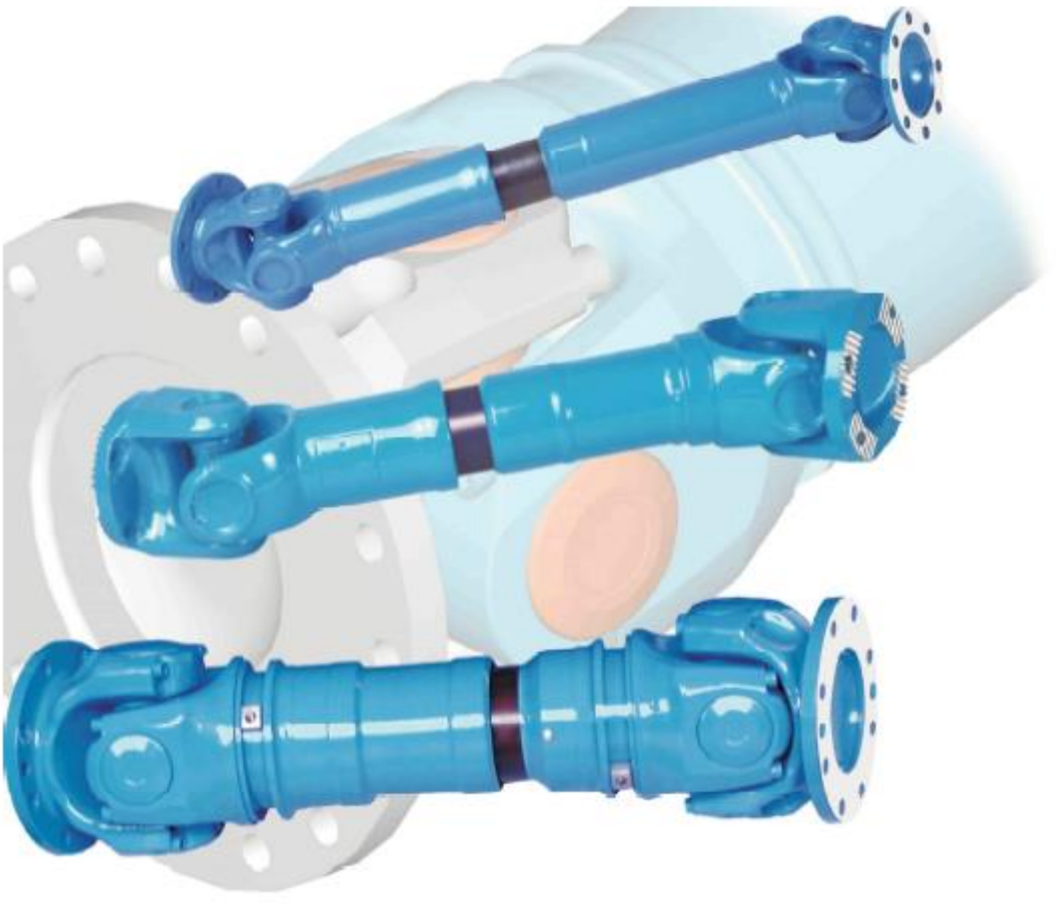
PRODUCT CATALOG
CARDAN SHAFTS



EXPLANATORY NOTES

MdB	Reference torque
MdG	Limiting torque Li Li
MdW	Alternating torque
KZ 41/45	Normal angle design
KZ 46	Wide angle design
β_{max}	Maximum joint deflection angle
LA	Length compensation
L_{min}	Shortest lenght
LZ_{min}	Shortest compressed length
LZ_{max}	Longest compressed length
LA_{min}	Lenght compensation for LZ_{min}
LA_{max}	Lenght compensation for LZ_{max}
$m/J/C_{min}$	Values for LZ_{min}
$m/J/C_{max}$	Values for LZ_{max}
mR, JR, CR	Values per 1 m tube length
MdB	Reference torque

SURVEY OF SIZES

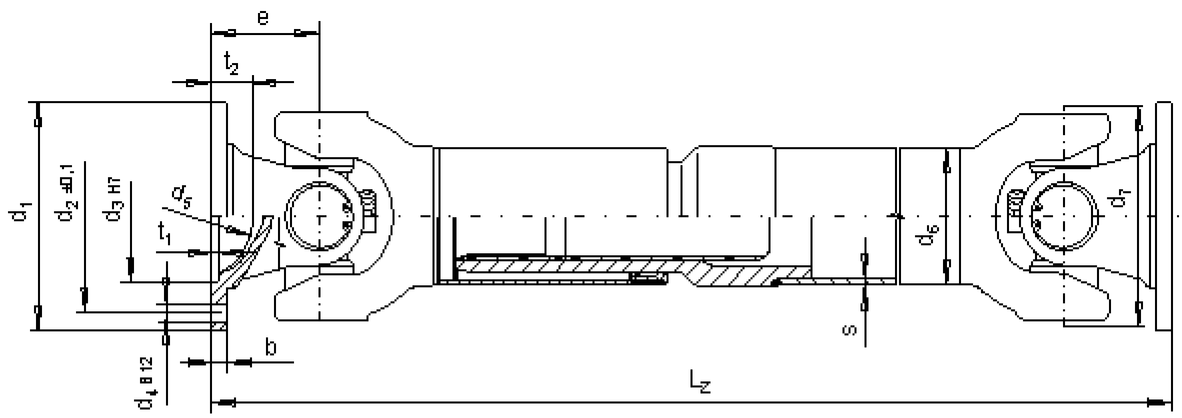
Size	Reference torque	Limiting torque	Alternating torque	Swing diameter	Flange connection DIN	Flange connection SAE	Flange connection KV/XS
	[Nm]	[Nm]	[Nm]	[mm]	[mm]		[mm]
15	200	350	-	60	58/65	-	-
30	800	1100	-	90	75/90/100	1120/1300	-
43	1800	2400	-	98	90/100/120	1120/1300/1400	100
53	3000	4200	-	115	100/120/150	1400/1500	120
63	4400	6200	-	125	120/150/165/180	1500/1600	120
58	6900	8800	-	155	150/165/180	1600/1700/1800	152
68	10000	11500	-	160	150/165/180	1600/1700/1800	152/180
70	12000	17000	-	174	180/225	1800	-
72	15000	21000	-	170	180/225	1800	180
73	17000	25000	-	178	180/220/225/250	1800/1880	180
77	19000	28000	9000	204	180/225/250	1880	180
79	28000	34000	-	204	-	-	200
80	26000	33000	13000	215	225/250/285	1880/1900	-
83	30000	40000	18000	250	250/285	1880	-
84	37000	55000	23000	265	285	-	-
85	37000	55000	23000	250	225/250/285/315	-	-
86	45000	58000	24000	250	285/315	-	-
90	85000	120000	45000	285	285/315/350	-	-
95	125000	175000	58000	315	315/350/390	-	-
97	190000	260000	100000	350	350/390/435	-	-
98	155000	210000	80000	370	350/390/435	-	-

CARDAN SHAFTS UP TO 6200 Nm

Cardan shafts with length displacement

Size	MdB	MdG	d1	d2	d3	z x d4	b	t1	d5	t2	d7	d6	s
	[Nm]	[Nm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
15	200	350	65	52,0	35	4 x 6	4,5	2	42	8	60	30	2,5
30	800	1100	90	74,5	47	4 x 8	6,0	3	62	12	90	50	2,0
43	1800	2400	100	84,0	57	6 x 8	6,5	3	50	20	98	60	3,0
53	3000	4200	120	101,5	75	8 x10	8,0	3	70	22	115	70	3,0
63	4400	6200	150	130,0	90	8 x12	10,0	3	95	24	125	80	3,5

KZ 41/45 ..... Normal angle design
KZ 46 .... Wide angle design



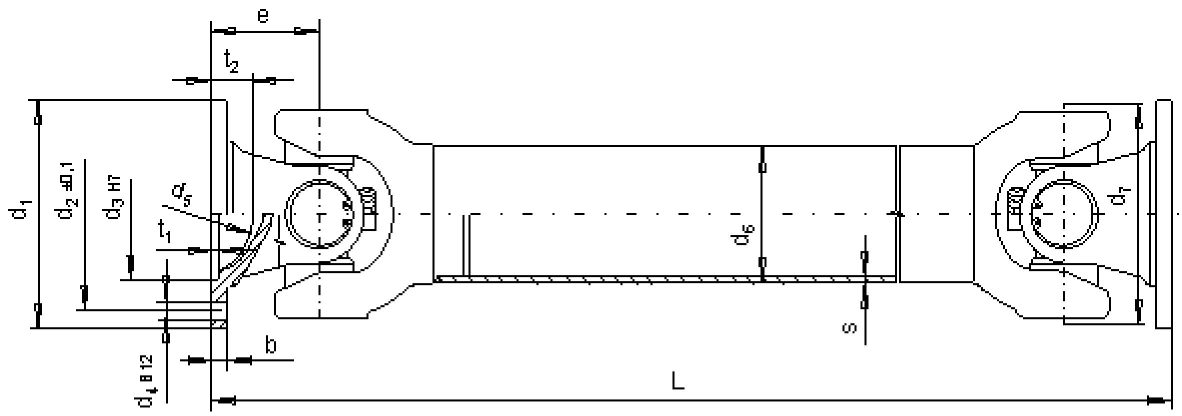
Size	KZ	ß max	e	LZ min	LA	m min	J min	C min	mR	JR	CR
		[°]	[mm]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]	[kg]	[kgm²]	[kNm/rad]
15	41	25	32	275	25	1,9	0,00105	5,3	1,70	0,00032	3,38
30	45	20	40	365	50	4,6	0,0030	22,0	2,37	0,00137	14,3
30	46	30	47	380	50	4,8	0,0033	21,2	2,37	0,00137	14,3
43	45	20	48	440	110	8,4	0,0077	35,5	4,22	0,00344	35,9
43	46	35	58	460	110	8,8	0,0082	32,5	4,22	0,00344	35,9
53	45	20	56	490	110	12,7	0,0134	55,4	4,96	0,00557	58,2
53	46	35	70	520	110	13,6	0,0148	49,8	4,96	0,00557	58,2
63	45	20	62	530	110	19,5	0,0250	88,5	6,60	0,00968	101
63	46	35	80	565	110	20,6	0,0270	80,8	6,60	0,00968	101

Other designs available on request.

Designation for a cardan shaft with length displacement, wide angle, size 53,
L_Z = 1250 mm, n = 2000 rpm, DIN flange Ø 120 mm, 8 holes Ø 10 mm:
Cardan shaft 46-53 · 1250-2,0 - DIN Ø 120 · 8 · Ø 10

Cardan shafts without length displacement

Size	MdB	MdG	d1	d2	d3	z x d4	b	t1	d5	t2	d7	d6	s
	[Nm]	[Nm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
15	200	350	65	52,0	35	4 x 6	4,5	2	42	8	60	30	2,5
30	800	1100	90	74,5	47	4 x 8	6,0	3	62	12	90	50	2,0
43	1800	2400	100	84,0	57	6 x 8	6,5	3	50	20	98	60	3,0
53	3000	4200	120	101,5	75	8 x10	8,0	3	70	22	115	70	3,0
63	4400	6200	150	130,0	90	8 x12	10,0	3	95	24	125	80	3,5



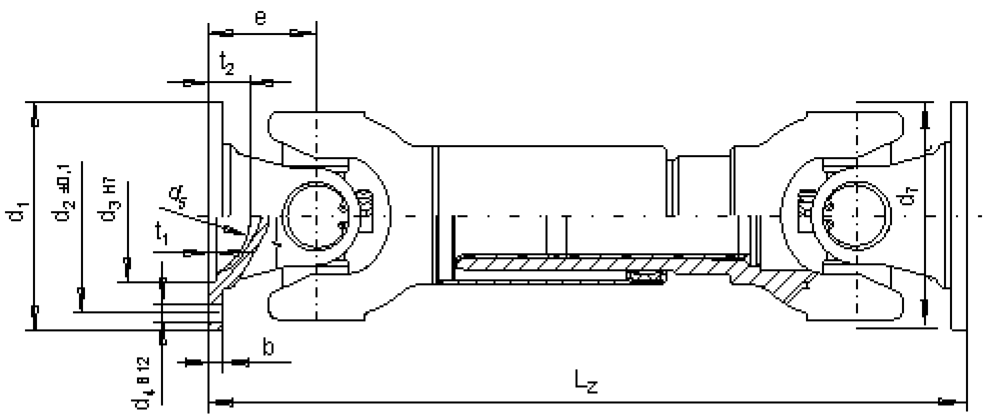
Size	KZ	ß max	e	L min	m min	J min	C min	mR	JR	CR
		[°]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]	[kg]	[kgm²]	[kNm/rad]
15	47	25	32	165	1,2	0,00036	6	1,70	0,00032	3,38
30	47	20	40	215	3,3	0,0023	28	2,37	0,00137	14,3
30	48	30	47	230	3,5	0,0025	26	2,37	0,00137	14,3
43	47	20	48	250	4,8	0,0046	55	4,22	0,00344	35,9
43	48	35	58	270	5,7	0,0050	46	4,22	0,00344	35,9
53	47	20	56	285	7,2	0,0085	92	4,96	0,00557	58,2
53	48	35	70	315	8,6	0,0101	85	4,96	0,00557	58,2
63	47	20	62	320	11,7	0,0190	133	6,60	0,00968	101
63	48	35	80	355	13,0	0,0210	121	6,60	0,00968	101

KZ 47 .... Normal angle design
KZ 48 .... Wide angle design
Other designs available on request.

Designation for a cardan shaft without length displacement, normal angle, size 53, L = 1000 mm, n = 2000 rpm, DIN flange Ø 120 mm, 8 holes Ø 10 mm:
Cardan shaft 47-53 · 1000-2,0 - DIN Ø 120 · 8 · Ø 10

Short cardan shafts with length displacement

Size	MdB	MdG	d1	d2	d3	z x d4	b	t1	d5	t2	d7
	[Nm]	[Nm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
15	200	350	65	52,0	35	4 x 6	4,5	2	42	8	60
30	800	1100	90	74,5	47	4 x 8	6,0	3	62	12	90
43	1800	2400	100	84,0	57	6 x 8	6,5	3	50	20	98
53	3000	4200	120	101,5	75	8 x10	8,0	3	70	22	115
63	4400	6200	150	130,0	90	8 x12	10,0	3	95	24	125



Size	KZ	ß max	e	LZ min	LA min	m min	J min	C min	LZ max	LA max	m max	J max	C max
		[°]	[mm]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]
15	43	25	32	225	20	1,6	0,0010	5,5	250	25	1,8	0,00103	5,4
30	43	20	40	230	15	3,3	0,0022	18,2	315	60	4,1	0,0024	17,3
30	44	30	47	245	15	3,5	0,0025	17,5	330	60	4,3	0,0027	16,6
43	43	20	48	280	25	5,5	0,0050	37,2	400	60	7,4	0,0058	34,2
43	44	30	58	300	25	5,9	0,0054	34,0	420	60	7,8	0,0062	31,3
53	43	20	56	315	30	8,4	0,0106	55,4	450	80	11,3	0,0120	51,3
53	44	35	70	365	45	9,3	0,0120	50,1	500	85	12,2	0,0134	46,5
63	43	20	62	365	35	13,5	0,0230	86,0	505	110	17,5	0,0245	79,0
63	44	35	80	400	35	14,6	0,0250	78,5	540	110	18,6	0,0265	72,0

KZ 43 .... Normal angle design
KZ 44 .... Wide angle design
Other designs available on request.

Designation for a short cardan shaft with length displacement, wide angle, size 53,
L_Z = 400 mm, n = 2000 rpm, DIN flange Ø 120 mm, 8 holes Ø 10 mm:
Cardan shaft 44-53 · 400-2,0 - DIN Ø 120 · 8 · Ø 10

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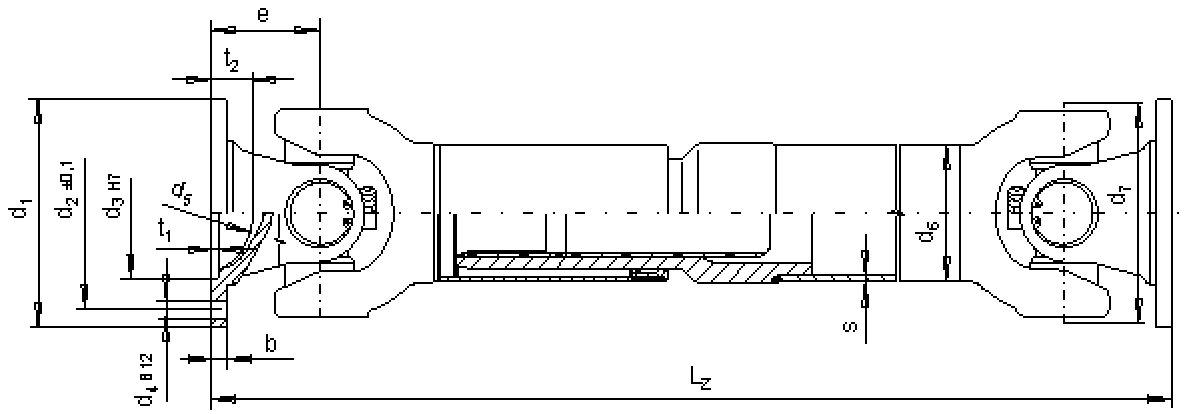
CARDAN SHAFTS 8,8 – 25 kNm

Cardan shafts with length displacement

Size	MdB	MdG	d1	d2	d3	z x d4	b	t1	d5	t2	d7	d6	s
	[Nm]	[Nm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
58	6900	8800	150	130,0	90	8 x12	10	3	92	26	155	100	3,0
68	10000	11500	180	155,5	110	8 x14	12	3	120	24	160	92	6,5
70	12000	17000	180	155,5	110	8 x14	12	3	100	28	174	120	4,0
72	15000	21000	180	155,5	110	10x16	12	3	95	26	170	104	8,0
73	17000	25000	180	155,5	110	10x16	14	3	95	26	178	111,5	6,75



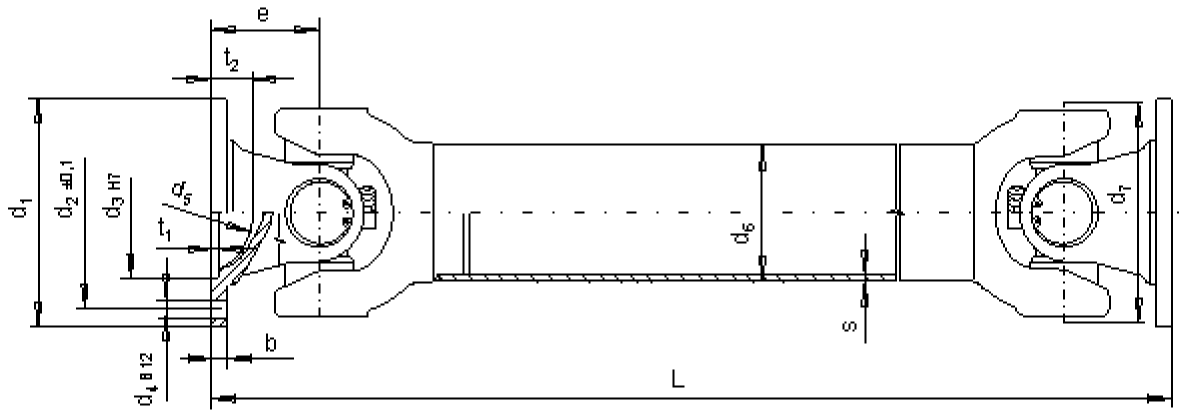
Size	KZ	ß max	e	LZ min	LA	m min	J min	C min	mR	JR	CR
		[°]	[mm]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]	[kg]	[kgm²]	[kNm/rad]
58	46	35	90	640	110	26,9	0,049	135	7,18	0,0169	177
68	45	24	78	640	110	34,1	0,074	210	13,7	0,0252	263
68	46	35	95	670	110	36,1	0,080	193	13,7	0,0252	263
70	45	25	95	600	110	35,6	0,096	210	11,4	0,0385	403
72	45	20	85	670	110	51,8	0,156	320	18,9	0,0439	459
72	46	33	100	700	110	53,0	0,161	300	18,9	0,0439	459
73	45	20	85	670	110	51,4	0,160	365	17,4	0,0480	502
73	46	24	100	700	110	52,6	0,165	345	17,4	0,0480	502

KZ 45 .... Normal angle design
KZ 46 .... Wide angle design
Other designs available on request.

Designation for a cardan shaft with length displacement, wide angle, size 68,
L_Z = 1250 mm, n = 2000 rpm, DIN flange Ø 180 mm, 8 holes Ø 14 mm:
Cardan shaft 46-68 · 1250-2,0 - DIN Ø 180 · 8 · Ø 14

Cardan shafts without length displacement

Size	MdB	MdG	d1	d2	d3	z x d4	b	t1	d5	t2	d7	d6	s
	[Nm]	[Nm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
58	6900	8800	150	130,0	90	8 x12	10	3	92	26	155	100	3,0
68	10000	11500	180	155,5	110	8 x14	12	3	120	24	160	92	6,5
70	12000	17000	180	155,5	110	8 x14	12	3	100	28	174	120	4,0
72	15000	21000	180	155,5	110	10x16	12	3	95	26	170	104	8,0
73	17000	25000	180	155,5	110	10x16	14	3	95	26	178	111,5	6,75



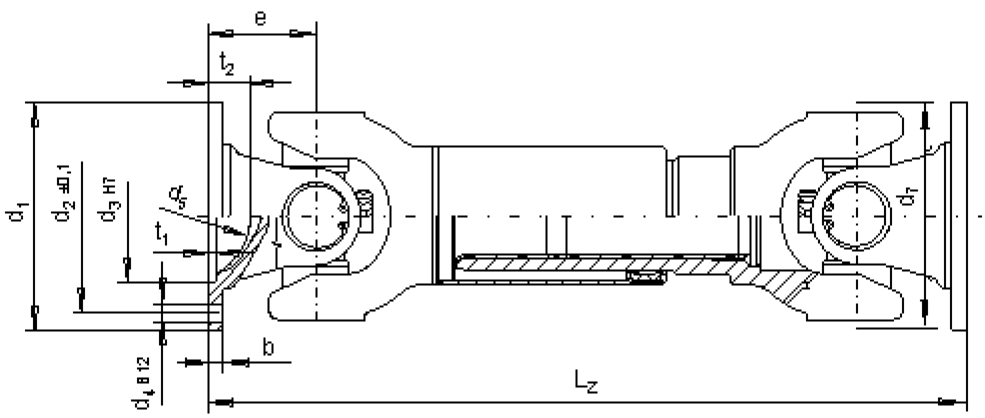
Size	KZ	ß max	e	L min	m min	J min	C min	mR	JR	CR
		[°]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]	[kg]	[kgm²]	[kNm/rad]
58	48	35	90	420	18,7	0,042	195	7,18	0,0169	177
68	47	24	78	430	24,8	0,063	300	13,7	0,0252	263
68	48	35	95	460	27,0	0,068	275	13,7	0,0252	263
70	47	25	95	430	27,8	0,083	300	11,4	0,0385	403
72	47	20	85	430	31,1	0,096	375	18,9	0,0439	459
72	48	33	100	460	32,2	0,099	320	18,9	0,0439	459
73	47	20	85	430	32,1	0,103	450	17,4	0,0480	502
73	48	24	100	460	33,3	0,107	375	17,4	0,0480	502

KZ 47 .... Normal angle design
KZ 48 .... Wide angle design
Other designs available on request.

Designation for a cardan shaft without length displacement, normal angle, size 68, L = 1000 mm, n = 2000 rpm, DIN flange Ø 180 mm, 8 holes Ø 14 mm:
Cardan shaft 47-68 · 1000-2,0 - DIN Ø 180 · 8 · Ø 14

Short cardan shafts with length displacement

Size	MdB	MdG	d1	d2	d3	z x d4	b	t1	d5	t2	d7
	[Nm]	[Nm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
58	6900	8800	150	130,0	90	8 x12	10	3	92	26	155
68	10000	11500	180	155,5	110	8 x14	12	3	120	24	160
70	12000	17000	180	155,5	110	8 x14	12	3	100	28	174
72	15000	21000	180	155,5	110	10x16	12	3	95	26	170
73	17000	25000	180	155,5	110	10x16	14	3	95	26	178



Size	KZ	ß max	e	LZ min	LA min	m min	J min	C min	LZ max	LA max	m max	J max	C max
		[°]	[mm]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]
58	44	30	90	460	20	21,6	0,046	141	585	110	25,4	0,048	131
68	43	24	78	430	40	25,6	0,065	207	565	110	31,3	0,071	190
68	44	35	95	465	40	27,6	0,071	194	650	110	35,4	0,079	170
70	43	25	95	550	90	33,7	0,091	210	570	110	34,2	0,092	205
72	43	20	85	510	40	38,8	0,104	330	650	110	45,3	0,110	300
72	44	24	100	540	40	40,0	0,108	320	680	110	46,5	0,114	290
73	43	20	85	510	40	40,5	0,110	380	650	110	47,0	0,116	340
73	44	24	100	540	40	41,7	0,115	370	680	110	48,2	0,121	330

KZ 43 .... Normal angle design
KZ 44 .... Wide angle design
Other designs available on request.

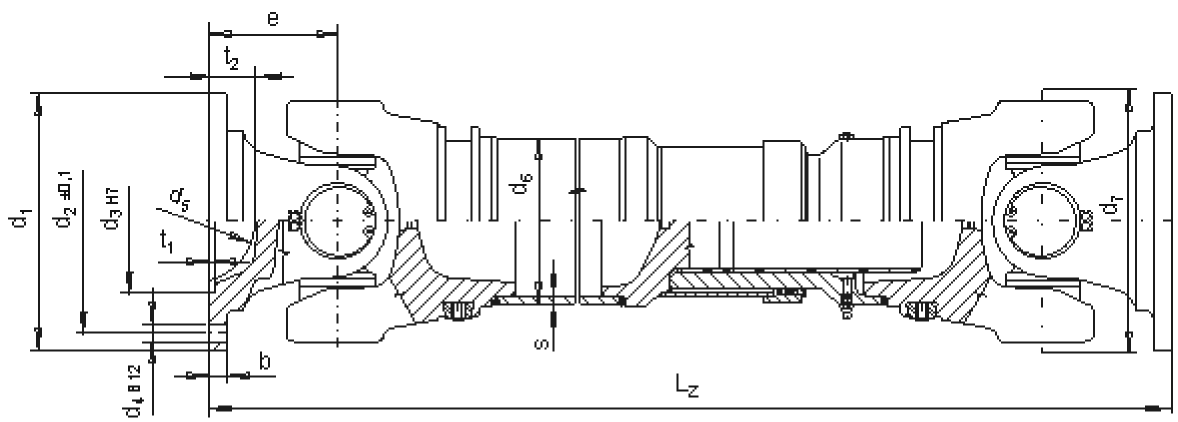
Designation for a short cardan shaft with length displacement, wide angle, size 68,
L_Z = 550 mm, n = 2000 rpm, DIN flange Ø 180 mm, 8 holes Ø 14 mm:
Cardan shaft 44-68 · 550-2,0 - DIN Ø 180 · 8 · Ø 14

CARDAN SHAFTS 28 – 55 kNm

Cardan shafts with length displacement

Size	MdB	MdG	MdW	d1	d2	d3	z x d4	b	t1	d5	t2	d7	d6	s
	[Nm]	[Nm]	[Nm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
77	19000	28000	9000	180	155,5	110	10x16	15	3	95	30	204	144	7,0
79*	28000	34000	-	200	165,0	-	4 x15	20	-	-	-	204	144	7,0
80	26000	33000	13000	225	196,0	140	8 x16	15	5	160	30	215	144	7,0
83	30000	40000	18000	250	218,0	140	8 x18	18	6	120	45	250	162	9,85
84	37000	55000	23000	285	245,0	175	8 x20	20	7	130	35	265	162	9,85

* only XS-flange connection



Size	KZ	ß max	e	LZ min	LA	m min	J min	C min	mR	JR	CR
		[°]	[mm]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]	[kg]	[kgm²]	[kNm/rad]
77	45	25	110	695	110	68,4	0,218	545	23,7	0,111	1162
79	45	22	113	785	110	82,0	0,319	565	23,7	0,111	1162
80	45	24	108	735	110	84,4	0,348	705	23,7	0,111	1162
83	41	20	125	860	110	121	0,620	945	37,0	0,215	2244
84	41	20	135	900	110	147	0,903	1060	37,0	0,215	2244

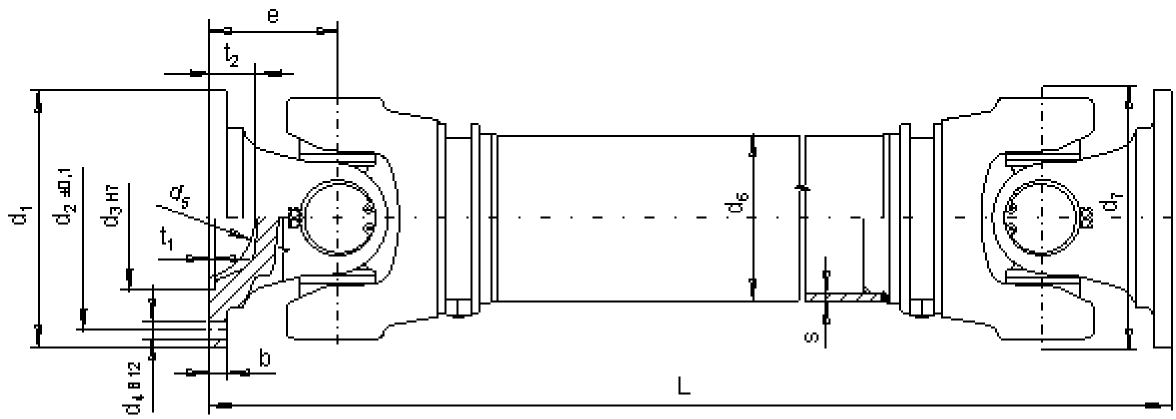
Other designs available on request.

Designation for a cardan shaft with length displacement, size 80,
L_Z = 1250 mm, n = 2000 rpm, DIN flange Ø 225 mm, 8 holes Ø 16 mm:
Cardan shaft 45-80 · 1250-2,0 - DIN Ø 225 · 8 · Ø 16

Cardan shafts without length displacement

Size	MdB	MdG	MdW	d1	d2	d3	z x d4	b	t1	d5	t2	d7	d6	s
	[Nm]	[Nm]	[Nm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
77	19000	28000	9000	180	155,5	110	10x16	15	3	95	30	204	144	7,0
79*	28000	34000	-	200	165,0	-	4 x15	20	-	-	-	204	144	7,0
80	26000	33000	13000	225	196,0	140	8 x16	15	5	160	30	215	144	7,0
83	30000	40000	18000	250	218,0	140	8 x18	18	6	120	45	250	162	9,85
84	37000	55000	23000	285	245,0	175	8 x20	20	7	130	35	265	162	9,85

* only XS-flange connection



Size	KZ	ß max	e	L min	m min	J min	C min	mR	JR	CR
		[°]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]	[kg]	[kgm²]	[kNm/rad]
77	47	25	110	495	47,2	0,195	680	23,7	0,111	1162
79	47	22	113	555	62,8	0,287	670	23,7	0,111	1162
80	47	24	108	560	65,1	0,320	965	23,7	0,111	1162
83	47	20	125	610	88,4	0,560	1415	37,0	0,215	2244
84	47	20	135	640	115	0,815	1525	37,0	0,215	2244

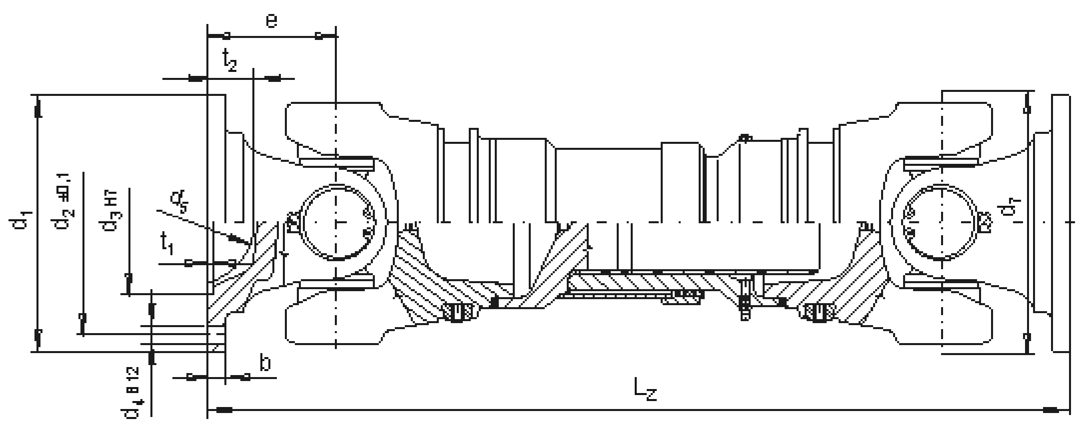
Other designs available on request.

Designation for a cardan shaft without length displacement, size 80,
L = 1000 mm, n = 2000 rpm, DIN flange Ø 225 mm, 8 holes Ø 16 mm:
Cardan shaft 47-80 · 1000-2,0 - DIN Ø 225 · 8 · Ø 16

Short cardan shafts with length displacement

Size	MdB	MdG	MdW	d1	d2	d3	z x d4	b	t1	d5	t2	d7
	[Nm]	[Nm]	[Nm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
77	19000	28000	9000	180	155,5	110	10x16	15	3	95	30	204
79*	28000	34000	-	200	165,0	-	4 x15	20	-	-	-	204
80	26000	33000	13000	225	196,0	140	8 x16	15	5	160	30	215
83	30000	40000	18000	250	218,0	140	8 x18	18	6	120	45	250
84	37000	55000	23000	285	245,0	175	8 x20	20	7	130	35	265

* only XS-flange connection



Size	KZ	ß max	e	LZ min	LA min	m min	J min	C min	LZ max	LA max	m max	J max	C max
		[°]	[mm]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]
77	43	25	110	590	60	62,5	0,211	620	690	110	69,8	0,223	570
79	43	22	113	650	95	75,2	0,302	630	810	160	86,6	0,321	560
80	43	24	108	560	30	71,2	0,320	785	730	110	82,5	0,340	720
83	43	20	125	700	60	104	0,570	1010	855	110	119	0,605	940
84	43	20	135	735	60	131	0,825	1130	895	110	146	0,860	1070

KZ 43 .... Normal angle design
Other designs available on request.

Designation for a short cardan shaft with length displacement, size 80,
L_Z = 650 mm, n = 2000 rpm, DIN flange Ø 225 mm, 8 holes Ø 16 mm:
Cardan shaft 44-80 · 650-2,0 - DIN Ø 225 · 8 · Ø 16

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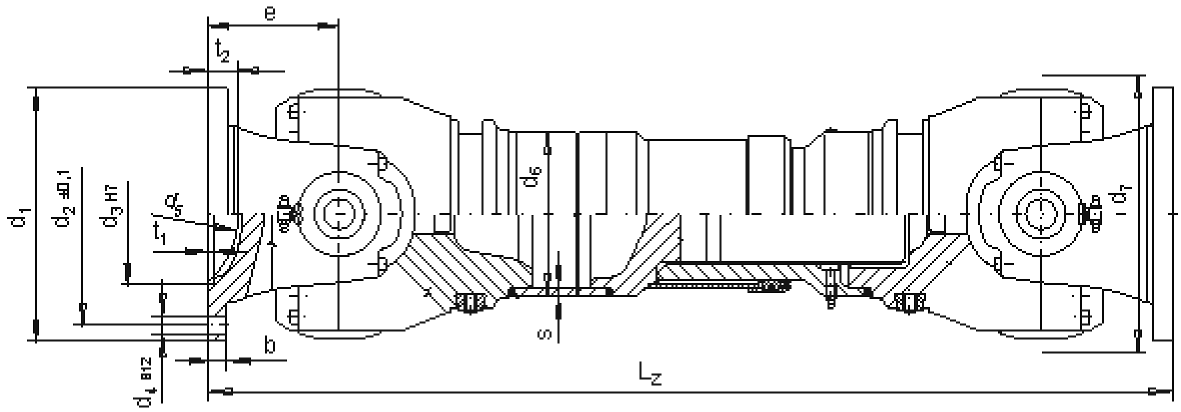
CARDAN SHAFTS 55 – 260 kNm

Cardan shafts with length displacement

Size	MdB	MdG	MdW	d1	d2	d3	z x d4	b	t1	d5	t2	d7	d6	s
	[Nm]	[Nm]	[Nm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
85	37000	55000	23000	250	218	140	8 x18	18	6	170	34	250	162	9,85
86	45000	58000	24000	285	245	175	8 x20	20	6	170	34	250	165	12,5
90	85000	120000	45000	315	280	175	8 x22	22	6	180	40	285	218	10,5
95	125000	175000	58000	350	310	220	10x22	25	7	210	44	315	219	15,0
97	190000	260000	100000	390	345	250	10x24	28	7	280	35	350	273	19,0
97*	150000	200000	70000	390	345	250	10x24	28	7	280	35	350	273	11,6
98	155000	210000	80000	390	345	250	10x24	28	7	280	35	370	273	19,0
98*	150000	200000	70000	390	345	250	10x24	28	7	280	35	370	273	11,6



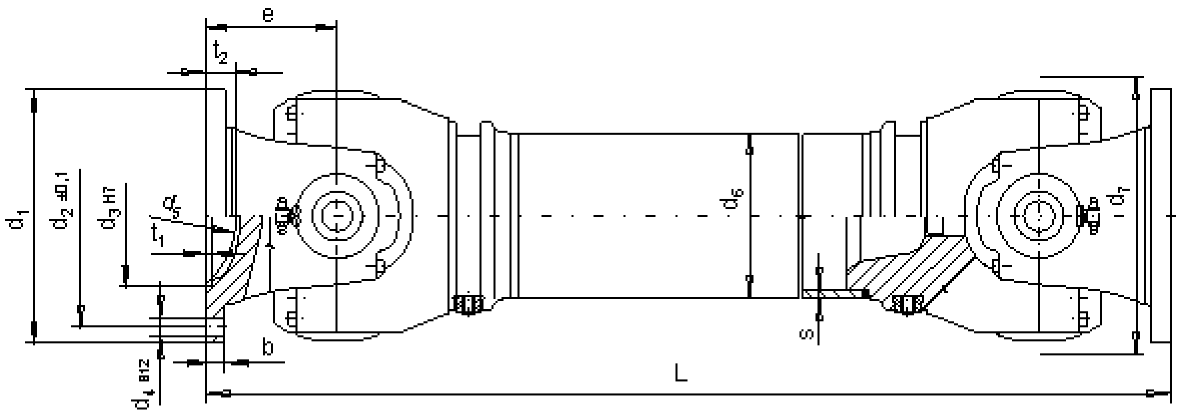
Size	KZ	ß max	e	LZ min	LA	m min	J min	C min	mR	JR	CR
		[°]	[mm]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]	[kg]	[kgm²]	[kNm/rad]
85	41	15	130	905	110	164	0,91	1200	37,0	0,215	2244
86	41	15	130	905	110	168	1,00	1220	47,0	0,275	2874
90	41	15	150	1005	135	265	2,17	2170	53,7	0,580	6057
95	41	15	170	1105	135	340	3,39	3210	75,5	0,789	8246
97	41	15	195	1285	170	525	7,22	5350	119,0	1,93	20165
97*	41	15	195	1285	170	506	7,14	5315	74,8	1,28	13370
98	41	15	195	1285	170	534	7,48	5360	119,0	1,93	20165
98*	41	15	195	1285	170	515	7,40	5325	74,8	1,28	13370

* for lifetime-oriented applications

Designation for a cardan shaft with length displacement, size 85,
L_Z = 1250 mm, n = 2000 rpm, DIN flange Ø 250 mm, 8 holes Ø 18 mm:
Cardan shaft 41-85 · 1250-2,0 - DIN Ø 250 · 8 · Ø 18

Cardan shafts without length displacement

Size	MdB	MdG	MdW	d1	d2	d3	z x d4	b	t1	d5	t2	d7	d6	s
	[Nm]	[Nm]	[Nm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
85	37000	55000	23000	250	218	140	8 x18	18	6	170	34	250	162	9,85
86	45000	58000	24000	285	245	175	8 x20	20	6	170	34	250	165	12,5
90	85000	120000	45000	315	280	175	8 x22	22	6	180	40	285	218	10,5
95	125000	175000	58000	350	310	220	10x22	25	7	210	44	315	219	15,0
97	190000	260000	100000	390	345	250	10x24	28	7	280	35	350	273	19,0
97*	150000	200000	70000	390	345	250	10x24	28	7	280	35	350	273	11,6
98	155000	210000	80000	390	345	250	10x24	28	7	280	35	370	273	19,0
98*	150000	200000	70000	390	345	250	10x24	28	7	280	35	370	273	11,6



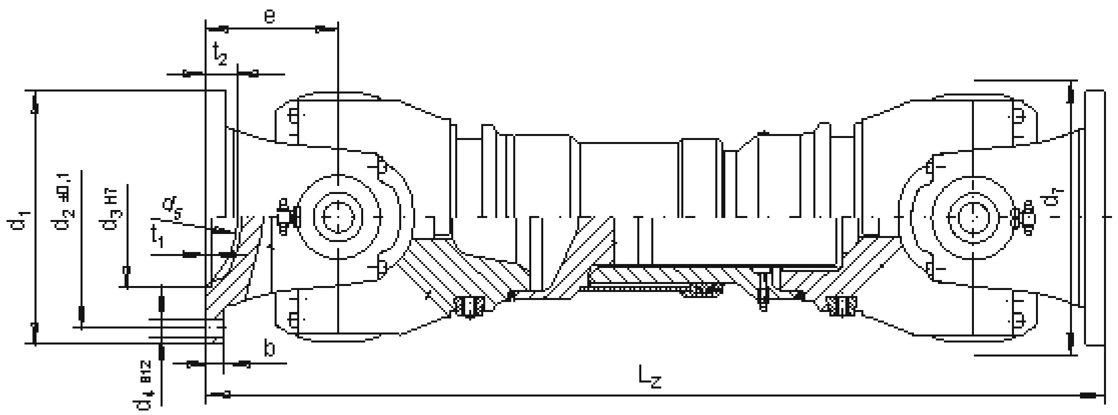
Size	KZ	ß max	e	L min	m min	J min	C min	mR	JR	CR
		[°]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]	[kg]	[kgm²]	[kNm/rad]
85	47	15	130	650	125	0,840	1755	37,0	0,215	2244
86	47	15	130	650	130	0,935	1770	47,0	0,275	2874
90	47	15	150	720	202	1,87	2605	53,7	0,580	6057
95	47	15	170	800	263	3,03	4215	75,5	0,789	8246
97	47	15	195	925	410	6,22	5990	119,0	1,93	20165
97*	47	15	195	925	408	6,19	5945	74,8	1,28	13370
98	47	15	195	925	419	6,48	6000	119,0	1,93	20165
98*	47	15	195	925	416	6,45	5955	74,8	1,28	13370

* for lifetime-oriented applications
ther designs available on request.

Designation for a cardan shaft without length displacement, size 85,
L = 1000 mm, n = 2000 rpm, DIN flange Ø 250 mm, 8 holes Ø 18 mm:
Cardan shaft 47-85 · 1000-2,0 - DIN Ø 250 · 8 · Ø 18

Short cardan shafts with length displacement

Size	MdB	MdG	MdW	d1	d2	d3	z x d4	b	t1	d5	t2	d7
	[Nm]	[Nm]	[Nm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
85	37000	55000	23000	250	218	140	8 x18	18	6	170	34	250
86	45000	58000	24000	285	245	175	8 x20	20	6	170	34	250
90	85000	120000	45000	315	280	175	8 x22	22	6	180	40	285
95	125000	175000	58000	350	310	220	10x22	25	7	210	44	315
97	190000	260000	100000	390	345	250	10x24	28	7	280	35	350
98	155000	210000	80000	390	345	250	10x24	28	7	280	35	370



Size	KZ	ß max	e	LZ min	LA min	m min	J min	C min	LZ max	LA max	m max	J max	C max
		[°]	[mm]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]
85	43	15	130	585*	30	123	0,75	1430	900	110	163	0,84	1220
86	43	15	130	585*	30	127	0,84	1430	900	110	167	0,93	1220
90	43	15	150	800	40	238	2,00	2410	1000	135	268	2,15	2280
95	43	15	170	900	40	306	3,18	3470	1100	135	345	3,37	3250
97	43	15	195	1210	120	502	6,98	5505	1280	170	520	7,13	5390
97**	43	15	195	1090	100	482	6,97	5505	1205	170	512	7,21	5320
98	43	15	195	1210	120	510	7,25	5515	1280	170	529	7,40	5400
98**	43	15	195	1090	100	490	7,24	5515	1205	170	521	7,47	5330

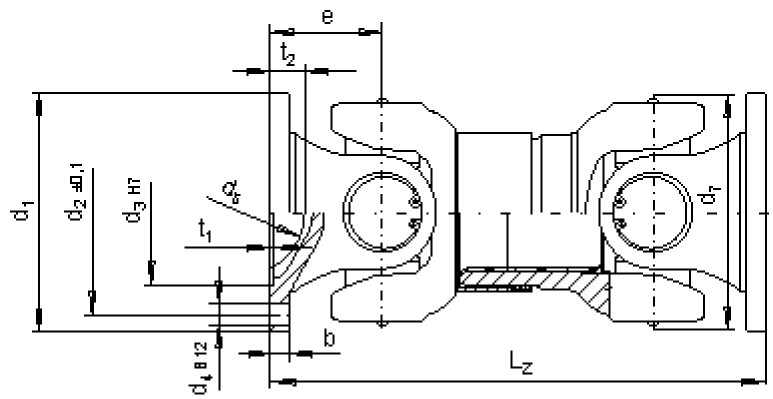
* when L_Z less 700 mm is $\beta_{max} = 5°$
** without balancing grooves
KZ 43 .... Normal angle design
Other designs available on request.

Designation for a short cardan shaft with length displacement, size 85,
L_Z = 900 mm, n = 2000 rpm, DIN flange Ø 250 mm, 8 holes Ø 18 mm:
Cardan shaft 44-85 · 900-2,0 - DIN Ø 250 · 8 · Ø 18

SUPER-SHORT-CARDAN SHAFTS

Code No. 4496 - Super-short-cardan shafts with length displacement

Size	MdB	MdG	MdW	d1	d2	d3	z x d4	b	t1	d5	t2	d7
	[Nm]	[Nm]	[Nm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
63	4400	6200	-	150	130	90	8 x12	10	3	95	24	125
73	17000	25000	-	180	155,5	110	10x16	14	3	95	26	178
73*	17000	25000	-	180	150	-	4 x14	18	-	-	-	178
80	26000	33000	13000	225	196	140	8 x16	15	5	160	30	215
85	37000	-	23000	348	314	175	10x18	18	7	-	-	285
90	80000	-	40000	360	328	175	10x18	18	7	-	-	315
97	160000	-	75000	390	345	250	10x24	28	7	280	35	350
98	160000	-	75000	390	345	250	10x24	28	7	280	35	370



Size	ß max	e	LZ min	LA min	m min	J min	C min	LZ max	LA max	m max	J max	C max
	[°]	[mm]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]
63	20	62	340	30	12,8	0,0225	87,5	365	50	13,5	0,0230	86,0
73	10	85	365	15	33,6	0,097	450	475	70	41,9	0,111	420
73*	5	56	290	15	30,8	0,094	590	420	70	40,3	0,110	535
80	5	108	485	35	64,0	0,285	760	585	85	72,2	0,298	710
85	5	110	545	40	124	0,836	1470	595	80	129	0,851	1420
90	5	105	600	40	190	2,15	3240	700	110	210	2,28	3100
97	15	195	1025	50	437	6,42	5320	1085	100	451	6,53	5220
98	15	195	1025	50	445	6,68	5330	1085	100	459	6,80	5230

* only XS-flange connection
Other designs available on request.

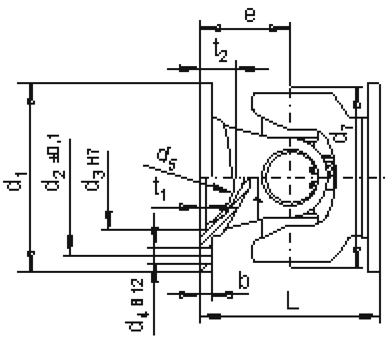
Designation for a super-short-cardan shaft with length displacement, size 80, L_Z = 500 mm, n = 2000 rpm, DIN flange Ø 225 mm, 8 holes Ø 16 mm:
Cardan shaft 4496-80 · 500-2,0 - DIN Ø 225 · 8 · Ø 16

FLANGE JOINTS

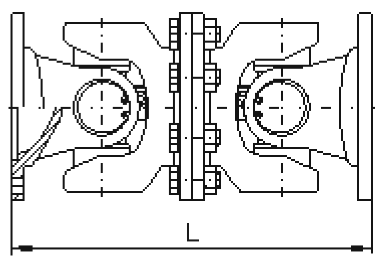
Flange joints up to 25 kNm

Flange joints / Double joints

Size	MdB	MdG	d1	d2	d3	z x d4	b	t1	d5	t2	d7
	[Nm]	[Nm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
15	200	350	65	52,0	35	4 x 6	4,5	2	42	8	60
30	800	1100	90	74,5	47	4 x 8	6,0	3	62	12	90
43	1800	2400	100	84,0	57	6 x 8	6,5	3	50	20	98
53	3000	4200	120	101,5	75	8 x10	8,0	3	70	22	115
63	4400	6200	150	130,0	90	8 x12	10	3	95	24	125
58	6900	8800	150	130,0	90	8 x12	10	3	92	26	155
68	10000	11500	180	155,5	110	8 x14	12	3	120	24	160
70	12000	17000	180	155,5	110	8 x14	12	3	100	28	174
72	15000	21000	180	155,5	110	10x16	12	3	95	26	170
73	17000	25000	180	155,5	110	10x16	14	3	95	26	178



Flange joint - KZ 310/314



Double joint - KZ 7670/7675

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Flange joints

Size	KZ	ß max	e	L	m	J	C
		[°]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]
15	310	25	32	64	0,5	0,00019	12
30	310	20	40	80	1,4	0,0012	58
30	314	30	47	94	1,5	0,0013	55
43	310	20	48	96	2,3	0,0025	110
43	314	35	58	116	2,6	0,0027	95
53	310	20	56	112	3,5	0,0045	185
53	314	35	70	140	4,2	0,0055	175
63	310	20	62	124	5,9	0,0107	265
63	314	35	80	160	7,0	0,0125	245
58	314	35	90	180	9,2	0,0225	380
68	310	24	78	156	10,8	0,030	600
68	314	35	95	190	12,8	0,036	560
70	310	25	95	190	12,9	0,042	590
72	310	20	85	170	14,4	0,050	720
72	314	33	100	200	15,6	0,054	630
73	310	20	85	170	15,0	0,053	880
73	314	24	100	200	16,2	0,058	740

Double joints

Size	KZ	ß max	e	L	m	J	C
		[°]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]
15	7670	25	32	128	1,1	0,00039	6
30	7670	20	40	160	2,9	0,0025	29
30	7675	30	47	188	3,1	0,0027	27
43	7670	20	48	192	4,8	0,0052	55
43	7675	35	58	232	5,4	0,0056	47
53	7670	20	56	224	7,4	0,0093	90
53	7675	35	70	280	8,8	0,0113	85
63	7670	20	62	248	12,3	0,022	130
63	7675	35	80	320	14,5	0,026	120
58	7675	35	90	360	18,8	0,046	190
68	7670	24	78	312	22,5	0,062	300
68	7675	35	95	380	26,5	0,074	280
70	7670	25	95	380	26,8	0,094	295
72	7670	20	85	340	30,0	0,103	360
72	7675	33	100	400	32,4	0,111	315
73	7670	20	85	340	31,2	0,110	440
73	7675	24	100	400	33,6	0,120	370

KZ 310, 7670 .... Normal angle design
KZ 314, 7675 .... Wide angle design
Other designs available on request.

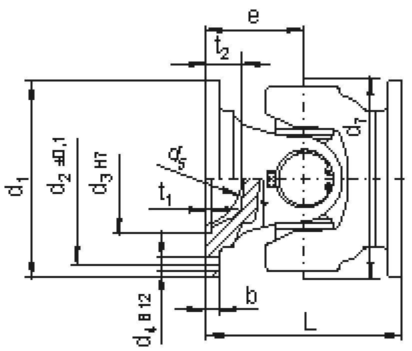
Designation samples:
Flange joint, size 30, wide angle: **Flange joint 314-30**
Double joint, size 63, normal angle: **Double joint 7670-63**

Flange joints 28 – 55 kNm

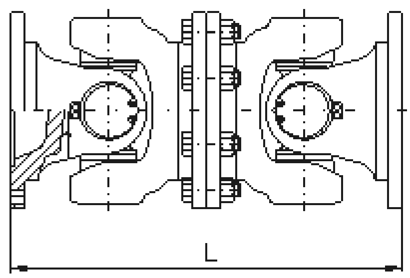
Flange joints / Double joints

Size	MdB	MdG	MdW	d1	d2	d3	z x d4	b	t1	d5	t2	d7
	[Nm]	[Nm]	[Nm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
77	19000	28000	9000	180	155,5	110	10x16	15	3	95	30	204
79*	28000	34000	-	200	165,0	-	4 x15	20	-	-	-	204
80	26000	33000	13000	225	196,0	140	8 x16	15	5	160	30	215
83	30000	40000	18000	250	218,0	140	8 x18	18	6	120	45	250
84	37000	55000	23000	285	245,0	175	8 x20	20	7	130	35	265

* only XS flange connection



Flange joint - KZ 310



Double joint - KZ 767

Flange joints

Size	KZ	ß max	e	L	m	J	C
		[°]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]
77	310	25	110	220	20,9	0,080	1320
79	310	22	113	226	29,3	0,140	1300
80	310	24	108	216	28,0	0,147	1860
83	310	20	125	250	40,8	0,269	2700
84	310	20	135	270	57,9	0,455	2920

Double joints - consisting of two flange joints

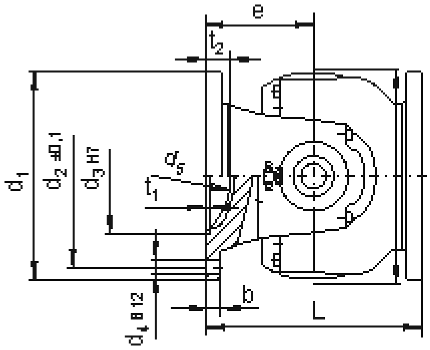
Size	KZ	ß max	e	L	m	J	C
		[°]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]
77	767	25	110	440	42,8	0,165	660
80	767	24	108	432	57,0	0,304	930
83	767	20	125	500	83,1	0,556	1350
84	767	20	135	540	118	0,940	1460

KZ 310, 767 ..... Normal angle design

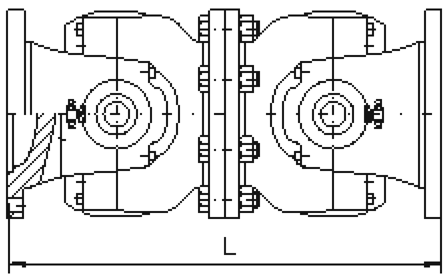
Flange joints 55 – 260 kNm

Flange joints / Double joints

Size	MdB	MdG	MdW	d1	d2	d3	z x d4	b	t1	d5	t2	d7
	[Nm]	[Nm]	[Nm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
85	37000	55000	23000	250	218	140	8 x18	18	6	170	34	250
86	45000	58000	24000	285	245	175	8 x20	20	6	170	34	250
90	85000	120000	45000	315	280	175	8 x22	22	6	180	40	285
95	125000	175000	58000	350	310	220	10x22	25	7	210	44	315
97	190000	260000	100000	390	345	250	10x24	28	7	280	35	350
98	155000	210000	80000	390	345	250	10x24	28	7	280	35	370



Flange joint - KZ 310



Double joint - KZ 767

Flange joints

Size	KZ	ß max	e	L	m	J	C
		[°]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]
85	310	15	130	260	54,2	0,396	3370
86	310	15	130	260	58,6	0,482	3370
90	310	15	150	300	87,0	0,880	5200
95	310	15	170	340	130	1,62	8000
97	310	15	195	390	187	2,94	12500
98	310	15	195	390	191	3,07	12540

Double joints

Size	KZ	ß max	e	L	m	J	C
		[°]	[mm]	[mm]	[kg]	[kgm²]	[kNm/rad]
85	767	15	130	520	110	0,81	1680
86	767	15	130	520	119	0,99	1680
90	767	15	150	600	177	1,80	2600
95	767	15	170	680	264	3,32	4000
97	767	15	195	780	379	6,03	6250
98	767	15	195	780	387	6,30	6270

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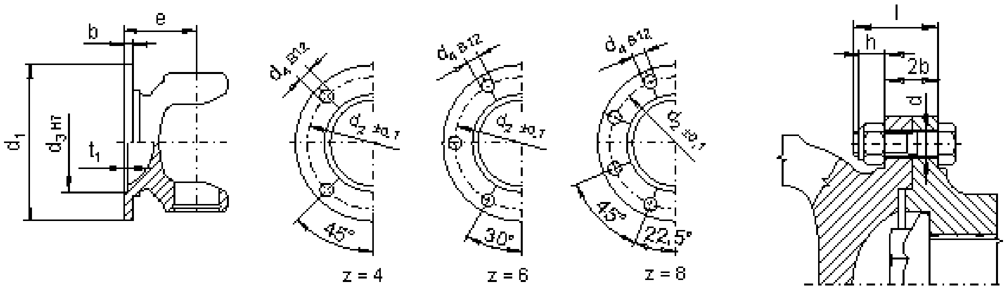
FLANGES / FLANGE BOLTINGS

DIN – Flanges up to size 63

Flanges and boltings (See ISO 7646 resp. DIN 15451 too)



Size	d1	d2	d3	z x d4	b	t1	e	ß max	d	l	h	2b	MA	Bolts inserted
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[°]	[mm]	[mm]	[mm]	[mm]	[Nm]	1)
15	58	47	30	4 x 5	4,5	2	32	25	M5	16	5	9	9	
15	65	52	35	4 x 6	4,5	2	32	25	M6	16	6	9	15	
30	75	62	42	6 x 6	5	2	47	30	M6	20	6	10	15	no
30	90	74,5	47	4 x 8	6	3	40	20	M8	22	8	12	35	
30	90	74,5	47	4 x 8	6	3	47	30	M8	22	8	12	35	yes
30	90	74,5	47	6 x 8	6	3	47	30	M8	22	8	12	35	
30	100	84	57	6 x 8	6,5	3	40	20	M8	22	8	13	35	
43	90	74,5	47	4 x 8	6,5	3	48	20	M8	22	8	13	35	no
43	100	84	57	6 x 8	6,5	3	48	20	M8	22	8	13	35	no
43	100	84	57	6 x 8	6,5	3	58	35	M8	22	8	13	35	yes
43	100	84	57	8 x 8	6,5	3	58	35	M8	22	8	13	35	no
43	120	101,5	75	8 x 8	7	3	48	20	M8	25	8	14	35	no
43	120	101,5	75	8 x10	7	3	48	20	M10	25	10	14	70	no
53	100	84	57	6 x 8	8	3	65	25	M8	25	8	16	35	no
53	100	84	57	6 x10	8	3	65	25	M10	30	10	16	70	no
53	100	84	57	8 x10	8	3	65	25	M10	30	10	16	70	no
53	120	101,5	75	8 x 8	8	3	56	20	M8	25	8	16	35	no
53	120	101,5	75	8 x 8	8	3	70	35	M8	25	8	16	35	
53	120	101,5	75	8 x10	8	3	56	20	M10	30	10	16	70	no
53	120	101,5	75	8 x10	8	3	70	35	M10	30	10	16	70	yes*
53	150	130	90	4 x10	10	3	56	20	M10	35	10	20	70	no
53	150	130	90	8 x10	10	3	56	20	M10	35	10	20	70	no
53	150	130	90	8 x12	10	3	56	20	M12	35	12	20	120	no
63	120	101,5	75	8 x10	8	3	75	35	M10	30	10	16	70	yes*
63	150	130	90	8 x10	10	3	62	20	M10	35	10	20	70	no
63	150	130	90	8 x10	10	3	80	35	M10	35	10	20	70	yes
63	150	130	90	8 x12	10	3	62	20	M12	35	12	20	120	no
63	150	130	90	8 x12	10	3	80	35	M12	35	12	20	120	yes
63	165	140	95	8 x14	12	3	80	30	M14	40	14	24	200	
63	180	155,5	110	8 x14	12	3	80	30	M14	40	14	24	200	

1) Bolts inserted from joint side * only spanner size 16

It is not possible to insert bolts from the yoke side for all designs! Other flange connections on request.
The following connecting elements are recommended for flange bolted connections:
Hexagon head bolt ISO 4014-10.9 (reduced thread length, if available) **Hexagon nut ISO 7042-V-10** (self-locking)
All bolts must be tightened with the specified torque M_A. Permitted tolerance: ± 5 %. For reference see DIN 25202

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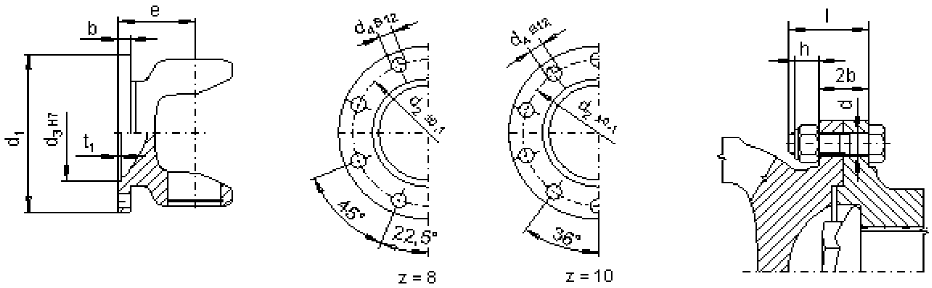
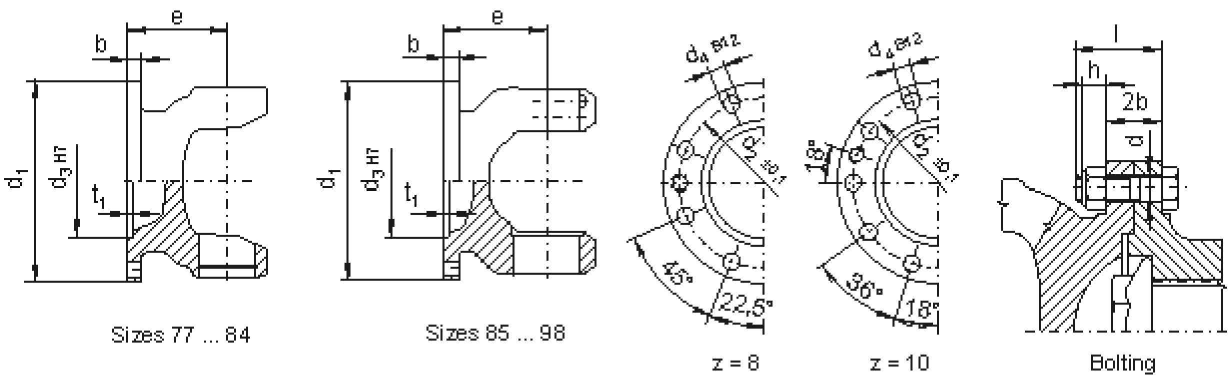
DIN – Flanges sizes 58 – 73



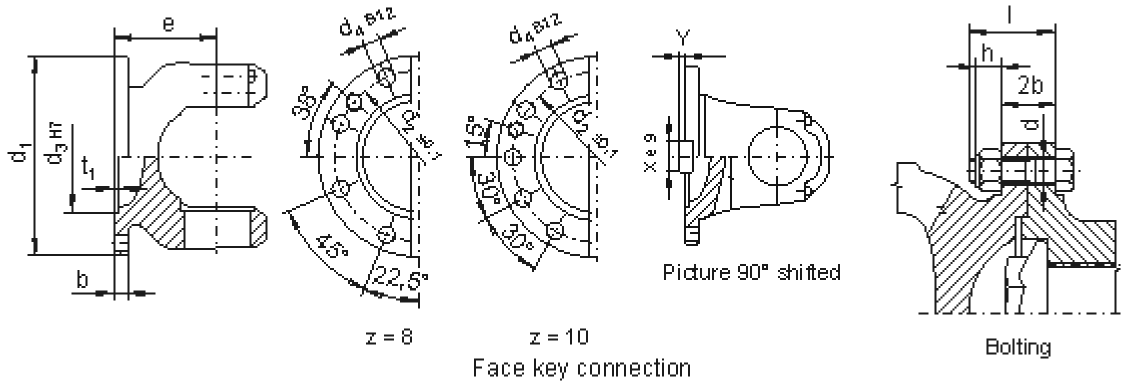
Size	d1	d2	d3	z x d4	b	t1	e	ß max	d	l	h	2b	MA	Bolts inserted
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[°]	[mm]	[mm]	[mm]	[mm]	[Nm]	1)
58	150	130	90	8 x10	10	3	90	35	M10	35	10	20	70	yes
58	150	130	90	8 x12	10	3	90	35	M12	35	12	20	120	yes
58	150	130	90	8 x14	10	3	90	35	M14	35	14	20	200	
58	165	140	95	8 x14	12	3	90	35	M14	40	14	24	200	
58	165	140	95	8 x16	12	3	90	35	M16	42	16	24	300	
58	180	155,5	110	8 x12	10	3	90	35	M12	35	12	20	120	yes
58	180	155,5	110	8 x14	10	3	90	35	M14	40	14	20	200	yes
68	150	130	90	8 x12	12	3	95	35	M12	40	12	24	120	no
68	165	140	95	8 x14	12	3	95	35	M14	40	14	24	200	
68	165	140	95	8 x16	12	3	95	35	M16	42	16	24	300	
68	180	155,5	110	8 x12	12	3	78	24	M12	40	12	24	120	no
68	180	155,5	110	8 x12	12	3	95	35	M12	40	12	24	120	yes
68	180	155,5	110	8 x14	12	3	78	24	M14	40	14	24	200	no
68	180	155,5	110	8 x14	12	3	95	35	M14	40	14	24	200	yes
68	180	155,5	110	8 x16	12	3	78	24	M16	42	16	24	300	no
68	180	155,5	110	8 x16	12	3	95	35	M16	42	16	24	300	yes
68	180	155,5	110	10x16	12	3	78	24	M16	42	16	24	300	no
68	180	155,5	110	10x16	12	3	95	35	M16	42	16	24	300	
70	180	155,5	110	8x14	12	3	95	25	M14	40	14	24	200	yes
70	225	196	140	8 x16	15	5	95	25	M16	50	16	30	300	yes
72	180	155,5	110	8 x14	12	3	85	20	M14	40	14	24	200	no
72	180	155,5	110	8 x14	12	3	100	33	M14	40	14	24	200	
72	180	155,5	110	8 x16	12	3	85	20	M16	42	16	24	300	no
72	180	155,5	110	8 x16	12	3	100	33	M16	42	16	24	300	
72	180	155,5	110	10x16	12	3	85	20	M16	42	16	24	300	no
72	180	155,5	110	10x16	12	3	100	33	M16	42	16	24	300	yes
72	225	196	140	8 x16	15	5	100	33	M16	50	16	30	300	yes
72	225	196	140	10x16	15	5	100	33	M16	50	16	30	300	
73	180	155,5	110	8 x16	14	3	85	20	M16	50	16	28	300	no
73	180	155,5	110	8 x16	14	3	100	33	M16	50	16	28	300	
73	180	155,5	110	10x16	14	3	85	20	M16	50	16	28	300	no
73	180	155,5	110	10x16	14	3	100	33	M16	50	16	28	300	yes
73	220	196	150	8 x14	15	5	100	33	M14	50	14	30	200	yes
73	225	196	140	8 x16	15	5	85	20	M16	50	16	30	300	yes
73	225	196	140	8 x16	15	5	100	33	M16	50	16	30	300	yes
73	225	196	140	10x16	15	5	100	33	M16	50	16	30	300	
73	250	218	140	8 x18	15	6	100	33	M18	50	18	30	410	yes

DIN – Flanges up to size 77 – 98



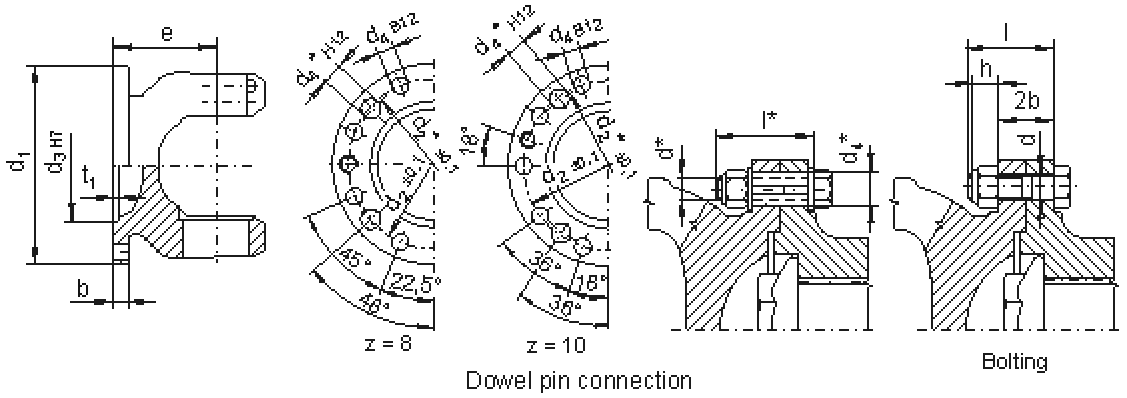
Size	d1	d2	d3	z x d4	b	t1	e	ß max	d	l	h	2b	MA	Bolts inserted
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[°]	[mm]	[mm]	[mm]	[mm]	[Nm]	1)
77	180	155,5	110	8 x16	15	3	110	25	M16	50	16	30	300	yes
77	180	155,5	110	10x16	15	3	110	25	M16	50	16	30	300	no
77	225	196	140	8 x16	15	5	110	25	M16	50	16	30	300	yes
77	250	218	140	8 x18	18	6	110	25	M18	56	18	36	410	yes
80	225	196	140	8 x16	15	5	108	24	M16	50	16	30	300	yes
80	250	218	140	8 x18	18	6	108	24	M18	56	18	36	410	yes
80	285	245	175	8 x20	18	6	108	24	M20	60	20	38	600	yes
83	250	218	140	8 x18	18	6	125	20	M18	56	18	36	410	yes
83	285	245	175	8 x20	20	6	125	20	M20	65	20	40	600	yes
84	285	245	175	8 x20	20	6	135	20	M20	65	20	40	600	yes
84	315	280	175	8 x22	22	6	135	20	M22	70	22	44	800	yes
85	225	196	140	8 x16	15	5	208	15	M16	50	16	30	300	no
85	250	218	140	8 x18	18	6	130	15	M18	56	18	36	410	yes
85	285	245	175	8 x20	20	6	130	15	M20	65	20	40	600	yes
85	315	280	175	8 x22	22	6	130	15	M22	70	22	44	800	yes
86	285	245	175	8 x20	20	6	130	15	M20	65	20	40	600	yes
86	315	280	175	8 x22	22	6	130	15	M22	70	22	44	800	yes
90	285	245	175	8 x20	20	6	150	15	M20	65	20	40	600	no
90	315	280	175	8 x22	22	6	150	15	M22	70	22	44	800	yes
90	350	310	220	10x22	25	7	150	15	M22	75	22	50	800	yes
95	315	280	175	8 x22	22	6	170	15	M22	70	22	44	800	no
95	350	310	220	10x22	25	7	170	15	M22	75	22	50	800	yes
95	390	345	250	10x24	28	7	170	15	M24	85	24	56	1000	yes
97/98	350	310	220	10x22	25	7	225	15	M22	75	22	50	800	no
97/98	390	345	250	10x24	28	7	195	15	M24	85	24	56	1000	yes
97/98	435	385	280	10x27	32	9	195	15	M27	95	27	64	1500	yes

Flange connections with »Face Key«



Size	d1	d2	d3	z x d4	b	t1	e	ß max	d	l	h	2b	MA	X	Y	Bolts inserted
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[°]	[mm]	[mm]	[mm]	[mm]	[Nm]	[mm]	[mm]	1)
85	250	218	105	8 x19	25	6	130	15	M18	70	18	50	410	40	12,5	no
90	285	245	125	8 x21	27	6	150	15	M20	80	20	54	600	40	15,0	no
95	315	280	130	10x23	32	6	170	15	M22	90	22	64	800	40	15,0	no
97/98	350	310	155	10x23	35	7	195	15	M22	95	22	70	800	50	16,0	no

Flange connections with »Dowel Pin« according to DIN 15451



Size	d1	d2	d2*	d3	z x d4	b	t1	d	l	zxd4*	d*	l*	MA	MA*	Bolts inserted
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[Nm]	[Nm]	1)
85	285	245	240	175	8 x20	20	6	M20	65	4 x28	M16	75	600	200	yes
90	315	280	270	175	8 x22	22	6	M22	70	4 x30	M16	75	800	200	yes
95	350	310	300	220	10x22	25	7	M22	75	4 x32	M18	90	800	300	yes
97/98	390	345	340	250	10x24	28	7	M24	85	4 x32	M18	95	1000	300	yes

* for dowel pin connection 1) Bolts inserted from joint side

It is not possible to insert bolts from the yoke side for all designs! Other flange connections on request.

Flange boltings

The following connecting elements are recommended for flange bolted connections:

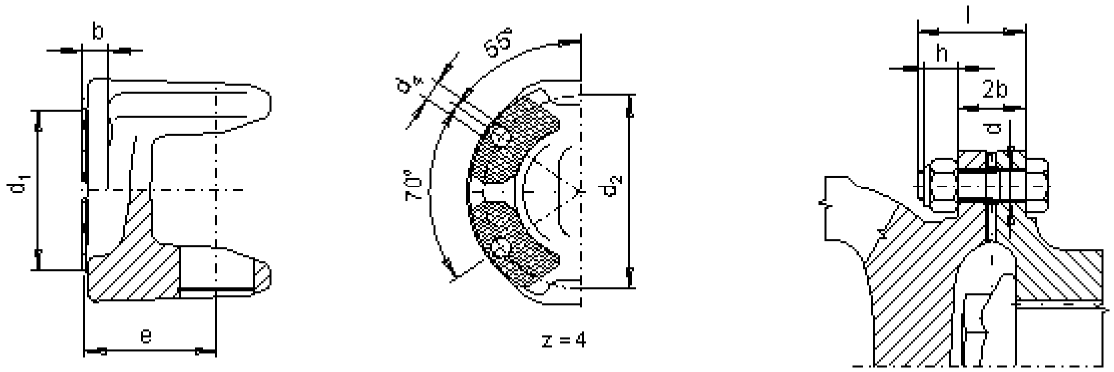
Hexagon head bolt ISO 4014-10.9 (reduced thread length, if available)

Hexagon nut ISO 7042-V-10 (self-locking)

All bolts must be tightened with the specified torque M_A. Permitted tolerance: ± 5 %.

XS – Flanges

70° X-serrated according to ISO 12667 resp. ISO 8667



Size	d1	d2	z x d4	b	e	ß max	d	l	h	2b	MA
	[mm]	[mm]	[mm]	[mm]	[mm]	[°]	[mm]	[mm]	[mm]	[mm]	[Nm]
43	100	84	4 x 8	10	58	35	M8	30	8	20	35
53	120	100	4 x11	14	68	35	M10	40	10	28	70
63	120	100	4 x11	14	75	35	M10	40	10	28	70
58	152	130	4 x13	16	95	35	M12	45	12	32	120
68	152	130	4 x13	16	75	20	M12	45	12	32	120
68	152	130	4 x13	16	95	35	M12	45	12	32	120
68	180	150	4 x15	18	95	35	M14	55	14	36	200
72	180	150	4 x15	18	100	35	M14	55	14	36	200
73	180	150	4 x15	18	95	30	M14	55	14	36	200
77	180	150	4 x15	18	100	22	M14	55	14	36	200
79	200	165	4 x15	20	113	22	M14	55	14	40	200

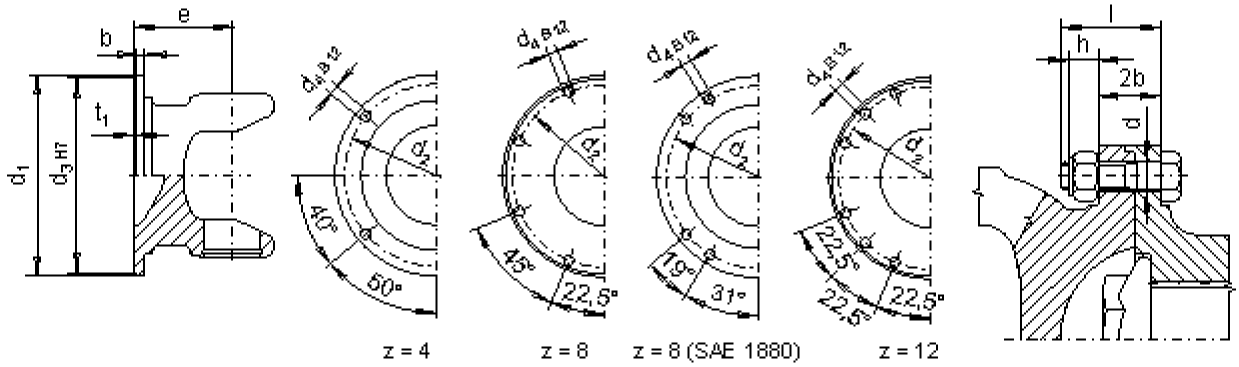
Other flange connections on request

Flange boltings
The following connecting elements are recommended for flange bolted connections:

Hexagon head bolt ISO 4014-10.9 (reduced thread length, if available)
Hexagon nut ISO 7042-V-10 (self-locking)

All bolts must be tightened with the specified torque M_A.
Permitted tolerance: ± 5 %.

SAE – Flanges



Size	d1	d2	d3	z x d4	b	t1	e	ß max	d	l	h	2b	MA	SAE
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[°]	[mm]	[mm]	[mm]	[mm]	[Nm]	
30	90	69,9	57,15	4 x 8	6	2	40	20	M8	22	8	12	35	1120
30	90	69,9	57,15	4 x 8	6	2	47	30	M8	22	8	12	35	1120
30	97	79,4	60,32	4 x10	6	2	40	20	M10	25	10	12	70	1300
30	97	79,4	60,32	4 x10	6	2	47	30	M10	25	10	12	70	1300
43	90	69,9	57,15	4 x 8	6	2	48	20	M8	22	8	12	35	1120
43	97	79,4	60,32	4 x10	6,5	2	58	35	M10	25	10	13	70	1300
43	116	95,25	69,85	4 x11	7	2	48	20	M10	25	10	14	70	1400
53	116	95,25	69,85	4 x12	8	2	56	20	M12	30	12	16	120	1400
53	116	95,25	69,85	4 x12	8	2	70	35	M12	30	12	16	120	1400
53	150	120,65	95,25	4 x14	10	2	56	20	M14	35	14	20	200	1500
58	174,6	155,52	168,23	8 x10	12	3	90	35	M10	35	10	24	70	1600
58	203,2	184,15	196,82	8 x10	11	3	95	35	M10	35	10	22	70	1700
58	203,2	184,15	196,82	12x10	11	3	95	35	M10	35	10	22	70	1800
63	150	120,65	95,25	4 x14	10	2	62	20	M14	35	14	20	200	1500
63	150	120,65	95,25	4 x14	10	2	80	35	M14	35	14	20	200	1500
63	174,6	155,52	168,23	8 x10	10	3	80	30	M10	35	10	20	70	1600
68	174,6	155,52	168,23	8 x10	10	3	95	35	M10	35	10	20	70	1600
68	203,2	184,15	196,82	8 x10	11	3	95	35	M10	35	10	22	70	1700
68	203,2	184,15	196,82	12x11	11	3	95	35	M10	35	10	22	70	1800
70	203,2	184,15	196,82	12x11	11,5	3	95	25	M10	35	10	23	70	1800
72	203,2	184,15	196,82	12x11	11,5	3	100	33	M10	35	10	23	70	1800
73	203,2	184,15	196,82	12x10	11,5	3	100	33	M10	35	10	23	70	1800
73	203,2	184,15	196,82	12x11	11,5	3	100	33	M10	35	10	23	70	1800
73	244,5	209,55	177,8	8 x16	15	3,4	100	33	M16	50	16	30	300	1880
77	244,5	209,55	177,8	8 x16	15	3,4	110	25	M16	50	16	30	300	1880
80	244,5	209,55	177,8	8 x16	15	3,4	108	24	M16	55	16	36	300	1880
80	250,0	228,57	196,8	12x12	18	1,5	108	24	M12	50	12	36	120	1900GS
80	276,0	247,64	222,22	8 x16	18	2,4	108	24	M16	55	16	36	300	1900
80	276,0	251,70	222,22	8 x16	18	2,4	108	24	M16	55	16	36	300	1900HS
83	244,5	209,55	177,8	8 x16	18	3,4	125	20	M16	55	16	36	300	1880

JOURNAL CROSS ASSEMBLIES

Crosses sizes 15 up to 84

Size	d	l	m
	[mm]	[mm]	[kg]
15	20	44,34	0,14
30	26	72,10	0,39
43	30	82,40	0,64
53	35	96,85	0,98
63	42	104,5	1,45
63*	42	106,0	1,48
55*	38	105,8	1,28
57*	47	132,2	2,32
58	48	132,2	2,38
65*	48	116,5	2,16
68	52	133,1	2,93
69*	53	135,05	3,11
70	52	147,2	3,35
72	57	144,0	3,94
73	57	152,0	4,17
77	65	172,0	6,27
79**	68	117,0	7,75
80	72	185,0	8,30
83	74	217,0	10,3
84	83	231,4	15,0

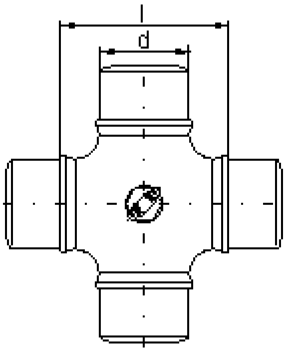
* spare equipment ** with inside snap ring

Other designs available on request

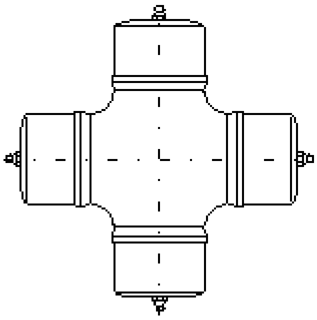
Designation sample for a journal cross assembly, size 63 with length 106 mm:
Journal cross assembly, 2110-63/106

Designation sample for a journal cross assembly, size 68 with bush lubrication:
Journal cross assembly, 2111-68

Crosses sizes 85 up to 97



Central lubrication
Code No. 2112



Bush lubrication
Code No. 2111

Size	d	l	m
	[mm]	[mm]	[kg]
82*	74	154	12,9
85	83	139	16,2
85*	83	129	15,9
85*	83	175	19,4
90	95	160	23,3
90*	95	139	22,3
90**	95	190	26,8
95	110	176	33,8
95*	110	160	32,8
95*	110	210	39,1
97	120	196	46,6
97*	120	176	43,7
98	130	196	55,3

* spare equipment ** for cardan shaft code no. 4496

Other designs available on request

Designation sample for a journal cross assembly, size 85 with length 139 mm:
Journal cross assembly, 2112-85/139

Designation sample for a journal cross assembly, size 85 with length 129 mm and bush lubrication:
Journal cross assembly, 2111-85/129

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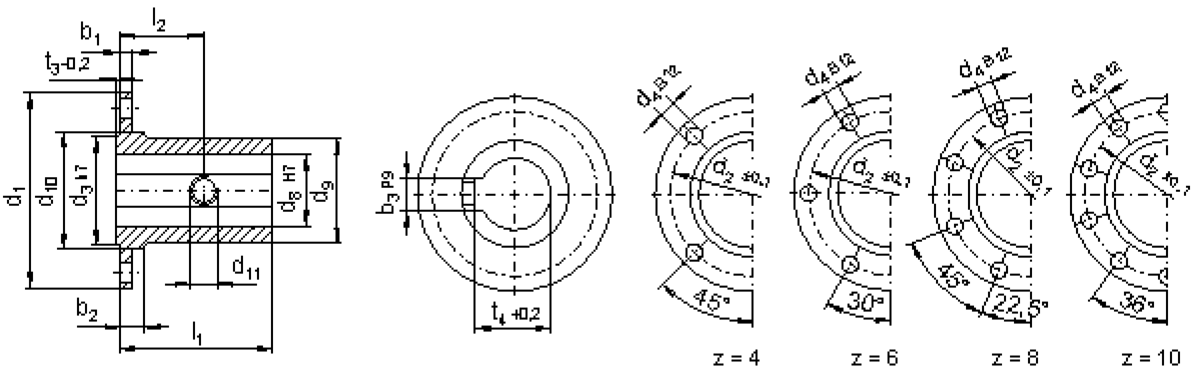
DIN – COMPANION FLANGES

Code No. 141

In the following table we have listed different designs of companion flanges, offered by us. In your request please inform us about the required design, as shown in the list, and the technical data.

See ISO 7646 (DIN), ISO 7647 (SAE) and ISO 12667 resp. ISO 8667 (XS) too.



Size	d1	d2	d3	z x d4	d8	d9	d10	d11	b1	b2	b3	t3	t4	l1	l2	m
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]
15	65	52,0	35	4 x 6	28	41	41	M6	5	-	8	1,6	31,3	40	20	0,3
30	90	74,5	47	4 x 8	35	52	57	M6	8	11	10	2,3	38,3	55	27	0,8
43	100	84,0	57	6 x 8	38	60	70	M6	8	11	10	2,3	41,3	62	31	1,2
53	120	101,5	75	8 x10	45	80	84	M8	8	11	14	2,3	48,8	70	35	2,3
63	150	130	90	8 x12	55	95	111	M12	10	14	16	2,3	59,3	85	42	4,1
58	150	130	90	8 x12	60	100	111	M12	12	15	18	2,3	64,4	100	50	5,0
68	180	155,5	110	8 x14	75	120	133	M16	12	16	20	2,3	79,9	120	60	7,9
80	225	196	140	8 x16	90	155	171	M18	15	20	25	4,5	95,4	150	75	18,4
83	250	218	140	8 x18	100	170	190	M18	18	22	28	5,0	106,4	160	80	25,4
86	285	245	175	8 x20	110	190	214	M20	20	25	28	6,0	116,4	180	90	32,1
90	315	280	175	8 x22	120	210	247	M20	22	28	32	6,0	127,4	180	90	40,4
95	350	310	220	10x22	130	220	277	M22	25	30	32	7,0	137,4	200	100	50,1
97	390	345	250	10x24	150	250	308	M24	28	32	36	7,0	158,4	220	110	62,5

For feather key according to DIN 6885 and DIN flange connections.

Other designs available on request. (e.g. with SAE- or with XS-connection)

Designation sample for a companion flange, size 63: **Companion flange 141-63**

APPLICATION

General product describtion

No machine element other than the cardan shaft allows power transmission of torque between spacially offset driving and driven shafts whose position can be changed additionally during operation.

Spatial angular motion and changes of axial length are ensured by advanced constructional elements.

Thus, cardan shafts have become an indispensable transmission component in automotive engineering and industry.

Cardan shafts offer

» **universal application**
» **excellent efficiency**
» **high reliability**
» **low maintenance**
» **easy use**

and have made broad inroads in almost all industries during the last few decades.

Convince yourself that our products will solve your drive problems to your complete satisfaction.

General notes

» The installation of cardan shafts requires expertise and careful workmanship!
» Be sure to follow manufacturer's instructions for installation and repair.
» Make sure that cardan shaft locating centres are properly seated and that the flange surfaces are in perfect contact!
» The operation ratings must never be exceeded (M_d, β, n).
» Do not use high pressure (water, stream, air) for cleaning to prevent damage of the bearings and sealings!

Storage

Store cardan shafts on suitable shelves in dry, closed rooms. Do not stack cardan shafts, place one beside the other, lying or standing upright. Cardan shafts standing upright must be backed to prevent them from falling, lying shaft must be secured against rolling way.

Deflection angle

The distinguishing feature of a universal joint is its ability to transmit rotary motion at a constant or varying misalignment within a deflection angle of $\pm\beta$.
The deflection angles shown on the dimensional sheets can safely be obtained where special circumstances necessitate their use.
Generally, as an increase of ß reduces the lifetime of the joint bearing, the operating deflection angle should be as small as possible, however not below 1° for maintaining a sufficient lubrication of the bearings.

Where a universal joint has angles in the horizontal and vertical planes at the same time, the resulting angle can be calculated from the components β_H and β_V, or it can be gathered from the diagram, which gives sufficient accuracy in most cases (Fig. 1).c

$$\boxed{\tan\beta = \sqrt{\tan^2\beta_H + \tan^2\beta_V}}$$

Example: $\beta_V = 25°$; $\beta_H = 15° \rightarrow \beta = 28{,}3°$

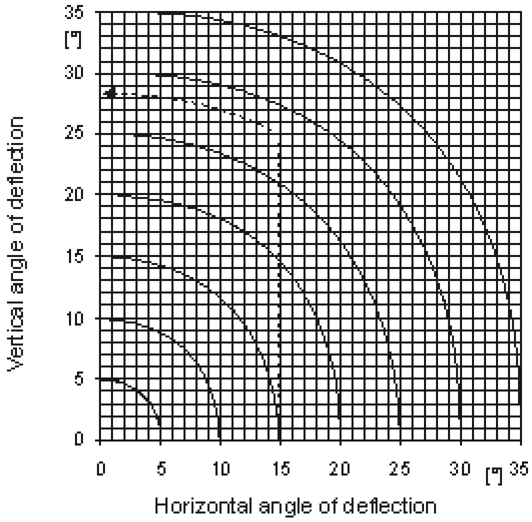


Figure 1

Kinematics

The universal joint works in accordance with a certain kinematical law:

With the driving shaft at a constant angular velocity ω_1 the angle at the joint results in periodic variations in ω_2. This angular velocity on the driven side passes through peaks and valleys twice per revolution, their absolute amounts progressively increasing with the deflection angle. With constant output, the torques are inversely proportional to the angular velocities, so that the resulting extremes for the driven shaft are as follows:

Turning angle φ	
0° and 180°	90° and 270°
$\omega_2 = \omega_1 \cdot \cos\beta$	$\omega_2 = \frac{\omega_1}{\cos\beta}$
$M_{I2} = \frac{M_{I1}}{\cos\beta}$	$M_{I2} = M_{I1} \cdot \cos\beta$

This kinematical unevenness is critical if two shafts positioned at an angle of deflection are linked by a single joint. The mid-section of a cardan shaft located between two joints can also induce vibration in the power train due to acceleration and deceleration. Small angles of deflection are therefore important also to this shaft configuration, especially in the high-speed range.
Therefore, to ensure that cardan shafts run smoothly and with little vibration, the product of n · β (speed · angle of deflection) should remain within empirical limits.

For orientation:

$$n \cdot \beta \leq \frac{36000}{\sqrt[5]{m}} \qquad \text{or:} \qquad n \cdot \beta \cdot \sqrt[5]{m} \leq 36000$$

ni = Speed [rpm]
βi = Deflection angle [°]
m = Mass of cardan shaft [kg]

Where a single joint is used, it is all-important to check that the differential angle of the dissimilar rotation and the resulting mass forces are within permissible limits for the given application.

The maximum differential angle of a single joint can be calculated by the following formula:

$$\Delta\varphi_{max} = \pm \arctan \frac{1-\cos\beta}{2 \cdot \sqrt{\cos\beta}}$$

An other term for the dissimilar rotation is the non-uniformity U.
It is defined by:

$$U = \frac{\omega_{2max} - \omega_{2min}}{\omega_1} \qquad \text{or:} \qquad U = \sin\beta \cdot \tan\beta$$

Arrangement

Two joints allow to compensate the periodic fluctuations of the angular velocity of a single joint. With reference to the following figure, this is achieved by locating the inner pin axes, shafts 1, 2 and 3 in a single plane which makes identical deflection angles of both joints. M and Z arrangements have the same kinematical value. (Fig. 2)

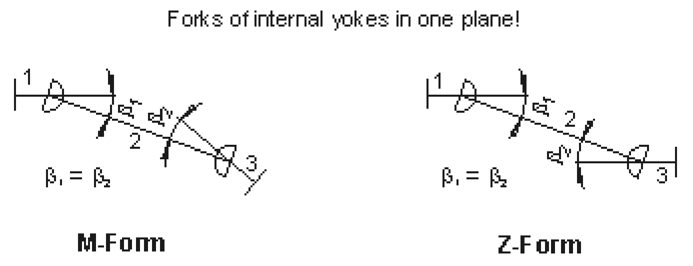


Figure 2

On the other hand, homokinetic transmission of the rotary motion is also possible when shafts 1, 2 or 3 are not in one plane. However, identical spatial deflection angles will be needed in this situation.

This is the case, if one view shows the M shape whereas the other is of Z shape. In this situation, the joints must be rotated relative to each other until the inner joint axes are located in their respective deflection planes. Cardan shafts for this application have to be designed specially.

Basically, all deflection angles in a cardan shaft should be the same. This may not be possible in some cases. Then it should be decided if the remaining degree of angular irregularity can be tolerated.

Exact figures for the permitted difference between the deflection angles on the input (driving) side and the output (driven) side cannot be specified because the degree of angular irregularity strongly depends on the absolute magnitude of the angle.

Other factors that need to be considered are speed and stiffness, i. e., the drive system's torsion spring coefficient.

Where the cardan shafts are arranged one after the other in a line, the following combinations are recommended:

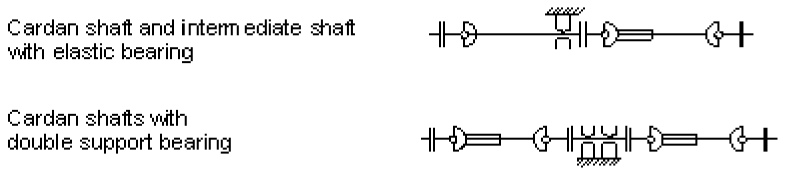


Figure 3

To avoid dissimilarities and vibrations connected with them, it is advisable, in the appropriate circumstances, to install the individual cardan shafts offset to one another (90°).

Non-operating bending moment

The deflection of the force lines by the deflection angle causes transverse forces and flexural moments on the shaft ends which support the joint or cardan shaft.

This phenomenon becomes particularly clear if one imagines the practically useless deflection angle of 90°, in which the entire torque of one drive fork acts as flexural moment in the other. For the shaft ends connected to the cardan shaft this creates a superposition of lateral thrust and flexion which is free of transverse forces. So this means additional load on the bearings of these connected shafts, especially at high angles and torques, a consideration which must be taken into account in the design of the drive.

Speed

Transverse critical speed

Every cardan shaft has a transverse critical speed which must never be reached during operation. This depends mainly on the distance between the two joints and on the flexural strength of the tube used. Also, it is influenced by the wear and tear of the shaft, especially of the splined connection of the telescopic section.

Excessive speed causes vibration and premature failure of the cardan shaft and the connected parts of equipment.

The transverse critical speed for cardan shafts can be calculated as follows:

$$n_k = 0{,}9 \cdot 10^7 \cdot \frac{\sqrt{D^2 + d^2}}{l^2}$$

D = Tube outer diameter [cm]

di = Tube inner diameter [cm]

Iv = Distance between joints or distance between joint and intermediate bearing [cm]

The operating speed should not exceed 80 % of the critical speed calculated, otherwise the application would require, instead of one cardan shaft, the arrangement of two cardan shafts with an intermediate bearing, a so called train of cardan shafts. This involves certain requirements with respect to the deflection angle. For advice contact our design department.

Limitations of length and speed

The length of tubular cardan shafts is limited by the speed beyond which deflection is likely, or simply by the limits set in production. The largest length available is L = 6000 mm, for shafts that need balancing it is L = 4500 mm.

Larger length options on request.

Balancing of cardan shafts

Unless some low speed is required, as a rule, cardan shafts are balanced dynamically. Dynamic balancing guarantees smooth running of the cardan shaft, minimizing the load on the bearings caused by centrifugal forces.

Depending on the specific requirement, balancing is done in various quality categories according to DIN IS0 1940. (Fig. 4)

Balancing quality	Service conditions
G 16	Cardan shafts with special requirements
G 40	Cardan shafts for general use

Unbalance at gmm per kg mass of cardan shaft:

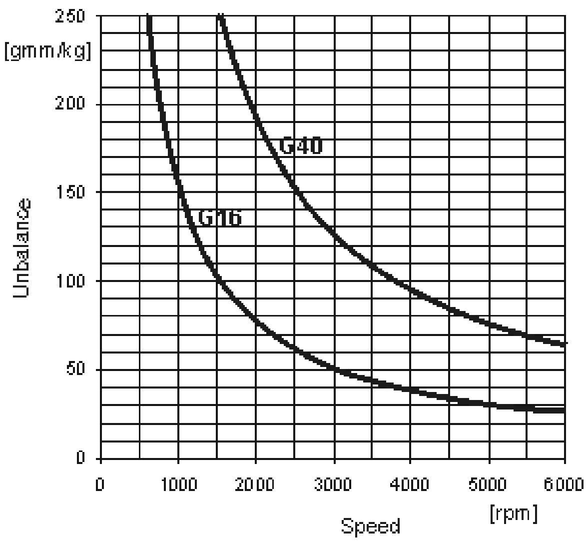


Figure 4

Or calculate by the following formula:

$$U_{R\,zul} = \frac{G \cdot 30000}{\pi \cdot n}$$

$U_{R\,zul}$ = Permitted unbalance [gmm/kg]

G = Balancing quality (16 or 40)

n = Speed [rpm]

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Selection

Cardan shafts being used for various duties, it is impossible to choose their size and predict their service life with reliable accuracy following just one general rule.
The familiar failure probability rates for antifriction bearings apply to cardan shafts as well.
The size of the cardan shaft should be chosen so that its maximum momentary torque rating, is not smaller than the maximum torque to be transmitted in your application. Additionally parameters like deflection angle, speed, length, operating conditions (kind of drive, temperature, dust etc.) should be considered. Therefore please refer to our technical questionnaire. Our experts will evaluate your information given in this questionnaire, to find the best choice for your application. If you deem more detailed calculations necessary determining lifetime, stability etc. please contact our design department.

Torque definitions:

M_{dB} = Reference torque - Torque for selection of cardan shaft size with optimal life.
M_{dG} = Limiting torque - Capable of transmitting torque in a limited frequency without damages to the function of a cardan shaft
M_{dW} = Alternating torque - At this torque the cardan shaft is permanently solid at alternating loads.
The permanently solid at pulsating load ($M_{d\ Sch}$) can be calculated as follows: $M_{d\ Sch} = M_{dW} \times 1{,}45$

Determine the length L_Z of cardan shaft for static application:

- Size 15: $L_Z = L_B - 10$
- Size 30: $L_Z = L_B - 20$
- Size 43 … 70: $L_Z = L_B - 45$
- Size 72 … 98: $L_Z = L_B - 50$

Calculation of m, J and C for other cardan shaft lenghts than specified in the dimension charts:

Determine the lenght of the additional tube (L_R):

$$L_R = L - L_{min} \quad \text{resp.} \quad L_R = L_Z - L_{Z\,min} \quad [\text{mm}]$$

1. Mass:

$$m = m_{min} + \left(m_R \cdot \frac{L_R}{1000} \right) \quad [\text{kg}]$$

2. Moment of inertia:

$$J = J_{min} + \left(J_R \cdot \frac{L_R}{1000} \right) \quad [\text{kgm}^2]$$

3. Torsional stiffness:

$$\frac{1}{C} = \frac{1}{C_{min}} + \left(\frac{L_R}{C_R \cdot 1000} \right) \quad \left[\frac{\text{kNm}}{\text{rad}} \right]$$

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Installation

To make sure the running quality and precise balancing of the cardan shaft are not impaired, for connecting flanges running at zero-clearance we recommend the centring tolerances and maximum values for radial and axial deviation listed in the table below.
(see Fig. 5 too)

Cardan shaft speed [rpm]	Fit for d_3	Radial runout K_R [mm]	Axial runout K_S [mm]
up to 500	h8	0,15	0,18
500 up to 3000	h7	0,08	0,10
over 3000	h6	0,05	0,07

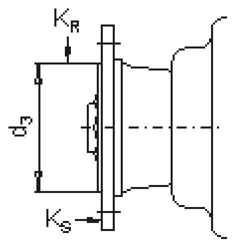

Figure 5

All anti-corrosion paint should be removed carefully from the cardan shaft flanges before the shaft is installed. Anti-corrosion agent on the cardan mounting flanges reduces frictional adhesion (not with flange yokes with staggered tooth arrangement).
On kinematical grounds, make sure that the markings on the length displacement are matching exactly. Otherwise the inner yokes will not be located in one plane and rotation causes vibration and early failure of the drive system components.
All cardan shafts have an alkaloid-base priming coat; the finish coat can be customized.

Maintenance

The moving parts of a cardan shaft need relubricating at certain intervals, removing used lubricant and foreign matter, if any, and replenishing the lubricant.
Lubrication is required after cleaning with high pressure or a steam jet.

Maintenance procedure

Lubricant is supplied to the joints and the sliding member by taper lubricator nipples acc. to DIN 71412 or flat lubricator nipples acc. to DIN 3404. Where the lubricating points on a joint are placed opposite each other, lubricant need only be supplied at one nipple. Make absolutely sure to clean the lubricator nipples before lubrication. The grease reaches four joint bearings through the ducts in the spider. Supply lubricant until lubricant emerges from the seals. When supplying lubricant avoid harsh strokes or forceful impact that can damage the seals.
The splined shaft connection of the length displacement of cardan shaft requires a controlled supply of lubricant in order to avoid high hydraulic forces that impair the axial movement.
Rilsan-coated spline shaft connections are lifetime lubricated.

Lubricant

We recommend the use of lithiumcomplex greases of specification KP 1-2 N-30 or KP 2 N-20 DIN 51502 with EP additives for European climates or of non-freezing grease of the same base of specification KP 2 N-40 or KP 3 N-40 for use in temperatures of down to -40 °C.
Lubricant should never be replenished with a grease of a different soap base.
Do not grease cardan shaft bearings with MoS_2 or other solid lubricant additives.

Maintenance cycle

Maintenance intervals for cardan shafts depend mainly on the conditions of the given application; heavy duty or higher than average ambient temperatures, for instance, lead to faster lubricant consumption. Hostile environments, heavy soiling or exposure to water, necessitate shorter maintenance intervals. The following are recommended lubrication intervals in the interest of a prolonged service life (The values below are valid only for use at normal conditions):

Cardan shafts in

- motor vehicles - Road application .... 50000 km or 1 year
- motor vehicles - Road and off-road applications .... 30000 km or 1 year
- motor vehicles - Construction site and off-road .... 10000 km or 250 hours of operation
- rail vehicles .... 3000 hours of operation or 1/2 year
- stationary installations and travelling cranes .... 500 hours of operation
- marine drive lines .... 1500 hours of operation or 1/2 year

SAFETY CONSIDERATIONS

Rotating shafts create a hazard!
The user must therefore strictly adhere to the safety-standards and take suitable precautions, providing e. g. safeguards or covers.
Observe the EC-Regulations for machinery!
When working at the cardan shaft the drive motor must be shut off. Disassembling, assembling, repair and maintenance should only be performed by qualified personnel. At such work and at the transportation the cardan shafts have to be secured in such a way, that they cannot slip apart and the flanges are fixed preventing damages to the cardan shaft and avoiding the risk of getting hurt.

Please attention to our relevant indications for selection, installation and safety.

Because the customer has the knowledge of the various demands on our product for your application, it is his responsibility to verify the drawings and documents that we prepared on the basis of the data made available by the customer and to examine the suitability of the product for the proposed use.
Our offer shall in this case be considered as a recommendation only.