

167LP Pneum. Buoyancy Transmitter with Torque Tube for Liquid Level, Interface and Density



Measuring of liquid level, interface or density with displacer (Archimedes principle) and torque tube as transmitting element.

FEATURES

- Level transmission between vessel and transmitter by torque tube
- Applicable for service temperatures from $-196\text{ }^{\circ}\text{C}$ to $+500\text{ }^{\circ}\text{C}$ and pressures up to PN 250
- The span can be set over a 1:5 ratio
- A wide selection of materials facilitates service under corrosive conditions
- Material approval certificates acc. to EN 10204-3.1 available
- Various licenses in accordance with national regulations

TECHNICAL DATA

In accordance with standard DIN IEC 770, data refer to the sensor material Type 316L (1.4404)

Input

Measuring span 3¹⁾ to 15 N
 Density range ²⁾ $200 < \rho < 1600 \text{ kg/m}^3$
 Standard lengths of
 displacers ³⁾ 350 to 3000 mm
 14 to 120 inch
 Weight of displacer ⁴⁾ max. 25 N

Output 0.2 to 1 bar / 3 to 15 psi /
 20 to 100 kPa /
 0.2 to 1 kp/cm²

Supply air $1.4 \pm 0.1 \text{ bar}$ or $20 \pm 1.4 \text{ psi}$

Operating conditions

Process temperature ^{5) 6)} -196 °C to $+500 \text{ °C}$
 Pressure rating
 acc. to DIN PN 16, 40, 63, 100, 160, 250
 acc. to ANSI Class 150, 300, 600, 900, 1500
 with heating jacket ⁸⁾ wafer body
 max. PN 160 / Class 900;
 heating jacket PN 25,
 heating with saturated steam
 or thermal oils
 Ambient temperature ⁹⁾ -40 to $+90 \text{ °C}$
 Relative humidity $\leq 100 \%$
 Condensation permitted
 Transportation and
 storage temperature -40 to $+90 \text{ °C}$
 Protection class IP 55;
 IP 65 with ECEP ET 2730

The device can be operated at a class D2 location in accordance with DIN IEC 654, part 1.

Transitional behaviour

Relative error $\leq 1 \%$
 Sensitivity $< 0.1 \%$
 Ambient temperature
 influence $\leq 0.2 \%/10 \text{ K}$
 Process temperature
 influence $\leq 0.1 \%/10 \text{ K}$
 Supply air influence $\leq 0.2 \%/0.1 \text{ bar}$
 Air consumption $\leq 200 \text{ l/h}$
 Air capacity 1200 l/h
 Load effect
 (measured at 0.6 bar) $+3 \%$ for 400 l/h exhausted flow
 -3% for 400 l/h delivered flow

Mounting

Mounting method sandwich mounted
 acc. to DIN DN 80, DN 100
 acc. to ANSI 3 inch, 4 inch
 Pneum. connections internal thread
 DIN 45 141-Q $\frac{1}{4}$ -18 NPT

Materials

Material table see page 4

Wafer body Carbon Steel 1.0460 (~ A105),
 316L (1.4404) or
 Hastelloy C
 Wafer body with
 heating jacket
 Wafer body Carbon Steel 1.0460 (~ A105),
 316L (1.4404)
 Heating jacket Steel 1.0308 (A519-1020)
 Torque tube 316L (1.4404 / 1.4435),
 Hastelloy C, Inconel 600 or
 Monel
 Displacer 204DE 316L (1.4404 / 1.4435),
 PTFE,
 PTFE with 25% carbon or
 Hastelloy C
 Suspension 316L
 (1.4404 / 1.4435 / 1.4436)
 or Hastelloy C
 Amplifier housing Aluminium
 (Alloy Al-AISI12),
 Polyurethan coated, grey

For Sour Gas applications according to NACE Standard MR-0175-92:
 Wafer body 316L (1.4404)
 Torque tube Hastelloy C or Inconel 600

The material of the seal at the Torque tube bearing corresponds to the material of the head piece.

Weight

Head with transmitter housing
 without heating jacket 15 kg (Class 1500: 18.5 kg)
 with heating jacket 16 kg

5) Dependent on material of the wafer body:

-10 ... 350 °C with Carbon Steel

-60 ... 400 °C with 316L, other temperature ranges on request

6) Ambient temperature must not exceed 50 °C at measuring module housing, when process medium or heating of medium exceed 300 °C

8) Available with amplifier to wafer body mounting direction "Right hand mounted" (Model Code R) only

9) -50 °C on request

- 1) Span 1 N possible on request
- 2) Density difference of media; other ranges on request
- 3) Lengths < 350 mm and > 3000 mm on request
- 4) For measurement of interface or density:
 weight $\leq 25 \text{ N}$ + buoyant force at lowest density

SAFETY REQUIREMENTS

Explosion protection acc. to ATEX, Type AC 628

For use at Zone 1, group IIC (AC628B)

For use at Zone 0 for tanks or pipes

II 1/2 G c IIB + H2 + C2H2 - AC 628A

II 1/2 G c IIC - AC 628B

CE Label

P.E.D.

97/23/EG Annex III Module D . . . fulfilled

Explosion protection acc. to ATEX . . . 94/9/EC

Comparison of Material

Code	WNR	DIN	Remarks	equivalent to
St 35.8 III	1.0305 1.0345	EN 10 216-2		ASTM A 106 Gr.8
C 22.8	1.0460	EN 10 273	VdTÜV - Wbl. 350/3	ASTM A 105
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	equ. to Hastelloy C-276 VdTÜV - Wbl. 400	UNS N 12 276
NiCr 15 Fe	2.4816	17 742	Inconel 600 VdTÜV - Wbl. 305	UNS N 06600
NiCr 22 Mo 9 Nb	2.4856	17 744	Inconel 625 VdTÜV 499	UNS N 06625
NiCr 21 Mo	2.4858	17 744	Inconel 825 VdTÜV 432	UNS N 08825
X 2 CrNiMo 22 5 3	1.4462	EN 10222-5	Duplex	UNS 31803
GD - AlSi 12	3.2582.05	17 007	Al - Diecasting	

Service Limits of wafer body PN 250 made of (material)

Max. operating pressure in bar at temperature in °C

1.0460

°C	-10 ... +120	200	250	300	350		
bar	250	200	175	150	140	DIN	
bar	231	219	206	180	145	ANSI	

1.4404 / 1.4435 / 1.4571

°C	-196 ... -10	-10 ... +50	100	200	300	400	500	
bar	250	250	230	200	177	162	148	DIN
bar	248	248	211	178	158	145	138	ANSI

1.4462

°C	-40 ... +50	100	150	200	250	280	
bar	250	225	209	194	184	178	DIN
bar	260	234	218	201	191	185	ANSI

Inconel 625 ¹⁾

°C	-10 ... +50	100	200	300	400	450	
bar	250						DIN
bar	260	¹⁾					ANSI

Inconel 825

°C	-10 ... +50	100	200	300	400	450	
bar	250	216	187	176	164	158	DIN
bar	260	224	195	183	171	165	ANSI

HC

°C	-196 ... -10	50	100	200	300	400	
bar	250	250	233	209	200	184	DIN
bar	260	260	243	217	209	192	ANSI

1) Values on request

MODEL CODES 167LP

Pneumatic Buoyancy Transmitter with Torque Tube for Liquid Level, Interface and Density	167LP									160114
Wafer Body with Indicator: (Flange Size & Pressure Rating)										
DN 80 PN 16-40 (available with Contact Face C)	-20									
DN 80 PN 16-160 (available with Contact Face U, N)	-21									
DN 80 PN 16-250 (available with Contact Face E, L)	-22									
DN 100 PN 16-160 (available with Contact Face U, N)	-23									
DN 100 PN 16-250 (available with Contact Face E, L)	-24									
DN 100 PN 16-40 (available with Contact Face C)	-25									
3-Inch ANSI Class 150	-31									
3-Inch ANSI Class 300/600/900	-32									
3-Inch ANSI Class 1500	-34									
4-Inch ANSI Class 150	-41									
4-Inch ANSI Class 300/600/900	-42									
4-Inch ANSI Class 1500	-44									
Wafer Body Contact Face:										
Type C/C (Rz 40 - 160) Per DIN 2526 (available with -20, -25)										C
Type E/E (Rz 0 - 16) Per DIN 2526 (available with -22, -24)										E
Type N/F DIN 2512 (available with -21, -23)										U
Type N/N DIN 2512 (available with -21, -23)										N
Type L/L DIN 2696 (available with -22, -24)										L
Type RF/RF Raised Face Per ANSI B16.5 (available w. -31, -32, -34, -41, -42, -44)										R
Type RJF/RJF Ring Joint Face Per ANSI B16.5 (available w. -31, -32, -34, -41, -42, -44)										J
Type SF/SFSmooth Finish (125 microinch) (available w. -31, -32, -34, -41, -42, -44)										S
Wafer Body Material: (Process wetted)										
Carbon Steel 1.0460 (A-105)										K
1.4404 (316L)										S
Hastelloy C										C
Wafer Body Mounting Direction: (Transmitter on body)										
Right Hand Mounted										R
Left Hand Mounted										L
Torque Tube Material: (Process wetted)										
316 (1.4571 / 1.4404 / 1.4435)										S
Hastelloy C										C
Inconel 600										I
Monel										M
Signal Range:										
0.2 to 1 bar										1
3 to 15 psi										2
20 to 100 kPa										3

(continued on next page)

MODEL CODES 167LP (continued)**Options:****Electrical Certificates**

ATEX - II 1/2 G c IIC (Zone 0) for media Al, All, B (c) -E

ATEX - II 2 G c IIC (Zone 1) for media Al, All, B -P

Certificates

EN 10204-2.1 -1

EN 10204-2.2 Specific Test Report (Calibration) -2

EN 10204-3.1 Inspection Certificate of Process Wetted Metallic Material -3

PED 97/23/EC additional unit verification, according to module F/G -4

Comply with NACE Standard MR-01-75
(available with Wafer Body Material Code S and Torque Tube Material Code C, I or M). -6**Material Test**

X-Ray or Isotope Test For Weldings -7

Dye Penetrate Test -8

Tag No. Labeling

Stainless Steel Label Fixed With Wire. -L

(c) Available with Contact Face E, N, R & S

Displacer 204DE

Typical Dimensions and Weights for Density Ranges $\Delta \rho$ ¹⁾

Material	316L (1.4404 / 1.4435) ²⁾										PTFE / PTFE with 25 % C				Hastelloy C							
Code	-S (PN 100)				-T ³⁾ (PN 40 / 63)				-S (PN 250)				-S (PN 500)				-S (PN 100 / 160)					
Density Range $\Delta \rho$																						
250 ... 1500 kg/m ³					300 ... 600 kg/m ³					400 ... 2000 kg/m ³				200 ... 1500 kg/m ³				300 ... 1500 kg/m ³				
Len. L	\varnothing mm	Vol. cm ³	Wei. N	PN bar	\varnothing mm	Vol. cm ³	Wei. N	PN bar	ρ_{min} ⁴⁾ kg/m ³	\varnothing mm	Vol. cm ³	Wei. N	PN bar	\varnothing mm	Vol. cm ³	Wei. N	PN bar	\varnothing mm	Vol. cm ³	Wei. N	PN bar	
mm																						
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	
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	
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	
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	
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	
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	
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	
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	
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	
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																						
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	
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	
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	
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	
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	
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	
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	
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	

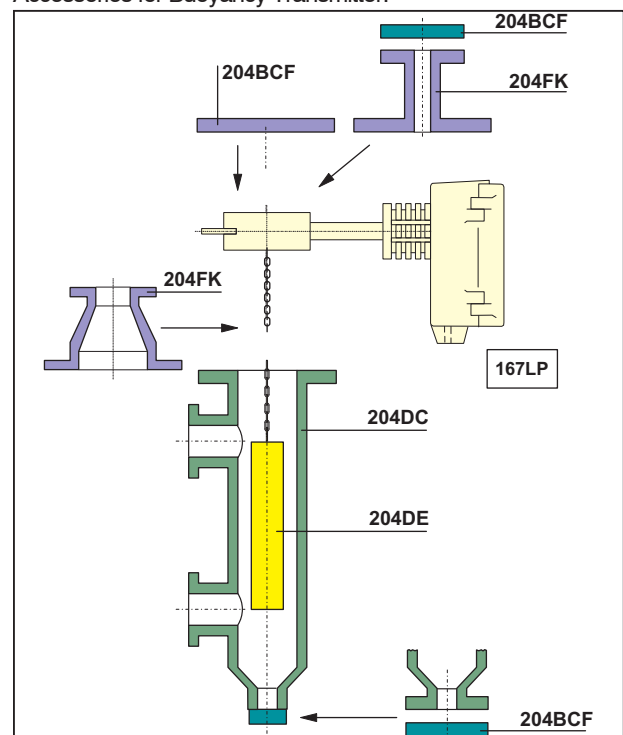
- $\Delta \rho = \rho_1 - \rho_2$
 ρ_1 = density of lower medium
 ρ_2 = density of upper medium
- Using displacer material 1.4571 can cause small deviations in diameter, volume and weight.
- For measurement of interface or density, the max. density of the lower medium is 1350 kg/m³.
- Min. density of the lower medium

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 < 300 kg/m³ and > 2000 kg/m³ on request.

Accessories

For Displacer Chamber 204DC, Flange combination 204FK and Cover Flange Kit 204BCF see PSS EML0901, 204.. Accessories for Buoyancy Transmitter.



MODEL CODES 204DE

210714

Displacer for Buoyancy Transmitters from 2N buoyancy up to 20N, 204DE

RANGE OF APPLICATION: (a)

- Liquid Level - Media: Liquid / Gas or Air
(Density difference = 250 kg/m³ to 2000 kg/m³)
(= 9x10⁻³ lbm/in³ to 72.2x10⁻³ lbm/in³) -S
- Interface Level / Density - Media: Liquid 1 / Liquid 2
(Density difference = 300 kg/m³ to 600 kg/m³)
(= 10.8x10⁻³ lbm/in³ to 22.7x10⁻³ lbm/in³) (g)(h) . . . -T

DISPLACER MATERIAL:

- 316L (1.4404 / 1.4435 / 1.4571) S
- 321 (1.4541) H
- PTFE (not for applications in Zone 0) P
- PTFE with 25% Carbon O
- Hastelloy C. C
- Inconel 625 (2.4856) (e) R
- Monel 400 (2.4360) (e) M
- Titan (3.7035) (e) T

PRESSURE RATING:

- Up to PN 100 / Class 600 D
- Up to PN 160 / Class 900 E
- Up to PN 250 / Class 1500 F
- Up to PN 500 / Class 2500 G

SUITABLE FOR FLANGE SIZE: (at Top of vessel/chamber)

- DN 50. 0
- DN 70. 1
- DN 80. 2
- DN 100 3
- DN 150 4
- 2 inch 5
- 3 inch 6
- 4 inch 7
- 6 inch 8

DISPLACER LENGTH "L": (inches are approx.)

for Displacer Material codes P and O:

- 300 mm (12 in) to 2000 mm (79 in) without partitioning A
- 2001 mm (79 in) to 4000 mm (157 in) One partition point B
- 4001 mm (157 in) to 6000 mm (236 in) Two partition points C
- 6001 mm (236 in) to 8000 mm (315 in) Three partition points D
- 8001 mm (315 in) to 10000 mm (394 in) Four partition points E
- 10001 mm (394 in) to 12000 mm (472 in) Five partition points F

for Displacer Material S, H, C, R, M and T:

- 300 mm (12 in) to 3000 mm (118 in) without partitioning K
- 3001 mm (118 in) to 6000 mm (236 in) One partition point L
- 6001 mm (236 in) to 9000 mm (354 in) Two partition points M
- 9001 mm (354 in) to 12000 mm (472 in) Three partition points N
- 12001 mm (472 in) to 15000 mm (591 in) Four partition points O

MATERIAL AND LENGTH OF THE SUSPENSION: (Length "b") (d)

- 316L / 1.4404 / ... Standard length of Suspension (b) S1
- 316L / 1.4404 / ... Customized Suspension Length (c) S2
- 321 / 1.4541 Standard length of Suspension (b) H1
- 321 / 1.4541 Customized Suspension Length (c) H2
- Hastelloy C Standard length of Suspension (b) C1
- Hastelloy C Customized Suspension Length (c) C2
- Inconel Standard length of Suspension (b) I1
- Inconel Customized Suspension Length (c) I2
- Monel Standard length of Suspension (b) M1
- Monel Customized Suspension Length (c) M2
- Titan Standard length of Suspension (b) T1
- Titan Customized Suspension Length (c) T2

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MODEL CODES 204DE (continued)

OPTIONS:

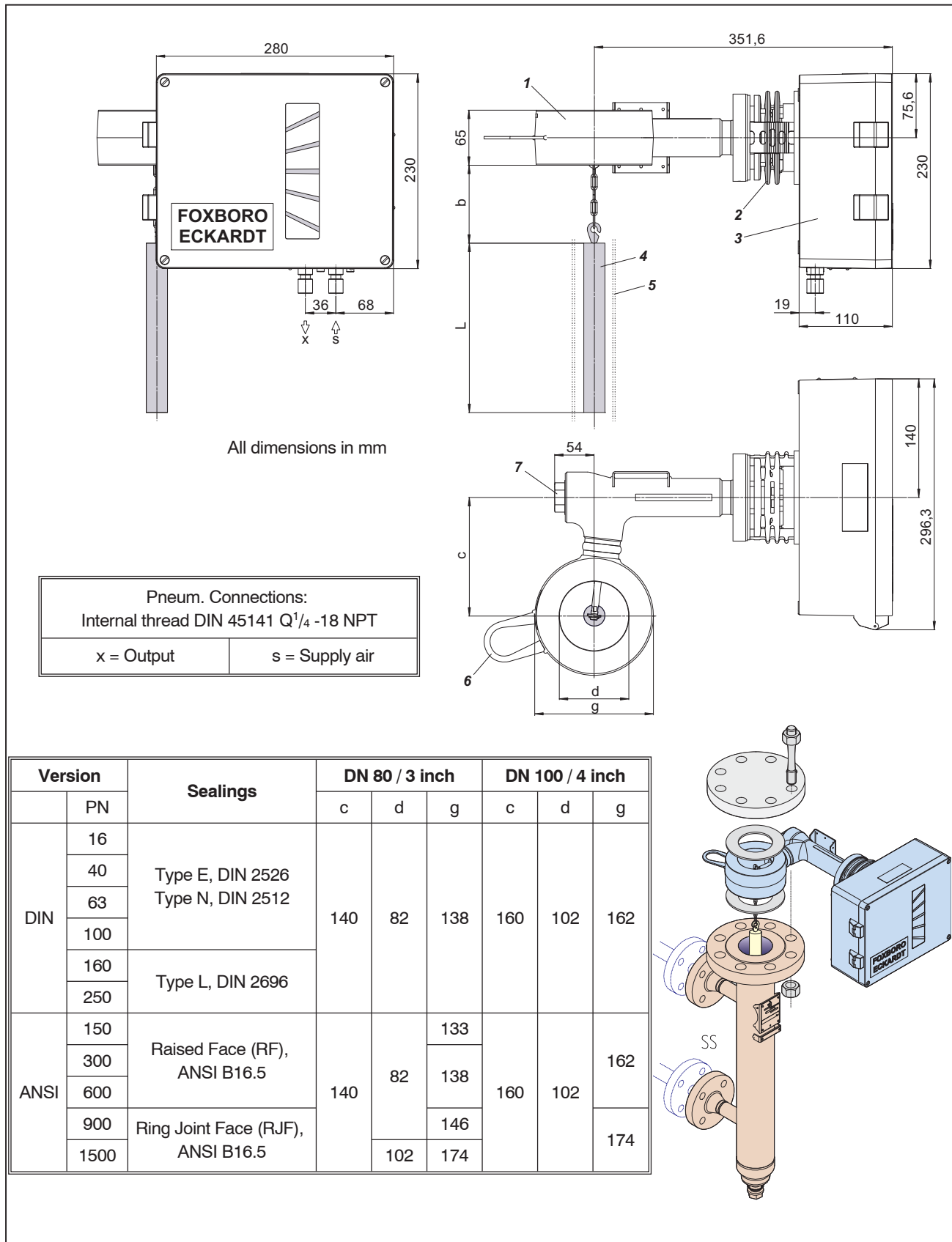
for application in Zone 0 (Additional grounding rope) (not available with Displacer Material: P)	-E
Damping Spring (Mat. 1.4310, max. 250 °C (482 °F)) (f)	-D
Damping Spring (Mat. HC, max 350 °C (662 °F)) (f)	-C
Free of oil and fat	-O
Density difference > 300 kg/m ³ (a)	-K
Tag No. Labeling Stainless Steel Label Fixed With Wire (Text required)	-L

Certificates

EN 10204-2.1 Certificate Of Compliance	-1
EN 10204-3.1 Inspection Certificate Of Process Wetted Material (not available with Displacer Material: P and O).	-3
PMI - Test (not available with Displacer Material: P and O)	-5

- (a) Upper and Lower Medium Density required (at operating temperature)
- (b) Only in connection with Modelcode 204DC
- (c) Exact length required (Contact face of flange to upper end of displacer)
- (d) +/- 8mm (+/- 0.3 inch)
- (e) On ECEP request
- (f) Required for 244LD with Option -G
- (g) Consult factory if pressure rating is F or G
- (h) Option K required

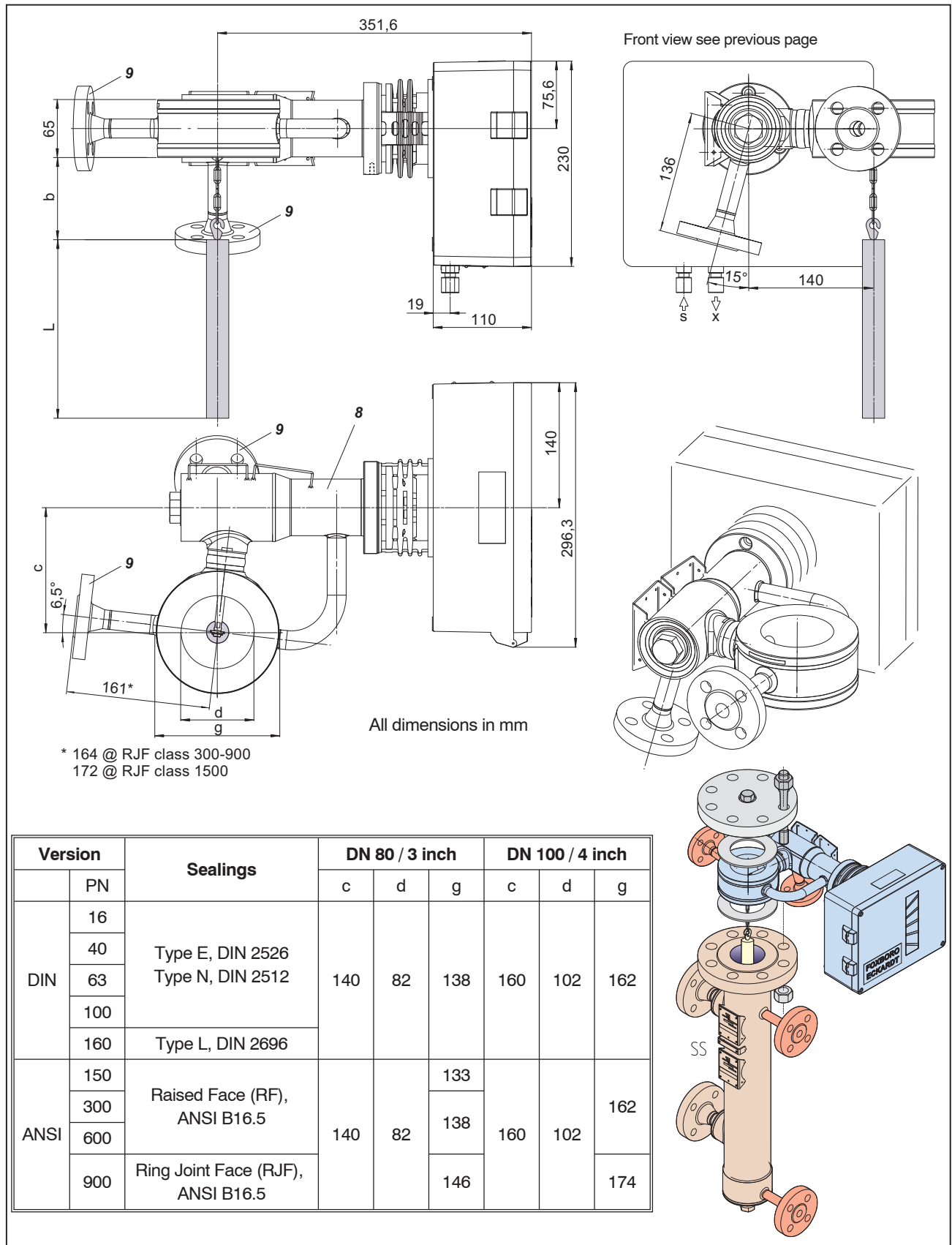
DIMENSIONS Transmitter



- 1 Head
- 2 Cooling Body
- 3 Transmitter housing
- 4 Displacer

- 5 Protective cage or tube for displacer to be supplied by customer if process liquid is in turbulent conditions
- 6 Lifting hook
- 7 Plug screw

DIMENSIONS Transmitter with heating jacket



- 8 Heating jacket PN 25
- 9 Connection flanges for heating jacket DN 15, PN 25

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