



# Installation and servicing instruction for stainless steel corrugated hoses

## 1. Introduction

Flexible pipe joints in the form of stainless steel tubes and expansion joints are important and essential components of pipe technology.

ROTH stainless steel corrugated hoses are for general use in a variety of applications and are compatible with a large number of chemicals as well as steam, water, oil, gas, neg. pressures, for absorbing expansion, lifting movements, vibrations, neutralizing installation imprecisions or as suction hoses for tanker vehicles, etc.

Besides the standard SE106 type, which is perfectly suitable for most applications, we also offer the special SE111 and SE112 types with higher pressure resistance and better vibration strength.

The braiding of all our high-quality corrugated hoses, if required, is also made solely from stainless steel wire. Similarly, the end protection sleeves are made only of stainless steel and the connecting components are TIG welded. The materials are given in table 1 section 1.1.

The service life of tubes depends on a number of factors, such as:

- operating pressure
- pressure thrusts
- temperature
- installation conditions
- degree of movement
- frequency of movement

In addition, more demanding loads can be exerted by aggressive media, incorrect installation, torsion, improper treatment, etc.

**Designed and manufactured in accordance to ISO 10380**



**PED Pressure Equipment Directive 97/23/EG**

**DIN DVGW in accordance to DIN 3384**

### 1.1 Materials

The most commonly used materials for corrugated hoses, braid, protection sleeve and connecting components are shown in the table 1.



table 1

application	material-no.	short name	DIN EN	AISI	ASTM
corrugated hoses connecting components	1.4301	X5CrNi18-10	10088	304	SA 240 TP 304
	1.4404	X2CrNiMo17-12-2	10088	316L	SA 240 TP 316L
	1.4541	X6CrNiTi18-10	10088	321	SA 240 TP 321
	1.4571	X6CrNiMoTi17-12-2	10088	316Ti	SA 240 TP 316Ti
protection sleeve	1.4301	X5CrNi18-10	10088	304	SA 240 TP 304
braid	1.4301	X5CrNi18-10	10088	304	SA 240 TP 304
connecting components	1.4306	X2CrNi19-10	10088	304L	SA 240 TP 304 L
	1.4310	X10CrNi18-8	10088	301	-
	1.4401	X5CrNiMo17-12-2	10088	316	SA 240 TP 316
	1.4435	X2CrNiMo18-14-3	10088	-	-
	1.4436	X3CrNiMo17-13-3	10088	-	-
	Temperguß	GTW-35-04	1562	-	-
	1.0037	S235JR	10025	-	A 570 Gr 36
	1.0305	St35.8	17175	-	A 106-65 Gr A
	1.0308	St35	17175	-	A 53-65 Gr A
	1.0345	P235GH	10028	-	A 515 Gr 65,55
	1.0425	P265GH	10028	-	A 515-65 Gr 60
	1.0481	P295GH	10028	-	A 515 Gr 70
	1.0570	S355J2G3	10025	-	-
	1.5415	16Mo3	10028	-	A 204 Gr A
1.7335	13CrMo4-5	10028	-	A 182-F11,F12	

## 1.2 Pressure reduction factors with high operating temperatures

The pressure reduction factors given in table 2 must be obeyed.

table 2

material		temperature [°C]												
		-200 / -20	20	50	100	150	200	250	300	350	400	450	500	550
		factor <b>ft</b>												
1.4301	X5CrNi18-10	1,0	1,0	0,90	0,73	0,66	0,60	0,55	0,51	0,49	0,48	0,46	0,46	0,46
1.4306	X2CrNi19-11	1,0	1,0	0,89	0,72	0,64	0,58	0,54	0,50	0,48	0,46	0,44	0,43	0,43
1.4541	X6CrNiTi18-10	1,0	1,0	0,93	0,83	0,78	0,74	0,70	0,66	0,64	0,62	0,60	0,59	0,58
1.4401	X5CrNiMo17-12-2	1,0	1,0	0,91	0,78	0,70	0,65	0,61	0,57	0,55	0,53	0,52	0,51	0,50
1.4404	X2CrNiMo17-12-2	1,0	1,0	0,90	0,73	0,67	0,61	0,58	0,53	0,51	0,50	0,49	0,47	0,47
1.4571	X6CrNiMoTi17-12-2	A	1,0	0,92	0,80	0,76	0,72	0,68	0,64	0,62	0,60	0,59	0,58	0,58

A = on request

The maximum permissible operating over-pressure **p<sub>zul.</sub>** For an expansion joint with norm pressure **PN** and the factor **ft** for higher operating temperature is :

$$p_{zul.} = PN \cdot ft$$

## 2. Installation

The following notes must be observed for correct installation of ROTH stainless steel corrugated hoses:

### 2.1. Correct handling and careful treatment

Hose lines must be protected against external, mechanical damage. They must not be dragged along the floor or across sharp edges, and during operation they must not come into contact with one another or with adjacent objects.

### 2.2. Correct choice of hose length

No movements or bending stresses must occur directly adjacent to the end fittings. This "neutral" section of the hose ends should be sufficiently long. If necessary, a corrugated buckling guard can be fitted at the ends.

### 2.3. Stress-free installation

Tighten hose firmly at one end. Attach hose loosely at the other end. Move the hose two or three times in the desired direction of movement to allow it to relax and find its position without twisting, only then tighten the other end. In case of unions it is essential to use two spanners, one to stop the union from turning and the other one to tighten it. When choosing the end fittings, care must be taken that at least one end of the hose can be rotatably connected. In case of movements, fit the hose so that the hose axis and the direction of movement are in the same plane, to make torsion impossible.

### 2.4. Stainless steel corrugated hoses with internal teflon-liner

When setting a greater store on smooth passage and/or chemical resistance of PTFE, hoses with internal PTFE liner are used. Greater flexural stiffness and bending radii compared to conventional hoses are to be considered.


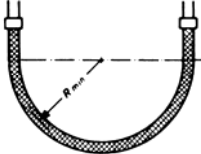
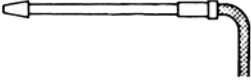
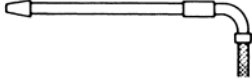


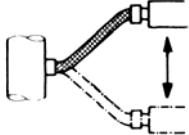
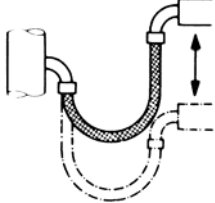
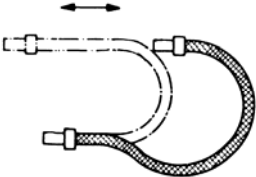
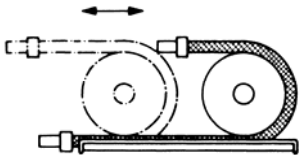
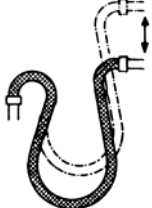
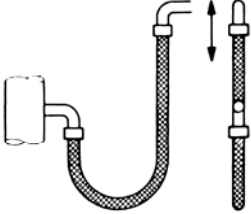


**Metal hoses are wear and tear parts.**



**In case of hose defect, take precautions and provide for appropriate safety devices.**

## 2.5. Examples: typically wrong situations of installation and their correction

WRONG	CORRECT
	
	
	
	
	
	

## 2.6. Permissible linear deviation

table 3

nominal length NL	mm	permitted linear tolerance
	> 500	+ 7 / - 3 mm
	501 <	+ 3 % / - 1 % (ISO 10380)

## 2.7. Nominal pressure

The requirements of the PED 97/23/EG are met.

The pressure reduction factors by high operating temperatures see table 2. section 1.2

For PN without braid:

Elongation less than 3% at a length of 500mm.

For PN with braid:

Quadruple protection against braid tracture, ISO 10380.

## 2.8. Life time

The life time of hose assemblies is determined acc. to EN ISO 10380.

The existing service conditions (i.e. pulsating and discontinuous demand, type and frequency of motion, higher working temperature or pressure, etc.) exert additional demands on the hose material and result in a reduction of life time.

Improper installation and handling may also cause a reduction of life time.

The lubrication of the braiding also influences the life time expectancy of a hose assembly.

For larger number of life cycles, the permissible bend radii must be increased.

In turn, smaller bend radii decrease the number of life cycles.

Metal hoses installed as a 180° bend, the chosen bend radii shall be multiplied with a factor  $f_{si}$  for life-time between 1,5 and 4 according to the operating data and the wanted life-time.

## 2.9. Bend radii

The minimum bend radius depends on the pressure, the temperature and the required service life. The values for bend radii are given in table 4 and 5.



design type SE105/106

Typ SE 105 = without braiding

Typ SE 106 = with single stainless-steel-wire braiding with DIN-DVGW-permission  
in accordance to DIN3384 (DN10-65)

design type SE110/111/112

with increased pressure resistance

Typ SE 110 = without braiding

Typ SE 111 = with single stainless-steel-wire braiding with DIN-DVGW-permission  
in accordance to DIN3384 (DN10-300)

Typ SE 112 = with double stainless-steel-wire braiding

**Tabelle 4**

DN		Typ	nom. press. PN [bar]	static bend radius [mm]	dynamic bend radius [mm]	weight [g/m]
[mm]	inch					
6	1/4	105	4,5	25	80	105
		106	140	25	80	220
10	3/8	105	2,3	25	80	150
		106	60	25	80	205
12	1/2	105	2,3	30	90	170
		106	40	30	90	235
20	3/4	105	2,3	35	120	260
		106	30	35	120	395
25	1	105	2,3	45	130	370
		106	35	45	130	625
32	1 1/4	105	1,5	50	160	630
		106	20	50	160	905
40	1 1/2	105	1,5	85	170	680
		106	20	85	170	1120
50	2	105	1,5	120	220	860
		106	15	120	220	1340
65	2 1/2	105	0,6	200	330	950
		106	10	200	330	1560



**Tabelle 5**

DN [mm] inch	type	nom. press. PN [bar]	static bend radius [mm]	dynamic bend radius [mm]	weight [g/m]
6 1/4	110	8	25	100	70
	111	160	25	100	155
	112	240	-	110	260
8 1/4	110	12	25	120	110
	111	150	25	120	215
	112	225	-	135	350
10 3/8	110	3	35	130	110
	111	120	35	130	280
	112	180	-	145	490
12 1/2	110	3	45	160	130
	111	90	45	160	330
	112	135	-	175	580
15 5/8	110	3	50	180	150
	111	80	50	180	360
	112	120	-	200	630
20 3/4	110	2	70	200	250
	111	60	70	200	540
	112	90	-	220	910
25 1	110	1	80	220	320
	111	60	80	220	800
	112	90	-	245	1410
32 1 1/4	110	1	100	270	450
	111	40	100	270	1000
	112	60	-	300	1700
40 1 1/2	110	0,8	130	300	520
	111	40	130	300	1250
	112	60	-	330	2180
50 2	110	1	155	350	900
	111	30	155	350	1650
	112	45	-	385	2640
65 2 1/2	110	0,6	200	410	1020
	111	25	200	410	2380
	112	40	-	450	4090
80 3	110	0,7	220	450	1460
	111	20	220	450	2600
	112	30	-	500	4210
100 4	110	0,7	270	560	1900
	111	16	270	560	3450
	112	24	-	620	5500
125 5	110	0,4	-	660	2980
	111	14	-	660	5800
	112	20	-	730	9480
150 6	110	0,4	-	815	6290
	111	12	-	815	8200
	112	18	-	900	11120
200 8	110	0,2	-	1015	8210
	111	10	-	1015	11500
	112	15	-	1120	16270
250 10	110	0,15	-	1200	13160
	111	8	-	1200	17250
	112	12	-	1320	23470
300 12	110	0,10	-	1400	16230
	111	8	-	1400	22200
	112	11	-	1540	30980