

## 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  $-196\text{ °C}$  to  $+400\text{ °C}$  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 to DIN 50 049-3.1 B available
- Various licences in accordance with national regulations



## SAFETY REQUIREMENTS

### **Explosion protection, Zone 0 to VbF, Type BF 628**

For level indication in Zone 0 of tanks for combustible liquids, groups and danger classes A I, A II and B, with the exception of carbon bisulphide.

Certificate No.: 01/PTB/III B/S 1506

### **Overflow protection for combustible liquids to VbF (Zone 0), Type BFF 628**

For avoidance of overflow in stationary tanks for combustible liquids, danger classes A I, A II, A III and B, with the exception of carbon bisulphide, as well as for use in Zone 0.

Certificate No.: 01/PTB No. III B/S 1698 F

### **Overflow protection for liquids hazardous to water (except VbF), Type BWF 628**

For avoidance of overflow in stationary tanks for storage of non-combustible liquids hazardous to water.

Approval mark: Z-65.11-21

**National safety aspects of level transducers see page 12.**

### **Wasserstand 100/1**

To VdTÜV specification, water level 252 licensed as 2nd level transmitter.

Registration code: TÜV WRS 84-252 (79-252)

### **Use on ships**

Licensed for use on ships in the Germanic Lloyd class, or on other structures classified by Germanic Lloyd, Certificate No.: 36 561 HH 5/85

When ordering, please note the No. ECEP ET 0056 in addition to the Model Code.

## TABLE OF MATERIALS

### Comparison of Material

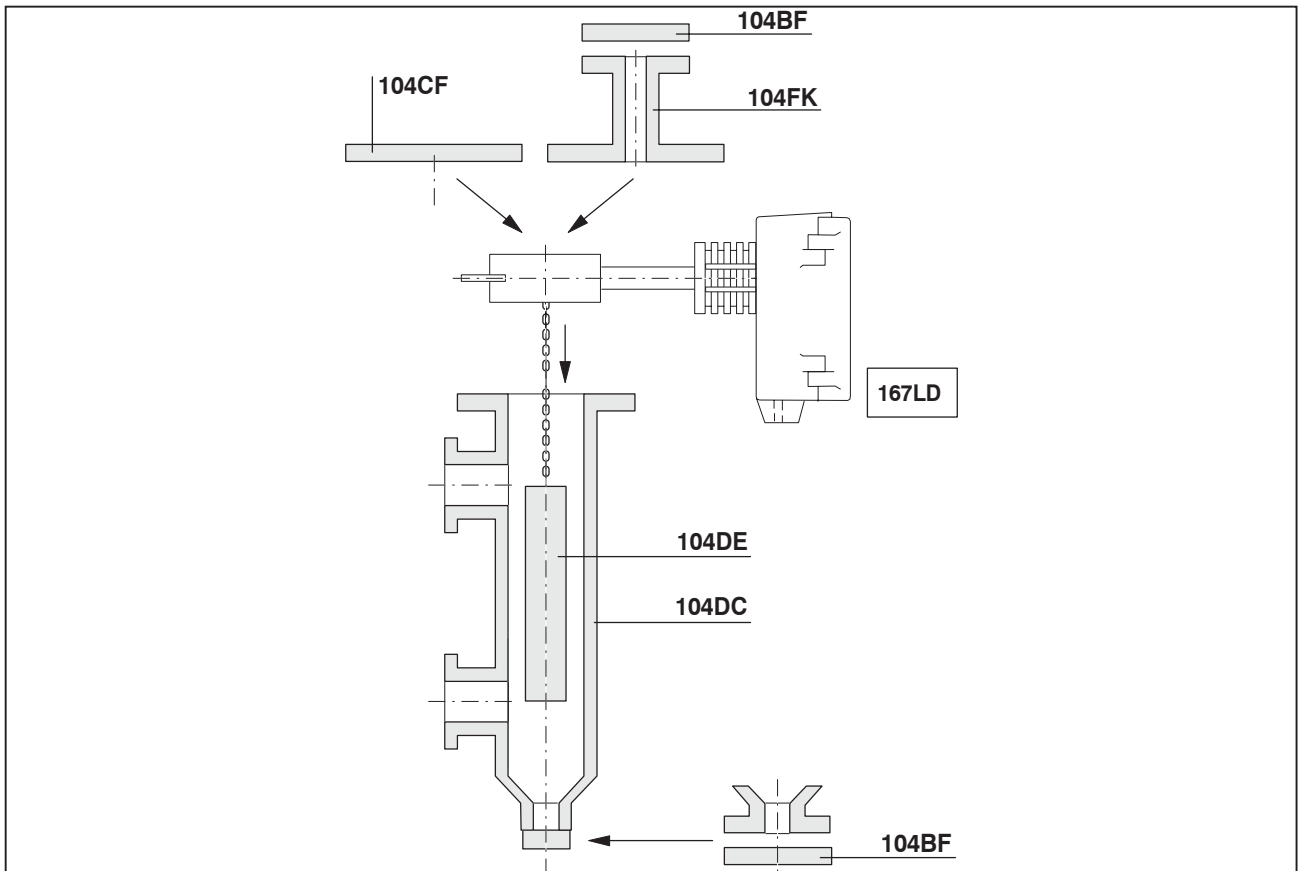
Code	Wnr	DIN	Remarks	equivalent to
St 35	1.0308	2391		ASTM A 519 - 1020
St 35.8 III	1.0305	17 175		
C 21	1.0432	–	VdTÜV - Wbl. 399 (for ANSI Flanges only)	ASTM A 105
C 22.8	1.0460	17 243	VdTÜV - Wbl. 350/3	ASTM A 576 - 1020
HI	1.0345	17 155		ASTM A - 201 - A
X6 CrNiMoTi 17 12 2	1.4571	17 440		~ ASTM Type 316Ti
X2 CrNiMo 17 13 2	1.4404			ASTM Type 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
NiCr 15 Fe	2.4816	17 742	Inconel 600® VdTÜV - Wbl. 305	UNS N 06600
GD - AlSi 12	3.2582.05	17 007	Al - Diecasting	

### Service Limits

Nominal pressure	C22.8 (~ A105)								316 / 316L (1.4404 / 1.4571) / Hastelloy C <sup>1)</sup> / Inconel 600						
	Max. operating pressure in bar at temperature in °C														
	-60 ... -10 <sup>2)</sup>	-10 ... 120	200	250	300	350	400 <sup>2)</sup>	-196 ... -60 <sup>2)</sup>	-60 ... -10	-10 ... 50	100	200	300	400	
PN 16 DIN 2633	12	16	13	11	9	8	–	16			12	9	7		
PN 40 DIN 2635	30	40	35	32	27	21	–	40		35	32	28	25		
PN 63 DIN 2636	48	64	50	45	39	30	–	63		57	51	45	33		
PN 100 DIN 2637	73	98	80	70	60	48	–	100		95	80	70	64		
PN 160 DIN 2638	120	160	130	112	96	90	76	160		142	128	113	97		
PN 250 DIN 2628	187	250	200	175	150	140	119	250		230	200	177	162		
Class 150	14	16	14	12	10	8	–	19	18	16	13	10	6		
Class 300	38	46	43	41	38	37	–	49		42	35	31	27		
Class 600	76	92	87	83	77	73	–	99		84	71	63	58		
Class 900	114	139	131	123	116	110	90	160		142	128	113	97		
Class 1500	191	231	219	206	180	145	120	248		211	178	158	145		

1) With material wafer body Hastelloy C: max. PN 100 / Class 600

2) On request only

**OVERVIEW ACCESSORIES**

For Displacer 104DE see page 8.

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.



**MODEL CODES 167LP (continued)**

<b>Options</b>	
<b>Options</b>	
Oil Damping . . . . .	-D
<b>Electrical Certificates</b>	
ATEX - II 1/2 G c IIC (Zone 0) for media AI, AII, B . . . . . (c) . . . . .	-E
ATEX - II 2 G c IIC (Zone 1) for media AI, AII, B . . . . .	-P
Overfill Protection Per WHG For Environmental Pollution Fluids . . . . . (e) . . . . .	-V
<b>Certificates</b>	
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 only) . . . . .	-6
Wasserstand 100 . . . . .	-9
<b>Material Test</b>	
Comply with NACE Standard MR-01-75 X-Ray And Isotope Test For Weldings . . . . .	-7
Dye Penetrate Test . . . . .	-8
<b>Tag No. Labeling</b>	
Stamped With Weather Resistant Color . . . . .	-S
Stainless Steel Label Fixed With Wire . . . . .	-L

Example: 167LP -21 E K R S 1 -DS

Tube Fittings .....See EOO9001

**Footnotes**

- (c) Available with Contact Face E, N, R & S
- (e) Not available with Wafer Body -33, -34, -43 & -44

## DISPLACER 104DE

### Standard Dimensions and Weights for Density Range <sup>1)</sup>

Material		316L (1.4404 / 1.4435) <sup>2)</sup>										PTFE / PTFE with 25 % C				Hastelloy C							
Transmitter Type		-SD (PN 100)				-ID <sup>3)</sup> (PN 40 / 63)				-SD (PN 250)				-SD (PN 500)				-SD (PN 100 / 160)					
		Density Range $\Delta\rho$																					
167LP		250 ... 1500 kg/m <sup>3</sup>				100 ... 600 kg/m <sup>3</sup>					400 ... 1600 kg/m <sup>3</sup>				200 ... 1500 kg/m <sup>3</sup>				300 ... 1500 kg/m <sup>3</sup>				
Model Code	Len. L	$\varnothing$ mm	Vol. cm <sup>3</sup>	Wei. N	PN bar	$\varnothing$ mm	Vol. cm <sup>3</sup>	Wei. N	PN bar	$\rho_{\min}$ kg/m <sup>3</sup>	$\varnothing$ mm	Vol. cm <sup>3</sup>	Wei. N	PN bar	$\varnothing$ mm	Vol. cm <sup>3</sup>	Wei. N	PN bar	$\varnothing$ mm	Vol. cm <sup>3</sup>	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)  $\Delta\rho = \rho_1 - \rho_2$

$\rho_1$  = density of lower medium

$\rho_2$  = 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/m<sup>3</sup>.

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/m<sup>3</sup> and > 1600 kg/m<sup>3</sup> on request.

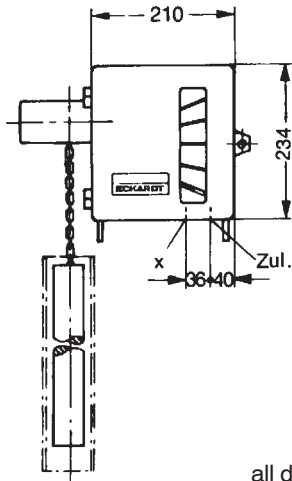


**MODEL CODES 104DE**

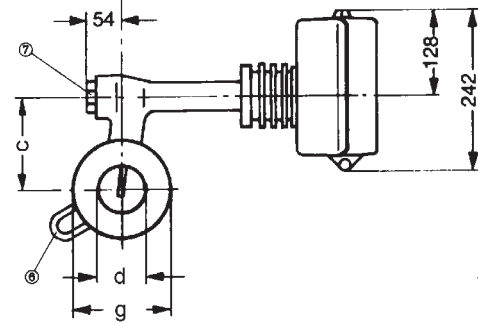
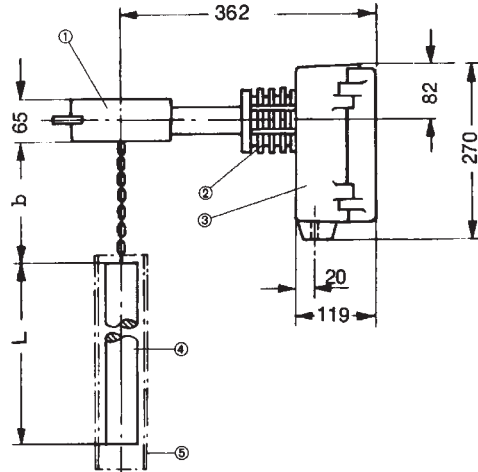
<b>Displacer Element</b>	<b>104DE</b>								011207
<b>Density Range</b>									
For 144LD, 244LD, 144LVD, 244LVP and 167LP									
Standard (Density Ranges see PSS)	(b)	-SD							
Interface (Density Ranges see PSS)	(c)	-ID							
<b>Displacer Material</b>									
316L (1.4404 / 1.4435 / 1.4571) (not 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) (not with device 167LP)		O							
Hastelloy C (for -SD only) (not available with Pressure Rating Codes B, C)	(a)	C							
<b>Displacer Length "L"</b>									
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 Max Range									
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
<b>Suspension Length: (Dimension "b") (Specify exact length)</b>									
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
<b>Suspension Material</b>									
316L (1.4404 / 1.4435 / 1.4436)									S
Hastelloy C									C
<b>Pressure Rating</b>									
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 devices 144LD, 244LD, 144LVD, 244LVP and 167LP (Density ranges see PSS)									B
PN 500/Class 2500 use only with devices 144LVD and 167LP in Version -51 and -52 (Density ranges see PSS)									C
<b>Options</b>									
Damping Spring (Mat. 1.4301, Max. 250°C)									-D
Oxygen Service Cleaned									-O
Additional Partition Point									-X
<b>Tag No. Labeling</b>									
Stamped With Weather Resistant Color									-S
Stainless Steel Label Fixed With Wire									-L
<b>Certificates</b>									
EN 10204-2.1, Certificate Of Compliance									-1
EN 10204-3.1, Inspection Certificate Of Process Wetted Metallic Material									-3
<b>Footnotes</b>									
(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

### Transmitter



all dimensions in mm



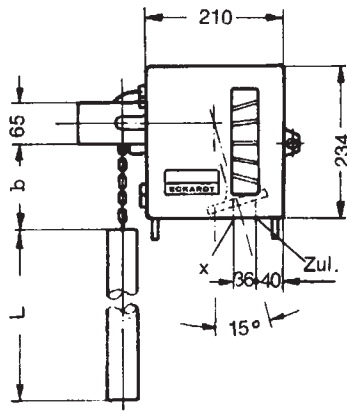
Pneum. Connections: Internal thread DIN 45141 Q <sup>1</sup> / <sub>4</sub> -18 NPT	
x = Output	Zul. = Supply air

Version	PN	Sealings	DN 80 / 3 inch			DN 100 / 4 inch		
			c	d	g	c	d	g
DIN	16	Type E, DIN 2526 Type N, DIN 2512	140	82	138	160	102	162
	40							
	63							
	100							
	160							
250	Type L, DIN 2696							
ANSI	150	Raised Face (RF), ANSI B16.5	140	82	133	160	102	162
	300				138			
	600				146			
	900	Ring Joint Face (RJF), ANSI B16.5			174			
	1500							

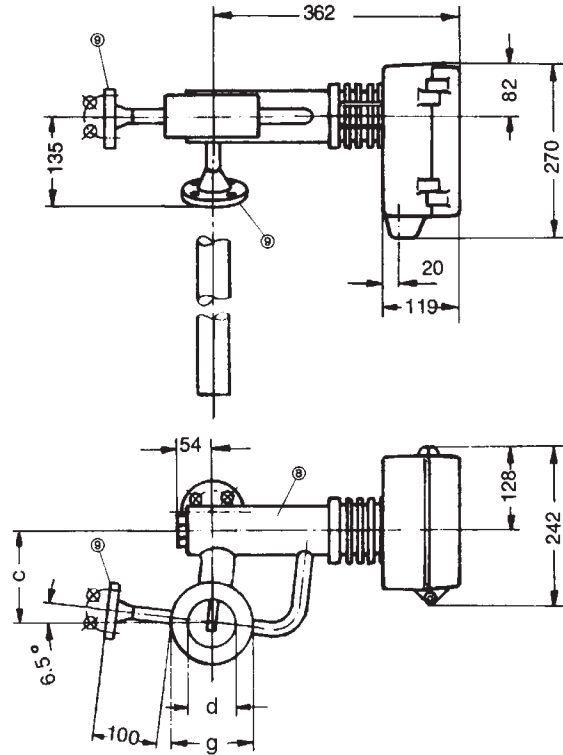
- 1 Head
- 2 Cooling Body
- 3 Transmitter housing
- 4 Displacer

- 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

**Transmitter with heating jacket**



all dimensions in mm



Pneum. Connections: Internal thread DIN 45141 Q <sup>1</sup> / <sub>4</sub> -18NPT	
x = Output	Zul. = Supply air

Version		Sealings	DN 80 / 3 inch			DN 100 / 4 inch		
	PN		c	d	g	c	d	g
DIN	16	Type E, DIN 2526 Type N, DIN 2512	140	82	138	160	102	162
	40							
	63							
	100							
	160	Type L, DIN 2696						
ANSI	150	Raised Face (RF), ANSI B16.5	140	82	133	160	102	162
	300				138			
	600				138			
	900	Ring Joint Face (RJF), ANSI B16.5			146			

8 Heating jacket PN 25

9 Connection flanges for heating jacket DN 15, PN 25

## NATIONAL SAFETY ASPECTS OF LEVEL TRANSDUCERS

The pressurized parts of measuring transducers for liquid levels are designed in accordance with the recognized rules of technology.

### Use in the explosion-risk area of Zone 0.

In accordance with test certificate 01/PTB/III B/S 1506, the pneumatic transducers type BF 628 may be used to indicate the liquid levels in stationary tanks for the storage of combustible liquids in groups and danger classes A I, A II and B, danger area 0, with the exception of carbon bisulfide. The "Special requirements" on the test certificate must be observed!

### Use as part of the overflow protection liquids to VbF.

In accordance with certificate 01/PTB/III B/S 1698 F the pneumatic transducer, Type BFF 628, may be used as part of the overflow protection for avoidance of overflow in stationary tanks for combustible liquids, danger classes A I, A II, A III and B, with the exception of carbon bisulfide, and for use in Zone 0. The "Special requirements" on the test certificate must be observed!

The parts of the system used for overflow protection and not having a certificate must conform with the requirements of Nos. 3 and 4 of TRbF 510, Annex 1.

The overflow protection units must be installed and operated in accordance with the requirements of TRbF 510, Annex 1.

### Use as part of the overflow protection for non-combustible liquids

In accordance with approval mark Z-65.11-21 the pneumatic transducer, Type BWF 628, may be used as part of the overflow protection for stationary tanks for storage of non-combustible liquids hazardous to water. The "Special requirements" on the test certificate must be observed!

The parts of the system used for overflow protection must conform with the requirements in Sections 3 and 4 of the Design and Test Regulations for Overflow Protection. The overflow protection units must be installed and operated in accordance with the requirements of Annex 1, "Setting instructions for overflow protection for tanks", and Annex 2, "Installation and operating guidelines for overflow protection" of the Design and Test Regulations for Overflow Protection.

### Use in steam boiler systems as a second water level transducer subject to license

According to the VdTÜV brochure "Water Level 252", component identification TÜV WRS 84-252 (79-252) the transducer may be used as a second water level transducer subject to license in land-type steam boilers. In the event of a failure or malfunction in the auxiliary energy, there must be a guarantee, for example via a pressure switch in the supply line, that the firing system and the

supply water pump are switched off. Transducers with displacer vessel with side-to-side or side-to-top vessel connections which have been manufactured in accordance with the component drawing, may only be used.

### Use in steam boiler systems

In accordance with § 2 of Article 1 "Ordinance on Steam Boiler Systems" of the "Ordinance superseding Ordinances in accordance with § 24 of the Industrial Code" of 27.02.80, liquid level transducers are equipment parts within the scope of this ordinance.

They must be subjected to a design and pressure test by the fittings manufacturer in accordance with TRD 110 Fittings Group 5. The materials used must correspond to the technical rules applicable to steam boilers (TRD). By marking the fittings in accordance with TRD 110, Point 5.1, the fittings manufacturer guarantees that the fittings correspond to TRD 110 Fittings Group 5. The material certificates are in the possession of the manufacturer.

### Use on pressure tanks

In accordance with § 3 of Article 2 "Ordinance on pressure tanks, pressurized gas containers and filling systems" of the "Ordinance superseding Ordinances in accordance with § 24 of the Industrial Code" of 27.02.80, liquid level transducers **are not independent pressure tanks**. They are equipment parts of pressure tanks in accordance with the Ordinance if they can influence the equipment parts necessary for safety when installed as measurement and control devices on the pressure tank.

They are **not** subject to this Ordinance if they cannot influence equipment parts necessary for safety reasons installed as devices on pressure tanks.

### Therefore, liquid level transducers must be classified by the user of the system.

The pressurized parts of transducers in accordance with AD brochure A4 "Housings of fittings" are designed as equipment parts on pressure tanks within the scope of this Ordinance.

In accordance with the AD brochure A4 "Housings of fittings" liquid level transducers are subject to a design and pressure test by the fittings manufacturer. The materials of the pressurized parts used must correspond with the permissible materials in accordance with the AD brochures, series W. Quality evidence is guaranteed by the acceptance test certificate 3.1 B DIN 50049. The certificates are in the hands of the manufacturer.

By identifying the fittings in accordance with AD-A4, Point 7.2, the fittings manufacturer confirms that the materials used, the manufacturing and testing methods for the fittings comply with the AD brochure A4.

If so wished by the user, the acceptance test (pressure test) of the fitting can also be carried out by an independent expert.

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