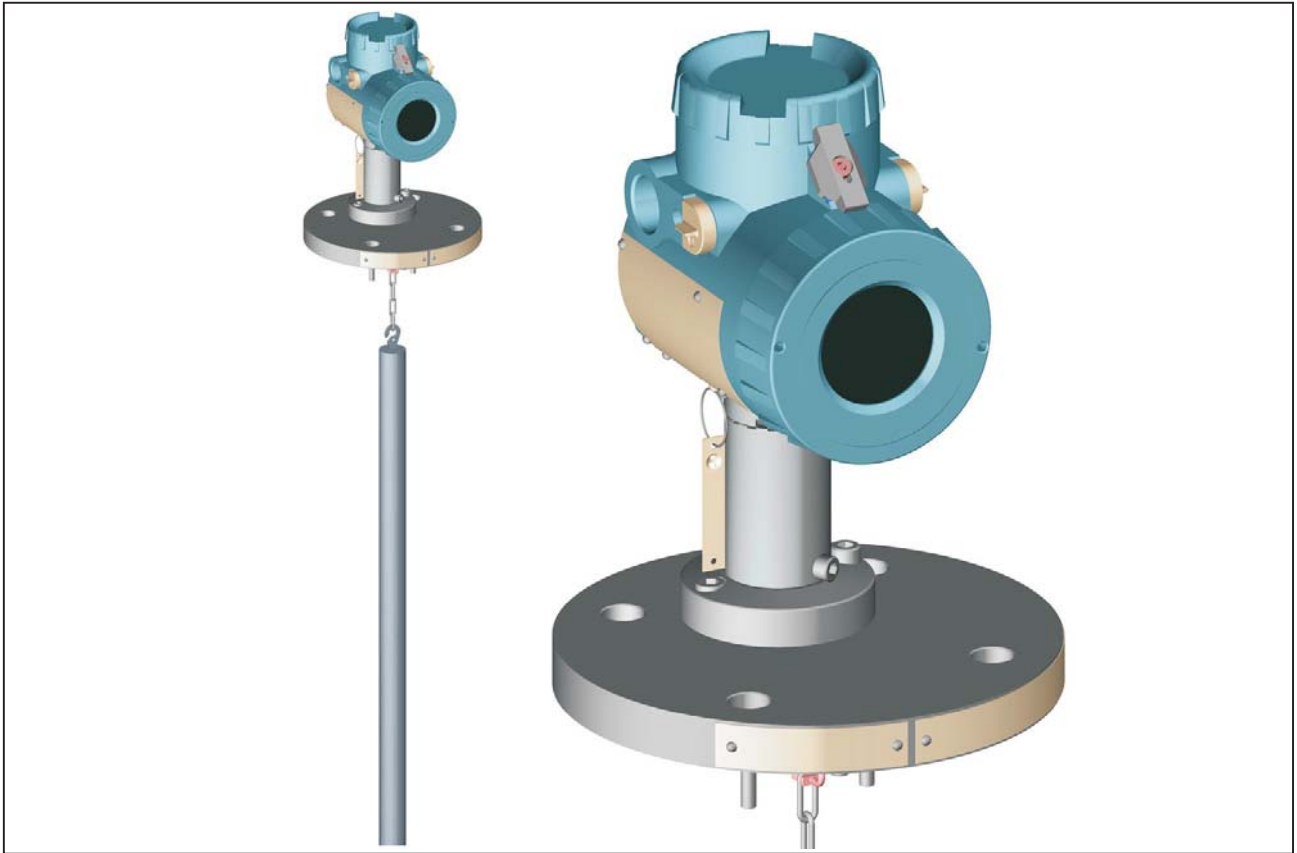


244LVP Intelligent Buoyancy Transmitter for Liquid Level, Interface and Density



The intelligent transmitter 244LVP is designed to perform continuous measurements for liquid level, interface or density of liquids in the process of all industrial applications. The measurement is based on the proven Archimedes buoyancy principle and thus extremely robust and durable. Measuring values can be transferred analog and digital. Digital communication facilitates complete operation and configuration via PC or control system. The 244LVP measures with consistent reliability and high precision. For installations in contact with explosive atmospheres up to Zone 0, certificates are available. The 244LVP combines the abundant experience of FOXBORO ECKARDT with most advanced digital technology.

FEATURES

- Communication HART (4-20 mA)
- Conventional operation with local keys
- Easy adaptation to the measuring point without calibration at the workshop
- Backdocumentation of measuring point
- Configurable safety value
- Software lock against unauthorized operation
- Simulation of analog output for loop-check
- Local display in %, mA or physical units
- Signal noise suppression by Smart Smoothing
- Continuous self-diagnostics
- Linear or customized characteristic
- Process temperature from $-50\text{ }^{\circ}\text{C}$ to $+120\text{ }^{\circ}\text{C}$
- Static pressure up to PN 40
- Micro sintermetal sensor technology

TECHNICAL DATA

Data refer to the sensor material Type 316L (1.4404)

Explosion protection certificates must be observed!

Input / Output

Measuring ranges 0 ...50 mm to 0...3 m
upper and lower range value
continuously adjustable

Standard lengths of

Displacer (104DE) 350 .. 3000 mm, 14 .. 120 in;
further lengths on request

Weight of displacer ¹⁾ max. 25 N

Measuring span 2... 20 N contin. adjustable
(to 1 N on request)

Span ratio

Turn-down 1:1 .. 1:10 (1:20 on request)

Accuracy ²⁾ $\pm 0.2\%$; increased accuracy
with customized adjustment

Transfer function linear or customized with up
to 32 setpoints

Configuration

- with local push buttons and LCD
- Digital (see communication ...)

Local display LCD 5 digits, configurable in
%, mA or phys. units

Load $R_{Bmax} = (U_S - 12V) / 23\text{ mA}$

Communication HART

Connection Two-wire system

Supply voltage U_S : 12 .. 42 V DC ³⁾, $V_{SS} < 1\%$

Current sink max. 23 mA

Signal range 4 .. 20 mA

Operating range 3.8 .. 21 mA

Digital communication HART Protocol, 1200 Baud

Hand held terminal HHT 991

PC Software PC20 / PC 50

Hardware HART Modem MOD991 for PC

Min. load 250 Ω

Failure handling

Substitute value. last value or safety value

Safety value 3.6 ... 23 mA, adjustable

Reset substitute value automatically or manual

Select messages. Internal calibration failed,

Pressure peaks > 150 %,

Data access failed,

Over range > 110 %,

Ambient temp. out of limits,

Process temp. out of limits,

Measuring range invalid

1) For measurement of interface or density:
25 N + buoyant force at lowest density

2) Acc. ANSI / ISA - S51.1 - 1979

3) With explosionproof device 12 .. 30 V

Operating conditions ¹⁾

Process temperature -50 °C ... +120 °C
 Pressure rating
 acc. to DIN PN 40
 acc. to ANSI Class 150, 300
 Ambient temperature ²⁾
 without indicator -40 °C ... +85 °C
 with LCD indicator -40 °C ... +70 °C ³⁾
 Relative humidity < 100%
 Condensation permitted
 Transportation-
 storage temperature -50 °C ... +85 °C
 Protection IP 66 (acc. DIN EN 60 529)

Operation condition effects

Ambient temperature -10 °C ... +70 °C
 Zero < 0.1 % / 10 K ⁴⁾
 Span < 0.07 % / 10 K
 Total
 $(0.1 \frac{\text{max. sp.}}{\text{adjusted sp.}} \pm 0.07 \frac{\text{measured value}}{\text{adjusted sp.}}) \% / 10\text{K}$
 (sp. = measuring span)
 < -10 °C / > +70 °C twice the value
 Process temperature < 0.1 % / 10 K ⁴⁾
 Operating pressure < 0.03 % / 10 bar

Transitional behavior

Dynamic behavior
 Damping (90%-time) 0 ... 32 s
 Switch-on time 7 s
 Step response (63%-time)
 with damping 0 s 250 ms
 Update rate 10/s
 Long term stability < 0.2 % / 6 months at 20°C ⁴⁾
 Noise suppression
 Common mode voltage < AC 250 V_{eff}
 Common mode rejection 120 dB
 Series mode rejection 50 dB
 Mains synchronization 50 Hz / 60 Hz
 Filter Smart Smoothing

1) Not with all materials - see Table of Comparison of Materials page 6
 2) -50 °C on request
 3) Display invisible at temperatures less than -30 °C
 4) For max. measuring span

Materials (Table of Comparison see page 6)

Sensor	
Measuring cell	316L (1.4404 / 1.4435) or Hastelloy C
Fill fluid	silicone oil
Filling volume	approx. 0.3 cm ³
Displacer 104DE	316L (1.4404 / 1.4435), PTFE, PTFE with 25% carbon or Hastelloy C
Suspension	316L (1.4404 / 1.4435 / 1.4436) or Hastelloy C
Connection flange	316 (1.4404 / 1.4571)
Amplifier housing	Aluminium (Alloy No GD-Al Si 12), Polyurethan coated, or Stainless Steel 316L (1.4404)

For Sour Gas applications according to NACE Standard
MR-0175-95:

Diaphragm	Hastelloy C
Flange	316 (1.4404 / 1.4571)

Mounting

Mounting method	flange mounted
acc. DIN	DN 50, DN 80
acc. ANSI	2 inch or 3 inch

Weight

Transmitter	see table page 6
Displacer	see table page 10

Electrical connection

Cable entry thread M20x1.5 or 1/2-14 NPT
Cable gland and screwed sealing plug have to be ordered
separately under model code BUSG ...
For equipment in Ex d version, 1 screwed sealing plug
made of stainless steel is included in delivery.
Screw terminals wire cross-section up to 2.5 mm²
Test sockets Ø 2 mm

Electromagnetic compatibility EMC

Operating conditions industrial environment
Immunity according to
EN 61326 (3/2002) fulfilled
Emission according to
EN 61326 (3/2002) fulfilled
EN 55011, May 2000,
Group 1, Class A. fulfilled
EN 61000-6-3 fulfilled
NAMUR recommendation Ne21 Status Aug.1998 fulfilled

SAFETY REQUIREMENTS**CE Label**

Electromagnetic compatibility . . 89/336/EWG
Low-voltage regulation 73/23/EWG
Explosion protection 94/9/EG

Safety

According to EN 61010-1
(resp. IEC 1010-1) safety class III
Internal fuses none (or not replaceable by
customer)
External fuses Limitation of power supplies
for fire protection have to be observed due to EN 61010-1,
appendix F (resp. IEC 1010-1)

Electrical classification ATEX ^{1) 2)}

Intrinsic safe:

AI 408	HART electronics	II 2 G EEx ia/ib IIB/IIC T4	PTB 01 ATEX 2168	Zone 1
mounted with:				
AI 419 C	Sensor part 244LVP	II 1/2 G EEx ib/ia IIB T4..T6	PTB 01 ATEX 2044	Zone 0
AI 419 D	Sensor part 244LVP	II 1/2 G EEx ib/ia IIC T4..T6	PTB 01 ATEX 2044	Zone 0

Explosion-proof:

AD 931	Housing for HART	II 2 G EEx d IIC T6	PTB 02 ATEX 1025 X	Zone 1
mounted with:				
AD 406 D	Sensor part 244LVP	II 2 G EEx d IIC T6..T4	PTB 02 ATEX 1025 X	Zone 1
AD 406 C	Sensor part 244LVP	II 2 G EEx d IIB T6..T4	PTB 02 ATEX 1025 X	Zone 1

Intrinsic safe and auxilliary protection:

AID421	Housing for HART ¹⁾	II 2 G EEx ia d IIC T6	PTB 04 ATEX 2011 X	Zone 1
mounted with:				
AD 406 D	Sensor part 244LVP	II 2 G EEx d IIC T6..T4	PTB 02 ATEX 1025 X	Zone 1
AD 406 C	Sensor part 244LVP	II 2 G EEx d IIB T6..T4	PTB 02 ATEX 1025 X	Zone 1

Zone 2:

AN 408	HART electronics	II 3 G EEx ia/ib IIC T4	Certificated by Manufacturer	Zone 2
mounted with:				
AI 419 C	Sensor part 244LVP	II 3 G EEx ib/ia IIB T4..T6	PTB 01 ATEX 2044	Zone 2

Further National certificates

- Overfill protection according to WHG

International Certificates

FM Certification

Intrinsically Safe / I, II, III / 1 / ABCDEFG / T4 Ta=85°C
 Nonincendive / I / 2 / ABCD / T4 Ta=85°C
 Special Protection / II / 2 / FG / T4 Ta=85°C
 Special Protection / III / 2 / T4 Ta=85°C
 Explosion proof / I / 1 / BCD / T6
 Dust-Ignitionproof / II, III / 1 / EFG / T6
 Type 4X
 Entity Parameters:
 Vmax=30 V, I_{max}=150 mA, Ci=2.45 nF, Li=0.14 mH

CSA Certification

Intrinsically safe / I, II, III / 2 / ABCDEFG /
 T3C Ta= 85 °C
 T4 Ta= 60 °C
 T4A Ta= 40 °C
 Type 4X
 Explosionproof / I, II, III / 1 / CDEFG / Ta= 85 °C
 Type 4X

RUSSIAN “Intrinsic safety”

RUSSIAN “Explosionproof”

Belarus - Certificate Number 2176

- Further protection types of on request -

1) With appropriate order only
 2) National requirements have to be observed

TABLE OF MATERIALS

Comparison of Material

Code	Wnr	DIN	Remarks	equivalent to
X6 CrNiMoTi 17 12 2	1.4571	17 440		~ ASTM Typ 316Ti
X2 CrNiMo 17 13 2	1.4404			ASTM Typ 316L
X2 CrNiMo 18 14 3	1.4435			
X5 CrNiMo 17 13 3	1.4436			
NiMo 16 Cr 15 W	2.4819	17 744	equivalent to Hastelloy C-276 VdTÜV - Wbl. 400	UNS N 12 276
GD - AlSi 12	3.2582.05	17 007	Al - Diecasting	

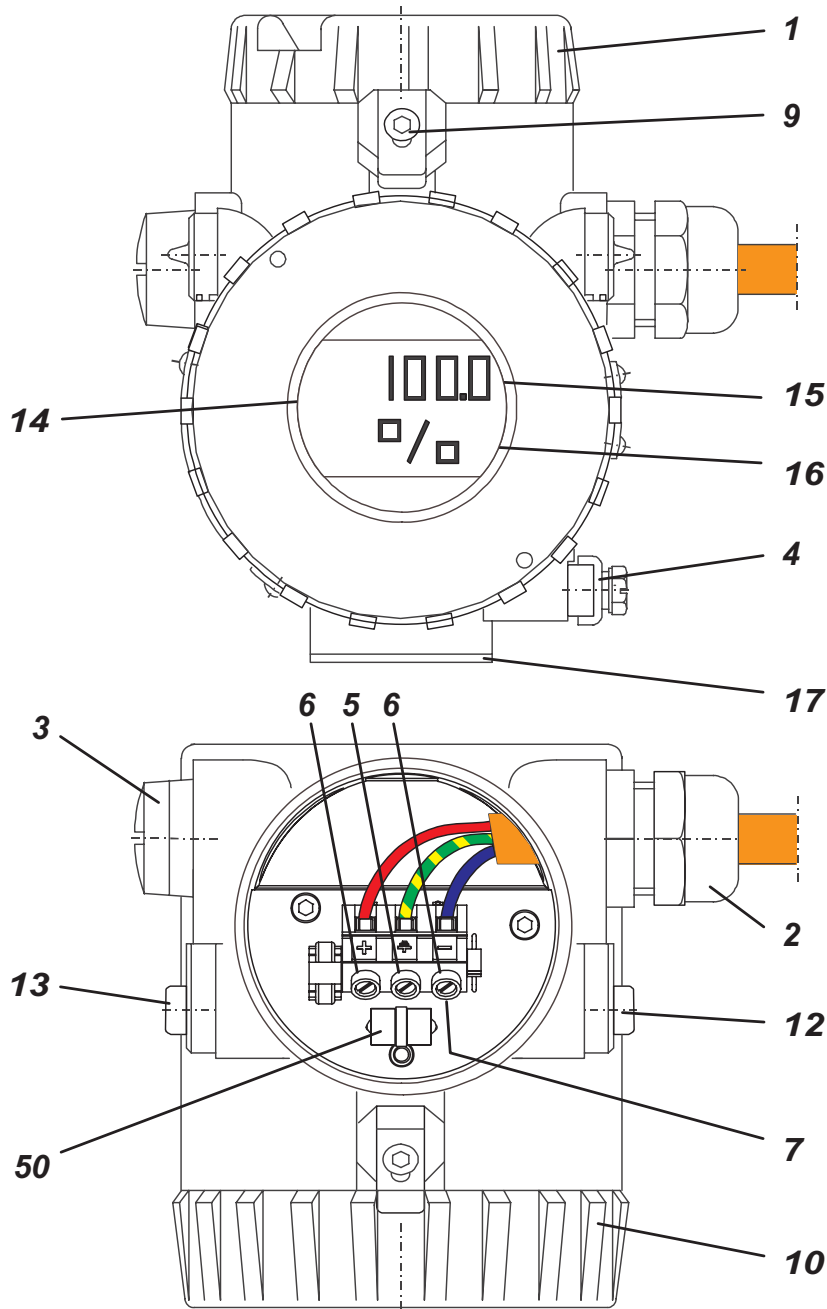
Service Limits 244LVP

Nominal pressure	316 / 316L (1.4404 / 1.4571) Hastelloy C		
	Max. operating pressure in bar at temperature in °C		
	-50 ... -10	-10 ... +50	+120
PN 40 DIN 2635	40	40	35
Class 150	19	18	16
Class 300	49	49	42

Table of Weights

Transmitter, without displacer	Weight [kg]		
	PN	Class	
	40	150	300
DN 50 / 2 inch	4.9	4.5	5.5
DN 80 / 3 inch	7.2	7.4	9.2

CONNECTIONS, OPERATIONAL ELEMENTS



- 1 Cover for terminal compartment
- 2 Cable gland (as ordered)
- 3 Plug, interchangeable by Pos. 2
- 4 External ground connection
- 5 Internal ground connection
- 6 Terminals (+/-)
- 7 Test sockets Ø 2 mm integrated in terminals
- 9 Security lock for EEx d version

- 10 Cover for amplifier housing (with local display)
- 12 Local key for lower range value / zero
- 13 Local key for upper range value / damping
- 14 LCD indicator
- 15 Measuring variable
- 16 Engineering unit
- 17 Bottom housing cover
- 50 Overvoltage protection (if present)

MODEL CODES 244LVP

Intelligent Buoyancy Transmitter with Displacer		244LVP							
Flange Material: (Process wettet)									
316L 1.4404 1.4435		-S							
Sensor Material: (Process Wettet)									
316L / 1.4435 / 1.4404		S							
316L / 1.4435 / 1.4404 with HC-Diaphragm		N							
Flange Size									
DN 50					5				
DN 80					8				
2-Inch					2				
3-Inch					3				
Flange Pressure Rating & Contact Face									
PN40 (PN16 to PN40) C (a) (a)						C1			
PN160 (PN16 to PN40) N (a) (a)						N1			
PN250 (PN16 to PN40) E (a) (a)						E1			
ANSI Class 150 RF (b) (b)						R1			
ANSI Class 300 RF (c) (c)						R2			
ANSI Class 150 SF (b) (b)						S1			
ANSI Class 300 SF (c) (c)						S2			
ANSI Class 150 RJF (b) (b)						J1			
ANSI Class 300 RJF (c) (c)						J2			
Version									
Base						B			
Cable Entry									
M20x1.5 Without Cable Gland						M			
1/2-14 NPT Without Cable Gland						N			
Communication:									
HART							H		
Electrical Classification									
ATEX intrinsic safe, Zone 0 - IIB T4								0B4	
ATEX Intrinsic safe, Zone 0 - IIC T4								0C4	
ATEX intrinsic safe, Zone 1 - IIC T4								1C4	
ATEX intrinsic safe, Zone 1 - IIC T6								1C6	
ATEX intrinsic safe, Zone 2 - IIC T4								2C4	
ATEX intrinsic safe, Zone 1 - IIB T6								1B6	
ATEX explosionproof, Zone 1 - IIB T6								D1B	
ATEX explosionproof, Zone 1 - IIC T6								D1C	
FM Nonincendive (d)								NFM	
FM Explosionproof (d)								FDZ	
RUS Intrinsically Safe (d)								GAA	
CSA Explosionproof (d)								CDZ	
FM Intrinsically Safe								FAA	
CSA Intrinsically Safe (d)								CAA	
For General Purpose Areas, Not Explosionproof								ZZZ	

OPTIONS

(continued on next page)

MODEL CODES 244LVP (continued)

Options	
Custom Configuration	-T
Tag No. Labeling	
Stamped With Weather Resistant Color	-S
Stainless Steel Label Fixed With Wire	-L
Stainless Steel Label Fixed On Amplifier	-F
National Certificates	
Overfill Protection Per WHG Environmental Pollution . (d).	-V
Certificates	
EN 10204-2.1 (DIN 50 049-2.1), Certificate Of Compliance	-1
EN 10204-2.3 (DIN 50 049-2.3), Specific Test Report (Calibration)	-2
EN 10204-3.1B (DIN 50 049-3.1B), Inspection Certificate Of Process Wetted Material	-3
PED 97/23/EC additional unit verification, according to module F/G	-4
Comply With NACE Standard MR-01-75 (e) . . (e)	-6
EN 10204-3.1B (DIN 50 049-3.1B), Inspection Certificate Of Process Wetted Material with Copy of Original individual Material Certificate	-9
Footnotes	
a) Available with Flange Size 5 or 8	
b) Available with Flange Size 2 or 3	
c) Available with Flange Size 3	
d) Pending	
e) Only with Sensor Material N	

Displacer 104DE**Standard Dimensions and Weights for Density Ranges $\Delta\rho$ ¹⁾**

Material		316L (1.4404 / 1.4435) ²⁾												PTFE / PTFE with 25 % C				Hastelloy C					
Transmitter Type		-SD (PN 100)				-ID ³⁾ (PN 40 / 63)				-SD (PN 250)				-SD (PN 500)				-SD (PN 100 / 160)					
		Density Range $\Delta\rho$																					
244LVP		250 ... 1500 kg/m ³				100 ... 600 kg/m ³				400 ... 2000 kg/m ³				200 ... 1500 kg/m ³				300 ... 1500 kg/m ³					
Model Code	Len. L	Ø mm	Vol. cm ³	Wei. N	PN bar	Ø mm	Vol. cm ³	Wei. N	PN bar	ρ_{\min} kg/m ³	Ø mm	Vol. cm ³	Wei. N	PN bar	Ø mm	Vol. cm ³	Wei. N	PN bar	Ø mm	Vol. cm ³	Wei. N	PN bar	
	mm																						
10	350	60.3	1000	19	100	101.6	2840	38	40	460	42.4	500	18	250	62	1056	23	500	60.3	1000	18	100	
11	500	48.3	920	17	100	88.9	3100	43	63	580	42.4	710	24	250	51	1021	23	500	48.3	920	19	100	
12	750	42.4	1060	21	100	76.1	3410	44	63	545	33.7	670	21	250	42	1039	24	500	48.3	1370	27	100	
13	1000	33.7	890	17	100	60.3	2855	41	63	545	26.9	570	18	250	35	961	21	500	33.7	890	19	100	
14	1200	33.7	1070	20	100	60.3	3425	48	63	675	26.9	680	22	250	35	1153	25	500	33.7	1070	22	100	
15	1500	26.9	850	16	100	51	3065	39	63	460	21.3	540	17	250	30	1060	24	500	26.9	850	18	160	
16	1800	26.9	1020	19	100	42.4	2540	38	63	495	21.3	640	20	250	28	1107	25	500	26.9	1020	21	160	
17	2000	26.9	1140	21	100	42.4	2825	41	63	565	21.3	710	22	250	25	981	22	500	26.9	1140	23	160	
18	2500	21.3	890	20	100	38	2840	37	63	425	17.2	580	16	250	22.5	993	23	500	21.3	890	23	160	
19	3000	21.3	1070	24	100	38	3400	45	63	575	17.2	700	23	250	20	942	22	500	21.3	1070	27	160	
	inch																						
20	14	60.3	1020	20	100	101.6	2885	38	40	455	42.4	510	18	250	62	1074	23	500	60.3	1020	18	100	
22	32	42.4	1150	23	100	76.1	3700	47	63	595	33.7	730	23	250	42	1126	26	500	33.7	720	16	100	
24	48	33.7	1090	20	100	60.3	3480	49	63	680	26.9	690	22	250	35	1171	26	500	33.7	1090	23	100	
25	60	26.9	870	16	100	51	3115	40	63	465	21.3	540	18	250	30	1076	24	500	26.9	870	18	100	
26	72	26.9	1040	19	100	42.4	2580	38	63	505	21.3	650	21	250	28	1124	26	500	26.9	1040	21	160	
27	84	26.9	1210	22	100	42.4	3000	44	63	635	21.3	760	23	250	25	1046	24	500	26.9	1210	25	160	
28	96	21.3	870	20	100	38	2765	37	63	420	17.2	570	16	250	22.5	968	22	500	21.3	870	23	160	
29	120	21.3	1090	25	100	38	3455	46	63	595	17.2	710	24	250	20	957	22	500	21.3	1090	25	160	

1) $\Delta\rho = \rho_1 - \rho_2$

ρ_1 = density of lower medium

ρ_2 = density of upper medium

2) Using displacer material 1.4571 can cause small deviations in diameter, volume and weight.

3) For measurement of interface or density, the max. density of the lower medium is 1350 kg/m³.

If a Displacer Chamber is used, the difference between the diameter of the Displacer and the inside diameter of the Displacer Chamber must be at least 10 mm.

Lengths < 350 mm and > 3000 mm, and density ranges < 100 kg/m³ and > 2000 kg/m³ on request.

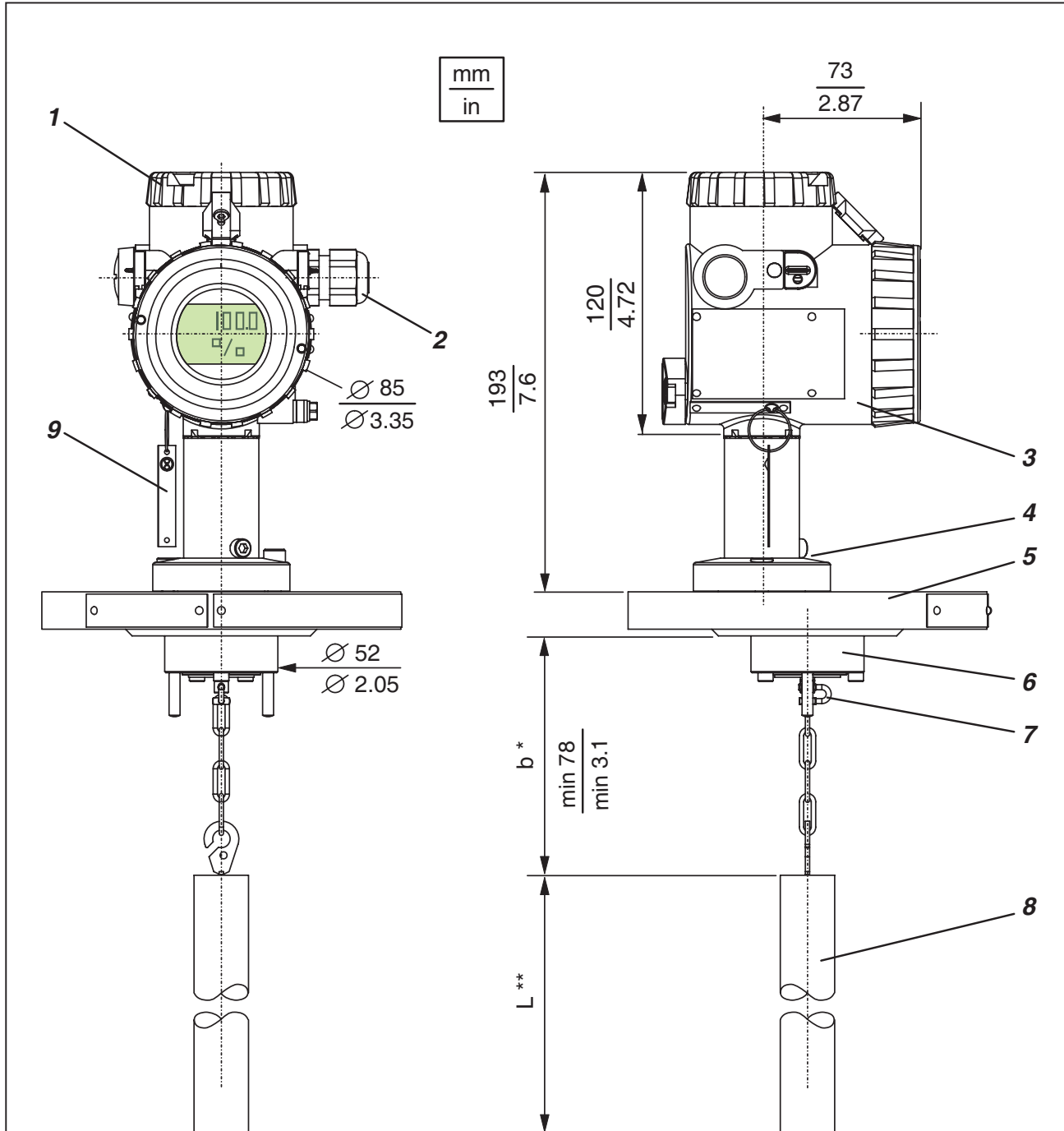
MODEL CODES 104DE

Displacer Element	104DE						
Density Range							
For 144LVD, 244LVP, 144LD, 244L and 167LP							
Standard (Density Ranges see PSS) . . . (b)							-SD
Interface (Density Ranges see PSS) . . . (c)							-ID
Displacer Material							
316L (1.4404 / 1.4435 / 1.4571) (not available with Pressure Rating Code C) (a) . . .							S
PTFE (for -SD only)							
(not for application in Zone 0 and Overfill Protection per VbF)							P
PTFE With 25% Carbon (for -SD only) (for application in Zone 0, IIA, IIB, IIC)							
(not with device 167LP).							O
Hastelloy C (for -SD only) (not available with Pressure Rating Codes B, C) . (a) . . .							C
Displacer Length "L"							
Standard for DIN		Max Range					
350 mm		0 - 350 mm					10
500 mm		0 - 500 mm					11
750 mm		0 - 750 mm					12
1000 mm		0 - 1000 mm					13
1200 mm		0 - 1200 mm					14
1500 mm		0 - 1500 mm					15
1800 mm		0 - 1800 mm					16
2000 mm		0 - 2000 mm					17
2500 mm		0 - 2500 mm					18
3000 mm		0 - 3000 mm					19
Standard for ANSI							
14-Inch		0 - 14 inch					20
32-Inch		0 - 32 inch					22
48-Inch		0 - 48 inch					24
60-Inch		0 - 60 inch					25
72-Inch		0 - 72 inch					26
84-Inch		0 - 84 inch					27
96-Inch		0 - 96 inch					28
120-Inch		0 - 120 inch					29
Intermediate Lengths		0 - 3000 mm/0-120 inch (d)					30
Suspension Length: (Dimension "b") (Specify exact length)							
Up To 0.99 m/39 Inches							000
1 m / 39.4 Inches To 3 m / 118.1 Inches							003
3 m / 118.1 Inches To 5 m / 196.8 Inches							005
5 m / 196.8 Inches To 10 m / 394 Inches							010
Suspension Material							
316L (1.4404 / 1.4435 / 1.4436)							S
Hastelloy C							C
Pressure Rating							
Up to PN 100/Class 600 (for interface Max PN 40/63) (Density ranges see PSS)							A
Up to PN 250/Class 1500 use only with 144LD, 244LD, 144LVD, 244LVP and 167LP (Density ranges s. PSS)							B
PN 500/Class 2500 use only with devices 144LVD and 167LP in Version -51 and -52 (Density ranges s. PSS)							C
Options							
Damping Spring (Mat. 1.4301, Max. 250°C)							-D
Oxygen Service Cleaned							-O
Additional Partition Point							-X
Tag No. Labeling							
Stamped With Weather Resistant Color							-S
Stainless Steel Label Fixed With Wire							-L
Certificates							
EN 10204-2.1 (DIN 50 049-2.1), Certificate Of Compliance							-1
EN 10204-3.1.B (DIN 50 049-3.1.B), Inspection Certificate Of Process Wetted Material . . . (e)							-3

- (a) For application in Zone 0, IIA, IIB
- (b) Fluid Density, Pressure & Temp. required for calibration
- (c) Upper and Lower Fluid Density required for calibration
- (d) Length of Displacer in mm or inches required for manufacturing
- (e) Not with Displacer Material P or O

DIMENSIONS

DN 50 and DN 80

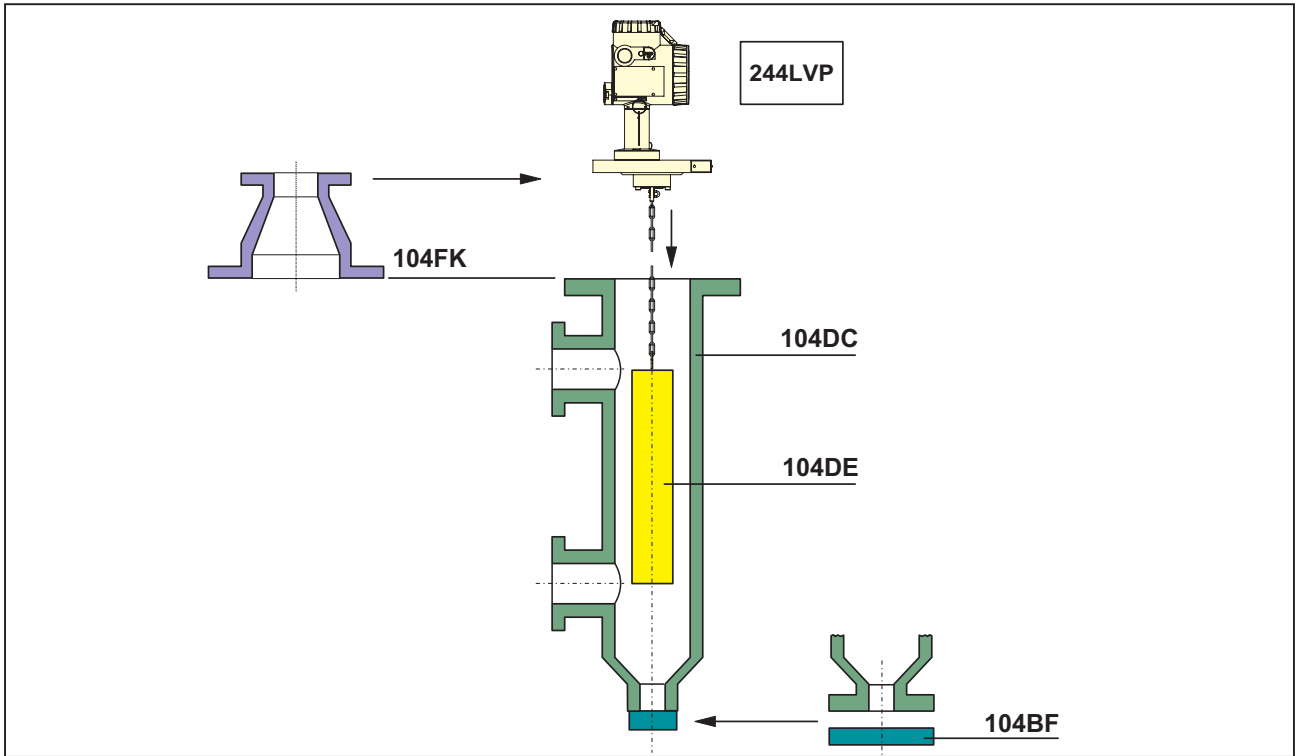


- 1 Connecting compartment cover
- 2 Cable entry with screwed gland
- 3 Amplifier housing
- 4 Disconnection of sensor from the amplifier
- 5 Connection flange (as per DIN / ANSI)
- 6 Measuring cell
- 7 Suspension
- 8 Displacer 104DE
- 9 Steel label with Tag.No.

* Suited to the dimensions of FOXBORO ECKARDT - displacer, other lengths on request

** L (measuring range) see table page 10.

OVERVIEW ACCESSORIES



For Displacer 104DE see page 10.

For Displacer Chamber 104DC, Flange combination 104FK, Cover Flange Kit 104CF and Blanking Flange Kit 104BF see Product Specifications PSS EML0900 A-(en), 104.. Accessories for Buoyancy Transmitter.

Product Specifications for Intelligent Transmitters

PSS EMP0610 A-(en)	141GP	Intelligent Gauge Pressure Transmitter<R>
PSS EMP0620 A-(en)	142AP	Intelligent Absolute Pressure Transmitter
PSS EMP0630 A-(en)	143DP	Intelligent d/p Transmitter
PSS EML0610 A-(en)	144LD	Intelligent Buoyancy Transmitter with Torque Tube for Liquid Level, Interface and Density
PSS EML0710 A-(en)	244LD	Intelligent Buoyancy Transmitter with Torque Tube for Liquid Level, Interface and Density
PSS EML1610 A-(en)	144LVD	Intelligent Buoyancy Transmitter for Liquid Level, Interface and Density
PSS EML1710 A-(en)	244LVP	Intelligent Buoyancy Transmitter for Liquid Level, Interface and Density
PSS EML2610 A-(en)	144FP	Intelligent d/p Transmitter for Liquid Level, Interface and Density - Flange mounted
PSS EML0900 A-(en)	104..	Accessories for Buoyancy Transmitters
PSS EMO0100 A-(en)		Accessories for Devices with HART-Protocol

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