/10 - 4	0	≤ 130 <sup>1)</sup>

\*) at 40°C ambient temperatures and Temperature Class T3  
1) For Meter Size DN 25 & DN 32 [1" & 1-14"] for Model DE47:  
T<sub>Operate</sub> ≤ 125 °C (Ex-Specification) applies

**Maximal allow. Cleaning Temperature**

CIP-Cleaning Type	Liner	T <sub>max</sub> °C	T <sub>max</sub> Minutes	T <sub>Umg</sub> °C
Steam cleaning	PFA	150	60	25
Liquid cleaning	PFA	140	60	25

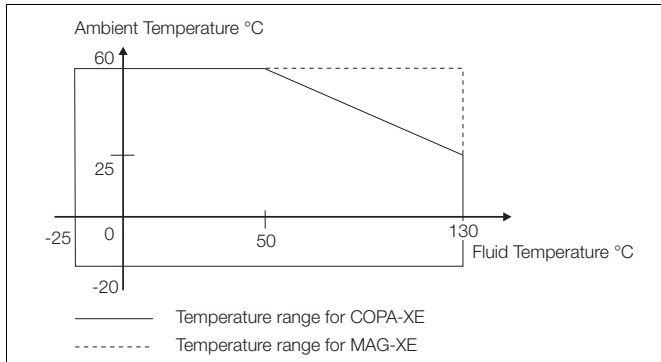
If the ambient temperature is > 25°C, the difference must be deducted from the max. cleaning temp., T<sub>max</sub> - Δ °C. Δ °C = T<sub>Amb</sub> - 25 °C)  
For steam or liquid cleaning the temperature specifications in the Ex-Approval must be observed! See also Temperature Table page. If the ambient temperature > 25 °C, the difference must be deducted from the max. cleaning temperature. T<sub>max</sub> - Δ °C. Δ °C = (T<sub>Amb</sub> - 25 °C).

For steam or liquid cleaning the temperature specifications in the Ex-Approval must be observed! See also temperature table page 15.

**Maximal allow. Shock Temperature**

Liner	Temp.-Shock max. Temp.-Diff. °C	Temp.-Gradient °C/min
PFA	any	any

**Temperature Diagram**



**Fig. 18:** Maximum allow. Ambient Temperature as a Function of the Fluid Temperature for Stainless Steel Process Connections and Wafer Designs

**Ambient Conditions**

**Ambient Temperature**  
-20 °C to +60 °C

**Fluid Temperature**  
-25 °C to +130 °C, CIP-cleanable, see Temperature Diagram and max. allow. cleaning temperature.  
Observe the Ex-Specifications page 15.

**Storage Temperature**  
-20 °C to +70 °C

**Materials Flowmeter Primary**

Liner Material	Electrode Material		Electrode Design	
	Standard	Others	Standard	Others
PFA	Hast.-C4 (1.4539 at Pipe fittings & Tri-Clamp	Hast.-B2 SS 1.4539 SS 1.4751 [316Ti] Tantalum, Titanium, Platinum-Iridium	Flat head	Pointed head (≥ DN10 [3/8"])

**Process Connection Materials**

	Standard
Flanges per DIN	SS 1.4751 [316Ti]
Wafer Design	none
Weld stubs	SS 1.4404 [316L]
Pipe fittings per DIN 11851	SS 1.4404 [316L]
Tri-Clamp per DIN 32676	SS 1.4404 [316L]
External threads	SS 1.4404 [316L]

Connection Box	Standard	Option
COPA-XE	Alum alloy, painted, Paint coat Center: dark gray, RAL 7012 Cover: light gray, RAL 9002	
MAG-XE	SS 1.4301 [304]	-
Meter pipe	SS 1.4301 [304]	-
PG-Connector	Polyamide	
Primary housing	Deep drawn housing SS 1.4301 [304]	

**Gasket Materials**

Process Connections	Gasket Materials
Wafer Design	none
Weld stubs, pipe fittings, Tri-Clamp, external threads	EPDM (Ethylene-Propylene) std. with FDA-Approval, Silicone with FDA-Approval (Option)
Housing flat gaskets	Silicone

**Protection Class per EN 60529**  
IP67 Standard

**Pipeline Vibrations Based on EN 60068-2-6 as a Guide**

**For Compact Design (COPA) Model DE27/DE27F applies:**  
In the range 10-55 Hz max. 0.15 mm amplitude  
In the range 55-150 Hz max. 2 g acceleration



**Ex-Specifications for Flowmeter Primary:  
Max. Ambient Temperatures, Temperature Classes, max. Fluid Temperatures**

**a) Models DE27, DE27F, DE47**

Max. Ambient Temp. (°C)	Temperature Class	Liner	Max. allow. Fluid Temp. (operating specifications)				
			DN3-20[1/10"-3/4"]	DN25-32[1"-1 1/4"]	DN40-100[1 1/2"-4"]	DN125-300[5"-12"]	DN350-1000[14"-40"]
40 °C	T3	PTFE/PFA	130	125	130	130	-
		Hard/soft rbr.	90	90	90	90	-
	T4	PTFE/PFA	110	110	115	125	130
		Hard/soft rbr.	90	90	90	90	90
	T5	PTFE/PFA	75	75	80	90	95
		Hard/soft rbr.	75	75	80	90	90
T6	PTFE/PFA	60	60	70	75	80	
	Hard/soft rbr.	60	60	70	75	80	
50 °C	T3	PTFE/PFA	130	125	125	130	-
		Hard/soft rbr.	90	90	90	90	-
	T4	PTFE/PFA	110	110	115	125	120
		Hard/soft rbr.	90	90	90	90	90
	T5	PTFE/PFA	75	75	80	90	95
		Hard/soft rbr.	75	75	80	90	90
T6	PTFE/PFA	60	60	70	75	80	
	Hard/soft rbr.	60	60	70	75	80	
60 °C	T3	PTFE/PFA	-	-	-	-	-
		Hard/soft rbr.	-	-	-	-	-
	T4	PTFE/PFA	85	85	-	-	-
		Hard/soft rbr.	85	85	-	-	-
	T5	PTFE/PFA	75	75	80	85	-
		Hard/soft rbr.	75	75	80	85	-
T6	PTFE/PFA	60	60	70	75	80	
	Hard/soft rbr.	60	60	70	75	80	

**b) Models DE46, DE48**

Max. Ambient Temp. (°C)	Temperature Class	Liner	Max. allow. Fluid Temp. (operating specifications)			
			DN3-40[1/10"-1 1/2"]	DN50-100[2"-4"]	DN125-300[5"-12"]	DN350-1000[14"-40"]
40 °C	T3	PTFE/PFA	130	130	130	-
		Hard/soft rbr.	90	90	90	-
	T4	PTFE/PFA	110	115	125	130
		Hard/soft rbr.	90	90	90	90
	T5	PTFE/PFA	75	85	90	100
		Hard/soft rbr.	75	85	90	90
T6	PTFE/PFA	60	70	75	85	
	Hard/soft rbr.	60	70	75	85	
50 °C	T3	PTFE/PFA	-	130	130	-
		Hard/soft rbr.	-	90	90	-
	T4	PTFE/PFA	110	115	125	130
		Hard/soft rbr.	90	90	90	90
	T5	PTFE/PFA	75	85	90	100
		Hard/soft rbr.	75	85	90	90
T6	PTFE/PFA	60	70	75	85	
	Hard/soft rbr.	60	70	75	85	
60 °C	T3	PTFE/PFA	-	120	-	-
		Hard/soft rbr.	-	90	-	-
	T4	PTFE/PFA	90	115	120	105
		Hard/soft rbr.	90	90	90	90
	T5	PTFE/PFA	75	85	90	100
		Hard/soft rbr.	75	85	90	90
T6	PTFE/PFA	60	70	75	85	
	Hard/soft rbr.	60	70	75	85	

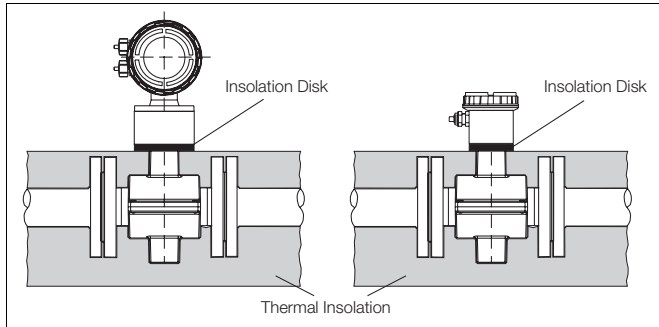
**i Important!**

The higher Temperature Class always include the lower ones. The lowest allow. fluid temperature is -25 °C. The max. allow. fluid temperatures specified in the tables are based on installations in non-insulated pipelines. The max. allow. temperature at the cable connectors is 70 °C. The converter for Models DE48 (COPA-XE Remote Design) can be operated to max. ambient temperatures of 60 °C. The Temperature Class is T6.



**Information for Operation in Thermally Insulated Pipelines**

When the flowmeter primary is insulated, the insulation may not extend above the lower edge of the insulation disk. The converter housing may not be insulated.



**Fig. 19:**



**Caution:**

It is essential that the temperature specifications per the Ex-Approval be observed. (Page 15)

**Specifications: Dust Ex-Approval**

**Marking**

II 2D T155 °C (use in Zone 21)

Max. allow. surface temperature T155 °C, applies for a dust layer thickness up to 5 mm. For thicker dust layers the max. allow. surface temperature is to be reduced (see EN 50281-1-2).

The dust may be electrically conductive or non-conductive.

**This is the data which is supplied with your instrument:**

Select instrument  
Find the Ordering Number key beginning on page 47  
The converter design is coded in the Ordering Number.

**Supply power**

High voltage 85-253 V AC  
Low voltage 16.8-26.4 V AC/16.8-31.2 V DC

**G**  
**K**

**Display**

Magnet Stick operation and light display

**G**

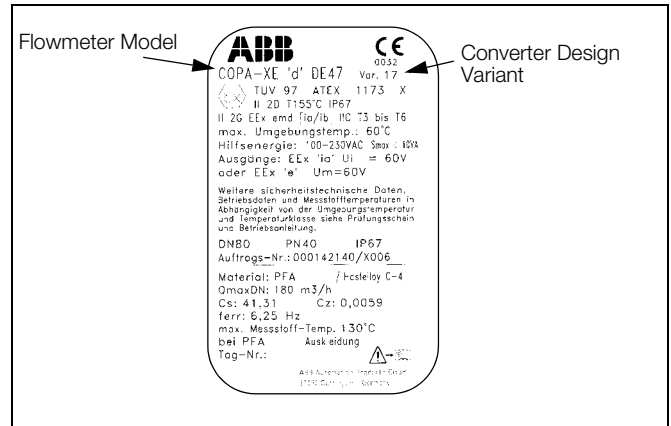
**In-/Output variants (converter design)**

Active current output + pulse output passive + contact input + contact output **03**  
Active current output + pulse output passive + contact input + contact output + HART **04**  
PROFIBUS PA 3.0 **14**  
FOUNDATION Fieldbus **15**  
PROFIBUS PA with M12 plug **16**  
Passive current output + pulse output passive + contact input + contact output + HART **17**

**Application**

Converter housing with threads for cable connector M20x1.5 (std.) **0**

The converter design options may also be found on the Type Plate on the instrument.



This Specification sheet is structured based on the individual converter designs. The specifications for each converter design are grouped together in one Chapter (e.g. electrical Interconnection Diagram, the Ex-Specifications, safety information, peripheral connections etc.)

Models	Pages
DE27, DE27F, DE47F, DE48F with converter design Var. 3/4	17-21
DE27, DE27F, DE47F, DE48F with converter design Var. 14/15	22-23
DE27, DE27F, DE47F, DE48F with converter design Var. 17	24-28
DE46F with converter Model E4 in design Var. 1/2/3/4	29-31
DE46F with converter Model E4 in design Var. 14/15/16	32-34

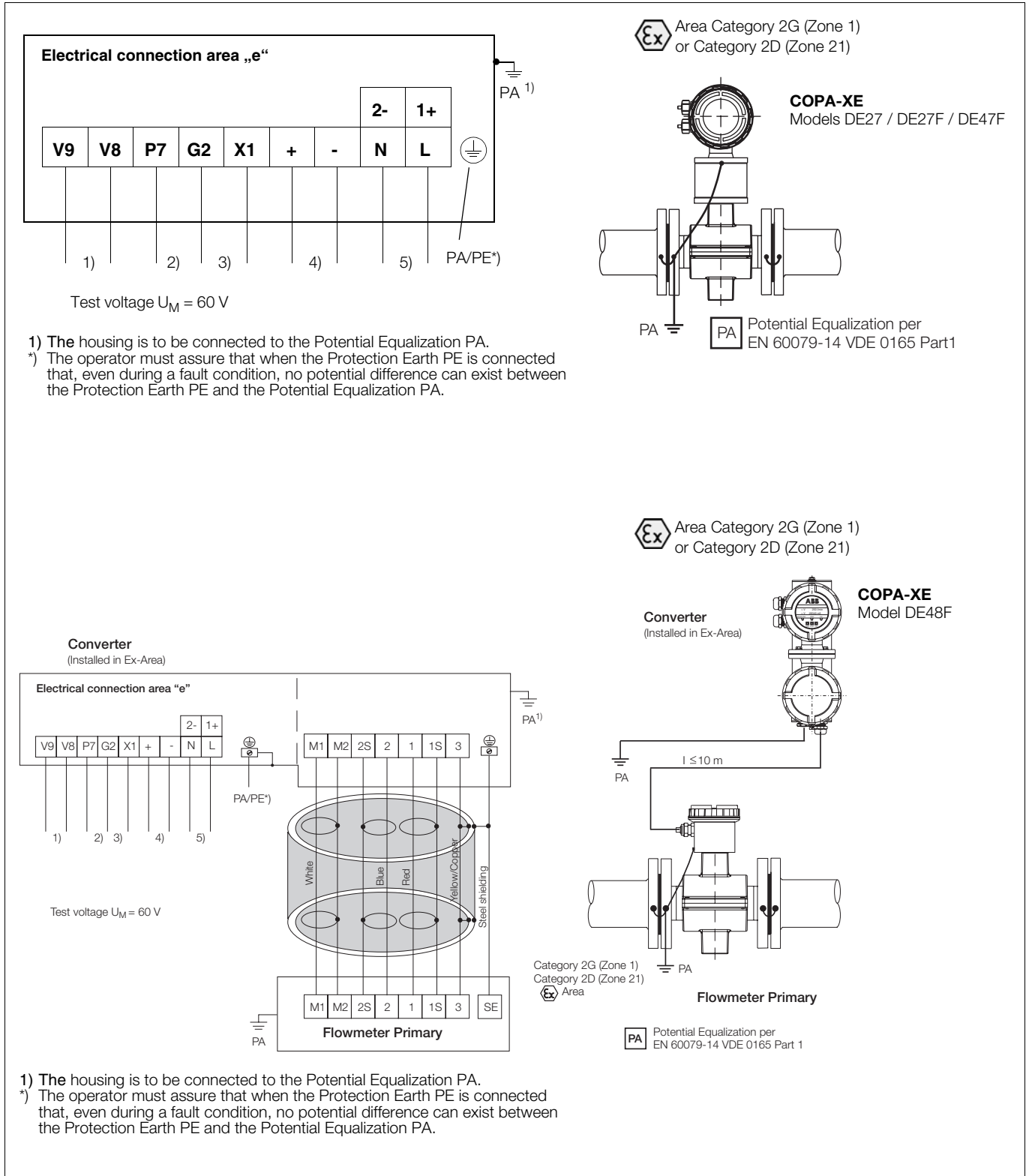




**Specifications for Converter Design Var. 03/04**

(active current output, pulse output passive, contact input, contact output, with/without HART-Protocol)

**Interconnection Diagram for Models DE27, DE27F, DE47F, DE48F**



**Fig. 20:** Interconnection Diagram for Model DE27, DE27F, DE47F, DE48F; Converter Design Var. 03/04



- 1) **Scaled pulse output**, passive, optocoupler  
 terminals: V8, V9,  
 Pulse factor selectable, pulse width from 0.1 ms to 2000 ms selectable,  $f_{\max} = 5$  kHz
  - a) Connection to an **intrinsically safe** circuit with the following maximum values:  
 $U_i = 15$  V,  $I_i = 30$  mA,  $P_i = 115$  mW, effective internal capacitance: 2.4 nF, effective internal inductance: 0.17 mH  
 Ignition Type : EEx ib IIC / IIB  
 Preferably configured in a NAMUR configuration for connection to a switch amplifier per DIN EN 60947-5-6 or
  - b) Connection to a **non-intrinsically safe** circuit  
 $0$  V  $\leq U_{\text{CEL}} \leq 2$  V,  $16$  V  $\leq U_{\text{CEH}} \leq 30$  V  
 $0$  mA  $\leq I_{\text{CEH}} \leq 0.2$  mA,  $2$  mA  $\leq I_{\text{CEL}} \leq 220$  mA  
 Shipped configuration is design b). (standard connections)  
 For design a) set the jumpers as shown in figure on page 19.
  
- 2) **Contact output**, passive, optocoupler  
 terminals: G2, P7  
 The following functions can be assigned in the software:  
 system monitor, empty pipe ( $\geq$  DN 10 [3/8"];  $\geq 20$   $\mu$ S/cm), forward/reverse direction signal, min. Alarm, max. Alarm
  - a) Connection to an **intrinsically safe** circuit with the following maximum values:  
 $U_i = 30$  V,  $I_i = 250$  mA,  $P_i = 1.1$  W, effective internal capacitance: 4.8 nF, effective internal inductance: 0.17 mH  
 Ignition Type : EEx ib IIC / IIB  
 Preferably configured in a NAMUR configuration for connection to a switch amplifier per DIN EN 60947-5-6  
 or
  - b) Connection to a **non-intrinsically safe** circuit  
 „closed“  $0$  V  $\leq U_{\text{CEL}} \leq 2$  V,  $2$  mA  $\leq I_{\text{CEL}} \leq 220$  mA  
 „opened“  $16$  V  $\leq U_{\text{CEH}} \leq 30$  V,  $0$  mA  $\leq I_{\text{CEH}} \leq 0.2$  mA  
 Shipped configuration is design b).  
 For design a) set the jumpers as shown in picture on page 19.
  
- 3) **Contact input**, passive, optocoupler  
 terminals: G2, X1  
 The following functions can be assigned in the software:  
 external zero return, external totalizer reset, external totalizer stop
  - a) Connection to an **intrinsically safe** circuit with the following maximum values:  
 $U_i = 30$  V,  $I_i = 250$  mA,  $P_i = 1.1$  W, effective internal capacitance: 4.8 nF, effective internal inductance: 0.17 mH  
 Ignition Type : EEx ib IIC / IIB  
 or
  - b) Connection to a **non-intrinsically safe** circuit  
 „On“:  $16$  V  $\leq U_{\text{CE}} \leq 30$  V, „Off“:  $0$  V  $\leq U_{\text{CE}} \leq 2$  V,  $I \leq 10$  mA
  
- 4) **Current output active** selectable  
 terminals: +/- the terminal - is connected internally to PA
 

0/4 to 20 mA	load $\leq 300$ Ohm
0/2 to 10 mA	load $\leq 800$ Ohm
0 to 5 mA	load $\leq 1800$ Ohm
0–10–20 mA	load $\leq 300$ Ohm
4–12–20 mA	load $\leq 300$ Ohm

  - a) Connection to an **intrinsically safe** circuit (Ignition Type : EEx ib IIC / IIB)  
 values for  $U_o$ ,  $I_o$ ,  $P_o$ ,  $L_o$  see page 19
  - b) Connection to a **non-intrinsically safe** circuit

Option: HART-Protocol, technical specifications see page 37.
  
- 5) **Supply power**, see Type Plate



**Attention!**

For technical reasons, PA should be identical to the pipeline potential.

Fig. 21: Legends for Fig. 20



**Internal switching between Standard Configuration (as shipped) and NAMUR-Configuration**

The Ignition Type of the outputs remains unchanged.

The instruments connected to these circuits must satisfy the specific Ex-Requirements.

When plugging the jumpers into the „NAMUR Configuration“ position the resistors used to monitor for cable breaks or short circuits are integrated into the output circuits. The design as a NAMUR contact for connection to a switch amplifier is per DIN EN 60947-5-6. This applies to the pulse output and the contact output. The instrument is shipped in the standard configuration.

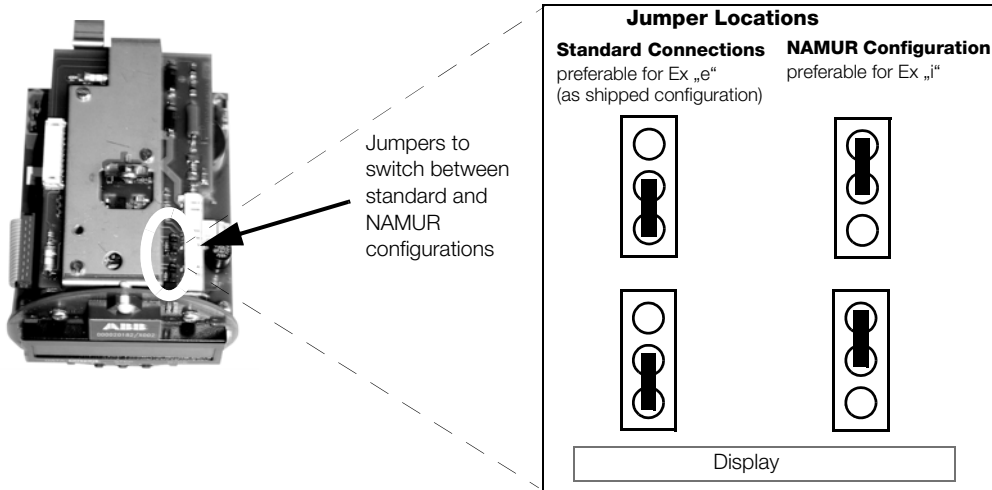


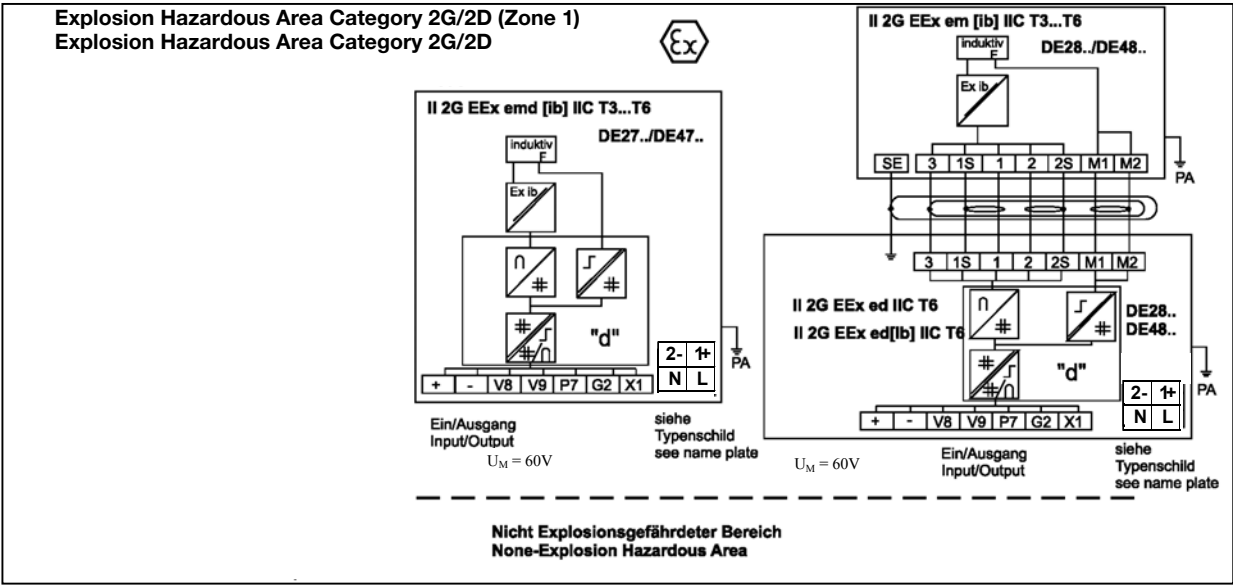
Fig. 22:

**Safety Specifications for In- and Outputs for Converter Design Var. 03 and Var. 04 for Models DE27, DE27F, DE47F, DE48F**

Output Circuit	In Ignition Type Intrinsic Safety EEx ib IIC / IIB						Connections in Increased Safety, $U_m = 60\text{ V}, I_m = 35\text{ A}$
Current output active terminals +/-  the terminal - is connected to PA	$U_o = 20\text{ V}$						Operating values: $U = 30\text{ V}$ $I = 30\text{ mA}$
	$I_o$ [mA]	$P_o$ [mW]	EEx ib IIC		EEx ib IIB		
			$C_o$ [nF]	$L_o$ [mH]	$C_o$ [nF]	$L_o$ [mH]	
	100	500	218	3.8	1400	14.8	
	curve: linear effective internal capacitance $C_i = 1.2\text{ nF}$ effective internal inductance $L_i = 0.082\text{ mH}$ for connection to passive, intrinsically safe circuits or intrinsically safe circuits with a maximum value: $U_i = 60\text{ V}$ the terminal - is connected to PA						
Pulse output terminals V8/V9 (V9 → Plus)	$U_i = 15\text{ V}$ $I_i = 30\text{ mA}$ $P_i = 115\text{ mW}$		$C_i = 2.4\text{ nF}$ $L_i = 0.17\text{ mH}$				Operating values: $U = 30\text{ V}$ $I = 220\text{ mA}$
Contact output terminals P7/G2 (P7 → Plus)	$U_i = 30\text{ V}$ $I_i = 250\text{ mA}$ $P_i = 1.1\text{ W}$		$C_i = 4.8\text{ nF}$ $L_i = 0.17\text{ mH}$				Operating values: $U = 30\text{ V}$ $I = 10\text{ mA}$
Contact input terminals X1/G2 (X1 → Plus)	$U_i = 30\text{ V}$ $I_i = 250\text{ mA}$ $P_i = 1.1\text{ W}$		$C_i = 4.8\text{ nF}$ $L_i = 0.17\text{ mH}$				Operating values: $U = 30\text{ V}$ $I = 10\text{ mA}$



**TÜV 97 ATEX 1173 X**



**Safety Specifications**

- Ambient temperature range -20 °C to +60 °C, minimum fluid temperatures -25 °C
- The output circuits are designed so that they can be connected to intrinsically safe as well as non-intrinsically safe circuits. A combination of intrinsically safe and non-intrinsically safe circuits is not permissible. For intrinsically safe circuits, potential equalization is to be maintained along the entire length of the circuit. The test voltage for the non-intrinsically safe circuits is  $U_T = 60 \text{ V}$ . The connection values to the flowmeter primary are  $U_{Nom} = 60 \text{ V}$ ,  $U_{Test} \geq 1500 \text{ V}$ , Signal cable Part No.: D173D018U02. After turning the power to the flowmeter off wait at least  $t > 2 \text{ min.}$  before opening the converter housing. At start-up the requirements in EN 50281-1-2 for applications with combustible dust must be observed. The operator must assure that when the Protection Earth PE is connected that, even during a fault condition, no potential difference can exist between the Protection Earth PE and the Potential Equalization PA.

**Special requirements:**

The contact and pulse outputs can be configured internally (terminals V8, V9 / P7, G2) as NAMUR-contacts for connection to a NAMUR-amplifier. The instrument is not shipped in the NAMUR configuration. As shipped, the installed cable connectors are black. If the signal outputs are connected to intrinsically safe circuits, then the light blue caps included with the shipment should be used for the those cable entries.



**Caution:**

Observe the max. allow. ambient temperatures, Temperature Classes as well as the fluid temperatures, page 15 and the information for operation with thermally insulated pipelines and with combustible dust page 16.

**Fig. 23:** Safety Specifications, Converter Design Variants Var. 03 and Var. 04

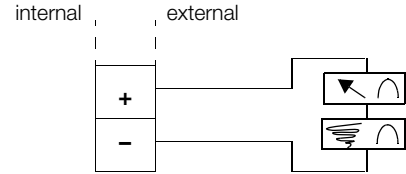


### Interconnection Examples for Peripherals for Converter Design Var. 03/04 for Models DE27, DE27F, DE47F, DE48F

With the exception of the supply power, the voltages in the remaining circuits do not represent a personnel contact hazard. Only instruments whose circuit voltages are not hazardous and do not exceed  $U_T = 60\text{ V}$  may be connected.

#### Current Output active

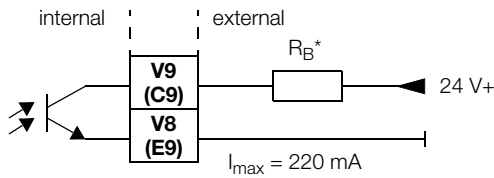
0/4-20 mA	load ≤ 300 Ohm
0/2-10 mA	load ≤ 800 Ohm
0-5 mA	load ≤ 1800 Ohm
0-10, 10-20 mA	load ≤ 300 Ohm
4-12, 12-20 mA	load ≤ 300 Ohm



#### **i** Important!

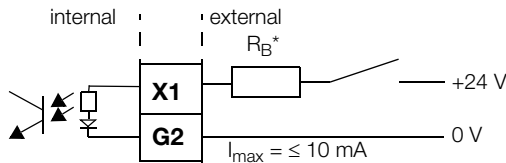
The circuits, based on the selected Ex-Protection Class („i“ or „e“), are to be configured as Intrinsically safe or non-intrinsically safe as are the peripheral instruments which are to be connected to them.

#### Pulse output (optocoupler)



$$* R_B \geq \frac{U_{CE}}{I_{CE}}$$

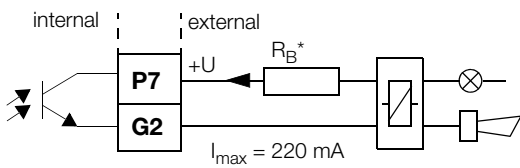
#### Contact input for external zero return Function selectable in software



$$* R_B \geq \frac{U}{I}$$

Contact setting:  
Output is turned off when the contact is closed or  
the internal totalizer is reset to zero when contact is closed

#### Contact output e.g. for system monitor, Max.-Min.-Alarm, empty pipe or forward/reverse direction Function selectable in software



$$* R_B \geq \frac{U_{CE}}{I_{CE}}$$

#### Pulse output passive optocoupler, separate forward and reverse pulses on contact output

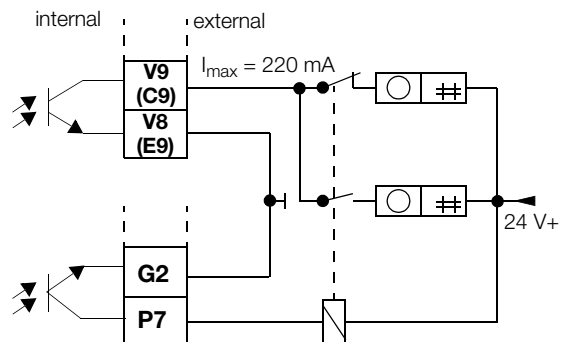
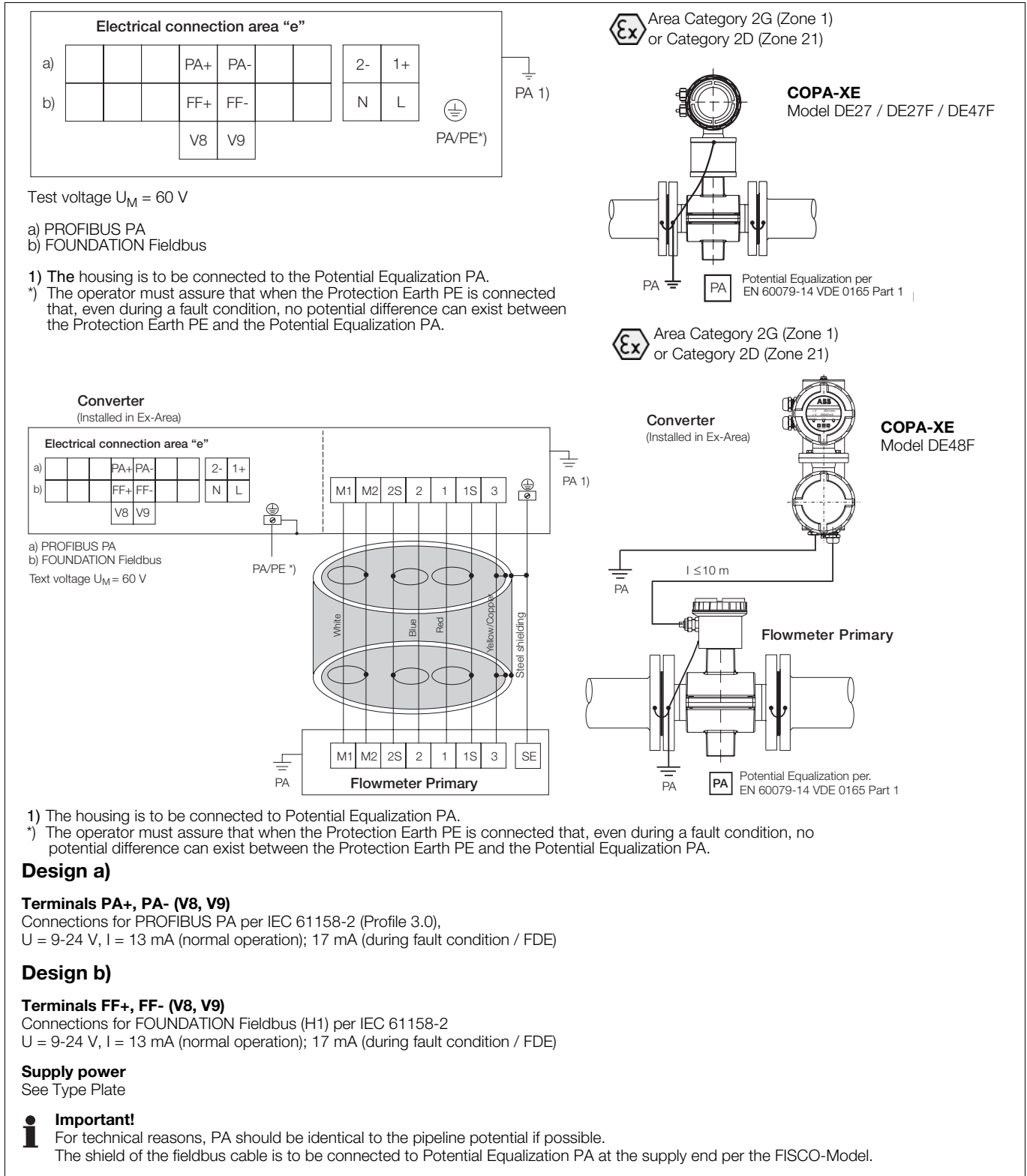


Fig. 24: Interconnection Examples for Peripherals with Analog Communication (incl. HART-Protocol)



**Specifications for Converter Design Var. 14/15/16  
(PROFIBUS PA, FOUNDATION Fieldbus)**

**Interconnection Diagram for Models DE27, DE27F, DE47F, DE48F**



**Fig. 25:** Interconnection Diagram for Models DE27, DE27F, DE47F, DE48F; Converter Design Var. 14/15/16



**Safety Specifications for the In- and Outputs for Converter Design Var. 14/15/16 for Models DE27, DE27F, DE47F, DE48F**

Output Circuit	in Ignition Type Intrinsic Safety EEx ia IIC	Non-Intrinsic Safety $U_m = 60\text{ V}$
Fieldbus terminals V8/V9	$U_i = 60\text{ V}$ The effective internal capacitance and Inductance are negligibly small	Operating values: $U = 9 \dots 32\text{ V}$ $I = 10\text{ mA}$

**Information for FISCO-Model**

The Ex-Design of the COPA-XE/MAG-XE is designed according to the FISCO-Model (FISCO = **F**ieldbus **I**ntrinsically **S**afe **C**oncept) of PTB. A certification of the Intrinsic Safety for interconnections to other intrinsically safe equipment is not required if the boundary conditions listed below are met:

- All participants must be approved per FISCO, e.g. by PTB, TÜV, BVS, KEMA.
- The max. cable length in the Segment for EEx is limited to 1000 m or for EEx ib to 1900 m.
- The bus cable (Type A) must satisfy the following values:  
 $R' = 15 \dots 150\ \Omega/\text{km}$ ,  $L' = 0.4 \dots 1\ \text{mH}/\text{km}$ ,  $C' = 80 \dots 200\ \text{nF}/\text{km}$ .
- For each field instrument ( $U_i, I_i, P_i$ ) the following applies:  
 $U_0 \leq U_i, I_0 \leq I_i, P_0 \leq P_i$ .
- All participants operate as passive current sinks.
- When a bus participant transmits, no power is introduced.
- There is only one active instrument in the segment (supply instrument/segment coupler).

**Safety Specifications:**

- Ambient temperatures  $-20\text{ °C}$  to  $+60\text{ °C}$ ,  
minimum fluid temperature  $-25\text{ °C}$

The output circuits are designed so that they can be connected to **intrinsically safe** as well as **non-intrinsically safe** circuits. As long as the test voltage  $U_T = 60\text{ V}$  at a connection is not exceeded the Intrinsic Safety is maintained.

When a shielded interconnection cable is connected to the output circuit the shield must be connected to the Potential Equalization outside of the explosion hazardous area per the FISCO-Model.

Flowmeter primary connection values  $U_{Nom} = 60\text{ V}$ ,  
 $U_{Test} \geq 1500\text{ V}$ , Signal cable Part No.: D173D018U02.

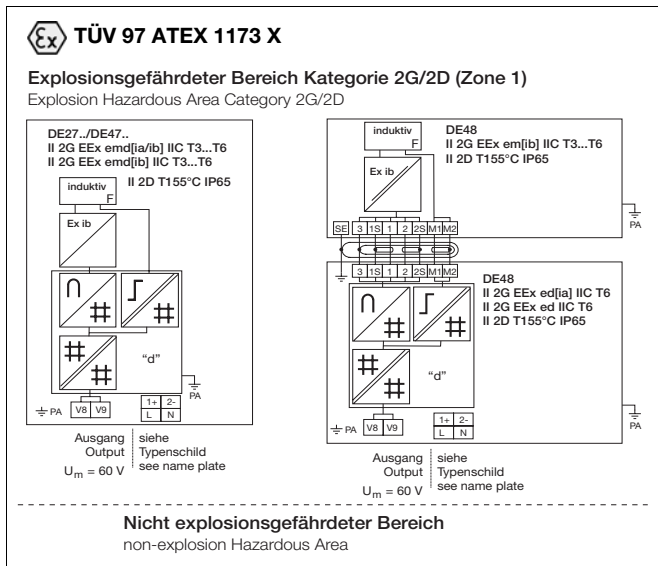
After turning the power to the flowmeter off wait at least  $t > 2\text{ min}$ . before opening the converter housing.

At start-up the requirements in EN 50281-1-2 for applications with combustible dust must be observed.

The operator must assure that when the Protection Earth PE is connected that, even during a fault condition, no potential difference can exist between the Protection Earth PE and the Potential Equalization PA.

**Important!**

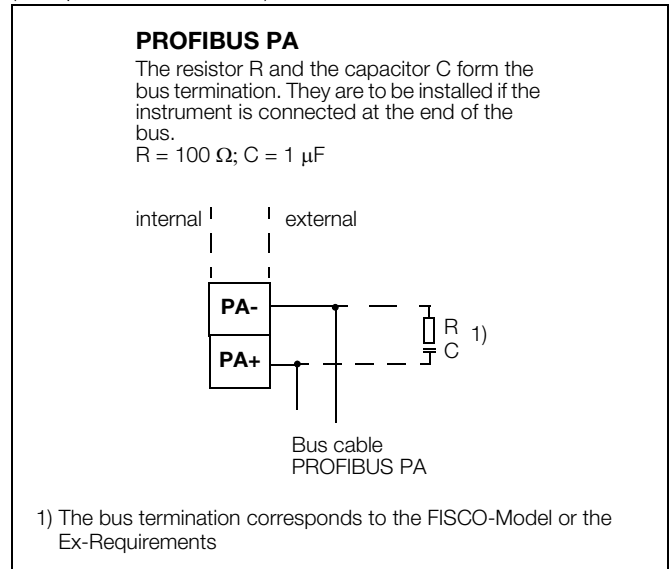
Observe the max. allow. ambient temperatures, Temperature Classes as well as the fluid temperatures, page 15 and the information for operation with thermally insulated pipelines and with combustible dust page 16.



**Fig. 26:** Safety Specifications, Converter Design Variants Var. 14/15/16

**Interconnection Examples for Peripherals for Converter Design Var. 14/15/16**

(example for PROFIBUS PA)

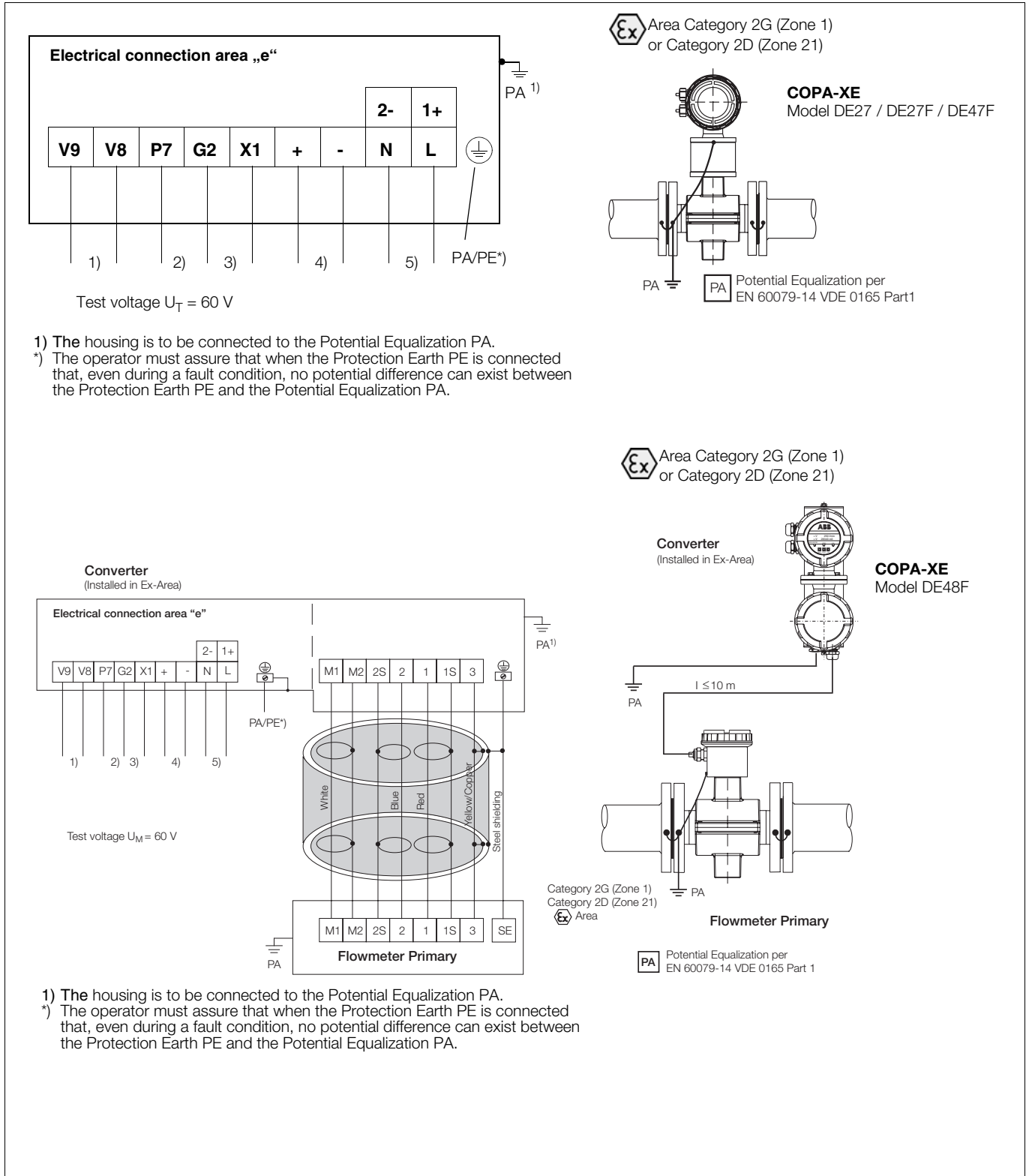




**Specifications for Converter Design Var. 17**

(passive current output, pulse output passive, contact input, contact output, HART-Protocol)

**Interconnection Diagram for Models DE27, DE27F, DE47F, DE48F**



**Fig. 27:** Interconnection Diagram for Model DE27, DE27F, DE47F, DE48F; Converter Design Var. 17





- 1) **Scaled pulse output**, passive, optocoupler  
terminals: V8, V9,  
Pulse factor selectable, pulse width from 0.1 ms to 2000 ms selectable,  $f_{\max} = 5$  kHz
  - a) Connection to an **intrinsically safe** circuit with the following maximum values:  
 $U_i = 30$  V,  $I_i = 250$  mA,  $P_i = 1.1$  W, effective internal capacitance: 12 nF, effective internal inductance: negligibly small  
Ignition Type : EEx ia IIC / IIB  
Preferably configured in a NAMUR configuration for connection to a switch amplifier per DIN EN 60947-5-6 or
  - b) Connection to a **non-intrinsically safe** circuit  
 $0$  V  $\leq U_{CEL} \leq 2$  V,  $16$  V  $\leq U_{CEH} \leq 30$  V  
 $0$  mA  $\leq I_{CEH} \leq 0.2$  mA,  $2$  mA  $\leq I_{CEL} \leq 220$  mA  
Shipped configuration is design b). (standard connections)  
For design a) set the jumpers as shown in figure on page 26.
  
- 2) **Contact output**, passive, optocoupler  
terminals: G2, P7  
The following functions can be assigned in the software:  
system monitor, empty pipe ( $\geq$  DN 10 [3/8"];  $\geq 20$   $\mu$ S/cm), forward/reverse direction signal, min. Alarm, max. Alarm
  - a) Connection to an **intrinsically safe** circuit with the following maximum values:  
 $U_i = 30$  V,  $I_i = 250$  mA,  $P_i = 1.1$  W, effective internal capacitance: 24 nF, effective internal inductance: negligibly small  
Ignition Type : EEx ia IIC / IIB  
Preferably configured in a NAMUR configuration for connection to a switch amplifier per DIN EN 60947-5-6  
or
  - b) Connection to a **non-intrinsically safe** circuit  
„closed“  $0$  V  $\leq U_{CEL} \leq 2$  V,  $2$  mA  $\leq I_{CEL} \leq 220$  mA  
„opened“  $16$  V  $\leq U_{CEH} \leq 30$  V,  $0$  mA  $\leq I_{CEH} \leq 0.2$  mA  
Shipped configuration is design b).  
For design a) set the jumpers as shown in Fig. on page 26.
  
- 3) **Contact input**, passive, optocoupler  
terminals: G2, X1  
The following functions can be assigned in the software:  
external zero return, external totalizer reset, external totalizer stop
  - a) Connection to an **intrinsically safe** circuit with the following maximum values:  
 $U_i = 30$  V,  $I_i = 250$  mA,  $P_i = 1.1$  W, effective internal capacitance: 24 nF, effective internal inductance: negligibly small  
Ignition Type : EEx ia IIC / IIB  
or
  - b) Connection to a **non-intrinsically safe** circuit  
„On“:  $16$  V  $\leq U_{CE} \leq 30$  V, „Off“:  $0$  V  $\leq U_{CE} \leq 2$  V,  $I \leq 10$  mA
  
- 4) **Current output passive** selectable  
terminals: +/- the terminal (+ and -) are potential free (not connected internally to PA)  
allowable load: 250 Ohm to 560 Ohm  
Output signal: 4–20 mA with superimposed HART-Protocol  
Operating specifications for the passive current output  
Operating voltage: 9–30 V (see also diagram page 28)  
Output current: 4–26 mA (max)  
Ex-Specifications for the passive current outputs
  - a) Connection to an **intrinsically safe** circuit (Ignition Type : EEx ia IIC / IIB)  
 $U_i = 60$  V;  $C_i = 24$  nF; effective internal inductance: negligibly small
  - b) Connection to a **non-intrinsically safe** circuit  
Test voltage:  $U_m = 60$  V  
Operating values:  $U = 30$  V;  $I = 26$  mA
  
- 5) **Supply power**, see Type Plate



**Caution!**

For technical reasons, PA should be identical to the pipeline potential.

Fig. 28: Legends for Fig. 27

### Internal switching between standard configuration (as shipped) and NAMUR-Configuration

The Ignition Type of the outputs remains unchanged.

The instruments connected to these circuits must satisfy the specific Ex-Requirements.

When plugging the jumpers into the „NAMUR Configuration“ position the resistors used to monitor for cable breaks or short circuits are integrated in the output circuits. The design as a NAMUR contact for connection to a switch amplifier per DIN EN 60947-5-6. This applies to the pulse output and the contact output. The instrument is shipped in the standard configuration.

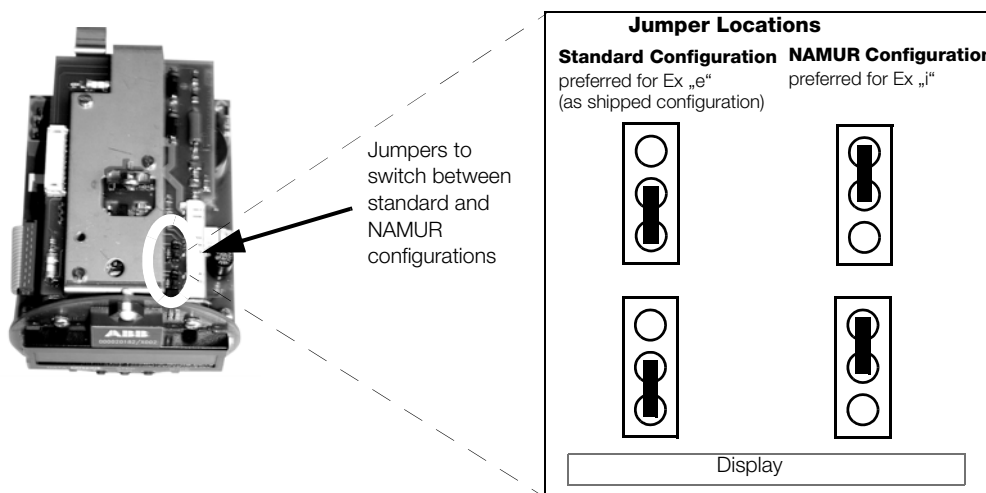


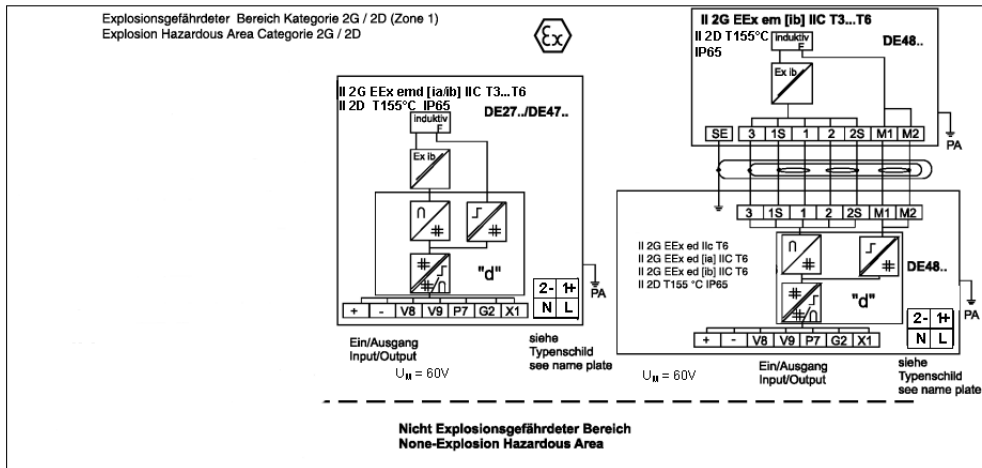
Fig. 29:

### Safety Specifications for Converter In- and Outputs Design Var. 17 for Models DE27, DE27F, DE47F, DE48F

Circuit	in Ignition Type Intrinsic Safety EEx ia IIC / IIB for connection to a certified intrinsically safe circuit	Non-intrinsically safe $U_m = 60\text{ V}$ Operating values:
Current output (passive) terminals +/-	$U_i = 60\text{ V}$ $C_i = 24\text{ nF}$ $L_i$ : negligibly small	$U = 30\text{ V}$ $I = 30\text{ mA}$
Pulse output terminals V8/V9 (V9 → Plus)	$U_i = 30\text{ V}$ $I_i = 250\text{ mA}$ $P_i = 1.1\text{ W}$ $C_i = 12\text{ nF}$ $L_i$ : negligibly small	$U = 30\text{ V}$ $I = 220\text{ mA}$
Contact output terminals P7/G2 (P7 → Plus)	$U_i = 30\text{ V}$ $I_i = 250\text{ mA}$ $P_i = 1.1\text{ W}$ $C_i = 24\text{ nF}$ $L_i$ : negligibly small	$U = 30\text{ V}$ $I = 10\text{ mA}$
Contact input terminals X1/G2 (X1 → Plus)	$U_i = 30\text{ V}$ $I_i = 250\text{ mA}$ $P_i = 1.1\text{ W}$ $C_i = 24\text{ nF}$ $L_i$ : negligibly small	$U = 30\text{ V}$ $I = 10\text{ mA}$



**TÜV 97 ATEX 1173X**



**Safety Specifications**

- Ambient temperatures -20 °C to +60 °C, minimum fluid temperature -25 °C

The output circuits are designed so that they can be connected to **intrinsically safe** as well as **non-intrinsically safe** circuits. A combination of **intrinsically safe** and **non-intrinsically safe** circuits is not permissible.

For **intrinsically safe** circuits, potential equalization is to be maintained along the entire length of the circuit. The test voltage for the **non-intrinsically safe** circuits is  $U_T = 60 V$ .

The connection values to the flowmeter primary are  $U_{Nom} = 60 V$ ,  $U_{Test} \geq 1500 V$ , Signal cable Part No.: D173D018U02.

The connection values to the flowmeter primary are  $U_{Nom} = 60 V$ ,  $U_{Test} \geq 1500 V$ , Signal cable Part No.: D173D018U02.

After turning the power to the flowmeter off wait at least  $t > 2 \text{ min.}$  before opening the converter housing. At start-up the requirements in EN 50281-1-2 for applications with combustible dust must be observed. The operator must assure that when the Protection Earth PE is connected that, even during a fault condition, no potential difference can exist between the Protection Earth PE and the Potential Equalization PA.

**Special Requirements:**

The contact and pulse outputs can be configured internally (terminals V8, V9 / P7, G2) as NAMUR-contacts for connection to a NAMUR-amplifier.

The instrument is not shipped in the NAMUR configuration. As shipped, the installed cable connectors are black. If the signal outputs are connected to intrinsically safe circuits, then the light blue caps included with the shipment should be used for the those cable entries.



**Caution!**

Observe the max. allow. ambient temperatures, Temperature Classes as well as the fluid temperatures, page 15 and the information for operation with thermally insulated pipelines and with combustible dust page 16.

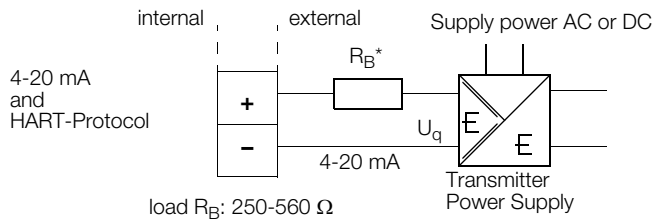
**Fig. 30:** Safety Specifications, Instrument with Converter with Passive Current Output (Var. 17)



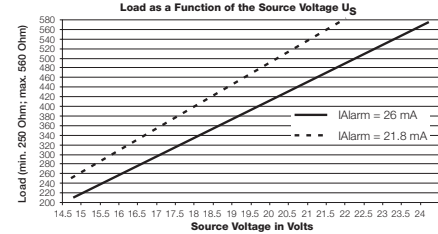
### Interconnection Examples for Peripherals for Converter Design Var. 17 Models DE27, DE27F, DE47F, DE48F

With the exception of the supply power, the voltages in the remaining circuits do not represent a personnel contact hazard. Only instruments whose circuit voltages are not hazardous and do not exceed  $U_T = 60\text{ V}$  may be connected.

#### Current Output passive



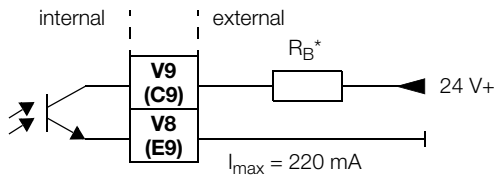
The power supplies or voltage sources are to be selected so that the voltage at the terminals of the converter is  $U \geq 9\text{ Volt}$ .



#### Important!

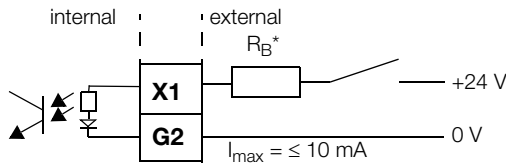
The circuits, based on the selected Ex-Protection Class („i“ or „e“), are to be configured as Intrinsically safe or non-intrinsically safe as are the peripheral instruments which are to be connected.

#### Pulse output (optocoupler)



$$* R_B \geq \frac{U_{CE}}{I_{CE}}$$

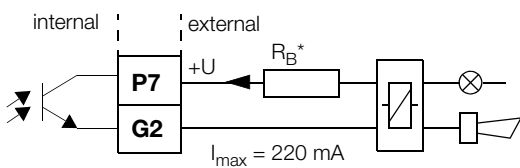
#### Contact input for external zero return Function selectable in software



$$* R_B \geq \frac{U}{I}$$

Contact setting:  
Output is turned off when the contact is closed or  
the internal totalizer is reset to zero when contact is closed

#### Contact output e.g. for system monitor, Max.-Min.-Alarm, empty pipe or forward/reverse direction signal Function selectable in software



$$* R_B \geq \frac{U_{CE}}{I_{CE}}$$

#### Pulse output passive optocoupler, separate forward and reverse pulses for contact output

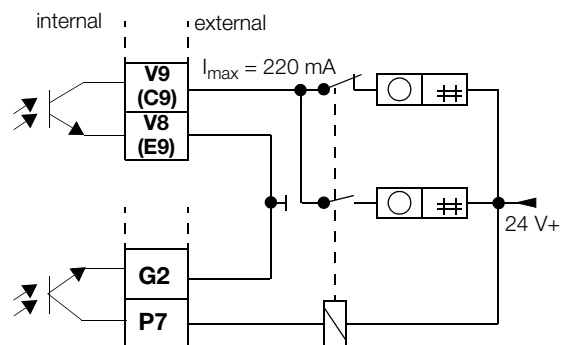


Fig. 31: Interconnection Examples for Peripherals with Analog Communication (incl. HART-Protocol)

## Specifications for External Converter Model E4

### Interconnection Diagram for Flowmeter Primary Model DE46F to External Converter Model E4 in the Converter Design Var. 01/02/03/04

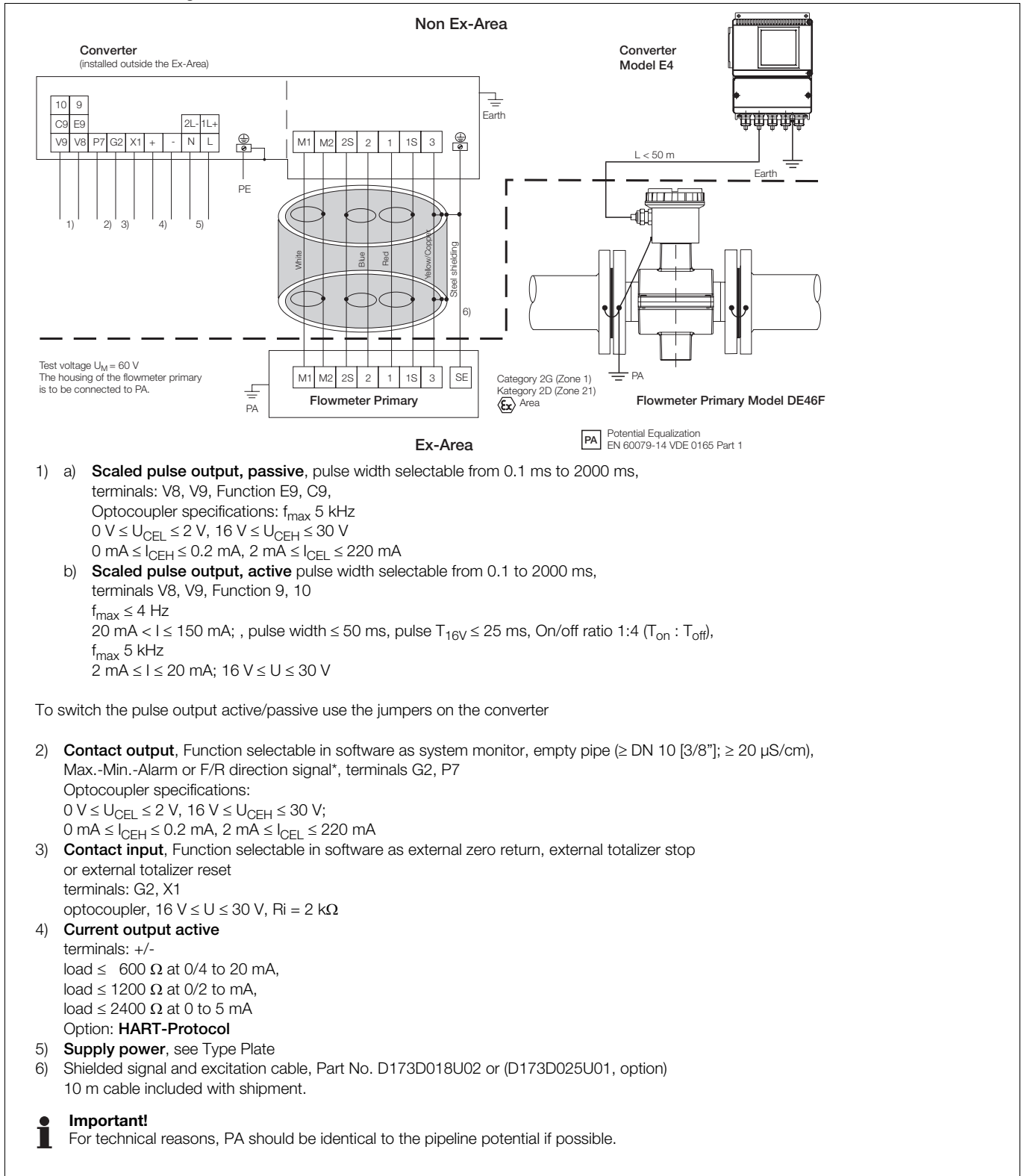
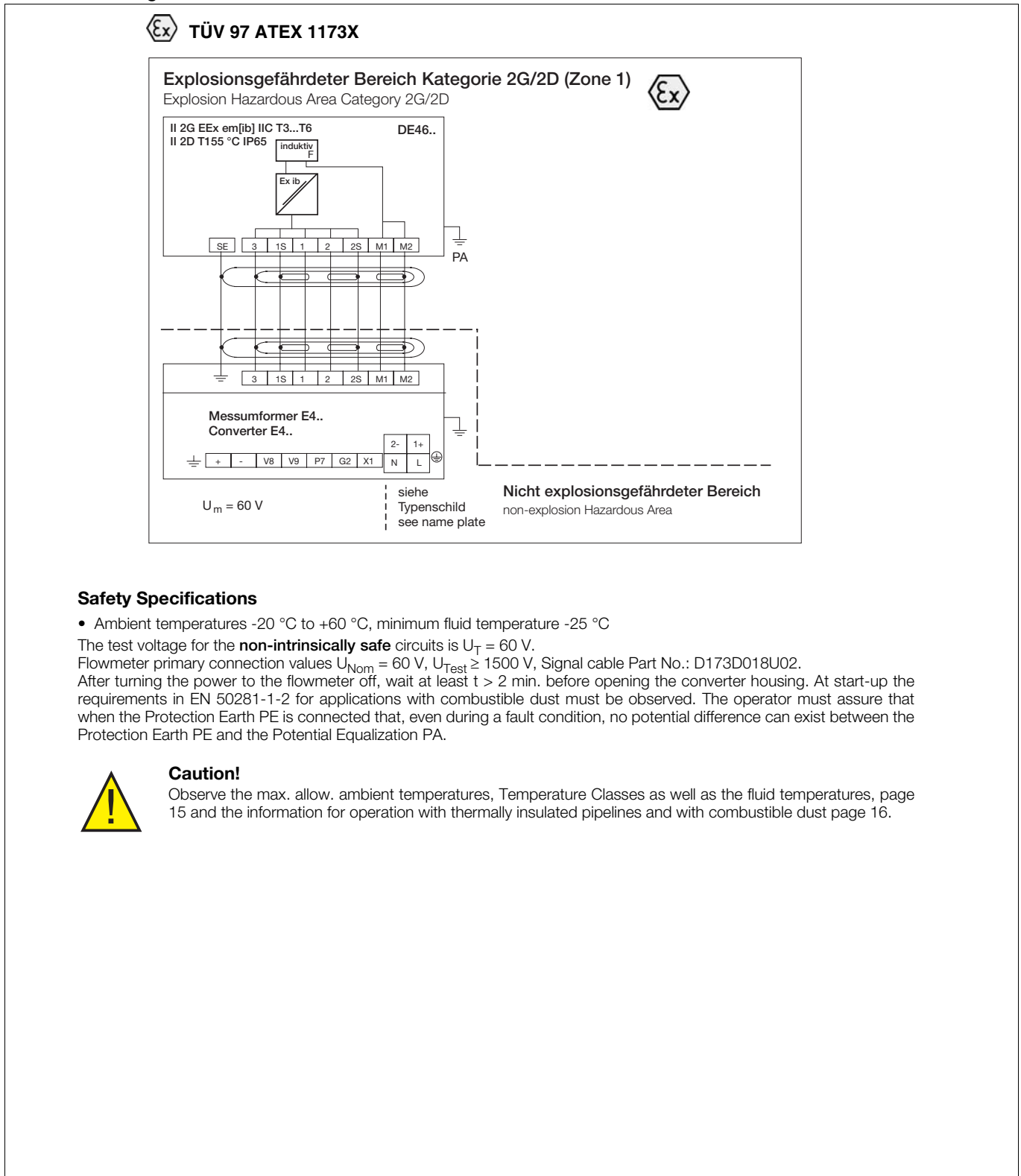


Fig. 32: Interconnection Diagram for Model DE46F to External Converter Model E4, Converter Design Var. 01/02/03/04



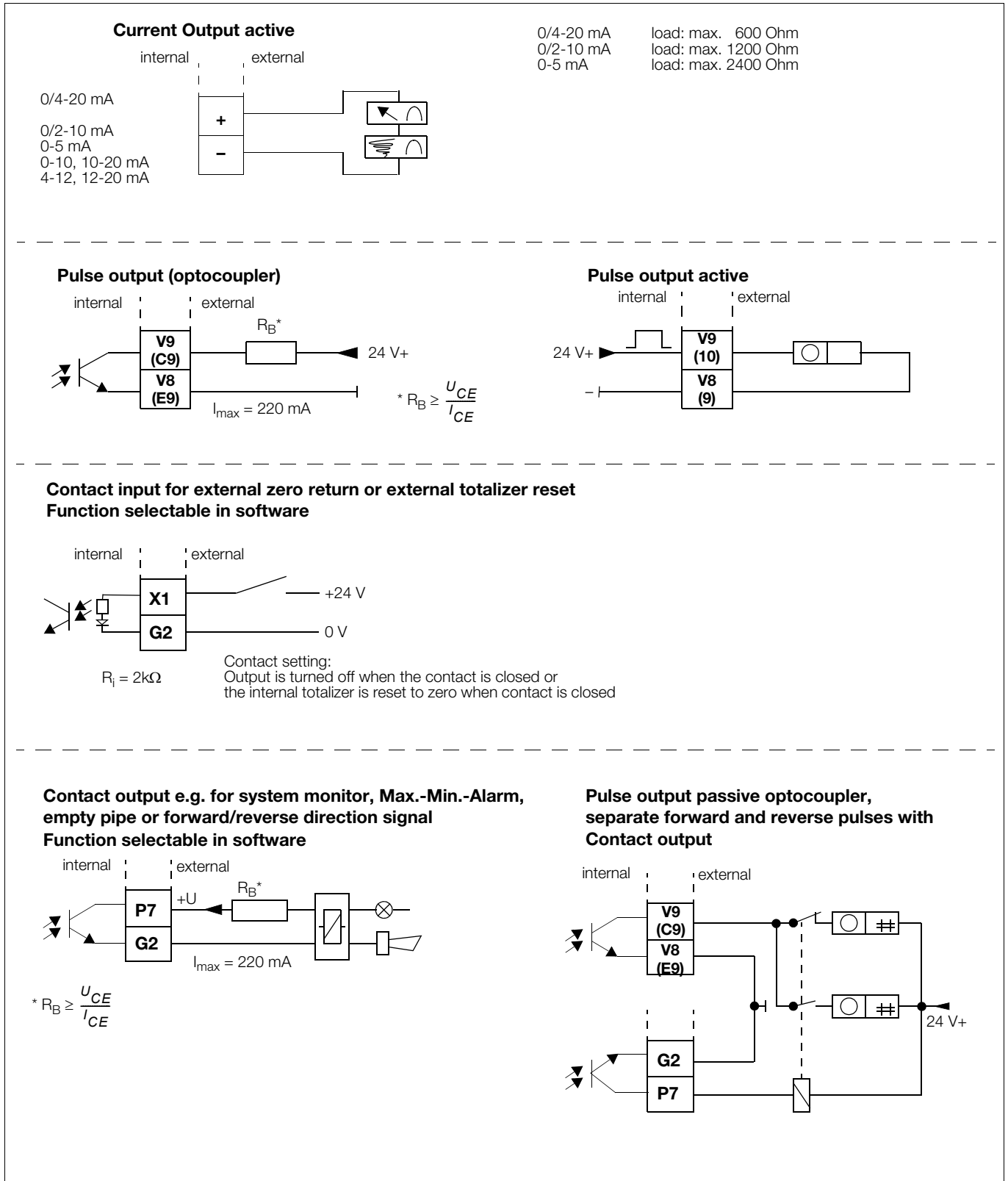
**Safety Specifications for the In- and Outputs for Flowmeter Primary Model DE46F with External Converter Model E4 in Design Var. 01/02/03/04**



**Fig. 33:** Safety Specifications for the In- and Outputs for Flowmeter Primary Model DE46F with External Converter Model E4 in Design Var. 01/02/03/04



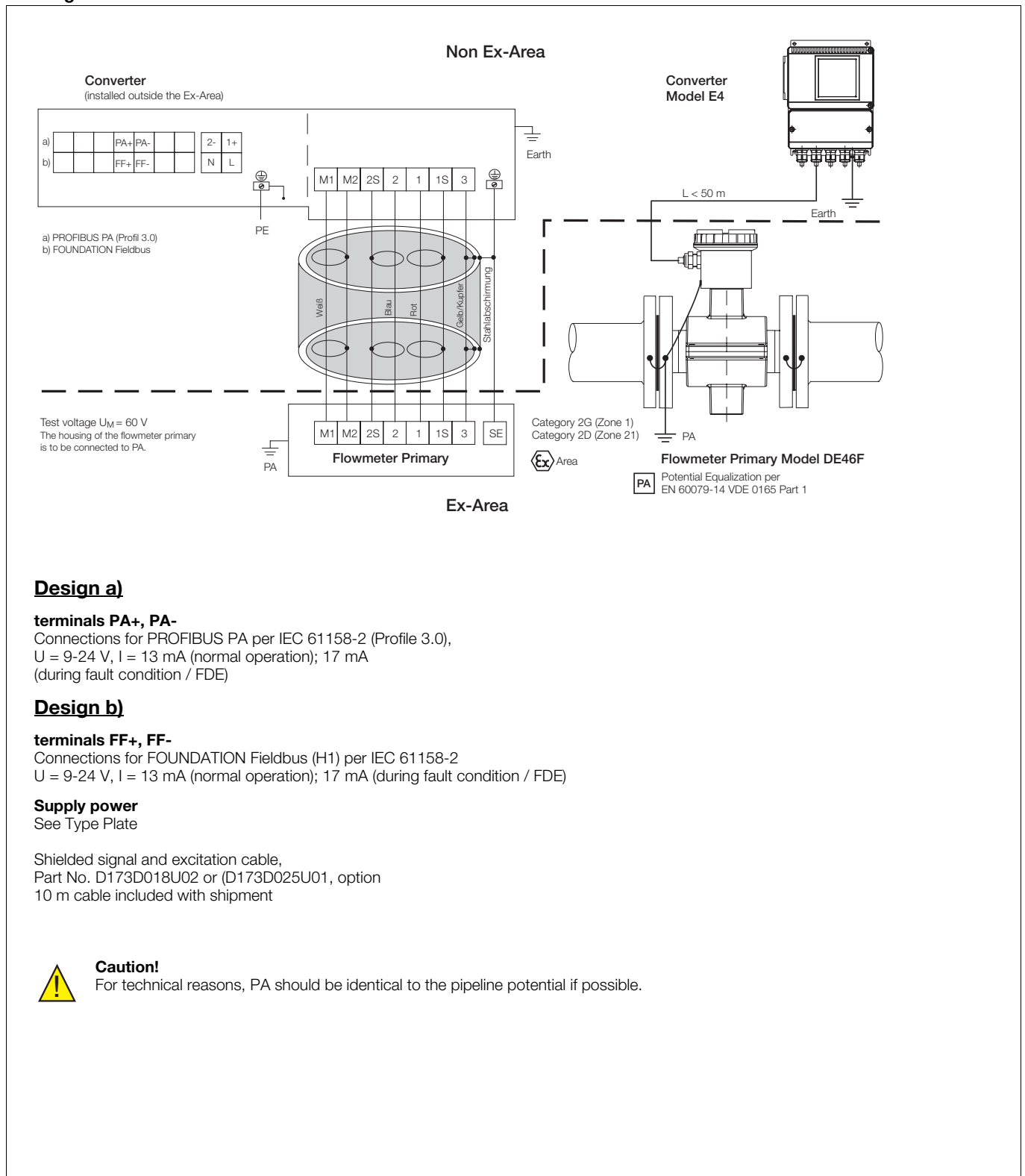
**Interconnection Examples for Peripherals to External Converter Model E4 in Design Var. 01/02/03/04**



**Fig. 34:** Interconnection Examples for Peripherals for External Converter Model E4 in Design Var. 01/02/03/04

## Specifications for External Converter Model E4

### Interconnection Diagram for Flowmeter Primary Model DE46F to External Converter Model E4 in Design Var. 14/15/16



#### Design a)

##### terminals PA+, PA-

Connections for PROFIBUS PA per IEC 61158-2 (Profile 3.0),  
 $U = 9-24\text{ V}$ ,  $I = 13\text{ mA}$  (normal operation);  $17\text{ mA}$  (during fault condition / FDE)

#### Design b)

##### terminals FF+, FF-

Connections for FOUNDATION Fieldbus (H1) per IEC 61158-2  
 $U = 9-24\text{ V}$ ,  $I = 13\text{ mA}$  (normal operation);  $17\text{ mA}$  (during fault condition / FDE)

#### Supply power

See Type Plate

Shielded signal and excitation cable,  
Part No. D173D018U02 or (D173D025U01, option  
10 m cable included with shipment



#### Caution!

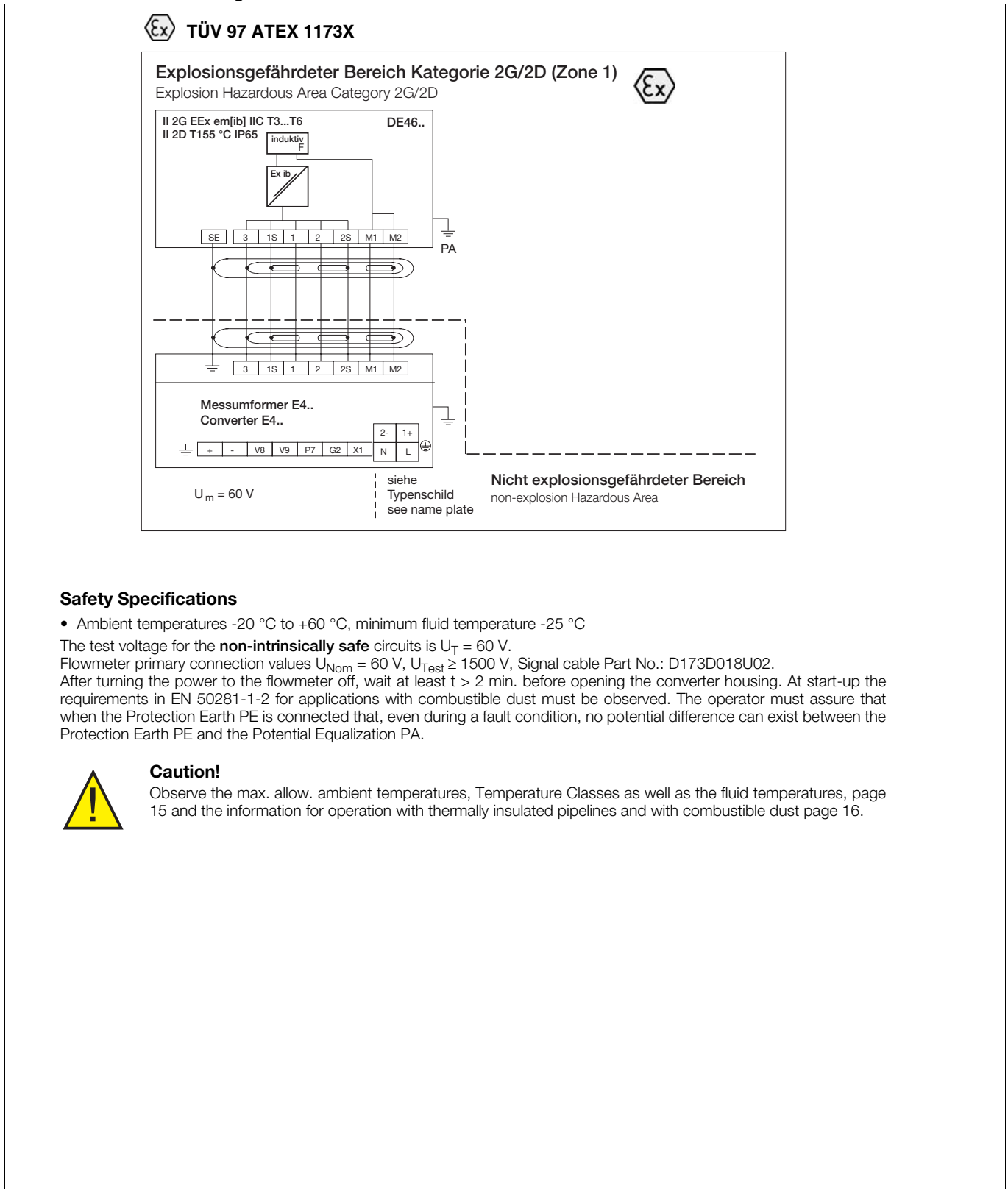
For technical reasons, PA should be identical to the pipeline potential if possible.

Fig. 35: Interconnection Diagram for Flowmeter Primary Model DE46F to External Converter Model E4 in Design Var. 14/15/16





**Safety Specifications for In- and Outputs for Flowmeter Primary Model DE46F with External Converter Model E4 in Design Var. 14/15/16**



**Safety Specifications**

- Ambient temperatures -20 °C to +60 °C, minimum fluid temperature -25 °C

The test voltage for the **non-intrinsically safe** circuits is  $U_T = 60\text{ V}$ .  
 Flowmeter primary connection values  $U_{Nom} = 60\text{ V}$ ,  $U_{Test} \geq 1500\text{ V}$ , Signal cable Part No.: D173D018U02.  
 After turning the power to the flowmeter off, wait at least  $t > 2\text{ min.}$  before opening the converter housing. At start-up the requirements in EN 50281-1-2 for applications with combustible dust must be observed. The operator must assure that when the Protection Earth PE is connected that, even during a fault condition, no potential difference can exist between the Protection Earth PE and the Potential Equalization PA.



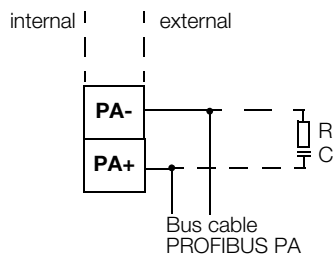
**Caution!** Observe the max. allow. ambient temperatures, Temperature Classes as well as the fluid temperatures, page 15 and the information for operation with thermally insulated pipelines and with combustible dust page 16.

**Fig. 36:** Safety Specifications for In- and Outputs to External Converter Model E4 in the Design Var. 14/15/16

## Interconnection Examples for Peripherals to External Converter Model E4 in Design Var. 14/15/16

### PROFIBUS PA

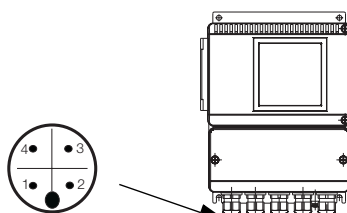
The resistor R and the capacitor C form the bus termination.  
They are to be installed if the instrument is connected at the end of the bus cable  
 $R = 100 \Omega$ ;  $C = 1 \mu F$



### Connection using M12 plug (only for design PROFIBUS PA)

Pin designations  
(view from the front to  
the pin insert and pins)

PIN 1 = PA+  
PIN 2 = nc  
PIN 3 = PA-  
PIN 4 = Shield



The converter in a field mount hsg. can  
have a M12-plug installed (applies only  
for PROFIBUS PA).

As an option the bus termination can be made over a M12-plug instead of in the cable connector.  
The instrument is then shipped completely wired. Compatible receptacles (Type EPG300) as well additional accessories may be found in the Parts List 10/63.6.44 DE.

**Fig. 37:** Interconnection Examples for Peripherals to External Converter Model E4 in the Design Var. 14/15/16



## Recommendations for Isolation Amplifiers and Transmitter Power Supplies

### Recommended Isolation Amplifiers for connection to active current output

- ABB: PEA 61-Ex (60 mA or 90 mA,  $R_i = 50 \Omega$ )
- Foxboro Eckardt: TV80, TV924, TV925 ( $R_i = 50 \Omega$ )
- CEAG: AH MS 270 ( $R_i = 80 \Omega$ )
- Knick: IsoTrans 36 A7 ( $R_i = 250 \Omega$ )

### Recommended Switch Amplifiers (DIN EN 60947-5-6) for connection to active current output

- ABB: V17131-51...53 / V17131-54...56
- ABB Digitale: Ci 1/941, Ci 1/942
- CEAG: AH TS 920, AH 90 924
- Pepperl+Fuchs: Various types

### Recommended Valve Control Modules for connection to active current output

- ABB: V17132-51...56
- Knick: IsoTrans 37 A7
- ABB: Digitale Ka 2/915, Ka 4/915
- Pepperl+Fuchs: Various types

## General Specifications for the Converter

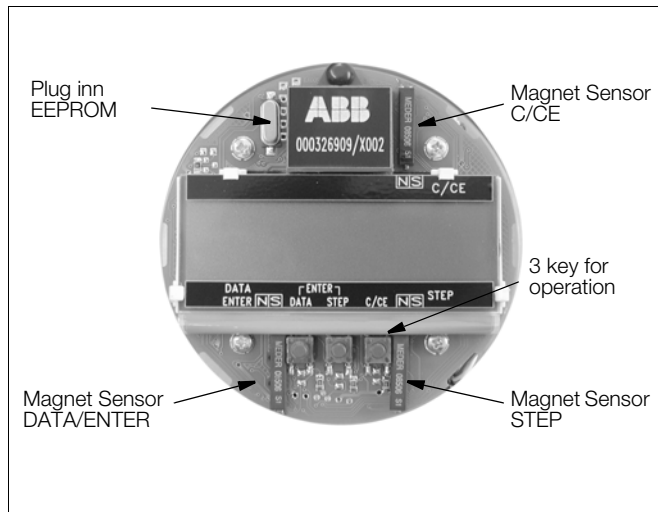


Fig. 38: Converter Keypad and Display

### Measurement range

Continuously selectable between 0.5 and 10 m/s

### Max. accuracy

≤ 0.5 % of rate  
(Option: 0.25 % of rate)

### Reproducibility

≤ 0.15 % of rate

### Minimum conductivity

5 μS/cm  
(20 μS/cm with deionized water)

### Response time

For a step change 0-99 % (corres. to 5 τ) ≥ 1 s at 6¼, 7½ Hz excitation

### Supply power

High voltage AC: 100-230 V (-15/+10 %)  
Low voltage AC: 16.8-26.4 V  
Low voltage DC: 16.8-31.2 V  
Ripple: < 5 %

### Magnetic field supply

6¼, 7½ Hz 12½ Hz, 15 Hz  
(50/60 Hz supply power)

### Power

≤ 14 VA (Flowmeter primary including converter)  
for AC supply power  
≤ 6 W for DC supply power (flowmeter primary including converter)

### Allowable ambient temperature range per Ex-Approval

-20 to +60 °C

### Electrical connections

Screw terminals and screwless, spring loaded terminals

### Protection Class per EN 60529

IP67, IP68 (only Model DE46)

### Forward/Reverse Measurements

The flow direction is indicated in the display by direction arrows and signalled over the optocoupler output (ext. signal). The signal is transmitted for the forward direction.

## Display

With a lighted display, data is entered using the 3 keys or externally using a Magnet Stick without opening the housing.

2x16-character full graphic LC-Dot Matrix-Display. The internal flow totalization is integrated separately for each flow direction in 16 different engineering units. The flowrate can be displayed in percent or in 45 different direct reading engineering units. The converter housing can be rotated 90° and the display can be plugged into 3 orientations so that the optimal readability is assured. In multiplex operation the flowrate indication in %, engineering units or as a bar graph, totalizer values, forward or reverse flow direction, TAG No. or current output value can additionally be displayed in the 1st or 2nd line of the display.

## Design Variants of the Converter Housing

### For COPA XE Models DE27, DE27F, DE47F, DE48F

Compact Design with cast, light metal, painted converter housing, Paint coat 60 μm thick, center section RAL 7012 dark gray, front and rear sections (cover) RAL 9002 light gray

## Design Variants for Instruments with a Separate Converter (MAG-XE)

### For Model DE46 with a Separate Converter Model E4

- Cast, light metal, painted field mount housing  
Paint coat 60 μm thick, center section RAL 7012 dark gray, front and rear sections (cover) RAL 9002 light gray
- 19" Insert
- Panel mount housing
- Housing for rail mount installations

### For Model DE48

Cast, light metal, painted field mount housing  
Paint coat 60 μm thick, center section RAL 7012 dark gray, front and rear sections (cover) RAL 9002 light gray

### Signal cable (only MAG-XE)

The maximum cable length between the flowmeter primary and the converter is 50 m. A 10 m long cable is supplied with each meter. If a cable longer than 10 m is required, order using Part No. D173D018U02 or D173D025U01.

## Important

The instrument conforms to the NAMUR-Recommendations NE21. Electromagnetic Compatibility of Equipment in the Process Industries and Laboratories 5/93 and EMC Guideline 89/336/EWG (EN50081-1, EN50081-2) as well as the Low Voltage Guideline 73/23/EWG (EN61010-1).

**Attention:** When the housing cover is opened the Ex-Protection and the personnel contact protection are voided.

After turning the power to the flowmeter off, wait at least  $t > 2$  min. before opening the converter housing.

## Digital Communication

There are three digital communication options available in the converter:

### a) The HART-Protocol

The digital communication utilizes an AC signal superimposed on the current output. The instrument is configured using the three keys directly at the converter or alternatively, using the Configuration and Operation Software SMART VISION® and the accompanying HART DTM for SMART VISION®. (Detailed information may be found in the separate Data Link Description Part No. D184B108U01). The instrument is registered with the HART Communication Foundation.

### b) The PROFIBUS PA-Protocol

The digital communication is in accord with IEC 61158-2. The instrument is configured using the three keys directly at the converter or alternatively using the Configuration and Operation Software SMART VISION® and the accompanying PROFIBUS PA DTM. Detailed information may be found in the separate Profibus PA Data Link Description Part No. D184B093U25. The instrument is designed per the FISCO-Model.

### c) FOUNDATION Fieldbus FF

The digital communication is in accord with IEC 61158-2. The instrument is configured using the three keys directly at the converter or using the Services integrated in the system or using the National Configurator. Additional information in the separate Data Link Description Part-No. D184B093U17. The instrument is designed per the FISCO-Model.

## HART-Protocol

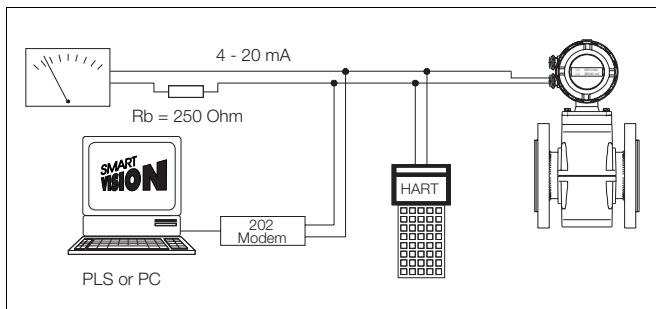


Fig. 39: Communication with HART-Protocol

## Transmission Mode

Transmission Mode  
FSK Modulation of the current output 4-20 mA per Bell 202 standard.  
Max. signal amplitude:  $1.2 \text{ mA}_{PP}$   
Current output load: min.  $250 \Omega$ , max.  $< 600 \Omega$   
Cabel: AWG 24 twisted  
Max. cable length: 1500 m



**PROFIBUS PA Protocol**

The PROFIBUS PA data link in the COPA-XE or MAG-XE conforms to Profile 3.0 (Standard PROFIBUS, EN 50170, DIN 19245 [PRO91]). The transmission signal of the converter corresponds to IEC 61158-2. The Ex-Design corresponds to the FISCO-Model.

The manufacturer specific PROFIBUS PA Ident-No. of the COPA-XE or MAG-XE is: 0691 hex.

The instrument can also be operated using the PROFIBUS Standard-Ident-No. 9700 or 9740.

For additional specifications see separate Data Link Description Part No. D184B093U25.

**Cable**

A shielded, twisted cable is recommended (based on IEC 61158-2 Types A and B are preferred).

Additional detailed layout information may be found in the Brochure "PROFIBUS Solutions from ABB" (No. 30/FB10). Accessories such as dividers, joiners and cable may be found in the Parts List 10/63-6.44. In addition, detailed information may be found on our home page at <http://www.abb.de/Fieldbus> as well as on the home page of the PROFIBUS International Organization <http://www.profibus.com>.

**Information for Voltage and Current Usage**

The turn on behavior corresponds to the Draft DIN IEC 65C/155/CDV of June 1996. The average current draw of the COPA-XE or MAG-XE is 13 mA. During a fault condition the current is limited to a max. 17 mA by the integrated FDE-Function (=Fault Disconnection Electronic). The upper value of the current is electronically limited. The voltage on the bus cable must be within the range of 9-24 V DC .

**Bus Topology**

Tree and/or linear structure  
Bus termination: Passive at both end of the ends of the main bus cable (RC-component R = 100 Ω, C = 1 μF)

**FOUNDATION Fieldbus Protocol**

FOUNDATION Fieldbus data link conforms to the Standards FF-890/891 and FF-902/90. The transmission signal of the converter corresponds to IEC 61158-2. The instrument is registered with the Fieldbus FOUNDATION. Interoperability Test Campaign No. IT 019500.

The registration is listed by the Fieldbus FOUNDATION under the Manufacturer ID: 0x000320 and the Device ID 0x0016 .

The Ex-Design corresponds to the FISCO-Model. The FOUNDATION Fieldbus data link also includes a PID-Controller.

**Setting the Bus-Address**

The bus address is automatically assigned by FF, but it can also be manually set in the system. The Address-Recognition is made using a unique combination of the Manufacturer-ID, Instrument-ID and Instrument Series No.

**Information for Voltage / Current Usage**

The turn on behavior corresponds to the Draft DIN IEC 65C/155/CDV of June 1996. The average current draw of the COPA-XE or MAG-XE is 13 mA. During a fault condition the current is limited to a max. 17 mA by the integrated FDE-Function (=Fault Disconnection Electronic).

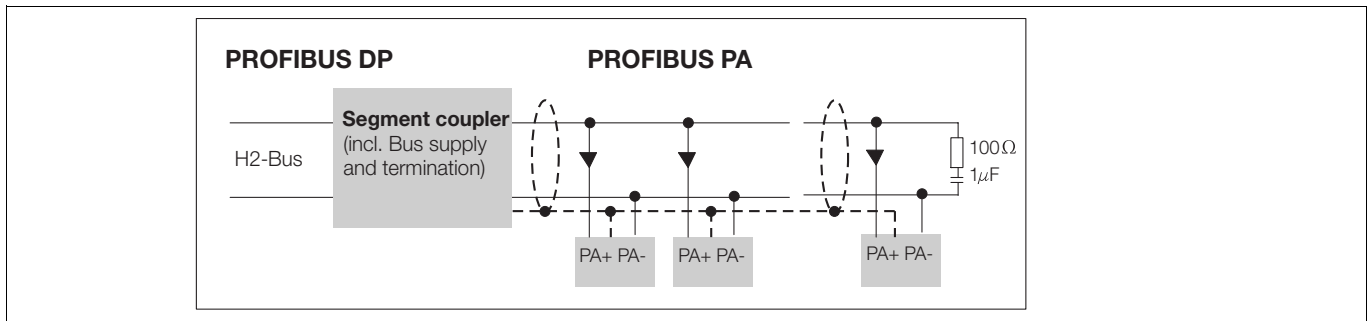
The upper value of the current is electronically limited. The voltage on the bus cable must be within the range of 9-24 V DC.

**System Integration**

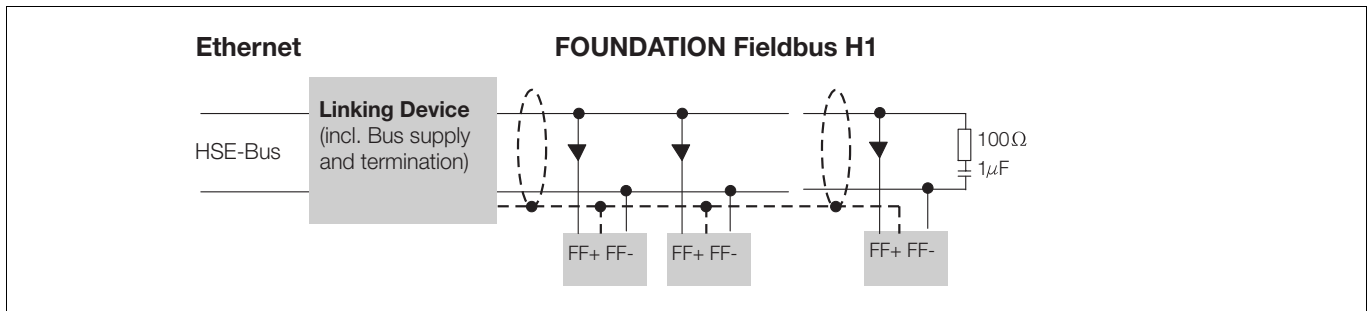
To integrate into a process control system a DD-File (Device Description), which contains the instrument description and a CFF-File (Common File Format) are required. The CFF-File is required to engineer the segment. The engineering can be made On- or Offline. Both files, as well as the Data Link Description are included on the CD (Part No.: D699D002U01) included with the shipment. They can be reordered from ABB at no cost if required. The files required for operation can also be downloaded at <http://www.fieldbus.org>.

**Bust Topology**

Tree and/or linear structure  
Bus termination: Passive at both end of the ends of the main bus cable (RC-component R = 100 Ω, C = 1 μF)



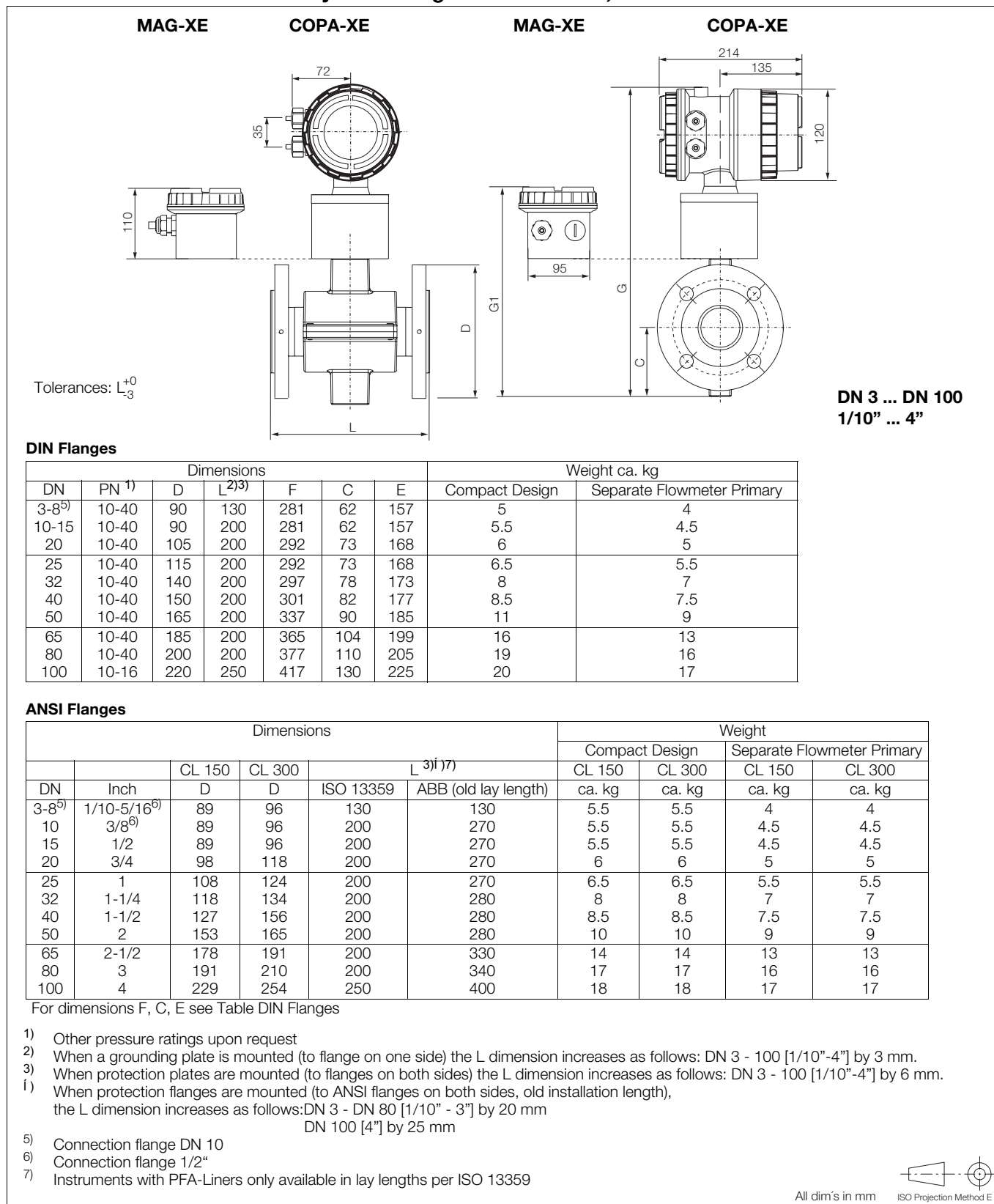
**Fig. 40:** Example for PROFIBUS PA Connections



**Fig. 41:** Examples for FOUNDATION Fieldbus Connections



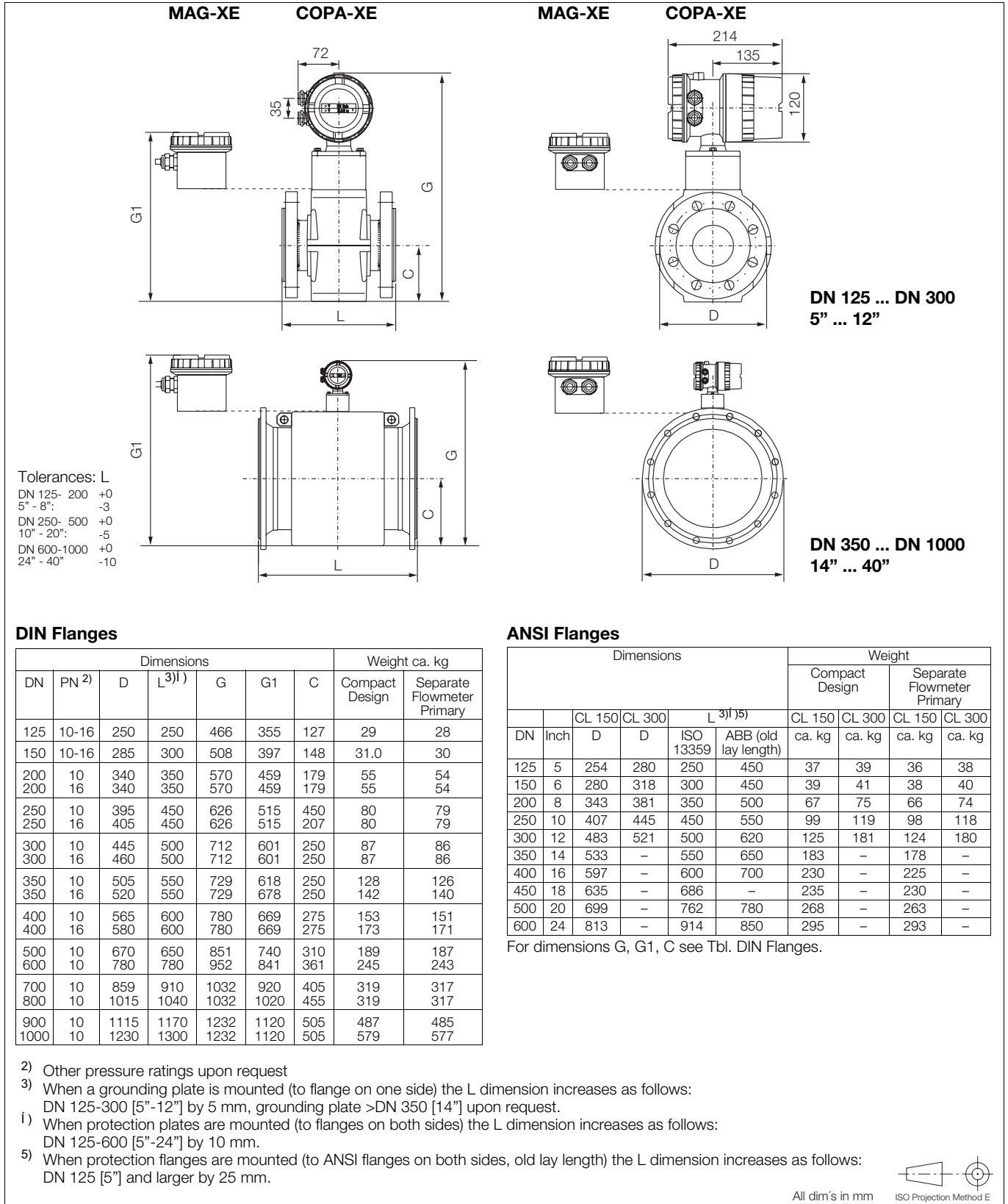
**Dimensions: Flowmeter Primary with Flanged Connections, Models DE46F/DE47F/DE48F**



**Fig. 42:** Dimensions Flowmeter Primary DN 3 to DN 100 [1/10" - 4"], DIN/ANSI Flanges



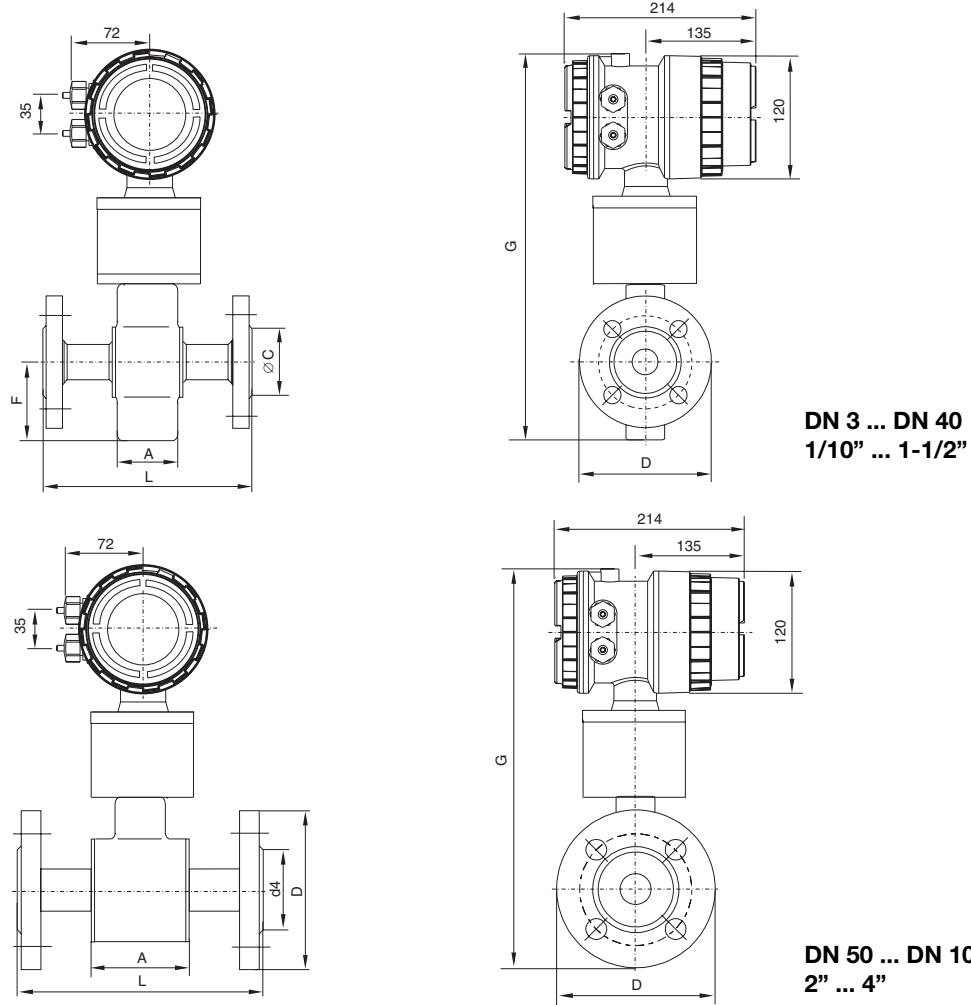
**Dimensions: Flowmeter Primary with Flanged Connections, Models DE46F/DE47F/DE48F**



**Fig. 43:** Dimensions Flowmeter Primary DN 125 to DN 1000 [5" to 40"], DIN/ANSI Flanges



**Dimensions: Flowmeter Primary with Flanged Connections, Model DE27F**



Tolerances:  $L_{-3}^{+0}$

Flanges per DIN 2501									Weight ca. kg
Dimensions									
DN	PN	D	L	F	G	G1	d4	A	
3-8 <sup>1)</sup>	10-40	90	130	63	284	172	34.9	37	5
10	10-40	90	200	63	284	172	34.9	37	5.5
15	10-40	95	200	63	284	172	34.9	37	5.5
20	10-40	105	200	66	288	176	42.9	42	6
25	10-40	115	200	73	295	183	50.8	54	6.5
32	10-40	140	200	78	300	188	63.5	62	8
40	10-40	150	200	82	304	192	73	67	8.5
50	10-40	165	200	-	312	200	104	100	11
65	10-40	185	200	-	326	214	124	107	16
80	10-40	200	200	-	332	220	139	107	19
100	10-16	220	250	-	352	240	161	159	20

When a grounding plate is used, L + 3 mm and material upon request

- 1) Connection flange DN 10
- 2) Connection flange 1/2"

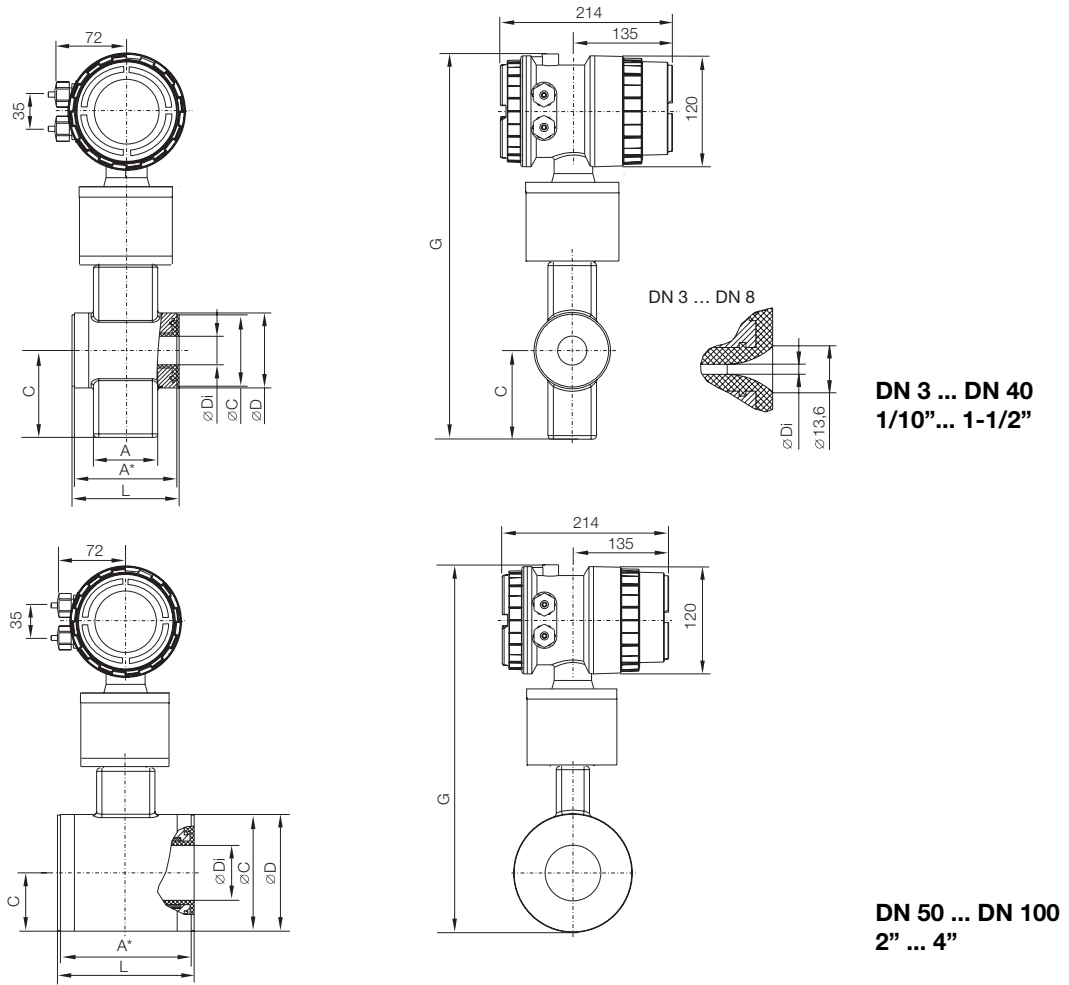
ANSI-Flanges					Weight ca. kg	
Dimensions						
		CL 150	CL 300		CL 150	CL 300
DN	Inch	D	D	L	ca. kg	ca. kg
3-8 <sup>2)</sup>	1/2	89	95	130	5.5	5.5
10	1/2	89	95	200	5.5	5.5
15	1/2	89	95	200	5.5	5.5
20	3/4	98	118	200	6	6
25	1	108	124	200	6.5	6.5
32	1-1/4	118	134	200	8	8
40	1-1/2	127	156	200	8.5	8.5
50	2	152	165	200	10	10
65	2-1/2	178	191	200	14	14
80	3	191	210	200	17	17
100	4	229	254	250	18	18

All dim's in mm ISO Projection Method E

**Fig. 44:** Dimensions Flowmeter Primary with Flanged Connections, Model DE27F

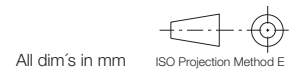


**Dimensions: Flowmeter Primary Wafer Design, Model DE27**



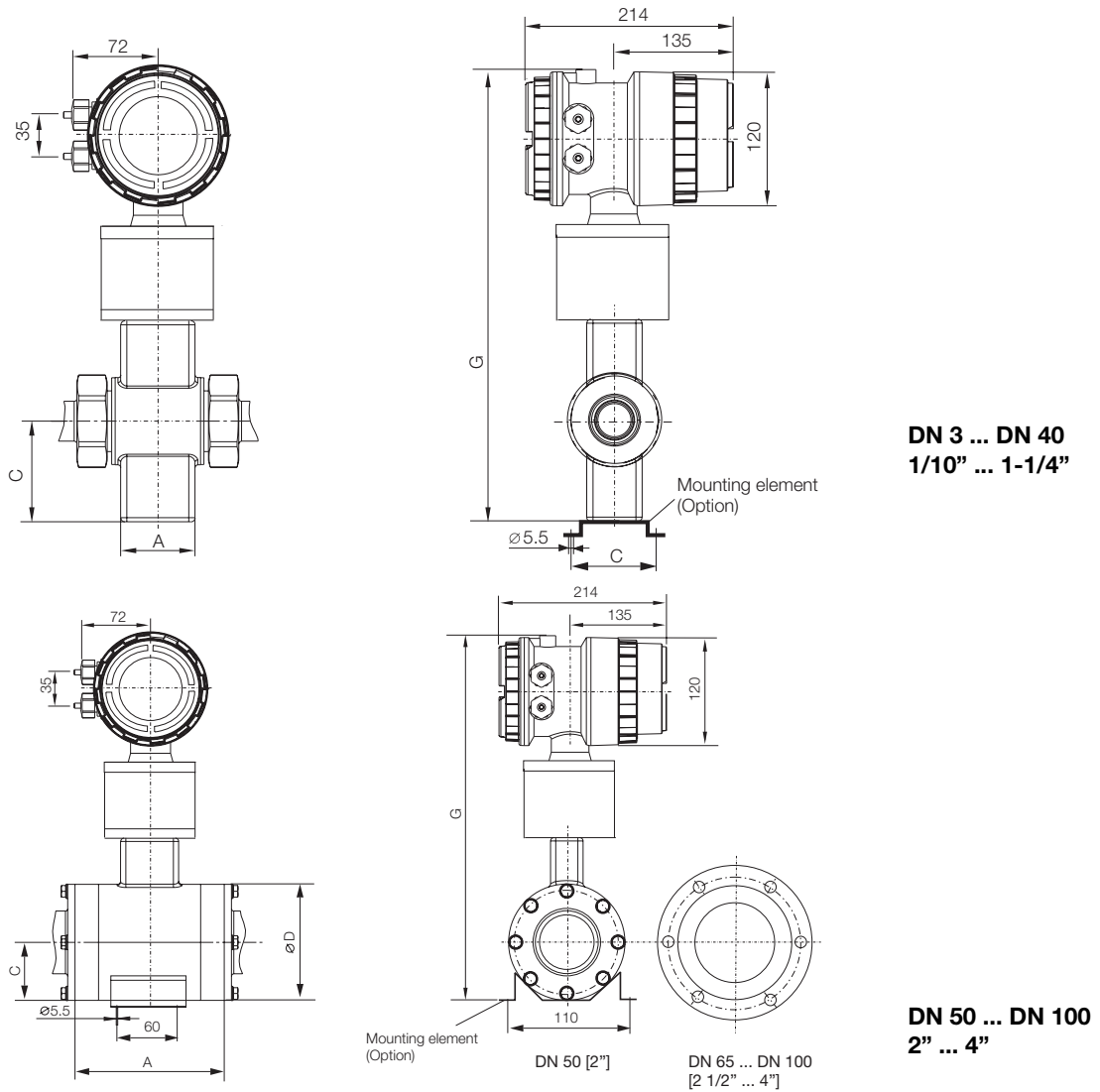
DN	Inch	PN	A*	A	ØC	ØD	ØDi	C	G	L <sup>1)</sup>	ca. kg
3	1/10	10-40 CL 150/ CL 300	64	37	42	45	3	62	346	68	4
4	5/32						4				
6	1/4						6				
8	5/16						8				
10	3/8						10				
15	1/2		13								
20	3/4		74	42	50	54	18	66	354	78	4.5
25	1		86	54	59	63	24	73	368	90	5
32	1-1/4		94	62	69	73	30	78	378	98	5
40	1-1/2		99	67	77	82	36	82	386	103	5.5
50	2	112	-	95	100	47	50	362	117	7	
65	2-1/2	99	-	111	116	62	58	384	103	7.5	
80	3	99	-	128	133	74	66.5	399	103	9	
100	3	129	-	155	160	96	80	432	133	11.5	

1) Lay length with 2 grounding plates L + 3 mm  
Upper instrument section can be rotated by 90°



**Fig. 45:** Dimensions Flowmeter Primary DN 3 to DN 100 [1/10" to 4"], Wafer Design

**Dimensions: Flowmeter Primary with Variable Process Connections, Model DE27**



DN	A	C	G	kg <sup>1)</sup>
3-10	37	62	346	4
15	37	62	346	4
20	42	66	354	4.5
25	54	73	368	5
32	62	78	378	5
40	67	82	386	5.5
50	128	50	362	7
65	114	58	384	7.5
80	114	66.5	399	9
100	144	80	432	11.5

\* When the mounting element is used the dimension increases by 10.5 mm

Lay length with process connections see page 44

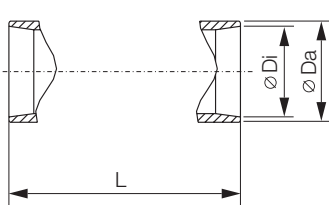
1) Additional process connection weights see page 44

**Fig. 46:** Dimensions Flowmeter Primary with Variable Process Connections

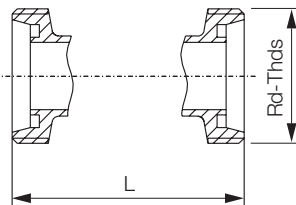
**Dimensions: Adapters for Variable Process Connections, Model DE27**

DN	Inch	Weld Stubs											
		ISO 2037				DIN 11850				DIN 2463			
		∅ Di	∅ Da	L	Wgt./kg	∅ Di	∅ Da	L	Wgt./kg	∅ Di	∅ Da	L	Wgt./kg
3-10	1/10-3/8	-	-	-	-	10.0	13.0	127	0.4	10.3	13.5	127	0.4
15	1/2	-	-	-	-	16.0	19.0	127	0.4	18.1	21.3	127	0.4
20	3/4	-	-	-	-	20.0	23.0	132	0.7	23.7	26.9	132	0.7
25	1	22.6	25.0	149	0.7	26.0	29.0	149	0.7	25	28	149	0.7
32	1-1/4	31.3	33.7	166	1.0	32.0	34.0	166	1.0	32	35	166	1.0
40	1-1/2	35.6	38.0	171	1.0	38.0	41.0	171	1.0	36.8	40	171	1.0
50	2	48.6	51.0	173	1.0	50.0	54.0	173	1.0	49	52	173	1.0
65	2-1/2	60.3	63.5	165	1.4	66.0	70.0	165	1.4	66	70	165	1.4
80	3	72.9	76.1	169	2.0	81.0	85.0	169	2.0	81	85	169	2.0
100	4	97.6	101.6	199	2.6	100.0	104.0	199	2.6	100	104	227	3.0

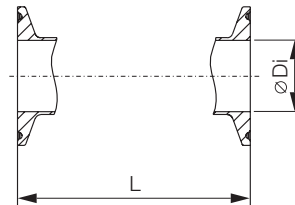
DN	Inch	Pipe Fittings DIN 11851			Tri-Clamp DIN 32676		
		Rd. Wgt.	L	Wgt./kg	∅ Di	L	Wgt./kg
3-10	1/10-3/8	28 x 1/8"	169	0.5	10.0	163	0.5
15	1/2	34 x 1/8"	169	0.5	16.0	163	0.5
20	3/4	44 x 1/6"	180	0.9	20.0	168	0.7
25	1	52 x 1/6"	207	0.9	26.0	192	0.8
32	1-1/4	58 x 1/6"	230	1.4	32.0	209	1.5
40	1-1/2	65 x 1/6"	237	1.4	38.0	214	1.4
50	2	78 x 1/6"	243	1.4	50.0	216	1.2
65	2-1/2	95 x 1/6"	245	2.2	66.0	221	1.6
80	3	110 x 1/4"	259	3.2	81.0	225	2.4
100	4	130 x 1/4"	307	4.4	100.0	255	3.1



Weld subs per DIN 11850 or ISO 2037 or DIN 2463

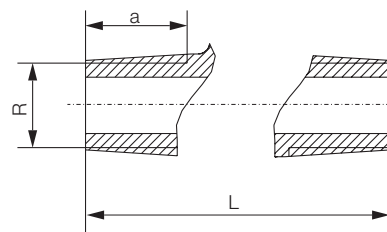


Pipe fittings per DIN 11851



Tri-Clamp per DIN 32676

External threads ISO 228 / DIN 2999					
DN	Inch	R	a	L	Weight kg <sup>1)</sup>
3-10	1/10-3/8	3/8"	18	139	0.4
15	1/2	1/2"	18	139	0.4
20	3/4	3/4"	25	164	0.8
25	1	1"	25	179	0.8



External threads

All dim's in mm ISO Projection Method E

**Fig. 47:** Dimensions Stainless Steel Flowmeter DN 3 to DN 100 [1/10" to 4"], Adapters for Variable Process Connections



**Wafer Design Accessories for Model DE27**

The following accessory kits differ depending on the meter size and pressure rating:  
(Bolts, nuts, lock washers)  
Centering elements and gaskets are not included in the kits.

**Material: Stainless Steel**

Meter Size	Pressure Rating	Part Number
DN 3 to 10 [1/10" to 3/8"]	PN 10 - 40	D614L265U03
	CL 150	D614L265U03
	CL 300	D614L265U04
DN 15 [1/2"]	PN 10 - 40	D614L265U03
	CL 150	D614L266U05
	CL 300	D614L266U06
DN 20 [3/4"]	PN 10 - 40	D614L267U04
	CL 150	D614L267U05
	CL 300	D614L267U06
DN 25 [1"]	PN 10 - 40	D614L268U04
	CL 150	D614L268U05
	CL 300	D614L268U06
DN 32 [1-1/4"]	PN 10 - 40	D614L269U04
	CL 150	D614L269U05
	CL 300	D614L269U06
DN 40 [1'1/2"]	PN 10 - 40	D614L270U04
	CL 150	D614L270U05
	CL 300	D614L270U06
DN 50 [2"]	PN 10 - 40	D614L296U04
	CL 150	D614L296U05
	CL 300	D614L296U06
DN 65 [2-1/2"]	PN 10 - 16	D614L297U08
	CL 150	D614L297U10
DN 80 [3"]	PN 10 - 40	D614L298U08
	CL 150	D614L298U09
DN 100 [4"]	PN 10 - 16	D614L299U07
	CL 150	D614L299U09



Dimensions for External Converter Model E4

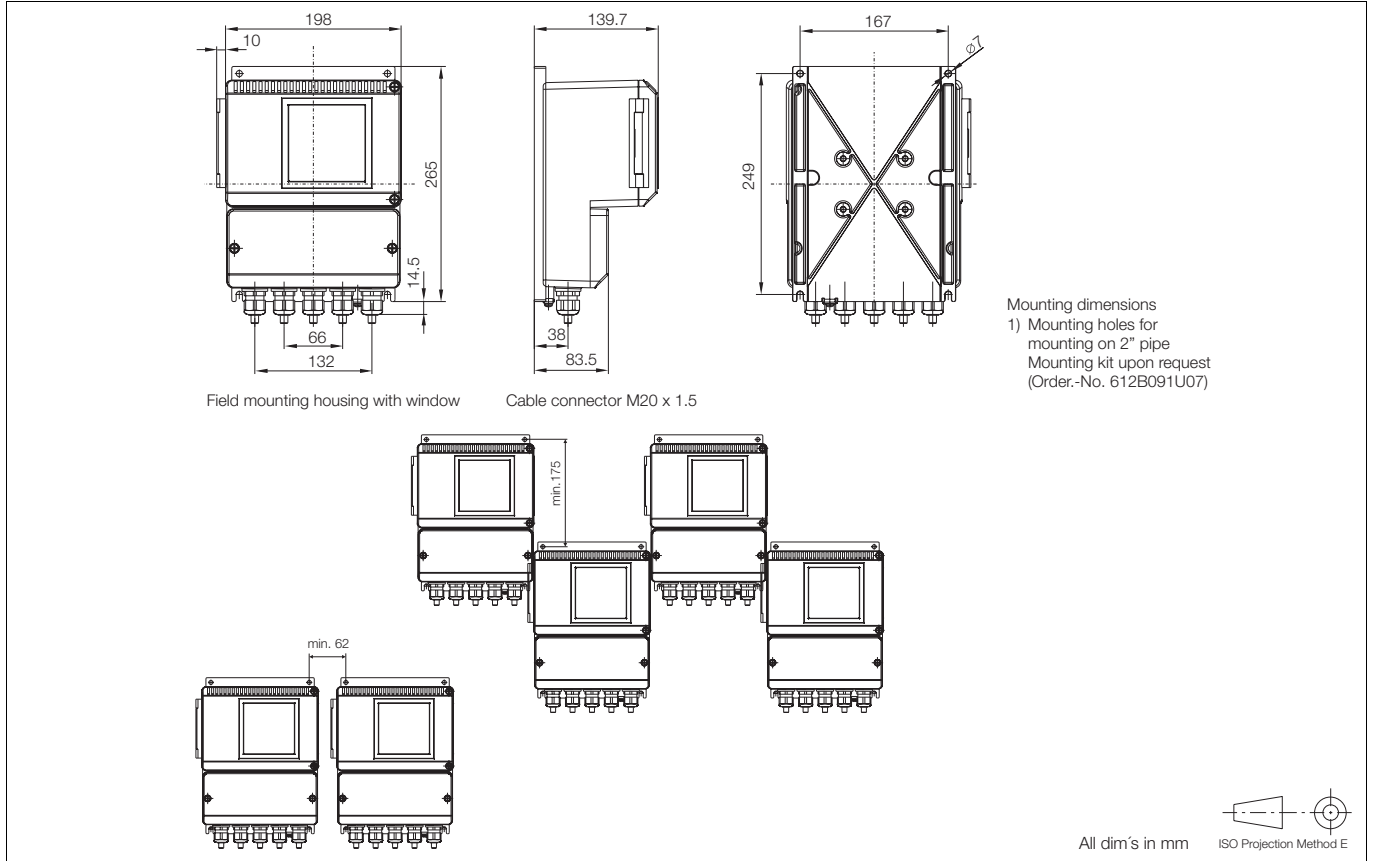


Fig. 48: Dimensions Converter Model E4 Installed Outside the Ex-Zone

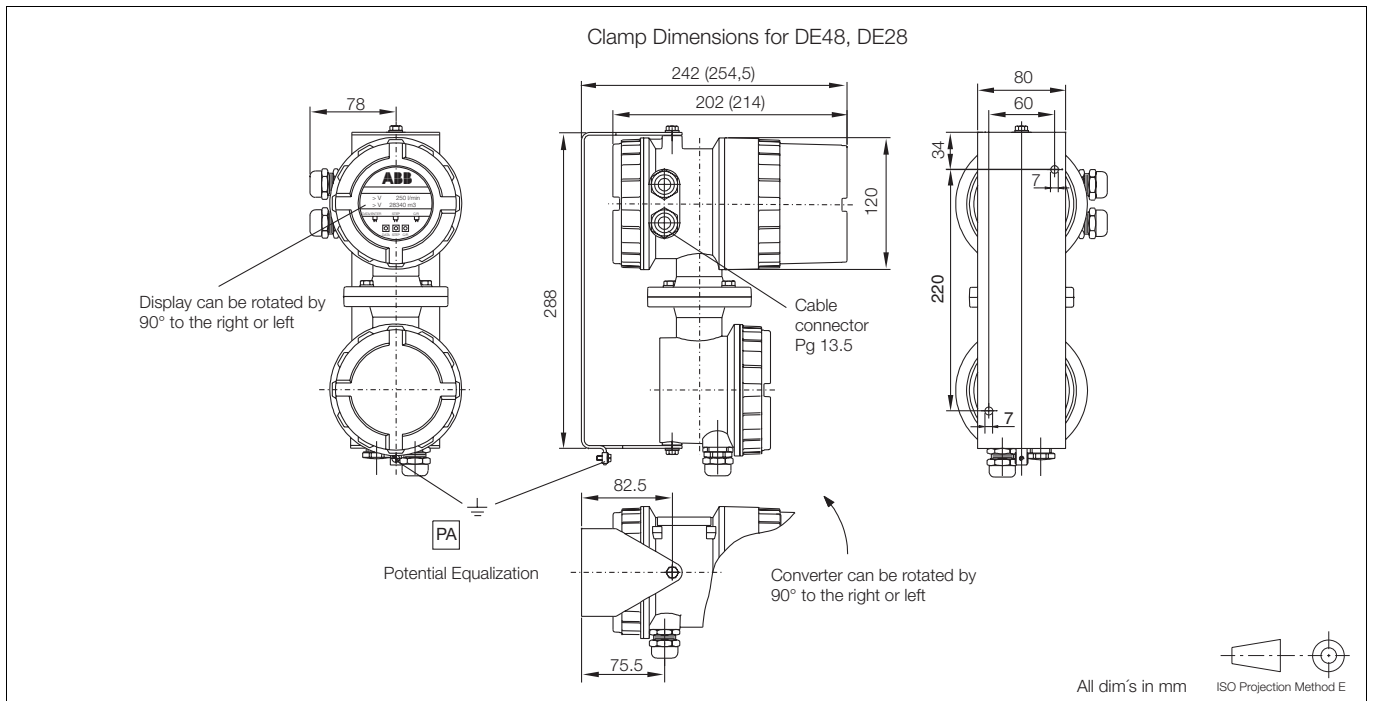
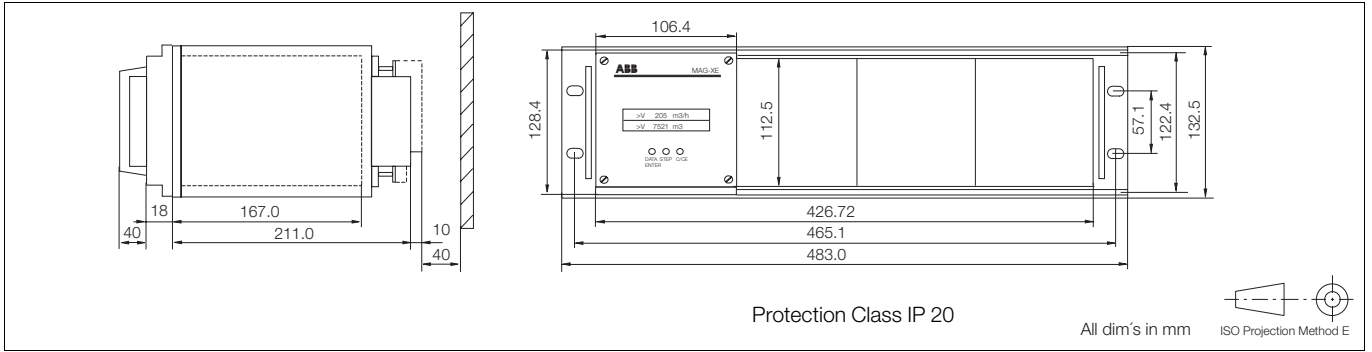
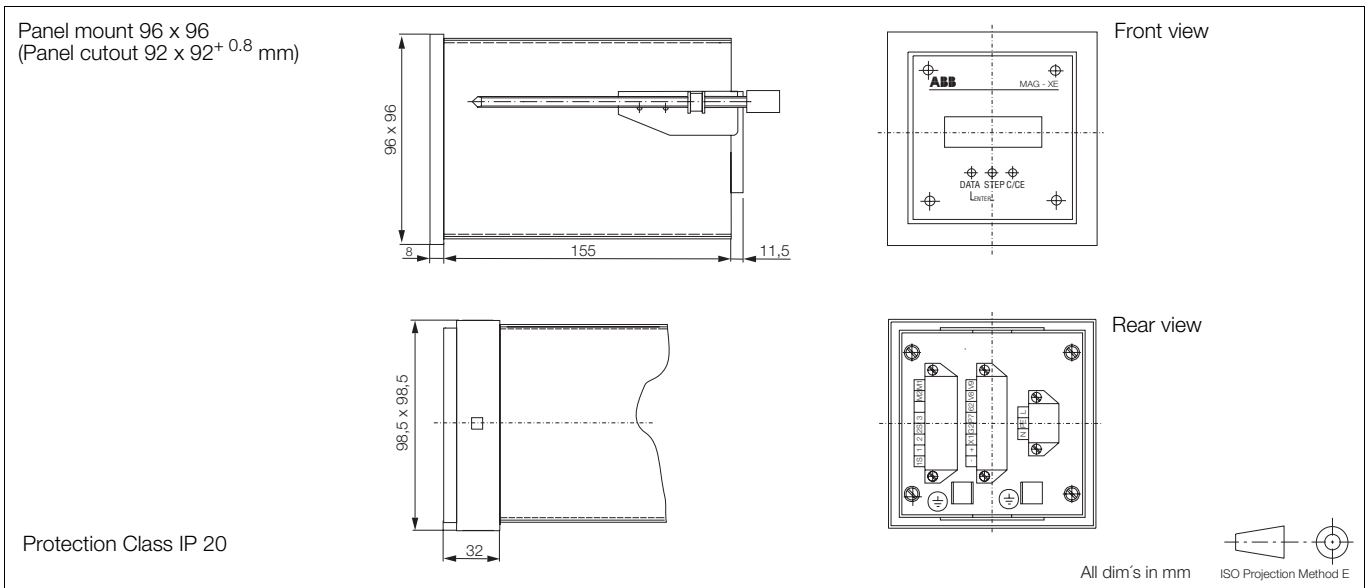


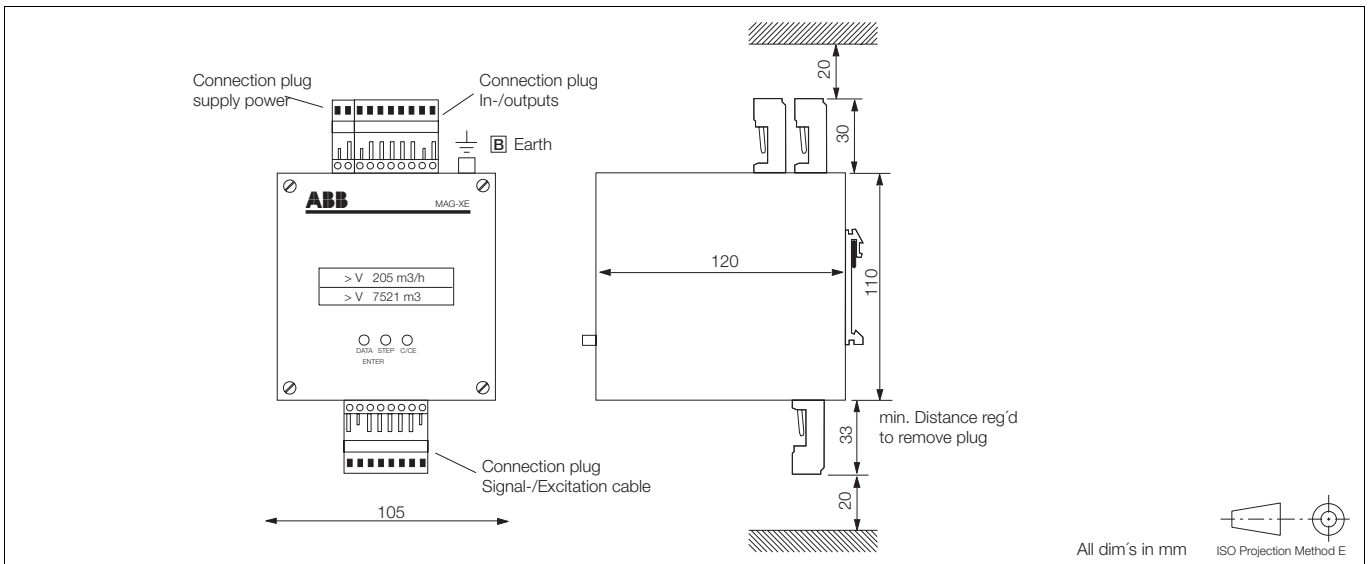
Fig. 49: Dimensions Converter for Model DE48 Installed Inside the Ex-Zone.



**Fig. 50:** Dimensions 19" Converter MAG-XE for Rack Mount



**Fig. 51:** Dimensions Converter in Panel Mount Housing



**Fig. 52:** Dimensions for Rail Mounting Housing



**Ordering Information: Flowmeter with Flanged Connections, Model DE46F / DE47F / Mod. DE48F**

In addition to the Ordering Number please include the following information: Fluid, fluid temperature, operating pressure, flow range, pipeline type, (grounding plate, grounding electrode)

COPA-XE/COPA-XE separate				MAG-XE			
Compact COPA-XE		DE47F		DE46F			
Separate COPA-XE		DE48F					
<b>Liner</b>							
Hard rubber	DN 15 - 1000		H			H	
Soft rubber	DN 50 - 1000		S			S	
PTFE	DN 10 - 600		T			T	
PFA	DN 3 - 100		P			P	
<b>Meter Size</b>							
DN	3	1/10"	03			03	
DN	4	5/32"	04			04	
DN	6	1/4"	06			06	
DN	8	5/16"	08			08	
DN	10	3/8"	10			10	
DN	15	1/2"	15			15	
DN	20	3/4"	20			20	
DN	25	1"	25			25	
DN	32	1-1/4"	32			32	
DN	40	1-1/2"	40			40	
DN	50	2"	50			50	
DN	65	2-1/2"	65			65	
DN	80	3"	80			80	
DN	100	4"	1H			1H	
DN	125	5"	1Q			1Q	
DN	150	6"	1F			1F	
DN	200	8"	2H			2H	
DN	250	10"	2F			2F	
DN	300	12"	3H			3H	
DN	350	14"	3F			3F	
DN	400	16"	4H			4H	
DN	500	20"	5H			5H	
DN	600	24"	6H			6H	
DN	700	28"	7H			7H	
DN	800	32"	8H			8H	
DN	900	36"	9H			9H	
DN	1000	40"	1T			1T	
<b>Signal/Grounding Electrode Material<sup>1)</sup></b>							
SS (1.4571 [316Ti])	/ none (std. for hard/soft rbr.)		S			S	
Hastelloy B-2 (2.4617)	/ none		B			B	
Hastelloy C-4 (2.4610)	/ none (standard for PTFE/PFA)		H			H	
Titanium	/ none		M			M	
Tantalum	/ none		T			T	
SS (1.4539)	/ none		F			F	
Platinum-Iridium	/ none		P			P	
SS (1.4571 [316Ti])	/ with		E			E	
Hastelloy B-2 (2.4617)	/ with		N			N	
Hastelloy C-4 (2.4610)	/ with		O			O	
Titanium	/ with		I			I	
Tantalum	/ with		Q			Q	
SS (1.4539)	/ with		R			R	
Platinum-Iridium	/ with		G			G	
<b>Pressure Rating</b>							
PN 10			C			C	
PN 16			D			D	
PN 25			E			E	
PN 40			F			F	
JIS K10 (only to DN 100 [4"])			K			K	
ANSI CL 150*	old lay length (only for replacements)		P			P	
ANSI CL 300*	old lay length (only for replacements)		Q			Q	
ANSI CL 150	ISO-lay length		R			R	
ANSI CL 300	ISO-lay length		S			S	

<sup>1)</sup> Not available with PFA Liners

Continued on next page





Continuation

**COPA-XE/COPA-XE Separate**

Compact COPA-XE Separate COPA-XE	DE47F DE48F																				
<b>Process Connection Material</b>																					
Steel (standard from DN 20 [3/4"])																					1
SS 1.4571 [316Ti] std. for DN 3-15 [1/10"-1/2"]																					3
<b>Accessories</b>																					
None																					A
Protection plates 1.4571 [316Ti] (both sides)																					B
Grounding plate 1.4571 [316Ti] (one side)																					C
Protection flanges 1.4571 [316Ti] (both sides <sup>3</sup> )																					D
<b>Certificates</b>																					
Standard (none)																					A
Material Certificate 3.1B per EN10204 and Pressure Test per AD-2000																					D
Pressure Test per AD-2000																					G
Inspection Certificate per EN10204 3.1B																					F
<b>Calibration Certificates</b>																					
None																					A
Certified Cold/Waste Water (DN 25 - 1000 [1" - 40"])																					B
Certified Liquids other than Water																					C
<b>Protection Class</b>																					
IP 67 (threads for cable connector see Section "Application")																					2
<b>Supply power</b>																					
High voltage AC 100-230 V (-15/+10 %)																					G
Low voltage AC 16.8-26.4V/DC 16.8-31.2 V																					K
<b>Display</b>																					
Magnet Stick operation and lighted display																					G
<b>In/Output Options (Converter Design Var.)</b>																					
Current output active + pulse output passive + contact input + contact output																					03
Current output active + pulse output passive + contact input + contact output + HART																					04
PROFIBUS PA 3.0																					14
FOUNDATION Fieldbus																					15
Current output passive + pulse output passive + contact input + contact output + HART																					17
<b>Application</b>																					
Converter housing with threads for cable connector M 20 x 1.5 (standard)																					0

**MAG-XE**

DE46F																						
<b>Process Connection Material</b>																						
Steel (standard from DN 20 [3/4"])																						1
SS 1.4571 [316Ti] std. for DN 3-15 [1/10"-1/2"]																						3
<b>Accessories</b>																						
None																						A
Protection plates 1.4571 [316Ti] (both sides)																						B
Grounding plate 1.4571 [316Ti] (one side)																						C
Protection flanges 1.4571 [316Ti] (both sides <sup>3</sup> )																						D
<b>Certificates</b>																						
Standard (none)																						A
Material Certificate 3.1B per EN10204 and Pressure Test per AD-2000																						D
Pressure Test per AD-2000																						G
Inspection Certificate per EN10204 3.1B																						F
<b>Calibration Certificates</b>																						
None																						A
Cert'd Cold/Waste Water (DN25-1000[1"-40"])																						B
Certified Liquids other than Water																						C
<b>Protection Class</b>																						
IP 67 (threads for cable connector M20 x1.5, standard)																						2
IP 68 (hose design)																						3

- 1) Grounding electrodes available for meter size range DN 3-300 [1/10" - 12"].  
For instruments with hard/soft rubber liners DN 125-1000 [5" - 40"] a conductive element is integrated as standard.  
Grounding electrodes not required.
- 2) Grounding plate mounted to flange on one side (only possible for flowmeter primaries ≤ DN 300 [12"])
- 3) Not in combination with ANSI-Flanges (old lay length)
- 4) Certificates for meter pipe and process connections.

Additional Ordering Information can be included in writing.

Type Plate	Excitation Frequency
German	DN3-1000[1/10"-40"] / 6¼ Hz (50 Hz line)
English	DN3- 100[1/10"-4"] / 12½ Hz (50 Hz line)
French	DN3-1000[1/10"-40"]/ 7½ Hz (60 Hz line)
	DN3- 100[1/10"-4"] / 15 Hz (60 Hz line)

Electrode Design
Standard
Pointed head (from DN 10 [3/8"], mat'l 1.4539), e.g. for high fat content



**Ordering Information: Flowmeter with Flanged Connections, Model DE27F**

In addition to the Ordering Number please include the following information: Fluid, fluid temperature, operating pressure, flow range, pipeline type, (grounding plate, grounding electrode)

Compact COPA-XE		DE27F													
<b>Liner material</b>		P													
PFA															
<b>Meter Sizes</b>															
DN	3	1/10"	03												
DN	4	5/32"	04												
DN	6	1/4"	06												
DN	8	5/16"	08												
DN	10	3/8"	10												
DN	15	1/2"	15												
DN	20	3/4"	20												
DN	25	1"	25												
DN	32	1-1/4"	32												
DN	40	1-1/2"	40												
DN	50	2"	50												
DN	65	2-1/2"	65												
DN	80	3"	80												
DN	100	4"	1H												
<b>Signal Electrode Material</b>		<b>/Grounding Electrode Material<sup>1)</sup></b>													
SS 1.4571 [316Ti]		/none		S											
Hastelloy B-2 (2.4617)		/none		B											
Hastelloy C-4 (2.4610)		/none		H											
Titanium		/none		M											
Tantalum		/none		T											
SS 1.4539		/none (for Food industry applications)		F											
Platinum-Iridium		/none		P											
SS 1.4571 [316Ti]		/with		E											
Hastelloy B-2 (2.4617)		/with		N											
Hastelloy C-4 (2.4610)		/with		O											
Titanium		/with		I											
Tantalum		/with		Q											
SS 1.4539		/with (for Food industry applications)		R											
Platinum-Iridium		/with		G											
<b>Pressure Rating</b>															
PN 16 (only DN 100)				D											
PN 40 (DN 3 - 80)				F											
JIS K10				K											
ANSI CL 150 (ISO lay length)				P											
ANSI CL 300 (ISO lay length)				Q											
<b>Process Connection Material</b>															
SS 1.4571 [316Ti]			3												
<b>Accessories</b>															
None				A											
Protection plate 1.4571 [316Ti] (both sides)				B											
Grounding plate 1.4571 [316Ti] (one side)				C											
<b>Certificates</b>															
Standard (none)				A											
Material Certificate 3.1B per EN10204 and Pressure Test per AD-2000				D											
Pressure Test per AD-2000				G											
Inspection Certificate per EN10204				F											
<b>Calibration Certificates</b>															
None				A											
Certified: Cold/Waste Water (DN 25 - 100)				B											
Certified: Liquids other than Water				C											
<b>Protection Class</b>															
IP67 (threads for cable connector see Section „Application“)			2												

Continued on next page



Continuation

<b>Compact COPA-XE</b>	<b>DE27F</b>																		
<b>Supply power</b>																			
High voltage AC 100–230 V (-15/+10 %)																			
Low voltage AC 16.8–26.4 V/DC 16.8–31.2 V																			
<b>G</b>																			
<b>K</b>																			
<b>Display</b>																			
Magnet Stick operation and Display lighted																			
<b>G</b>																			
<b>In/Output Options (Converter Design Var.)</b>																			
Current output active + pulse output passive + contact input + contact output																			
Current output active + pulse output passive + contact input + contact output + HART																			
PROFIBUS PA 3.0																			
FOUNDATION Fieldbus																			
Current output passive + pulse output passive + contact input + contact output + HART																			
<b>03</b>																			
<b>04</b>																			
<b>14</b>																			
<b>15</b>																			
<b>17</b>																			
<b>Application</b>																			
Aluminum converter housing with threads for cable connector M20 x 1.5																			
<b>0</b>																			

<sup>1)</sup> Grounding electrodes available for meter size range DN 3–100 [1/10" -4"]  
<sup>2)</sup> Certificates for meter pipe and process connections

Additional Ordering Information can be included in writing.

<b>Type Plate</b>	<b>Excitation Frequency</b>	<b>Electrode Design</b>
German	12½ Hz	Standard
English	15 Hz (60 Hz line)	Pointed head (from DN 10 [3/8"], Material 1.4539), e.g. for high fat content



### Ordering Information: Flowmeter with Variable Process Connections, Model DE27

In addition to the Ordering Number please include the following information: Fluid, fluid temperature, operating pressure, flow range, pipeline type, (grounding plate, grounding electrode)

Compact COPA-XE		DE27																		
<b>Process Connections</b>																				
External threads ISO 228 (only DN 3-25 [1/10"-1"])																				
Weld stubs per ISO 2037 (only DN 25-100 [1" - 4"])																				
Weld stubs per DIN 2463																				
Weld stubs per DIN 11850																				
pipe fittings per DIN 11851																				
Tri-Clamp per DIN 32676																				
Without adapter (e.g. replacement order)																				
Wafer Design																				
Others																				
<b>Liner material</b>																				
PFA																				
<b>Meter Sizes</b>																				
DN	3	1/10"																		03
DN	4	5/32"																		04
DN	6	1/4"																		06
DN	8	5/16"																		08
DN	10	3/8"																		10
DN	15	1/2"																		15
DN	20	3/4"																		20
DN	25	1"																		25
DN	32	1-1/4"																		32
DN	40	1-1/2"																		40
DN	50	2"																		50
DN	65	2-1/2"																		65
DN	80	3"																		80
DN	100	4"																		1H
<b>Signal Electrode Material</b>		<b>/Grounding Electrode Material <sup>1)</sup></b>																		
SS 1.4571 [316Ti]		/none																		
Hastelloy B-2 (2.4617)		/none																		
Hastelloy C-4 (2.4610)		/none																		
Titanium		/none																		
Tantalum		/none																		
SS 1.4539		/none (for Food industry applications)																		
Platinum-Iridium		/none																		
SS 1.4571 [316Ti]		/with																		
Hastelloy B-2 (2.4617)		/with																		
Hastelloy C-4(2.4610)		/with																		
Titanium		/with																		
Tantalum		/with																		
SS 1.4539		/with (for Food industry applications)																		
Platinum-Iridium		/with																		
<b>Pressure Rating</b>																				
PN 10, standard for Tri-Clamp, external threads, pipe fittings																				
PN 16	(Wafer Design DN 3 - 100 [1/10"- 4"])																			
PN 40	(Wafer Design DN 3 - 50 [1/10"- 2"])																			
ANSI CL 150	(Wafer Design DN 3 - 100) [1/10"- 4"])																			
ANSI CL 300	(Wafer Design DN 3 - 50) [1/10"- 2"])																			
<b>Process Connection Material</b>																				
None (only Wafer Design)																				
SS 1.4404 [316L]																				0
Others																				9
<b>Accessories</b>																				
None																				
With mounting element																				
<b>Certificates <sup>2)</sup></b>																				
Standard (none)																				
Material Certificate 3.1B per EN10204 and Pressure Test per AD-2000																				
Pressure Test per AD-2000																				
Inspection Certificate per EN10204																				

Continued on next page



Continuation

Compact COPA-XE	DE27F														
<b>Calibration Certificates</b>															
None															
Certified: Cold/Waste Water (DN 25 - 100 [1" - 4"])															
Certified: Liquids other than Water															
<b>Protection Class</b>															
IP 67 (threads for cable connector see section „Application“)															
<b>Supply power</b>															
High voltage AC100–230 V (-15/+10 %)															
Low voltage AC16.8–26.4 V/DC 16.8–31.2 V															
<b>Display</b>															
Magnet Stick operation and lighted display															
<b>In/Output Options (Converter Design Var.)</b>															
Current output active + pulse output passive + contact input + contact output															03
Current output active + pulse output passive + contact input + contact output + HART															04
PROFIBUS PA 3.0															14
FOUNDATION Fieldbus															15
Current output passive + pulse output passive + contact input + contact output + HART															17
<b>Application</b>															
Aluminum converter housing with threads for cable connector M20 x 1.5															0

<sup>1)</sup> Grounding electrodes available for meter size range DN 3–100 [1/10" -4"]  
<sup>2)</sup> Certificates for meter pipe and process connections

Additional Ordering Information can be included in writing.

Type Plate	Excitation Frequency
German	DN3-1000[1/10"-40" ]/ 6¼ Hz (50 Hz line)
English	DN3- 100[1/10"-4"] /12½ Hz (50 Hz line)
	DN3-1000[1/10"-40"]/ 7½ Hz (60 Hz line)
	DN3- 100[1/10"-4"] / 15 Hz (60 Hz line)

Electrode Design
Standard
Pointed head (from DN 10 [3/8"], mat'l 1.4539), e.g. for high fat content



## Ordering Information: External Converter Model E4 for Connection to Flowmeter Primary Model DE46F

Accuracy: ≤ 0.5 % of rate

External Converter	E4														
<b>Housing</b>															
Field mount hsg. rectangular (threads for cable connector M20 x 1.5), Standard	Q														
Field mount hsg. rectangular (threads for cable connector NPT 1/2")	R														
Field mount hsg. rectangular (threads for cable connector PF 1/2")	S														
19" insert cassette	M														
Housing for rail mount	O														
Panel mount housing 96 x 96 mm with hinge and lock	T														
No housing (only insert, as replacement) for in/output options 01 to 04	X														
<b>Supply power</b>															
High voltage AC 100 - 230 V (-15/+10 %)	G														
Low voltage AC 16.8 - 26.4 V/DC 16.8 - 31.2 V	K														
<b>Display</b>															
Magnet Stick operation and Display lighted															D
<b>In/Output Options (Converter Design)</b>															
Current output active + pulse output active + contact input + contact output															01
Current output active + pulse output active + contact input + contact output + HART-Protocol															02
Current output active + pulse output passive + contact input + contact output															03
Current output active + pulse output passive + contact input + contact output + HART-Protocol															04
PROFIBUS PA 3.0															14
FOUNDATION Fieldbus															15
PROFIBUS PA 3.0 (with M12 plug)															16
<b>Flowmeter Primary</b>															
Ex-Flowmeter Primary (Model DE46)															1
<b>Application</b>															
Standard															0
<b>Approvals</b>															
Standard (none)															0
Certified for Cold/Waste Water															1
Certified for Liquids other than Water															2
<b>Type Plate</b>															
German															G
English															E
French															F
<b>Design Level</b>															
															*
<b>Software Level</b>															
															*

Shielded signal/excitation cable Part No. D173D018U02 or D173D025U01, (10 m included with shipment)

**Information:**

Mounting accessories for 2" pipe mount Part No. 612B091U07



## Ordering Information for Flowmeter Primary Simulator

Ordering Number	D55CX4				
<b>Setting of the Flowrate Signal</b>					
3-Digi-switches in 1000 steps	1				
Others	9				
<b>Supply Power<sup>1)</sup></b>					
Schuko plug 115 V - 230 V 50/60 Hz		1			
Banana plug (4 mm) AC/DC 24 V - 48 V		2			
USA-plug for 115 V - 230 V 60 Hz		3			
Others		9			
<b>Extra Equipment</b>					
None			0		
Adapter for Converter E4			1		
Adapter for operation with old Simulator 55XC2000			2		
<b>Design Level (is specified by ABB-Automaton Products)</b>					*
<b>Type Plate</b>					
German					1
English					2
French					3
Others					9

1) Supply power used to supply the converter

## Accessories

### Software

Operating, monitoring and configuration software  
SMART VISION (no cost 90-day trial upon request) includes  
DTM for PA 3.0 and DTM for HART

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