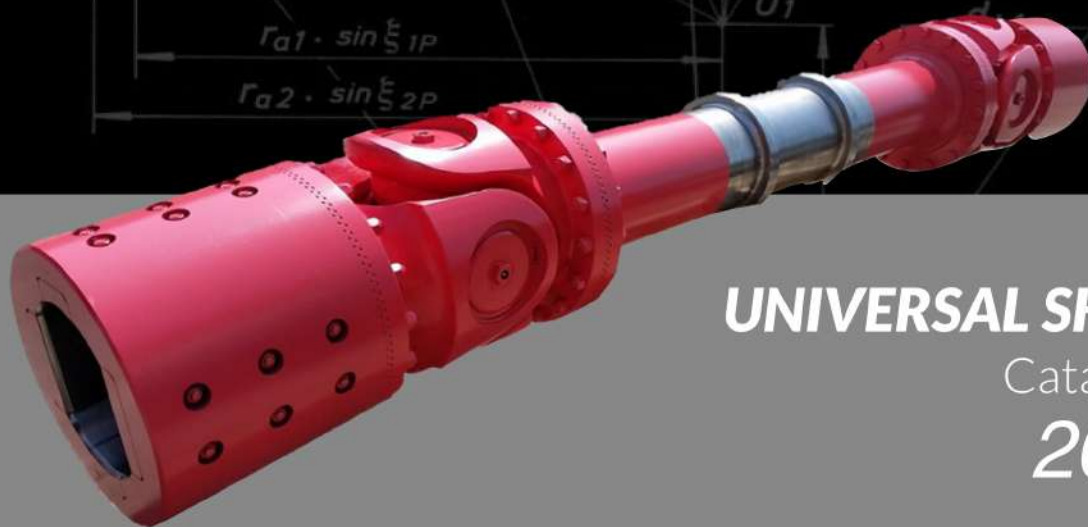




ETSANET

Trade & Industrial Service



UNIVERSAL SHAFT

Catalogue

2025

Our production partner is located in Italy and surrounded by strategic suppliers, we are able to respond to every requirement, guaranteeing high-standard services thanks to our flexible manufacturing process, adequate stock availability and skilled staff.

Operating under **ISO 9001:2015 STANDARDS**, our products has been delivered to more than 20 countries, delivered in **Europe, Asia and America.**

Customers are our commitment. For that purpose our production partner continuously invests in cutting edge technology equipment, along with it's local strategic partners. Always with the aim of making the best universal spindles, setting the global benchmark.





Our universal spindles are the best choice for your business, considering the following manufacturing features:



Monolithic yoke, giving an excellent performance under the most exigent applications



Selected heat treated materials



First-rate weldings



Balanced following ISO 1940-1, G-16 and higher grade on demand

NETSANET UNIVERSAL SHAFT are widely selected for metalurgic industry (Steel, Aluminium, Copper, Brass) counting several uses:

Bar and rod mills
Continuous casters
Hot strip mills
Levelers
Pipe and tube mills



Other typical applications for our products:

Mining equipment
Marine propulsion
Paper mills
Pumps
Plastic manufacturing

INDEX

US. A SERIE

FEATURES

Torque range up to 27 kNm
Flange diameter from 58 to 250 mm
Operating angle up to 25°

APPLICATIONS

Rolling mill plants
Paper mill plants
Marine drives
Food equipment

P7 | 8

US. B SERIE

FEATURES

Torque range up to 1250 kNm
Flange diameter from 160 to 620 mm
Operating angle up to 15°

APPLICATIONS

Rolling mill plants
Bar mills
Paper mill plants
Marine drives

P9 | 12

US. C SERIE

FEATURES

Torque range up to 9.000 kNm
Flange diameter from 680 to 1200 mm
Operating angle up to 10°

APPLICATIONS

Cold rolling mill
Hot strip mill
Edger drive

P13 | 14



US. F SERIE

FEATURES

Torque range to 700 kNm

Flange diameter from 225 to 640 mm

Operating angle up to 10°

APPLICATIONS

Bar mill vertical stand

P15 | 16



COMPANION FLANGES

P17 | 18

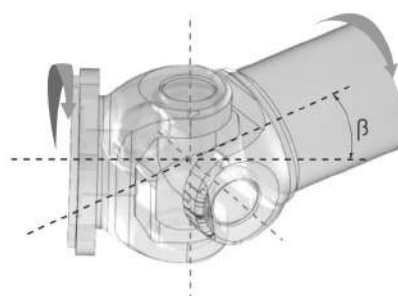


PINION / ROLL END CASING DESIGN

P19 | 20

KINEMATICS

P21 | 22



SELECTION AND DIMENSIONING

P23 | 24

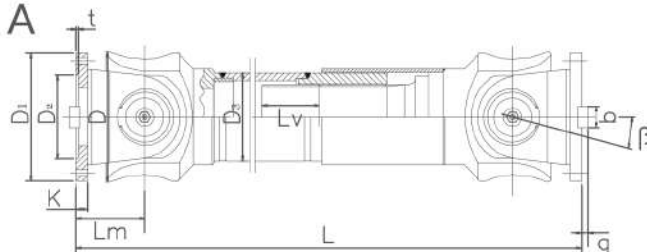
APPLICATION SHEET

P25 | 26

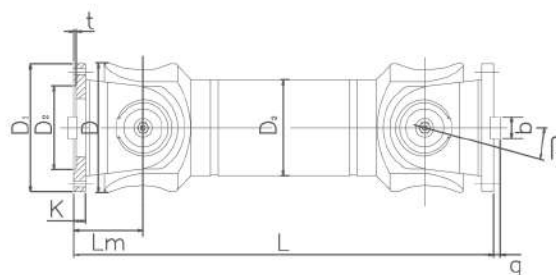
US. A SERIES



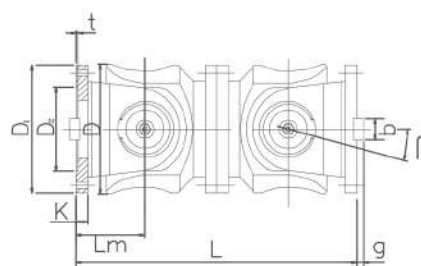
TYPE A



TYPE B



TYPE C



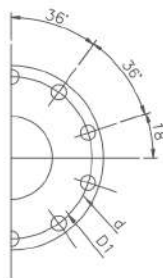
SERIES	US.A 58		US.B 65		US.A 75		US.A 90				US.A 100						US.A 120								
Lmin	225	165	285	165	335	200	285	182	226	366	445	226	296	261	366	242	500	211	294	237	261	242	286		
Lv	35	15	40	15	40	30	45	30	25	100	55	25	50	5	100	15	80	25	50	5	5	15	15		
Tn(Nm)	180	280	240	260	500	560	800	560	860	1800	1200	860	1100	1800		2700	2300	860	1100	1800		2700	3300		
Tf(Nm)	90	180	120	180	250	280	400	280	430	900	600	430	550	900		1350	1150	430	550	900		1350	1650		
B(°)	35	29	35	29	35	25	35	20	28		35	28	25	28		30	35	28	25	18	28	30	28		
D	52	59	63	59	72	77	92	77	90		100	90	100	122	90	98	112	90	100	122		98	136		
Df	DIN58		DIN65		DIN75		DIN90				DIN100						DIN120								
D1	47		52		62		74,5				84						101,5								
D2	30 H7		35 H7		42 H7		47 H7				57 H7						75 H7								
D3xΔmin	38x1,5	35x3	45x1,5	51x2,5	51x2,5		63,5x2,5	51x2,5	80x2,5		78x2,5	51x2,5	51x2,5	76,2x2,4	80x2,5		89x2,5	60x2,5	60x2,5	90x4	75x3	90			
Lm	32	37	39	37	45	42	52	33	50,5		55	50,5	53	68	50,5	54	63	43	53	56	68	54	72		
k	3,5	4	4,5	4	5,5		6	6,5	7		8	7		8	7		8				8,5		8		
t	1,5	2	1,7	2,8	2		2,5		2,8		2,5					2,6	2,5	2,7	2,5		3	2,6	3,1		
n	4		4		6	4	6	4				6						8							
d	5		6,5	6	6	6	6	8,5	8,5		8,5	8					10,5	10							

Flange yokes US.A SERIES

BOLT HOLE (FYBH-FYBH/SP DIN15452)



N 8



N 10

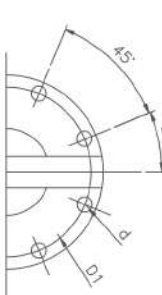


N 8



N 10

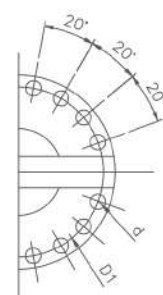
INTEGRAL / PARTIAL FACE KEY (FYIK/FYPK)



N 8



N 10



N 16

SERIES	U.S.A 150							U.S.A 180									U.S.A 200				U.S.A 225				U.S.A 250	
Lmin	590	286	484	376	567	599	544	640	612	600	640	580	753	761	618	605	690	775	860	753	597	690	690			
Lv	80	15	110	70	120	100	110	80	100	120	110	140	110				100	120	14	110	110	110				
Tn(Nm)	4500	3300	5000	5200	6200	10000	10500	8400	10000	12000	13000	16000	19000		27000	16000	27000	16000	19000	27000	27000					
Tf(Nm)	2250	1650	2500	2600	3100	5000	5250	4200	5000	6000	6500	8000		9500	13500	8000	13500	8000	9500	13500	13500					
B(°)	35	28	30	25		35	25	25	35	30	25	25	30	25	30	25	25	25	25	25	25	25				
D	142	136	125	138	141	158	160	154	158	170	172	178				204	187	204	178	178	204	204				
Df		DIN150							DIN180									DIN200	DIN225				DIN250			
D1		130							155,5									170	196				218			
D2		90 H7							110 H7									125 H7	140 H7				140 H7			
D3xΔmin	102x3	90x4	76,2x2,4	90x4	85x5	100x6	120x4	120x3	100x6		120x4	112x7		120x6	140x5	112x10	140x6,5	112x7	120x6	140x5	140x5					
Lm	85	72	78	73	86	89,5	90	87	96	90	100	95	96	100	96	100	110	110	120	96	96	110	120			
k	10							12									14			14	15	15	15	15	18	
t	3	3,3	3,1	3		3,3		4	3,3	3		3,4			2,9		4	5	5	5	5	6				
n	8							8	8	10	8		8	10	8	10		8	8	08 12	08 12	8	8			
d	13	12						15	14	16	14		16			17	16	16	16	16	16	18				

Tn=Nominal torque

Tf=Fatigue torque

L=Minimum length

Lv= Length compensation

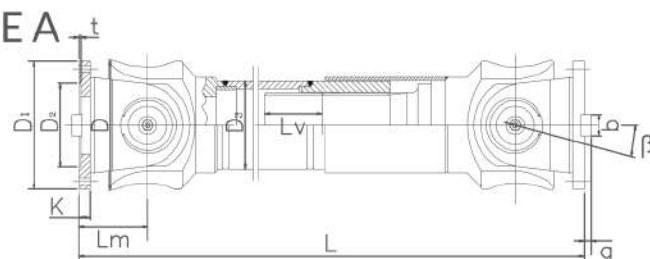
*all dimension in millimetres(unless otherwise specified)

Contact us for special dimensions

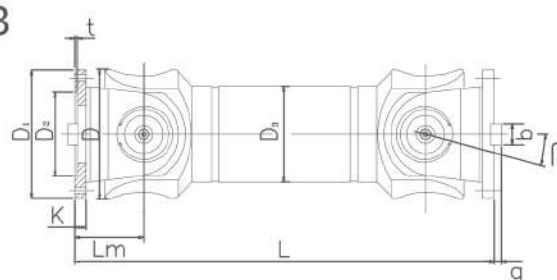
US. B SERIES



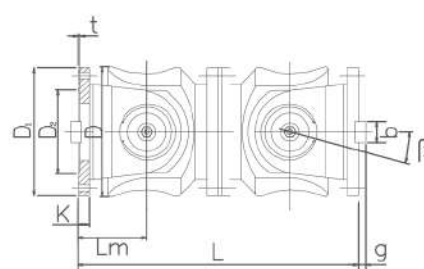
TYPE A



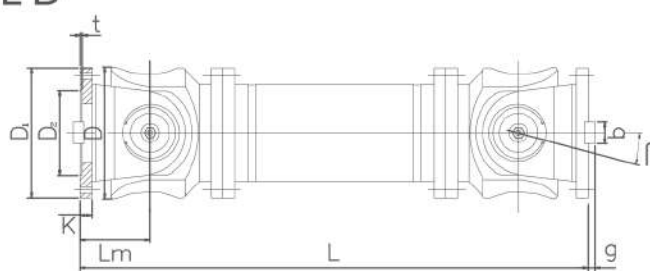
TYPE B



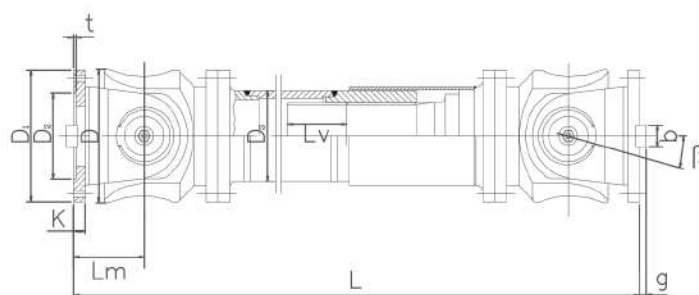
TYPE C



TYPE D



TYPE E



Lm			US.B 160		US.B 180		US.B 200		US.B 225		US.B 250		US.B 265		US.B 285		US.B 315		US.B 350		US.B 390		US.B 440		US.B 490		US.B 550		US.B 620													
Tn(kNm)			21		28		40		56		80		100		120		160		225		320		500		700		1000		1250													
Tf(kNm)			11		14		20		28		40		50		58		80		110		160		250		350		500		625													
Tp(kNm)			16		21		29		41		58		73		87		116		160		232		363		508		725		907													
Tcs(kNm)			28		36		52		73		106		130		156		208		292.5		416		650		910		1300		1625													
			0,16		0,51		1,47		7,81		28,2		54,8		82,8		279		744		1860		8250		21450		63400		130000													
T Y P E	A	L	740		800		900		1000		1060		1120		1270		1390		1520		1530		1690		1850		2060		2280													
		Lv	100		100		120		140		140		140		140		150		150		170		190		190		240		250													
		m(Kg)	65		83		115		152		219		260		311		42		610		804		1122		1468		2154		2830													
	B	L	480		530		590		640		730		790		840		930		1000		1010		1130		1240		1400		1520													
		m(Kg)	44		60		85		110		160		180		226		320		440		590		820		1090		1560		2100													
	C	L	380		420		440		500		560		600		640		720		780		860		1040		1160		1220		1360													
		m(Kg)	35		48		66		90		130		160		189		270		355		510		780		970		1330		1865													
	D	L	520		580		620		690		760		810		860		970		1030		1120		1230		1360		1550		1720													
		m(Kg)	48		65		90		120		173		220		250		355		485		665		920		1240		1765		2390													
	E	L	800		850		940		940		1120		1180		1320		1440		1550		1710		1880		2050		2310		2540													
		Lv	100		100		120		120		140		140		140		150		150		170		190		190		240		250													
			m(Kg)	70		92		126		126		238		280		340		472		660		886		1230		1625		2368		3155												
SERIES			US.B 160		US.B 180		US.B 200		US.B 225		US.B 250		US.B 265		US.B 285		US.B 315		US.B 350		US.B 390		US.B 440		US.B 490		US.B 550		US.B 620													
D			160		180		200		225		250		265		285		315		350		390		440		490		550		620													
jmax(°)			15		15		15		15		15		15		15		15		15		15		15		15		15		15													
D3XΔ			114x10		127x10.5		146x11.5		159x10.5		180x12.5		194x13.5		203x14.5		219x16.5		245x19		273x21		325x25		351x30		402x32		426x40													
Df			160	225	180	225	200	225	250	225	250	285	250	285	315	265	285	315	285	315	315	350	350	390	390	440	440	490	490	550	550	620										
D1(± 0.1)			137	196	155.5	196	170	196	218	196	218	245	218	245	280	233	245	280	245	280	280	310	310	345	345	385	385	425	425	492	492	555										
D2(H7)			90	105	90	105	90	105	105	105	125	105	125	130	125	125	130	125	130	130	155	155	170	170	190	190	205	205	250	250	320											
Lm			95		105		110		125		140		145		150		155		160		165		180		195		200		215		260		265		290		295		305		340	
t			4	5	5		5		5		6		7		6	7		8		5	7		8		7	8		8		8		8		12		12		12				
K			16	20	17	20	18	20	25	20	25	27	25	27	32	25	27	32	27	32	32	35	35	40	40	42	42	47	47	50	50	55	55	55								
g			6	9	7	9	8	9	12.5	12.5	15		12.5	15		12.5	15		15	16	16	18	18	20	20	22.5	22.5	22.5		22.5		25		25								
b(E9)			20	32	24	32	28	32	40	32	40		40		40		40	50		50	70	70	80	80	90	90	100	100	100		100		100									
n			8		8		8		8		8		10		8	10		8	10		10	10		10	16		16	16		16		16										

Tn=Nominal torque

Tf=Fatigue torque

Tp=Pulsating torque

Tcs= Limit torque

L=Minimum lenght

Lv= Lenght compensation

*all dimension in millimetres(unless otherwise specified)

Contact us for special dimensions

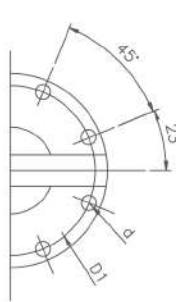
Flange yokes US.B SERIES



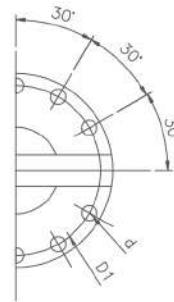
BOLT HOLE (FYBH-FYBH/SP DIN15452)

INTEGRAL/PARTIAL FACE KEY (FYIK-FYPK)

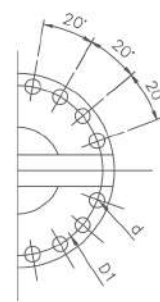
DOG TEETH (FYDT)



N 8

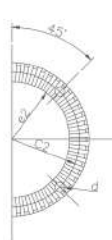


N 10

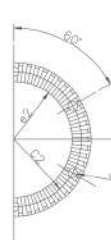


N 16

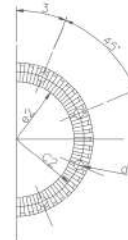
HIRTH SERRATION (FYHS)



Z48 N4



Z72 N6



Z96 N8



Z120 N16

SERIES	Type	FYBH-FYBH/SP DIN15452				FYIK-FYPK			FYDT			FYHS				
	Df	d(C12)	n1	C1	b2(H12)	d	b(E9)	g	e	d2	z	C2(± 0.1)	e2	d(C12)	z	n
US.B 160	160	-	-	-	-	15	20	6	-	-	-	-	-	-	-	-
	180	16	4	192	21	17	32	9	165	15	8	196	180	18	48	4
US.B 180	180	-	-	-	-	17	24	7	130	13	8	-	-	-	-	-
	225	16	4	192	21	17	32	9	165	15	8	196	180	18	48	4
US.B 200	200	-	-	-	-	17	28	8	130	13	8	-	-	-	-	-
	225	16	4	192	21	17	32	9	165	15	8	196	180	18	48	4
	250	18	4	214	25	19	40	12,5	185	17	8	218	200	20	48	4
US.B 225	225	16	4	192	21	17	32	9	165	15	8	196	180	18	48	4
	250	18	4	214	25	19	40	12,5	185	17	8	218	200	20	48	4
	285	20	4	240	28	21	40	15	205	17	8	245	225	21	60	4
US.B 250	250	18	4	214	25	19	40	12,5	185	17	8	218	200	20	48	4
	285	20	4	240	28	21	40	15	205	17	8	245	225	21	60	4
	315	22	4	270	30	23	40	15	245	19	10	280	250	23	60	4
US.B 265	265	18	4	228	25	19	40	12,5	200	17	8	-	-	-	-	-
	285	20	4	240	28	21	40	15	205	17	8	245	225	21	60	4
	315	22	4	270	30	23	40	15	245	19	10	280	250	23	60	4
US.B 285	285	20	4	240	28	21	40	15	205	17	8	245	225	21	60	4
	315	22	4	270	30	23	40	15	245	19	10	280	250	23	60	4
US.B 315	315	22	4	270	30	23	40	15	245	19	10	280	250	23	60	4
	350	22	4	300	32	23	50	16	270	19	10	310	280	24	72	6
US.B 350	350	22	4	300	32	23	50	16	270	19	10	310	280	25	72	6
	390	24	4	340	32	25	70	18	300	21	10	345	315	25	72	6
US.B 390	390	24	4	340	32	25	70	18	300	21	10	345	315	25	72	6
	440	27	4	378	35	28	80	20	330	21	16	385	345	28	96	6
US.B 440	440	27	4	378	35	28	80	20	330	21	16	385	345	28	96	6
	490	-	-	-	-	31	90	22,5	360	23	16	425	370	31	96	8
US.B 490	490	-	-	-	-	31	90	22,5	360	23	16	425	370	31	96	8
	550	-	-	-	-	31	100	22,5	430	23	16	492	440	32	96	8
US.B 550	550	-	-	-	-	31	100	22,5	430	23	16	492	440	32	96	8
US.B 620	620	-	-	-	-	38	100	25	490	25	16	575	500	25	120	16

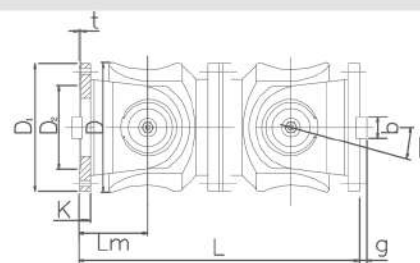
*all dimension in millimetres(unless otherwise specified)

Contact us for special dimensions

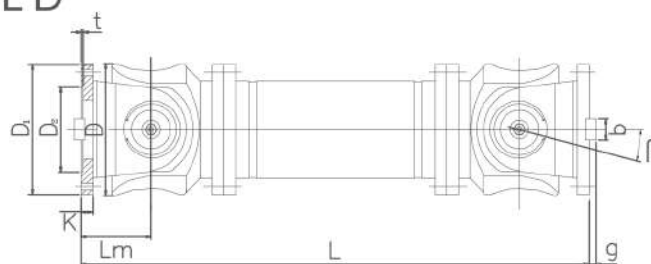
US. C SERIES



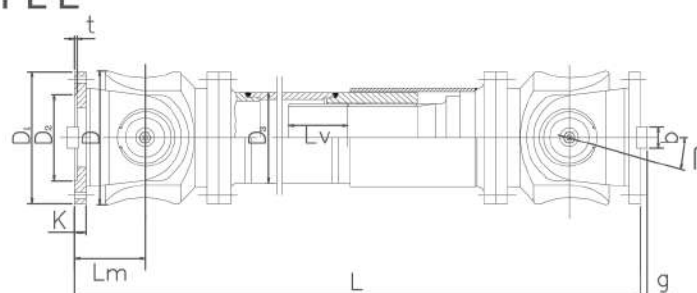
TYPE C



TYPE D



TYPE E

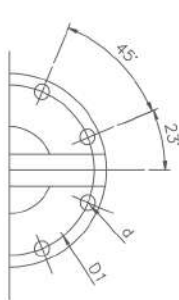


SERIES			US.C 650	US.C 700	US.C 750	US.C 780	US.C 800	US.C 840	US.C 900	US.C 960	US.C 1000	US.C 1060	US.C 1100	US.C 1200	
T Y P E	Tn(kNm)		1800	2330	2850	3100	3420	4170	5035	6120	6710	8150	8950	11420	
	Tf(kNm)		1120	1450	1780	1935	2130	2610	3145	5770	4190	5085	5595	7140	
	C	L	1540	1600	1840	1920	1920	2120	2280	2280	2380	2480	2500	2720	
		m(Kg)	3150	3450	4300	4680	5050	6400	8420	8950	10600	12100	13500	16900	
	D	L	1940	2100	2400	2500	2500	2680	2950	2950	3130	3200	3300	3570	
		m(Kg)	3220	3530	4500	5400	5800	7470	9980	10500	12300	14500	15800	19500	
	E	L	3230	3460	3620	4000	4000	4250	4580	4580	4770	4950	5100	5660	
		Lv	200	200	200	200	200	200	300	300	300	300	300	300	
			m(Kg)	4880	5400	8000	8450	9070	11800	15900	16500	19900	22000	27500	34800
TECHNICAL DATA			US.C	US.C	US.C	US.C	US.C	US.C	US.C	US.C	US.C	US.C	US.C	US.C	
SERIES			650	700	750	780	800	840	900	960	1000	1060	1100	1200	
D			650	700	750	780	800	840	900	920	1000	1060	1100	1200	
α max(°)			15												
D3			560	580	620	660			750			790	800	850	900
Df			650	700	750	780	800	840	900	920	1000	1060	1100	1200	
D1(± 0.1)			635	655	695	710	740	770	825	850	915	970	1015	1100	
D2(H7)			520	570	610	630	650	680	710	740	800	840	880	960	
Lm			385	400	460	480	480	530	570	570	595	620	625	680	
K			70		95			110	120		130				

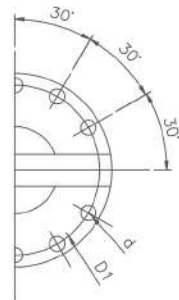
Contact us for special dimensions

Flange yokes US.C SERIES

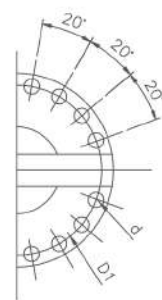
DOG TEETH (FYDT)



N 8

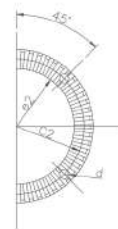


N 10



N 16

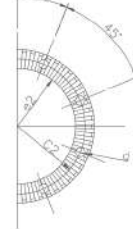
HIRTH SERRATION (FYHS)



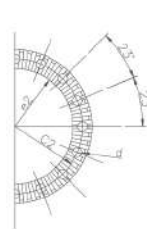
Z48 N4



Z72 N6



Z96 N8



Z120 N16

SERIES	TYPE		FYDT	z	C2(±0.1)	e2	FYHS	z	n
	Df	e	d2				d(C12)		
US.C 650	650	520	595	30	595	520	28	120	30
US.C 700	700	570	645	34	645	570	28	120	30
US.C 750	750	610	695	30	695	610	31	144	32
US.C 780	780	630	710	32	710	630	31	144	32
US.C 800	800	650	740	34	740	650	31	144	32
US.C 840	840	680	770	30	770	680	31	144	36
US.C 900	900	710	825	32	825	710	37	144	32
US.C 960	920	740	850	34	850	740	37	144	30
US.C 1000	1000	800	915	32	915	800	43	180	30
US.C 1060	1060	840	970	34	970	840	43	180	30
US.C 1100	1100	880	1015	34	1015	880	43	180	30
US.C 1200	1200	960	1100	32	1100	960	49	180	30

Tn=Nominal torque

Tf=Fatigue torque

L=Minimum length

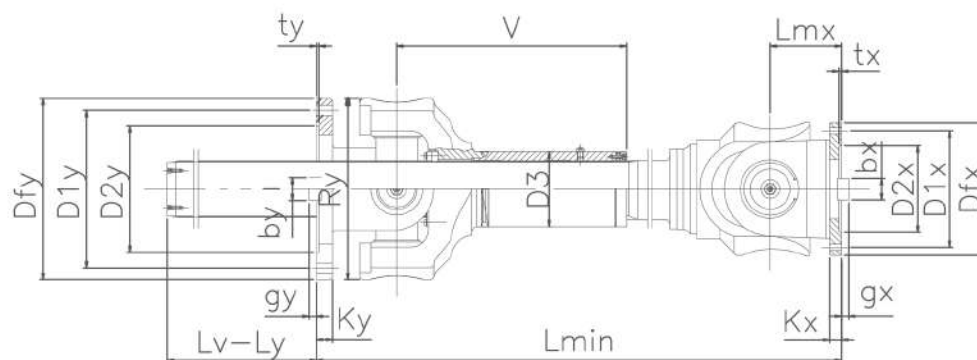
Lv= Length compensation

*all dimension in millimetres(unless otherwise specified)

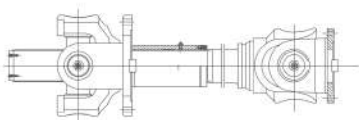
US. F SERIES



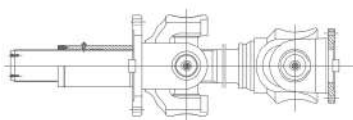
TYPE A



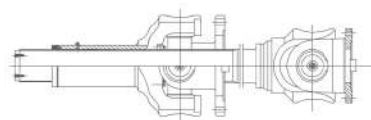
TYPE B



TYPE C



TYPE D



TRANSMISSIBLE TOQUE VALUES AND MAIN DIMENSIONS

SERIES			US.F 225/315	US.F 250/330	US.F 285/390	US.F 315/435	US.F 350/480	US.F 390/520	US.F 435/600	US.F 480/650
Tn(kNm)			56	80	120	160	225	320	520	700
Tf(kNm)			28	40	58	80	110	160	260	350
T Y P E	A	Lv	920	1020	1140	1300	1445	1605	1760	1955
		m(Kg)	650	700	750	750	800	800	900	900
	B	Lv	260	285	325	360	400	445	500	570
		m(Kg)	650	700	750	750	800	800	900	900
	C	Lv	610	655	750	827	885	985	1124	1225
		m(Kg)	650	700	750	750	800	800	900	900
	D	L	740	820	925	1050	1140	1250	1385	1535
		m(Kg)	650	700	750	750	800	800	900	900
S			100	120	130	150	170	185	210	220
D3			146	159	180	203	219	245	273	325

Tn=Nominal torque

Tf=Fatigue torque

L= Minimum length

Lv= Length compensation

*all dimension in millimetres(unless otherwise specified)

Contact us for special dimensions

Flange yokes US.F SERIES



X Side

**INTEGRAL
/PARTIAL FACE KEY
(FYIK/FYFK)**



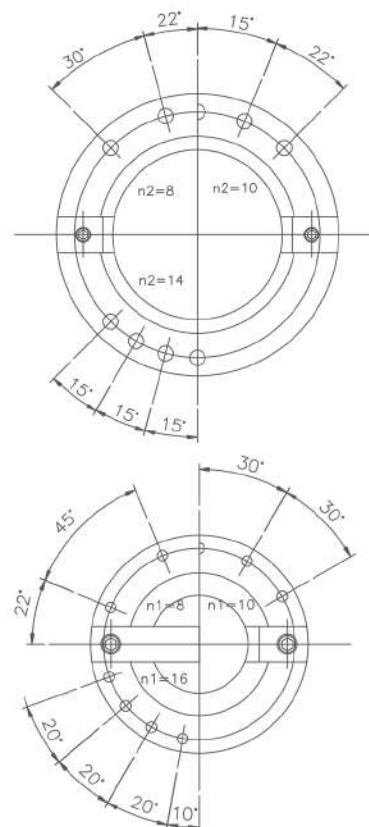
DOG TEETH (FYDT)

HIRTH SERRATION (FYHS)



Y Side

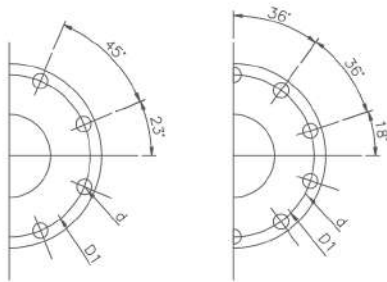
PARTIAL FACE KEY (FYPF)



TECHNICAL DATA FLANGE SIDE X															
SERIES			US.F 225/315		US.F 250/330		US.F 285/390		US.F 315/435		US.F 350/480		US.F 390/520	US.F 435/600	US.F 480/650
βmax(°)			15		15		15		15		15		15	15	15
D			225	250	250	285	285	315	315	350	350	390	390	435	480
Dfx			225	250	250	285	285	315	315	350	350	390	390	435	480
Lmx			125	140	140	160	160	180	180	195	195	215	215	260	290
tx			5	5	5	7	7	7	7	8	8	8	8	10	12
Kx			20	25	25	27	27	32	32	35	35	40	40	42	47
T Y P E	FYFK FYIK	D1x(±0.1)	196	218	218	245	245	280	280	310	310	345	345	385	425
		D2x(H7)	105	115	115	135	135	150	150	165	165	190	190	200	225
		bx	32	40	40	40	40	40	40	50	50	70	70	80	90
		gx	9	12,5	12,5	15	15	15	15	16	16	18	18	20	22,5
		d1(C12)	196	218	218	245	245	280	280	310	310	345	345	385	425
	FYDT	n1	8	8	8	8	8	10	10	10	10	10	10	16	16
		e	165	185	205	245	270	300	330	360	390	435	480	520	560
		d2	15	17	17	19	19	21	21	23	23	25	25	27	29
		z	8	8	8	10	10	10	10	10	10	10	10	10	10
	FYHS	C2(±0.1)	196	218	245	280	310	345	385	425	465	505	545	585	625
		e2	180	200	225	250	280	315	345	375	405	435	465	495	525
		d(C12)	18	20	21	23	25	25	28	31	31	34	37	40	43
		z	48	48	60	60	72	72	72	72	72	72	72	72	72
		n	4	4	4	4	4	6	6	6	6	6	6	6	6
TECHNICAL DATA FLANGE SIDE Y															
SERIES			US.F 225/315		US.F 250/330		US.F 285/390		US.F 315/435		US.F 350/480		US.F 390/520	US.F 435/600	US.F 480/650
βmax(°)			5/7,5		5/7,5		5/7,5		5/7,5		5/7,5		5/7,5	5/7,5	5/7,5
RY			315		330		390		435		480		520	600	650
Dfy			315		330		390		435		480		520	600	650
Lmy			140		150		170		190		210		230	280	290
V			395		435		480		565		630		695	735	810
ty			5		7		8		8		10		10	12	15
Kv			28		30		40		42		47		50	60	60

COMPANION FLANGES

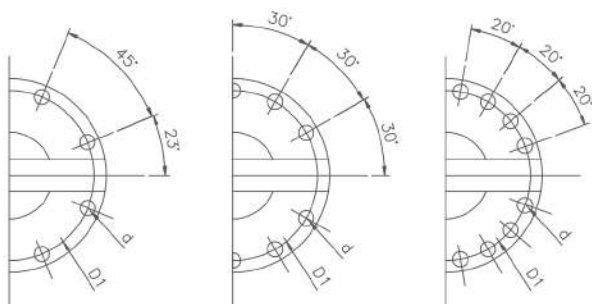
FLANGE WITH **BOLT HOLE** (CFBH)



N 8

N 10

FLANGE WITH **INTEGRAL FACE KEY** (CFIK)

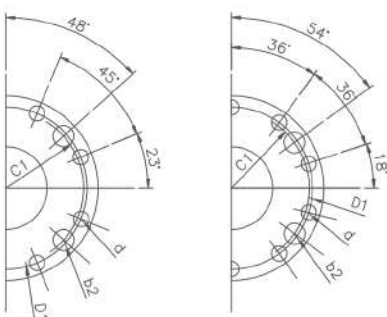


N 8

N 10

N 16

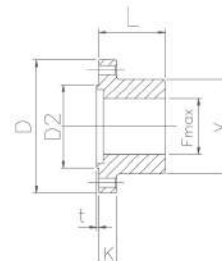
FLANGE WITH **BOLT** WITH **SLIT SLEEVE CONNECTION** ACCORDING TO **DIN 15452** (CFBH/SP DIN15452)



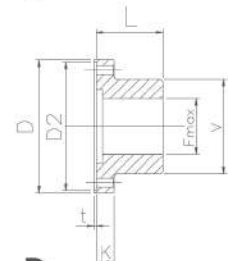
N 8

N 10

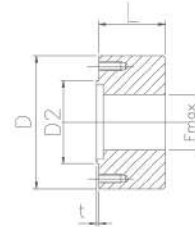
A



B



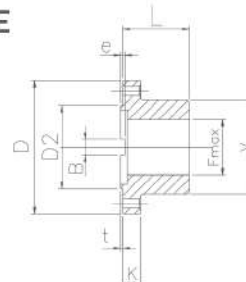
C



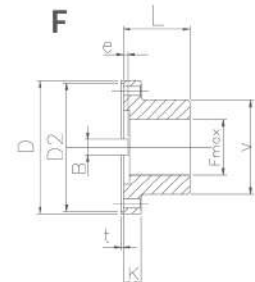
D



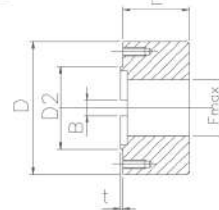
E



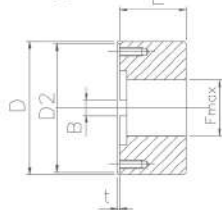
F



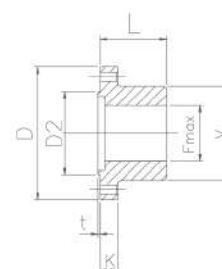
G



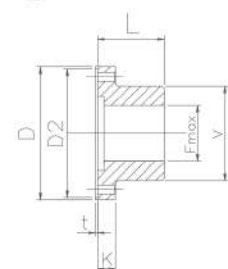
H



I



L



CFBH														
TYPE A/C(inner centering)				TYPE B/D(outer centering)										
TYPE	D	D2	V	D	D2	V	D1	d A/d B	d C/d D	Fmax A/ Fmax B	Fmax C/ Fmax D	L	t	k
150	150	90	110	160	150	140	130	14	M14	80	110	170	4	12
180	180	110	130	190	180	150	155,5	16	M16	90	120	180	5	12
200	200	125	150	210	200	160	170	16	M16	100	140	190	5	15
225	225	140	171	235	225	170	196	16	M16	115	150	200	5	18
250	250	140	190	260	255	190	218	18	M18	125	170	210	6	20
285	285	175	214	295	285	214	245	20	M20	140	190	220	7	22
315	315	175	247	330	315	247	280	22	M22	165	210	230	8	25
350	350	220	277	365	350	277	310	22	M22	185	235	240	8	27
390	390	250	307	405	390	307	345	24	M24	205	260	250	8	32
440	440	280	342	460	440	342	385	27	M27	225	295	280	9	32

CFIK																	
TYPE E/G(inner centering)					TYPE F/H(outer centering)												
TYPE	D	D2	V	e	D	D2	V	e	D1	d E/d F	d G/d H	Fmax E/ Fmax F	Fmax C/ Fmax D	L	t	k	B
160	160	90	110	4	170	160	140	6	137	15	M14	80	170	170	4	18	20
180	180	90	130	4	190	180	150	7	155,5	17	M16	90	180	180	5	19	24
200	200	90	150	4	210	200	160	8	170	17	M16	100	190	190	5	20	28
225	225	105	171	5	235	225	170	9	196	17	M16	115	200	200	5	22	32
250	250	105	190	12,5	260	250	190	12,5	218	19	M18	125	210	210	6	25	40
265	265	125	190	12,5	275	265	190	12,5	233	19	M18	130	210	210	6	25	40
285	285	125	214	15	295	285	214	15	245	21	M20	140	220	220	7	27	40
315	315	130	247	15	330	315	247	15	280	23	M22	165	230	230	8	32	40
350	350	155	277	16	365	350	277	16	310	23	M22	185	240	240	8	35	50
390	390	170	307	18	405	390	307	18	345	25	M24	205	250	250	8	40	70
440	440	190	342	20	460	440	342	20	390	28	M27	225	260	260	10	42	80
490	490	205	378	22,5	510	490	378	22,5	435	31	M30	255	300	300	12	47	90
550	550	250	445	22,5	570	550	445	22,5	492	31	M30	295	320	320	12	50	100
620	620	320	500	25	640	620	500		555	38	M37	330	350	350	12	55	100

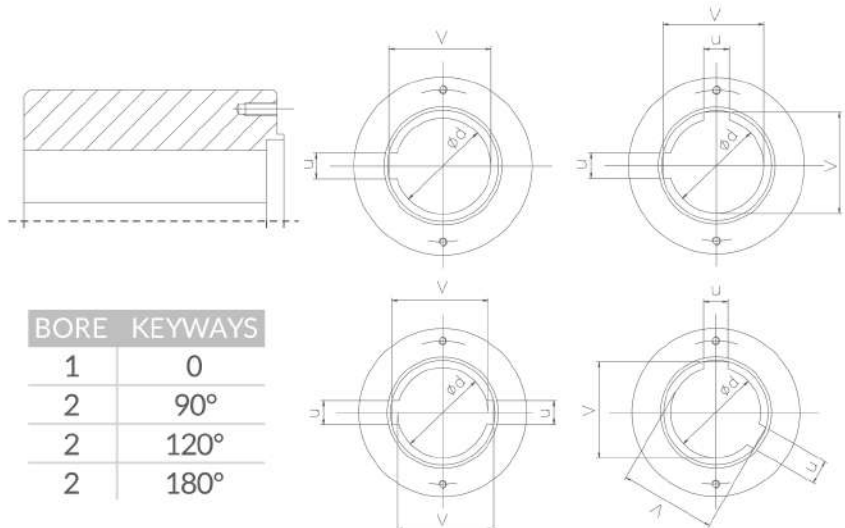
CFBH/SP DIN15452														
TYPE I (inner centering)			TYPE L (outer centering)											
TYPE	D	D2	D	D2	D1	C1	d	B2	V	Fmax	L	t	k	
150	150	100	160	150	130	126	15	19	110	50	170	4	18	
180	180	105	190	180	155,5	150	17	21	130	70	180	5	19	
200	200	120	210	200	170	165	17	21	150	90	190	5	22	
225	225	135	235	225	196	192	17	21	165	100	200	5	22	
250	250	150	260	255	218	214	19	25	175	110	210	6	25	
285	285	170	295	285	245	240	21	28	205	130	220	7	27	
315	315	185	330	315	280	279	23	30	225	140	230	8	32	
350	350	210	365	350	310	300	23	32	260	160	240	8	35	
390	390	235	405	390	345	340	25	32	290	180	250	8	40	
440	440	280	455	435	385	378	27	35	310	190	280	8	42	

*all dimension in millimetres(unless otherwise specified)

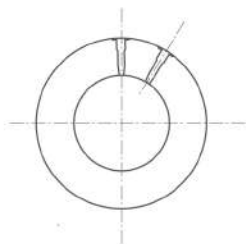
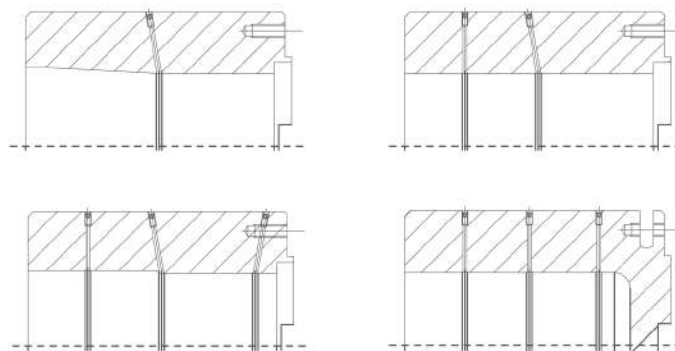
Contact us for special dimensions

PINION END CASING DESIGN

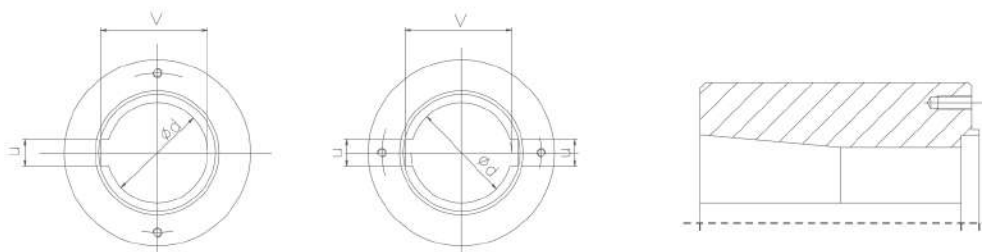
CYLINDRICAL FINISHED



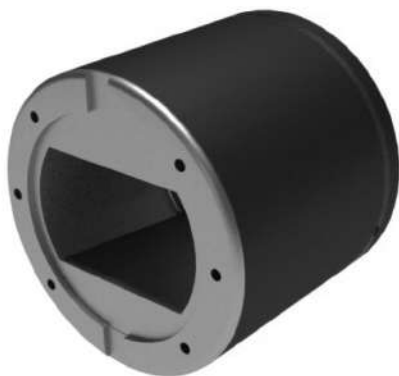
SHRINK FITTING AND OIL PRESSURE REMOVAL, TAPER FINISHED



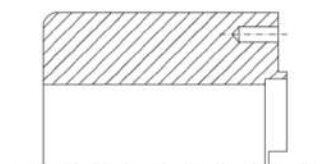
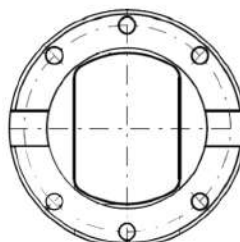
TAPER BORE AND 1 KEYWAY TAPER BORE AND 2 KEYWAYS 90°



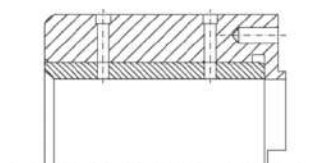
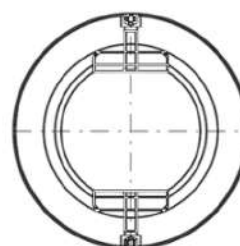
ROLL END CASING DESIGN



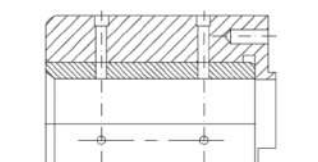
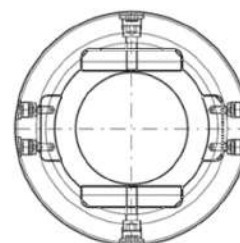
INTEGRAL BORE



TWO FLAT WEAR KEYS / TWO
ROUND WEAR KEYS



SPLINED ACCORDING TO
DIN 5480



KINEMATICS

The universal joint, also called cardan joint or Hooke's joint, is defined as a spatial or spherical drive unit with a non-uniform gear ratio or transmission. When a universal joint is set as an angle(β), non-uniform motion is developed. With the driving yoke of the joint operating at a uniform rotational velocity(ω_1), the driven yoke rotates non-uniformly with respect to angular displacement, velocity(ω_2) and acceleration.

The transmission behaviour of this joint is described by the following equations:

$$\alpha_2 = \tan^{-1}\left(\frac{1}{\cos\beta} \cdot \tan\alpha_1\right)$$

$$\omega_2 = \left(\frac{\cos\beta \cdot \omega_1}{1 - \sin^2\alpha_1 \cdot \sin^2\beta}\right)$$

Where,

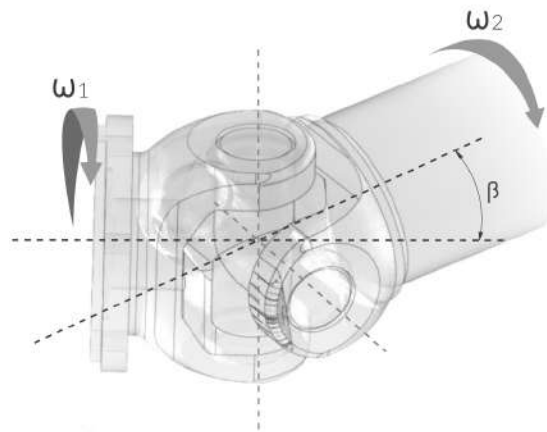
β = Deflection angle

ω_1 = Rotational velocity drive side

ω_2 = Rotational velocity driven side

α_1 = Angle of rotation drive side

α_2 = Angle of rotation driven side



The average angular displacement and velocity is uniform, which means that if the driving yoke rotates one revolution, the driven also rotates one revolution. Nevertheless, the incremental angular displacement, instantaneous angular velocity and acceleration is not transmitted uniformly through the joint during this revolution.

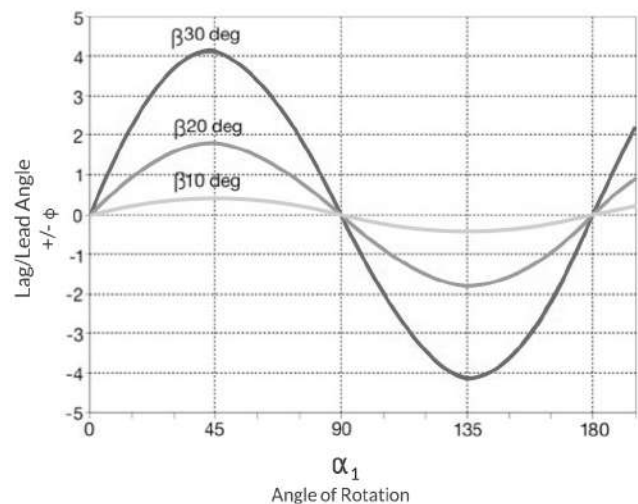
The angular displacement of the driven yoke during one revolution lags and leads the driving yoke twice. This lag and lead angle (ϕ) depends on the angular rotation (α) of the joint and on the bend angle(β),

$$\phi = \tan^{-1}\left(\frac{\tan\alpha_2 - \tan\alpha_1}{1 + \tan\alpha_1 \cdot \tan\alpha_2}\right) \cdot \tan\alpha_1$$

The maximum and minimum angular velocity will be:

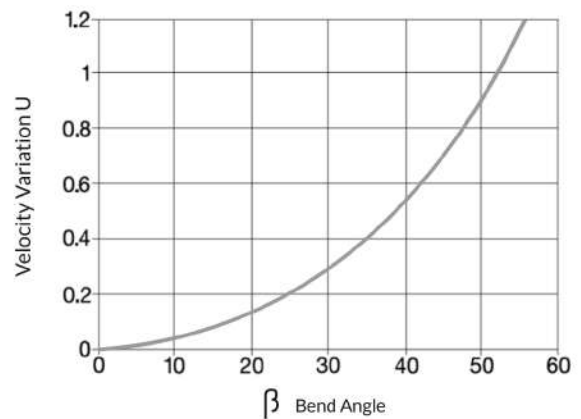
$$\omega_{2max} = \frac{\omega_1}{\cos\beta}$$

$$\omega_{2min} = \cos\beta \cdot \omega_1$$



Following the previous graph, velocity variation ($U = \omega_1 / \omega_2$) depends also on the bend angle (β). This can be represented using the next formula:

$$U = \left(\frac{\omega_{2max} - \omega_{2min}}{\omega_1} \right) = \tan\beta \cdot \sin\beta$$



Due to the non-constant rotational speed, few applications are suitable for a single joint. However, by placing two universal joints in tandem the irregularities of a single joint can be compensated. Usual configurations are "Z" or "W" bend.



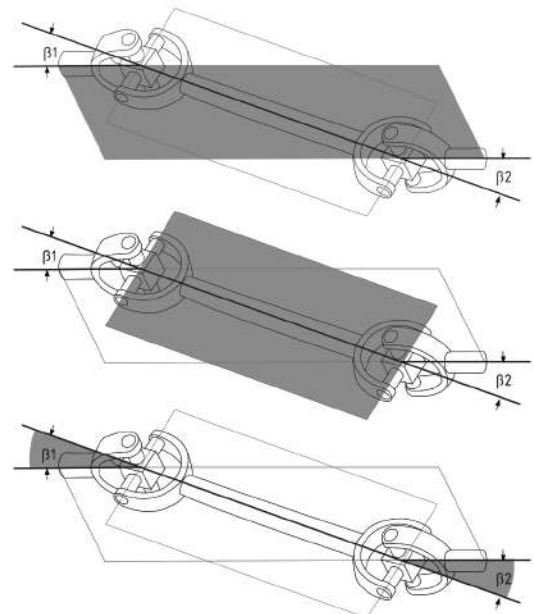
W Bend



Z Bend

Using these configurations, to achieve synchronous rotation of the drive and driven shafts three conditions are necessary to be fulfilled:

1. The axes of all shaft sections lie in the same plane.
2. The bearing bores of the inboard yokes of the center section lie in the same plane.
3. The bend angles β_1 and β_2 are equal.



The third condition ($\beta_1 = \beta_2$) is an essential requirement for a uniform output speed condition, but cannot always be fulfilled. We recommend therefore not to exceed $1,5^\circ$ difference between bend angles, especially for high-torque/high-speed applications.

SELECTION AND DIMENSIONING

Please use the following method to select the best solution for your application. Is important to notice that this selection method is valid only for US.A and US.B series. In case you need a product from our US.C or US.F series, we will be glad to assist you.

Usually, a universal shaft is selected according to two principal values; torque and required bearing life. One is the torque to transmit and the other is the required bearing life.

1. To calculate the nominal torque, please use the next formulas:

$$T_c = KT$$

$$T = 9950 \frac{P_w}{n}$$

$$T = 7020 \frac{P_h}{n}$$

Where,

T_c = Calculated Torque (Nm)

K = Service Factor

T = Operation Torque (Nm)

P_w = Driving Power (kW)

P_h = Driving Power (HP)

n = Operating speed (rpm)

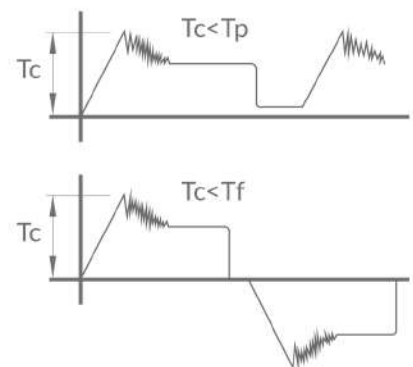
SERVICE FACTOR		
LIGHT SHOCK LOAD	HEAVY SHOCK LOAD	EXTRA HEAVY SHOCK LOAD
K=1,1 - 1,5	K=2-3	K=3-5
Generators	Paper machines	Crushers
Belt conveyers	Bar mills	Cold rolling mills
Centrifugal pumps	Calender Drives	Blooming mills
Ventilators	Compressors(single)	Continuous tube mills
Wood handling machines	Continuous tube mills	Vibration conveyors
MEDIUM SHOCK LOAD	Marine transmissions	Medium section mills
K=1,5-2	Medium section mills	
Compressors(multi)	Mixers	EXTREME SHOCK LOAD
Continuous wire mills	Presses	K=5-10
Conveyer primary drives	Pumps(single)	
Pumps(multi)	Straightener machines	Feed roller drives
Small section mills	Transport roller tables	Plate shears

2. Shaft that meets following conditions

One-way not pulsating loads: $T_c < T_n$,
where T_n = Nominal Torque. This is the maximum admitted torque. After this level, plastic deformation may occur.

One-way pulsating loads: $T_c < T_p$
where T_p = Pulsating Torque, and
 $T_p = 1,45 T_f$

Reversing loads: $T_c < T_f$
where T_f = Fatigue Torque



3. Once the torque conditions are satisfied, a calculation of the related bearing life is required:

$$L_n = \frac{K_l}{K_1 \cdot n \cdot \beta \cdot T^{\frac{10}{3}}} \cdot 10^{10}$$

$$L_n \geq L_{min}$$

Where,

L_n = Service life (hrs)

K_l = Bearing capacity factor

K_1 = Motor factor (=1 for electric motor/=1,2 for diesel motors)

n = Operating speed (rpm)

β = Working angle (°)

T = Operating torque (Nm)

L_{min} = Minimum bearing life (hrs)

In case of simultaneous horizontal and vertical angular misalignments on the universal joint shaft, the composite deflection angle is calculated using the next formula:

$$\beta = \text{tg}^{-1}(\sqrt{\text{tg}^2\beta_1 + \text{tg}^2\beta_2})$$

Where,

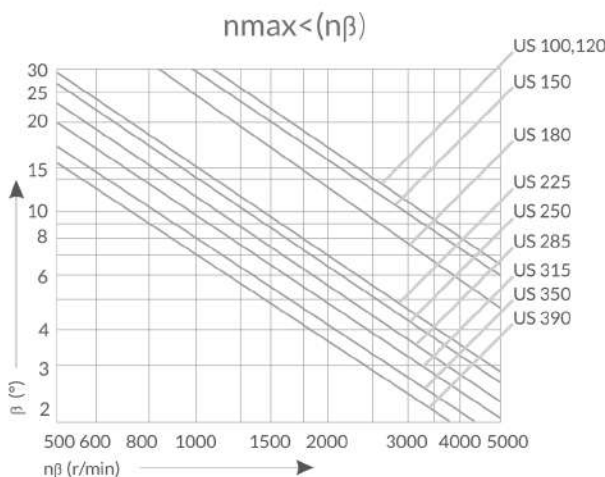
β =Composite deflection angle(°)

β_1 =Horizontal defection angle(°)

β_2 =Vertical deflection angle(°)

BEARING CAPACITY FACTOR KL					
DESIGN	KL	DESIGN	KL	DESIGN	KL
USA 58	0.022x10 ⁻⁵	US.B 200	1,47	US.B 460	13.53x10 ³
USA 65	0.012x10 ⁻⁴	US.B 225	7,812	US.B 490	2.145x10 ⁴
USA 75	0.058x10 ⁻⁴	US.B 250	28,2	US.B 540	5.6367x10 ⁴
USA 90	0.048x10 ⁻³	US.B 265	54,8	US.B 550	6.335x10 ⁴
USA 100	0.26x10 ⁻³	US.B 285	82,8	US.B 560	7.287x10 ⁴
USA 120	0.26x10 ⁻²	US.B 315	279	US.B 620	0.13x10 ⁶
USA 150	2.65x10 ⁻²	US.B 350	744	US.C 700	0.32x10 ⁶
USA 180	0,56	US.B 370	1,02	US.C 750	0.75x10 ⁶
USA 200	1,03	US.B 390	1860	US.C 800	1.06x10 ⁶
USA 225	1,89	US.B 410	4416	US.C 900	5.62x10 ⁶
US.B 160	0,16	US.B 425	6333	US.C 1060	303x10 ⁶
US.B 180	0,51	US.B 440	8.25x10 ³		

4. When torque and bearing requirements are accomplished, maximum operating speed should be checked considering angle β and operating length L of the shaft according the following charts:

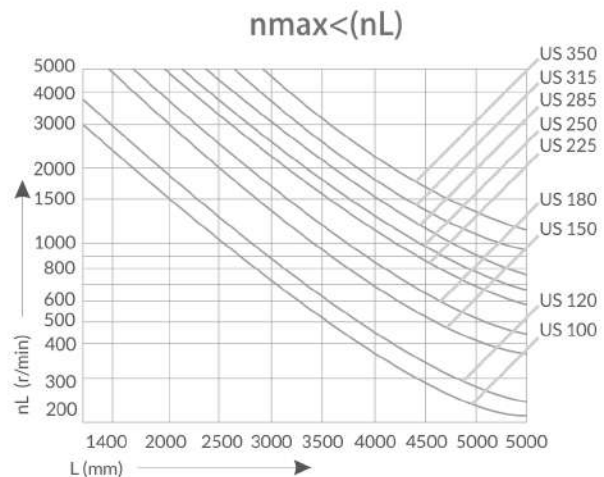


Where,

n_{max} =maximum operating speed(rpm)

β =Misalignment angle

$n\beta$ =Maximum permissible speed in relation to operating deflection angle(rpm)



Where,

n_{max} =maximum operating speed(rpm)

nL =maximum permissible speed in relation to operating length(rpm)

L= Operating length

5. Finally, under some operating circumstances(linear speed > 7 m/s) dynamic balancing test is required. The grade of balancing, according to DIN ISO 1940:2003, will depend on the application of the joint:

GUIDANCE FOR BALANCE QUALITY GRADES FOR ROTORS		
G40	G6.3	G 2,5
Cars: wheels, wheel rims, wheel sets, drive shafts Crankshaft drives, inherently balanced, elastically mounted	Aircraft gas turbines Centrifuges (separators, decanters) Electric motors and generators (of at least 80 mm shaft height), of maximum rated speeds up to 950 r/min Electric motors of shaft heights smaller than 80 mm	Compressors Computer drives Electric motors and generators (of at least 80 mm shaft height), of maximum rated speeds above 950 r/min Gas turbines and steam turbines Machine-tool drives Textile machines
G16	Fans Gears Machinery, general Machine-tools Paper machines Process plant machines Pumps Turbo-chargers Water turbines	
Agricultural machinery Crankshaft drives, inherently balanced, rigidly mounted Crushing machines Drive shafts (cardan shafts, propeller shafts)		

APPLICATION SHEET FOR SELECTION AND DESIGN

Customer:	Type of mill:
Contact name:	No. of stands:
Phone:	Inquiry No:
Mail:	Date:

	DIMENSION	UNIT
1. Motor power		
2. Base motor speed		
3. Operation motor speed		
4. Maximun motor speed		
5. Reducer ratio		
6. Pinion stand shafts centers		
7. Distance between shaft ends		
8. Spindle slide(if required)		
9. Minimum roll diameter		
10. Maximum roll diameter		
11. Minimum roll center		
12. Maximum roll center		
13. Ambient temperature		
14. Pinion end shaft		
15. Roll end shaft		
16. Comments or special conditions		

KINEMATIC CHAIN

