

# ANGULAR EXPANSION JOINT with fixed flanges

# Type WN F-F



### Tasks

- › Absorption of one-sided angular movements
- › Reduction of tensions in the pipe system
- › Absorption of large movements in two-joint and three-joint pipe systems
- › Reduction of forces and moments in connections

### Areas of application

- › Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building
- › Food processing industry
- › Gas, water supply, building and heating technology
- › Energy and offshore technology, oil and gas production
- › Chemical and pharmaceutical industry, acid production
- › Paper, textile, cellulose and paint industry
- › Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

## Design type WN F-F

HKS angular expansion joint with compact design, consisting of multi-convolution and multi-layered metal bellows with standardised fixed flanges in line with EN 1092-1 type 01 and joint tensioners for absorbing the axial reaction forces.

Materialcombination <sup>1)</sup>	Component		Permitted operating temperature TS <sup>2)</sup>
	Metal bellows	Flange, joint tensioners <sup>4)</sup>	
Standard <sup>3)</sup>	1.4541 (X6CrNiTi18-10)	1.0038 (S235JR)	-10 °C bis 300 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12)		bis 900 °C
Nickel-base alloy	2.4858 (NiCr21Mo - Incoloy 825)		-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.
4. Selection of the Material combination depending on installation and ambient conditions.

### Special versions

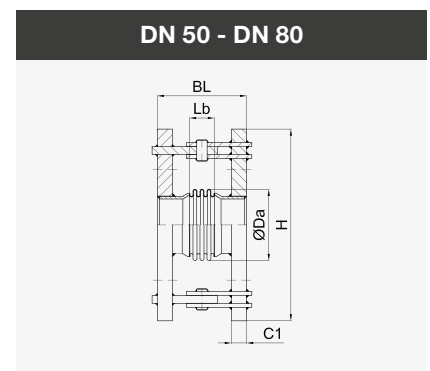
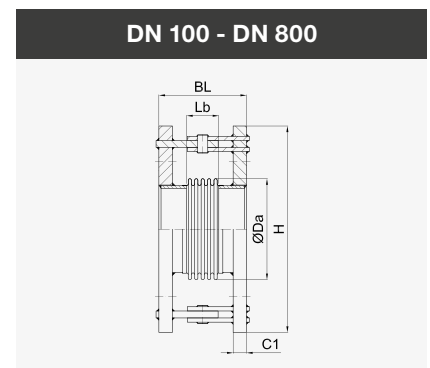
On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

#### Expansions:

- › Inner sleeve, telescopic inner sleeve or conical inner sleeve
- › External protective sleeve or telescopic inner sleeve

#### On customer request:

- › Flanges in line with ASME, JIS, BS
- › With special coating, galvanised or hot galvanised
- › Connection variants with weld end or swivel flanges



Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Angular adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	$\Delta\alpha$	BL	G	H	PN	C1	Da	Lb	Ae	$C/\Delta\alpha$
-	Degrees	mm	kg	mm	-	mm	mm	mm	cm <sup>2</sup>	Nm/Degrees

**ANGULAR EXPANSION JOINT with fixed flanges - type WN F-F - nominal pressure PN 6**

50	19	90	7.3	256	6	16	84	30	42.5	3
50	33	115	7.4	256	6	16	84	52	42.5	2
50	42	140	7.7	256	6	16	84	78	42.1	2
65	17	95	8.6	276	6	16	105	33	66.4	3
65	26	110	8.7	276	6	16	105	49	66.4	2
65	37	125	8.8	276	6	16	100	64	62.8	3
80	18	105	12	306	6	18	118	43	86.6	10
80	27	130	13	306	6	18	118	64	86.6	7
80	41	160	13	306	6	18	118	95	86.6	5
100	17	140	14	326	6	18	142	80	125	4
100	29	140	14	326	6	18	142	83	125	5
100	39	175	15	326	6	18	143	116	125	7
125	18	120	18	356	6	20	173	60	188	5
125	27	185	19	356	6	20	174	92	189	7
125	37	240	20	356	6	20	175	144	189	13
150	15	195	22	381	6	20	207	101	271	9
150	25	200	23	381	6	20	208	106	271	12
150	34	235	23	381	6	20	208	141	271	18
200	14	175	33	448	6	22	265	76	453	30
200	22	210	34	448	6	22	265	113	453	20
200	33	290	41	448	6	22	268	195	453	38
250	13	180	47	517	6	24	321	80	684	48
250	19	220	48	517	6	24	321	120	684	32
250	32	315	54	517	6	24	323	212	684	68
300	14	215	64	592	6	24	375	106	948	53
300	20	260	66	592	6	24	376	152	948	62
300	29	330	72	592	6	24	377	224	948	94
350	14	195	81	642	6	26	410	116	1136	49
350	20	240	84	642	6	26	411	163	1139	68
350	27	320	90	642	6	26	412	240	1139	104
400	11	215	103	700	6	28	465	98	1474	149
400	16	265	108	700	6	28	465	150	1474	87
400	22	320	114	700	6	28	466	205	1474	106
450	10	230	127	755	6	30	520	108	1856	150
450	16	280	131	755	6	30	520	162	1856	100
450	24	365	138	755	6	30	521	245	1856	167
500	10	240	143	805	6	30	578	120	2291	208
500	15	305	154	805	6	30	579	186	2291	169
500	26	420	162	805	6	30	578	300	2291	294
600	9	255	212	955	6	32	684	125	3258	296

**Design:** All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Angular adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	$\Delta\alpha$	BL	G	H	PN	C1	Da	Lb	Ae	C $\Delta\alpha$
-	Degrees	mm	kg	mm	-	mm	mm	mm	cm <sup>2</sup>	Nm/Degrees
600	16	345	223	955	6	32	684	216	3258	216
600	20	420	241	955	6	32	685	288	3258	363
700	8	280	330	1082	6	40	788	132	4375	415
700	12	345	342	1082	6	40	788	197	4375	277
700	16	405	348	1082	6	40	790	256	4389	376
800	8	310	434	1197	6	44	900	148	5715	549
800	12	385	451	1197	6	44	900	222	5715	366
800	14	445	448	1197	6	44	896	282	5699	471
<b>ANGULAR EXPANSION JOINT with fixed flanges · type WN F-F · nominal pressure PN 10</b>										
50	19	95	12	281	16	20	84	30	42.5	3
50	28	120	12	281	16	20	84	52	42.5	2
50	39	145	12	281	16	20	84	78	41.8	4
65	17	100	14	301	16	20	100	32	62.8	5
65	26	115	14	301	16	20	100	48	62.8	3
65	32	120	14	301	16	20	100	56	62.8	3
80	14	100	15	316	16	20	118	34	87	6
80	24	120	15	316	16	20	118	56	87	4
80	35	165	16	316	16	20	118	99	86	7
100	19	120	19	336	16	22	142	55	125	10
100	26	145	19	336	16	22	142	82	125	7
100	38	185	20	336	16	22	143	120	125	12
125	18	125	22	366	16	22	173	61	188	11
125	27	155	23	366	16	22	174	94	189	12
125	36	200	25	366	16	22	176	138	189	20
150	17	135	31	413	16	24	207	69	271	22
150	25	215	34	413	16	24	208	110	271	21
150	33	270	37	413	16	24	210	160	271	31
200	14	190	45	482	10	24	267	80	453	31
200	22	225	46	482	10	24	266	116	453	32
200	33	300	52	482	10	24	268	195	453	63
250	13	195	61	547	10	26	322	85	682	52
250	19	235	62	547	10	26	321	123	683	53
250	31	355	77	547	10	26	326	244	684	113
300	14	230	79	605	10	26	377	116	948	95
300	20	270	82	605	10	26	377	160	948	87
300	26	330	89	605	10	26	378	216	948	143
350	14	210	108	665	10	30	411	124	1135	79
350	20	265	115	665	10	30	413	180	1139	121
350	25	320	119	665	10	30	413	231	1139	159
400	13	230	150	755	10	32	467	135	1474	161
400	19	280	155	755	10	32	467	188	1474	153
400	24	350	160	755	10	32	466	260	1474	238
450	13	250	191	815	10	36	522	145	1856	188
450	18	315	204	815	10	36	523	210	1856	213
450	24	395	225	815	10	36	525	288	1856	341

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Angular adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	$\Delta\alpha$	BL	G	H	PN	C1	Da	Lb	Ae	C $\Delta\alpha$
-	Degrees	mm	kg	mm	-	mm	mm	mm	cm <sup>2</sup>	Nm/Degrees
500	10	235	220	870	10	38	576	124	2277	285
500	15	300	234	870	10	38	580	192	2291	268
500	23	400	249	870	10	38	580	288	2291	451
600	9	285	320	1002	10	42	681	128	3236	562
600	14	415	345	1002	10	42	685	256	3258	408
600	18	425	358	1002	10	42	687	269	3258	513
700	8	275	483	1135	10	50	791	140	4378	795
700	12	345	501	1135	10	50	791	209	4378	530
700	16	420	524	1135	10	50	793	282	4389	669
<b>ANGULAR EXPANSION JOINT with fixed flanges · type WN F-F · nominal pressure PN 16</b>										
50	14	90	12	281	16	20	84	22	42.5	4
50	23	105	12	281	16	20	84	37	42.5	2
50	34	135	12	281	16	20	84	69	41.8	5
65	16	100	14	301	16	20	100	32	62.8	5
65	25	115	14	301	16	20	100	48	62.8	3
65	31	130	14	301	16	20	105	66	65.5	5
80	15	110	16	316	16	20	114	45	83.2	8
80	25	130	16	316	16	20	118	62	86	8
80	31	145	16	316	16	20	118	77	86	8
100	12	105	19	336	16	22	142	42	125	23
100	24	135	19	336	16	22	143	72	125	11
100	34	175	21	336	16	22	144	112	125	17
125	18	130	25	378	16	22	173	67	186	14
125	25	185	27	378	16	22	176	121	189	22
125	31	195	28	378	16	22	177	129	189	28
150	17	145	35	427	16	24	207	74	269	26
150	21	200	36	427	16	24	208	91	271	25
150	32	270	40	427	16	24	210	160	271	50
200	14	195	53	492	16	26	266	84	451	56
200	22	240	56	492	16	26	268	130	453	56
200	28	295	62	492	16	26	270	186	453	86
250	13	220	79	565	16	29	324	92	684	104
250	19	255	79	565	16	29	321	130	678	83
250	23	310	85	565	16	29	324	183	684	115
300	11	230	113	650	16	32	377	97	945	153
300	14	255	116	650	16	32	377	121	945	122
300	20	325	123	650	16	32	378	192	948	161
350	11	200	152	720	16	35	411	103	1134	230
350	14	225	155	720	16	35	411	128	1134	184
350	20	280	161	720	16	35	413	180	1139	204
400	10	220	211	802	16	38	468	112	1474	318
400	14	260	214	802	16	38	466	156	1474	397

**Design:** All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Angular adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	$\Delta\alpha$	BL	G	H	PN	C1	Da	Lb	Ae	$C\Delta\alpha$
-	Degrees	mm	kg	mm	-	mm	mm	mm	cm <sup>2</sup>	Nm/Degrees
400	19	295	221	802	16	38	467	188	1474	259
450	10	235	259	862	16	42	520	120	1844	419
450	15	310	266	862	16	42	519	196	1847	429
450	18	315	269	862	16	42	520	202	1846	330
500	10	255	331	937	16	46	581	130	2291	707
500	15	320	344	937	16	46	581	195	2291	471
500	19	380	354	937	16	46	580	256	2291	507
600	6	245	509	1080	16	55	683	101	3240	1545
600	13	350	534	1080	16	55	683	202	3240	773
600	18	410	549	1080	16	55	686	266	3258	738
<b>ANGULAR EXPANSION JOINT with fixed flanges · type WN F-F · nominal pressure PN 25</b>										
50	14	90	12	281	40	20	84	26	42.1	5
50	23	110	12	281	40	20	84	44	42.1	3
50	29	125	12	281	40	20	84	61	41.8	5
65	17	110	16	301	40	22	103	42	64.1	11
65	21	120	16	301	40	22	103	53	64.1	9
65	26	130	16	301	40	22	103	63	64.1	7
80	17	115	21	328	40	24	118	44	86	14
80	21	125	21	328	40	24	118	55	86	12
80	26	135	21	328	40	24	118	66	86	10
100	14	115	27	363	40	26	144	46	125	23
100	23	145	28	363	40	26	144	76	125	14
100	28	165	28	363	40	26	144	96	125	20
125	13	130	38	412	40	28	176	53	189	42
125	22	165	39	412	40	28	176	88	189	25
125	27	195	41	412	40	28	178	118	189	38
150	12	145	50	452	40	30	210	61	271	63
150	20	185	52	452	40	30	210	101	271	38
150	29	280	58	452	40	30	212	152	271	70
200	11	160	73	520	25	32	269	69	453	133
200	14	180	75	520	25	32	269	92	453	100
200	23	305	86	520	25	32	271	174	453	113
250	9	170	109	615	25	35	323	72	679	241
250	14	240	117	615	25	35	323	144	679	121
250	19	270	117	615	25	35	322	176	681	162
300	11	205	171	707	25	38	380	103	948	395
300	14	230	175	707	25	38	380	128	948	316
300	18	285	183	707	25	38	380	180	948	226
350	11	220	225	777	25	42	414	109	1137	457
350	14	250	230	777	25	42	414	136	1137	366
350	17	275	234	777	25	42	414	164	1137	305
400	8	220	289	842	25	48	470	90	1474	871
400	13	280	300	842	25	48	470	150	1474	523
400	17	320	303	842	25	48	468	196	1473	469
450	8	240	378	910	25	54	523	96	1848	1103

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Angular adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	$\Delta\alpha$	BL	G	H	PN	C1	Da	Lb	Ae	$C/\Delta\alpha$
-	Degrees	mm	kg	mm	-	mm	mm	mm	cm <sup>2</sup>	Nm/Degrees
450	13	300	393	910	25	54	523	160	1848	662
450	17	380	403	910	25	54	519	240	1837	567
500	7	255	450	970	25	58	574	102	2256	1495
500	13	320	467	970	25	58	575	170	2259	870
500	18	390	485	970	25	58	581	238	2284	755

**Design:** All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

# ANGULAR EXPANSION JOINT with welding ends

# Type WN R-R

**TYPE WN R-R ≥ DN 100**



**TYPE WN R-R ≤ DN 80**



**Tasks**

- › Absorption of one-sided angular movements
- › Reduction of tensions in the pipe system
- › Absorption of large movements in two-joint and three-joint pipe systems
- › Reduction of forces and moments in connections

**Areas of application**

- › Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building
- › Food processing industry
- › Gas, water supply, building and heating technology
- › Energy and offshore technology, oil and gas production
- › Chemical and pharmaceutical industry, acid production
- › Paper, textile, cellulose and paint industry
- › Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

## Design type WN R-R

HKS angular expansion joint with compact design, consisting of multi-convolution and multi-layered metal bellows with welding ends (pipe nozzle) made of standardised pipes in line with EN 10216/10217 ff or rolled sheet metal in line with EN 10028 ff and joint tensioners for absorbing the axial reaction forces.

Materialcombination <sup>1)</sup>	Component		Permitted operating temperature TS <sup>2)</sup>
	Metal bellows	Welding end, joint tensioners <sup>4)</sup>	
<b>Standard</b> <sup>3)</sup>	1.4541 (X6CrNiTi18-10)	1.0345 (P235GH)	-10 °C bis 400 °C
<b>Stainless steel</b>	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		-196 °C bis 550 °C
<b>Heat resistant steel</b>	1.4828 (X15CrNiSi20-12)		bis 900 °C
<b>Nickel-base alloy</b>	2.4858 (NiCr21Mo - Incoloy 825)		-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.
4. Selection of the Material combination depending on installation and ambient conditions.

## Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

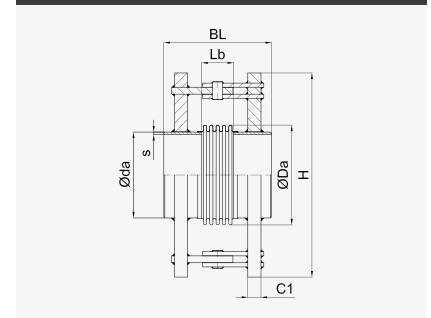
**Expansions:**

- › Inner sleeve, telescopic inner sleeve or conical inner sleeve
- › External protective sleeve or telescopic inner sleeve

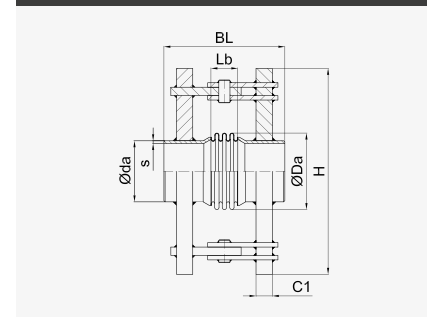
**On customer request:**

- › With 30° groove or special dimensions
- › With special coating, galvanised or hot galvanised
- › Connection variants with swivel, fixed or welding neck flanges

**DN 100 - DN 800**



**DN 50 - DN 80**



Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Angular adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	$\Delta\alpha$	BL	G	H	da	s	Da	Lb	Ae	$C/\Delta\alpha$
-	Degrees	mm	kg	mm	mm	mm	mm	mm	cm <sup>2</sup>	Nm/Degrees

**ANGULAR EXPANSION JOINT with welding ends · type WN R-R · nominal pressure PN 6**

50	19	260	3.9	200	60.3	2.9	84	30	42.5	3
50	28	275	4	200	60.3	2.9	84	44	42.5	2
50	38	290	4.1	200	60.3	2.9	84	59	42.5	2
65	17	265	4.8	221	76.1	2.9	105	33	66.4	3
65	26	280	4.9	221	76.1	2.9	105	49	66.4	2
65	37	295	4.8	216	76.1	2.9	100	64	62.8	3
80	19	275	5.6	234	88.9	3.2	118	45	87	5
80	29	300	5.8	234	88.9	3.2	118	67	87	3
80	41	325	6.2	234	88.9	3.2	118	95	86.6	5
100	18	285	7.4	258	114.3	3.6	142	53	132	10
100	27	310	7.6	258	114.3	3.6	142	80	132	7
100	38	340	8.1	258	114.3	3.6	142	111	132	8
125	18	290	9.6	290	139.7	4.0	174	60	196	9
125	30	355	11	290	139.7	4.0	174	122	197	10
125	37	375	12	291	139.7	4.0	175	144	198	13
150	17	295	13	323	168.3	4.5	207	66	280	11
150	27	350	14	323	168.3	4.5	207	118	281	13
150	33	370	15	324	168.3	4.5	208	141	282	17
200	14	305	22	393	219.1	6.3	265	74	465	26
200	25	365	24	394	219.1	6.3	266	135	467	23
200	33	465	33	395	219.1	6.3	267	225	469	45
250	13	320	37	463	273	6.3	321	79	699	41
250	22	380	39	463	273	6.3	321	140	700	44
250	30	460	46	465	273	6.3	323	220	705	62
300	14	345	50	526	323.9	7.1	374	104	963	47
300	23	440	57	528	323.9	7.1	376	200	970	68
300	29	470	60	529	323.9	7.1	377	228	972	102
350	11	330	57	558	355.6	8.0	406	90	1146	75
350	23	430	65	563	355.6	8.0	411	191	1163	82
350	28	485	69	564	355.6	8.0	412	244	1165	109
400	11	340	72	624	406.4	8.0	464	96	1498	132
400	18	420	80	626	406.4	8.0	466	177	1502	84
400	26	545	89	626	406.4	8.0	466	303	1502	167
450	10	355	100	680	457	8.0	520	106	1884	247
450	18	440	108	680	457	8.0	520	189	1886	128
450	24	500	114	681	457	8.0	521	249	1889	166
500	10	365	115	737	508	8.0	577	114	2322	255
500	18	450	121	737	508	8.0	577	199	2322	146
500	23	530	138	739	508	8.0	579	278	2332	229
600	11	400	171	881	610	8.0	681	148	3285	310

**Design:** All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.



Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Angular adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	$\Delta\alpha$	BL	G	H	da	s	Da	Lb	Ae	$C\Delta\alpha$
-	Degrees	mm	kg	mm	mm	mm	mm	mm	cm <sup>2</sup>	Nm/Degrees
600	18	510	216	884	610	8.0	684	247	3301	269
600	23	580	233	885	610	8.0	685	320	3308	486
700	8	390	267	1012	711	8.0	790	130	4440	679
700	14	490	286	1012	711	8.0	790	230	4442	310
700	18	575	316	1014	711	8.0	792	314	4454	506
800	8	405	320	1121	813	8.0	899	144	5776	618
800	12	475	331	1121	813	8.0	899	214	5773	515
800	16	545	340	1121	813	8.0	899	282	5770	582
<b>ANGULAR EXPANSION JOINT with welding ends · type WN R-R · nominal pressure PN 10</b>										
50	19	260	3.9	200	60.3	2.9	84	30	42.5	3
50	28	275	4	200	60.3	2.9	84	44	42.5	2
50	36	325	4.6	200	60.3	2.9	84	95	41.8	3
65	17	265	4.5	216	76.1	2.9	100	32	62.8	5
65	26	280	4.7	216	76.1	2.9	100	48	62.8	3
65	36	305	5.4	221	76.1	2.9	105	76	65.5	5
80	16	275	5.4	230	88.9	3.2	114	45	83.2	8
80	25	300	5.5	230	88.9	3.2	114	68	83.2	5
80	35	330	6.4	234	88.9	3.2	118	99	86	7
100	17	285	7.8	258	114.3	3.6	142	53	132	10
100	26	310	8.1	258	114.3	3.6	142	80	132	7
100	32	330	8.4	258	114.3	3.6	142	97	132	9
125	18	290	9.8	287	139.7	4.0	171	60	194	11
125	23	310	11	290	139.7	4.0	174	77	197	11
125	31	345	12	291	139.7	4.0	175	112	198	17
150	17	310	18	335	168.3	4.5	207	68	281	22
150	27	360	20	335	168.3	4.5	207	121	281	23
150	32	395	22	337	168.3	4.5	209	154	284	30
200	14	315	30	407	219.1	6.3	265	76	466	48
200	25	380	33	408	219.1	6.3	266	139	468	42
200	34	500	40	410	219.1	6.3	268	260	472	91
250	13	330	48	473	273	6.3	321	80	699	78
250	22	400	52	474	273	6.3	322	147	703	66
250	28	480	59	476	273	6.3	324	228	707	103
300	14	360	66	536	323.9	7.1	376	108	969	135
300	20	405	70	536	323.9	7.1	376	156	970	87
300	29	505	83	539	323.9	7.1	379	252	979	172
350	14	370	76	571	355.6	8.0	411	116	1162	145
350	20	415	78	571	355.6	8.0	411	163	1162	103
350	25	480	89	573	355.6	8.0	413	231	1169	163
400	11	350	99	652	406.4	8.0	462	98	1491	252
400	19	420	104	652	406.4	8.0	462	171	1491	144
400	24	515	138	658	406.4	8.0	468	252	1512	250
450	11	400	143	721	457	8.0	521	136	1887	447
450	16	425	147	721	457	8.0	521	166	1889	248
450	21	500	164	723	457	8.0	523	240	1898	315

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Angular adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	$\Delta\alpha$	BL	G	H	da	s	Da	Lb	Ae	$C/\Delta\alpha$
-	Degrees	mm	kg	mm	mm	mm	mm	mm	cm <sup>2</sup>	Nm/Degrees
500	10	380	182	800	508	8.0	578	119	2326	390
500	15	440	191	800	508	8.0	578	178	2326	260
500	23	540	211	801	508	8.0	579	278	2332	384
600	9	400	255	907	610	8.0	685	128	3308	720
600	16	495	273	907	610	8.0	685	224	3308	412
600	20	560	285	907	610	8.0	685	288	3308	540
700	8	415	385	1031	711	10.0	791	135	4446	914
700	14	515	408	1031	711	10.0	791	236	4446	523
700	18	600	438	1033	711	10.0	793	317	4456	911
<b>ANGULAR EXPANSION JOINT with welding ends · type WN R-R · nominal pressure PN 16</b>										
50	19	265	3.9	200	60.3	2.9	84	35	42.1	4
50	28	285	4.1	200	60.3	2.9	84	52	42.1	3
50	34	300	4.3	200	60.3	2.9	84	69	41.8	5
65	16	265	4.5	216	76.1	2.9	100	32	62.8	5
65	25	280	4.7	216	76.1	2.9	100	48	62.8	3
65	31	295	5.3	221	76.1	2.9	105	66	65.5	5
80	15	270	5.9	234	88.9	3.2	118	38	86	12
80	25	295	6.2	234	88.9	3.2	118	62	86	8
80	31	310	6.5	234	88.9	3.2	118	77	86	8
100	15	295	9.6	256	114.3	3.6	140	53	130	13
100	23	335	13	270	114.3	3.6	142	96	132	13
100	29	355	13	271	114.3	3.6	143	116	133	17
125	15	300	15	300	139.7	4.0	172	61	195	22
125	22	350	16	302	139.7	4.0	174	110	197	20
125	31	365	17	304	139.7	4.0	176	124	200	30
150	14	310	21	349	168.3	4.5	207	69	281	40
150	22	345	22	349	168.3	4.5	207	104	281	27
150	34	405	26	352	168.3	4.5	210	162	286	54
200	12	330	39	417	219.1	6.3	265	77	465	85
200	20	370	41	418	219.1	6.3	266	119	468	49
200	28	425	46	420	219.1	6.3	268	173	472	83
250	10	335	53	478	273	6.3	318	82	692	160
250	18	395	56	478	273	6.3	318	143	692	92
250	22	405	59	483	273	6.3	323	152	704	109
300	11	355	89	567	323.9	7.1	377	92	972	254
300	14	375	91	567	323.9	7.1	377	114	972	203
300	20	420	95	567	323.9	7.1	377	160	972	145
350	11	360	108	612	355.6	8.0	412	98	1165	275
350	14	385	111	611	355.6	8.0	411	124	1163	186
350	20	440	119	613	355.6	8.0	413	180	1169	209
400	8	370	160	686	406.4	8.0	464	101	1497	540

**Design:** All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Angular adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	$\Delta\alpha$	BL	G	H	da	s	Da	Lb	Ae	$C\Delta\alpha$
-	Degrees	mm	kg	mm	mm	mm	mm	mm	cm <sup>2</sup>	Nm/Degrees
400	14	450	170	686	406.4	8.0	464	177	1497	309
400	21	515	184	689	406.4	8.0	467	242	1508	333
450	8	360	181	744	457	8.0	522	87	1893	665
450	13	415	190	744	457	8.0	522	144	1893	399
450	23	545	216	746	457	8.0	524	274	1899	498
500	10	405	231	801	508	8.0	579	124	2332	864
500	15	465	241	801	508	8.0	579	185	2332	576
500	21	590	276	804	508	8.0	582	306	2346	646
600	6	380	317	923	610	10.0	683	100	3295	1392
600	11	450	332	923	610	10.0	683	166	3295	836
600	18	560	391	927	610	10.0	687	269	3316	812
<b>ANGULAR EXPANSION JOINT with welding ends · type WN R-R · nominal pressure PN 25</b>										
50	15	265	4	200	60.3	2.9	84	35	41.8	9
50	25	285	4.2	200	60.3	2.9	84	52	41.8	6
50	29	290	4.2	200	60.3	2.9	84	61	41.8	5
65	17	285	6.5	219	76.1	2.9	103	42	64.1	11
65	21	295	6.6	219	76.1	2.9	103	53	64.1	9
65	26	305	6.7	219	76.1	2.9	103	63	64.1	7
80	17	285	9.3	246	88.9	3.2	118	44	86	14
80	21	295	9.5	246	88.9	3.2	118	55	86	12
80	26	305	9.7	246	88.9	3.2	118	66	86	10
100	14	310	12	268	114.3	3.6	140	68	130	21
100	21	340	13	271	114.3	3.6	143	101	133	19
100	27	330	13	271	114.3	3.6	143	90	133	20
125	14	330	21	314	139.7	4.0	172	78	194	36
125	21	350	22	317	139.7	4.0	175	100	199	36
125	28	400	25	319	139.7	4.0	177	149	201	48
150	13	340	29	358	168.3	4.5	206	88	279	61
150	21	345	30	359	168.3	4.5	207	92	280	43
150	24	365	31	361	168.3	4.5	209	116	284	56
200	9	340	51	427	219.1	6.3	267	80	468	181
200	16	365	52	426	219.1	6.3	266	102	467	106
200	20	390	55	428	219.1	6.3	268	131	472	86
250	10	380	86	510	273	7.1	320	106	696	274
250	16	385	89	514	273	7.1	324	115	707	158
250	19	410	91	514	273	7.1	324	137	707	171
300	11	370	133	599	323.9	8.0	377	96	973	356
300	15	440	143	599	323.9	8.0	377	168	973	204
300	20	450	146	601	323.9	8.0	379	177	979	245
350	11	410	163	635	355.6	8.0	413	128	1169	490
350	14	415	165	636	355.6	8.0	414	134	1173	370
350	20	500	179	637	355.6	8.0	415	218	1174	410
400	8	390	185	686	406.4	10.0	464	108	1496	897
400	13	420	193	688	406.4	10.0	466	140	1505	496
400	16	450	197	688	406.4	10.0	466	168	1505	413

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Angular adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	$\Delta\alpha$	BL	G	H	da	s	Da	Lb	Ae	$C\Delta\alpha$
-	Degrees	mm	kg	mm	mm	mm	mm	mm	cm <sup>2</sup>	Nm/Degrees
450	7	385	258	764	457	10.0	524	92	1899	1494
450	12	445	270	764	457	10.0	524	152	1899	897
450	17	505	282	764	457	10.0	524	213	1899	641
500	7	390	286	815	508	10.0	575	98	2316	1939
500	12	455	300	815	508	10.0	575	162	2316	1163
500	18	540	410	862	508	10.0	582	238	2346	830

**Design:** All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

# ANGULAR EXPANSION JOINT with fixed flanges

# Type KN F-F

**TYPE KN F-F  $\geq$  DN 100**



**TYPE KN F-F  $\leq$  DN 80**



## Design type KN F-F

HKS angular expansion joint with compact design, consisting of multi-convolution and multi-layered metal bellows with standardised fixed flanges in line with EN 1092-1 type 01 and joint tensioners for absorbing the axial reaction forces.

### Tasks

- › Absorption of all-around angular movements
- › Reduction of tensions in the pipe system
- › Absorption of large movements in two-joint and three-joint pipe systems
- › Reduction of forces and moments in connections

### Areas of application

- › Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building
- › Food processing industry
- › Gas and water supply, building and heating technology
- › Energy and offshore technology, oil and gas production
- › Chemical and pharmaceutical industry, acid production
- › Paper, textile, cellulose and paint industry
- › Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

Materialcombination <sup>1)</sup>	Component		Permitted operating temperature TS <sup>2)</sup>
	Metal bellows	Flange, joint tensioners <sup>4)</sup>	
<b>Standard <sup>3)</sup></b>	1.4541 (X6CrNiTi18-10)	1.0038 (S235JR)	-10 °C bis 300 °C
<b>Stainless steel</b>	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		-196 °C bis 550 °C
<b>Heat resistant steel</b>	1.4828 (X15CrNiSi20-12)		bis 900 °C
<b>Nickel-base alloy</b>	2.4858 (NiCr21Mo - Incoloy 825)		-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.
4. Selection of the Material combination depending on installation and ambient conditions.

## Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

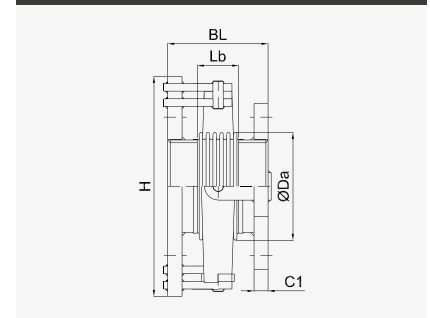
### Expansions:

- › Inner sleeve, telescopic inner sleeve or conical inner sleeve
- › External protective sleeve or telescopic inner sleeve

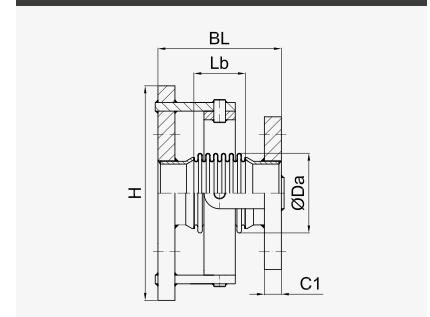
### On customer request:

- › Flanges in line with ASME, JIS, BS
- › With special coating, galvanised or hot galvanised
- › Connection variants with weld end or swivel flanges

**DN 100 - DN 700**



**DN 50 - DN 80**



Expansion joints with a nominal pressure  $\leq$  0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Angular adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	$\Delta\alpha$	BL	G	H	PN	C1	Da	Lb	Ae	C $\Delta\alpha$
-	Degrees	mm	kg	mm	-	mm	mm	mm	cm <sup>2</sup>	Nm/Degrees

**ANGULAR EXPANSION JOINT with fixed flanges · type KN F-F · nominal pressure PN 6**

50	19	90	9	256	6	16	84	30	42.5	3
50	33	115	9.2	256	6	16	84	52	42.5	2
50	42	140	9.5	256	6	16	84	78	42.1	2
65	17	95	11	276	6	16	105	33	66.4	3
65	26	110	11	276	6	16	105	49	66.4	2
65	37	125	11	276	6	16	100	64	62.8	3
80	18	105	15	306	6	18	118	43	86.6	10
80	27	130	15	306	6	18	118	64	86.6	7
80	41	160	15	306	6	18	118	95	86.6	5
100	17	140	16	326	6	18	142	80	125	4
100	29	140	17	326	6	18	142	83	125	5
100	39	175	17	326	6	18	143	116	125	7
125	18	120	25	370	6	20	173	60	188	5
125	27	185	23	356	6	20	174	92	189	7
125	37	240	24	356	6	20	175	144	189	13
150	15	195	27	381	6	20	207	101	271	9
150	25	200	28	381	6	20	208	106	271	12
150	34	235	28	381	6	20	208	141	271	18
200	14	175	43	448	6	22	265	76	453	30
200	22	210	44	448	6	22	265	113	453	20
200	33	290	51	448	6	22	268	195	453	38
250	13	180	64	517	6	24	321	80	684	48
250	19	220	65	517	6	24	321	120	684	32
250	32	315	72	517	6	24	323	212	684	68
300	14	215	91	592	6	24	375	106	948	53
300	20	260	94	592	6	24	376	152	948	62
300	29	330	99	592	6	24	377	224	948	94
350	14	280	124	642	6	26	412	199	1139	67
350	20	240	126	656	6	26	411	163	1139	68
350	27	320	124	642	6	26	412	240	1139	104
400	11	215	165	720	6	28	465	98	1474	149
400	16	265	155	700	6	28	465	150	1474	87
400	22	320	161	700	6	28	466	205	1474	106
450	13	255	198	765	6	30	520	135	1856	120
450	18	315	195	755	6	30	521	194	1856	140
450	24	365	198	755	6	30	521	245	1856	167
500	10	240	278	865	6	30	578	120	2291	208
500	15	305	256	835	6	30	579	186	2291	169
500	26	420	235	805	6	30	578	300	2291	294
600	11	295	388	975	6	32	685	161	3258	288

**Design:** All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Angular adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	$\Delta\alpha$	BL	G	H	PN	C1	Da	Lb	Ae	$C\Delta\alpha$
-	Degrees	mm	kg	mm	-	mm	mm	mm	cm <sup>2</sup>	Nm/Degrees
600	16	345	360	955	6	32	684	216	3258	216
600	20	420	378	955	6	32	685	288	3258	363
700	9	415	571	1082	6	40	791	269	4389	312
700	12	345	610	1112	6	40	788	197	4375	277
700	16	405	557	1082	6	40	790	256	4389	376
<b>ANGULAR EXPANSION JOINT with fixed flanges · type KN F-F · nominal pressure PN 10</b>										
50	18	180	15	281	16	20	84	112	41.8	3
50	28	120	14	281	16	20	84	52	42.1	3
50	39	145	14	281	16	20	84	78	41.8	4
65	17	105	16	301	16	20	107	39	67.4	4
65	27	125	16	301	16	20	105	59	65.1	5
65	31	135	16	301	16	20	105	68	65.1	4
80	14	155	18	316	16	20	114	90	83.2	4
80	25	135	18	316	16	20	114	68	83.2	5
80	35	165	19	316	16	20	118	99	86	7
100	14	220	24	336	16	22	143	159	125	10
100	26	145	23	340	16	22	142	82	125	7
100	38	185	24	336	16	22	143	120	125	12
125	17	160	28	366	16	22	175	96	189	10
125	27	165	31	374	16	22	175	100	189	17
125	36	200	30	366	16	22	176	138	189	20
150	17	170	41	413	16	24	207	104	271	15
150	25	215	42	413	16	24	208	110	271	21
150	33	270	45	413	16	24	210	160	271	31
200	14	190	61	482	10	24	267	80	453	31
200	22	225	61	482	10	24	266	116	453	32
200	33	300	68	482	10	24	268	195	453	63
250	13	195	87	547	10	26	322	85	682	52
250	19	235	88	547	10	26	321	123	683	53
250	31	355	103	547	10	26	326	244	684	113
300	14	230	117	605	10	26	377	116	948	95
300	20	270	119	605	10	26	377	160	948	87
300	26	330	127	605	10	26	378	216	948	143
350	14	260	160	665	10	30	412	171	1139	96
350	20	265	179	685	10	30	413	180	1139	121
350	25	320	168	665	10	30	413	231	1139	159
400	13	320	239	755	10	32	468	224	1474	159
400	19	290	256	775	10	32	468	196	1474	182
400	24	350	237	755	10	32	466	260	1474	238
450	14	365	309	815	10	36	522	260	1856	234
450	18	315	331	835	10	36	523	210	1856	213
450	24	395	328	815	10	36	525	288	1856	341
500	10	340	395	892	10	38	573	234	2270	242
500	15	355	406	892	10	38	579	247	2291	282

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Angular adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	$\Delta\alpha$	BL	G	H	PN	C1	Da	Lb	Ae	C $\Delta\alpha$
-	Degrees	mm	kg	mm	-	mm	mm	mm	cm <sup>2</sup>	Nm/Degrees
500	23	400	420	892	10	38	580	288	2291	451
600	9	380	541	1002	10	42	681	224	3236	321
600	14	415	550	1002	10	42	685	256	3258	408
600	18	425	562	1002	10	42	687	269	3258	513
<b>ANGULAR EXPANSION JOINT with fixed flanges · type KN F-F · nominal pressure PN 16</b>										
50	17	125	14	281	16	20	84	61	42.1	3
50	23	110	14	281	16	20	84	44	42.1	3
50	34	135	14	281	16	20	84	69	41.8	5
65	9	120	16	301	16	20	100	56	62.8	3
65	16	135	17	301	16	20	105	68	65.1	4
65	31	140	17	301	16	20	103	73	64.1	6
80	8	165	24	328	16	20	118	97	85.5	6
80	16	140	23	328	16	20	118	74	86.6	6
80	23	140	24	328	16	20	118	75	86	6
100	10	195	28	348	16	22	143	130	125	12
100	27	155	28	348	16	22	144	92	125	12
100	34	175	29	348	16	22	144	112	125	17
125	19	215	36	378	16	22	177	148	189	24
125	25	185	34	378	16	22	176	121	189	22
125	31	195	36	378	16	22	177	129	189	28
150	16	160	51	437	16	24	207	92	269	21
150	21	200	49	427	16	24	208	91	271	25
150	32	270	53	427	16	24	210	160	271	50
200	14	195	75	492	16	26	266	84	451	56
200	22	240	78	492	16	26	268	130	453	56
200	28	295	84	492	16	26	270	186	453	86
250	13	220	122	575	16	29	324	92	684	104
250	19	255	115	565	16	29	321	130	678	83
250	23	310	121	565	16	29	324	183	684	115
300	11	275	178	650	16	32	377	146	945	102
300	17	275	178	650	16	32	378	144	948	127
300	20	325	183	650	16	32	378	192	948	161
350	8	345	256	720	16	35	415	245	1139	196
350	13	305	247	720	16	35	413	205	1139	179
350	21	320	253	720	16	35	415	218	1139	221
400	9	320	350	802	16	38	467	215	1474	226
400	13	340	350	802	16	38	466	234	1474	265
400	21	410	377	802	16	38	470	300	1474	393
450	10	360	435	862	16	42	524	244	1856	327
450	14	440	457	862	16	42	525	320	1856	461
450	17	385	438	862	16	42	523	270	1856	418

**Design:** All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.



Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Angular adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	$\Delta\alpha$	BL	G	H	PN	C1	Da	Lb	Ae	$C\Delta\alpha$
-	Degrees	mm	kg	mm	-	mm	mm	mm	cm <sup>2</sup>	Nm/Degrees

**ANGULAR EXPANSION JOINT with fixed flanges · type KN F-F · nominal pressure PN 25**

50	10	120	14	281	40	20	84	52	42.1	3
50	21	135	14	281	40	20	84	69	41.8	5
50	29	125	15	281	40	20	84	61	41.8	5
65	9	145	19	301	40	22	105	59	65.1	5
65	14	155	19	301	40	22	103	73	64.1	6
65	23	140	19	301	40	22	105	57	65.5	6
80	13	165	27	328	40	24	118	77	86	8
80	17	145	27	328	40	24	114	59	82.7	18
80	21	140	27	328	40	24	118	55	86	12
100	11	195	36	363	40	26	144	125	125	18
100	20	160	35	363	40	26	143	90	125	16
100	32	190	36	363	40	26	145	118	125	26
125	11	210	53	412	40	28	176	135	189	30
125	21	225	54	412	40	28	177	148	189	39
125	27	240	56	412	40	28	179	160	189	47
150	11	240	73	452	40	30	210	160	271	50
150	21	255	75	452	40	30	211	128	271	48
150	29	280	76	452	40	30	212	152	271	70
200	12	240	110	520	25	32	268	152	453	80
200	18	250	113	520	25	32	270	163	453	98
200	23	305	118	520	25	32	271	174	453	113
250	8	405	196	615	25	35	327	260	684	195
250	14	360	186	615	25	35	325	216	684	181
250	19	290	179	615	25	35	326	147	684	188
300	7	380	311	707	25	38	381	272	948	274
300	12	330	298	707	25	38	379	227	948	253
300	18	350	307	707	25	38	381	245	948	305

**Design:** All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.



# ANGULAR EXPANSION JOINT with welding ends

# Type KN R-R

**TYPE KN R-R ≥ DN 100**



**TYPE KN R-R ≤ DN 80**



**Tasks**

- › Absorption of all-around angular movements
- › Reduction of tensions in the pipe system
- › Absorption of large movements in two-joint and three-joint pipe systems
- › Reduction of forces and moments in connections

**Areas of application**

- › Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building
- › Food processing industry
- › Gas and water supply, building and heating technology
- › Energy and offshore technology, oil and gas production
- › Chemical and pharmaceutical industry, acid production
- › Paper, textile, cellulose and paint industry
- › Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

## Design type KN R-R

HKS angular expansion joint with compact design, consisting of multi-convolution and multi-layered metal bellows with welding ends (pipe nozzle) made of standardised pipes in line with EN 10216/10217 ff or rolled sheet metal in line with EN 10028 ff and joint tensioners for absorbing the axial reaction forces.

Materialcombination <sup>1)</sup>	Component		Permitted operating temperature TS <sup>2)</sup>
	Metal bellows	Welding end, joint tensioners <sup>4)</sup>	
<b>Standard <sup>3)</sup></b>	1.4541 (X6CrNiTi18-10)	1.0345 (P235GH)	-10 °C bis 400 °C
<b>Stainless steel</b>	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		-196 °C bis 550 °C
<b>Heat resistant steel</b>	1.4828 (X15CrNiSi20-12)		bis 900 °C
<b>Nickel-base alloy</b>	2.4858 (NiCr21Mo - Incoloy 825)		-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.
4. Selection of the Material combination depending on installation and ambient conditions.

## Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

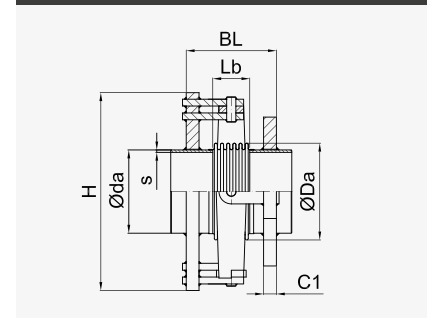
**Expansions:**

- › Inner sleeve, telescopic inner sleeve or conical inner sleeve
- › External protective sleeve or telescopic inner sleeve

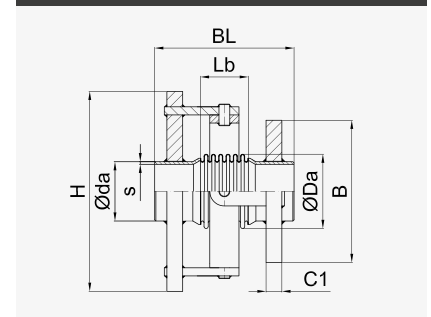
**On customer request:**

- › With 30° groove or special dimensions
- › With special coating, galvanised or hot galvanised
- › Connection variants with swivel, fixed or welding neck flanges

**DN100 - DN 800**



**DN 50 - DN 80**



Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Angular adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	$\Delta\alpha$	BL	G	H	da	s	Da	Lb	Ae	$C\Delta\alpha$
-	Degrees	mm	kg	mm	mm	mm	mm	mm	cm <sup>2</sup>	Nm/Degrees

**ANGULAR EXPANSION JOINT with welding ends · type KN R-R · nominal pressure PN 6**

50	19	260	5.8	230	60.3	2.9	84	30	42.5	3
50	28	275	5.9	230	60.3	2.9	84	44	42.5	2
50	38	290	6.1	230	60.3	2.9	84	59	42.5	2
65	17	265	6.9	251	76.1	2.9	105	33	66.4	3
65	26	280	7.1	251	76.1	2.9	105	49	66.4	2
65	37	295	7	246	76.1	2.9	100	64	62.8	3
80	19	275	7.9	264	88.9	3.2	118	45	87	5
80	29	300	8.1	264	88.9	3.2	118	67	87	3
80	41	325	8.5	264	88.9	3.2	118	95	86.6	5
100	18	285	11	288	114.3	3.6	142	53	132	10
100	27	310	11	288	114.3	3.6	142	80	132	7
100	38	340	11	288	114.3	3.6	142	111	132	8
125	18	290	14	320	139.7	4.0	174	60	196	9
125	30	355	15	320	139.7	4.0	174	122	197	10
125	37	375	15	321	139.7	4.0	175	144	198	13
150	17	295	18	353	168.3	4.5	207	66	280	11
150	27	350	19	353	168.3	4.5	207	118	281	13
150	33	370	20	354	168.3	4.5	208	141	282	17
200	14	315	37	423	219.1	6.3	265	74	465	26
200	25	375	39	424	219.1	6.3	266	135	467	23
200	33	465	44	425	219.1	6.3	267	225	469	45
250	13	320	54	493	273	6.3	321	79	699	41
250	22	380	57	493	273	6.3	321	140	700	44
250	30	460	64	495	273	6.3	323	220	705	62
300	14	345	77	556	323.9	7.1	374	104	963	47
300	23	440	84	558	323.9	7.1	376	200	970	68
300	29	470	87	559	323.9	7.1	377	228	972	102
350	11	330	88	588	355.6	8.0	406	90	1146	75
350	23	440	108	593	355.6	8.0	411	191	1163	82
350	28	495	113	594	355.6	8.0	412	244	1165	109
400	11	350	131	654	406.4	8.0	464	96	1498	132
400	18	430	139	656	406.4	8.0	466	177	1502	84
400	26	555	148	656	406.4	8.0	466	303	1502	167
450	10	355	158	710	457	8.0	520	106	1884	247
450	18	440	165	710	457	8.0	520	189	1886	128
450	24	500	172	711	457	8.0	521	249	1889	166
500	10	365	187	767	508	8.0	577	114	2322	255
500	18	450	193	767	508	8.0	577	199	2322	146
500	23	530	210	769	508	8.0	579	278	2332	229
600	11	410	331	911	610	8.0	681	148	3285	310
600	18	510	350	914	610	8.0	684	247	3301	269

**Design:** All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Angular adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	$\Delta\alpha$	BL	G	H	da	s	Da	Lb	Ae	$C\Delta\alpha$
-	Degrees	mm	kg	mm	mm	mm	mm	mm	cm <sup>2</sup>	Nm/Degrees
600	23	580	368	915	610	8.0	685	320	3308	486
700	8	390	487	1042	711	8.0	790	130	4440	679
700	14	490	491	1042	711	8.0	790	230	4442	310
700	18	575	522	1044	711	8.0	792	314	4454	506
800	10	450	720	1169	813	8.0	899	180	5776	495
800	12	485	671	1151	813	8.0	899	214	5773	515
800	16	555	658	1151	813	8.0	899	282	5770	582
<b>ANGULAR EXPANSION JOINT with welding ends · type KN R-R · nominal pressure PN 10</b>										
50	19	260	5.8	230	60.3	2.9	84	30	42.5	3
50	28	275	5.9	230	60.3	2.9	84	44	42.5	2
50	36	325	6.6	230	60.3	2.9	84	95	41.8	3
65	17	265	6.7	246	76.1	2.9	100	32	62.8	5
65	26	280	6.8	246	76.1	2.9	100	48	62.8	3
65	36	305	7.6	251	76.1	2.9	105	76	65.5	5
80	16	275	7.7	260	88.9	3.2	114	45	83.2	8
80	25	300	7.8	260	88.9	3.2	114	68	83.2	5
80	35	330	8.8	264	88.9	3.2	118	99	86	7
100	17	285	12	288	114.3	3.6	142	53	132	10
100	26	310	12	288	114.3	3.6	142	80	132	7
100	32	330	12	288	114.3	3.6	142	97	132	9
125	18	300	18	317	139.7	4.0	171	60	194	11
125	23	320	18	320	139.7	4.0	174	77	197	11
125	31	355	19	321	139.7	4.0	175	112	198	17
150	17	310	27	365	168.3	4.5	207	68	281	22
150	27	360	28	365	168.3	4.5	207	121	281	23
150	32	395	30	367	168.3	4.5	209	154	284	30
200	14	315	45	437	219.1	6.3	265	76	466	48
200	25	380	48	438	219.1	6.3	266	139	468	42
200	34	510	62	440	219.1	6.3	268	260	472	91
250	13	330	73	503	273	6.3	321	80	699	78
250	22	400	77	504	273	6.3	322	147	703	66
250	28	480	85	506	273	6.3	324	228	707	103
300	14	360	103	566	323.9	7.1	376	108	969	135
300	20	405	107	566	323.9	7.1	376	156	970	87
300	29	505	121	569	323.9	7.1	379	252	979	172
350	14	370	120	601	355.6	8.0	411	116	1162	145
350	20	415	123	601	355.6	8.0	411	163	1162	103
350	25	480	133	603	355.6	8.0	413	231	1169	163
400	11	360	182	682	406.4	8.0	462	98	1491	252
400	19	430	188	682	406.4	8.0	462	171	1491	144
400	24	515	209	688	406.4	8.0	468	252	1512	250
450	11	400	238	751	457	8.0	521	136	1887	447
450	16	425	243	751	457	8.0	521	166	1889	248
450	21	500	260	753	457	8.0	523	240	1898	315

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Angular adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	$\Delta\alpha$	BL	G	H	da	s	Da	Lb	Ae	$C\Delta\alpha$
-	Degrees	mm	kg	mm	mm	mm	mm	mm	cm <sup>2</sup>	Nm/Degrees
500	10	390	342	830	508	8.0	578	119	2326	390
500	15	450	351	830	508	8.0	578	178	2326	260
500	23	550	372	831	508	8.0	579	278	2332	384
600	11	430	468	937	610	8.0	685	160	3308	576
600	16	495	465	937	610	8.0	685	224	3308	412
600	20	560	477	937	610	8.0	685	288	3308	540
700	8	520	692	1057	711	10.0	787	237	4423	457
700	14	515	735	1061	711	10.0	791	236	4446	523
700	18	600	727	1063	711	10.0	793	317	4456	911
<b>ANGULAR EXPANSION JOINT with welding ends · type KN R-R · nominal pressure PN 16</b>										
50	19	265	5.9	230	60.3	2.9	84	35	42.1	4
50	28	285	6.1	230	60.3	2.9	84	52	42.1	3
50	34	300	6.3	230	60.3	2.9	84	69	41.8	5
65	16	275	8.3	246	76.1	2.9	100	32	62.8	5
65	25	290	8.5	246	76.1	2.9	100	48	62.8	3
65	31	305	9	251	76.1	2.9	105	66	65.5	5
80	15	280	11	264	88.9	3.2	118	38	86	12
80	25	305	11	264	88.9	3.2	118	62	86	8
80	31	320	11	264	88.9	3.2	118	77	86	8
100	15	295	18	298	114.3	3.6	140	53	130	13
100	23	335	18	300	114.3	3.6	142	96	132	13
100	29	355	19	301	114.3	3.6	143	116	133	17
125	15	300	22	330	139.7	4.0	172	61	195	22
125	22	350	23	332	139.7	4.0	174	110	197	20
125	31	365	25	334	139.7	4.0	176	124	200	30
150	14	320	37	379	168.3	4.5	207	69	281	40
150	22	355	38	379	168.3	4.5	207	104	281	27
150	34	415	42	382	168.3	4.5	210	162	286	54
200	12	330	60	447	219.1	6.3	265	77	465	85
200	20	370	62	448	219.1	6.3	266	119	468	49
200	28	425	67	450	219.1	6.3	268	173	472	83
250	10	345	94	508	273	6.3	318	82	692	160
250	18	405	97	508	273	6.3	318	143	692	92
250	22	415	101	513	273	6.3	323	152	704	109
300	11	355	146	597	323.9	7.1	377	92	972	254
300	14	375	148	597	323.9	7.1	377	114	972	203
300	20	420	152	597	323.9	7.1	377	160	972	145
350	11	370	195	642	355.6	8.0	412	98	1165	275
350	14	395	198	641	355.6	8.0	411	124	1163	186
350	20	450	206	643	355.6	8.0	413	180	1169	209
400	8	370	276	716	406.4	8.0	464	101	1497	540
400	14	450	286	716	406.4	8.0	464	177	1497	309

**Design:** All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Angular adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	$\Delta\alpha$	BL	G	H	da	s	Da	Lb	Ae	$C\Delta\alpha$
-	Degrees	mm	kg	mm	mm	mm	mm	mm	cm <sup>2</sup>	Nm/Degrees
400	21	515	301	719	406.4	8.0	467	242	1508	333
450	8	370	347	774	457	8.0	522	87	1893	665
450	13	425	345	774	457	8.0	522	144	1893	399
450	23	555	372	776	457	8.0	524	274	1899	498
500	10	430	401	830	508	8.0	578	150	2329	870
500	15	465	410	831	508	8.0	579	185	2332	576
500	21	590	446	834	508	8.0	582	306	2346	646
600	8	580	644	950	610	10.0	680	288	3282	659
600	14	525	641	953	610	10.0	683	233	3295	597
600	18	560	657	957	610	10.0	687	269	3316	812
<b>ANGULAR EXPANSION JOINT with welding ends - type KN R-R - nominal pressure PN 25</b>										
50	15	275	7.1	230	60.3	2.9	84	35	41.8	9
50	25	295	7.3	230	60.3	2.9	84	52	41.8	6
50	29	300	7.4	230	60.3	2.9	84	61	41.8	5
65	17	285	9.5	249	76.1	2.9	103	42	64.1	11
65	21	295	9.6	249	76.1	2.9	103	53	64.1	9
65	26	305	9.7	249	76.1	2.9	103	63	64.1	7
80	17	285	15	276	88.9	3.2	118	44	86	14
80	21	295	15	276	88.9	3.2	118	55	86	12
80	26	305	15	276	88.9	3.2	118	66	86	10
100	14	320	21	298	114.3	3.6	140	68	130	21
100	21	350	22	301	114.3	3.6	143	101	133	19
100	27	340	22	301	114.3	3.6	143	90	133	20
125	14	330	31	344	139.7	4.0	172	78	194	36
125	21	350	33	347	139.7	4.0	175	100	199	36
125	28	400	36	349	139.7	4.0	177	149	201	48
150	13	350	50	388	168.3	4.5	206	88	279	61
150	21	355	50	389	168.3	4.5	207	92	280	43
150	24	375	52	391	168.3	4.5	209	116	284	56
200	9	340	79	457	219.1	6.3	267	80	468	181
200	16	365	80	456	219.1	6.3	266	102	467	106
200	20	390	84	458	219.1	6.3	268	131	472	86
250	10	380	137	540	273	7.1	320	106	696	274
250	16	385	141	544	273	7.1	324	115	707	158
250	19	410	143	544	273	7.1	324	137	707	171
300	11	380	247	629	323.9	8.0	377	96	973	356
300	15	450	256	629	323.9	8.0	377	168	973	204
300	20	460	260	631	323.9	8.0	379	177	979	245
350	11	410	271	665	355.6	8.0	413	128	1169	490
350	14	415	274	666	355.6	8.0	414	134	1173	370
350	20	500	287	667	355.6	8.0	415	218	1174	410
400	10	425	339	716	406.4	10.0	464	134	1496	718
400	13	430	343	718	406.4	10.0	466	140	1505	496
400	16	460	348	718	406.4	10.0	466	168	1505	413

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Angular adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	$\Delta\alpha$	BL	G	H	da	s	Da	Lb	Ae	$C\Delta\alpha$
-	Degrees	mm	kg	mm	mm	mm	mm	mm	cm <sup>2</sup>	Nm/Degrees
450	7	420	484	793	457	10.0	523	120	1898	1576
450	13	510	488	793	457	10.0	523	210	1898	901
450	17	515	490	794	457	10.0	524	213	1899	641
500	8	650	753	892	508	10.0	582	340	2346	868
500	12	495	673	889	508	10.0	579	192	2331	1157
500	18	550	723	892	508	10.0	582	238	2346	830

**Design:** All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.