Propeller shafts from 350 up to 175,000 Nm

General Product Description

No machine element other than the propeller shaft allows power transmission of torque between spatially 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, propeller shafts have become an indispensable transmission component in automotive engineering and industry.

Propeller shafts offer

» universal application

» advanced economy

» 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. This catalogue is intended as a source of ready reference.

Line of Products Overview

Series	Reference torque [Nm]	Limiting torque [Nm]	Alternating torque [Nm]	Diameter of rotation [mm]	Flange connection DIN [mm]	Flange connection SAE	Flange connection KV/XS [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	152/180
68	10000	11500	-	160	150/165/180	1600/1700/1800	152/180
70	12000	17000	-	174	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	-	-

Unser Produktsortiment umfasst außerdem

Our product ranges also includes

» Doppelgelenkwellen « » Double jointed propeller shafts «

Für Vorderradantriebe von LKW, Geländefahrzeugen, Traktoren, Baumaschinen usw.

For front-wheel drives of trucks, off road vehicles, tractors, building machines etc.

Baureihe/ Series	Größtes kurzzeitig zulässiges Drehmoment/ Largest permitted short-time torque [Nm]	Rotations-durchmesser/ Diameter of rotation [mm]	Beugungswinkel/ Angle of deflection [°]
41	4000	112	50
51	8000	138	42/50
61	3200/4000	115/128	52
71	12000	152	42
81	15000	172	42

» Präzisionsdrehteile « » Precision turned parts «

Unser Teilespektrum umfasst:

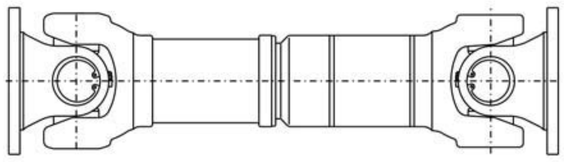
» Getriebebauteile wie Ausgleichbolzen in vielen Varianten
» Schaltstangen, Schaltfinger, Führungsbolzen usw. in Stückzahlen über 1 Mio. pro Jahr
» Lenkungsbauteile wie Achsschenkelbolzen usw.
» Antriebswellen mit Kupplungsverschiebeprofilen
» hydraulische Komponenten
» Wasserpumpenbauteile
» Bauteile für die Medizintechnik, chemische und Flugzeugindustrie mit bis zu 10.000 Teilen /Jahr

Our spectrum of production includes:

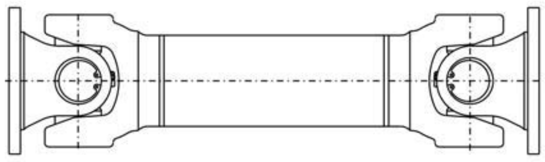
» Gear parts, such as differential pins in many variations
» Shift forks, shift fingers, guide bolts, etc. with more than 1 million pieces per year
» Besides control parts like king pins etc.
» Input shafts with moved clutch profiles
» Hydraulic components
» Water pump parts
» Parts for medical technology, chemical and aircraft industry with up to 10,000 pcs. per year

Propeller shaft-variants

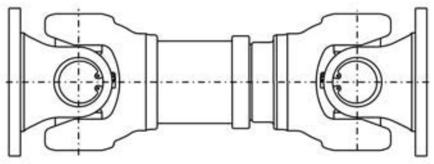
Propeller shafts with length displacement
Normal angle design -Code No. 41 and 45
Wide angle design -Code No. 46



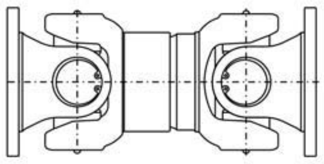
Propeller shafts without length displacement
Normal angle design -Code No. 47
Wide angle design -Code No. 48



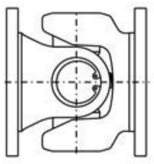
Short propeller shafts with length displacem.
Normal angle design -Code No. 43
Wide angle design -Code No. 44



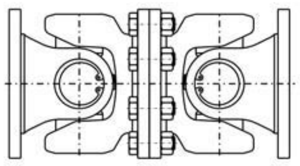
Super short propeller shafts
with length displacement
Reduced deflection angle design -Code No. 4496



Flange joints
Normal angle design -Code No. 310
Wide angle design -Code No. 314



Double joints
Normal angle design -Code No. 7670
Wide angle design -Code No. 7675



Explanations

M_{dB}		Reference torque
M_{dG}		Limiting torque
M_{dW}		Alternating torque
M_A		Tightening torque of flange fastening bolts
KZ		Code number (design)
L		Length of propeller shaft
L_{min}		Shortest length of propeller shaft without length displacement
L_Z		Compressed length
$L_{Z\,min}$		Shortest compressed length
$L_{Z\,max}$		Longest compressed length
L_A		Length compensation
$L_{A\,min}$		Length compensation for $L_{Z\,min}$
$L_{A\,max}$		Length compensation for $L_{Z\,max}$
L_B		Operating length
z		Number of flange holes
β_{max}		Maximum joint deflection angle
m		Mass of propeller shaft for L
m_{min}		Mass of propeller shaft for L_{min} resp. $L_{Z\,min}$
m_{max}		Mass of propeller shaft for $L_{Z\,max}$
m_R		Mass per 1 m tube length
J		Moment of inertia of propeller shaft for L
J_{min}		Moment of inertia of propeller shaft for L_{min} resp. $L_{Z\,min}$
J_{max}		Moment of inertia of propeller shaft for $L_{Z\,max}$
J_R		Moment of inertia per 1 m tube length
C		Torsional stiffness of the propeller shaft for L
C_{min}		Torsional stiffness of the propeller shaft for L_{min} resp. $L_{Z\,min}$
C_{max}		Torsional stiffness of the propeller shaft for $L_{Z\,max}$
C_R		Torsional stiffness for 1 m tube length

Torque Definitions

M_{dB}		Torque for selection of propeller shaft series with optimal life
M_{dG}		Capable of transmitting torque in a limited frequency without damages to the function of a propeller shaft
M_{dW}		At this torque the propeller 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 propeller shaft for static application:

-Series 15 ... 30: $L_Z = L_B - 20$ -
Series 43 ... 70: $L_Z = L_B - 45$ -
Series 72 ... 95: $L_Z = L_B - 50$

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

Determine the length of the additional tube (L_R):

$$L_R = L - L_{min} \quad [mm]$$

bzw./resp.

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

1. Mass:

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

2. Moment of inertia:

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

3. Torsional stiffness:

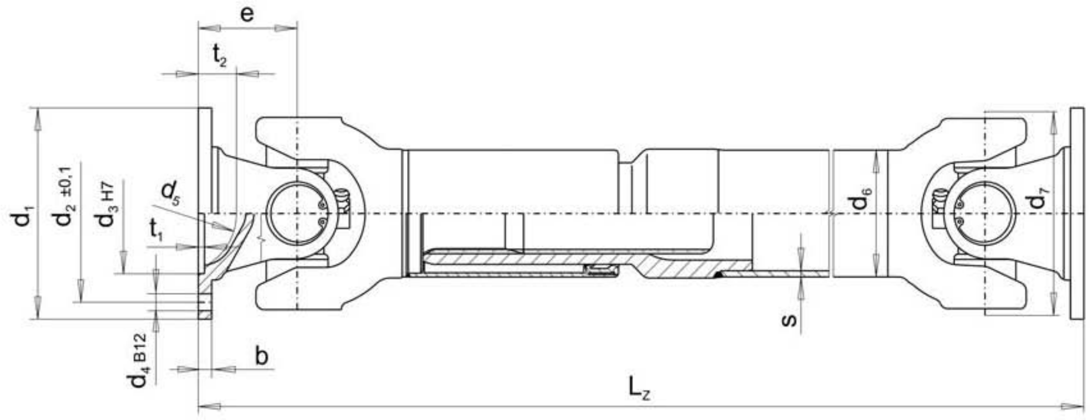
$$\frac{1}{C} = \frac{1}{C_{min}} + \left(\frac{L_R}{C_R \cdot 1000} \right) \quad \left[\frac{kNm}{rad} \right]$$

Propeller shafts up to 6200 Nm

Series	MdB [Nm]	MdG [Nm]	d1 [mm]	d2 [mm]	d3 [mm]	z x d4 [mm]	b [mm]	t1 [mm]	d5 [mm]	t2 [mm]	d7 [mm]	d6 [mm]	s [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 x 10	8,0	3	70	22	115	70	3,0
63	4400	6200	150	130,0	90	8 x 12	10,0	3	95	24	125	80	3,5

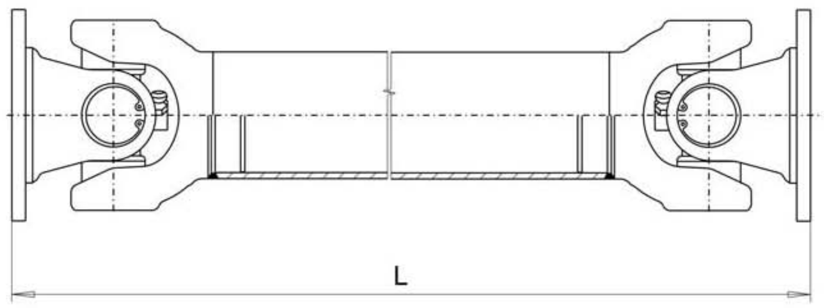
Kennzahlen/
Code No.

41, 45, 46



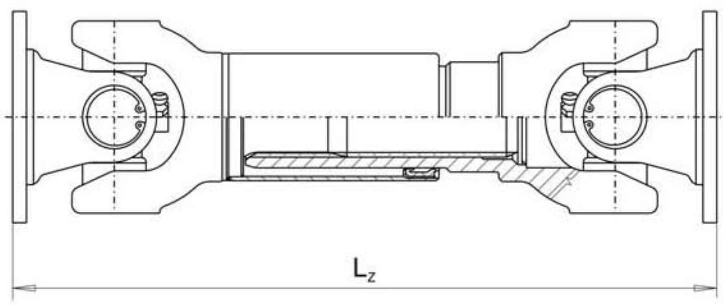
Kennzahlen/
Code No.

47, 48



Kennzahlen/
Code No.

43, 44



Prop. shafts with length displacement

Normal angle design -Code No. 41 and 45. Wide angle design -Code No. 46

Series 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											

G [illegible]

Normal angle design -Code No. 47. Wide angle design -Code No. 48

Series 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

Kurz-Gelenkwellen mit Längenausgl. Short prop. shafts with length displ.

Normal angle design -Code No. 43. Wide angle design -Code No. 44

Baureihe/ Series 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 18,2 300 65 4,1 0,0024 17,3													
30	44	30	47	245	15	3,5	0,0025	17,5	315	65	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	0,012	50,1	500	85	12,2	0,0134	46,5
63 43 20 62 365 35 13,5 0,0230 86,0 515 110 17,5 0,0245 79,0													

Andere Ausführungen auf Anfrage möglich Other designs available on request

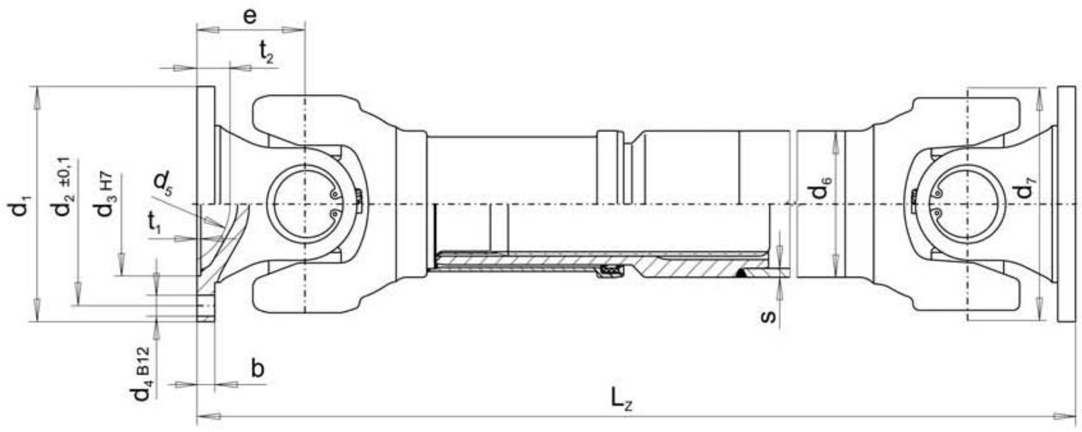
Propeller shafts 8.8 ... 25 kNm

Series	MdB [Nm]	MdG [Nm]	d1 d2 [mm] [mm]		d3 [mm]	z x d4 [mm]	b [mm]	t1 [mm]	d5 [mm]	t2 [mm]	d7 d6 [mm] [mm]		s [mm]
58	6900	8800	150	130,0	90	8 x 12	10	3	92	26	155	100	3,0
68	10000	11500	180 155,5		110	8 x 14	12	3	120	24	160 92		6,5
70	12000	17000	225	196,0	140	8 x 16	15	5	100	30	174	120	4,0
72	1500	2100	180 155.5		110	10 x 16	12	3	95	26	170 104		8.0

Erklärungen siehe Seite 8 Explanations see page 8 Weitere Flanschanschlüsse siehe Seiten 28, 32 und 34
Other flange connections see pages 28, 32 and 34

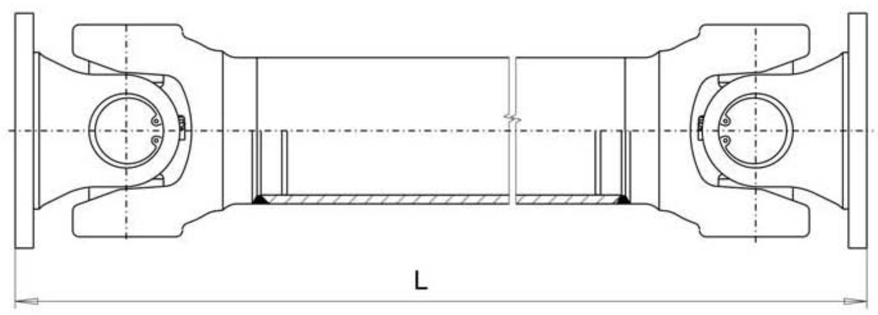
Kennzahlen/
Code No.

45, 46



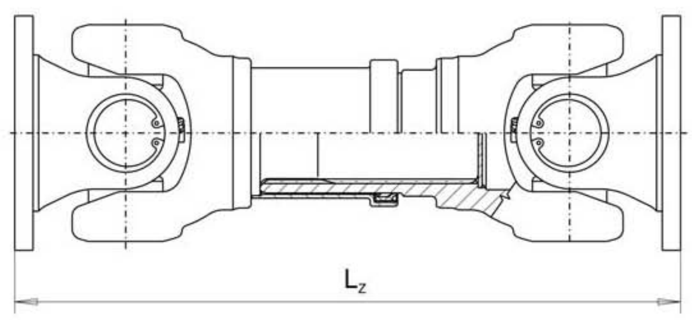
Kennzahlen/
Code No.

47, 48



Kennzahlen/
Code No.

43, 44



Prop. shafts with length displacement

Normal angle design -Code No. 45
Wide angle design -Code No. 46

Series 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 44,3 0,161 232 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

Gelenkwellen ohne Längenausgleich Prop. shafts without length displacem.

Normal angle design -Code No. 47. Wide angle design -Code No. 48

Baureihe/ Series 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 36,5 0,148 380 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										

Short prop. shafts with length displac.

Normal angle design -Code No. 43. Wide angle design -Code No. 44

Baureihe/ Series 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 42,4 0,156 244 570 110 42,9 0,157 240													
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	4	20	85	510	40	40,	0,11	380	650	110	47,0	0,116	340

Andere Ausführungen auf Anfrage möglich Other designs available on request

Propeller shafts 28 ... 55 kNm

Baureihe / Series	MdB [Nm]	MdG [Nm]	Md W [Nm]	d1 d2 d3 z x d4 [mm] [mm] [mm] [mm]				b t1 d5 t2 d7 d6 s [mm] [mm] [mm] [mm] [mm] [mm] [mm]						
77	19000	28000	9000	180	155,5	110	10 x 16	15	3	95	30	204	144	7,00
79*	28000	34000	-	200 165,0 -4 x 15				20 ---204 144 7,00						
80	26000	33000	13000	225	196,0	140	8 x 16	15	5	160	30	215	144	7,00
83	30000	40000	18000	250 218,0 140 8 x 18				18 6 120 45 250 162 9,85						
84	37000	55000	23000	285	245,0	175	8 x 20	20	7	130	35	265	162	9,85

Prop. shafts with length displacement

Normal angle design -Code No. 41 and 45

Series	KZ	ß max [°]	e [mm]	LZ min [mm]	LA [mm]	m min [kg]	J min kgm²	C min kNm/rad	mR [kg]	JR kgm²	CR 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

Prop. shafts without length displacem.

Normal angle design -Code No. 47

Series	KZ	ß max [°]	e [mm]	L min [mm]	m min [kg]	J min kgm²	C min kNm/rad	mR [kg]	JR kgm²	CR 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

Short prop. shafts with length displac.

Normal angle design -Code No. 43

Series	KZ	ß max [°]	e [mm]	LZ min [mm]	LA min [mm]	m min [kg]	J min kgm²	C min kNm/rad	LZ max [mm]	LA max [mm]	m max [kg]	J max kgm²	C max 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

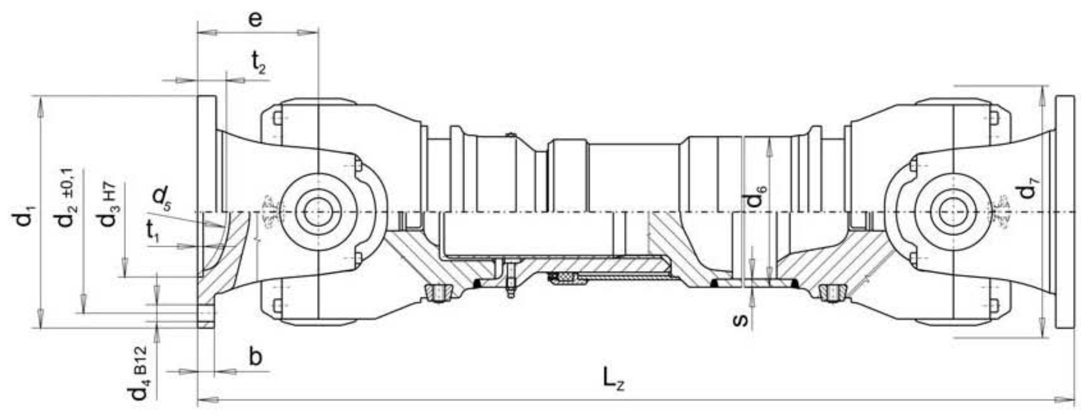
Andere Ausführungen auf Anfrage möglich Other designs available on request

Heavy duty propeller shafts 55 ... 175 kNm 55 ... 175 kNm

Baureihe / Series	MdB [Nm]	MdG [Nm]	Md W [Nm]	d1 d2 d3 [mm] [mm] [mm]			z x d4 [mm]	b t1 d5 t2 d7 d6 s [mm] [mm] [mm] [mm] [mm] [mm] [mm]						
85	37000	55000	23000	250	218	140	8 x 18	18	6	170	34	250	162	9,85
86	45000	58000	24000	285 245 175			8 x 20	20 7 170 34 250 165 12,5						
90	85000	120000	45000	315	280	175	8 x 22	22	7	180	40	285	218	10,5

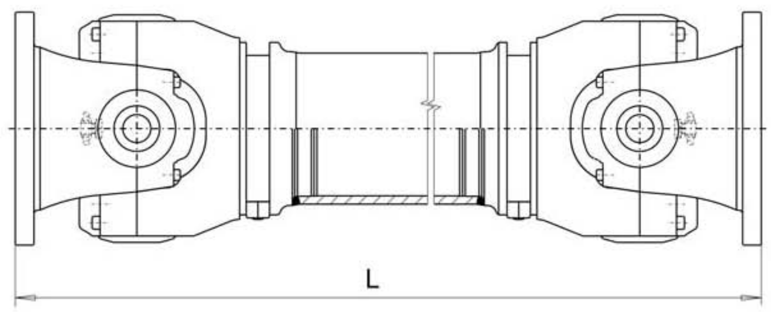
Kennzahl/
Code No.

41



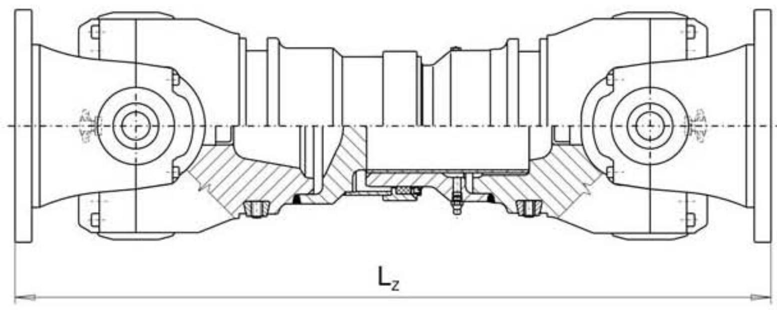
Kennzahl/
Code No.

47



Kennzahl/
Code No.

43



Prop. shafts with length displacement

Normal angle design -Code No. 41

Series	KZ	ß max [°]	e [mm]	LZ min [mm]	LA [mm]	m min [kg]	J min kgm²	C min kNm/rad	mR [kg]	JR kgm²	CR 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	342	3,40	3210	75,5	0,789	8246

Prop. shafts without length displacem.

Normal angle design -Code No. 47

Series	KZ	ß max [°]	e [mm]	L min [mm]	m min [kg]	J min kgm²	C min kNm/rad	mR [kg]	JR kgm²	CR 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	269	3,05	4215	75,5	0,789	8246

Short prop. shafts with length displac.

Normal angle design -Code No. 43

Baureihe / Series	KZ	ß max [°]	e [mm]	LZ min [mm]	LA min [mm]	m min [kg]	J min kgm²	C min kNm/rad	LZ max [mm]	LA max [mm]	m max [kg]	J max kgm²	C max kNm/rad
85	43	15	130	595*	40	124	0,75	1420	950	110	166	0,84	1220
86	43	15	130	595*	40	128	0,84	1420	950	110	170	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	308	3,19	3470	1100	135	347	3,38	3250

* [illegible]

Designation samples for propeller shafts

1. Propeller shaft with length displacement, standard angle, series 68, L_z = 980 mm, n = 3500 rpm, with XS connection Ø 180 mm

Propeller shaft 45-68 · 980-3,5 XS180

2. Propeller shaft with length displacement, wide angle, series 53 L_z = 1250 mm, n = 2000 rpm, DIN flange Ø 120 mm, 8 holes Ø 10 mm

Propeller shaft 46-53 · 1250-2,0 DIN Ø 120 · 8 · Ø 10

3. Propeller shaft without length displacement, wide angle, series 53, L_z = 1250 mm, n = 2000 rpm, DIN flange Ø 120 mm, 8 holes Ø 10 mm

Propeller shaft 48-53 · 1250-2,0 DIN Ø 120 · 8 · Ø 10

4. Short propeller shaft with length displacement, standard angle, series 43, L_z= 400 mm, n = 1500rpm, DIN flange Ø 100 mm, 6 holes Ø 8 mm

Short propeller shaft 43-43 · 400-1,5 DIN Ø 100 · 6 · Ø 8

5. Propeller shaft with length displacement, series 85, L_z = 1400 mm, n = 2500 rpm, DIN flange Ø 285 mm, 12 holes Ø 20 mm

Propeller shaft 41-85 · 1400-2,5 DIN Ø 285 · 12 · Ø 20

6. Short propeller shaft with length displacement, series 85, L_z = 710 mm, n = 3000 rpm, DIN flange Ø 250 mm, 8 holes Ø 18 mm

Short propeller shaft 43-85 · 710-3,0 DIN Ø 250 · 8 · Ø 18

7. Super short propeller shaft with length displacement, series 73, L_z = 365 mm, n = 3500 rpm, SAE flange Ø 203,2 mm, 12 holes Ø 11 mm

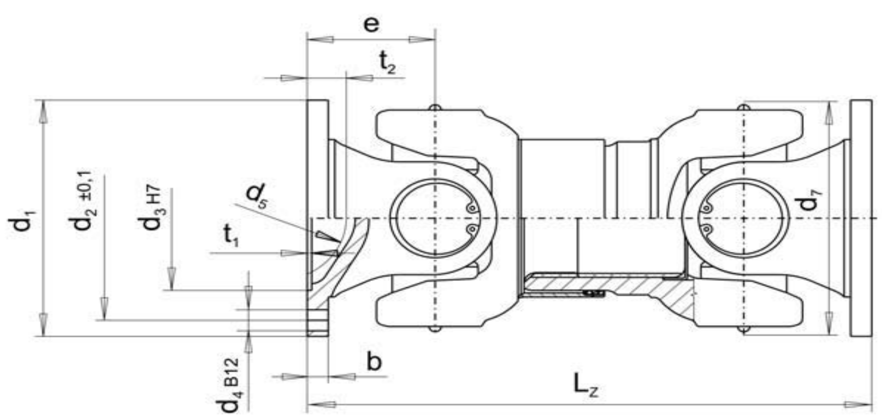
Super short propeller shaft 4496-73 · 365-3,5 SAE Ø 203,2 · 12 · Ø 11

-

Super short propeller shafts bis 52 kNm up to 52 kNm

Baureihe / Series	MdB [Nm]	MdG [Nm]	MdW [Nm]	d1 [mm]	d2 [mm]	d3 [mm]	z x d4 [mm]	b [mm]	t1 [mm]	d5 [mm]	t2 [mm]	d7 [mm]
73	17000	25000	-	180	155,5	110	10 x 16	14	3	95	26	178
73*	17000	25000	-	180	150	-	4 x 14	18	-	-	-	178
80	26000	33000	13000	225	196	140	8 x 16	15	5	160	30	215
85	37000	-	23000	348	314	175	10 x 18	18	7	-	-	285
90	52000	-	26000	360	328	175	10 x 18	18	7	-	-	315

Erklärungen siehe Seite 8 Explanations see page 8



Super short propeller shafts
with length displacement

Reduced deflection angle design -Code No. 4496

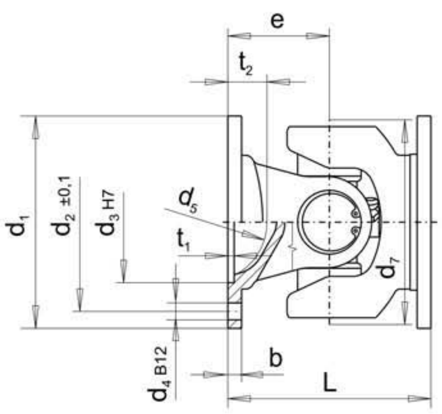
Baureihe / Series	KZ	ß max [°]	e [mm]	LZ min [mm]	LA min [mm]	m min J min [kg] kgm²		C min kNm/rad	LZ max [mm]	LA max [mm]	m max J max [kg] kgm²		C max kNm/rad
73	4496	10	85	365	15	33,6	0,097	450	475	70	41,9	0,111	420
73*	4496	5	56	290	15	30,8	0,094	590	420	70	40,3	0,110	535
80	4496	5	max	485	35	64,0	0,285	760	585	85	72,2	0,298	710
85	449	5	110	545	40	124	0,836	1470	595	80	129	0,851	1420

Flange Joints/Double Joints bis 25 kNm up to 25 kNm

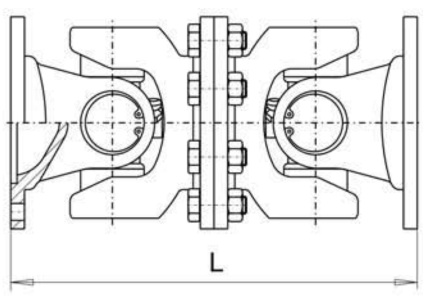
Baureihe/ Series	MdB [Nm]	MdG [Nm]	d1 [mm]	d2 [mm]	d3 [mm]	z x d4 [mm]	b [mm]	t1 [mm]	d5 [mm]	t2 [mm]	d7 [mm]
15	200	350	65	52,0	35	4 x 6	4,5	2	42	8	60
30	800	1100	90	74,5	47	4 x 8	6,0	3	62	12	90
43	1800	2400	100	84,0	57	6 x 8	6,5	3	50	20	98
53	3000	4200	120	101,5	75	8 x 10	8,0	3	70	22	115
63	4400	6200	150	130,0	90	8 x 12	10	3	95	24	125
58	6900	8800	150	130,0	90	8 x 12	10	3	92	26	155
68	10000	11500	180	155,5	110	8 x 14	12	3	120	24	160
70	12000	17000	225	196,0	140	8 x 16	15	5	100	30	174
72	15000	21000	180	155,5	110	10 x 16	12	3	95	26	170
73	17000	25000	180	155,5	110	10 x 16	14	3	95	26	178

Erklärungen siehe Seite 8 Explanations see page 8 Weitere Flanschanschlüsse siehe Seiten 26, 32 und 34
Other flange connections see pages 26, 32 and 34

Code No. **310**



Code No. **7670, 7675**



Designation samples

Flange joint, series 30, wide angle

Flange joint 314-30

Double joint, series 63, standard angle

Double joint 7670-63

Flange joints

Normal angle design -Code No. 310
Wide angle design -Code No. 314

Baureihe / Series	KZ	ß max [°]	e [mm]	L [mm]	m [kg]	J kgm²	C 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	21,6	0,107	985
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,	0,058	740

73	314	24	100	200	16,	0,058	740

Double joints

Doppelgelenke

bestehend aus zwei Flanschgelenken

consisting of two flange joints

Normalwinkelausführung -Kennzahl 7670

Normal angle design -Code No. 7670

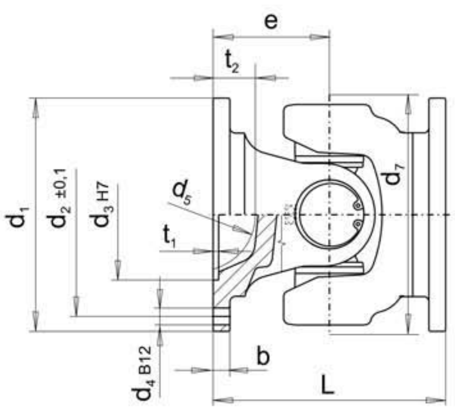
Baureihe / Series	KZ	ß max [°]	e [mm]	L [mm]	m [kg]	J kgm²	C kNm/rad
15	7670	25	32	128	1,1	0,00039	6
30	7670	20	40	160	2,9	0,0025	29
30	7675	30	47	188	3,1	0,0027	27
43	7670	20	48	192	4,8	0,0052	55
43	7675	35	58	232	5,4	0,0056	47
53	7670	20	56	224	7,4	0,0093	90
53	7675	35	70	280	8,8	0,0113	85
63	7670	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	44,2	0,224	490
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

Flange Joints/Double Joints 28 ... 55 kNm 28 ... 55 kNm

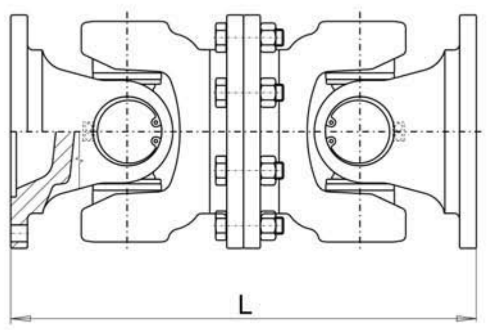
Baureihe/ Series MdB MdG MdW d1 d2 d3 z x d4 b t1 d5 t2 d7 [Nm] [Nm] [Nm] [mm] [mm] [mm] [mm] [mm] [mm] [mm] [mm] [mm]												
77	19000	28000	9000	180	155,5	110	10 x 16	15	3	95	30	204
79* 28000 34000 -200 165,0 -4 x 15 20 ---204												
80	26000	33000	13000	225	196,0	140	8 x 16	15	5	160	30	215
83 30000 40000 18000 250 218,0 140 8 x 18 18 6 120 45 250												
84	37000	55000	23000	285	245,0	175	8 x 20	20	7	130	35	265

* only XS flange connection

Code No. **310**



Code No. **767**



Designation Samples

Flange joint, series 83

Flange joint 310-83

Double joint, series 83

Double joint 767-83

Flange joints

Normal angle design -Code No. 310

Series	KZ	ß max [°]	e [mm]	L [mm]	m [kg]	J kgm²	C 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

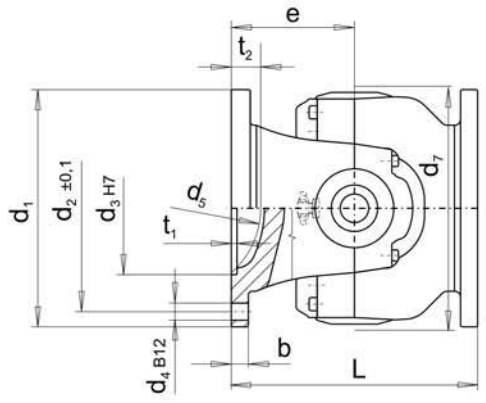
Double joints

Consisting of two flange joints. Normal angle design -Code No. 767

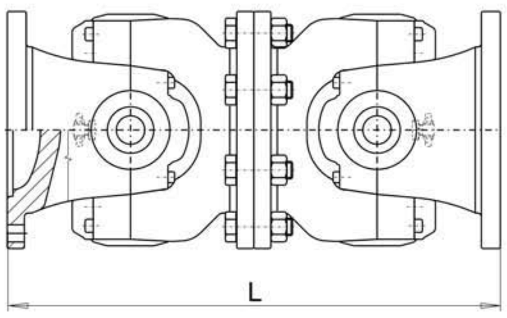
Flange joints/Double joints 55 ... 175 kNm 55 ... 175 kNm

Series 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 x 18	18	6	170	34	250
86 45000 58000 24000 285 245 175 8 x 20 20 7 170 34 250												
90	85000	120000	45000	315	280	175	8 x 22	22	7	180	40	285
95 125000 175000 58000 350 310 220 10 x 22 25 8 210 44 315												

Code No. **310**



Code No. **767**



Designation samples

Flange joint, series 85

Flange joint 310-85

Double joint, series 86

Double joint 767-86

Flange Joints

Normal angle design -Code No. 310

Series	KZ	ß max [°]	e [mm]	L [mm]	m [kg]	J kgm²	C kNm/rad
85	310	15	130	260	54,2	0,396	3370
86	310	15	130	260	58,8	0,486	3370
90	310	15	150	300	87,0	0,880	5200
95	310	15	170	340	126	1,570	8535

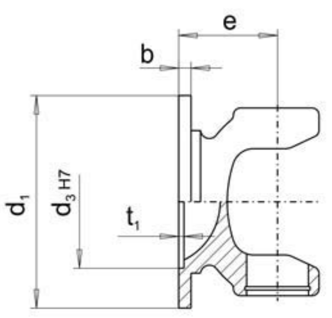
Double joints

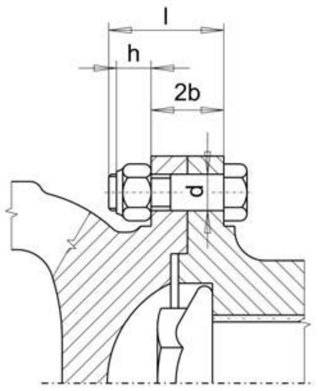
consisting of two flange joints. 767 Normal angle design -Code No. 767

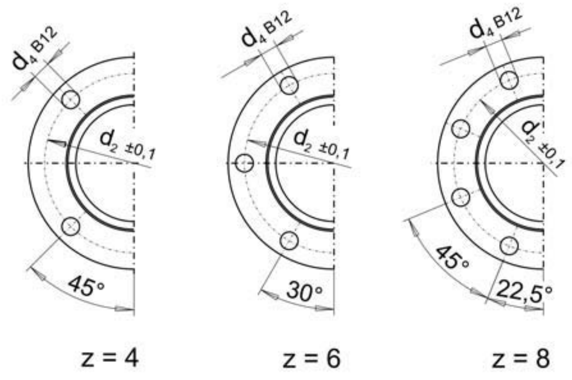
Series	KZ	ß max [°]	e [mm]	L [mm]	m [kg]	J kgm²	C kNm/rad
85	767	15	130	520	110	0,81	1680
86	767	15	130	520	119	1,00	1680
90	767	15	150	600	176	1,81	2600
95	767	15	170	680	253	3,22	4265

Flange bol
ings

See ISO 7646 resp. DIN 15451







Flange boltings

The following connecting elements
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

It is not possible to insert bolts from the yoke side for all designs!

Flange Connections / Flange Boltings

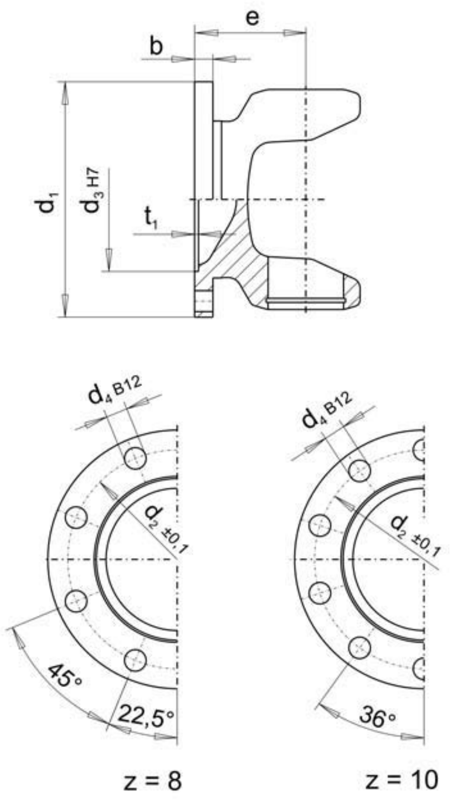
Baureihe / Series	d1 d2 [mm] [mm]		d3 z x d4 [mm] [mm]		b [mm]	t1 [mm]	e [mm]	ß max [°]	d [mm]	l [mm]	h [mm]	2b [mm]	MA 1) [Nm]	
15	58	47	30	4 x 5	4,5	2	32	25	M5	16	5	9	9	
15	65	52	35	4 x 6	4,5	2	32	25	M6	16	6	9	15	
30	75	62	42	6 x 6	5	2	47	30	M6	20	6	10	15	nein/no
30	90	74,5	47	4 x 8	6	3	40	20	M8	22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

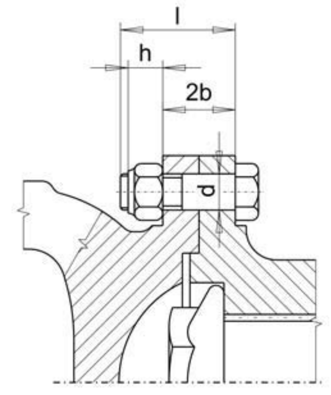
1) Schrauben gelenkseitig einführbar 1) Bolts inserted from joint side

Explanations see page 8

Flange connections »DIN«/ Flange boltings

See ISO 7646 resp. DIN 15451 too





Flange connections / Flange Boltings

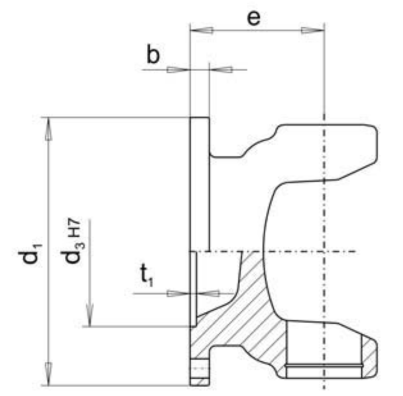
Baureihe / Series	d1 d2 [mm] [mm]		d3 z x d4 [mm] [mm]		b [mm]	t1 [mm]	e [mm]	ß max [°]	d [mm]	l [mm]	h [mm]	2b [mm]	MA 1) [Nm]	
58	150	130	90	8 x 10	10	3	90	35	M10	35	10	20	70	ja/yes
58	150	130	90	8 x 12	10	3	90	35	M12	35	12	20	120	ja/yes
58	150	130	90	8 x 14	10	3	90	35	M14	35	14	20	200	
58	165	140	95	8 x 14	12	3	90	35	M14	40	14	24	200	
58	165	140	95	8 x 16	12	3	90	35	M16	42	16	24	300	
58	180	155,5	110	8 x 12	10	3	90	35	M12	35	12	20	120	ja/yes
58	180	155,5	110	8 x 14	10	3	90	35	M14	40	14	20	200	ja/yes
68	150	130	90	8 x 12	12	3	95	35	M12	40	12	24	120	nein/no
68	165	140	95	8 x 14	12	3	95	35	M14	40	14	24	200	
68	165	140	95	8 x 16	12	3	95	35	M16	42	16	24	300	
68	180	155,5	110	8 x 12	12	3	78	24	M12	40	12	24	120	nein/no
68	180	155,5	110	8 x 12	12	3	95	35	M12	40	12	24	120	ja/yes
68	180	155,5	110	8 x 14	12	3	78	24	M14	40	14	24	200	ja/yes
68	180	155,5	110	8 x 14	12	3	95	35	M14	40	14	24	200	ja/yes
68	180	155,5	110	8 x 16	12	3	78	24	M16	42	16	24	300	nein/no
68	180	155,5	110	8 x 16	12	3	95	35	M16	42	16	24	300	
68	180	155,5	110	10 x 16	12	3	78	24	M16	42	16	24	300	nein/no
68	180	155,5	110	10 x 16	12	3	95	35	M16	42	16	24	300	
70	225	196	140	8 x 16	15	5	95	25	M16	50	16	30	300	ja/yes
72	180	155,5	110	8 x 14	12	3	85	20	M14	40	14	24	200	nein/no
72	180	155,5	110	8 x 14	12	3	100	33	M14	40	14	24	200	
72	180	155,5	110	8 x 16	12	3	85	20	M16	42	16	24	300	nein/no
72	180	155,5	110	8 x 16	12	3	100	33	M16	42	16	24	300	
72	180	155,5	110	10 x 16	12	3	85	20	M16	42	16	24	300	nein/no
72	180	155,5	110	10 x 16	12	3	100	33	M16	42	16	24	300	ja/yes
72	225	196	140	8 x 16	15	5	100	33	M16	50	16	30	300	ja/yes
72	225	196	140	10 x 16	15	5	100	33	M16	50	16	30	300	
73	180	155,5	110	8 x 16	14	3	85	20	M16	50	16	28	300	nein/no

1) Schrauben gelenkseitig einführbar 1) Bolts inserted from joint side Erklärungen siehe S[illegible]

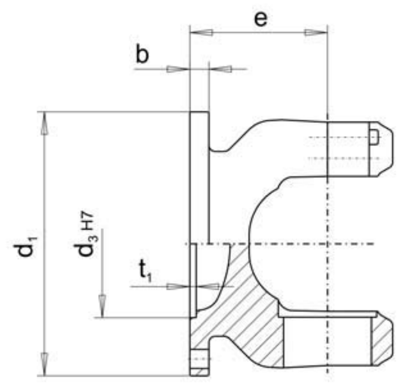
Weitere Flanschanschlüsse auf Anfrage Other flange connections on request

Flange connections »DIN«/ Flange boltings

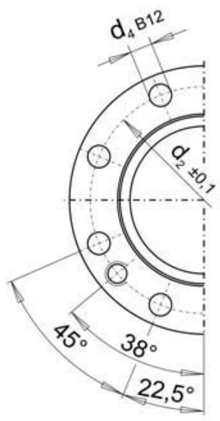
See ISO 7646 resp. DIN 15451 too



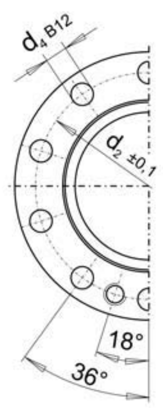
Baureihe/Series 77 ... 84



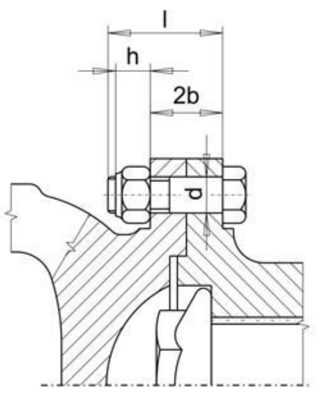
Baureihe/Series 85 ... 95



z = 8



z = 10



Flange connections »DIN«/ Flange Boltings

Baureihe / Series	d1 d2 [mm] [mm]		d3 z x d4 [mm] [mm]		b [mm]	t1 [mm]	e [mm]	ß max [°]	d [mm]	l [mm]	h [mm]	2b [mm]	MA 1) [Nm]	
77	180	155,5	110	8 x 16	15	3	110	25	M16	50	16	30	300	ja/yes
77	180	155,5	110	10 x 16	15	3	110	25	M16	50	16	30	300	nein/no
77	225	196	140	8 x 16	15	5	110	25	M16	50	16	30	300	ja/yes
77	250	218	140	8 x 18	18	6	110	25	M18	56	18	36	410	ja/yes
80	225	196	140	8 x 16	15	5	108	24	M16	50	16	30	300	ja/yes
80	250	218	140	8 x 18	18	6	108	24	M18	56	18	36	410	ja/yes
80	285	245	175	8 x 20	20	7	108	24	M20	60	20	40	600	ja/yes
83	250	218	140	8 x 18	18	6	125	20	M18	56	18	36	410	ja/yes
83	285	245	175	8 x 20	20	7	125	20	M20	60	20	40	600	ja/yes
84	285	245	175	8 x 20	20	7	135	20	M20	60	20	40	600	ja/yes
85	225	196	140	8 x 16	15	5	208	15	M16	50	16	30	300	nein/no
85	250	218	140	8 x 18	18	6	130	15	M18	56	18	36	410	ja/yes
85	285	245	175	8 x 20	20	7	130	15	M20	60	20	40	600	ja/yes
85	315	280	175	8 x 22	22	7	130	15	M22	70	22	44	800	ja/yes
86	285	245	175	8 x 20	20	7	130	15	M20	60	20	40	600	ja/yes
86	315	280	175	8 x 22	22	7	130	15	M22	70	22	44	800	ja/yes
90	285	245	175	8 x 20	20	7	150	15	M20	60	20	40	600	nein/no
90	315	280	175	8 x 22	22	7	150	15	M22	70	22	44	800	ja/yes
90	350	310	220	10 x 22	25	8	150	15	M22	75	22	50	800	ja/yes
95	315	280	175	8 x 22	22	7	170	15	M22	70	22	44	800	nein/no
95	350	310	220	10 x 22	25	8	170	15	M22	75	22	50	800	ja/yes

1) Schrauben gelenkseitig einführbar
Erklärungen siehe Seite 8

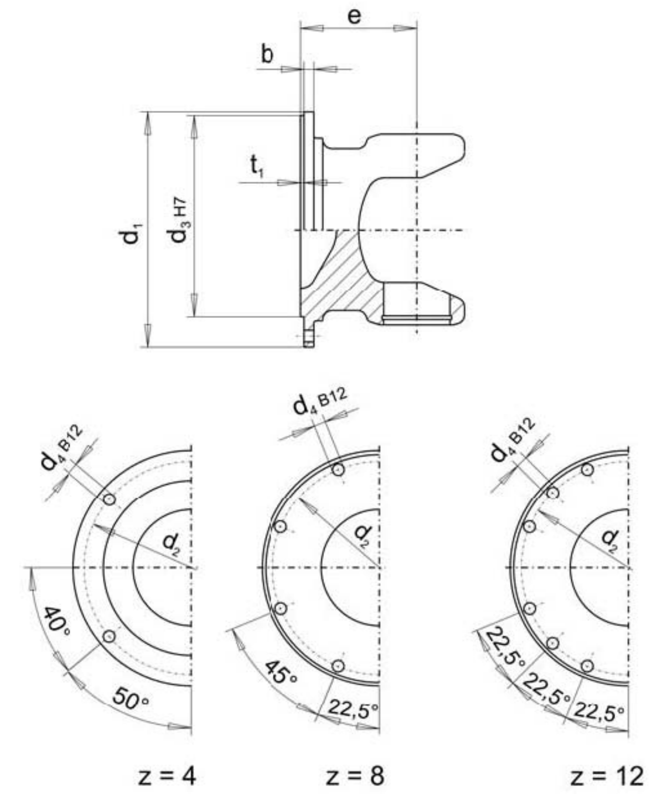
1) Bolts inserted from joint side
Explanations see page 8

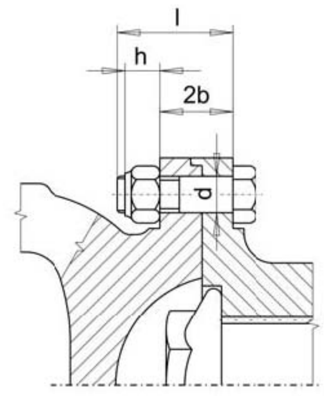
Weitere Flanschanschlüsse auf Anfrage,
z. B. mit Querkeil oder
mit Spannhülsenanschluss nach DIN 15451.

Other flange connections on request,
e. g. with face key or
with dowel pin connection according to DIN 15451.

SAE«/ Flange connections »SAE«/ Flange Boltings

Siehe ISO 7647 See ISO 7647





SAE Flange connections »SAE«/ Flange Boltings

Baureihe/ Series 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 x 10	6	2	40	20	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 x 10	6,5	2	58	35	M10	25	10	13	70	1300
43 116 95,25 69,85 4 x 11 7 2 48 20 M10 25 10 14 70 1400														
53	116	95,25	69,85	4 x 12	8	2	56	20	M12	30	12	16	120	1400
53 116 95,25 69,85 4 x 12 8 2 70 35 M12 30 12 16 120 1400														
53	150	120,65	95,25	4 x 14	10	2	56	20	M14	35	14	20	200	1500
58 174,6 155,52 168,23 8 x 10 12 3 90 35 M10 35 10 24 70 1600														
58	203,2	184,15	196,82	8 x 10	11	3	95	35	M10	35	10	22	70	1700
58 203,2 184,15 196,82 12 x 10 11 3 95 35 M10 35 10 22 70 1800														
63	150	120,65	95,25	4 x 14	10	2	62	20	M14	35	14	20	200	1500
63 150 120,65 95,25 4 x 14 10 2 80 35 M14 35 14 20 200 1500														
63	174,6	155,52	168,23	8 x 10	10	3	80	30	M10	30	10	20	70	1600
68 174,6 155,52 168,23 8 x 10 10 3 95 35 M10 30 10 20 70 1600														
68	203,2	184,15	196,82	8 x 10	11	3	95	35	M10	35	10	22	70	1700
68 203,2 184,15 196,82 12 x 11 11 3 95 35 M10 35 10 22 70 1800														
70	203,2	184,15	196,82	12 x 11	11,5	3	95	25	M10	35	10	23	70	1800
72 203,2 184,15 196,82 12 x 11 11,5 3 100 33 M10 35 10 23 70 1800														
73	203,2	184,15	196,82	12 x 10	11,5	3	100	33	M10	35	10	23	70	1800
73 203,2 184,15 196,82 12 x 11 11,5 3 100 33 M10 35 10 23 70 1800														
73	244,5	209,55	177,8	8 x 16	15	3,4	100	33	M16	45	12	30	300	1880
77 244,5 209,55 177,8 8 x 16 15 3,4 110 25 M16 45 12 30 300 1880														
80	244,5	209,55	177,8	8 x 16	18	3,4	108	24	M16	50	12	36	300	1880

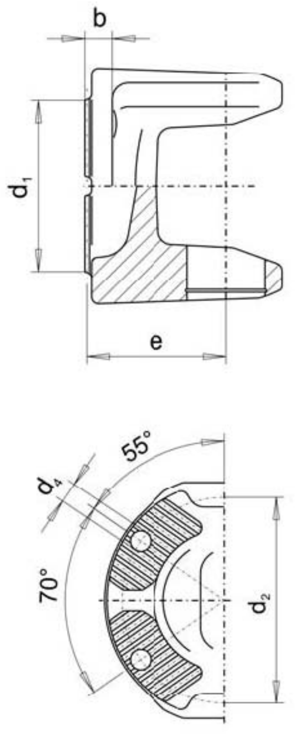
Erklärungen siehe Seite 8 Explanations see page 8 Weitere Flanschanschlüsse auf Anfrage Other flange connections on request

Flanschanschlüsse »KV«/ Flanschverschraubungen

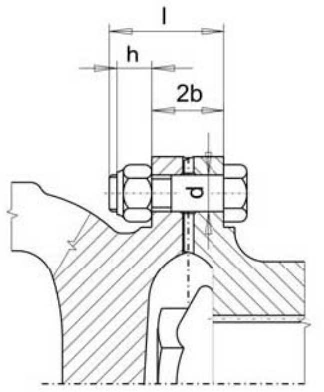
70° kreuzverzahnt
nach ISO 12667 bzw. ISO 8667

Flange connections »XS«/ Flange boltings

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



z = 4



Flange connections / Flange Boltings

Baureihe/ Series	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 x 11	14	68	35	M10	40	10	28	70
63	120	100	4 x 11	14	75	35	M10	40	10	28	70
58	152	130	4 x 13	16	95	35	M12	45	12	32	120
58	180	150	4 x 15	18	95	35	M14	50	14	36	200
68	152	130	4 x 13	16	75	20	M12	45	12	32	120
68	152	130	4 x 13	16	95	35	M12	45	12	32	120
68	180	150	4 x 15	18	95	35	M14	50	14	36	200
72	180	150	4 x 15	18	100	35	M14	50	14	36	200
73	180	150	4 x 15	18	95	30	M14	50	14	36	200
77	180	150	4 x 15	18	100	22	M14	50	14	36	200
79	200	165	4 x 15	20	113	22	M14	55	14	40	200

Erklärungen siehe Seite 8 Explanations see page 8 Weitere Flanschanschlüsse auf Anfrage Other

flange connections on request

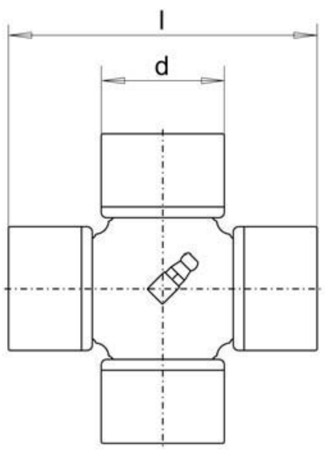
Universal joints

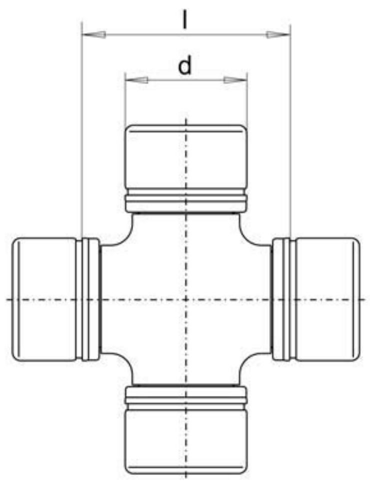
Code number 21

Baureihe/ Series	d [mm]	l [mm]	m [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

*

Ausführungen auf Anfrage möglich Other designs available on request





Baureihe/Series 79

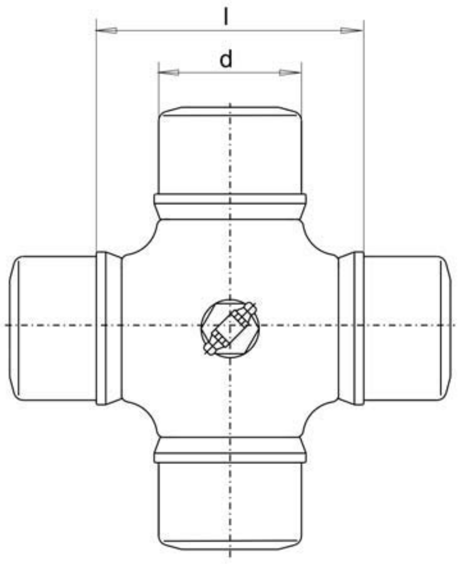
Universal joints

Code number 21

Series	d [mm]	l [mm]	m [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

* für Ersatz
** für Gelenkwelle Kennzahl 4496
Andere Ausführungen auf Anfrage möglich

* spare equipment
** for propeller shaft code no. 4496
Other designs available on request



Designation samples

Universal joint, series 63
with length 106 mm
Universal joint, 21-63/106

Universal joint, series 65
Universal joint, 21-65

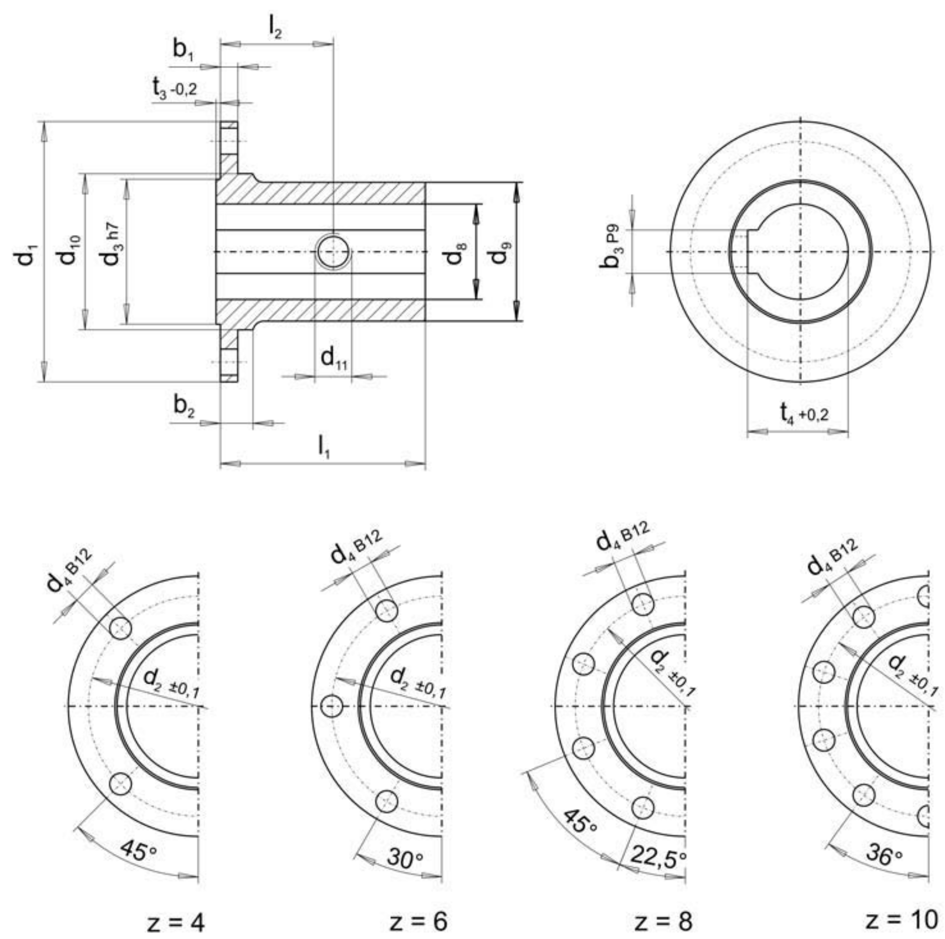
Universal joint, series 85
with length 175 mm
Universal joint 21-85/175

Companion flanges

Code number 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.



Companion flanges

Code number 141

Series	d1 d2 d3 z x d4 [mm] [mm] [mm] [mm]				d8 d9 d10 d11 b1 b2 b3 t3 t4 l1 l2 m [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 x 10				45 80 84 M8 8 11 14 2,3 48,8 70 35 2,3											
63	150	130	90	8 x 12	55	95	111	M12	10	14	16	2,3	59,3	85	42	4,1
58	150 130 90 8 x 12				60 100 111 M12 12 15 18 2,3 64,4 100 50 5,0											
68	180	155,5	110	8 x 14	75	120	133	M16	12	16	20	2,3	79,9	120	60	7,9
80	225 196 140 8 x 16				90 155 171 M18 15 20 25 4,5 95,4 150 75 18,4											
83	250	218	140	8 x 18	100	170	190	M18	18	22	28	5,0	106,4	160	80	25,4
86	285 245 175 8 x 20				110 190 214 M20 20 25 28 6,0 116,4 180 90 32,1											
90	315	280	175	8 x 22	120	210	247	M20	22	28	32	6,0	127,4	180	90	40,4
95	350 310 220 10 x 22				130 210 277 M22 25 30 32 7,0 137,4 200 100 45,6											

Für Passfeder nach DIN 6885
und DIN-Flanschanschlüsse.

Andere Ausführungen auf Anfrage möglich.
Passend zu SAE siehe Seite 32
und zu KV siehe Seite 34.

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

Other designs available on request.
Matching with SAE see page 32
and with XS see page 34.

Bezeichnungsbeispiel

Nabenflansch, Baureihe 63
Nabenflansch 141-63

Designation sample

Companion flange, series 63
Companion flange 141-63

Application engineering Advice on the use of Propeller shafts

The following is intended, in particular, to help the design and project engineer develop optimum in-service conditions for any intended use of propeller shafts and thereby obtain perfect functional reliability and a prolonged service life of the drive arrangement. It is often possible at the design stage to facilitate the incorporation of a universal drive, most desirably for efficiency reasons, as a standard type. We should be very pleased to counsel you on all your drive problems.

Deflection angle and service life

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 ±β. 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).

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

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

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 propeller 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 propeller shafts run smoothly and with little vibration, the product of n· β (speed · angle of deflection) should remain within empirical limits.

Als Richtwert gilt:

For orientation:

$$n \cdot \beta \leq \frac{36000}{\sqrt[6]{m}} \quad \text{oder/or:} \quad n \cdot \beta \cdot \sqrt[6]{m} \leq 36000$$

n = Gelenkwellendrehzahl [U/min] β = Beugungswinkel [°] m = Gelenkwellenmasse [kg]

n = Speed [rpm] β = Deflection angle [°] m = Mass of propeller shaft [kg]

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:

Drehwinkel/Turning angle φ	
0° und/and 180°	90° und/and 270°
[illegible]	[illegible]
$M_{t2} = \frac{M_{t1}}{\cos\beta}$	$M_{t2} = M_{t1} \cdot \cos\beta$

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

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:

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

Arrangement of propeller shafts

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)

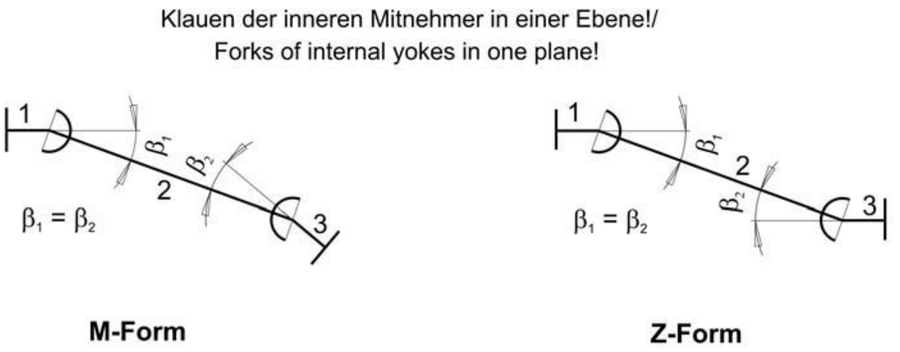


Bild 2/Figure 2

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. Propeller shafts for this application have to be designed specially. Basically, all deflection angles in a propeller 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 propeller shafts are arranged one after the other in a line, the following combinations are recommended:

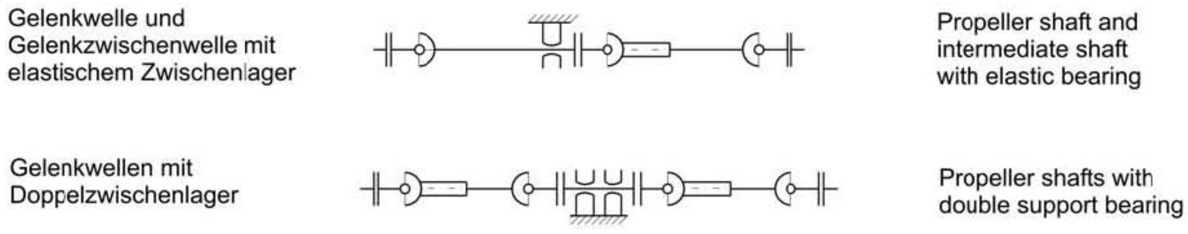


Bild 3/Figure 3

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

Transverse critical speed

Every propeller 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 propeller shaft and the connected parts of equipment. The transverse critical speed for propeller shafts can be calculated as follows:

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

D = Außendurchmesser des Rohres [cm] D = Tube outer diameter [cm]
d = Innendurchmesser des Rohres [cm] d = Tube inner diameter [cm]
l = Gelenkabstand oder Abstand vom Gelenk l = Distance between joints or distance bis zum Zwischenlager [cm] 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 propeller shaft, the arrangement of two propeller shafts with an intermediate bearing, a so called train of propeller shafts. This involves certain requirements with respect to the deflection angle. For advice contact our applications engineers.

Limitations of length and speed

The length of tubular propeller 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 propeller shafts

Unless some low speed is required, as a rule, propeller shafts are balanced dynamically. Dynamic balancing guarantees smooth running of the propeller 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)

Auswuchtgütestufe/ Balancing quality	Einsatzbedingungen	Service conditions
G 16	Gelenkwellen mit besonderen Anforderungen	Propeller shafts with special requirements
G 40	Gelenkwellen für allgemeinen Verwendungszweck	Propeller shafts for general use

Unbalance at gmm per kg mass of propeller shaft:

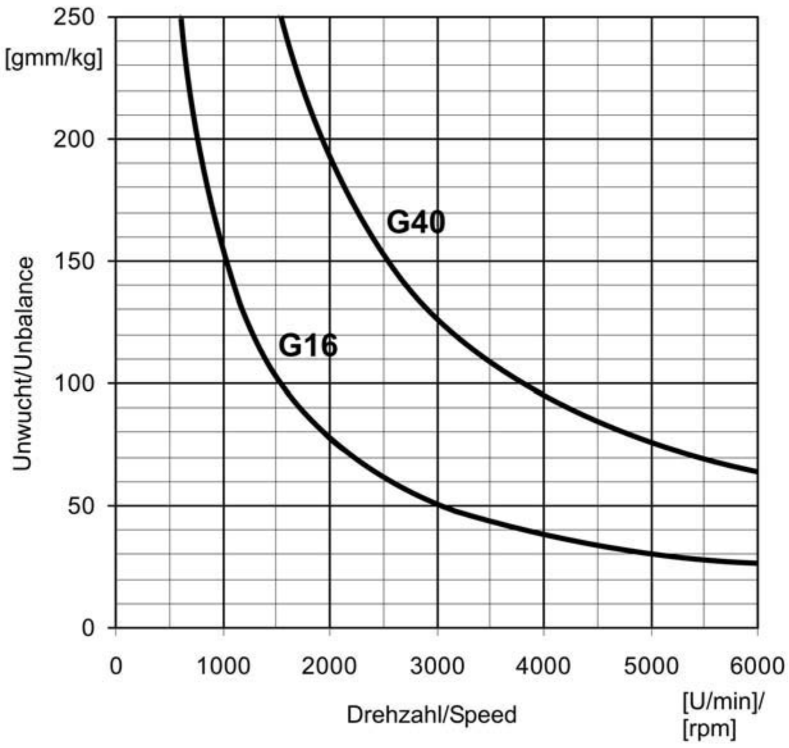


Bild 4/Figure 4

Or calculate by the following formula:

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

$U_{R\,zul}$ = Zulässige Restunwucht [gmm/kg] $U_{R\,zul}$ = Permitted unbalance [gmm/kg] G = Wuchtgüte (16 oder 40) G = Balancing quality (16 or 40) n = Gelenkwellendrehzahl [U/min] n = Speed [rpm]

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 propeller 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 propeller 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.

Selection and use of cardan shafts

Propeller 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 propeller shafts as well. The size of the propeller 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 us.

Installation instructions

To make sure the running quality and precise balancing of the propeller 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)

Gelenkwellendrehzahl [U/min]	Passung für d_3	Rundlaufabweichung	Stirnlaufabweichung
		Radial runout	Axial runout
Propeller shaft speed [rpm]	Fit for d_3	K_R [mm]	K_S [mm]
bis 500/ up to 500	h8	0,15	0,18
500 bis 3000/ 500 up to 3000	h7	0,08	0,10
über 3000/ over 3000	h6	0,05	0,07

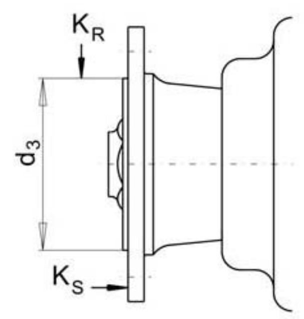


Bild 5/Figure 5

All anti-corrosion paint should be removed carefully from the propeller shaft flanges before the shaft is installed. Anti-corrosion agent on the propeller 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 propeller shafts have an alkaloid-base priming coat; the finish coat can be customized.

Propeller shaft maintenance

The moving parts of a propeller 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 propeller 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 lithium soap greases of specification KP 1-2 N-30 or KP 2 N-20 DIN 51502 with EP additives for European climates or of nonfreezing grease of the same base of specification 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. To not use grease with MoS_2 additives on propeller shaft bearings.

Maintenance schedule

Maintenance intervals for propeller 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):

Propeller shafts	Maintenance cycle
In motor vehicles:	
-Road application	50,000 km or 1 year
-Road and off-road applications	30,000 km or 1 year
-Construction site and off-road applications	10,000 km or 250 hours of operation
In rail vehicles:	3,000 hours of operat. or 6 months
In stationary installations and travelling cranes:	500 hours of operation

see DIN 15453 too

Storage

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

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 propeller 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 propeller shafts have to be secured in such a way, that they cannot slip apart and the flanges are fixed preventing damages to the propeller 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.

General notes

» The installation of propeller shafts requires expertise and careful workmanship!

» Be sure to follow manufacturer's instructions for installation and repair.

» Parts to be installed in universal drives must be in perfect working order and approved for the specific application in hand.

» Make sure that propeller 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!