COPA-XT

Electromagnetic Flowmeter with 2-Wire Technology in a Compact Design with Pulsed DC Field Excitation

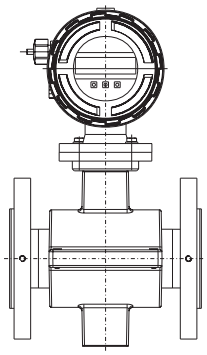
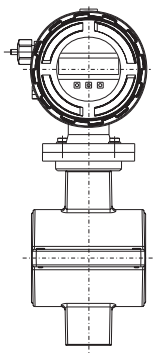
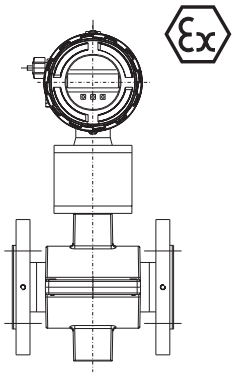
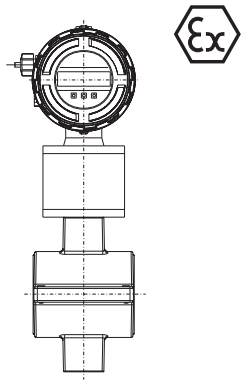
D184S043U02 Rev. 00 / 10.2001

Fig. 1 **Process connection:** Flange, Wafer Design

The flowrate of liquids, slurries and sludges can be metered accurately with an Electromagnetic Flowmeter “EMF” when the conductivity exceeds 20 µ S/cm. The COPA-XT is a flowmetering system in a Compact Design utilizing 2-Wire-Technology – Flowmeter primary and converter comprise a single entity and are supplied from a central power supply DC or a transmitter power supply instrument.

- Linear and accurate flowrate measurements, independent of flow profile due to weighting factor matched magnetic field distribution.
- Long term accuracy stability as a result of digital signal processing combined with pulsed DC magnetic field excitation with stable zero.
- Straight forward menu structured operation. Parameter entries made directly at the converter or externally using a Magnet Stick without opening the housing.
- EEPROM-Module for easy converter exchange.
- Flowmeter primary with various process connections:
  Flanges DN 10 to DN 100
  Wafer Design DN 10 to DN 100
- Ambient temperature -20 to +60 °C (-4 to +140 °F).
- Max. 130 °C (266 °F) fluid temperature.
- The same converter for all meter sizes.
- Metering system with a maximum measurement value deviation of 0.5 % of rate.
- Explosion proof design:
  TÜV 98 ATEX 1333 X II 2G EEx [ib] IIC T3 ... T6
- High contrast LC-Display, alphanumeric, 2x16 characters; both lines in the display freely configurable. Data can be entered without opening the housing using a magnetic stick or by using the 3 buttons when the housing is opened.
- Additional Binary-Output for pulses- or contact-output.
- Current output and pulse output galvanically isolated.
- Communication: Hart®-Protocol.

Overview, Flowmeter Primary and Converter Design for Model COPA-XT

				
Models	**Flange Design**	**Wafer Design**	**Flange Design**	**Wafer Design**
Accuracy	0.5 % of rate	0.5 % of rate	0.5 % of rate	0.5 % of rate
Model Number	DT43F	DT43W	DT47F	DT47W

Flowmeter Primary

	Meter size Press. rating	Meter size Press. rating	Meter size Press. rating	Meter size Press. rating
Flange Design	DN 10–100 PN 10–40	– –	DN 10–100 PN 10–40	– –
Wafer Design	– –	DN 10–100 PN 10–40	– –	DN 10–100 PN 10–40
Liner	Hard rubber, soft rubber (KTW app´d.), PTFE, others upon request	PTFE, others upon request	Hard rubber, soft rubber (KTW app´d.), PTFE, others upon request	PTFE, others upon request
Conductivity	≥ 20 µ S/cm	≥ 20 µ S/cm	≥ 20 µ S/cm	≥ 20 µ S/cm
Electrodes	Stn.Stl. 1.4571, 1.4539, Hastelloy B2/C4, Platinum-Iridium, Tantalum, Titanium	Stn.Stl. 1.4571, 1.4539, Hastelloy B2/C4, Platinum-Iridium, Tantalum, Titanium	Stn.Stl. 1.4571, 1.4539, Hastelloy B2/C4, Platinum-Iridium, Tantalum, Titanium	Stn.Stl. 1.4571, 1.4539, Hastelloy B2/C4, Platinum-Iridium, Tantalum, Titanium
Protection Class	IP 67	IP 67	IP 67	IP 67
Fluid temperature	-25 to +130 °C	-25 to +130 °C	-25 to +130 °C see Temperature Class and Liner Material	
Ambient temperature	-20 to +60 °C	-20 to +60 °C	-20 to +60 °C	-20 to +60 °C

Converter

Supply power	14 V – 55 V DC, transmitter power supply	14 V – 55 V DC, transmitter power supply	see Ex-technical data for Ex “ib” or Ex “e” design	
Current output	4 – 20 mA	4 – 20 mA	4 – 20 mA “ib” or “e”	4 – 20 mA “ib” or “e”
HART-Protocol	yes	yes	yes	yes
Profibus	in preparation	in preparation	in preparation	in preparation

Binary-output

Pulse output	Opto	Opto	Opto	Opto
Alarm signal	yes	yes	yes	yes
Forward/reverse flow metering	yes	yes	yes	yes
Self monitoring	yes	yes	yes	yes

Indicating Data Input

Local Indication and totalization	yes	yes	yes	yes
Fluid condition monitoring	yes	yes	yes	yes
Display with magnetic stick operation	yes	yes	yes	yes

Approvals

EEx-Design TÜV 98 ATEX 1333 X	–	–	II 2G EEx emd [ib] IIC T3 ... T6	

Accuracy, Reference Conditions and Operating Principles

Reference Conditions per EN 29104:

Fluid Temperature
20 °C ±2 K

Ambient Temperature
20 °C ±2 K

Supply Power
Nominal voltage 24 V ±1 % and
Frequency f ±1 %

Installation Requirements, Straight Pipe Sections
Upstream >10xDN
Downstream >5xDN
DN = Flowmeter primary size
Please observe the COPA-XT Instruction Bulletin

Warm Up Time
30 Minutes

Analog Output Effects
Plus ± 0.1 % of rate based on the value of the digital flowrate indication (HART®, display indication)

Operation Principles

The basis for the electromagnetic flow metering is Faraday's Laws of Induction which state that a voltage is induced in a conductor as it moves through a magnetic field.

This principle is applied to the flow of a conductive fluid in the meter tube through which a magnetic field is generated perpendicular to the flow direction. (See Schematic).

The voltage induced in the fluid is measured by two diametrically oriented electrodes. The signal voltage $\mathbf{U_E}$ is proportional to the magnetic flux density **B**, the electrode spacing **D** and the average flow velocity **v**.

Since the magnetic flux density **B** and the electrode spacing are constant values it can be seen that a proportionality exists between the signal voltage $\mathbf{U_E}$ at the electrodes and the average flow velocity **v**. From the equation for volume flowrate it follows that the signal voltage $\mathbf{U_E}$ is also linearly proportional to the volume flowrate.

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

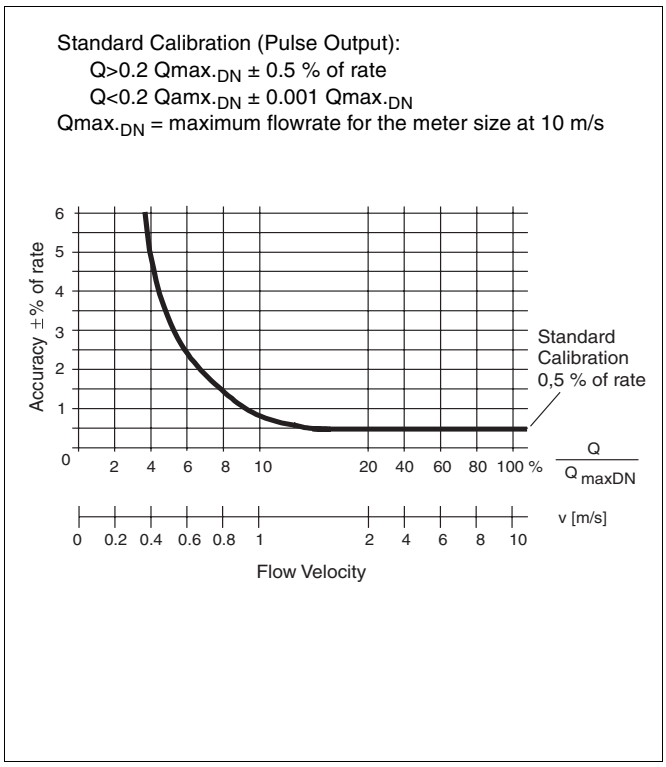


Fig. 2 COPA-XT Metering System Accuracy

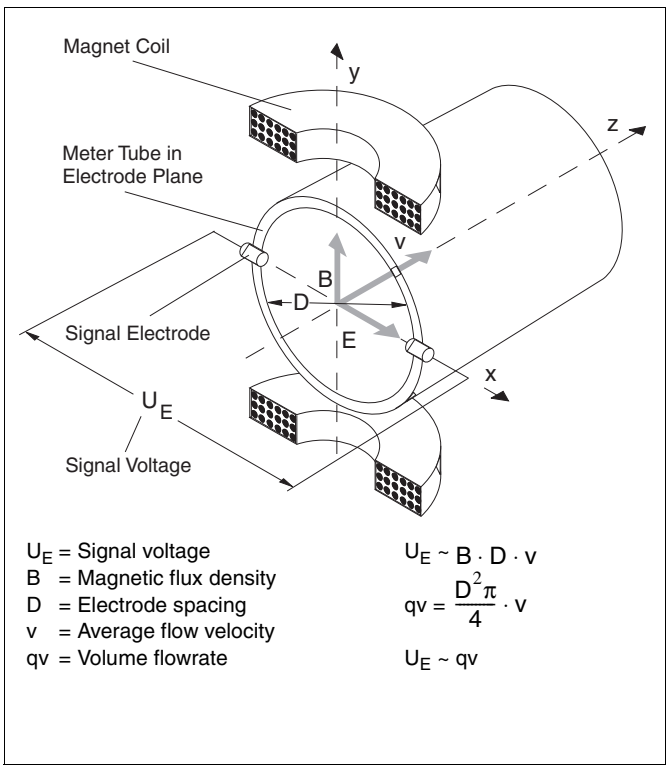


Fig. 3 Electromagnetic Flowmeter Schematic

Meter Sizes, Pressure Ratings and Flow Ranges, Flowrate Nomograph

Meter Size DN	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
10	40	0 to2.25l/min	0 to45 l/min
15	40	0 to5l/min	0 to100l/min
20	40	0 to7.5l/min	0 to150l/min
25	40	0 to10l/min	0 to200l/min
32	40	0 to20l/min	0 to400l/min
40	40	0 to30l/min	0 to600l/min
50	40	0 to3m^3/h	0 to60 m^3/h
65	40	0 to6m^3/h	0 to120m^3/h
80	40	0 to9m^3/h	0 to180m^3/h
100	16	0 to12m^3/h	0 to240m^3/h

Flowrate Nomograph

The volume flowrate is a function of the flow velocity and the size of the flowmeter primary. The flowrate nomograph shows the flow range associated with each flowmeter size and which flowmeter sizes are suitable for a specific flowrate.

Example:

Flowrate = 7 m^3/h (maximum value = flow range end value). Suitable are flowmeter primary sizes DN 20 to 65 for a flow velocity from 0.5 to 10 m/s.

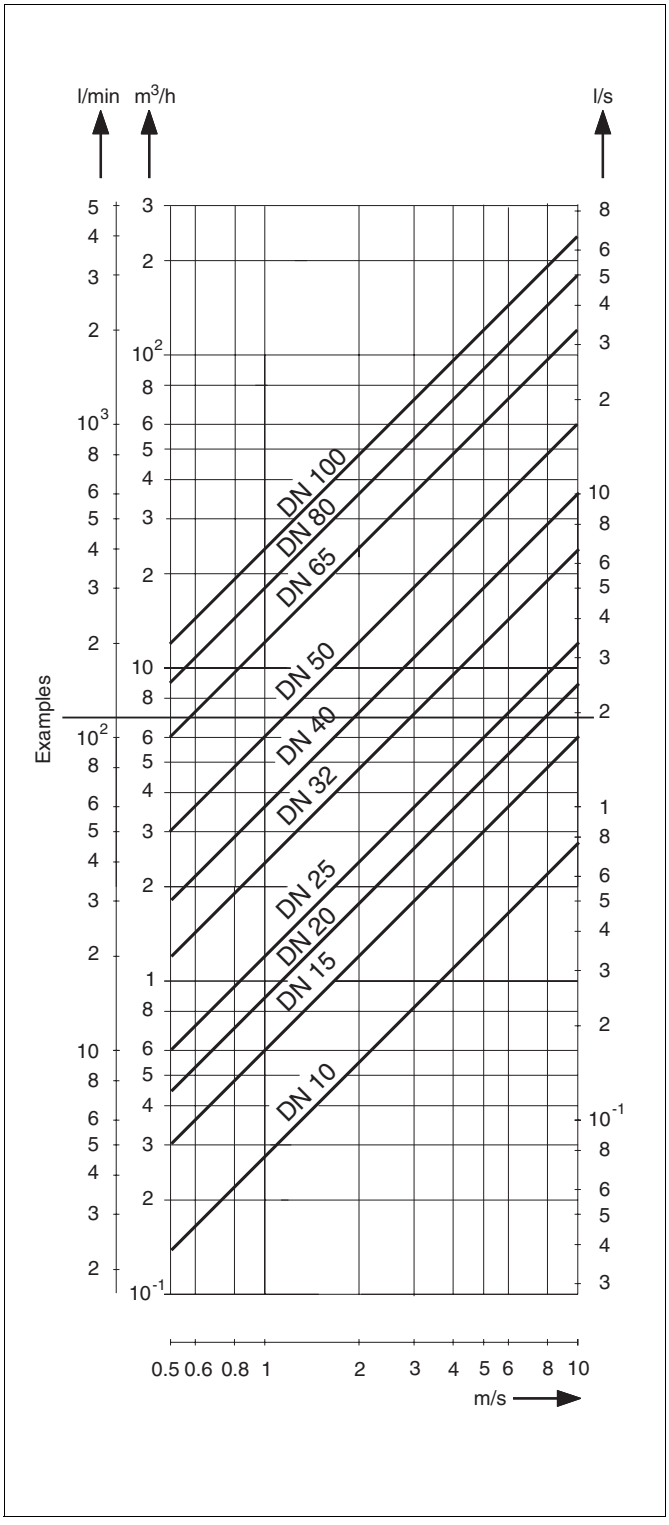


Fig. 4 Flowrate Nomograph DN 10 to DN 100

Installation Requirements and Grounding

Inlet and Outlet Sections

The operating principle is independent of the velocity profile as long as standing eddies do not extend into the metering section e.g. after space bends, tangential entries or partially open gate valves upstream of the flomweter primary. It is recommended that flow control devices be installed downstream from the flowmeter primary. The flowmeter primary must be installed in such a manner that the meter is always filled with fluid. (See Reference Conditions Page 3).

Electrode Axis

The flowmeter may be installed in vertical, horizontal or sloped pipelines. The electrode axis should be installed horizontal or up to 45° so that the measuring voltage cannot influence by any air bubbles. A vertical electrode axis is to be avoided. An ideal installation is shown in Fig. 5 . The meter tube always must be full with fluid.

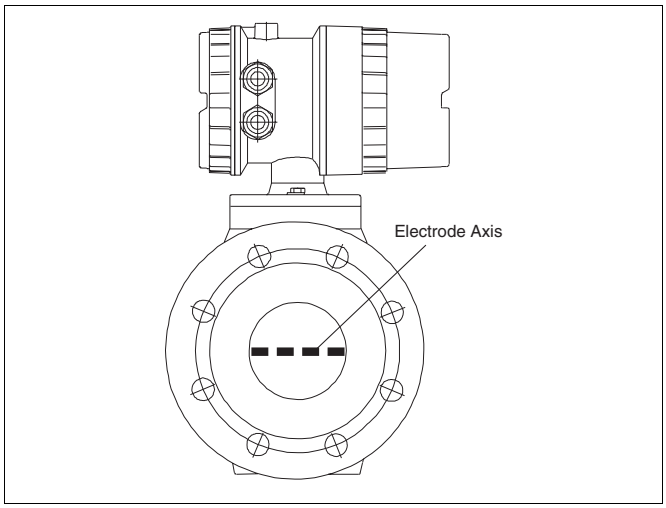


Fig. 5 Electrode Axis Example “COPA-XT”

Grounding

Grounding is essential for safety considerations and to assure trouble free operation of the electromagnetic flowmeter primary. The ground screw on the flowmeter primary is to be connected to the protection ground potential in accordance with VDE 0100, Section 540 (for Ex-design with the requirements of EN 60079-14 Part 1, DIN VDE 0165, the ground potential is connected to the appr. PA-terminal). For operating reasons this should be identical to the fluid potential.

For plastic pipelines or pipes lined with an insulating material the ground is made using a grounding ring (see Footnotes in Dimensions and Ordering Information, Flowmeter Primary). When stray currents exist in the pipeline the installation of grounding rings up- and downstream of the flowmeter primary is recommended.

Installation in Larger Size Pipelines

The flowmeter primary can be installed in larger size pipelines without concerns by utilizing transition fittings (flanged reducers per DIN 2616). The pressure drops resulting from the size reduction can be determined from the curves in Fig. 6 . 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. 4
3. The pressure drop can be read on the y-axis in Fig. 6 .

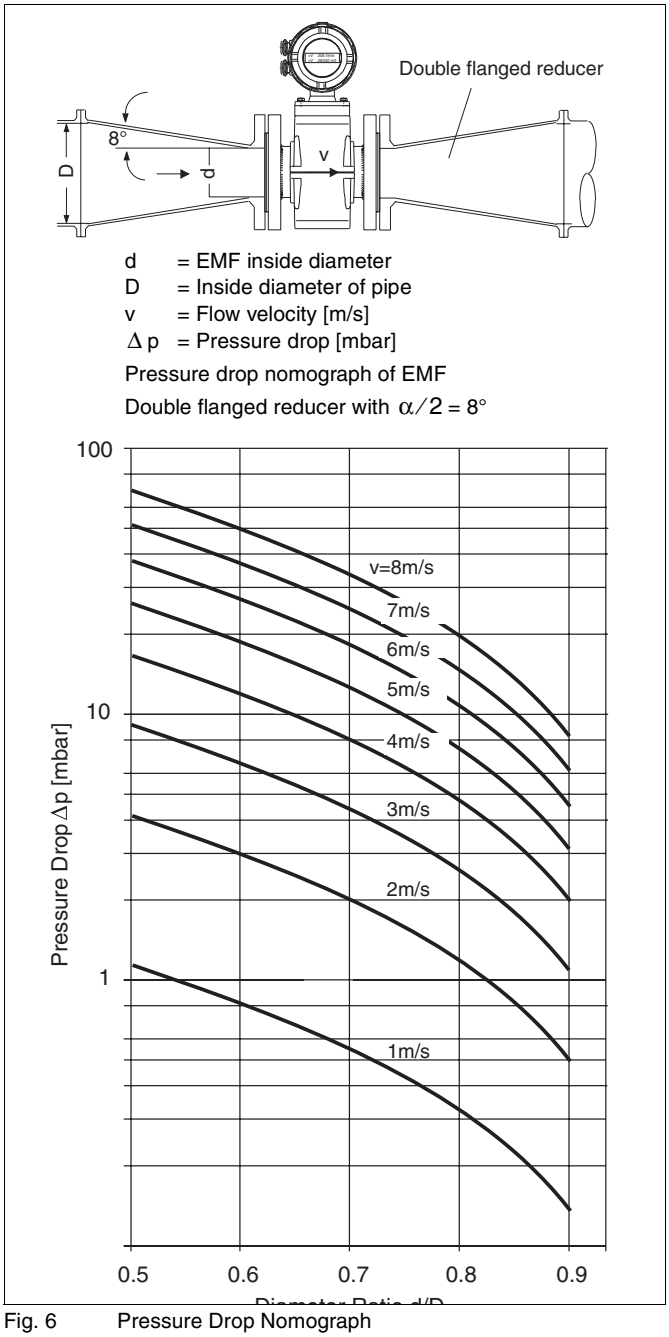


Fig. 6 Pressure Drop Nomograph

Specifications: Flowmeter Primary Flange, Wafer, Model DT43, DT47

Max. allowable Fluid Temperature and Pressure

Liner	Meter Size DN	$P_{Operate}$	mbar abs	at	$T_{Operate}$ °C
Hard rubber KTW approved	15 to 100	40 bar	0		< 90
Soft rubber KTW approved	50 to 100	16 bar	0		< 90
PTFE	10 to 100	40 bar 25 bar	270 500		< 20 < 130*

*) For meter size DN 25 and DN 32 (1" and 1 1/4") Model DT47 $T_{Operates} \leq 125$ °C. (see Ex-Specification table page 7)

Temperature Diagram

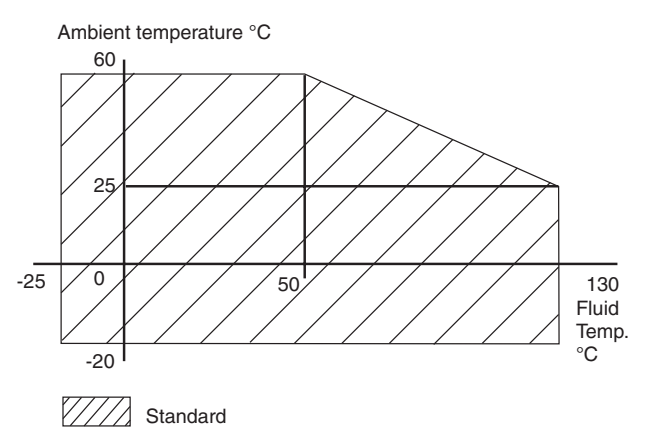


Fig. 7 Fluid temperature as Function of the Ambient Temperature

Max. allowable cleaning temperature

For steam or liquid cleaning the temperature specifications in the Ex-Approval are to be observed! See Temperature Table Page 7.

CIP-Cleaning	Liner	T_{max} °C	T_{max} Minutes	$T_{Amb.}$ °C
with Steam	PTFE	150	60	25
with Liquid	PTFE	140	60	25

If the ambient temperature >25 °C, deduct the difference from the max. cleaning temperature. $T_{max} - \Delta$ °C.
Δ °C = ($T_{Amb.}$ -25 °C).

Protection Class
IP 67

Pipeline Vibration
Max. allowable 15 m/s^2 (10–150 Hz)

Designs

Flanges per DIN 2501 and JIS K10
The flanged meters correspond to the lay lengths defined in VDI/VDE 2641, ISO 13359 or in DVGW (Working Paper W420. Design WP, ISO 4064 Short).

ANSI 150 lb/300 lb
Lay lengths equivalent to Series 1000
Protection flanges and grounding ring same as Series 1000.

Wafer

Ex-Protection
Ex-Protection per European standards TÜV 98, ATEX 1333 X.
II 2G EEx emd [ib] IIC T3 ... T6

Ex-Design and Identification
When connecting an Ex-Design converter to a Transmitter Power Supply with Intrinsically Safe (ground free) or Non-Intrinsically Safe circuits, its applicability can be determied by the following identifying attributes.

Instrument Tag
The identification on the Instrument Tag is a function of the design: Ex-Specification EEx "ib" or "e".

Cable Connectors
The cable connector is blue for EEx "ib" or black for EEx "e".

Identification of the Converter
An Instruction Tag is located on the converter indicating whether the converter is designed for EEx "ib" or for EEx "e". In addition, a sticker on the converter indicates the software revision level.

Materials

Fluid Wetted Parts

Part	Standard	Others
Liner	PTFE Hard rubber, Soft rubber	–
Signal and Ground Electrodes For liner - Hard rubber, Soft rubber	Stn. stl. No. 1.4571	Hast. B-2, Hast. C-4, Titanium, Tantalum, Platinum-Iridium
- PTFE	Hast. C-4	Stn. stl. No. 1.4571, Stn. stl. No. 1.4539 Hast. B-2, Titanium, Tantalum, Platinum-Iridium
Grounding ring For Flanged and Wafer Design meters	Stn. stl. No. 1.4571	Upon request
Protection flange Only for flanged meters	Stn. stl. No. 1.4571	Upon request

Non Fluid Wetted Parts

Part	Standard	Others
Housing DN 10 – 100	Two piece clam shell housing Cast Alum, painted, Color RAL 9006	–
Flanges DN 10 – 100	Steel (Zinc plated)	Stn. stl. No. 1.4571
Connection Box	Alum alloy, painted, Colors, Frame: sky blue RAL 5012, Cover: RAL 9006	–
Meter Tube	Stn. stl. No. 1.4301	–
Pg-Connector	Polyamide	PVDF

Specifications

Max. allowable Fluid Temperature,
max. Ambient Temperature and Temperature Class

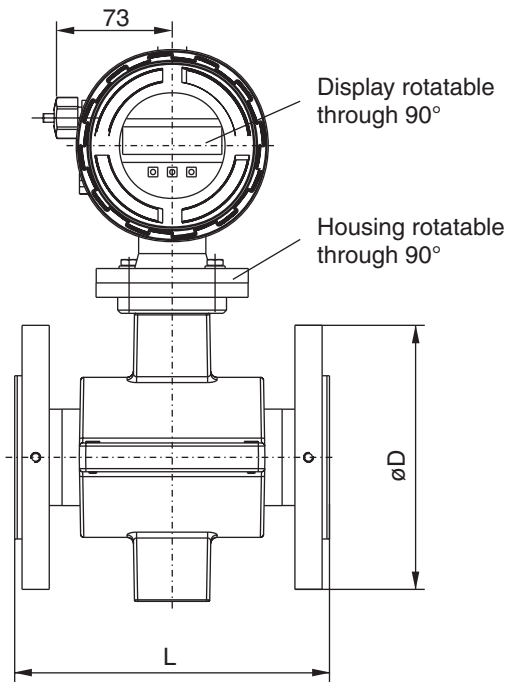
The maximum allowable fluid temperatures [°C], which is a function of the Temperature Class, the maximum allowable ambient temperature, the flowmeter primary liner material and size are listed in the following table.

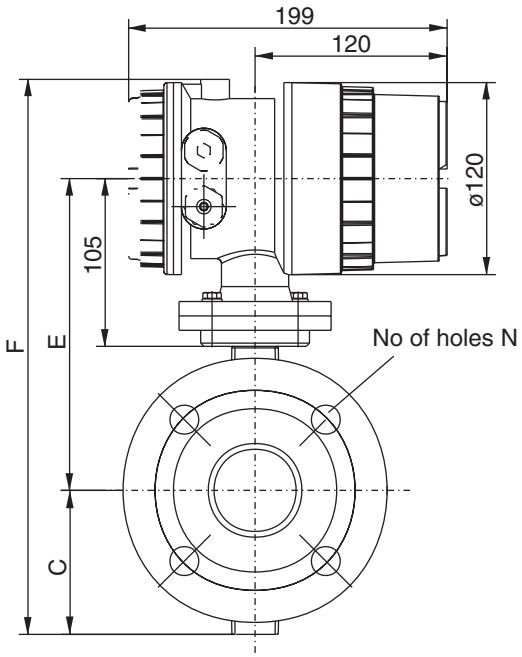
Max. Ambient Temperature [°C]	Liner Material	Meter Sizer Inch	Meter Sizer DN	Temperature Class	Max. allow. fluid temperature [°C] (Operating Values)(Meter Insulated)		Temperature Resistant Cable = 80 °C (176 °F)(Meter Insulated)	
40 °C (104 °F)	PTFE/PFA	3/8 - 3/4	3 - 20	T3	130	(125)	130	(120)
	PTFE/PFA			T4	110	(110)	110	(110)
	Hrd/Sft Rub			T4	90	(90)	90	(90)
	all			T5	75	(75)	75	(75)
	all			T6	60	(60)	60	(60)
	PTFE/PFA	1 - 1 1/4	25 - 32	T3	125	(125)	125	(125)
	PTFE/PFA			T4	110	(110)	110	(110)
	Hrd/Sft Rub			T4	90	(90)	90	(90)
	all			T5	75	(75)	75	(75)
	all			T6	60	(60)	60	(60)
	PTFE/PFA	1 1/2 - 4	40 - 100	T3	135	(135)	135	(135)
	PTFE/PFA			T4	115	(115)	115	(115)
	Hrd/Sft Rub			T4	90	(90)	90	(90)
	all			T5	80	(80)	80	(80)
	all			T6	70	(70)	70	(70)
50 °C (122 °F)	PTFE/PFA	3/8 - 3/4	3 - 20	T3	130	(125)	130	(120)
	PTFE/PFA			T4	110	(110)	110	(110)
	Hrd/Sft Rub			T4	90	(90)	90	(90)
	all			T5	75	(75)	75	(75)
	all			T6	60	(60)	60	(60)
	PTFE/PFA	1 - 1 1/4	25 - 32	T3	125	(125)	125	(125)
	PTFE/PFA			T4	110	(110)	110	(110)
	Hrd/Sft Rub			T4	90	(90)	90	(90)
	all			T5	75	(75)	75	(75)
	all			T6	60	(60)	60	(60)
	PTFE/PFA	1 1/2 - 4	40 - 100	T3	125	(125	125	(125
	PTFE/PFA			T4	115	(115)	115	(115)
	Hrd/Sft Rub			T4	90	(90)	90	(90)
	all			T5	80	(80)	80	(80)
	all			T6	70	(70)	70	(70)
60 °C (140 °F)	PTFE/PFA	3/8 - 3/4	3 - 20	T3	-	(-)	130	(120)
	PTFE/PFA			T4	85	(85)	110	(110)
	Hrd/Sft Rub			T4	85	(85)	90	(90)
	all			T5	75	(75)	75	(75)
	all			T6	60	(60)	60	(60)
	PTFE/PFA	1 - 1 1/4	25 - 32	T3	-	(-)	120	(120)
	PTFE/PFA			T4	85	(85)	110	(110)
	Hrd/Sft Rub			T4	85	(85)	90	(90)
	all			T5	75	(75)	75	(75)
	all			T6	60	(60)	60	(60)
	PTFE/PFA	1 1/2 - 4	40 - 100	T3	-	(-)	120	(120)
	PTFE/PFA			T4	-	(-)	115	(115)
	Hrd/Sft Rub			T4	-	(-)	90	(90)
	all			T5	80	(80)	80	(80)
	all			T6	70	(70)	70	(70)

⚠ Note:

The higher Temperature Class always includes the lower classes. The minimum allowable fluid temperature is -25 °C (-13 °F).

Dimensions: Flowmeter Primary DN 10 - DN 100, Flanges per DIN and ANSI, Model DT43F





DIN Flanges

Dimensions								Weight Compact Meter
DN	PN[1)]	D	N	L[2)3)]	F	C	E	ca. kg
10-15	10-40	90/95	4	200	291	62	167	4,0
20	10-40	105	4	200	302	73	178	5,0
25	10-40	115	4	200	302	73	178	5,5
32	10-40	140	4	200	307	78	183	7,0
40	10-40	150	4	200	311	82	187	7,5
50	10-40	165	4	200	347	90	195	10,0
65	10-16	185	4	200	375	104	209	14,0
	25-40	185	8	200	375	104	209	14,0
80	10-40	200	8	200	387	110	215	17,0
100	10-16	220	8	250	427	130	235	18,0

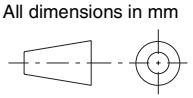
ANSI-Flanges

Dimensions							Weight Compact Meter
		150 lb		300 lb			
DN	Zoll	D	N	D	N	L[4)]	ca. kg
10-15	1/2	89	4	96	4	270	4,0
20	3/4	99	4	118	4	270	5,0
25	1	108	4	124	4	270	5,5
32	1 1/4	118	4	134	4	280	7,0
40	1 1/2	127	4	156	4	280	7,5
50	2	153	4	165	8	280	10,0
65	2 1/2	178	4	191	8	330	14,0
80	3	191	4	210	8	340	17,0
100	4	229	8	254	8	400	18,0

For dimensions F, C, E see Table DIN Flange

1) Other pressure ratings upon request.
2) When a grounding ring is attached to a flange at one end, the dimension L is increased as follows: DN 10–DN 100 by 3 mm.
3) When protection flanges are installed, the dimension L is increased as follows: DN 10–DN100 by 6 mm. A grounding ring is not required!
4) When a grounding ring is attached to the flange at one end, the dimension L increases by 3 mm with protection flanges, DN 10–DN 80 by 20 mm, DN 100 by 25 mm.

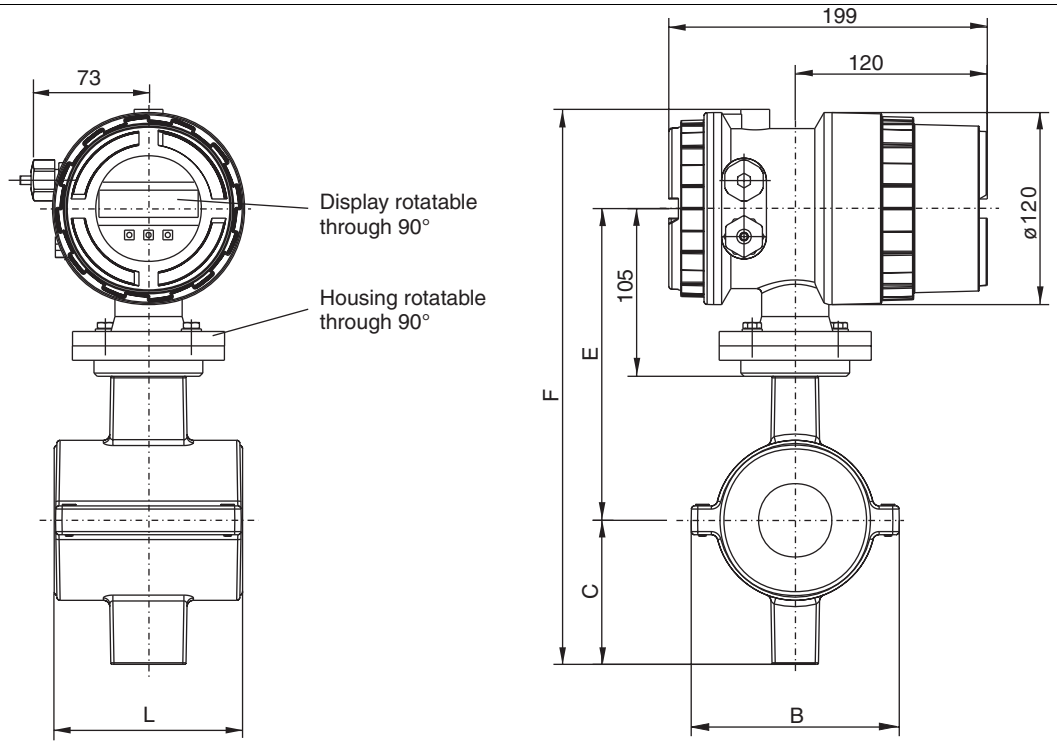
All dimensions in mm



ISO Projection Method E

Fig. 8 Flowmeter Primary DN 10 – DN 100

Dimensions: Flowmeter Primary DN 10 - DN 100, Wafer Design, Model DT43W



Wafer Design

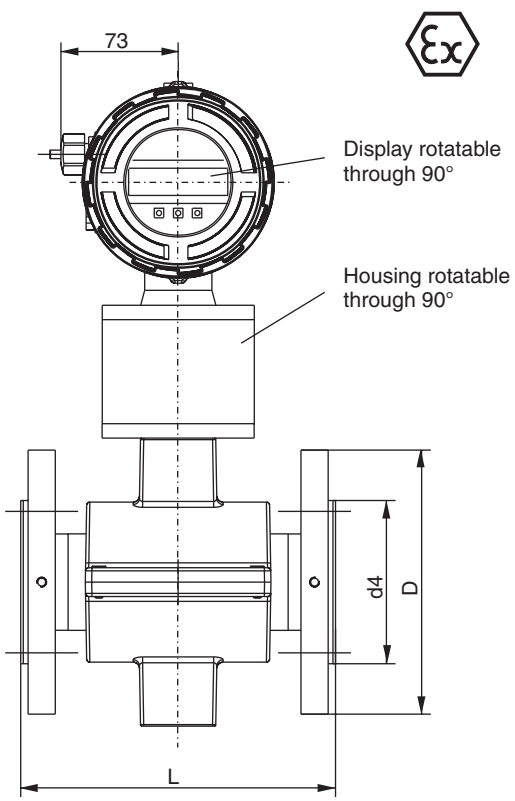
Dimensions							Weight Compact Meter
DN	PN	L	B	C	E	F	ca. kg
10	40	69	75	62	167	291	3,5
15	40	69	75	62	167	291	3,5
25	40	91	95	73	178	302	4,5
32	40	99	103	78	183	307	4,5
40	40	104	112	82	187	311	5,0
50	40	117	130	90	195	347	5,0
65	40	103	146	104	209	375	5,5
80	40	103	163	110	215	387	7,5
100	16	133	190	130	235	427	9,5

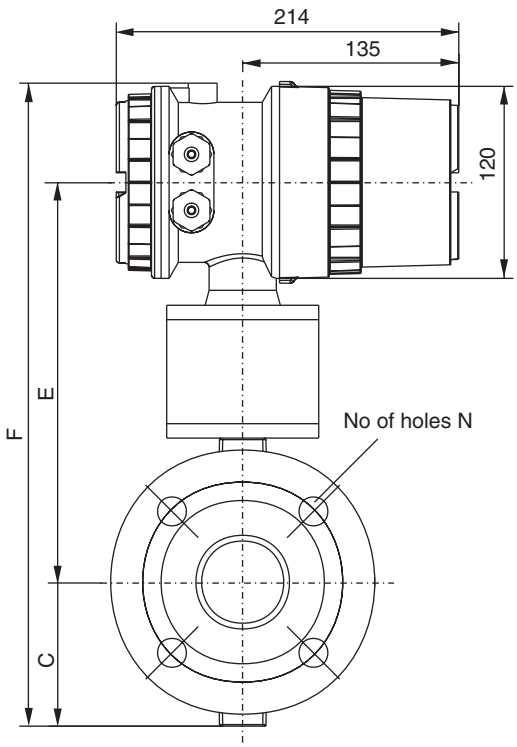
All dimensions in mm

ISO Projection Method E

Fig. 9 Flowmeter Primary, Wafer Design DN 10 – DN 100

Dimensions: Flowmeter Primary DN 10 - DN 100, Flanges per DIN and ANSI, Model DT47F





DIN Flanges

Dimensions								Weight Compact Meter
DN	PN[1)]	D	N	L[2)3)]	F	C	E	ca. kg
10-15	10-40	90/95	4	200	346	62	284	6,0
20	10-40	105	4	200	368	73	306	6,5
25	10-40	115	4	200	368	73	306	7,0
32	10-40	140	4	200	378	78	316	8,0
40	10-40	150	4	200	386	82	324	9,0
50	10-40	165	4	200	402	90	340	11,5
65	10-16	185	4	200	430	104	368	16,5
	10-40	185	8	200	430	104	368	16,5
80	10-40	200	8	200	442	110	380	19,5
100	10-16	220	8	250	482	130	420	20,5

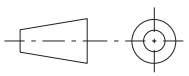
ANSI-Flanges

Dimensions							Weight Compact Design
		150 lb		300 lb			
DN	Zoll	D	N	D	N	L[4)]	ca. kg
10-15	1/2	89	4	96	4	270	6,0
20	3/4	98	4	118	4	270	6,5
25	1	108	4	124	4	270	7,0
32	1 1/4	118	4	134	4	280	8,0
40	1 1/2	127	4	156	4	280	9,0
50	2	153	4	165	8	280	11,5
65	2 1/2	178	4	191	8	330	16,5
80	3	191	4	210	8	340	19,5
100	4	229	8	254	8	400	20,5

For dimensions F, C, E see Table DIN Flanges

1) Other pressure ratings upon request.
2) When a grounding ring is attached to a flange at one end, the dimension L is increased as follows: DN 10–DN 100 by 3 mm.
3) When protection flanges are installed, the dimension L is increased as follows: DN 10–DN100 by 6 mm. A grounding ring is not required!
4) When a grounding ring is attached to the flange at one end, the dimension L increases by 3 mm with protection flanges, DN 10–DN 80 by 20 mm, DN 100 by 25 mm.

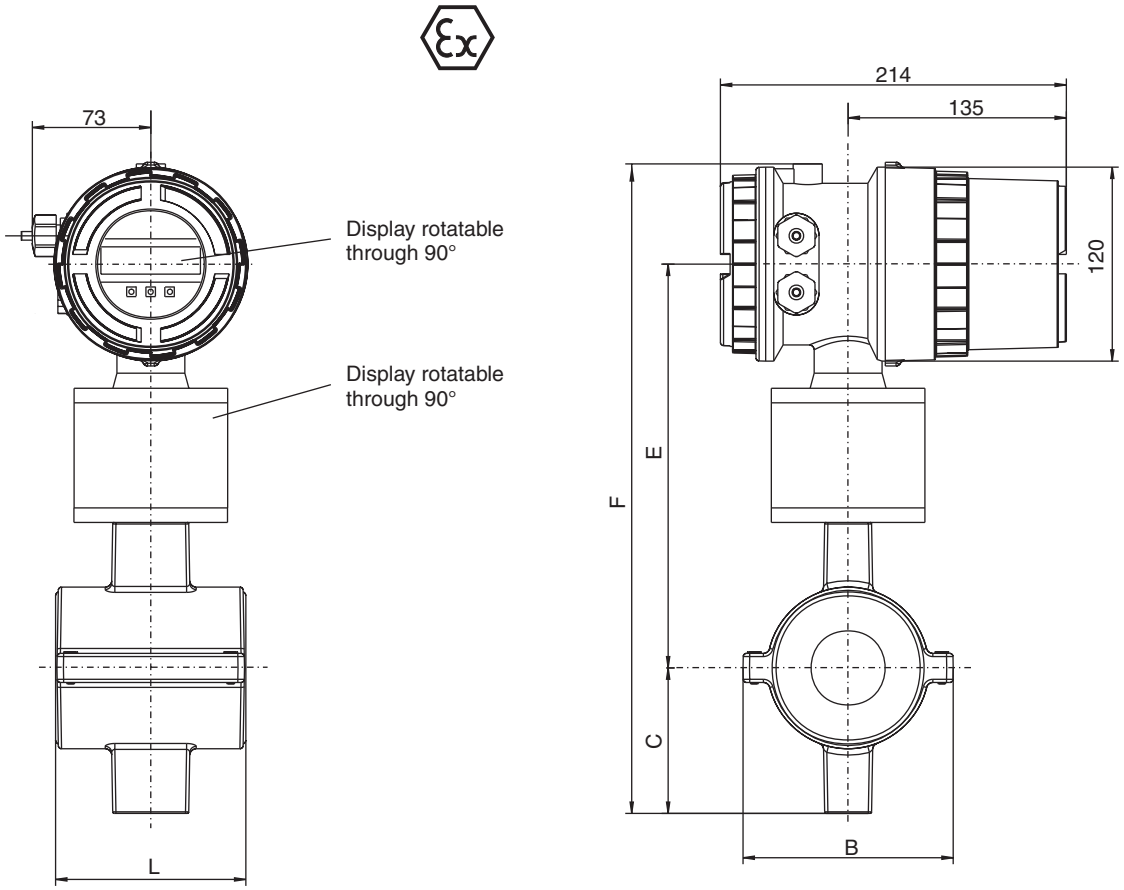
All dimensions in mm



ISO Projection Method E

Fig. 10 Flowmeter Primary DN 10 – DN 100

Dimensions: Flowmeter Primary DN 10 - DN 100, Wafer Design, Model DT47W



Wafer Design

Dimensions							Weight Compact Meter
DN	PN	L	B	C	E	F	ca. kg
10	40	69	75	62	284	346	3,5
15	40	69	75	62	284	346	3,5
25	40	91	95	73	306	368	5,0
32	40	99	103	78	316	378	5,5
40	40	104	112	82	324	386	6,5
50	40	117	130	90	340	402	7,0
65	40	103	146	104	368	430	8,5
80	40	103	163	110	380	442	9,5
100	16	133	190	130	420	482	10,5

All dimensions in mm

ISO Projection Method E

Fig. 11 Flowmeter Primray, Wafer Design DN 10 – DN 100

Ordering Information: Flanged Design DN 10 - DN 100

In addition to the Ordering Number please supply the following information: Fluid , fluid temperature, operating pressure, flow range, pipeline type, grounding ring[1], grounding electrodes[1].

Ordering Information		**DT43F**										
Ex-Design		**DT47F**										
Liner Material												
Hard rubber	DN 15 – DN 100 KTW approved (not for wafer)		**H**									
Soft rubber	DN 50 – DN 100 KTW approved (not for wafer)		**S**									
PTFE	DN 10 – DN 100		**T**									
Meter Size	**(Inch)**											
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**								
Measuring electrodes /	**Grounding electrodes**											
Stn.stl. 1.4571	without				**S**							
Hastelloy B-2	without				**B**							
Hastelloy C-4	without				**H**							
Titanium	without				**M**							
Tantalum	without				**T**							
Stn.stl. 1.4539	without				**F**							
Platinum-Iridium	without				**P**							
Stn.stl. 1.4571	with				**E**							
Hastelloy B-2	with				**N**							
Hastelloy C-4	with				**O**							
Titanium	with				**I**							
Tantalum	with				**Q**							
Stn.stl. 1.4539	with				**R**							
Platinum-Iridium	with				**G**							
Pressure Rating												
DIN PN 6						**B**						
DIN PN 10						**C**						
DIN PN 16						**D**						
DIN PN 25						**E**						
DIN PN 40						**F**						
JIS K10						**K**						
ANSI 150 lb						**P**						
ANSI 300 lb						**Q**						
Flange Material												
Stn.stl. 1.4571							**3**					
Flange Accessories												
None								**A**				
Protection rings[1]	Stn.stl. 1.4571 (attached)							**B**				
Grounding ring[1]	Stnstl. 1.4571 (attached one end)							**C**				
Protection flanges[2]	Stn.stl. 1.4571 (attached)							**D**				
Temperature range	**( ) for Ex-Design**											
	(Ambient temperature ≤ 40 °C)								**A**			
	(Ambient temperature ≤ 50 °C)								**B**			
Standard-design **C**	(Ambient temperature≤ 60 °C)								**C**			
Approvals												
Standard, none										**A**		
3.1B per EN 10204[3]										**D**		
Operating mode and design( ) for hazardous area												
Standard with display and magn. stick operation	(increased safety “e”)										**D**	
With display and magn. stick operation	(intrinsically safe “i”)										**F**	
Communication												
Standard, none												**A**
HART-Protocol												**D**

1) Protection flanges attached to flanges on both ends, grounding ring on one end, other materials upon request.
2) Protection flanges same as Series 1000 attached to flanges, ANSI only, others materials upon request.
3) Certification for meter tube and flanges.

Ordering Information: Wafer Design DN 10 - DN 100

In addition to the Ordering Number please supply the following information: fluid temperature, operating pressure, flow range, pipeline type, grounding ring, grounding electrodes.

Ordering Information		**DT43W**								
Ex-Design		**DT47W**								
Liner Matrial										
PTFE DN 10 - 100			**T**							
Meter Size	**(Inch)**									
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**						
Measuring electrodes	**/ Grounding electrodes**									
Stn.stl. 1.4571	without				**S**					
Hastelloy B-2	without				**B**					
Hastelloy C-4	without				**H**					
Titanium	without				**M**					
Tantalum	without				**T**					
Stn.stl. 1.4539	without				**F**					
Platinum-Iridium	without				**P**					
Stn.stl. 1.4571	with				**E**					
Hastelloy B-2	with				**N**					
Hastelloy C-4	with				**O**					
Titanium	with				**I**					
Tantalum	with				**Q**					
Stn.stl. 1.4539	with				**R**					
Platinum-Iridium	with				**G**					
Pressure Rating										
DIN PN 6						**B**				
DIN PN 10						**C**				
DIN PN 16						**D**				
DIN PN 25						**E**				
DIN PN 40						**F**				
JIS K10						**K**				
ANSI 150 lb						**P**				
ANSI 300 lb						**Q**				
Temperature range	**( ) for Ex-design**									
	(Ambient temperature ≤ 40 °C)						**A**			
	(Ambient temperature ≤ 50 °C)						**B**			
Standard-design **C**	(Ambient temperature≤ 60 °C)						**C**			
Certifications										
Standard, none								**A**		
3.1B per EN 10204[1)]								**D**		
Operating mode and design	**( ) for hazardous area**									
Standard with display and magn. stick operation	(increased safety “e”)								**D**	
With display and magn. stick operation	(intrinsically safe “i”)								**F**	
Communication										
Standard, none										**A**
HART-Protocol										**D**

1) Material certificate for meter tube.

Specifications: Converter for COPA-XT

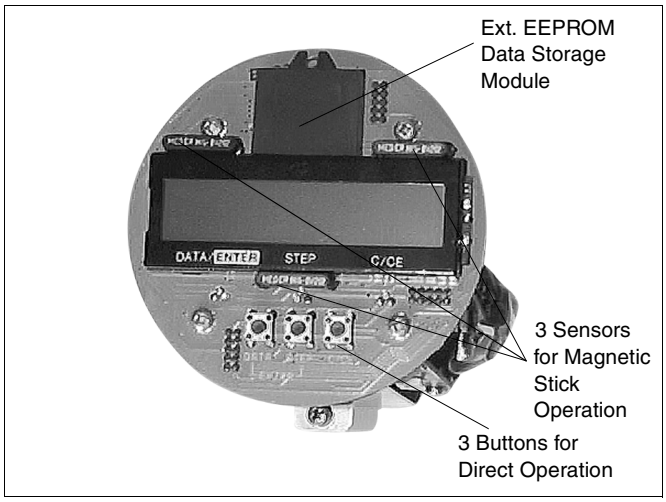


Fig. 12 Converter Keypad and Display

Flow Range
Continuously selectable between 0.5 and 10 m/s

Accuracy
≤ 0.5 % of rate

Reproducibility
≤ 0.2 % of rate

Minimum Conductivity
20 µS/cm

Response Time
Step function 0–99 % (corresp. 5 τ) ≥ 2 s

Supply Power
14 – 55 V DC, Ripple ≤ 5 %
Ex-design see electrical datas for transmitter power supply table page 18 and 19.

Magnet Field Supply
Pulse DC field

Power Consumption
≤ 0.5 Watts, Primary including converter

Ambient Temperature
-20 to +60 °C see Temperature Diagrams Page 6/7

Electrical Connections
Screwless spring terminals,
DN 10 to DN 100 Cable connector Pg 13.5

Protection Class per EN 60529
IP 67

Forward / Reverse Metering
The flow direction is indicated by direction arrows in the display.

Display
Warning: When the housing cover is removed the EMC-Protection is reduced.

> **With Display**, data is entered using the 3 buttons or directly from the outside when the housing is closed using a magnetic stick.

2x16 character LC-Dot Matrix Display. The flowrate is totalized internally in any of 15 different engineering units separately for each flow direction. The flowrate can be displayed in any of 42 different engineering units.

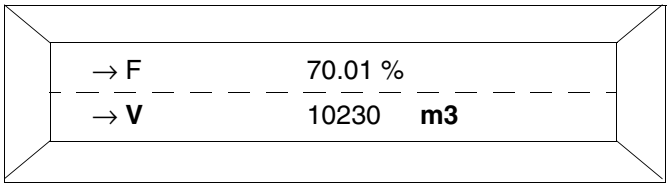
The converter housing can be rotated 90°. The display can be plugged in 3 orientations to assure optimal readability. In the multiplex mode the flowrate indication in %, engineering units or bargraph, the totalizer values, forward or reverse, the TAG No. and the current output value can be selected for display in the 1st or 2nd lines.

> **! Note:**
>
> The meter satisfies to the NAMUR-Recommendation NE21, Electromagnetic Compatibility of Equipment In Processes and Laboratories 5/93 and EMC-Guideline 89/336/EWG (EN 50081-1, EN 50082-2).
> **Warning:** When the housing cover is opened the EMC-Protection is reduced.

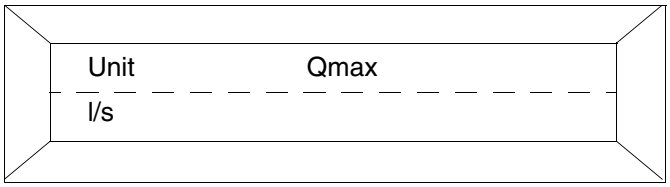
Data Security
All data is stored in an FRAM when the power is turned off or a power outage occurs. The parameter settings, process information and flowmeter primary specific calibration data are stored in both a serial EEPROM and in an external EEPROM. Therefore when an electronic module needs to be exchanged all stored data can be uploaded from the external EEPROM any time.

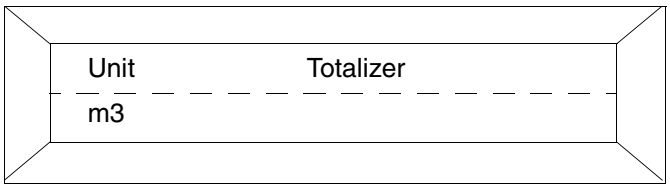
Display

When an electronic module and internal EEPROM are exchanged the parameter settings can be uploaded by simply pressing a button.



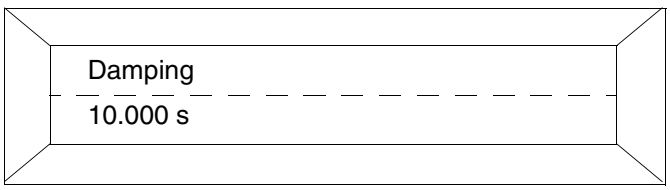
In the 1st line the instantaneous flowrate value is displayed in % of the flow range setting or in engineering units. In the 2nd line the totalized volume flow value is displayed (including units).

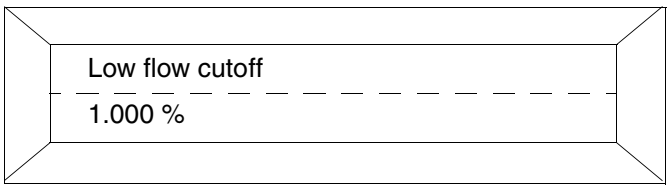




The flowrate is displayed in percent or in any of 42 different engineering units The flow totalizer values can be displayed in any of 15 different engineering units, e.g. Liter, Hectoliter, Cubic meter, Ton (if a density value has been entered). It is also possible to program an arbitrary units.

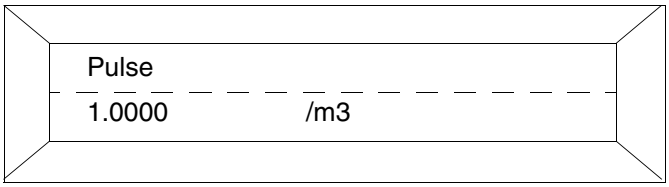
The damping value can be set from 5 s to 99 s.



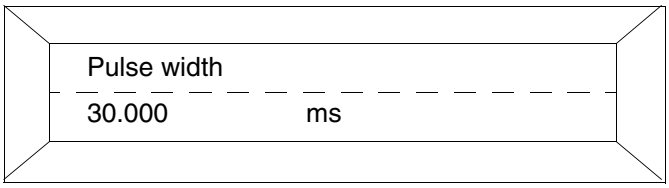


The low flow cutoff value can be set from 0,5 to 10 % of max. (affects current and pulse outputs).

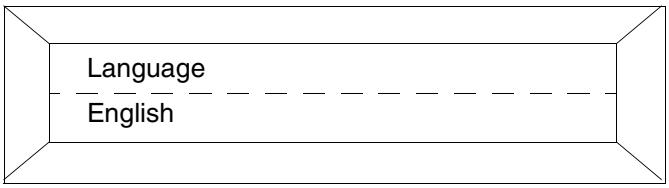
The pulse factor can be set between 0.001 and 1000. The pulse factor is a multiplier for the value shown in the display.

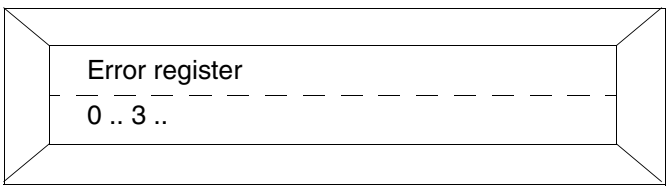


The pulse width can be set between 0.1 ms to 50 ms with an automatic plausibility check.

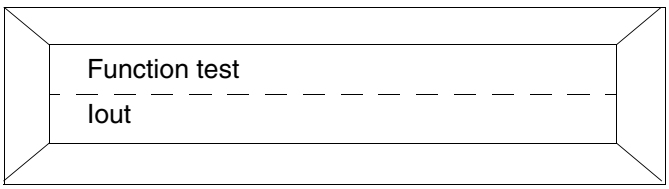


The data can be entered in 2 languages.





Automatic self monitoring with error diagnostics on the display and error signal over the contact output. All errors detected are stored in the error register.



The individual internal elements of the converter can be tested using the function test routines. All outputs can be simulated for start-up and testing purposes.

Specifications: Converter for COPA-XT

Supply Power
The flowmeter system in 2-Wire Technology is connected to a power supply of 14 - 55 V DC from a central - or transmitter power supply.

From Transmitter power supply instrument, specifications see Fig. 13, and 4–20 mA current output signal for connection to peripheral instruments.

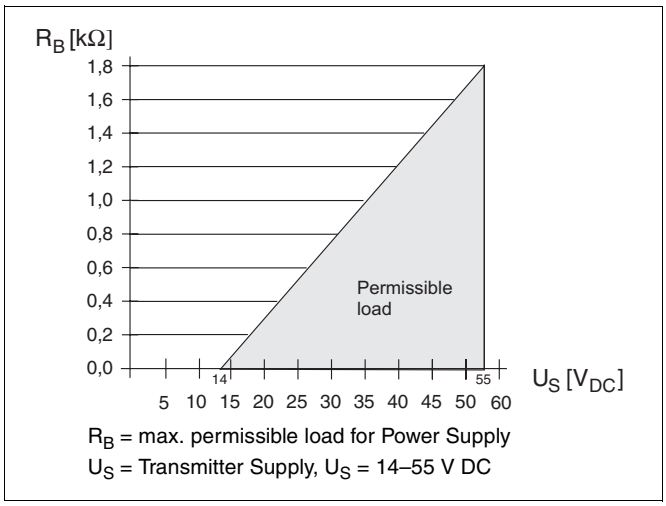


Fig. 13 Load Curve

Binary Output
The binary output can be configured as a pulse output or system alarm output. The output complies with the standard VDI/VDE 2188.

Contact Output (Terminals V8, V9)
The following functions can be assigned to the output in the software:
System Monitor: Open or closed contact
Forward/Reverse: Closed for the forward flow direction
Max-Alarm, Min-Alarm: Open or closed contact

External Power Supply
From e.g. SPS etc. with U_B = 19 - 33 V DC

Scaled Pulse Output (Terminals V8, V9)
Scaled pulse output, max. 100 Hz. The value indicated in the display can be multiplied by a pulse factor with a value selected between 0.001 and 1000 (1 pulse/m^3 * 1000). The pulse width can be set between 0.1 ms and 2000 ms.

Design	Optocoupler passive (Standard)
Terminal function	V8, V9
Operating voltage	16 V ≤ U_{CEH} ≤ 30 V 0 V ≤ U_{CEL} ≤ 2 V
Operating current and frequency	0 mA ≤ U_{CEH} ≤ 0,2 mA 2 mA ≤ U_{CEL} ≤ 220 mA f_{max} ≤ 100 Hz

Installation of the Binary Output and Connections

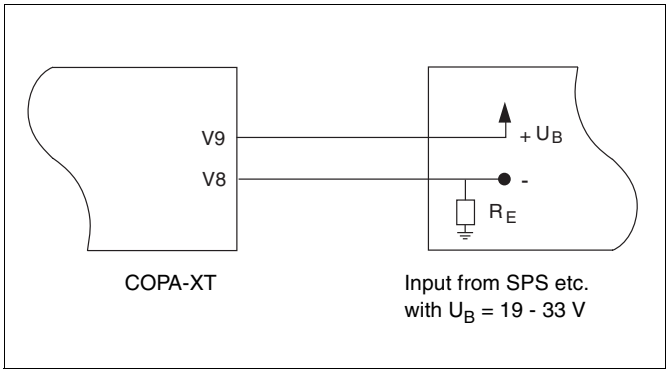


Fig. 14 Installation of the Binary Output EEx “e”

The load R_E is calculated for the desired category as a function of the available supply voltage U_B, the lead resistance R_L and the selected current output as follows:

$$R_E = \frac{(U_B - 3V)}{I_B} \cdot R_L \text{ mit } R_L = \frac{(2 \cdot \ell)}{56 m/\Omega mm^2 \cdot A}$$

Lead length ℓ [m]
Lead cross-section A [mm^2]

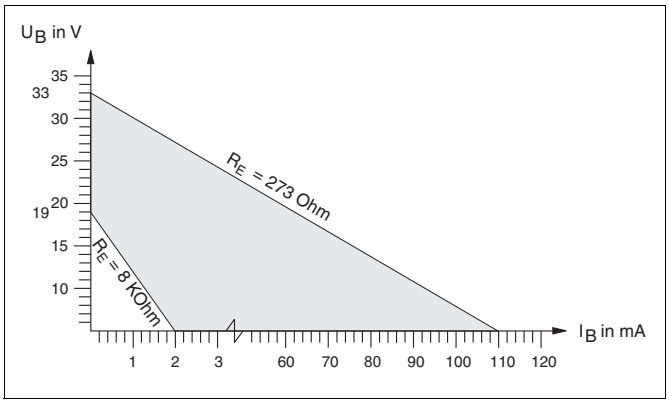


Fig. 15 Load Resistance as a FUnction of the Current and Voltage (see Equation)

Communication, Interconnection Diagram COPA-XT

HART-Protocol
The HART-Protocol provides for communication between a process control system or handheld terminal and the EMF field instrument. The digital communication utilizes an AC signal superimposed on the current output, which does not affect any other instruments connected to the current output. This option is only available with a 4–20 mA current output. Terminals: +/–.

The SMART VISION program can be used to configure and operate the system.

SMART VISION is a universal communication software program for intelligent field instruments, which utilizes a variety of communication means and thereby provides for data exchange to a complete palette of field instruments. The major uses are as a parameter display and for configuration, diagnostics and data management for all intelligent field instruments which themselves, satisfy the communication requirements.

The following communication means are possible:

HART-Communication
1. over FSK-Modem in Point-to-Point or Multidrop operation.
2. over Fischer & Porter HART-Multiplexer

SMART VISION can be used with standard modern PCs or notebooks running MS Windows, Version 3.1 and up, MS Windows 95 or Windows NT.

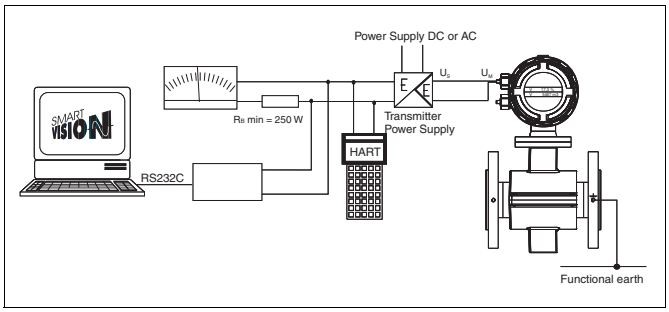


Fig. 16 Communication with HART-Protocol

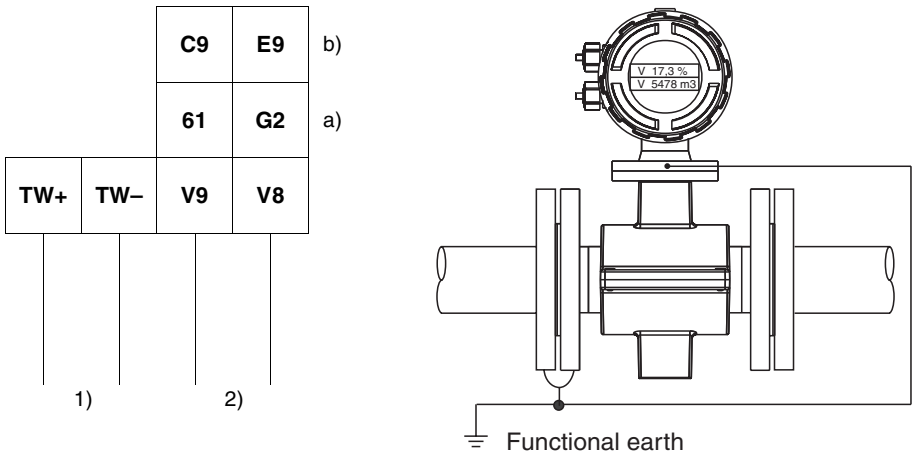
Transmission Mode
FSK-Modulation on the 4-20 MA current output per Bell 202 Standard. Max. signal amplitude 1,2 mA_{pp}

Load (Current Output)
Min.: >250 Ω , max. see Fig. 12

Cable
AWG 24 twisted

Max. cable length
1500 m

Baudrate
1200 Baud. Log. 1: 1200 Hz; Log. 0: 2200 Hz



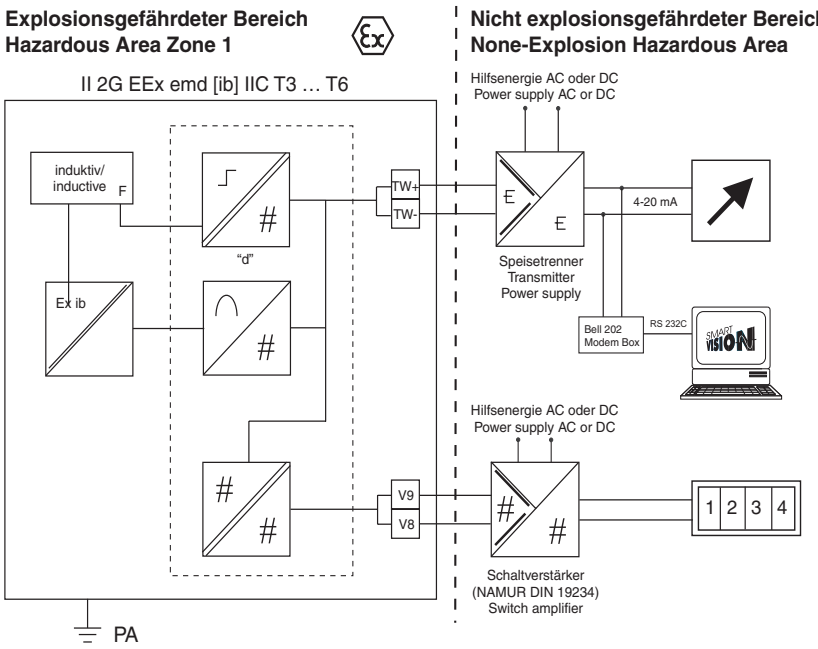
1) Supply power from Transmitter Power Supply, TW+, TW–, 14–55 V DC
2a) Binary-Output: Function software selectable for system monitoring, or F/R signal*). Output closed at alarm. Function C9, E9 **or**
b) scaled pulse output, passive, pulse width can be set between 0.1 ms and 50 ms, Terminals: V8, V9 Function 61, G2, optocoupler, fmax 100 Hz

Optocoupler passive Terminals V8, V9.
0 V ≤ U_{CEL} ≤ 2 V, 16 V ≤ U_{CEH} ≤ 30 V
0 mA ≤ I_{CEH} ≤ 0.2 mA, 2 mA ≤ I_{CEL} ≤ 220 mA

*) The function forward direction signal has been set at the factory.
Comment: To satisfy the electromagnetic compatibility requirements the meter is to be connected to ground.

Fig. 17 Interconnection Diagram COPA-XT

Interconnection Diagram COPA-XT: Supply Power from Transmitter Power supply „Intrinsically Safe“



Explosion Hazardous Area

Ex-APproval Specifications	
Ambient Temperature	-20 °C ... +60 °C
Fluid Temperature	-25 °C ... + see Temperature Class and Liner
Electrical Specifications	
Supply Power Circuit	EEx ib IIC / IIB U_i = 30 V I_i = 100 mA P_i = 760 mW C_i = 13 nF Terminal TW- is connected internally to PA
Cable Connector	blue
Recommended Transmitter Power Supplies	
Hartmann & Braun	TZN 128-Ex, electr. current limiter, Contrans I V 17151-62
ABB Digitable	CS3/420, CS5/420
Apparatebau Hundsbach	AH 90270, AH 77270
MTL	MTL 3046B, 3047, E 02009
Pepperl + Fuchs	KHD3-IST/Ex1, KFD2-STC1-Ex, KSD2-CI-S-Ex
Recommended Transmitter Power Supplies (HART-Capable)	
Hartmann & Braun	TZN 128-Ex
ABB Digitable	CS3/420-1
MTL	MTL E 02009 - 203_ _ 1/203_ _ 1S
Binary Output (NAMUR per DIN 19234)	EEx ib IIC / IIB U_i = 20 V I_i = 30 mA P_i = 150 mW C_i = 2,4 nF L_i = 67 µH Terminal V8 is connected internally to PA
Recommended Switching Amplifiers	
Hartmann & Braun	V17131-51...53, V17131-54...56
ABB Digitable	ci 1/941, ci 1/942
Apparatebau Hundsbach	AH TS 920, AH 90 924
Pepperl + Fuchs	Various types

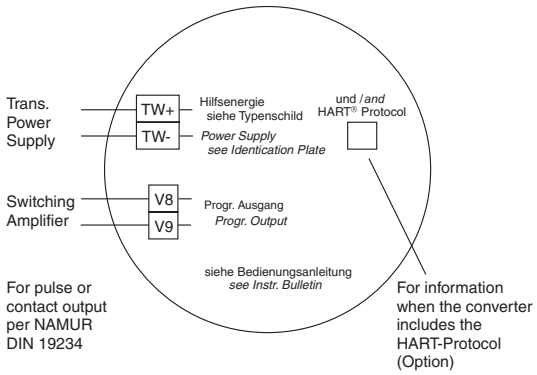
Non-Explosion Hazardous Area

The listed Transmitter Power Supplies or supply power sources are to be installed so that the voltage at the converter terminals is $U_{TW-/TW+} \geq 14$ V. The voltage drop and the loads on the leads muse be considered. Voltage drop in the leads:

$$\Delta U_{max} = \frac{22,8\text{mA} \cdot (2 \cdot \ell)}{56\text{m}/\Omega\text{mm}^2 \cdot \text{A}}$$

Lead length ℓ [m]
Lead cross-section A [mm^2]

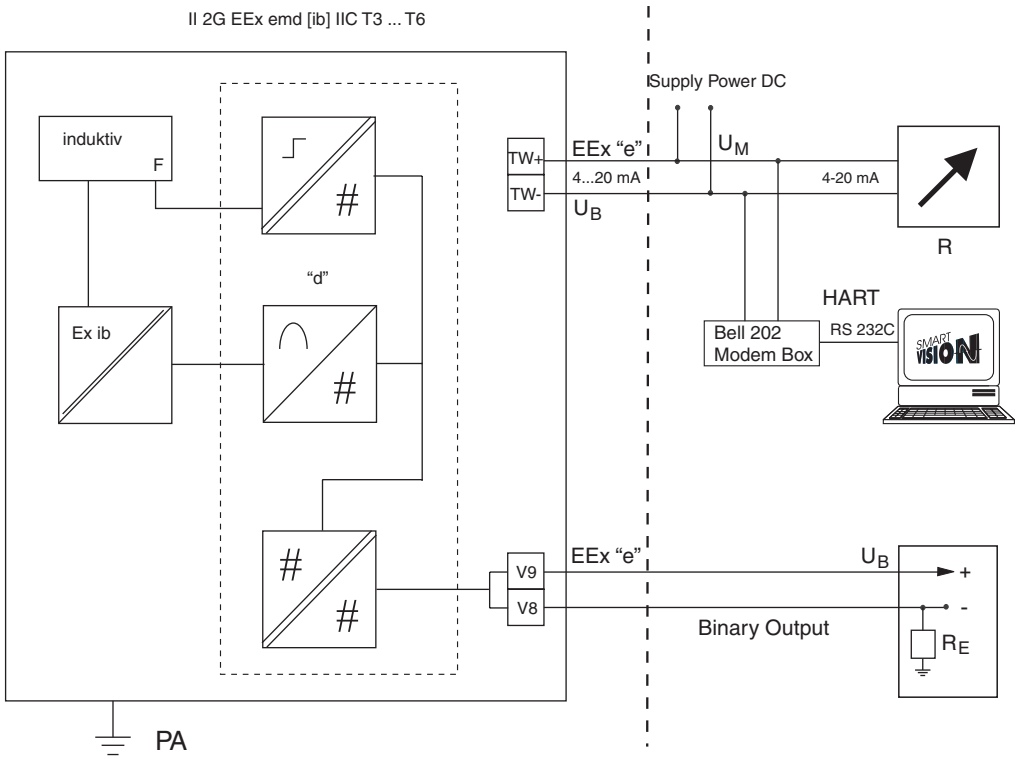
Ex “ib” Interconnection Diagram



Use care when replacing and tightening the housing cover screws. Check that the gasket is properly seated. Only then is Protection Class **IP 67** assured.

Fig. 18 Supply Power from Transmitter Power Supply “Intrinsically Safe”

Interconnection Diagram COPA-XT: Supply Power from Central Power supply „Non-Intrinsically Safe“



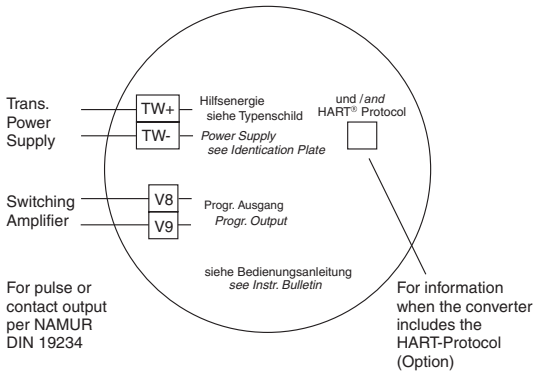
Explosion Hazardous Area

Ex-Approval Specifications	
Ambient Temperature	-20 °C ... +60 °C
Fluid Temperature	-25 °C ... + see Temperature Class and Liner
Electrical Specifications:	
Supply Power Circuit	U_M = 60 V 14 V ≤ U_B ≤ 55 V 3,8 mA ≤ I_B ≤ 22 mA
Binary Output	U_M = 60 V 19 V ≤ U_B ≤ 33 V 2 mA ≤ I_B ≤ 110 mA
Cable Connector	black

Non-Explosion Hazardous Area

Ex "e"

Interconnection Diagram



Use care when replacing and tightening the housing cover screws. Check that the gasket is properly seated. Only then is Protection Class **IP 67** assured.

Fig. 19 Supply Power from Central Power Supply "Non-Intrinsically Safe"

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