



# Stainless steel

corrugated hoses

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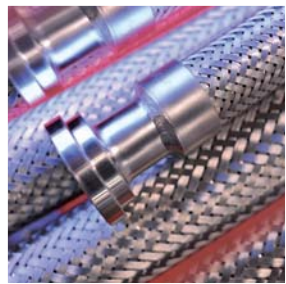




- ▶ Introduction | 4.1
- ▶ Design and Production | 4.2
  - Permissible linear deviation | 4.2
  - Life Time | 4.2
  - Nominal Pressure | 4.2
  - Pressure Reduction Factors | 4.3
- ▶ Constructive Types | 4.3
  - Corrugated Metal Hoses | 4.3
  - Exhaust Metal Hoses | 4.5
- ▶ Classification acc. PED 97/23/CE | 4.7
- ▶ Connecting Components | 4.9
- ▶ Special Design Flexible Hoses | 4.18
  - Corrugated Metal Hose with TEFLON-Liner | 4.18
  - Double Shell Corrugated Metal Hose | 4.18
- ▶ Installation Instructions | 4.19
- ▶ Typical Cases Calculations | 4.21
  - Absorption of Lateral Deflection without Movement | 4.21
  - Absorption of Thermal Expansion | 4.22
  - Absorption of Reciprocating Movements | 4.25
  - Absorption of Vibrations | 4.28



# Stainless steel corrugated hoses



## Introduction

Flexible pipe joints in the form of stainless steel tubes and expansion joints are important and essential components of pipe technology. As a specialist company with many years of product and market experience, we offer a comprehensive range of high-quality designs for all industrial applications.

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, vacuum use, for absorbing expansion, lifting movements, vibrations, neutralizing installation imprecisions or as suction hoses for tanker vehicles, etc.

Besides SE111 and SE112 types with standard pressure resistance and vibration strength we manufacture custom design flexible hose with up to 3 layers of wire braid and spiral metallic protection. 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 WIG welded. Flexible pipe joints in the form of stainless steel tubes and expansion joints are important and essential components of pipe technology.

The service life of flexible metal hoses 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.

## ▶ Design and Production

The essential parameters for calculating a theoretical service life have been determined in the laboratory. Depending on the load or failure risk in individual cases, the actual anticipated service life must be calculated with an accordingly high or low safety factor.

Corrugated metal hose, made from butt-welded tube. Common materials: 1.4541 (AISI 321), 1.4301 (AISI 304), 1.4404 (AISI 316L), 1.4571 (AISI 316Ti). Please note that our standard program is based on stainless steel 1.4404 (AISI 316L). Other materials or sizes are available on request.

### Permissible linear deviation

Please take in consideration our special installation recommendations in order to prolong the life span of the products.

Nominal length [mm]	Permitted linear tolerance
NL < 500	+ 7 / - 3 [mm]
NL > 501	+ 3 % / - 1 % (according to ISO 10380)

### Life Time

According to DIN EN ISO 10380 the life cycles of flexible metal hoses are specified as a minimum value of 8000 and an average value of 10000. Up to DN100 the reference testing procedure is a U-bend, for larger sizes the shear force bend testing is applied, both procedures with non-greased wire braid.

The working conditions pressure, temperature, means of installation (radius and geometry), dynamic stress and medium flow have their affect on the number of life cycles, as well as assembly, handling, storage and corrosive action from inside and outside.

Life cycle forecasts often base on empirical values. Therefore, generally all non-static applications (i.e. movements, flow- and pressure pulsations) should be discussed with and configured by the hose manufacturer, in order to obtain an appropriate installation and hose configuration.

### Nominal Pressure

The requirements of PED 97/23/CE are met completely. Hose design with increased pressure resistance is available on request. Please check table on page 4.4 for detailed information regarding pressure ratings for each constructive type.

For PN without braid	For PN with braid
Elongation less than 1% at $1.5 \times \text{PN}$ .	Quadruple protection against braid fracture, according to ISO 10380.

## Pressure Reduction Factors

The maximum permissible operating overpressure  $p_w$  for an expansion joint or corrugated hose with a given nominal pressure (PN) and the reduction factor  $ft$  for higher operating temperature is calculated with the following formula

$$p_w = PN \cdot ft$$

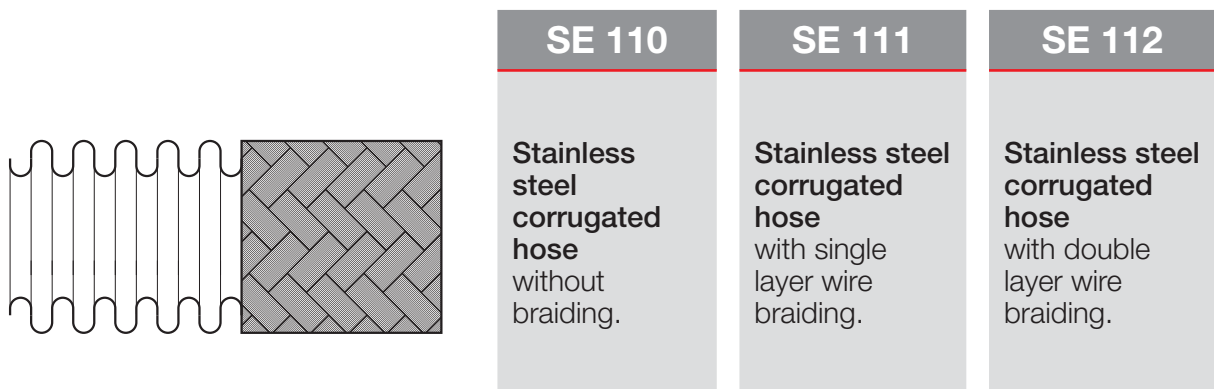
where  $ft$  values are given in the following table based on material and temperature range.

Material	Temperature [°C]												
	-200 / -20	20	50	100	150	200	250	300	350	400	450	500	550
Factor $ft$													
1.4301	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	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	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	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	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	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
ungraded	–	1,0	0,98	0,90	0,89	0,86	0,82	0,76	0,73	0,70	0,41	0,24	–

## Constructive Types

### Corrugated Metal Hoses

Our standard program for corrugated metal hoses is based on three constructive types which differ by the number of layers for the stainless steel wire braiding.



Please note the following table for a detailed presentation of technical characteristics for each individual constructive type of ROTH stainless steel corrugated hoses.

DN [mm]/[inch]	Type	Braid fracture pressure [bar]	Service pressure at triple protection [bar]	Service pressure at quadruple protection [bar]	Nominal pressure (ISO 10380) [bar]	Static bend radius [mm]	Dynamic bend radius [mm]	Weight [g/m]
6 1/4	110	–	–	18	16	25	100	70
	111	600	200	150	150	25	100	155
	112	864	288	216	150	–	110	260
8 1/4	110	–	–	13	10	25	120	110
	111	528	176	132	100	25	120	215
	112	766	253	191	150	–	135	350
10 3/8	110	–	–	9	6	35	130	110
	111	400	133	100	100	35	130	280
	112	500	164	125	100	–	145	490
12 1/2	110	–	–	7	6	45	160	130
	111	280	93	70	65	45	160	330
	112	410	136	105	100	–	175	580
15 5/8	110	–	–	5	4	50	180	150
	111	256	85	64	65	50	180	360
	112	420	140	105	100	–	200	630
20 3/4	110	–	–	3	2,5	70	200	250
	111	172	57	43	40	70	200	540
	112	310	103	77	65	–	220	910
25 1	110	–	–	2,5	2,5	80	220	320
	111	196	65	49	40	80	220	800
	112	290	96	72	65	–	245	1410
32 1 1/4	110	–	–	2	0,5	100	270	450
	111	140	46	35	25	100	270	1000
	112	240	80	60	50	–	300	1700
40 1 1/2	110	–	–	2	0,5	130	300	520
	111	152	50	38	25	130	300	1250
	112	230	76	57	50	–	330	2180
50 2	110	–	–	1	0,5	155	350	900
	111	104	34	26	25	155	350	1650
	112	180	60	45	40	–	385	2640
65 2 1/2	110	–	–	0,5	0,5	200	410	1020
	111	96	32	24	20	200	410	2380
	112	152	50	38	25	–	450	4090
80 3	110	–	–	0,5	0,5	220	450	1460
	111	72	24	18	16	220	450	2600
	112	112	37	28	25	–	500	4210
100 4	110	–	–	0,5	0,5	270	560	1900
	111	64	21	16	16	270	560	3450
	112	104	34	26	25	–	620	5500
125 5	110	–	–	0,5	0,5	–	660	2980
	111	48	16	12	10	–	660	5800
	112	80	26	20	20	–	730	9480
150 6	110	–	–	0,5	0,5	–	815	6290
	111	40	13	10	10	–	815	8200
	112	64	21	16	16	–	900	11120
200 8	110	–	–	0,5	0,5	–	1015	8210
	111	32	10	8	6	–	1015	11500
	112	48	16	12	10	–	1120	16270
250 10	110	–	–	0,5	0,5	–	1200	13160
	111	24	8	6	6	–	1200	17250
	112	40	13	10	10	–	1320	23470

\* Other sizes available on request (up to DN400). Subject to alteration.

## Exhaust Metal Hoses

ROTH Exhaust Metal Hoses are a distinct category of metallic hoses that are used mainly for low pressure exhaustion or as a protective hosing. They feature a high flexibility, very good mechanical resistance and are very easy to install with collars. Common applications are: hot and cold air exhaust, steam, smoke, transportation of dust and other granulates.



### ASF

**Exhaust Metal Hose** with auto-seal profile.



### ASG

**Exhaust Metal Hose** with material seal profile.

The characteristics of each constructive type are given by the material used and also by the material used for sealing between the profiles. The ASF type provides auto-sealing capabilities, whereas the ASG type requires an adequate choosing of sealing materials as listed below:

Constructive type	Hose material	Sealing material	Temperature resistance [°C]	Delivery lengths [m]
<b>ASF</b>	carbon steel (1.0330)	auto-seal	400	10 m ≤ DN100 5 m > DN100
	stainless steel (1.4301)	auto-seal	600	
<b>ASG</b>	carbon steel (1.0330)	rubber	60	10 m ≤ DN100 5 m > DN100
		fabric	120	
		ceramic	400	
	stainless steel (1.4301)	rubber	60	
		fabric	120	
		ceramic	600	

Please note the following table for a detailed presentation of all technical characteristics and available sizes for ROTH Exhaust Metal Hoses.

DN [mm]	Ø -inside [mm]	Ø -outside [mm]	Allowance/ Tolerance [mm]	Minimal bend radius [mm]	Weight [kg/m]
20	20,0	22,5	± 0,4	135	0,32
23	23,0	25,5	± 0,4	155	0,36
25	25,0	27,5	± 0,4	165	0,39
28	28,0	30,5	± 0,4	185	0,44
30	30,0	33,1	± 0,4	180	0,58
32	32,0	35,1	± 0,4	195	0,62
35	35,0	38,1	± 0,4	210	0,67
38	38,0	41,0	± 0,4	230	0,73
40	40,0	43,1	± 0,5	240	0,77
42	42,0	45,1	± 0,5	250	0,80
45	45,0	48,1	± 0,5	270	0,86
50	50,0	53,1	± 0,5	300	0,95
55	55,0	58,1	± 0,5	325	1,04
60	60,0	64,0	± 0,6	335	1,55
65	65,0	69,0	± 0,6	360	1,67
70	70,0	74,0	± 0,6	390	1,80
75	75,0	79,0	± 0,6	415	1,92
80	80,0	84,0	± 0,7	440	2,04
84	84,0	88,0	± 0,7	460	2,10
90	90,0	94,0	± 0,7	495	2,30
100	100,0	104,0	± 0,8	550	2,55
110	110,0	115,0	± 0,8	605	2,81
120	120,0	125,0	± 0,8	660	3,06
125	125,0	130,0	± 0,8	685	3,18
130	130,0	137,0	± 1,0	600	4,05
140	140,0	147,0	± 1,0	645	4,34
150	150,0	157,0	± 1,0	690	4,65
160	160,0	167,0	± 1,0	735	4,96
175	175,0	182,0	± 1,0	800	5,42
180	180,0	187,0	± 1,0	825	5,56
185	185,0	192,0	± 1,0	995	5,70
200	200,0	208,0	± 1,5	1085	7,74
225	225,0	233,0	± 1,5	1215	8,68
250	250,0	258,0	± 1,5	1350	9,60
275	275,0	283,0	± 1,5	1480	10,59
300	300,0	308,0	± 2,0	1615	11,49

\* Other sizes available on request (up to DN400). Subject to alteration.



## ▶ Classification acc. PED 97/23/CE

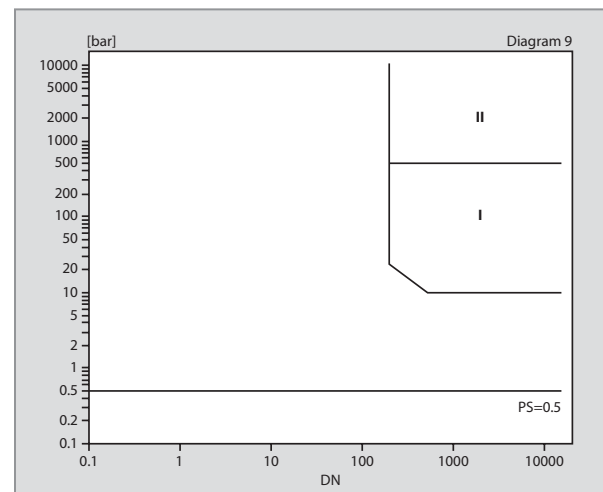
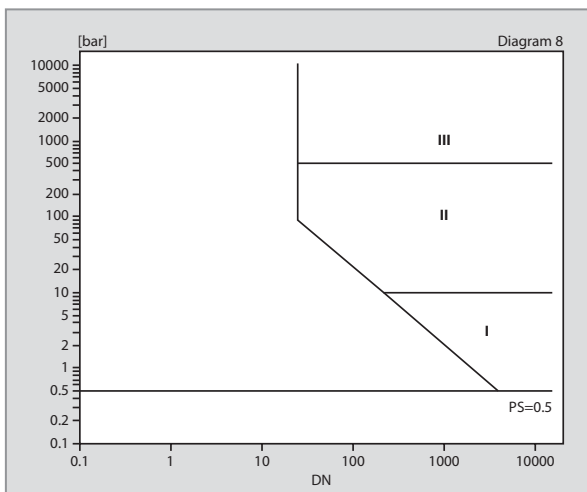
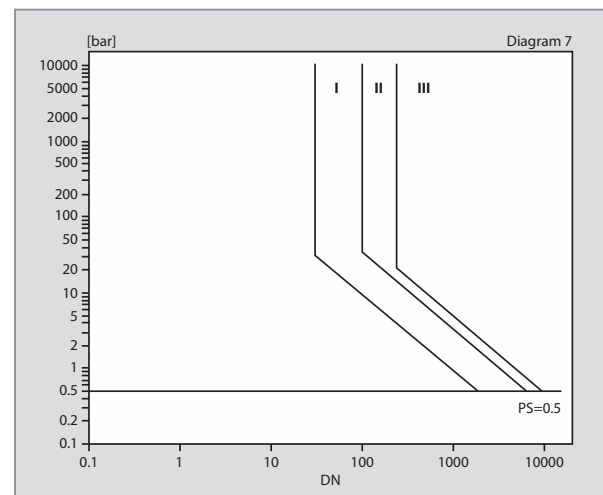
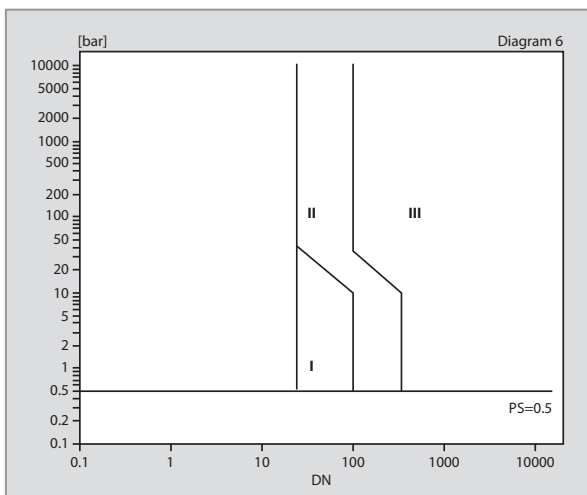
### Modules

<b>X</b>	<b>Not applicable:</b> $PS \leq 0,5$ bar
<b>Y</b>	<b>Applicable:</b> without CE-marking, good manufacturer experience
<b>A</b>	<b>Kat. I:</b> CE-marking + internal approval
<b>A1</b>	<b>Kat. II:</b> CE-marking + external approval

### Medium Classification

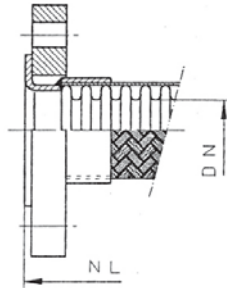
Medium	<b>M1</b> Gr. 1 $pD > 0,5$ bar (Diagram 6)	<b>M2</b> Gr. 2 $pD > 0,5$ bar (Diagram 7)	<b>M3</b> Gr. 1 $pD \leq 0,5$ bar (Diagram 8)	<b>M4</b> Gr. 2 $pD \leq 0,5$ bar (Diagram 9)
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Gr. 1 = dangerous; Gr. 2 = others;  $pD$  = steam pressure.



DN [mm]/[inch]	Type	Service pressure at quadruple protection [bar]	Medium			
			M1 Gr. 1 pD > 0,5	M2 Gr. 2 pD > 0,5	M3 Gr. 1 pD ≤ 0,5	M4 Gr. 2 pD ≤ 0,5
PED 97/23/CE			Diagram 6	Diagram 7	Diagram 8	Diagram 9
6 1/4	110	18	Y	Y	Y	Y
	111	150	Y	Y	Y	Y
	112	216	Y	Y	Y	Y
8 1/4	110	13	Y	Y	Y	Y
	111	132	Y	Y	Y	Y
	112	191	Y	Y	Y	Y
10 3/8	110	9	Y	Y	Y	Y
	111	100	Y	Y	Y	Y
	112	125	Y	Y	Y	Y
12 1/2	110	7	Y	Y	Y	Y
	111	70	Y	Y	Y	Y
	112	105	Y	Y	Y	Y
15 5/8	110	5	Y	Y	Y	Y
	111	64	Y	Y	Y	Y
	112	105	Y	Y	Y	Y
20 3/4	110	3	Y	Y	Y	Y
	111	43	Y	Y	Y	Y
	112	77	Y	Y	Y	Y
25 1	110	2,5	Y	Y	Y	Y
	111	49	Y	Y	Y	Y
	112	72	Y	Y	Y	Y
32 1 1/4	110	2	A	Y	Y	Y
	111	35	A1 / A (30 bar)	Y	Y	Y
	112	60	A1 / A (30 bar)	Y	Y	Y
40 1 1/2	110	2	A	Y	Y	Y
	111	38	A1 / A (25 bar)	A / Y (25 bar)	Y	Y
	112	57	A1 / A (25 bar)	A / Y (25 bar)	Y	Y
50 2	110	1	A	Y	Y	Y
	111	26	A1 / A (20 bar)	A / Y (20 bar)	Y	Y
	112	45	A1 / A (20 bar)	A / Y (20 bar)	Y	Y
65 2 1/2	110	0,5	A	Y	Y	Y
	111	24	A1 / A (15 bar)	A / Y (15 bar)	Y	Y
	112	38	A1 / A (15 bar)	A / Y (15 bar)	A1 / Y (30 bar)	Y
80 3	110	0,5	A	Y	Y	Y
	111	18	A1 / A (12 bar)	A / Y (12 bar)	Y	Y
	112	28	A1 / A (12 bar)	A / Y (12 bar)	A1 / Y (25 bar)	Y
100 4	110	0,5	A	Y	Y	Y
	111	16	A1 / A (10 bar)	A / Y (10 bar)	Y	Y
	112	26	A1 / A (10 bar)	A / Y (10 bar)	A1 / Y (20 bar)	Y
125 5	110	0,5	X	X	X	X
	111	12	A1	A / Y (8 bar)	Y	Y
	112	20	A1	A / Y (8 bar)	A1 / Y (16 bar)	Y
150 6	110	0,5	X	X	X	X
	111	10	A1	A / Y (6 bar)	Y	Y
	112	16	A1	A / Y (6 bar)	A1 / Y (13 bar)	Y
200 8	110	0,5	X	X	X	X
	111	8	A1	A / Y (5 bar)	Y	Y
	112	12	A1	A / Y (5 bar)	A1 / Y (10 bar)	Y
250 10	110	0,5	X	X	X	X
	111	6	A1	A / Y (4 bar)	Y	Y
	112	10	A1	A / Y (4 bar)	A1 / A (10 bar)	Y

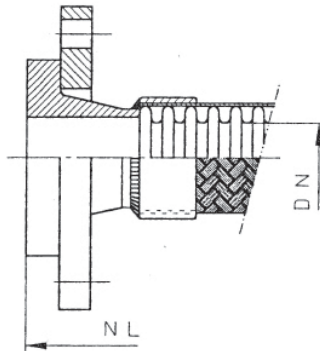
## ▶ Connecting Components



### AE 201

#### Collar and swivel flange

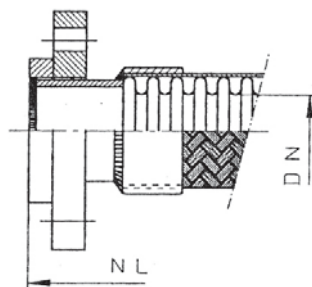
collar stainless steel  
flange carbon steel  
or stainless steel



### AE 202

#### Weld-on shoulder and floating flange, also with tongue and groove and with raised and recessed face

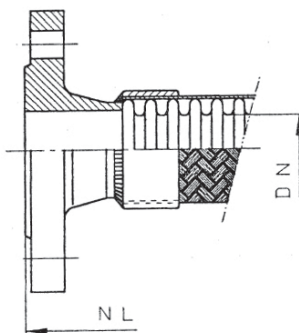
collar stainless steel  
flange carbon steel  
or stainless steel



### AE 203

#### Collar sockets and swivel flange

collar stainless steel  
flange carbon steel  
or stainless steel



### AE 204

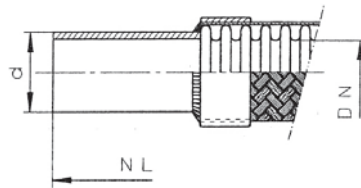
#### Weld-on flange

stainless steel  
carbon steel

**AE 301**

**Weld end**

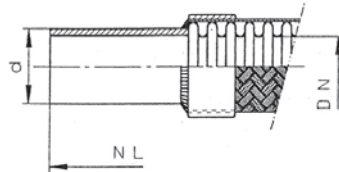
stainless steel  
carbon steel



**AE 302**

**Tubular fitting  
for pipe coupling  
with cutting and  
locking ring**

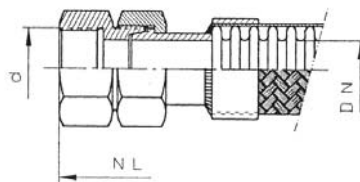
stainless steel  
carbon steel



**AE 401**

**Coupling  
with 24° Cone seal  
with internal thread**

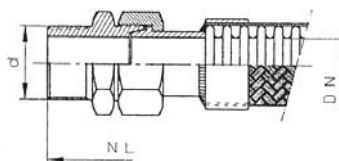
stainless steel  
carbon steel

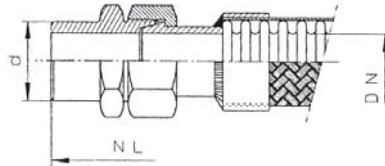


**AE 403**

**Coupling  
with 24° Cone seal  
with external thread**

stainless steel  
carbon steel

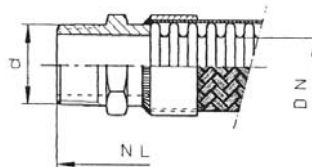




### AE 404

**Coupling  
with 24° Cone seal  
with weld end**

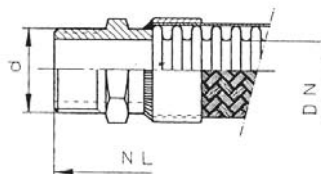
stainless steel  
carbon steel



### AE 405

**Hexagon nipple  
and tapered  
external thread  
DIN 2999**

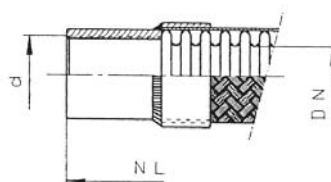
stainless steel  
carbon steel



### AE 406

**Hexagon nipple  
and cylindrical  
external thread  
DIN ISO 228**

stainless steel  
carbon steel



### AE 408

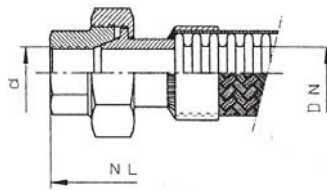
**Socket  
with internal thread**

stainless steel  
carbon steel

**AE 501**

**Pipe coupling  
with internal  
thread taper seal**

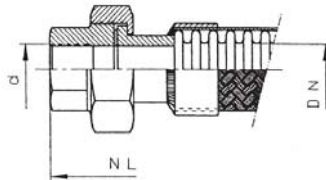
malleable cast iron  
carbon steel  
stainless steel



**AE 502**

**Pipe coupling  
with internal  
thread flat seal**

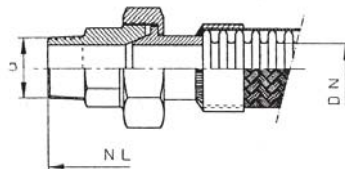
malleable cast iron  
carbon steel  
stainless steel



**AE 503**

**Pipe coupling  
with external  
thread taper seal**

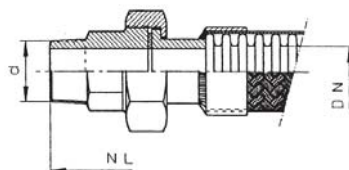
malleable cast iron  
carbon steel  
stainless steel

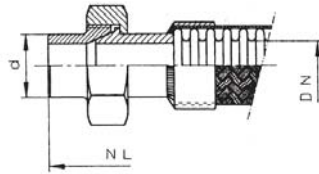


**AE 504**

**Pipe coupling  
with external  
thread flat seal**

malleable cast iron  
carbon steel  
stainless steel

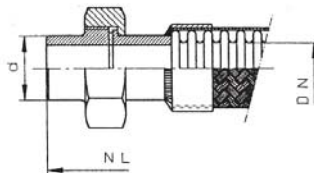




### AE 505

**Pipe coupling with weld end taper seal**

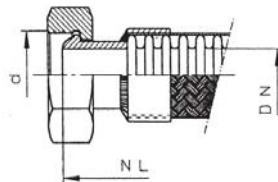
carbon steel  
stainless steel



### AE 506

**Pipe coupling with weld end flat seal**

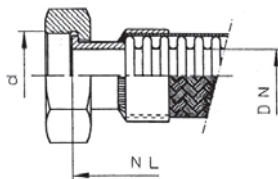
carbon steel  
stainless steel



### AE 507

**Pipe coupling cone seal with nut**

carbon steel  
stainless steel

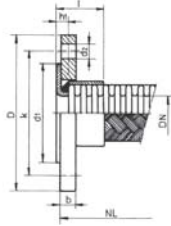


### AE 508

**Pipe coupling flat seal with nut**

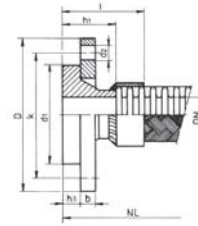
carbon steel  
stainless steel

**AE 201**



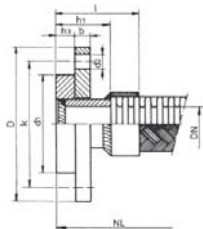
DN	l	h1
10	29	9
15	29	9
20	32	12
25	40	20
32	40	20
40	40	20
50	40	20
65	40	20
80	50	25
100	50	25
125	60	30
150	70	30

**AE 202**



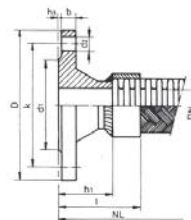
l	h1	h3
55	35	(10) 12
55	(35) 38	(10) 12
60	40	(12) 14
60	40	(12) 14
60	(40) 42	(12) 14
60	(40) 45	(12) 14
65	45	(14) 16
65	45	(14) 16
75	50	16
75	(50) 52	18
80	(50) 55	18
90	(50) 55	(18) 20

**AE 203**



DN	l	h1	h3
10	75	55	(10) 12
15	75	55	(10) 12
20	80	60	(12) 14
25	85	65	(12) 14
32	90	70	(12) 14
40	95	75	(12) 14
50	95	75	(14) 16
65	100	80	(14) 16
80	110	85	16
100	115	90	16
125	120	90	18
150	135	95	(18) 20

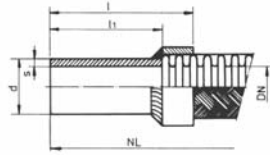
**AE 204**



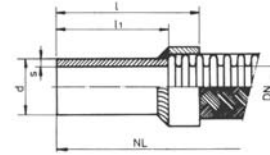
l	h1
55	35
55	(35) 38
58	(38) 40
58	(38) 40
60	(40) 42
62	(42) 45
65	45
65	45
75	50
77	52
85	55
95	55

D, k, d1, d2, b – measurements acc. to flange norm, refer to catalogue pages 5.51 other dimensions or norms on request  
Measures in mm, subject to alterations.



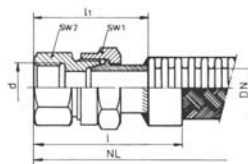
**AE301**


DN	d	s	l	l1
6	8	1	70	50
10	13,5	1,8*	70	50
12	17,2	1,8*	70	50
15	21,3	2	70	50
20	26,9	2,6	75	55
25	33,7	2,6	80	60
32	42,4	2,6	85	65
40	48,3	2,6	90	70
50	60,3	2,9	90	70
65	76,1	2,9	95	75
80	88,9	3,2	105	80
100	114,3	3,6	110	85
125	139,7	4	115	85
150	168,3	4,5**	130	90
200	219,1	6,3**	140	100
250	273,0	6,3**	140	100
300	323,9	7,1**	140	100

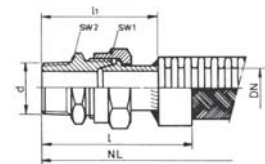
**AE302**


DN	d	s	l	l1
6	8	1	48	28
8	10	1	50	30
10	12	1,5	50	30
12	15	1,5	52	32
15	18	1,5	52	32
20	22	1,5	56	36
25	28	1,5	60	40
32	35	2	65	45
40	42	2	65	45

\* stainless steel: 1,6mm; \*\* stainless steel: 4,0mm; \*\*\* Other pipe diameters, thickness or lengths on request.

**AE401**


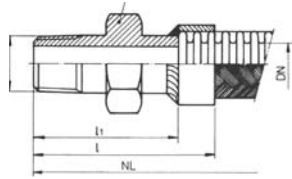
DN	d DIN2999	l	l1	SW1	SW2
6	1/4	65	45	19	19
10	3/8	68	48	22	22
12	1/2	75	55	32	27
15	1/2	75	55	32	27
20	3/4	82	62	36	32
25	1	87	67	41	41
32	1 1/4	93	73	50	46
40	1 1/2	97	77	60	55
50	2	105	85	70	65

**AE403 / AE404**


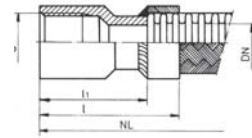
DN	d	l	l1	SW1	SW2
6	8	70	50	19	17
8	10	73	53	22	19
10	12	82	62	32	27
12	15	82	62	32	27
15	18	90	70	36	32
20	22	95	75	41	41
25	28	101	81	50	46
32	35	107	87	60	55
40	42	113	93	70	65

Other thread connections, i.e. metric precision threads, cylindrical external threads, NPT- threads, etc. available on request. Measures in mm, subject to alterations.

**AE405 / AE406**

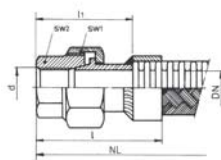


**AE408**

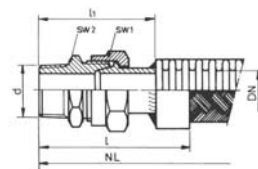


DN	d DIN2999	l	l1	SW	l	l1
6	1/4	45	25	17	45	25
10	3/8	48	28	19	46	26
12	1/2	51	31	22	54	34
15	1/2	51	31	22	54	34
20	3/4	52	32	27	56	36
25	1	60	40	36	63	43
32	1 1/4	63	43	46	68	48
40	1 1/2	66	46	50	68	48
50	2	70	50	60	76	56
65	2 1/2	80	60	80	85	65
80	3	100	75	95	96	71

**AE501 / AE502**

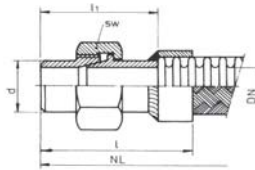


**AE503 / AE504**

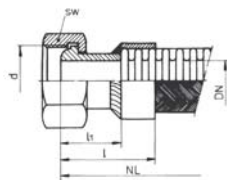
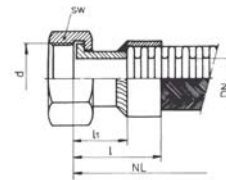


DN	d DIN2999	l	l1	SW1	SW2	l	l1	SW1	SW2
6	1/4	65	45	28	18	78	58	28	18
10	3/8	67	47	32	22	83	63	32	22
12	1/2	74	54	39	26	93	73	39	26
15	1/2	74	54	39	26	93	73	39	26
20	3/4	79	59	48	31	101	81	48	31
25	1	84	64	54	38	107	87	54	38
32	1 1/4	87	67	67	48	111	91	67	48
40	1 1/2	91	71	73	54	117	97	73	54
50	2	102	82	90	66	131	111	90	66

Size table Whitworth pipe thread DIN 2999 refer to catalogue page 5.3.  
Measures in mm, subject to alterations.

**AE505 / AE506**


DN	d	l	l1	SW
10	13,5	62	42	27
12	17,2	65	45	27
15	21,3	74	54	32
20	26,9	80	60	41
25	33,7	87	67	50
32	42,4	95	75	60
40	48,3	101	81	70
50	60,3	114	94	85
65	76,1	122	102	100
80	88,9	132	107	120

**AE507**

**AE508**


DN	d		d		l	l1
	M	SW	R	SW		
6	14 × 1,5	17	1/4	17	44	24
8	16 × 1,5	19	3/8	20	44	24
10	18 × 1,5	22	1/2	24	45	25
12	22 × 1,5	27	5/8	27	48	28
15	26 × 1,5	32	3/4	32	49	29
20	30 × 2	36	1	41	50	30
25	36 × 2	41	1 1/4	50	55	35
32	45 × 2	50	1 1/2	55	55	35
40	52 × 2	60	2	65	55	35
50			2 1/2	75	65	45

Measures in mm, subject to alterations.

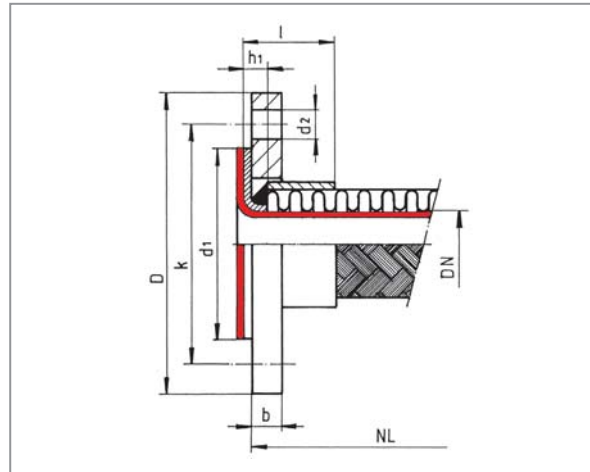
## ▶ Special Design Flexible Hoses

### Corrugated Metal Hose with TEFLON-Liner

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

ROTH stainless steel corrugated hose type SE with stainless steel wire braiding and internal smooth TEFLON liner are available within the range of DN 20 - DN 150. The maximal production length for these items is 5000 mm. Greater lengths can be obtained by connecting together smaller individual lengths.

Available couplings for TEFLON-liner hoses:

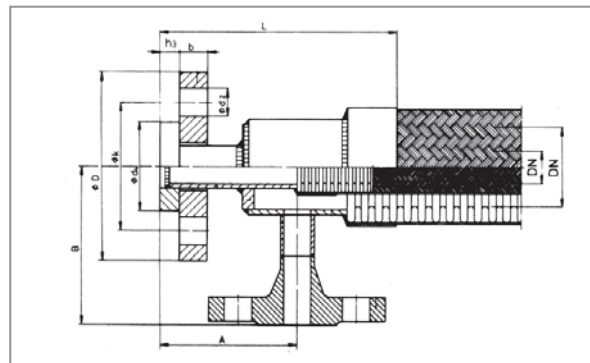


Coupling type	Seal type	Matching couples
flanged	flat seal	AE201, AE202, AE203, AE204
threaded	flat seal	AE502, AE504, AE506, AE508

### Double Shell Corrugated Metal Hose

Double Shell construction requires two corrugated hoses: one as primary (inner-hose) and one as secondary (outer-hose). The DN's for the hoses are chosen so that primary hose will fit easily inside the secondary hose. Usually that is obtained by choosing the secondary hose 2-sizes up from the DN of the primary hose.

ROTH Double Shell hoses are used for keeping the media in a pipeline permanently at the required temperature. By injecting either heating or cooling fluids into the secondary hose, the media temperature in the primary hose can be controlled at any time, even at difficult locations where other methods can't be applied.



ROTH Double Shell hoses can be fitted with any coupling available, based on the particular requirements of the application. Please note the following table for examples regarding the recommended DN's choosing and basic sizing.

DN (inside) Primary/Main	DN (outside) Secondary	L	A	B
25	50	125	80	95
50	80	150	90	115
65	100	150	90	125
80	125	165	100	150
100	150	180	110	150

\* Other sizes and couplings available on request.

## Installation Instructions

ROTH stainless steel corrugated hoses are high-quality products. They are reliable in operation and have a long service life. However, they can only function perfectly if, apart from choosing the correct hose design, they are properly fitted. The ways of installing metal hoses are primarily determined by direction, amplitude and frequency of their movement.

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

### A. 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.

### B. 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.

### C. The permissible bend radius must be respected.

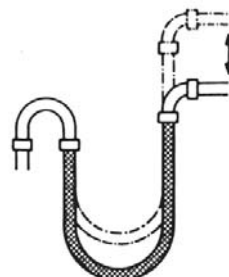
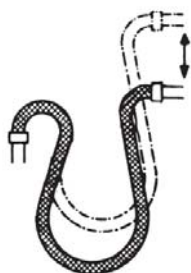
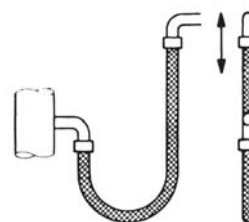
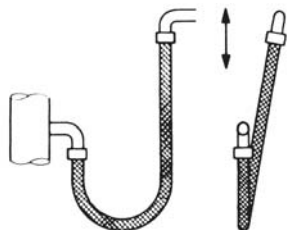
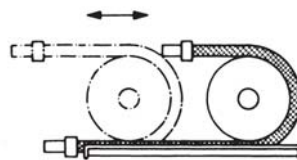
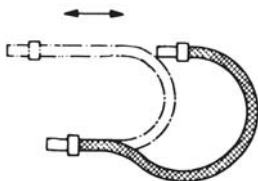
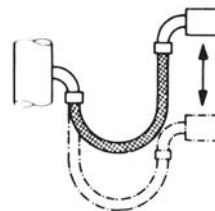
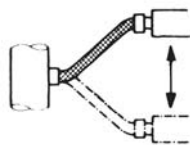
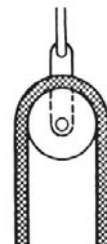
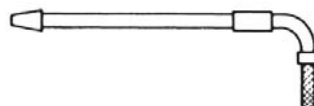
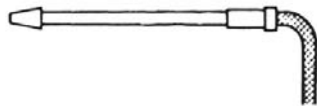
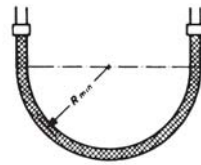
The minimum bend radius depends on the pressure, the temperature and the required service life. The values are given on catalogue page 4.4.

### D. 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 the movement are in the same plane, to make torsion possible.

Wrong

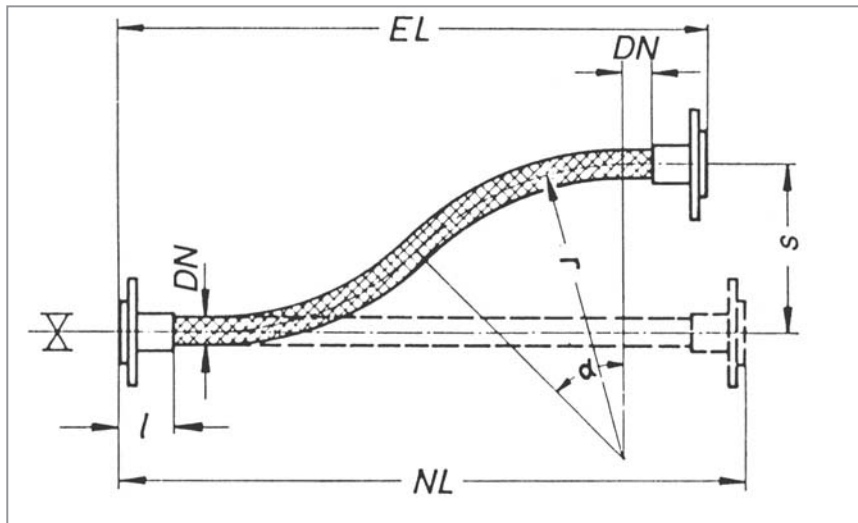
Right



## ▶ Typical Cases Calculations

### Absorption of Lateral Deflection without Movement

Determination of hose length. Installation in S-shape, only static demands, not for axial movements or vibrations.



$s$  = axis deflexion [mm]  
 $r$  = bend radius [mm]  
 (see tables on page 4.4 for bend radii)  
 $\alpha$  = bend angle [°]  
 $l$  = length of connecting component [mm]  
 $DN$  = nominal hose size [mm]  
 $EL$  = installation length [mm]  
 $NL$  = nominal length [mm]

- ▶ Bend angle  $\alpha$  for hoses with braiding: max. 45°

$$\begin{aligned}
 NL &= [(r \cdot \pi \cdot \alpha) / 90] + 2(l + DN) \\
 EL &= 2r \cdot \sin \alpha + 2(l + DN) \\
 s &= 2r(1 - \cos \alpha)
 \end{aligned}$$

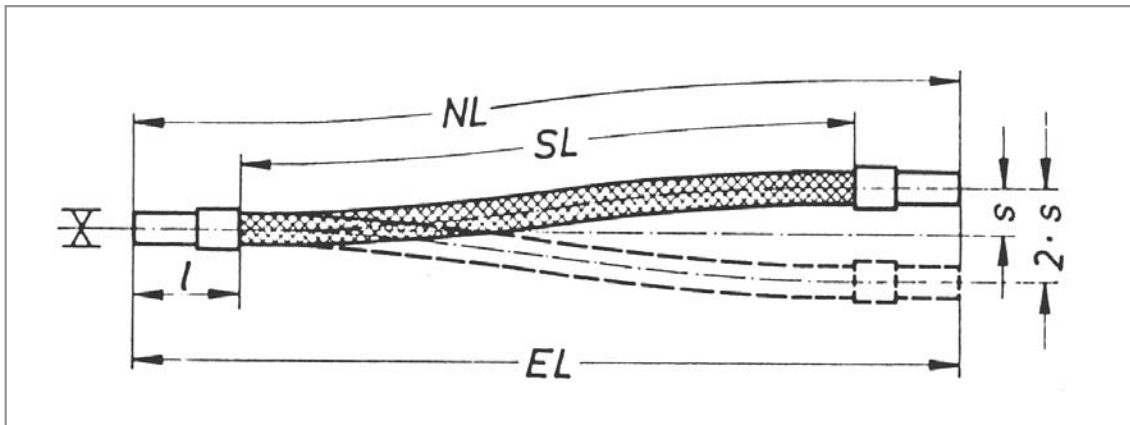
- ▶ If  $\alpha$  is greater than 45°, installation length (EL) and nominal length (NL) are calculated as follows:

$$\begin{aligned}
 EL &= 2,414s + 2(l + DN) \\
 NL &= 2,68s + 2(l + DN)
 \end{aligned}$$

## Absorption of Thermal Expansion

### ▶ Case 1

Length determination for metal hoses with lateral movements. Fit hose right-angled to the direction of movement. Max.lateral movement +/-100mm. Not for vibrations!



$2 \cdot s$  = total lateral movement [mm]  
 $s$  = lat.movement from the middle axis [mm]  
 $r$  = bend radius [mm]  
 (see tables on page 4.4 for bend radii)  
 $l$  = length of connecting components [mm]  
 (see tables on connecting components)  
 $SL$  = movable hose length [mm]  
 $EL$  = installation length [mm]  
 $NL$  = nominal length [mm]

$EL$  = installation length  
 $SL$  = hose length  
 $SL_{\min}$  = minimal hose length

$$\begin{aligned}
 NL &= \sqrt{20 \cdot r \cdot s} + 2l \\
 s &= SL^2 / 20r \\
 EL &= 0,995NL \\
 SL &= NL - 2l \\
 SL_{\min} &= 6s
 \end{aligned}$$

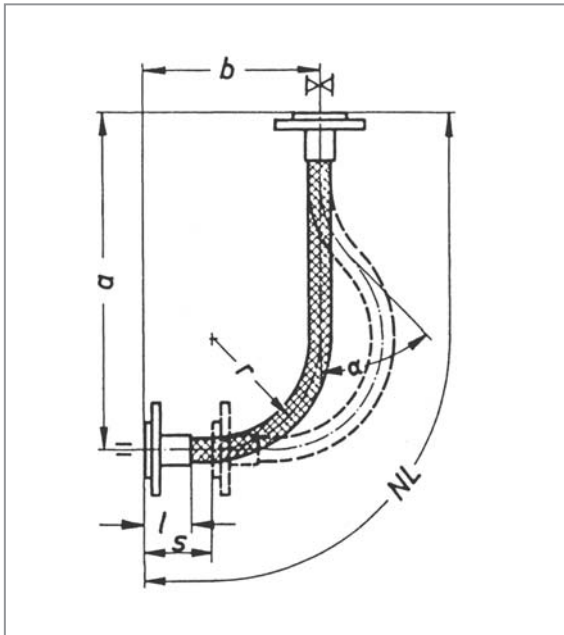
▶ Avoid condition of stress in neutral position.



► **Case 2**

Length determination for metal hoses for installation as a 90° bend for movements from one direction.

This layout does not apply to any vibration absorption!



s = movement [mm]  
 a = installation distance [mm]  
 b = installation distance [mm]  
 r = bend radius [mm]  
 (see tables on page 4.4 for bend radii)  
 l = length of connecting components [mm]  
 (see tables on connecting components)  
 $\alpha$  = bend angle [°]  
 NL = nominal length [mm]

$$NL = 0,035r \cdot \alpha + 1,57r + 2l$$

$$a = r + (2r \cdot \sin\alpha) + l$$

$$b = r + r(0,035\alpha - 2\sin\alpha) + l$$

$$f_{\alpha} = s/r$$

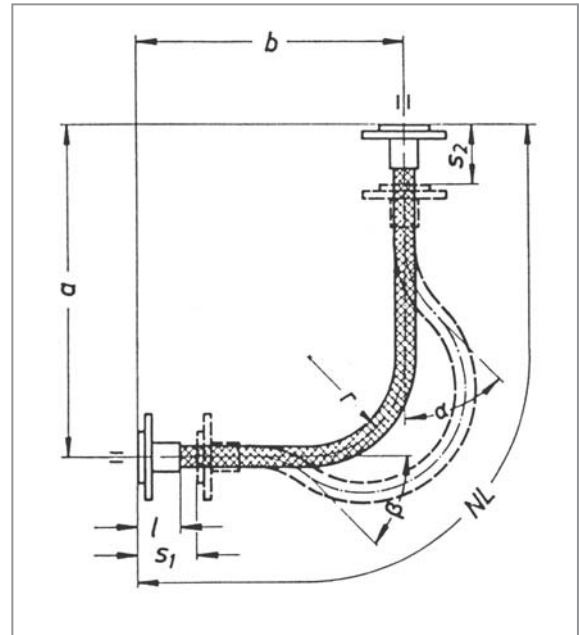
$$\alpha < 60^{\circ}$$

$f_{\alpha}$  - see table on page 4.4 for bend angles

► **Case 3**

Length determination for metal hoses for installation as a 90° bend for movements from two directions.

This layout does not apply to any vibration absorption!



$s_1$  = movements [mm]  
 $s_2$  = movements [mm]  
 a = installation distances [mm]  
 b = installation distances [mm]  
 r = bend radius [mm]  
 (see tables on page 4.4 for bend radii)  
 l = length of connecting components [mm]  
 (see tables on connecting components)  
 $\alpha$  = bend angles [°]  
 $\beta$  = bend angles [°]  
 NL = nominal length [mm]

$$NL = 0,035r \cdot (\alpha + \beta) + 1,57r + 2l$$

$$a = r + 2r \cdot \sin\alpha + r(0,035\beta - 2\sin\beta) + l$$

$$b = r + 2r \cdot \sin\beta + r(0,035\alpha - 2\sin\alpha) + l$$

$$f_{\alpha} = s_1/r$$

$$f_{\beta} = s_2/r$$

$$\alpha < 45^{\circ}$$

$$\beta < 45^{\circ}$$

$f_{\alpha}$ ,  $f_{\beta}$  – see table on page 4.4 for bend angles

Table of bend angles to determine the bend angle for calculating 90° bends.

0° – 30°				30° – 60°			
Bend angle $\alpha, \beta$	Angle factor $f_{\alpha}, f_{\beta}$			Bend angle $\alpha, \beta$	Angle factor $f_{\alpha}, f_{\beta}$		
	Degr.\min.	0°	30°		60°	Degr.\min.	0°
0	0,0000	0,0001	0,0003	30	0,3151	0,3263	0,3377
1	0,0003	0,0007	0,0012	31	0,3377	0,3493	0,3611
2	0,0012	0,0019	0,0028	32	0,3611	0,3731	0,3853
3	0,0028	0,0038	0,0050	33	0,3853	0,3977	0,4104
4	0,0050	0,0063	0,0078	34	0,4104	0,4232	0,4363
5	0,0078	0,0095	0,0113	35	0,4363	0,4495	0,4630
6	0,0113	0,0133	0,0155	36	0,4630	0,4767	0,4906
7	0,0155	0,0179	0,0204	37	0,4906	0,5048	0,5191
8	0,0204	0,0231	0,0259	38	0,5191	0,5337	0,5484
9	0,0259	0,0289	0,0322	39	0,5484	0,5634	0,5786
10	0,0322	0,0355	0,0391	40	0,5786	0,5940	0,6096
11	0,0391	0,0428	0,0468	41	0,6096	0,6255	0,6415
12	0,0468	0,0509	0,0551	42	0,6415	0,6578	0,6743
13	0,0551	0,0596	0,0643	43	0,6743	0,6910	0,7079
14	0,0643	0,0690	0,0741	44	0,7079	0,7250	0,7424
15	0,0741	0,0793	0,0847	45	0,7424	0,7599	0,7777
16	0,0847	0,0903	0,0961	46	0,7777	0,7957	0,8139
17	0,0961	0,1020	0,1082	47	0,8139	0,8323	0,8510
18	0,1082	0,1145	0,1211	48	0,8510	0,8698	0,8889
19	0,1211	0,1278	0,1347	49	0,8889	0,9082	0,9277
20	0,1347	0,1418	0,1491	50	0,9277	0,9474	0,9673
21	0,1491	0,1567	0,1644	51	0,9673	0,9874	1,0078
22	0,1644	0,1723	0,1804	52	1,0078	1,0284	1,0491
23	0,1804	0,1887	0,1972	53	1,0491	1,0701	1,0914
24	0,1972	0,2059	0,2148	54	1,0914	1,1128	1,1344
25	0,2148	0,2239	0,2332	55	1,1344	1,1563	1,1783
26	0,2332	0,2428	0,2525	56	1,1783	1,2006	1,2230
27	0,2525	0,2624	0,2725	57	1,2230	1,2457	1,2686
28	0,2725	0,2829	0,2934	58	1,2686	1,2918	1,3150
29	0,2934	0,3042	0,3151	59	1,3150	1,3386	1,3623

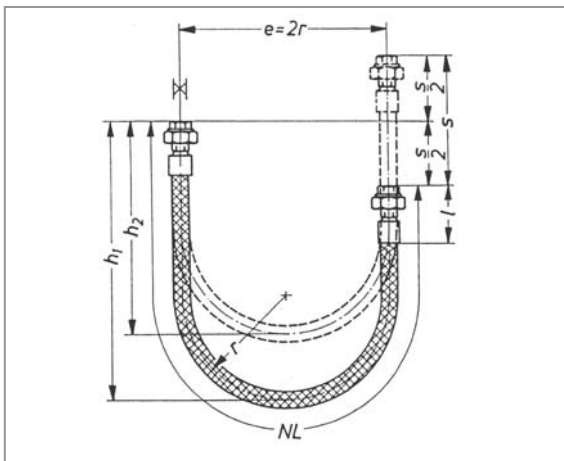
The bend angle must not exceed 60°. If the calculated value of  $s/r$  exceeds 1,3623, the bend angle must be calculated again with a larger bend radius  $r$ .

$f_{\alpha}, f_{\beta}$  = angle factor  
 $r$  = bend radius  
 (see tables on page 4.4)  
 $s$  = movements in mm  
 $\alpha$  = bend angle  
 $\beta$  = bend angle

## Absorption of Reciprocating Movements

### ▶ Case 1

Length determination for metal hoses for installation as a 180° bend. Vertical movement.



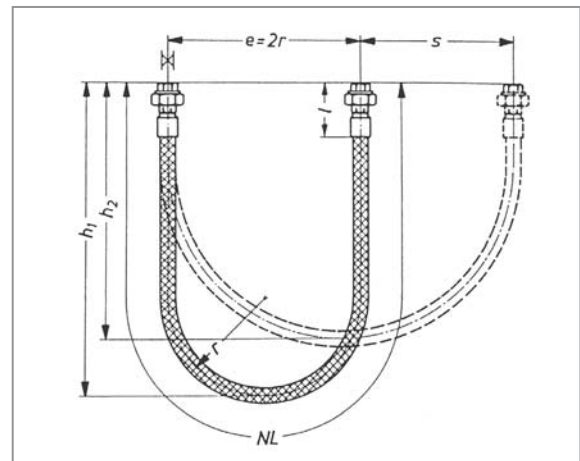
$r$  = bend radius [mm]  
 (see tables on page 4.4 for bend radii)  
 $e$  = installation distance [mm]  
 $l$  = length of connecting components [mm]  
 (see tables on connecting components)  
 $h_1$  = max. height of the 180° bend [mm]  
 $h_2$  = min. height of the 180° bend [mm]  
 $s$  = movement [mm]  
 $NL$  = nominal length [mm]

$$\begin{aligned} NL &= 4r + s/2 + 2l \\ h_1 &= 1,43r + s/2 + l \\ h_2 &= 1,43r + l \end{aligned}$$

- ▶ 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 requested life-time.

### ▶ Case 2

Length determination for metal hoses for installation as a 180° bend. Horizontal movement.



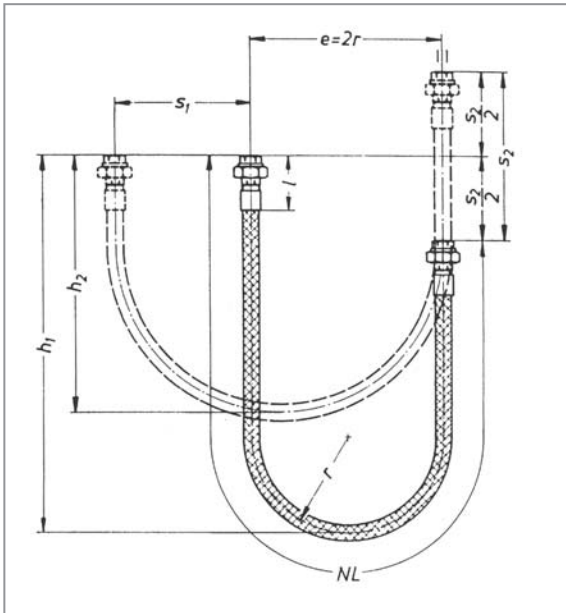
$r$  = bend radius [mm]  
 (see tables on page 4.4 for bend radii)  
 $l$  = length of connecting components [mm]  
 (see tables on connecting components)  
 $h_1$  = max. height of the 180° bend [mm]  
 $h_2$  = min. height of the 180° bend [mm]  
 $s$  = movement [mm]  
 $NL$  = nominal length in mm

$$\begin{aligned} NL &= 4r + 1,57s + 2l \\ h_1 &= 1,43r + 0,785s + l \\ h_2 &= 1,43r + s/2 + l \end{aligned}$$

- ▶ 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 requested life-time.

▶ Case 3

Length determination for metal hoses for installation as a 180° bend. Vertical and horizontal movements (each side one direction of movement only).



$r$  = bend radius [mm]  
 (see tables on page 4.4 for bend radii)  
 $l$  = length of connecting components [mm]  
 (see tables on connecting components)  
 $h_1$  = max. height of the 180° bend [mm]  
 $h_2$  = min. height of the 180° bend [mm]  
 $s_1$  = horizontal movement [mm]  
 $s_2$  = vertical movement [mm]  
 $NL$  = nominal length [mm]

$$NL = 4r + 1,57s_1 + s_2/2 + 2l$$

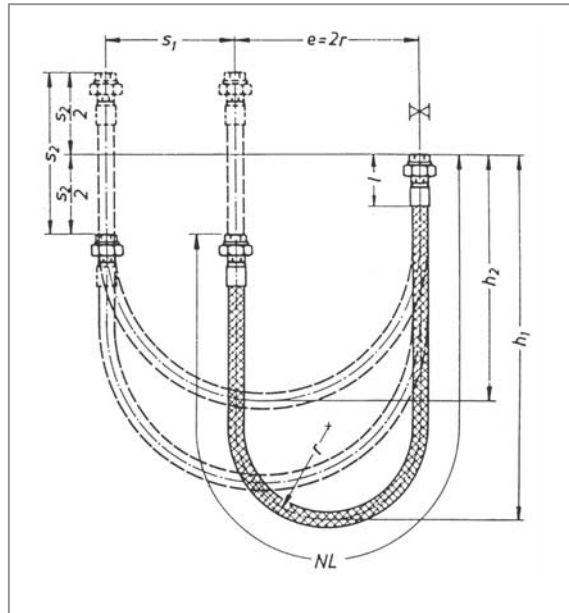
$$h_1 = 1,43r + 0,785s_1 + s_2/2 + l$$

$$h_2 = 1,43r + s_1/2 + l$$

- ▶ 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 requested life-time.

▶ Case 4

Length determination for metal hoses for installation as a 180° bend for absorption of movements from two directions with high amplitude and low frequency. Vertical and horizontal movements (one side fixed, other side moving in both directions).



$r$  = bend radius [mm]  
 (see tables on page 4.4 for bend radii)  
 $l$  = length of connecting components [mm]  
 (see tables on connecting components)  
 $h_1$  = max. height of the 180° bend [mm]  
 $h_2$  = min. height of the 180° bend [mm]  
 $s_1$  = horizontal movement [mm]  
 $s_2$  = vertical movement [mm]  
 $NL$  = nominal length [mm]

$$NL = 4r + 1,57s_1 + s_2/2 + 2l$$

$$h_1 = 1,43r + 0,785s_1 + s_2/2 + l$$

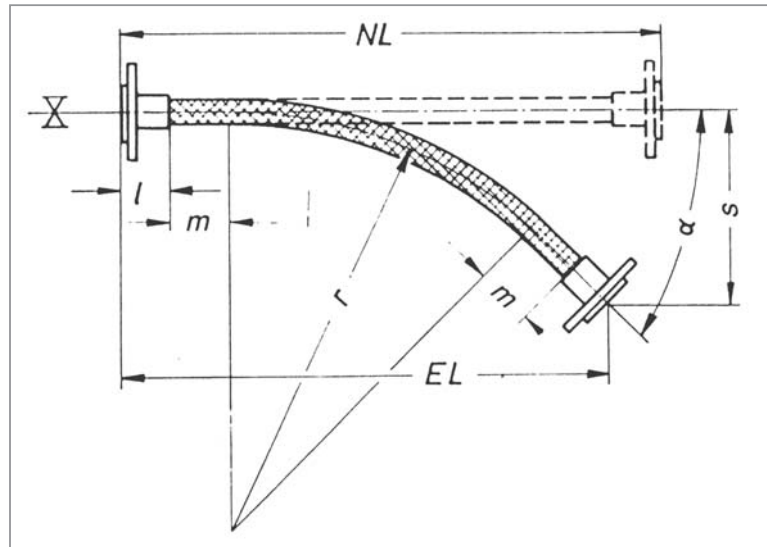
$$h_2 = 1,43r + s_1/2 + l$$

- ▶ 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 requested life-time.

## ► Case 5

Length determination for metal hoses for absorption of angular movements. The hose bend must be in the plane of movement.

This case does not apply to any vibration absorption!



$\alpha$  = bend angle [°]  
 $r$  = bend radius [mm]  
 (see tables on page 4.4 for bend radii)  
 $l$  = length of connecting components [mm]  
 (see tables on connecting components)  
 $m$  = length allowance [mm]  
 (see table below for values)  
 $s$  = deflexion distance [mm]  
 $EL$  = installation length [mm]  
 $NL$  = nominal length [mm]

$$\begin{aligned}
 NL &= [(r \cdot \pi \cdot \alpha) / 180] + 2(l + m) \\
 EL &= r \cdot \sin \alpha + (l + m)(1 + \cos \alpha) \\
 s &= r(1 - \cos \alpha) + (l + m) \sin \alpha
 \end{aligned}$$

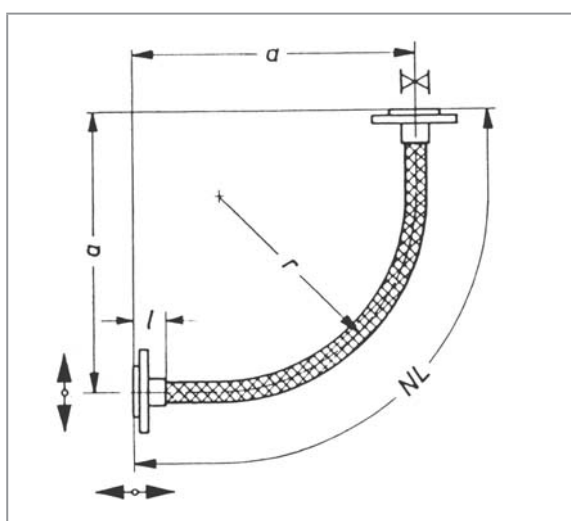
<b>DN range [mm]</b>	≥ 10	13 – 25	32 – 40	50 – 65	80 – 100	125 – 150	200 – 300
<b>Length allowance [mm]</b>	20	40	60	80	120	160	250

## Absorption of Vibrations

### ▶ Case 1

Length determination for metal hoses for installation as a 90° bend for absorbing vibrations.

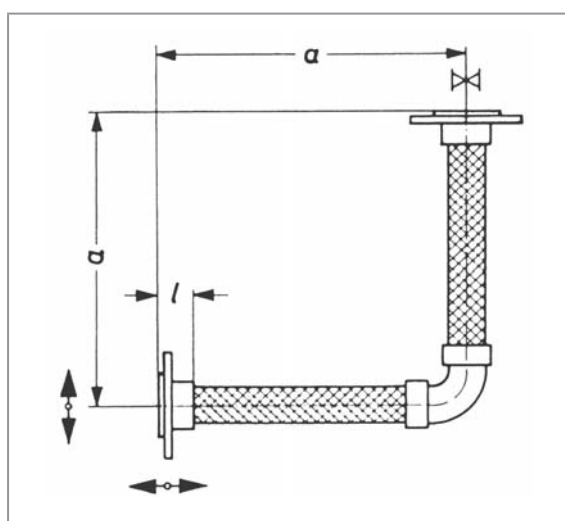
- ▶ Installation form 1 (DN15-100), 90° bend for installation form 1:



$$NL = 2,3r + 2l$$

$$a = 1,365r + l$$

- ▶ Installation form 2 (DN125-300), 90° angle



Permissible amplitude at permanent load:  
 $\pm 1$  mm in the normal case  
 max.  $\pm 10$  mm during turn on and turn off

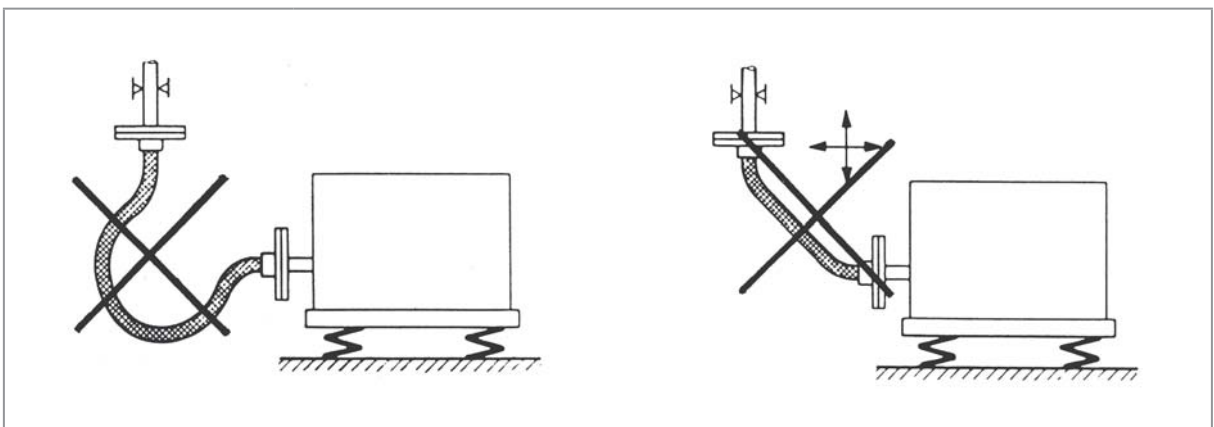
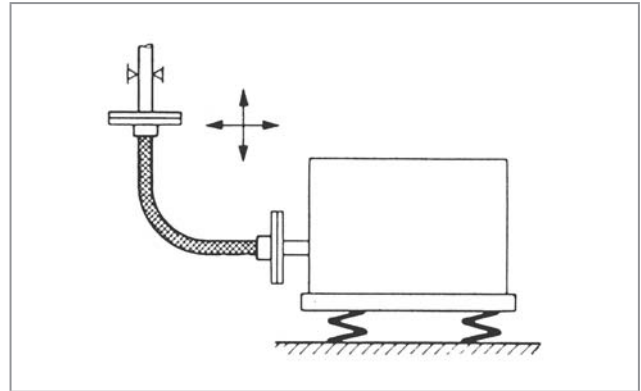
**Note:** Always fit the hose in hanging position as illustrated above.

SE111 Type	Installation form 1 90° bend								Installation form 2 90° angle					
DN	15	20	25	32	40	50	65	80	100	125	150	200	250	300
r	110	150	170	200	240	280	300	350	400	-	-	-	-	-
a	200	255	285	340	400	460	490	575	635	700	800	950	1100	1300
$l_{max}$	50	50	55	70	75	80	80	95	95	120	130	140	150	160
NL	350	450	500	600	700	800	850	1000	1100	-	-	-	-	-

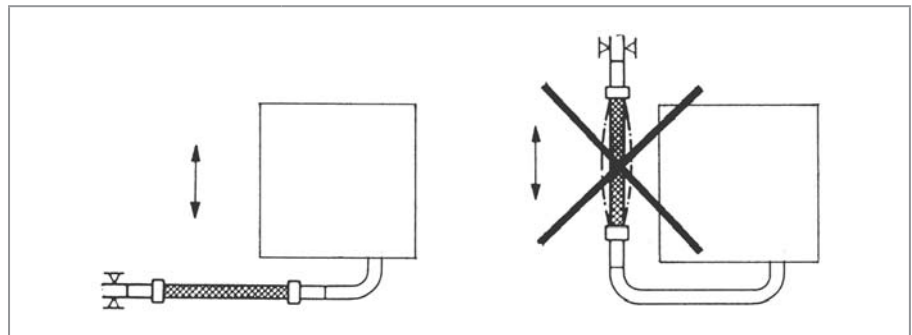
Measures in mm.

► Case 2

- Install 90° bend with permissible bend radius and sufficiently long neutral hose ends. Excessive curving and stretching of the hose elbow is not permissible!



- Install hose right-angled to the direction of vibration.



- To absorb two- or three-dimensional vibrations, install hoses in a 90° arrangement. Axial vibrations are not absorbed by hoses.

