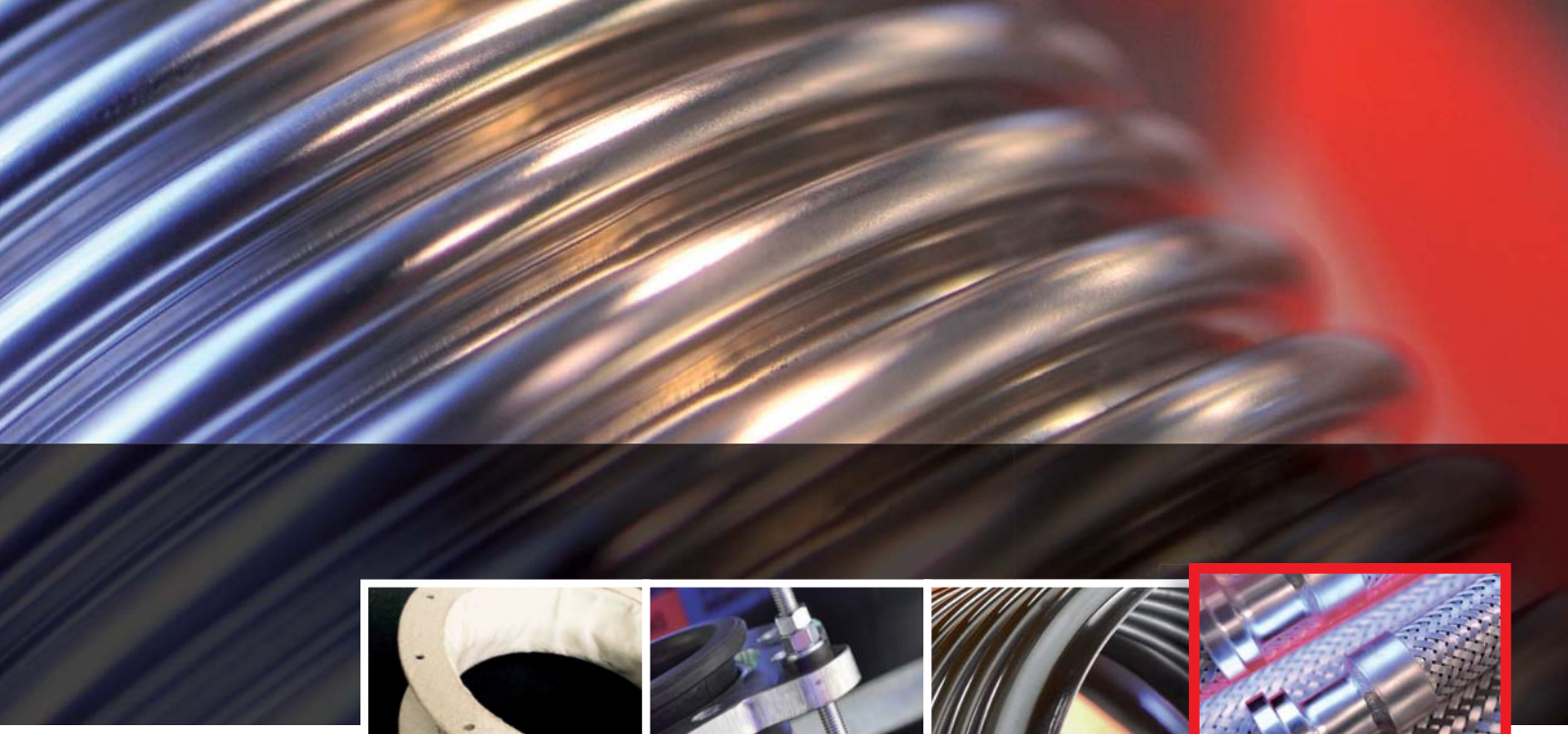

Stainless

steel corrugated hoses

www.roth-kompensatoren.de

ООО «ТИ-СИСТЕМС» ИНЖИНИРИНГ И ПОСТАВКА ТЕХНОЛОГИЧЕСКОГО ОБОРУДОВАНИЯ
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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 × 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

$$p_w = PN \cdot ft$$

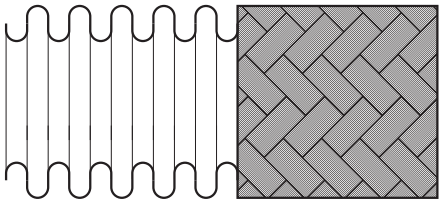
where ft values are given in the following table based on material and temperature range.

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.



SE 110	SE 111	SE 112
Stainless steel corrugated hose without braiding.	**Stainless steel corrugated hose** with single layer wire braiding.	**Stainless steel corrugated hose** with double layer 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]
	110	–	–	18	16	25	100	70
6 1/4	111	600	200	150	150	25	100	155
	112	864	288	216	150	–	110	260
	110	–	–	13	10	25	120	110
8 1/4	111	528	176	132	100	25	120	215
	112	766	253	191	150	–	135	350
	110	–	–	9	6	35	130	110
10 3/8	111	400	133	100	100	35	130	280
	112	500	164	125	100	–	145	490
	110	–	–	7	6	45	160	130
12 1/2	111	280	93	70	65	45	160	330
	112	410	136	105	100	–	175	580
	110	–	–	5	4	50	180	150
15 5/8	111	256	85	64	65	50	180	360
	112	420	140	105	100	–	200	630
	110	–	–	3	2,5	70	200	250
20 3/4	111	172	57	43	40	70	200	540
	112	310	103	77	65	–	220	910
	110	–	–	2,5	2,5	80	220	320
25 1	111	196	65	49	40	80	220	800
	112	290	96	72	65	–	245	1410
	110	–	–	2	0,5	100	270	450
32 1 1/4	111	140	46	35	25	100	270	1000
	112	240	80	60	50	–	300	1700
	110	–	–	2	0,5	130	300	520
40 1 1/2	111	152	50	38	25	130	300	1250
	112	230	76	57	50	–	330	2180
	110	–	–	1	0,5	155	350	900
50 2	111	104	34	26	25	155	350	1650
	112	180	60	45	40	–	385	2640
	110	–	–	0,5	0,5	200	410	1020
65 2 1/2	111	96	32	24	20	200	410	2380
	112	152	50	38	25	–	450	4090
	110	–	–	0,5	0,5	220	450	1460
80 3	111	72	24	18	16	220	450	2600
	112	112	37	28	25	–	500	4210
	110	–	–	0,5	0,5	270	560	1900
100 4	111	64	21	16	16	270	560	3450
	112	104	34	26	25	–	620	5500
	110	–	–	0,5	0,5	–	660	2980
125 5	111	48	16	12	10	–	660	5800
	112	80	26	20	20	–	730	9480
	110	–	–	0,5	0,5	–	815	6290
150 6	111	40	13	10	10	–	815	8200
	112	64	21	16	16	–	900	11120
	110	–	–	0,5	0,5	–	1015	8210
200 8	111	32	10	8	6	–	1015	11500
	112	48	16	12	10	–	1120	16270
	110	–	–	0,5	0,5	–	1200	13160
250 10	111	24	8	6	6	–	1200	17250
	112	40	13	10	10	–	1320	23470

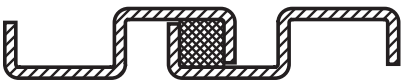
* Other sizes available on request (up to DN400). Subject to alteration.

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]
ASF	carbon steel (1.0330)	auto-seal	400	10 m ≤ DN100 5 m > DN100
	stainless steel (1.4301)	auto-seal	600	
ASG	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

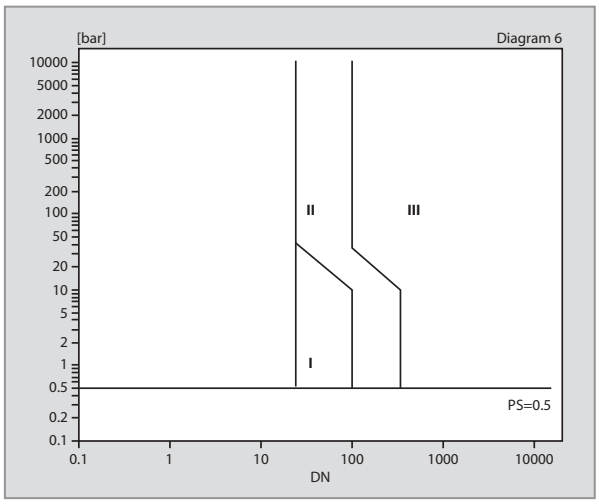
Modules

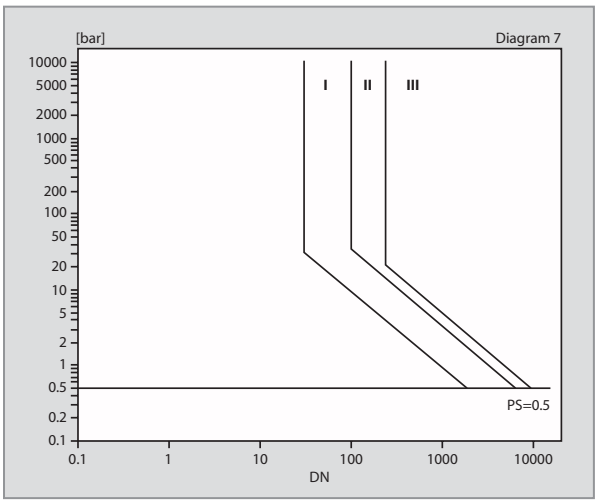
X	**Not applicable:** PS ≤ 0,5 bar
Y	**Applicable:** without CE-marking, good manufacturer experience
A	**Kat. I:** CE-marking + internal approval
A1	**Kat. II:** CE-marking + external approval

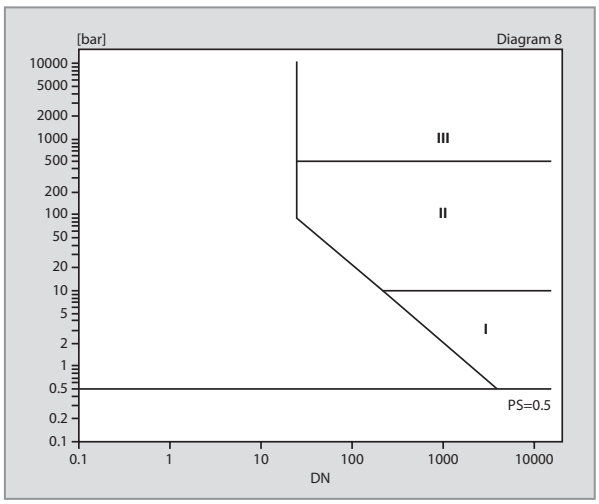
Medium Classification

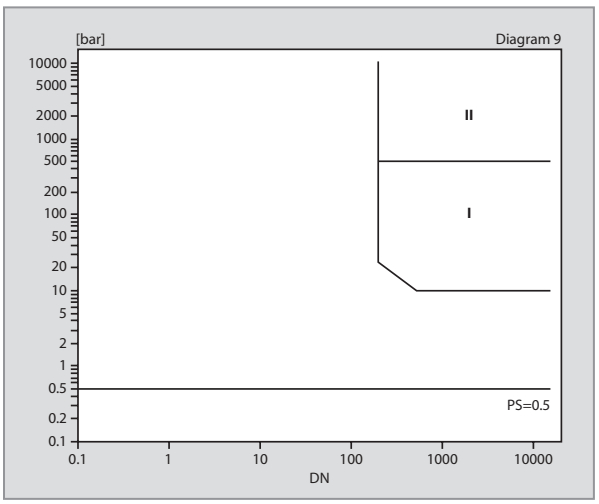
Medium	M1 Gr. 1 pD > 0,5 bar (Diagram 6)	M2 Gr. 2 pD > 0,5 bar (Diagram 7)	M3 Gr. 1 pD ≤ 0,5 bar (Diagram 8)	M4 Gr. 2 pD ≤ 0,5 bar (Diagram 9)

Gr. 1 = dangerous; Gr. 2 = others; pD = steam pressure.





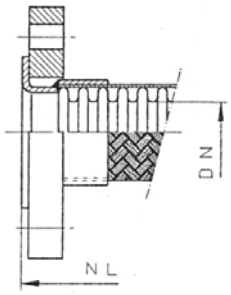




DN [mm]/[inch]	Type	Service pressure at quadruple protection [bar]	Medium			
			M1 Gr. 1 pD > 0,5	**M2** Gr. 2 pD >0 ,5	**M3** Gr. 1 pD ≤ 0,5	**M4** Gr. 2 pD ≤ 0,5
	PED 97/23/CE		Diagram 6	Diagram 7	Diagram 8	Diagram 9
	110	18	Y	Y	Y	Y
6 1/4	111	150	Y	Y	Y	Y
	112	216	Y	Y	Y	Y
	110	13	Y	Y	Y	Y
8 1/4	111	132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

Connecting Components

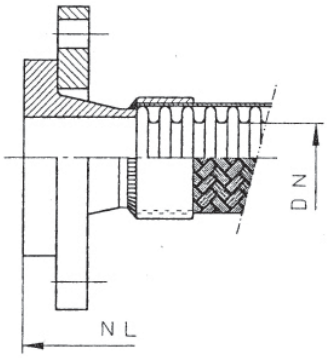
AE 201



Collar and swivel flange

collar stainless steel
flange carbon steel
or stainless steel

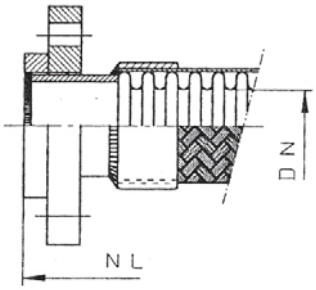
AE 202



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

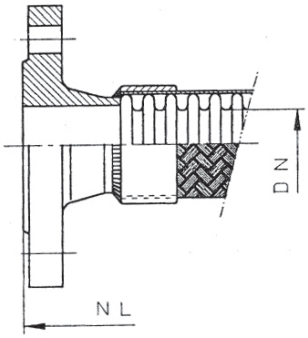
AE 203



Collar sockets and swivel flange

collar stainless steel
flange carbon steel
or stainless steel

AE 204



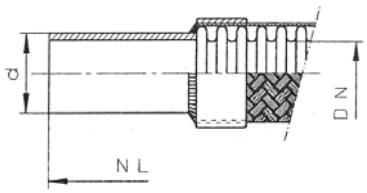
Weld-on flange

stainless steel
carbon steel

AE 301

Weld end

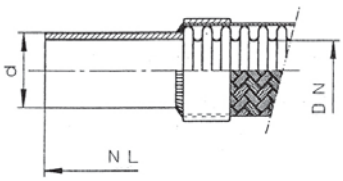
stainless steel
carbon steel



AE 302

Tubular fitting for pipe coupling with cutting and locking ring

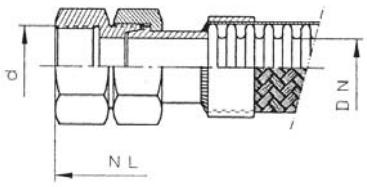
stainless steel
carbon steel



AE 401

Coupling with 24° Cone seal with internal thread

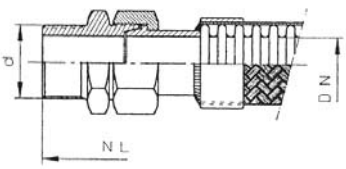
stainless steel
carbon steel



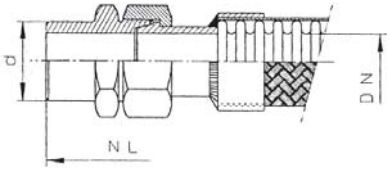
AE 403

Coupling with 24° Cone seal with external thread

stainless steel
carbon steel



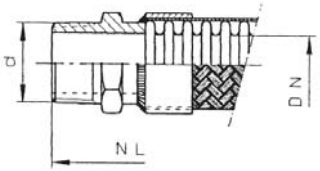
AE 404



Coupling with 24° Cone seal with weld end

stainless steel
carbon steel

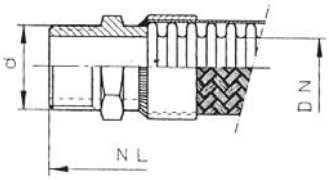
AE 405



Hexagon nipple and tapered external thread DIN 2999

stainless steel
carbon steel

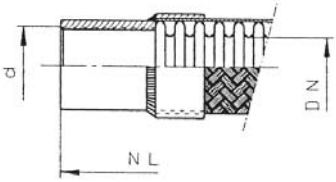
AE 406



Hexagon nipple and cylindrical external thread DIN ISO 228

stainless steel
carbon steel

AE 408



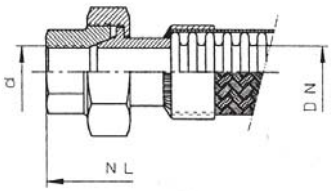
Socket with internal thread

stainless steel
carbon steel

AE 501

Pipe coupling with internal thread taper seal

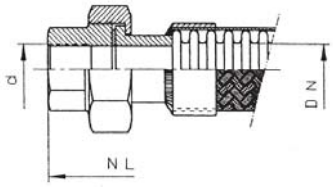
malleable cast iron
carbon steel
stainless steel



AE 502

Pipe coupling with internal thread flat seal

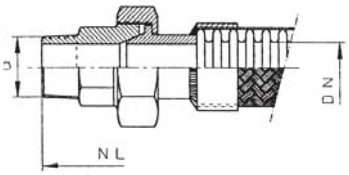
malleable cast iron
carbon steel
stainless steel



AE 503

Pipe coupling with external thread taper seal

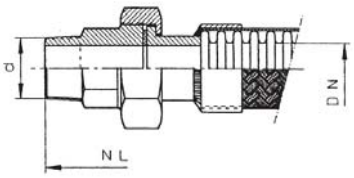
malleable cast iron
carbon steel
stainless steel

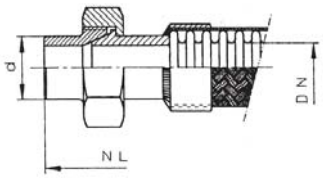


AE 504

Pipe coupling with external thread flat seal

malleable cast iron
carbon steel
stainless steel

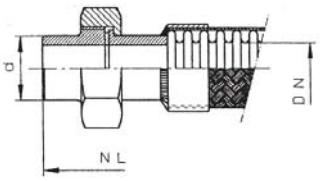




AE 505

Pipe coupling with weld end taper seal

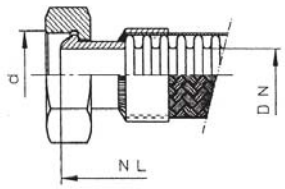
carbon steel
stainless steel



AE 506

Pipe coupling with weld end flat seal

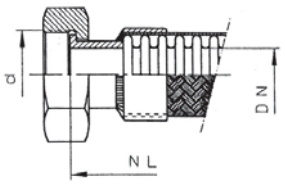
carbon steel
stainless steel



AE 507

Pipe coupling cone seal with nut

carbon steel
stainless steel

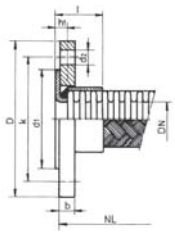


AE 508

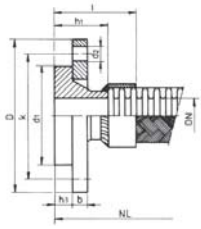
Pipe coupling flat seal with nut

carbon steel
stainless steel

AE 201

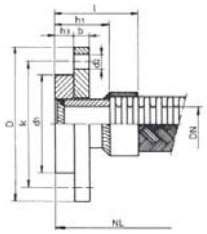


AE 202

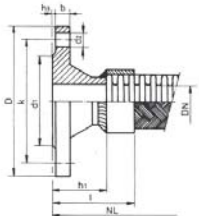


DN	l	h1	l	h1	h3
10	29	9	55	35	(10) 12
15	29	9	55	(35) 38	(10) 12
20	32	12	60	40	(12) 14
25	40	20	60	40	(12) 14
32	40	20	60	(40) 42	(12) 14
40	40	20	60	(40) 45	(12) 14
50	40	20	65	45	(14) 16
65	40	20	65	45	(14) 16
80	50	25	75	50	16
100	50	25	75	(50) 52	18
125	60	30	80	(50) 55	18
150	70	30	90	(50) 55	(18) 20

AE 203



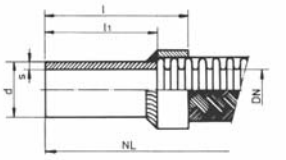
AE 204



DN	l	h1	h3	l	h1
10	75	55	(10) 12	55	35
15	75	55	(10) 12	55	(35) 38
20	80	60	(12) 14	58	(38) 40
25	85	65	(12) 14	58	(38) 40
32	90	70	(12) 14	60	(40) 42
40	95	75	(12) 14	62	(42) 45
50	95	75	(14) 16	65	45
65	100	80	(14) 16	65	45
80	110	85	16	75	50
100	115	90	16	77	52
125	120	90	18	85	55
150	135	95	(18) 20	95	55

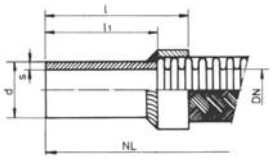
D, k ,d1, d2, b – measurements acc. to flange norm, refer to catalogue pages 5.5l other dimensions or norms on request
Measures in mm, subject to alterations.

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

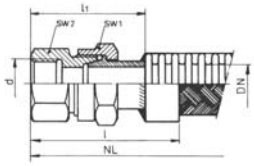
AE302



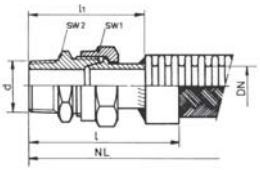
DN	d	s	l	l1
6	8	1	48	28
8	10	1	50	30
10	12	1,5	50	30
12	15	1,5	52	32
15	18	1,5	52	32
20	22	1,5	56	36
25	28	1,5	60	40
32	35	2	65	45
40	42	2	65	45

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

AE401

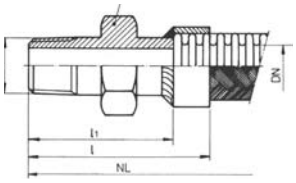
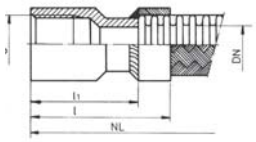


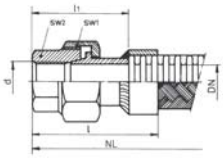
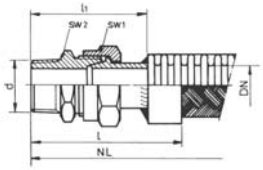
AE403 / AE404



DN	d DIN2999		l	l1	SW1	SW2	l	l1	SW1	SW2
6		1/4	65	45	19	19	70	50	19	17
10		3/8	68	48	22	22	73	53	22	19
12		1/2	75	55	32	27	82	62	32	27
15		1/2	75	55	32	27	82	62	32	27
20		3/4	82	62	36	32	90	70	36	32
25	1		87	67	41	41	95	75	41	41
32	1	1/4	93	73	50	46	101	81	50	46
40	1	1/2	97	77	60	55	107	87	60	55
50	2		105	85	70	65	113	93	70	65

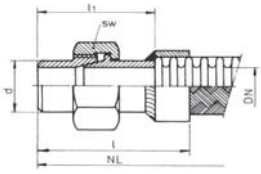
Other thread connections, i.e. metric precision threads, cylindrical external threads, NPT- threads, etc. available on request. Measures in mm, subject to alterations.

			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

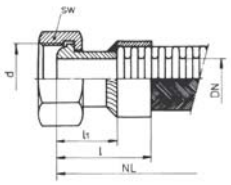
Size table Whitworth pipe thread DIN 2999 refer to catalogue page 5.3.
Measures in mm, subject to alterations.

AE505 / AE506

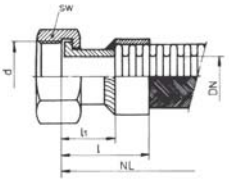


DN	d	l	l1	SW
10	13,5	62	42	27
12	17,2	65	45	27
15	21,3	74	54	32
20	26,9	80	60	41
25	33,7	87	67	50
32	42,4	95	75	60
40	48,3	101	81	70
50	60,3	114	94	85
65	76,1	122	102	100
80	88,9	132	107	120

AE507



AE508



DN	d M	SW	d R	SW	l	l1
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	11/4	50	55	35
32	45 × 2	50	11/2	55	55	35
40	52 × 2	60	2	65	55	35
50			21/2	75	65	45

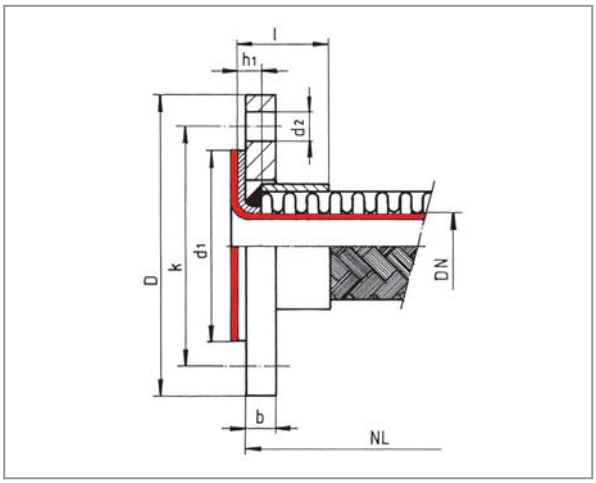
Measures in mm, subject to alterations.

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.



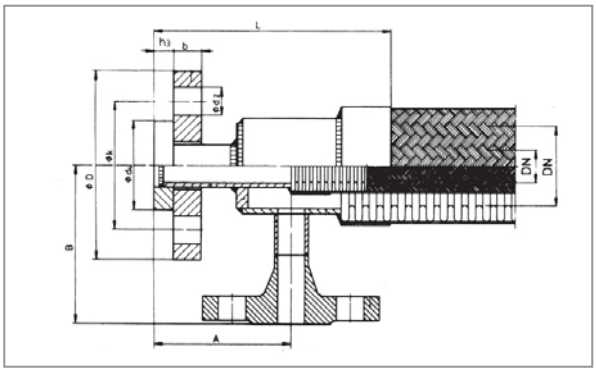
Available couplings for TEFLON-liner hoses:

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 DNs 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 DNs 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.

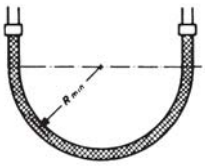
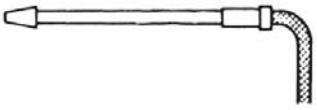
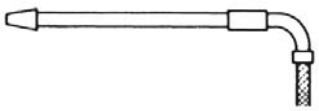
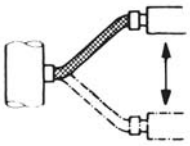
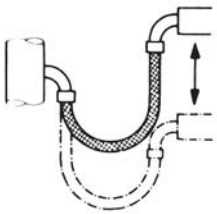
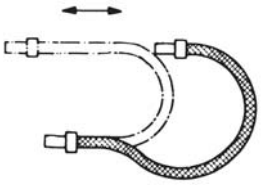
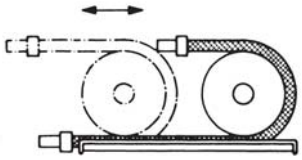
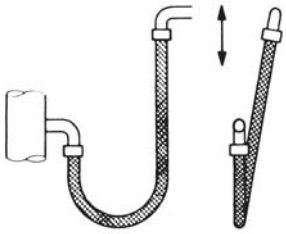
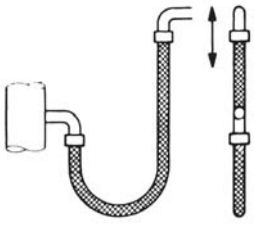
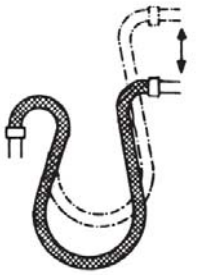
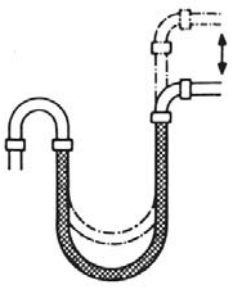
No movements or bending stresses must occur directly adjacent to the end fittings. This “neutral” section of the hose ends should be sufficiently long. If necessary, a corrugated buckling guard can be fitted at the ends.

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.

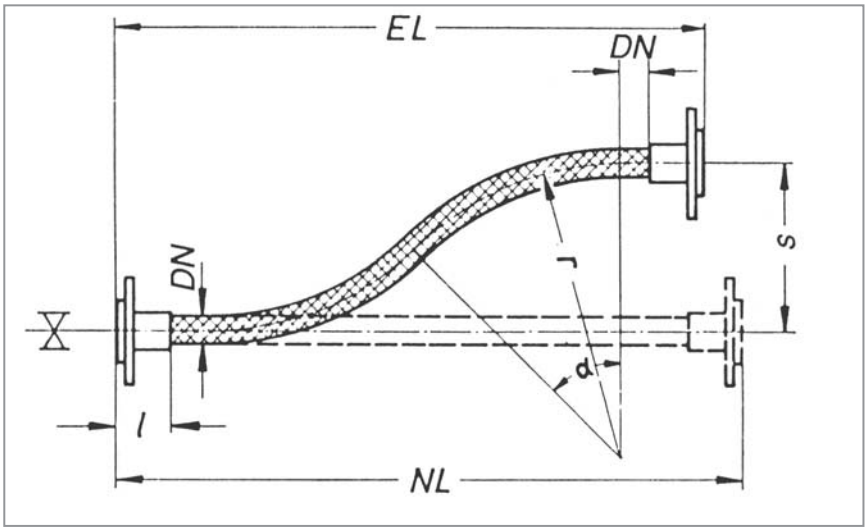
Tighten hose firmly at one end. Attach hose loosely at the other end. Move the hose two or three times in the desired direction of movement to allow it to relax and find its position without twisting, only then tighten the other end. In case of unions it is essential to use two spanners, one to stop 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)
α = bend angle [°]
l = length of connecting component [mm]
DN = nominal hose size [mm]
EL = installation length [mm]
NL = nominal length [mm]

- Bend angle α for hoses with braiding: max. 45°

$$NL = [(r \cdot \pi \cdot \alpha)/90] + 2(l + DN)$$
$$EL = 2r \cdot \sin\alpha + 2\,(l + DN)$$
$$s = 2r(1 - \cos\alpha)$$

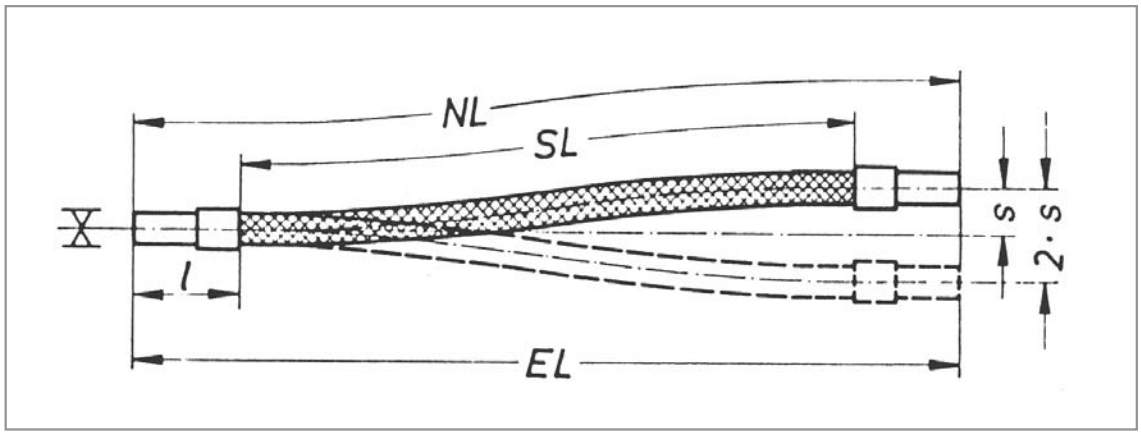
- If a is greater than 45°, installation length (EL) and nominal length (NL) are calculated as follows:

$$EL = 2{,}414s + 2(l + DN)$$
$$NL = 2{,}68s + 2(l + DN)$$

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 · 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

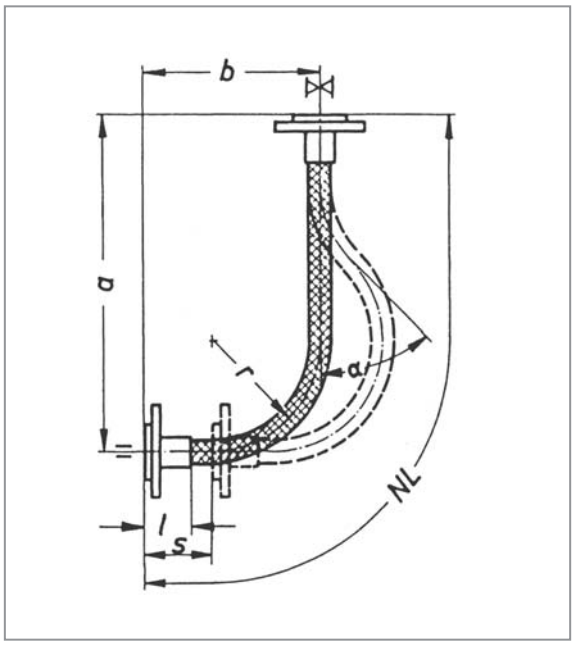
$$NL = \sqrt{20 \cdot r \cdot s} + 2l$$
$$s = SL^2/20r$$
$$EL = 0{,}995NL$$
$$SL = NL - 2l$$
$$SL_{min} = 6s$$

▶ 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)
α = bend angle [°]
NL = nominal length [mm]

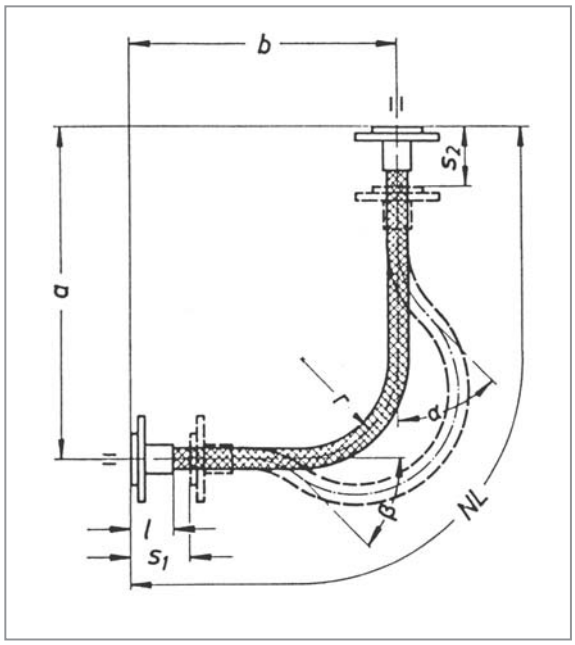
$$NL = 0{,}035r \cdot \alpha + 1{,}57r + 2l$$
$$a = r + (2r \cdot \sin\alpha) + l$$
$$b = r + r(0{,}035\alpha - 2\sin\alpha) + l$$
$$f_\alpha = s/r$$
$$\alpha < 60\ °$$

f_α - 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)
α = bend angles [°]
β = bend angles [°]
NL = nominal length [mm]

$$NL = 0{,}035r \cdot (\alpha + \beta) + 1{,}57r + 2l$$
$$a = r + 2r \cdot \sin\alpha + r(0{,}035\beta - 2\sin\beta) + l$$
$$b = r + 2r \cdot \sin\beta + r(0{,}035\alpha - 2\sin\alpha) + l$$
$$f_\alpha = s_1/r$$
$$f_\beta = s_2/r$$
$$\alpha < 45\ °$$
$$\beta < 45\ °$$

f_α , f_β – 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 α, β	Angle factor f_α , f_β			Bend angle α, β	Angle factor f_α , f_β		
Degr.\min.	0°	30°	60°	Degr.\min.	0°	30°	60°
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

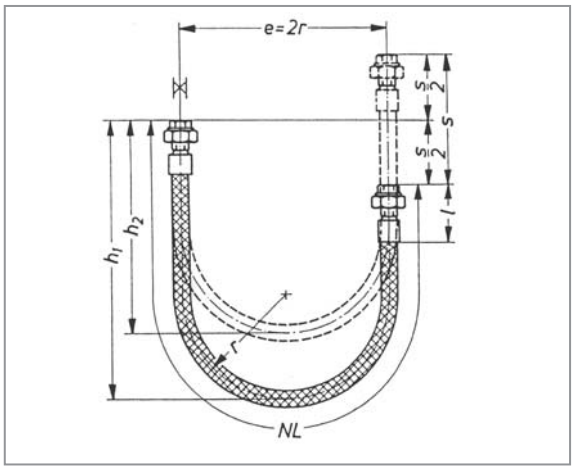
The bend angle must not exceed 60°. If the calculated value of s/r exceeds 1,3623, the bend angle must be calculated again with a larger bend radius r.

fα , fβ = angle factor
r = bend radius
(see tables on page 4.4)
s = movements in mm
α = bend angle
β = bend angle

Absorption of Reciprocating Movements

▷ Case 1

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



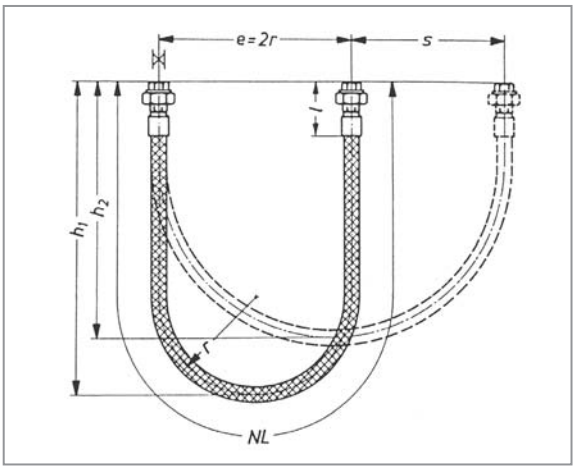
r = bend radius [mm]
(see tables on page 4.4 for bend radii)
e = installation distance [mm]
l = length of connecting components [mm]
(see tables on connecting components)
h_1 = max. height of the 180° bend [mm]
h_2 = min. height of the 180° bend [mm]
s = movement [mm]
NL = nominal length [mm]

$$NL = 4r + s/2 + 2l$$
$$h_1 = 1{,}43r + s/2 + l$$
$$h_2 = 1{,}43r + l$$

- 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 2

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



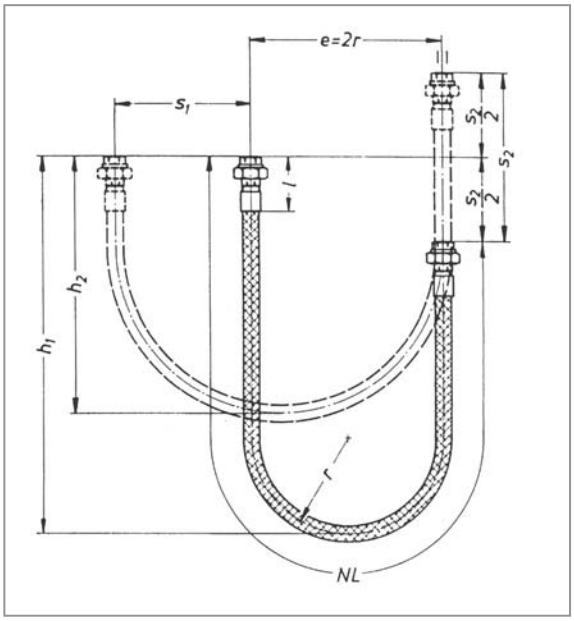
r = bend radius [mm]
(see tables on page 4.4 for bend radii)
l = length of connecting components [mm]
(see tables on connecting components)
h_1 = max. height of the 180° bend [mm]
h_2 = min. height of the 180° bend [mm]
s = movement [mm]
NL = nominal length in mm

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

- 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 3

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



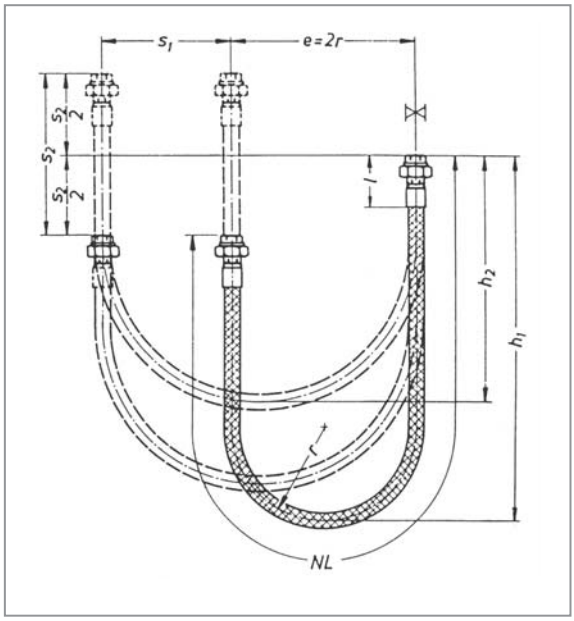
r = bend radius [mm]
(see tables on page 4.4 for bend radii)
l = length of connecting components [mm]
(see tables on connecting components)
h_1 = max. height of the 180° bend [mm]
h_2 = min. height of the 180° bend [mm]
s_1 = horizontal movement [mm]
s_2 = vertical movement [mm]
NL = nominal length [mm]

$$NL = 4r + 1{,}57s_1 + s_2/2 + 2l$$
$$h_1 = 1{,}43r + 0{,}785s_1 + s_2/2 + l$$
$$h_2 = 1{,}43r + s_1/2 + l$$

- 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]

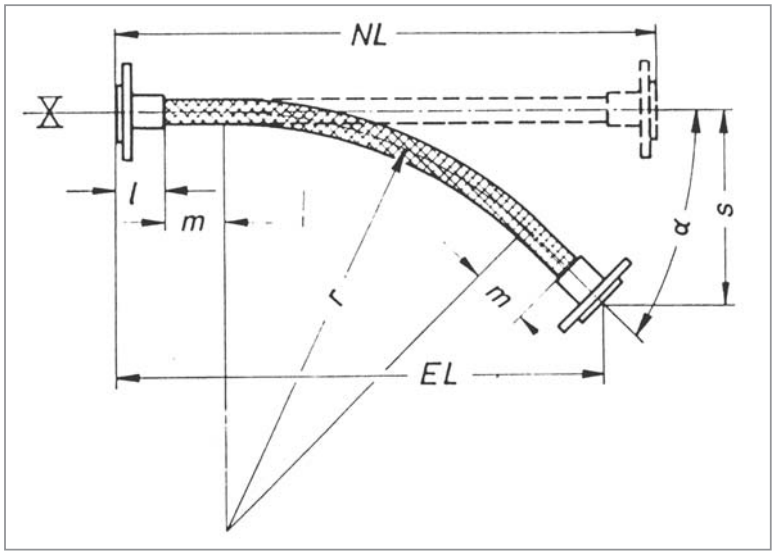
$$NL = 4r + 1{,}57s_1 + s_2/2 + 2l$$
$$h_1 = 1{,}43r + 0{,}785s_1 + s_2/2 + l$$
$$h_2 = 1{,}43r + s_1/2 + l$$

- 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!



α = 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]

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

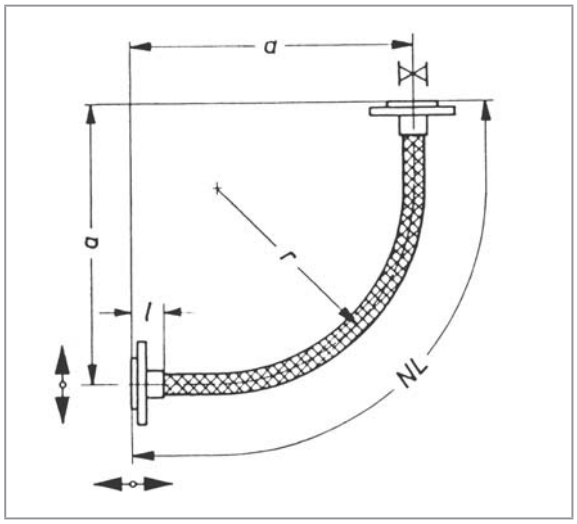
DN range [mm]	≥ 10	13 – 25	32 – 40	50 – 65	80 – 100	125 – 150	200 – 300
Length allowance [mm]	20	40	60	80	120	160	250

Absorption of Vibrations

▷ Case 1

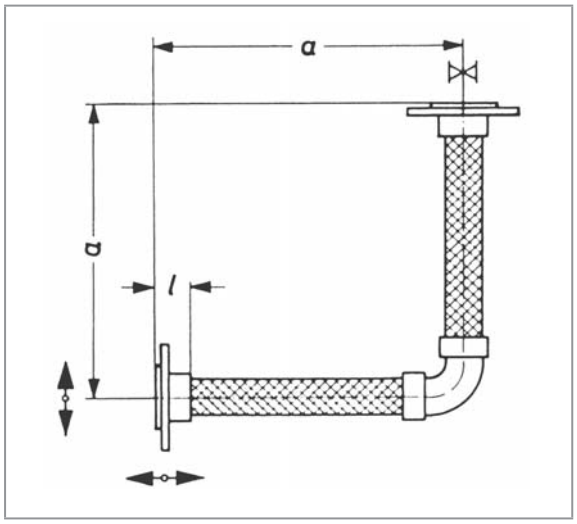
Length determination for metal hoses for installation as a 90° bend for absorbing vibrations.

▸ 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:
± 1 mm in the normal case
max. ± 10 mm during turn on and turn off

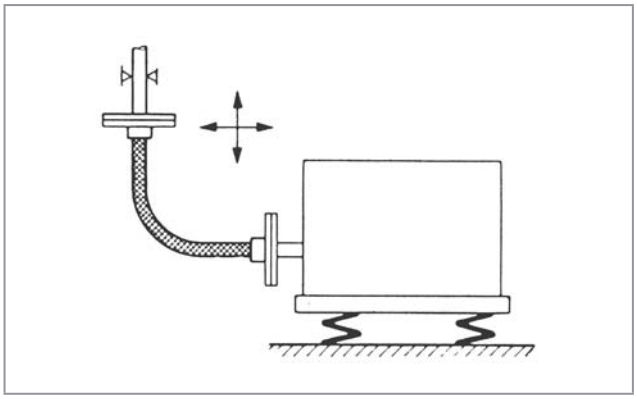
Note: Always fit the hose in hanging position as illustrated above.

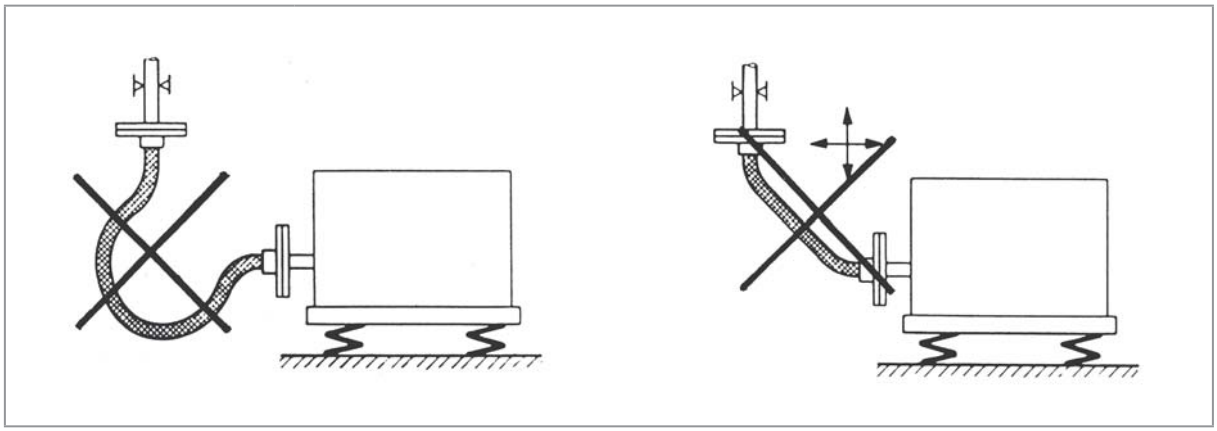
SE111 Type	Installation form 1 90° bend									Installation form 2 90° angle				
DN	15	20	25	32	40	50	65	80	100	125	150	200	250	300
r	110	150	170	200	240	280	300	350	400	-	-	-	-	-
a	200	255	285	340	400	460	490	575	635	700	800	950	1100	1300
l_{max}	50	50	55	70	75	80	80	95	95	120	130	140	150	160
NL	350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

Measures in mm.

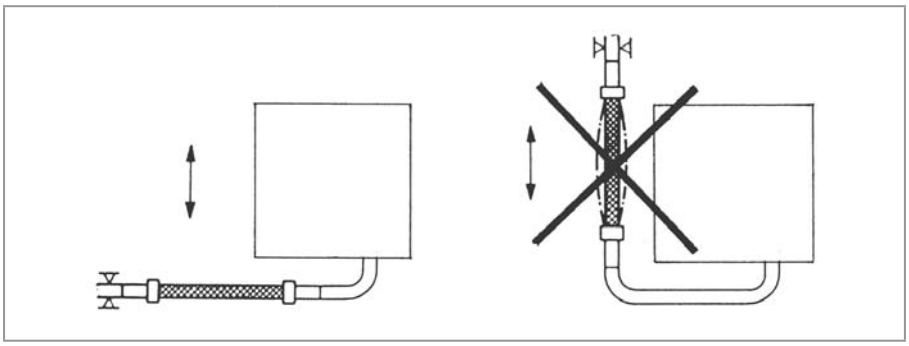
▷ Case 2

- 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.