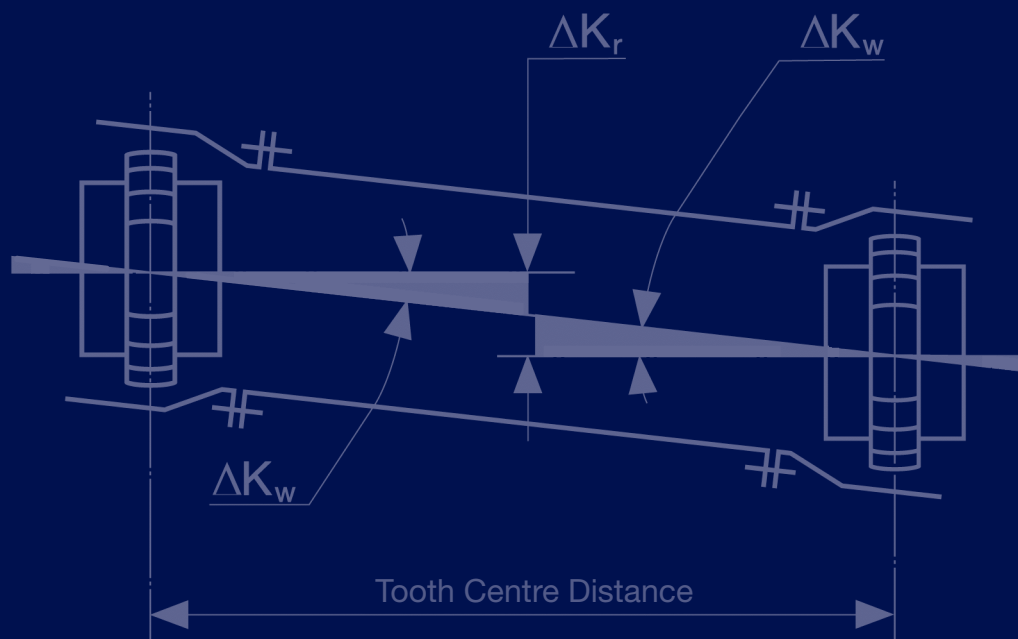


Innovative Power Transmission



Curved Tooth Couplings High-Speed Series

owner's choice

Curved Tooth Couplings

High-Speed Range

Safety and Reliability

The safety and reliability of machine installations depends to a great extent on the type and quality of the couplings used. This is even more so where the couplings have to satisfy special requirements.

Curved Tooth Couplings

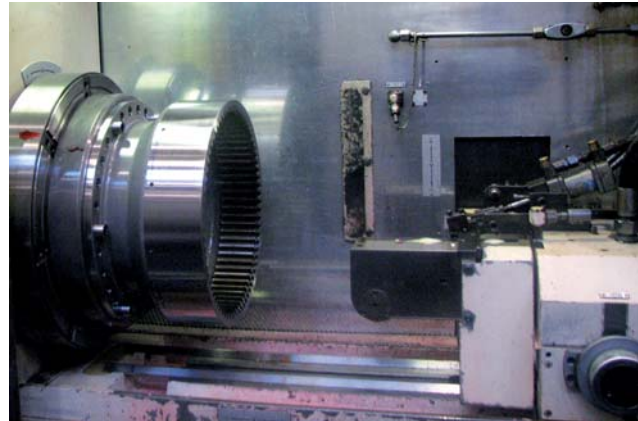
Curved tooth couplings in a wide variety of designs have proven themselves over decades in all fields of industrial engineering. The versatility of this ingenious drive element is shown in a comprehensive range of construction series, offering a solution for even the most unusual applications. Systematic structuring according to quality features and application-related criteria ensures optimum adaptation of the coupling design to the specific application.

New Development

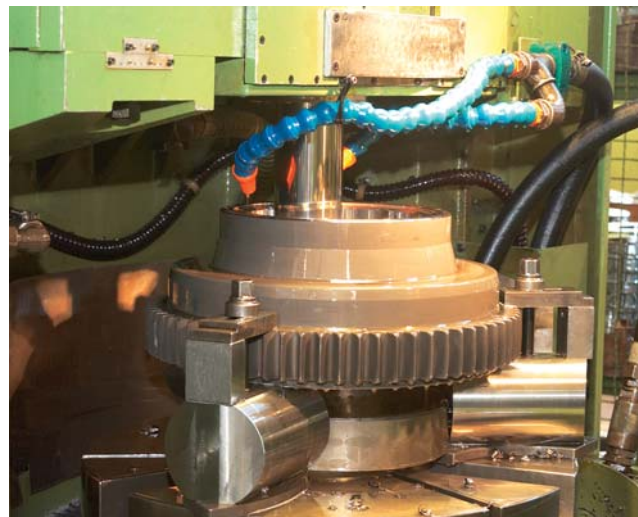
The ZT coupling series has been newly developed for high and very high speeds. It has its origins in the proven high-speed coupling series of RENK and TACKE and offers the best of what is currently possible in the field of gear couplings. The evolution of this coupling range is based on more than 75 years of experience in the development and manufacture of top-quality drive elements using state-of-the-art technology and most advanced production facilities.

Hardened and Ground

The external and internal gear teeth are hardened and ground. This ensures high percentage contact areas and thus high performance combined with small dimensions. Maximum precision in the manufacturing of all parts is the guarantee for exceptionally good running quality under all operating conditions. Owing to its low weight and high efficiency, this coupling particularly lends itself for use in installations involving flexible shaft lines which are susceptible to vibrations.



1



2



3



4

1 Gear tooth grinding machine

2 Gear tooth shaping machine while producing the internal teeth

3 Hubs of the curved tooth coupling Type VLBGkT 200 spec. for use in vertical thruster drives

4 Gear tooth milling machine with automatic work piece feed

Single Tooth Injection Lubrication

Single tooth injection lubrication with continuous lubricant supply provides a maximum of operating reliability combined with a minimum of maintenance. The deposition of centrifugally separated-out oil components is reliably prevented by the design of the coupling parts. This type of lubrication is prescribed for all the coupling series described in this catalogue. Upon request, the couplings can also be supplied with guards being equipped with integrated injection nozzles. The oil supply can be provided by a separate lube oil system or by the installation's own central lubrication station.

Quick Availability

This is ensured by permanent stock-keeping of all components requiring complex production processes. Couplings which do not require any additional parts such as spacers or intermediate shafts are therefore available from stock at short notice. Depending on the coupling series, this applies to hub bores up to a diameter of 280 mm.

Additional Tasks

The couplings can perform additional tasks if special parts or additional attachments are installed. These include retaining rings to axially lock generator or motor shafts equipped with floating bearings, as well as insulating bushes and washers to interrupt leakage currents in electrical installations. The combination with torque metering shafts of various designs or the installation of safety elements ensures safe monitoring and protection of the installations during operation. In addition, all coupling series can be supplied as customized designs to fulfil specific requirements.



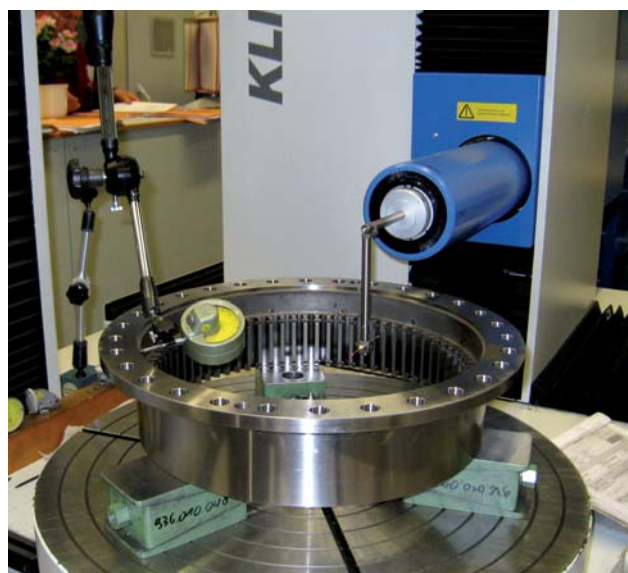
1



2



4



3

- 1 Key-seating machine
- 2 Cut-away model of a curved tooth coupling Type ZTNH 85
- 3 3-D measuring machine
- 4 Set-up of a gear cutting machine

Application and Quality Features



Application Features	Quality Features	Construction Series	Page			
<ul style="list-style-type: none"> • High and extremely high speeds • Flexible rotors susceptible to vibrations • Extended demands on the running performance, in particular in the idle and partial load ranges • Very low axial forces • High safety against overload • Safe interchangeability of components at a high quality level • Design according to API 671 	<ul style="list-style-type: none"> • Tooth tip centred • Single tooth injection lubrication • Nitrided and ground internal and external teeth • Gear teeth quality Q = 4 according to DIN 3962 • Low weight • High quality standard in terms of concentricity and balance quality • High-strength material • Slightly crowned external gear teeth • Flank hardness of internal and external teeth > 600 HV • Surface finish $R_a \leq 0.8 \mu\text{m}$ • Reproducible dimensions 	For highest demands				
		ZTNH	6 – 7			
		ZTKH	6 – 7			
		ZTF	8 – 9			
		ZTFK	8 – 9			
		ZTFR	8 – 9			
		ZTFKR	8 – 9			
		ZTA	10 – 11			
		ZTAK	10 – 11			
		ZTN	12 – 13			
		ZTK	12 – 13			
		<ul style="list-style-type: none"> • High speeds • Stiff rotors not susceptible to vibrations • Low axial forces • High safety against overload • Safe interchangeability of components • Design according to API 671 	<ul style="list-style-type: none"> • Tooth tip centred • Single tooth injection lubrication • Nitrided internal and external gear teeth • Gear teeth quality Q = 6 - 7 according to DIN 3962 • High quality standard in terms of concentricity and balance quality • Quenched and tempered alloy steel • Crowned external gear teeth • Flank hardness of internal and external gear teeth > 600 HV • Surface finish $R_a \leq 3.2 \mu\text{m}$ 	For high demands		
				TF	14 – 15	
TFH	16 – 17					
THB	18					
<ul style="list-style-type: none"> • Medium speeds • Stiff rotors not susceptible to vibrations • High safety against overload • Safe interchangeability of components • Low axial forces 	<ul style="list-style-type: none"> • Tooth tip centred • Single tooth injection lubrication • Natural hard internal and external gear teeth • Gear teeth quality Q = 7-8 according to DIN 3962 • Quenched and tempered steel • Crowned external gear teeth • Surface finish $R_a \leq 3.2 \mu\text{m}$ 			For medium demands		
				TSB	19	
				TSR	20	
				TSBL	21	
				TRL	22	
				TRG	23	
				Technical Annex	Distance plates and coupling guards	24 – 25
					Special designs	26 – 27
					Shaft-hub connections	28
		Calculation formulae and tables	29 – 30			

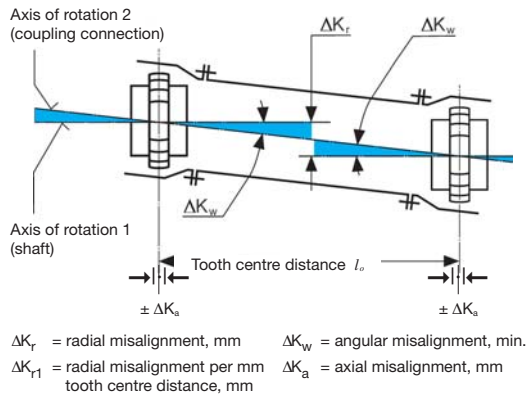
Subject to change due to technical improvement.

Coupling Selection and Size Determination



Coupling selection and size determination		
I. Selection on basis of the application and quality features on page 4	II. Size determination according to power rating $\frac{P_N}{n}$ Shock load Short circuit load Bore diameter Operating speed	III. Selection according to local site conditions Length Misalignment values according to table 1
Result: Coupling Series	Result: Coupling size	Result: Coupling type

Schematic representation to determine the misalignment values



Service Factor K_1

Constant torque: 1.50
(turbine, boiler feed pump, centrifugal compressor)

Design according to API 671 1.75

Minor torque fluctuations 2.00

The Service Factor K_1 is applicable for drives including soft starting electric motors, steam turbines or gas turbines.

For applications involving high torque fluctuations, alternating torques or reversing operation, please consult RENK AG, Rheine Works.

Table 1

Misalignment Values			Speed Factor f					
ΔK_{r1}	ΔK_w	ΔK_a	ZTNH	ZTF	TF	TSB	TSB	
$\Delta K_{r1} = \frac{\Delta K_r}{l_o}$			ZTKH	ZTFK	TFH	TSR	TSR	
mm			ZTA		THB	TSBL	TSBL	
minutes			ZTAK			TRL	TRL	
			ZTN			TRG	TRG	
			ZTK			up to	over	
						size	size	
						160	160	
0,00058	2	See dimension table, dimension S $\Delta K_{perm} \approx \pm S$	1	1	1	1	1	
0,00116	4		1	1	1	1	1	
0,00175	6		1	1	1	1	1	
0,00233	8		1	1	1	1	1	
0,00290	10		0,8	1	1	1	1	
0,00349	12				0,90	1	1	
0,00407	14				0,80	1	0,90	
0,00465	16				0,75	0,94	0,79	
0,00524	18			Upon request, special measures required	0,67	0,83	0,70	
0,00582	20				0,60	0,75	0,63	
0,00640	22			0,55	0,68	0,57		
0,00698	24			0,50	0,63	0,52		
$\Delta K_{w perm}$ in minutes			10'			24'		

Subject to change due to technical improvement.

Misalignment

In practice, misalignments mostly occur in combined form. The angular misalignment ΔK_w of the coupling connection results from the radial misalignment ΔK_r of the shafts.

An additional angular misalignment of the axis 1 (shaft) changes the angle ΔK_w relative to the axis 2 (coupling connection). Misalignments within the blue range do not cause an increase of the value ΔK_w , whereas ΔK_w is increased if misalignments outside this range occur. The total misalignment capacity may not exceed $\Delta K_{w perm}$, as per Table 1.

Speed factors

The maximum permissible operating speed n_{perm} depends on the type and size of the coupling and on the misalignment occurring during operation. It is determined by using the following formula:

$$n_{perm} = n_{max} \cdot f$$

n_{max} acc. to dimension table
speed factor f per Table 1.

Size determination

The size is determined by the power rating $\frac{P_N}{n}$

$$\text{Condition for continuous power } \frac{P_N}{n} \cdot K_1 \leq T_{KN}$$

- P_N = max. continuous power (kW)
- P_{KN} = coupling nominal power (kW) according to dimension table
- n = operating speed (rpm)

$$\begin{aligned} \text{Max. shock load of coupling} &= 1.5 \cdot P_{KN} \\ \text{Max. short circuit load of coupling} &= 3 \cdot P_{KN} \end{aligned}$$

Example:

A plant equipped with steam turbine – gearbox – generator
Needed: The coupling between steam turbine and gearbox

- Known: $P_N = 13,500 \text{ kW}$
 $n = 10,000 \text{ min}^{-1}$
 Short circuit load = $6 \cdot P_N$
 Shaft diameter, turbine d = 110 mm
 Shaft diameter, gearbox d = 115 mm
 Required min. length of coupling = 1000 mm
 Max. radial misalignment = 0.9 mm

I. According to the application and quality features, the series range for highest demands is selected.

$$\frac{P_N}{n} \cdot K_1 = \frac{13,500}{10,000} \cdot 1.75 = 2.36 \text{ requires the size}_{new} = 115$$

$$\text{Corresponding indication on the dimension list } \frac{P_N}{n} = 3.15$$

The review of the short circuit load, bore diameter and permissible speed n_{perm} does not result in another coupling size.

III. On the basis of the required length and misalignment, the coupling type ZTNH with spacer is selected.

$$\begin{aligned} \text{Total length } C &= 1000 \text{ mm} \\ \text{Tooth centre distance } l_o &= C - 2 \cdot X_2 = 1000 - 2 \cdot 63 = 874 \text{ mm} \\ \text{Required radial misalignment } \Delta K_r &= 0.9 \text{ mm} \end{aligned}$$

$$\Delta K_{r1} = \frac{\Delta K_r}{l_o} = \frac{0.9}{874} = 0.00103$$

According to Table 1, this value corresponds to an angular misalignment of $\Delta K_w \approx 4$ minutes. 10 minutes are permissible.

Result after the steps I, II and III:

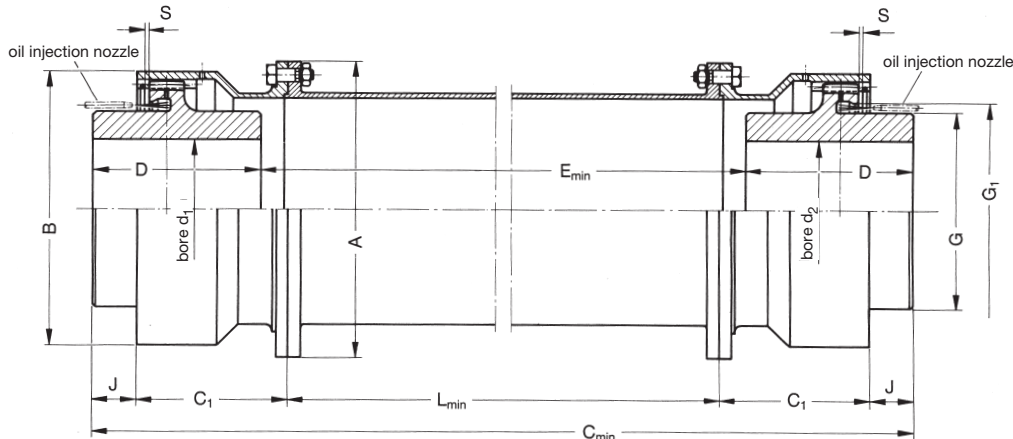
The selected coupling ZTNH 115 satisfies all of the requirements.

Curved Tooth Couplings

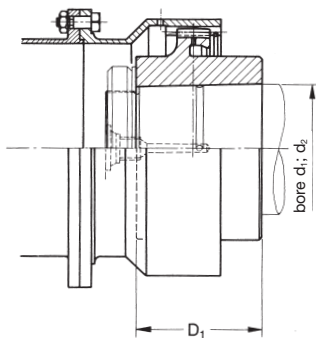
High-Speed Series ZTNH and ZTKH

Hardened and ground gear teeth
Dimension table No. 243 110/1

Series ZTNH with cylindrical bore



Series ZTKH with tapered bore



For hubs with tapered bore, the hub length D_1 can be maximum increased to dimension D . For technical reasons, hydraulic fits require the supply of the pressure oil through the shaft.

- 1) Values of the complete coupling, series ZTNH, with $E = E_{min}$ and bore $d_1; d_2_{max}$
- 2) Internal gear teeth not ground

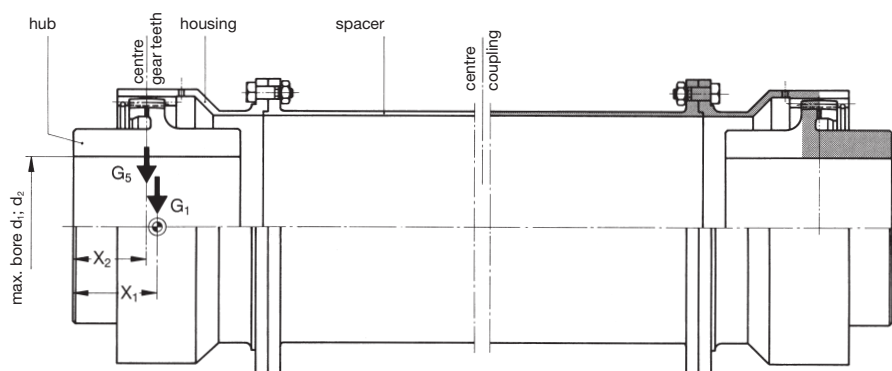
Sizes 45 to 205 are available from stock, without spacer.
Larger sizes on request.

For coupling selection and size determination, please see page 5.

Coupling Type ZTNH + ZTKH Size	Normal cont. operation P_{KN} n	Speed n_{max} rpm	Dimensions														Oil injection nozzles per half Quantity and size	Total oil requirement per min at 1,5 bar pressure litre	Mass moment of inertia J ¹⁾ kgm ²	per 10 mm tube length, if $L > L_{min}$ kgm ²	Weight ¹⁾ kg	
			bore $d_1; d_2$		A	B	C_{min}	C_1	D	D_1	E_{min}	G	G_1	J	L_{min}	S						
			min	max	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm						mm
35	-	0,11	40.000	18	35	117	82	166	49	45	35	76	50	60	9	50	1,5	1xØ2	4,5	0,0044	0,000091	3,1
40	-	0,14	37.500	20	40	127	88	176	54	50	40	76	56	66	9	50	1,5	1xØ2	4,5	0,0062	0,00011	3,8
45	10	0,19	32.000	35	45	123	104	212	85	55	45	102	64	74	- 4	50	2,5	1xØ2	4,5	0,0099	0,000088	5,4
55	20	0,32	28.000	40	55	133	120	228	88	65	55	98	77	87	1	50	2,5	1xØ2	4,5	0,017	0,00013	7,2
63	30	0,51	25.000	45	63	148	135	251	95	75	65	101	88	101	5,5	50	2,5	1xØ2,5	7	0,027	0,00020	9,5
73	40	0,79	22.000	50	73	168	155	283	100	90	75	103	102	118	16,5	50	3	1xØ2,5	7	0,048	0,00034	13
85	50	1,23	20.000	55	85	188	174	309	102	105	90	99	119	133	27,5	50	3	1xØ3	10	0,085	0,00061	19
100	60	1,92	18.000	65	100	217	198	341	112	120	105	101	140	156	31	55	3	1xØ3	10	0,17	0,0011	29
115	70	3,15	16.000	75	115	242	224	376	122	135	120	106	160	178	38,5	55	4	1xØ3,5	13	0,30	0,0021	40
130	80	4,40	13.500	85	130	276	256	421	140	155	135	111	182	200	40,5	60	4	1xØ3,5	13	0,60	0,0034	61
150	90	7,00	11.500	100	150	306	288	477	155	180	155	117	210	230	53,5	60	4	2xØ3	20	1,1	0,0058	88
175	100	10,5	10.000	115	175	354	330	561	180	210	180	141	245	265	63	75	5	2xØ3	20	2,3	0,0099	139
205	110	15,8	9.000	135	205	394	390	621	195	245	210	131	290	315	78	75	5	2xØ3,5	26	4,6	0,018	214
240	?)	24,6	8.000	160	240	465	465	705	227	285	245	135	340	379	88	75	5	2xØ3,5	26	10,0	0,034	333
260	?)	31,4	7.000	175	260	510	510	780	237,5	320	265	140	370	410	107,5	90	6	2xØ4	36	16,3	0,047	455
280	?)	39,2	6.500	185	280	560	560	820	255	340	285	140	400	455	110	90	6	2xØ4	36	24,1	0,066	565

Subject to change due to technical improvement.

Centres of Gravity, Torsional Spring Rates



Determination of the centres of gravity

Details for determining the centres of gravity

- X_1 = Distance to centre of gravity, G_1
- X_2 = Distance to weight take-up, G_5
- G_1 = Weight of hub
- G_2 = Weight of housing
- G_3 = Weight of spacer, if $E = E_{min}$
- G_4 = Extra weight of the spacer per 1 mm length, if $E > E_{min}$

Determination of the torsional spring rates

Details for determining the torsional spring rates

- C_{T1} = torsional spring rate of the complete coupling, if $E = E_{min}$
- C_{T2} = torsional spring rate per 1 mm spacer length, if $E > E_{min}$
- C_{T3} = torsional spring rate of the complete coupling, if $E > E_{min}$

2) Details based on bore d_1 ; d_2 max

$$G_5 = G_2 + \frac{1}{2} \cdot G_3 \text{ if } E = E_{min}$$

or

$$G_5 = G_2 + \frac{1}{2} \cdot G_3 + \frac{1}{2} \cdot (E - E_{min}) \cdot G_4 \text{ if } E > E_{min}$$

$$C_{T3} = \frac{1}{\frac{1}{C_{T1}} + \frac{E - E_{min}}{C_{T2}}}$$

Coupling Type		Weights and Centre of Gravity Distances ²⁾										Torsional Spring Rates ²⁾		
ZTNH + ZTKH		bore	X_1	X_1	X_2	G_1	G_1	G_2	G_3	G_4	G_5	C_{T1}	C_{T2}	C_{T3}
Size		$d_1; d_2$	ZTNH	ZTKH	mm	ZTNH	ZTKH	kg	kg	kg/mm	kg	MNm/rad	MNm-mm/rad	MNm/rad
new	old	mm	mm	mm	mm	kg	kg	kg	kg	kg/mm	kg			
35	-	35	22,2	18,8	20,5	0,47	0,40	0,63	0,9	0,0058		0,429	92	
40	-	40	24,3	20,4	21	0,61	0,53	0,77	1,1	0,0063		0,540	115	
45	10	45	23,8	19,7	8,5	0,89	0,81	1,3	1,1	0,0058		0,484	89	
55	20	55	29,1	24,8	14,5	1,46	1,29	1,6	1,2	0,0065		0,739	128	
63	30	63	34,2	29,9	20	2,17	1,93	1,9	1,4	0,0075		1,08	199	
73	40	73	41,5	35,2	33,5	3,50	3,03	2,3	1,6	0,009		1,74	340	
85	50	85	50,6	44,4	45,5	5,40	4,86	3,1	1,9	0,012		3,02	619	
100	60	100	58,8	52,6	51	8,46	7,60	4,2	3,3	0,018		4,88	1162	
115	70	115	67,2	60,9	63	12,33	11,3	5,8	4,0	0,025		8,20	2158	
130	80	130	76	67,8	68	18,83	16,9	8,7	6,1	0,031		11,5	3421	
150	90	150	88,4	78,1	84,5	29,00	25,8	11,5	7,3	0,041		18,0	5894	
175	100	175	102,7	90,1	99	45,40	40,2	17,5	13,1	0,054		26,2	10056	
205	110	205	122,1	107,7	117	75,30	66,0	23,9	16,0	0,073		43,6	17765	
240	-	240	141,6	126,5	131	121,0	126,5	35,8	19,8	0,094		66,3	34269	
260	-	260	160,3	139,1	156	160,6	139,1	50,8	32,3	0,11		85,6	47187	
280	-	280	169,7	148,6	161	202,0	148,6	62,3	36,4	0,13		112,7	66981	

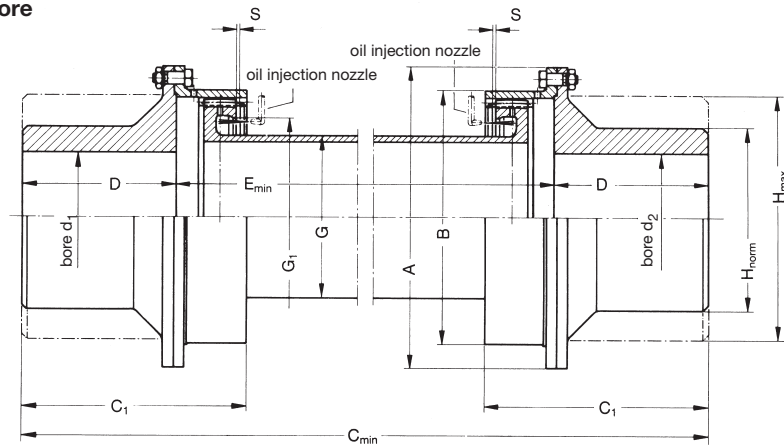
Subject to change due to technical improvement.

Curved Tooth Couplings

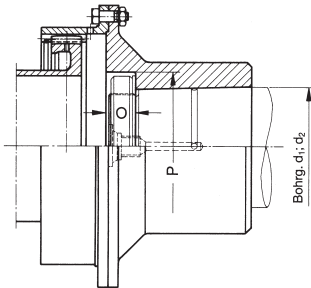
High-Speed Series ZTF and ZTFK

Hardened and ground gear teeth
Dimension table No. 243 111/1

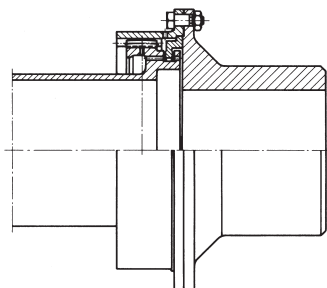
Series ZTF with cylindrical bore



Series ZTFK with tapered bore



Series ZTFR with retaining ring



For technical reasons, hydraulic fits require the supply of the pressure oil through the shaft.

For coupling selection and size determination, please see page 5.

The coupling series ZTFR and ZTFKR are equipped with two Z-shaped retaining rings for end float limitation.

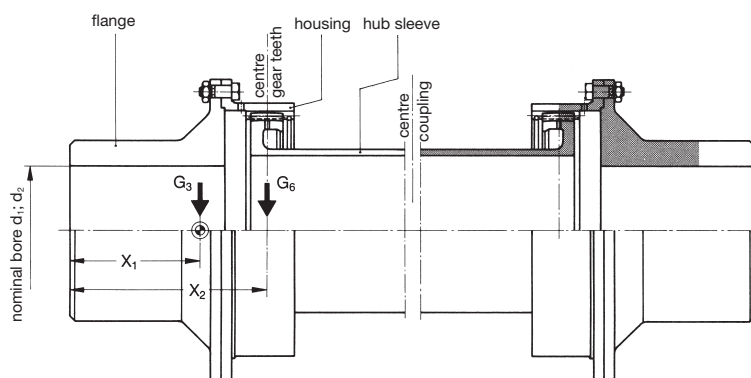
1) Values of the complete coupling, series ZTF and ZTFK, with $E = E_{min}$, H_{norm} and bore d_1 ; d_2 norm

Larger sizes on request.

Coupling Type ZTF + ZTFK	Normal cont. operation $\frac{P_{KN}}{n}$	Speed n_{max}	Dimensions																Oil injection nozzles per half Quantity and size	Total oil requirement per min at 1.5 bar pressure	Mass moment of inertia J ¹⁾	per 10 mm tube length, if $L > L_{min}$	Weight ¹⁾					
			bore d_1 ; d_2			A	B	C _{min}	C ₁	D	E _{min}	G	G ₁	H _{norm}	H _{max}	O	P	S										
Size	kW·min	rpm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	litre	kgm ²	kgm ²	kg
35	0,11	40.000	18	35	55	117	82	190	73	45	100	50	60	50	78	10	42	1,5	1xØ2	4,5	0,005	0,000022	3,5					
40	0,14	37.500	20	40	60	127	88	200	79	50	100	56	66	56	84	10	48	1,5	1xØ2	4,5	0,0071	0,000031	4,2					
45	0,19	32.000	35	45	71	143	104	222	91	55	112	55	73	65	100	10	58	2,5	1xØ2,5	4,5	0,013	0,000033	6,3					
55	0,32	28.000	40	55	80	157	120	255	104	65	125	70	87	77	115	10	70	2,5	1xØ2	4,5	0,022	0,000071	8,4					
63	0,51	25.000	45	63	90	172	135	290	117	75	140	80	101	88	130	10	80	2,5	1xØ2,5	7	0,034	0,00012	11,0					
73	0,79	22.000	50	73	110	197	155	340	139	90	160	90	118	102	155	15	90	3	1xØ2,5	7	0,067	0,00022	16,5					
85	1,23	20.000	55	85	120	212	174	390	156	105	180	100	133	120	170	15	106	3	1xØ3	10	0,11	0,00042	23,3					
100	1,92	18.000	65	100	130	247	198	440	176	120	200	120	156	140	185	15	126	3	1xØ3	10	0,20	0,00080	34,2					
115	3,15	16.000	75	115	155	277	224	495	199	135	225	140	178	160	220	15	144	4	1xØ3,5	13	0,38	0,0016	50					
130	4,40	13.500	85	130	170	310	256	590	229	155	280	165	200	182	240	20	166	4	1xØ3,5	13	0,73	0,0026	74					
150	7,00	11.500	100	150	200	345	288	675	263	180	315	190	230	210	280	25	192	4	2xØ3	20	1,3	0,0046	109					
175	10,5	10.000	115	175	220	398	330	775	305	210	355	215	265	245	310	30	227	5	2xØ3	20	2,8	0,0080	166					
205	15,8	9.000	135	205	270	465	390	890	348	245	400	255	315	290	380	35	270	5	2xØ3,5	26	6,0	0,014	264					

Subject to change due to technical improvement.

Centres of Gravity, Torsional Spring Rates



Determination of the centres of gravity

Details for determining the centres of gravity

X_1 = Distance to centre of gravity, G_3

X_2 = Distance to weight take-up, G_6

G_1 = Weight of flange

G_2 = Weight of housing

G_3 = $G_1 + G_2$

G_4 = Weight of hub sleeve, if $E = E_{min}$

G_5 = Extra weight of hub sleeve per 1 mm length, if $E > E_{min}$

Determination of the torsional spring rates

Details for determining the torsional spring rates

C_{T1} = torsional spring rate of the complete coupling, if $E = E_{min}$

C_{T2} = torsional spring rate of hub sleeve per 1 mm length,
if $E > E_{min}$

C_{T3} = torsional spring rate of the complete coupling, if $E > E_{min}$

2) Details based on H_{norm} and bore d_1 ; d_2 norm

$$G_6 = \frac{1}{2} \cdot G_4 \quad \text{if } E = E_{min}$$

or

$$G_6 = \frac{1}{2} \cdot G_4 + \frac{1}{2} \cdot (E - E_{min}) \cdot G_5 \quad \text{if } E > E_{min}$$

$$C_{T3} = \frac{1}{\frac{1}{C_{T1}} + \frac{E - E_{min}}{C_{T2}}}$$

Coupling Type ZTF + ZTFK	Weights and Centre of Gravity Distances ²⁾									Torsional Spring Rates ²⁾		
	bore d_1 ; d_2 nom mm	X_1 mm	X_2 mm	G_1 kg	G_2 kg	G_3 kg	G_4 kg	G_5 kg/mm	G_6 kg	C_{T1} MNm/rad	C_{T2} MNm·mm/rad	C_{T3} MNm/rad
35	35	38,0	61,5	1	0,51	1,51	0,5	0,0040		0,22	22	
40	40	40,9	67	1,2	0,64	1,84	0,56	0,0045		0,28	32	
45	45	49,2	78,5	1,8	0,91	2,71	0,86	0,0050		0,36	33	
55	55	56,8	90,5	2,4	1,2	3,6	1,18	0,0065		0,58	72	
63	63	63,3	102,5	3,2	1,4	4,6	1,72	0,0084		0,85	121	
73	73	73,8	122	5,1	1,8	6,9	2,9	0,0124		1,3	223	
85	85	81,4	138	7,1	2,2	9,3	4,7	0,0202		2,1	427	
100	100	89,8	156	10	3,1	13,1	6,8	0,0259		3,7	806	
115	115	103	174,5	15	4,3	19,3	11,1	0,0379		5,7	1584	
130	130	118	201,5	22	6,6	28,6	16,5	0,0435		7,9	2610	
150	150	132	232	33	8,4	41,4	24,8	0,0588		12,5	4660	
175	175	152,3	269	50	13	63	38,8	0,0808		19,6	8110	
205	205	173,2	309	84	18	102	57,8	0,0970	Calculation acc. to above equation	30,4	14037	Calculation acc. to above equation

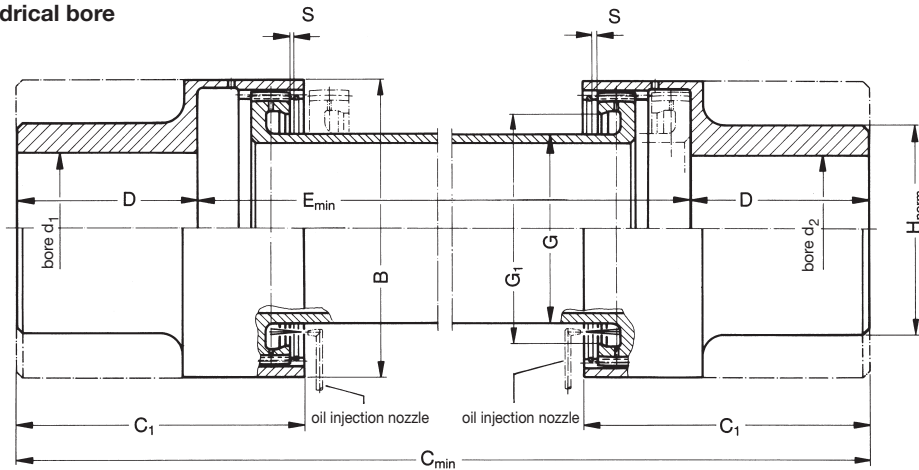
Subject to change due to technical improvement.

Curved Tooth Couplings

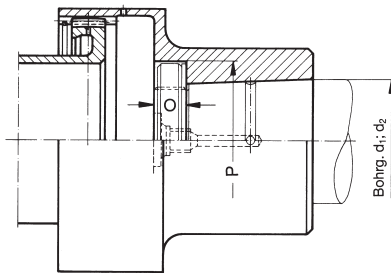
High-Speed Series ZTA and ZTAK

Hardened and ground gear teeth
Dimension table No. 243 112/1

Series ZTA with cylindrical bore

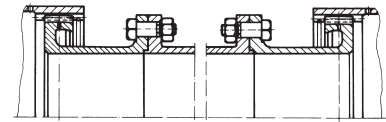


Series ZTAK with tapered bore



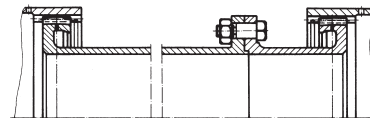
In the case of difficult installation conditions, the use of a coupling with split hub sleeve is recommended. Two options are available: Series ZTAF and ZTAKF with split hub sleeve for easy disconnection of the machines and simple installation, even if the equipment has already been aligned, and Series ZTAH and ZTAKH with split

hub sleeve and spacer to accommodate larger shaft distances.



For coupling selection and size determination, please see page 5.

For technical reasons, hydraulic fits require the supply of the pressure oil through the shaft.



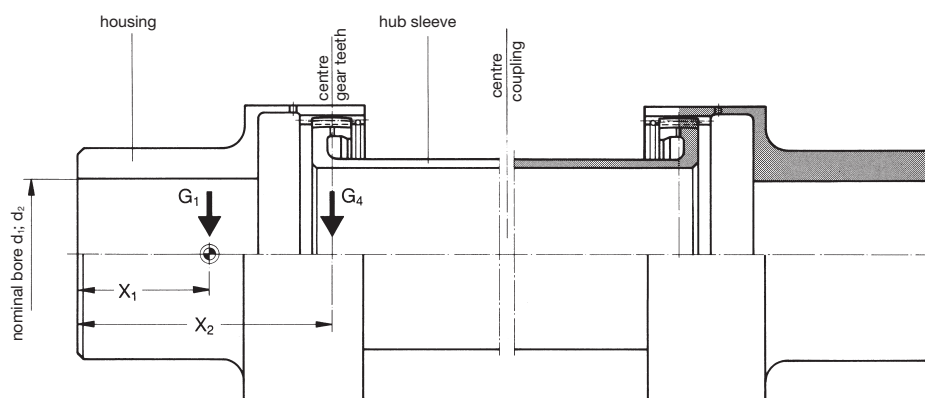
1) Values of the complete coupling, series ZTA with $E = E_{min}$, H_{norm} and bore d_1 ; $d_{2\,nom}$

Larger sizes on request.

Coupling Type ZTA + ZTAK Size	Normal Speed cont. operation		Dimensions															Oil injection nozzles per half Quantity and size	Total oil requirement per min at 1.5 bar pressure	Mass moment of inertia J ¹⁾	per 10 mm sleeve length, if $L > L_{min}$	Weight ¹⁾
	P_{KN}	n_{max}	bore $d_1; d_2$			B	C_{min}	C_1	D	E_{min}	G	G_1	H_{norm}	O	P	S						
	new	old	kW·min	rpm	min	nom	max	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm					
35	–	0,11	40.000	18	35	55	82	318	105	45	228	50	60	50	10	42	1,5	1xØ2	4,5	0,0025	0,000022	2,6
40	–	0,14	37.500	20	40	60	88	328	111	50	228	56	66	56	10	48	1,5	1xØ2	4,5	0,0034	0,000031	3,1
45	10	0,19	32.000	35	45	71	104	340	117	55	230	55	73	65	10	58	2,5	1xØ2	4,5	0,0073	0,000033	5,0
55	20	0,32	28.000	40	55	80	120	363	129	65	233	70	87	77	10	70	2,5	1xØ2	4,5	0,014	0,000071	7,0
63	30	0,51	25.000	45	63	90	135	402	142	75	252	80	101	88	10	80	2,5	1xØ2,5	7	0,023	0,00012	9,1
73	40	0,79	22.000	50	73	110	155	439	161	90	259	90	118	102	15	90	3	1xØ2,5	7	0,045	0,00022	14,1
85	50	1,23	20.000	55	85	120	174	488	179	105	278	100	133	120	15	106	3	1xØ3	10	0,086	0,00042	22,0
100	60	1,92	18.000	65	100	130	198	554	198	120	314	120	156	140	15	126	3	1xØ3	10	0,15	0,00080	29,8
115	70	3,15	16.000	75	115	155	224	626	221	135	356	140	178	160	15	144	4	1xØ3,5	13	0,30	0,0016	47
130	80	4,40	13.500	85	130	170	256	704	247	155	394	165	200	182	20	166	4	1xØ3,5	13	0,58	0,0026	67
150	90	7,00	11.500	100	150	200	288	799	289	180	439	190	230	210	25	192	4	2xØ3	20	1,1	0,0046	99
175	100	10,5	10.000	115	175	220	330	926	332	210	506	215	265	245	30	227	5	2xØ3	20	2,2	0,0080	155
205	110	15,8	9.000	135	205	270	390	1094	379	245	604	255	315	290	35	270	5	2xØ3,5	26	4,9	0,014	245

Subject to change due to technical improvement.

Centres of Gravity, Torsional Spring Rates



Determination of the centres of gravity

Details for determining the centres of gravity

X_1 = Distance to centre of gravity, G_1

X_2 = Distance to weight take-up, G_4

G_1 = Weight of housing

G_2 = Weight of hub sleeve, if $E = E_{\min}$

G_3 = Extra weight of hub sleeve per 1 mm length, if $E > E_{\min}$

Determination of the torsional spring rates

Details for determining the torsional spring rates

C_{T1} = torsional spring rate of the complete coupling, if $E = E_{\min}$

C_{T2} = torsional spring rate per 1 mm hub sleeve length,
if $E > E_{\min}$

C_{T3} = torsional spring rate of the complete coupling if $E > E_{\min}$

2) Details based on H_{norm} and bore d_1 ; $d_2 \text{ nom}$

$$G_4 = \frac{1}{2} \cdot G_2 \quad \text{if } E = E_{\min}$$

or

$$G_4 = \frac{1}{2} \cdot G_2 + \frac{1}{2} \cdot (E - E_{\min}) \cdot G_3 \quad \text{if } E > E_{\min}$$

$$C_{T3} = \frac{1}{\frac{1}{C_{T1}} + \frac{E - E_{\min}}{C_{T2}}}$$

Coupling Type		Weights and Centre of Gravity Distances ²⁾									Torsional Spring Rates ²⁾		
ZTA + ZTAK		bore d_1 ; d_2 nom mm	X_1 ZTA mm	X_1 ZTAK mm	X_2 kg	G_1 ZTA kg	G_1 ZTAK kg	G_2 kg	G_3 kg/mm	G_4 kg	C_{T1} MNm/rad	C_{T2} MNm-mm/rad	C_{T3} MNm/rad
new	old												
35	-	35	51,9	52,2	93,5	0,92	0,89	0,78	0,0040		0,11	22	
40	-	40	53,8	54	99	1,1	1,06	0,90	0,0045		0,16	32	
45	10	45	58	58,6	104,5	1,9	1,82	1,18	0,0050		0,19	33	
55	20	55	64,1	64,3	115,5	2,7	2,58	1,60	0,0065		0,37	72	
63	30	63	69,1	69,1	127,5	3,4	3,3	2,32	0,0084		0,56	121	
73	40	73	76,5	76,2	144	5,2	4,9	3,56	0,0124		0,87	223	
85	50	85	84,8	84,2	161	8	7,6	5,75	0,0202		1,54	427	
100	60	100	91,3	90,2	178	10,5	10	8,56	0,0259		2,3	806	
115	70	115	101,8	100,6	196,5	16	15	14,4	0,0379		3,7	1584	
130	80	130	115,1	113,4	219,5	24	23	19,7	0,0435		5,7	2610	
150	90	150	129,4	126,8	258	35	33	29	0,0588		8,6	4660	
175	100	175	147,2	143,5	296	54	50	46,2	0,0808		13,2	8110	
205	110	205	165,9	160,8	340	87	80	70,8	0,0970		19,9	14037	

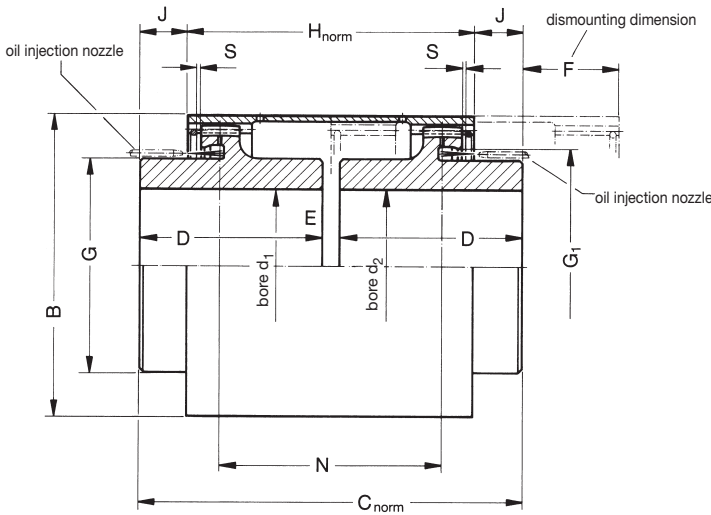
Subject to change due to technical improvement.

Curved Tooth Couplings High-Speed Series ZTN and ZTK

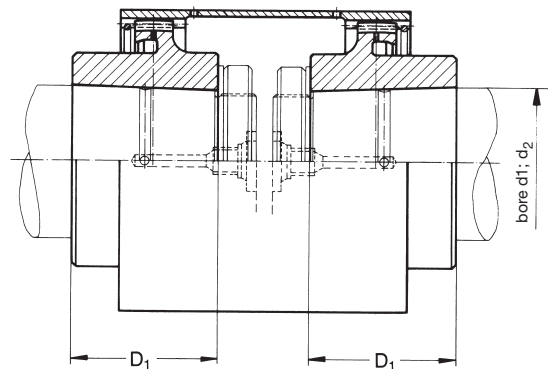


Hardened and ground gear teeth
Dimension table No. 243 113/1

Series ZTN with cylindrical bore



Series ZTK with tapered bore



The dismounting dimension F is required to allow vertical installation and removal of the machines.

For technical reasons, hydraulic fits require the supply of the pressure oil through the shaft.

For coupling selection and size determination, please see page 5.

Mass moments of inertia

J_2 = mass moment of inertia per 10 mm sleeve length, if $E > E_{min}$

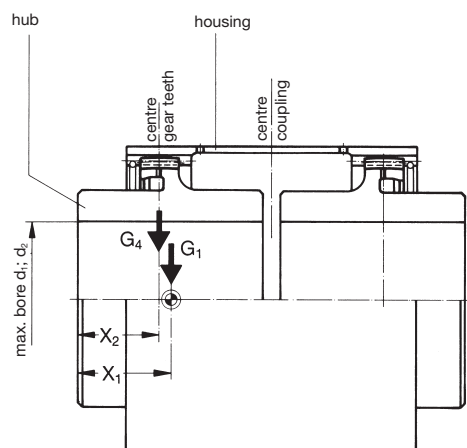
1) Values of the complete coupling, series ZTN, with H_{norm} and bore $d_1; d_{2max}$

Larger sizes on request.

Coupling Type ZTN + ZTK Size	Normal Speed cont. operation		Dimensions															Oil injection nozzles per half Quantity and Size	Total oil requirement per min at 1.5 bar pressure	Mass moment of inertia J ¹⁾	per 10 mm sleeve length, if E > E _{min}	Weight ¹⁾
	$\frac{P_{KN}}{n}$	n_{max}	bore $d_1; d_2$		B	C_{norm}	D	D_1	E	F	G	G_1	H_{norm}	J	N	S	litre					
new old	kW·min	rpm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	
35	-	0,11	40.000	18	35	82	95	45	35	5	30	50	60	77	9	54	1,5	1xØ2	4,5	0,0015	0,000091	1,5
40	-	0,14	37.500	20	40	88	105	50	40	5	40	56	66	87	9	63	1,5	1xØ2	4,5	0,0024	0,00011	1,9
45	10	0,19	32.000	35	45	104	120	55	45	10	68	64	74	128	-	103	2,5	1xØ2	4,5	0,0050	0,00019	3,3
55	20	0,32	28.000	40	55	120	140	65	55	10	68	77	87	138	1	111	2,5	1xØ2	4,5	0,010	0,00030	4,8
63	30	0,51	25.000	45	63	135	160	75	65	10	69	88	101	149	5,5	120	2,5	1xØ2,5	7	0,017	0,00049	6,7
73	40	0,79	22.000	50	73	155	190	90	75	10	62	102	118	157	16,5	123	3	1xØ2,5	7	0,033	0,00075	10,0
85	50	1,23	20.000	55	85	174	220	105	90	10	55	119	133	165	27,5	129	3	1xØ3	10	0,060	0,0011	15,0
100	60	1,92	18.000	65	100	198	250	120	105	10	63	140	156	188	31	148	3	1xØ3	10	0,12	0,0018	22,0
115	70	3,15	16.000	75	115	224	285	135	120	15	63	160	178	208	38,5	159	4	1xØ3,5	13	0,22	0,0029	32
130	80	4,40	13.500	85	130	256	325	155	135	15	79	182	200	244	40,5	189	4	1xØ3,5	13	0,46	0,0049	50
150	90	7,00	11.500	100	150	288	375	180	155	15	78	210	230	268	53,5	206	4	2xØ3	20	0,83	0,0083	74
175	100	10,5	10.000	115	175	330	440	210	180	20	89	245	265	314	63	242	5	2xØ3	20	1,8	0,015	115
205	110	15,8	9.000	135	205	390	510	245	210	20	94	290	315	354	78	276	5	2xØ3,5	26	3,9	0,024	185

Subject to change due to technical improvement.

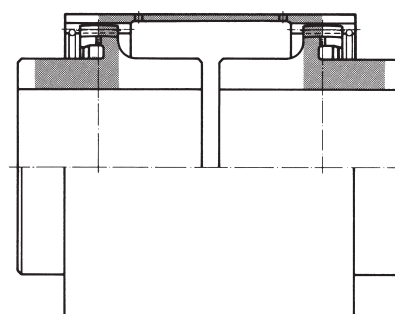
Centres of Gravity, Torsional Spring Rates



Determination of the centres of gravity

Details for determining the centres of gravity

- X_1 = Distance to centre of gravity, G_1
- X_2 = Distance to weight take-up, G_4
- G_1 = Weight of hub
- G_2 = Weight of sleeve, if $H = H_{norm}$
- G_3 = Extra weight of the sleeve per 1 mm length, if $H > H_{norm}$



Determination of the torsional spring rates

Details for determining the torsional spring rates

- C_{T1} = torsional spring rate of the complete coupling, if $H = H_{norm}$
- C_{T2} = torsional spring rate per 1 mm sleeve length, if $H > H_{norm}$
- C_{T3} = torsional spring rate of the complete coupling, if $H > H_{norm}$

2) Details based on H_{norm} and bore $d_1; d_2$ max

$$G_4 = \frac{1}{2} \cdot G_2 \quad \text{if } H = H_{norm}$$

or

$$G_4 = \frac{1}{2} \cdot G_2 + \frac{1}{2} \cdot (H - H_{norm}) \cdot G_3 \quad \text{if } H > H_{norm}$$

$$C_{T3} = \frac{1}{\frac{1}{C_{T1}} + \frac{H - H_{norm}}{C_{T2}}}$$

Coupling Type		Weights and Centre of Gravity Distances ²⁾									Torsional Spring Rates ²⁾		
ZTN + ZTK		bore	X_1	X_1	X_2	G_1	G_1	G_2	G_3	G_4	C_{T1}	C_{T2}	C_{T3}
Size	Size	max	ZTN	ZTK	kg	ZTN	ZTK	kg	kg/mm	kg	MNm/rad	MNm-mm/rad	MNm/rad
new	old	mm	mm	mm	kg	kg	kg	kg	kg/mm	kg			
35	-	35	22,2	18,8	20,5	0,47	0,40	0,55	0,0058		0,61	92	
40	-	40	24,3	20,4	21,0	0,61	0,53	0,69	0,0063		0,78	115	
45	10	45	23,8	19,7	8,5	0,89	0,81	1,41	0,0075		1,30	193	
55	20	55	29,1	24,8	14,5	1,46	1,29	1,85	0,0087		1,70	300	
63	30	63	34,2	29,9	20,0	2,17	1,93	2,42	0,0114		2,50	497	
73	40	73	41,5	35,2	33,5	3,50	3,03	3	0,0131		3,40	760	
85	50	85	50,6	44,4	45,5	5,40	4,86	4	0,0147		4,70	1083	
100	60	100	58,8	52,6	51,0	8,46	7,60	5	0,0191		7,2	1823	
115	70	115	67,2	60,9	63,0	12,33	11,3	7,7	0,0244		10,2	2971	
130	80	130	76	67,8	68,0	18,83	16,9	11,9	0,0310		14,9	4936	
150	90	150	88,4	78,1	84,5	29,00	25,8	16,0	0,0417		21,7	8401	
175	100	175	102,7	90,1	99,0	45,40	40,2	23,8	0,0558		32,2	14728	
205	110	205	122,1	107,7	117,0	75,30	66,0	34,4	0,0661		52,1	24552	

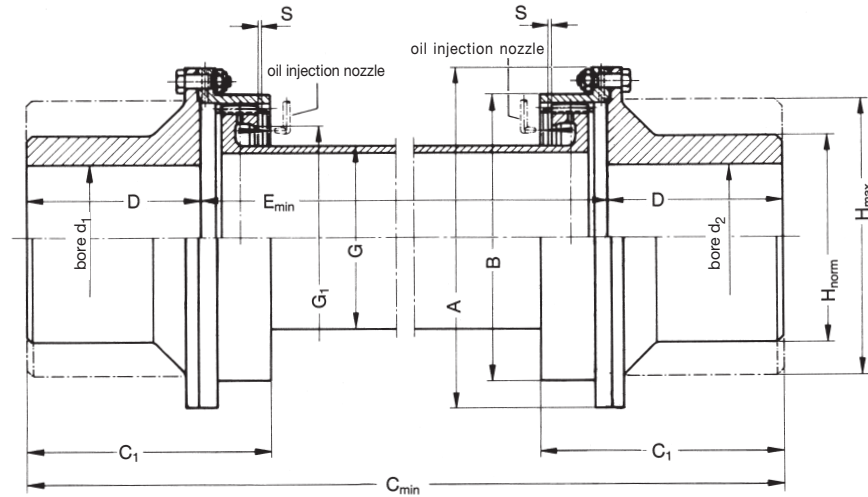
Subject to change due to technical improvement.

Curved Tooth Couplings

High-Speed Series TF

Hardened gear teeth

Dimension table No. 243 114/1



For coupling selection and size determination, please see page 5.

The couplings of the series TF can also be supplied with two Z-shaped retaining rings for end float limitation. These coupling types are denominated with TFR.

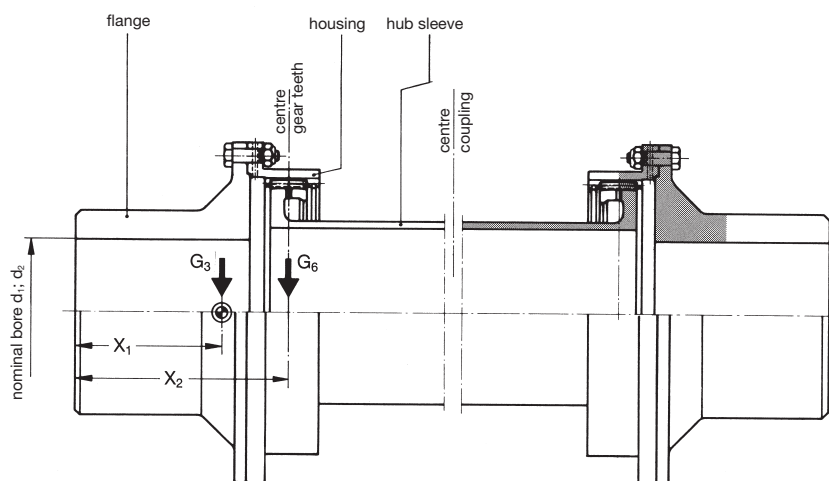
1) Value of the complete coupling, series TF, with $E = E_{min}$, H_{norm} and bore d_1 ; $d_{2\ nom}$.

Larger sizes on request.

Coupling Type TF	Normal Speed cont. operation $\frac{P_{KN}}{n}$ n_{max}	Dimensions															Oil injection nozzles per half Quantity and size	Total oil require- ment per min at 1.5 bar pressure litre	Mass moment of inertia J_1 kgm^2	per 10 mm tube length, if $E > E_{min}$ kgm^2	Weight ¹⁾ kg
		bore $d_1; d_2$			A	B	C_{min}	C_1	D	E_{min}	G	G_1	H_{norm}	H_{max}	S						
		min mm	nom mm	max mm																	
30	0,089 25.000	12	50	55	120	85	200	79	50	100	46	53	80	85	1,5	1xØ2	4,5	0,0108	0,000023	6,5	
40	0,161 22.500	22	55	65	145	105	232	95	60	112	60	72	90	105	1,5	1xØ2	4,5	0,024	0,000065	10,6	
50	0,287 20.000	22	60	75	165	125	265	107	70	125	70	88	100	125	1,5	1xØ2	4,5	0,045	0,000098	15	
60	0,560 18.000	28	70	90	200	145	300	122	80	140	86	105	112	148	1,5	1xØ2,5	7	0,108	0,00024	25	
70	0,893 16.000	28	80	100	215	168	340	138	90	160	100	120	125	168	2	1xØ2,5	7	0,150	0,00046	31	
80	1,278 14.000	32	90	115	235	185	380	151	100	180	115	135	140	185	2	1xØ3	10	0,235	0,00072	40	
90	1,803 12.500	32	100	125	270	210	420	167	110	200	130	155	160	210	2	1xØ3	10	0,393	0,0013	61	
100	2,240 11.200	55	110	140	275	224	465	177	120	225	145	170	180	224	2	1xØ3,5	13	0,525	0,0015	69	
110	3,238 10.000	65	125	160	305	245	510	190	130	250	158	185	200	245	2,5	1xØ3,5	13	0,975	0,0022	95	
125	4,498 9.000	75	140	180	335	268	580	220	150	280	185	205	225	272	3	1xØ3,5	13	1,59	0,0040	127	
140	6,370 8.000	85	160	200	380	305	645	241	165	315	200	235	250	305	3	2xØ3	20	2,83	0,0059	180	
160	10,063 7.100	120	180	225	430	347	735	279	190	355	225	265	280	348	4	2xØ3	20	5,43	0,0086	265	
180	14,368 6.300	140	200	250	470	392	840	318	220	400	250	300	315	392	4	2xØ3,5	26	8,75	0,013	360	
200	20,125 5.600	160	220	280	545	437	940	357	245	450	280	340	350	445	4	2xØ3,5	26	16,60	0,022	525	

Subject to change due to technical improvement.

Centres of Gravity, Torsional Spring Rates



Determination of the centres of gravity

Details for determining the centres of gravity

- X_1 = Distance to centre of gravity, G_3
- X_2 = Distance to weight take-up, G_6
- G_1 = Weight of flange
- G_2 = Weight of housing
- $G_3 = G_1 + G_2$
- G_4 = Weight of hub sleeve if $E = E_{\min}$
- G_5 = Extra weight of hub sleeve per 1 mm length, if $E > E_{\min}$

Determination of the torsional spring rates

Details for determining the torsional spring rates

- C_{T1} = torsional spring rate of the complete coupling, if $E = E_{\min}$
- C_{T2} = torsional spring rate of hub sleeve per 1 mm length, if $E > E_{\min}$
- C_{T3} = torsional spring rate of the complete coupling, if $E > E_{\min}$

2) Details based on H_{norm} and bore d_1 ; $d_2 \text{ nom}$

$$G_6 = \frac{1}{2} \cdot G_4 \quad \text{if } E = E_{\min}$$

or

$$G_6 = \frac{1}{2} \cdot G_4 + \frac{1}{2} \cdot (E - E_{\min}) \cdot G_5 \quad \text{if } E > E_{\min}$$

$$C_{T3} = \frac{1}{\frac{1}{C_{T1}} + \frac{E - E_{\min}}{C_{T2}}}$$

Coupling Type TF Size	Weights and Centre of Gravity Distances ²⁾									Torsional Spring Rates ²⁾		
	bore d_1 ; d_2 nom mm	X_1 mm	X_2 mm	G_1 kg	G_2 kg	G_3 kg	G_4 kg	G_5 kg/mm	G_6 kg	C_{T1} MNm/rad	C_{T2} MNm-mm/rad	C_{T3} MNm/rad
30	50	41,4	65	1,7	1,1	2,8	0,89	0,005		0,28	23,2	
40	55	49	76	2,8	1,6	4,4	1,5	0,009		0,68	66,2	
50	60	56,5	88	4,3	2,2	6,5	2,6	0,01		0,94	99	
60	70	69,7	100,5	6	3,6	9,6	4,5	0,015		1,92	239	
70	80	73,3	112,5	9	4,1	13,1	6	0,022		3,06	460,9	
80	90	78,9	124	11,7	4,6	16,3	9,1	0,026		4,37	729	
90	100	87,1	139,5	17	7,3	24,3	12,8	0,036		7,14	1280	
100	110	89,4	148,5	22	7,4	29,4	13,4	0,033		7,49	1544	
110	125	97,5	161	27,5	9,0	36,5	18,6	0,041		9,95	2270	
125	140	110,1	186	39	10,8	49,8	24,8	0,053		15,34	4025	
140	160	122,1	204	51	17,5	68,5	38	0,068		20,34	5966	
160	180	143	235,5	78	27	105	54	0,078		27,01	8714	
180	200	154,6	268	114	33	147	77	0,092		34,97	12854	
200	220	174,7	301	164	51	215	114	0,13		54,53	22068	

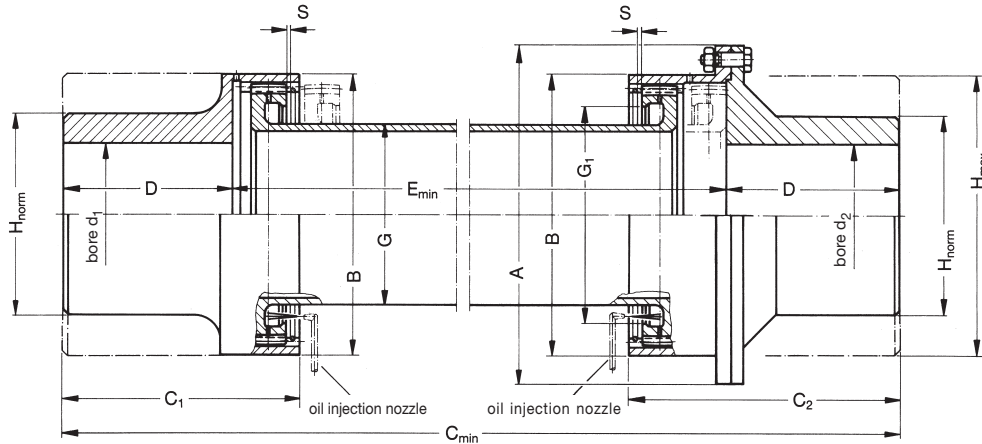
Subject to change due to technical improvement.

Curved Tooth Couplings High-Speed Series TFH



Hardened gear teeth

Dimension table No. 243 115/1



For coupling selection and size determination, please see page 5.

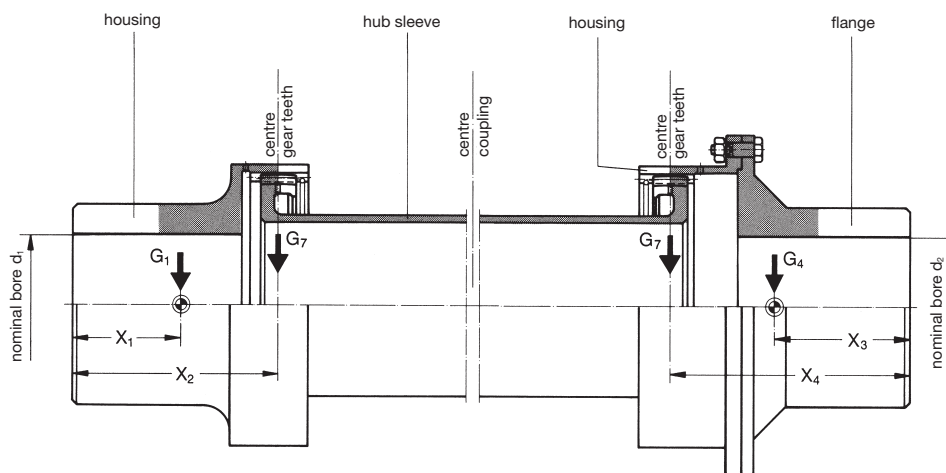
1) Values of the complete coupling, series TFH, with $E = E_{min}$, H_{norm} and bore d_1 ; d_2 norm

Larger sizes on request.

Coupling Type TFH	Normal operation $\frac{P_{KN}}{n}$	Speed n_{max} rpm	Dimensions																Oil injection nozzles per half Quantity and size	Total oil requirement per min at 1.5 bar pressure	Mass moment of inertia J ¹⁾	per 10 mm tube length, if $E > E_{min}$	Weight ¹⁾
			bore d_1 ; d_2			A	B	C_{min}	C_1	C_2	D	E_{min}	G	G_1	H_{norm}	H_{max}	S						
Size	kW·min	rpm	min mm	nom mm	max mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	litre	kgm ²	kgm ²	kg	
30	0,089	25.000	12	50	55	120	85	200	79	103	50	100	46	53	80	85	1,5	1xØ2	4,5	0,0075	0,000023	5,5	
40	0,161	22.500	22	55	65	145	105	232	95	125	60	112	60	72	90	105	1,5	1xØ2	4,5	0,018	0,000065	9,0	
50	0,287	20.000	22	60	75	165	125	265	107	139	70	125	70	88	100	125	1,5	1xØ2	4,5	0,035	0,000098	13,5	
60	0,560	18.000	28	70	90	200	145	300	122	158	80	140	86	105	112	148	1,5	1xØ2,5	7	0,080	0,00024	21	
70	0,893	16.000	28	80	100	215	168	340	138	180	90	160	100	120	125	168	2	1xØ2,5	7	0,125	0,00046	28	
80	1,278	14.000	32	90	115	235	185	380	151	196	100	180	115	135	140	185	2	1xØ3	10	0,200	0,00072	37	
90	1,803	12.500	32	100	125	270	210	420	167	216	110	200	130	155	160	210	2	1xØ3	10	0,360	0,0013	54	
100	2,240	11.200	55	110	140	275	224	465	177	226	120	225	145	170	180	224	2	1xØ3,5	13	0,475	0,0015	64	
110	3,238	10.000	65	125	160	305	245	510	190	242	130	250	158	185	200	245	2,5	1xØ3,5	13	0,825	0,0022	85	
125	4,498	9.000	75	140	180	335	268	580	220	280	150	280	185	205	225	272	3	1xØ3,5	13	1,38	0,0040	116	
140	6,370	8.000	85	160	200	380	305	645	241	307	165	315	200	235	250	305	3	2xØ3	20	2,40	0,0059	160	
160	10,063	7.100	120	180	225	430	347	735	279	356	190	355	225	265	280	348	4	2xØ3	20	4,65	0,0086	240	
180	14,368	6.300	140	200	250	470	392	840	318	404	220	400	250	300	315	392	4	2xØ3,5	26	7,88	0,013	335	
200	20,125	5.600	160	220	280	545	437	940	357	455	245	450	280	340	350	445	4	2xØ3,5	26	15,63	0,022	490	

Subject to change due to technical improvement.

Centres of Gravity, Torsional Spring Rates



Determination of the centres of gravity

Details for determining the centres of gravity

- X_1 = Distance to centre of gravity G_1
- X_2 = Distance to weight take-up
- X_3 = Distance to centre of gravity
- X_4 = Distance to weight take-up
- G_1 = Weight of housing
- G_2 = Weight of housing
- G_3 = Weight of flange
- $G_4 = G_2 + G_3$
- G_5 = Weight of hub sleeve, if $E = E_{min}$
- G_6 = Extra weight of hub sleeve per 1 mm length, if $E > E_{min}$

$$G_7 = \frac{1}{2} \cdot G_5 \quad \text{if } E = E_{min}$$

or

$$G_7 = \frac{1}{2} \cdot G_5 + \frac{1}{2} \cdot (E - E_{min}) \cdot G_6 \quad \text{if } E > E_{min}$$

Determination of the torsional spring rates

Details for determining the torsional spring rates

- C_{T1} = torsional spring rate of the complete coupling, if $E = E_{min}$
- C_{T2} = torsional spring rate of hub sleeve per 1 mm length, if $E > E_{min}$
- C_{T3} = torsional spring rate of the complete coupling if $E > E_{min}$

²⁾ Details based on H_{norm} and bore d_1 ; d_2_{nom}

$$C_{T3} = \frac{1}{\frac{1}{C_{T1}} + \frac{E - E_{min}}{C_{T2}}}$$

Coupling Type TFH	bore d_1 ; d_2 nom	Weights and Centre of Gravity Distances ²⁾											Torsional Spring Rates ²⁾		
		X_1	X_2	X_3	X_4	G_1	G_2	G_3	G_4	G_5	G_6	G_7	C_{T1}	C_{T2}	C_{T3}
Size	mm	mm	mm	mm	kg	kg	kg	kg	kg	kg	kg/mm	kg	MNm/rad	MNm-mm/rad	MNm/rad
30	50	36	65	46,7	89	1,7	1,3	1,7	3	0,76	0,005		0,36	23,2	
40	55	43,5	76	55,6	106	2,8	2	2,9	4,9	1,2	0,009		0,87	66,2	
50	60	50,7	88	64	120	4,3	2,8	4	6,8	2,3	0,01		1,24	99	
60	70	59,8	100,5	74,2	136,5	6	4,6	6,5	11,1	3,9	0,015		2,55	239	
70	80	67,6	112,5	83,3	154,5	9	5,4	8	13,4	5,3	0,022		3,91	460,9	
80	90	72,4	124	89	169	11,7	6,1	10,8	16,9	7,9	0,026		5,21	729	
90	100	79,7	139,5	98	188,5	17	9,6	16,5	26,1	11	0,036		8,46	1280	
100	110	81,8	148,5	99,8	197,5	22	9,8	20	29,8	11,7	0,033		8,73	1544	
110	125	87,3	161	107,9	213	27,5	11,8	28	39,8	16,5	0,041		11,47	2270	
125	140	100	186	122,8	246	39	15	39	54	21,7	0,053		17,04	4025	
140	160	109,5	204	130,3	270	51	23	52	75	34	0,068		23,18	5966	
160	180	128,4	235,5	158,3	312,5	78	35	75	110	48	0,078		31,55	8714	
180	200	146,2	268	177	354	114	45	106	151	69	0,092		40,8	12854	
200	220	166,1	301	196,7	399	164	69	150	219	101	0,13		61,36	22068	

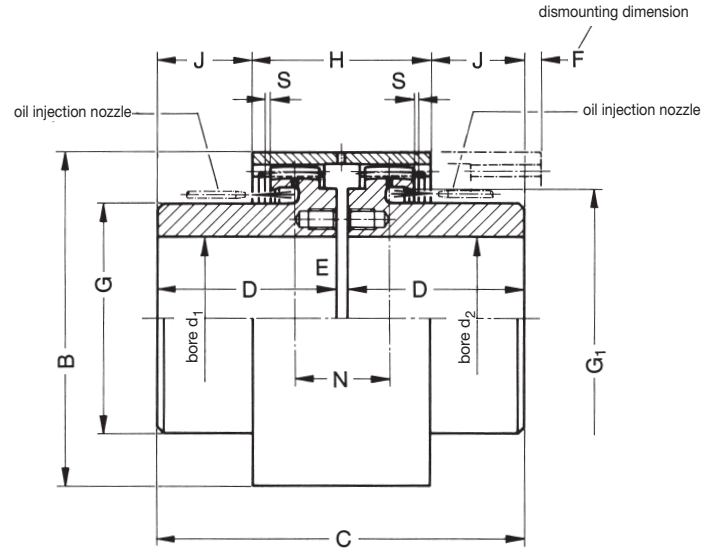
Subject to change due to technical improvement.

Curved Tooth Couplings High-Speed Series THB



Hardened gear teeth

Dimension table No. 243 116/1



For coupling selection and size determination, please see page 5.

1) Values of the complete coupling with bore d_1 ; $d_{2\max}$

Larger sizes on request.

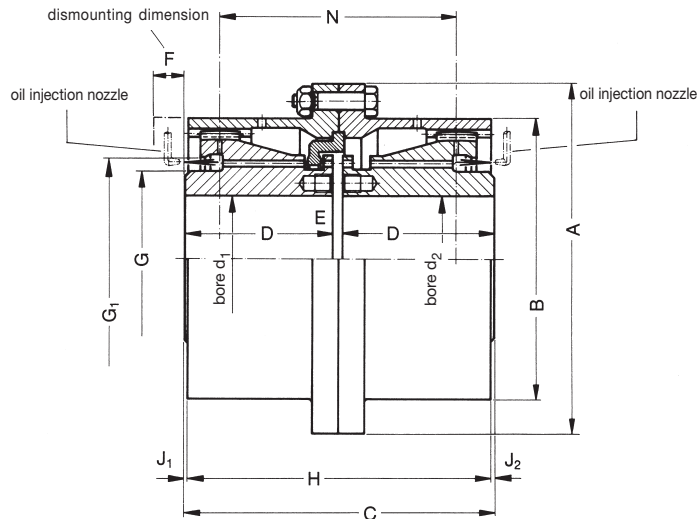
Coupling Type THB	Normal cont. operation $\frac{P_{KN}}{n}$	Speed n_{max}	Dimensions													Oil injection nozzles per half Quantity and size	Total oil requirement per min at 1.5 bar pressure litre	Torsional spring rate $^1) G_1$ MNm/rad	Mass moment of inertia $J^1)$ kgm ²	Weight $^1)$ kg
			bore $d_1; d_2$ min max	B	C	D	E	F	G	G ₁	H	J	N	S						
30	0,089	25.000	12 30	85	105	50	5	10	45	55	59	23	30	1,5	1xØ2	4,5	0,69	0,00175	2	
40	0,161	22.500	22 42	105	125	60	5	10	62	72	65	30	30	1,5	1xØ2	4,5	1,73	0,008	3,6	
50	0,287	20.000	22 55	125	145	70	5	5	77	88	70	37,5	31	1,5	1xØ2	4,5	3,23	0,0125	6	
60	0,560	18.000	28 65	148	166	80	6	5	92	105	80	43	41	1,5	1xØ2,5	7	5,91	0,0275	9,4	
70	0,893	16.000	28 75	168	186	90	6	10	105	120	95	45,5	49	2	1xØ2,5	7	8,92	0,050	13,4	
80	1,278	14.000	32 85	185	206	100	6	10	120	135	100	53	51	2	1xØ3	10	12,84	0,083	18,2	
90	1,803	12.500	32 100	210	228	110	8	10	140	155	110	59	58	2	1xØ3	10	21,25	0,160	27,5	
100	2,240	11.200	55 110	224	248	120	8	10	154	170	120	64	63	2	1xØ3,5	13	27,08	0,225	33	
110	3,238	10.000	65 120	245	268	130	8	10	168	185	130	69	70	2,5	1xØ3,5	13	35,58	0,35	42	
125	4,498	9.000	75 130	272	310	150	10	10	186	205	150	80	84	3	1xØ3,5	13	47,38	0,60	60	
140	6,370	8.000	85 150	305	340	165	10	10	210	235	165	87,5	94	3	2xØ3	20	69,94	1,15	84	
160	10,063	7.100	120 170	348	392	190	12	10	240	265	190	101	108	4	2xØ3	20	101,88	2,08	125	
180	14,368	6.300	140 190	392	452	220	12	10	270	300	220	116	124	4	2xØ3,5	26	143,83	3,83	185	
200	20,125	5.600	160 210	445	504	245	14	15	310	340	245	129,5	142	4	2xØ3,5	26	222,40	7,38	280	

Subject to change due to technical improvement.

Curved Tooth Couplings High-Speed Series TSB



Dimension table No. 243 117/1



**Sizes 30 to 200 are available
from stock**
Larger sizes on request.

For coupling selection and size
determination, please see page 5.

1) Values of the complete coupling with
bore d_1 ; $d_{2\max}$

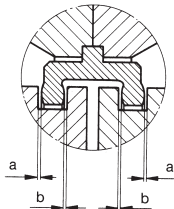
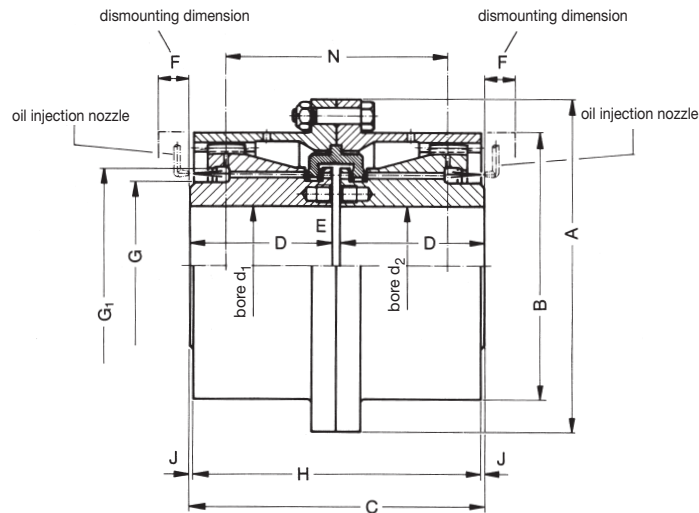
Coupling Type TSB	Normal Speed cont. operation		Dimensions														Oil injection nozzles per half Quantity and size	Total oil require- ment per min at 1.5 bar pressure litre	Torsional spring rate ¹⁾ C _t MNm/rad	Mass moment of inertia J ¹⁾ kgm ²	Weight ¹⁾ kg
	$\frac{P_{KN}}{n}$ kW·min	n_{max} rpm	bore d_1 ; d_2 min max		A	B	C	D	E	F	G	G ₁	H	J ₁	J ₂	N					
30	0,072	14.000	12	30	115	85	106	50	5	20	44	54	100	-	6	75	1xØ2	4,5	0,50	0,0055	4
40	0,128	12.500	22	40	145	105	125	60	5	20	58	71	121	1,5	2,5	92	1xØ2	4,5	1,29	0,0145	6,9
50	0,252	11.200	22	50	165	125	145	70	5	20	73	86	141	1,5	2,5	109	1xØ2	4,5	2,62	0,0288	10,5
60	0,438	10.000	28	60	195	145	166	80	6	25	88	103	164	0,5	1,5	128	1xØ2	4,5	4,39	0,0618	16,3
70	0,718	9.000	28	70	215	168	186	90	6	25	98	116	184	-	2	144	1xØ2	4,5	6,50	0,112	23
80	0,998	8.000	32	80	230	185	206	100	6	25	118	136	204	-	2	161	1xØ2	4,5	9,96	0,163	29,7
90	1,435	7.100	32	90	265	210	229,5	110	8	30	128	146	229	-	0,5	178	1xØ2	4,5	13,87	0,326	44
100	2,013	6.300	55	100	270	224	248,5	120	8	30	138	158	247	-	1,5	192	1xØ2,5	7	15,71	0,418	51,5
110	2,520	6.000	65	110	305	245	268	130	8	30	153	177	266	-	2	207	1xØ2,5	7	21,77	0,69	69
125	4,025	5.600	75	125	330	268	310	150	10	35	173	198	306	1	3	238	1xØ2,5	7	26,67	1,06	90
140	5,670	5.000	85	140	375	305	341	165	10	35	198	224	340	-	1	263	2xØ2	9	43,21	2	132
160	8,085	4.750	120	160	425	347	392	190	12	40	228	260	388	2	2	306	2xØ2	9	62,73	3,8	195
180	11,305	4.500	140	180	470	392	452	220	12	40	258	290	438	7	7	350	2xØ2,5	14	89,02	6,65	276
200	16,100	4.250	160	200	535	437	504	245	14	45	288	330	492	6	6	391	2xØ2,5	14	115,28	11,75	389
220	22,400	4.000	180	220	580	495	556	270	16	20	330	365	500	28	28	413	2xØ2,5	14	164,85	19,65	540
240	28,700	3.750	200	240	645	535	598	290	18	30	355	415	540	29	29	446	2xØ3	20	198,71	29,74	690
260	35,875	3.550	220	260	680	580	640	310	20	30	385	425	580	30	30	481	2xØ3	20	261,05	42,17	848
280	44,975	3.350	240	280	745	630	702	340	22	30	415	460	640	31	31	534	2xØ4	36	291,69	62,71	1080
300	56,700	3.150	260	300	775	660	744	360	24	35	445	490	680	32	32	569	2xØ4	36	393,66	86,16	1275
320	71,750	3.000	280	320	825	710	786	380	26	40	480	530	720	33	33	604	3xØ4	54	509,68	115,96	1565

Subject to change due to technical improvement.

Curved Tooth Couplings High-Speed Series TSR



Dimension table No. 243 118/1



The dismounting dimension F is required to allow vertical installation and removal of the machines and for installing the retaining ring.

The coupling series TSR is equipped with a U-shaped retaining ring for end float limitation.

For coupling selection and size determination, please see page 5.

Sizes 30 to 200 are available from stock.
Larger types on request.

The axial clearances a and b can be altered if required by the service conditions.

1) Values of the complete coupling with bore d_1 ; $d_{2\max}$

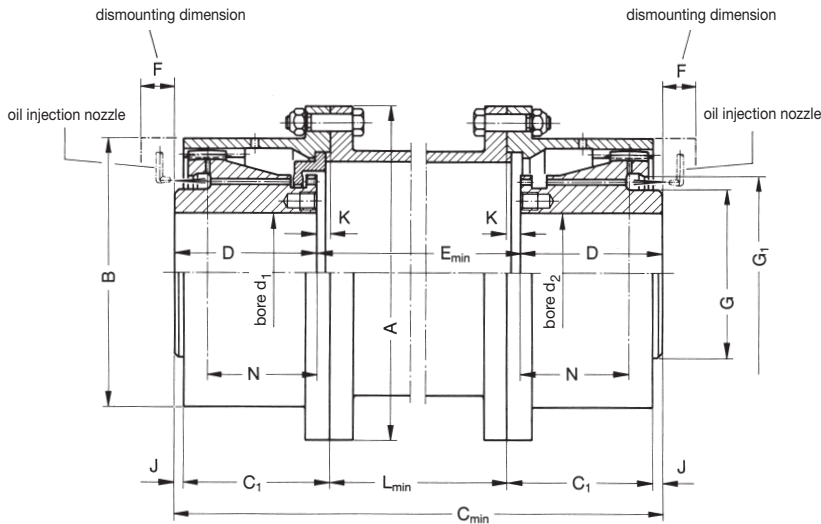
Coupling Type TSR	Normal Speed cont. operation		Dimensions														Axial clearances a and b	Oil injection nozzles per half Quantity and size	Total oil require- ment per min at 1,5 bar pressure	Torsional spring rate $1/J_1$	Mass moment of inertia J_1	Weight 1)
	$\frac{P_{KN}}{n}$	n_{max}	bore d_1 ; d_2 min max	A	B	C	D	E	F	G	G_1	H	J	N	litre	MNm/rad						
30	0,072	14.000	12 30	115	85	105	50	5	20	44	54	100	2,5	75	0,5	1xØ2	4,5	0,50	0,0056	4,1		
40	0,128	12.500	22 40	145	105	125	60	5	20	58	71	121	2	92	0,5	1xØ2	4,5	1,29	0,0147	7,0		
50	0,252	11.200	22 50	165	125	145	70	5	20	73	86	141	2	109	0,5	1xØ2	4,5	2,62	0,0291	10,6		
60	0,438	10.000	28 60	195	145	166	80	6	25	88	103	164	1	128	0,5	1xØ2	4,5	4,39	0,063	16,5		
70	0,718	9.000	28 70	215	168	186	90	6	25	98	116	184	1	144	0,5	1xØ2	4,5	6,50	0,111	23,5		
80	0,998	8.000	32 80	230	185	206	100	6	25	118	136	204	1	161	0,5	1xØ2	4,5	9,96	0,168	30,3		
90	1,435	7.100	32 90	265	210	228	110	8	30	128	146	229	-	178	0,5	1xØ2	4,5	13,87	0,333	45		
100	2,013	6.300	55 100	270	224	248	120	8	30	138	158	247	0,5	192	1,0	1xØ2,5	7	15,71	0,425	53		
110	2,520	6.000	65 110	305	245	268	130	8	30	153	177	266	1	207	1,0	1xØ2,5	7	21,77	0,71	71		
125	4,025	5.600	75 125	330	268	310	150	10	35	173	198	306	2	238	1,0	1xØ2,5	7	26,67	1,08	92		
140	5,670	5.000	85 140	375	305	340	165	10	35	198	224	340	-	263	1,0	2xØ2	9	43,21	2,05	135		
160	8,085	4.750	120 160	425	347	392	190	12	40	228	260	388	2	306	1,0	2xØ2	9	62,73	3,88	198		
180	11,305	4.500	140 180	470	392	452	220	12	40	258	290	438	7	350	1,0	2xØ2,5	14	89,02	6,78	281		
200	16,100	4.250	160 200	535	437	504	245	14	45	288	330	492	6	391	1,0	2xØ2,5	14	115,28	11,93	394		
220	22,400	4.000	180 220	580	495	556	270	16	20	330	365	500	28	413	1,5	2xØ2,5	14	164,85	20,13	550		
240	28,700	3.750	200 240	645	535	598	290	18	30	355	415	540	29	446	1,5	2xØ3	20	198,71	30,38	703		
260	35,875	3.500	220 260	680	580	640	310	20	30	385	425	580	30	481	1,5	2xØ3	20	261,05	43,25	865		
280	44,975	3.350	240 280	745	630	702	340	22	30	415	460	640	31	534	1,5	2xØ4	36	291,69	64,00	1100		
300	56,700	3.150	260 300	775	660	744	360	24	35	445	490	680	32	569	1,5	2xØ4	36	393,66	84,13	1305		
320	71,750	3.000	280 320	825	710	786	380	26	40	480	530	720	33	604	1,5	3xØ4	54	509,68	118,50	1595		

Subject to change due to technical improvement.

Curved Tooth Couplings High-Speed Series TSBL



Dimension table No. 243 119/1



Coupling Type TSBL Size	Torsional Spring Rate	
	$C_{T1}^{1)}$ MNm/rad	C_{T2} MNm · mm/rad
30	0,44	186
40	1,03	274
50	2,07	537
60	3,36	898
70	4,93	1335
80	7,48	1895
90	9,89	2638
100	11,84	3557
110	14,94	4690
125	19,30	6909
140	27,83	8928
160	39,57	14088
180	59,05	23218
200	78,11	36882

- 1) Values of the complete coupling with $E = E_{min}$ and bore d_1 ; $d_{2 max}$
- C_{T2} = torsional spring rate per 1 mm spacer length
- C_{T3} = torsional spring rate of the complete coupling, if $E > E_{min}$

$$C_{T3} = \frac{1}{\frac{1}{C_{T1}} + \frac{E - E_{min}}{C_{T2}}}$$

Sizes 30 to 200 are available from stock, without spacer. Larger types on request.

For coupling selection and size determination, please see page 5.

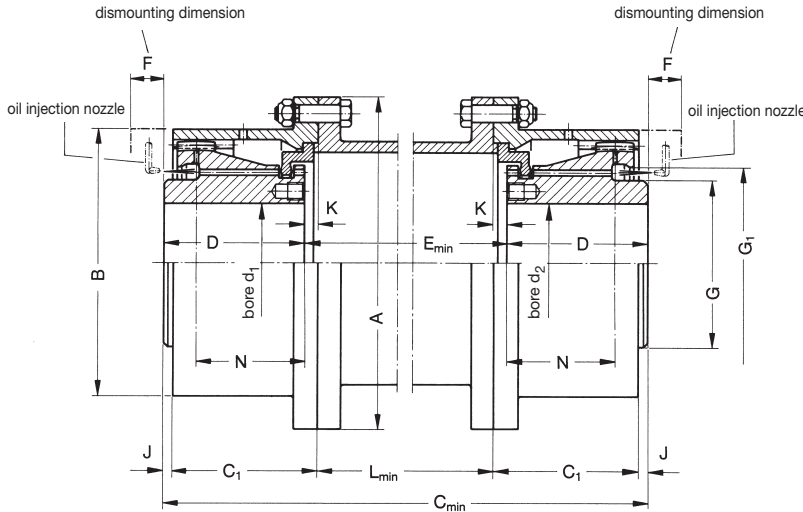
Coupling Type TSBL Size	Normal Speed cont. operation		Dimensions														Oil injection nozzles per half Quantity and size	Total oil requirement per min at 1.5 bar pressure	Mass moment of inertia J ¹⁾	per 10 mm tube length, if L > L _{min}	Weight ¹⁾	Extra weight per 10 mm spacer length
	$\frac{P_{KN}}{n}$ kW·min	n_{max} rpm	bore d_1 ; d_2 min max	A	B	C_{min}	C_1	D	E_{min}	F	G	G_1	J	K	L_{min}	N						
30	0,072	14.000	12 30	115	85	182	50	50	82	20	44	54	3,5	3,5	75	35	1xØ2	4,5	0,0091	0,00018	5,8	0,12
40	0,128	12.500	22 40	145	105	209	60,5	60	89	25	58	71	6,5	7	75	43,5	1xØ2	4,5	0,0228	0,00027	9,6	0,13
50	0,252	11.200	22 50	165	125	229	70,5	70	89	25	73	86	6,5	7	75	52	1xØ2	4,5	0,0427	0,00053	13,8	0,18
60	0,438	10.000	28 60	195	145	267	82	80	107	30	88	103	6,5	8,5	90	61	1xØ2	4,5	0,0929	0,00089	21,6	0,22
70	0,718	9.000	28 70	215	168	288	92	90	108	30	98	116	7	9	90	69	1xØ2	4,5	0,154	0,0013	29,3	0,25
80	0,998	8.000	32 80	230	185	308	102	100	108	35	118	136	7	9	90	77,5	1xØ2	4,5	0,222	0,0019	36,5	0,28
90	1,435	7.100	32 90	265	210	349	114,5	110	129	40	128	146	7,5	12	105	85	1xØ2	4,5	0,438	0,0026	54	0,31
100	2,013	6.300	55 100	270	224	369	123,5	120	129	45	138	158	8,5	12	105	92	1xØ2,5	7	0,538	0,0035	62	0,36
110	2,520	6.000	65 110	305	245	419	133	130	159	50	153	177	9	12	135	99,5	1xØ2,5	7	0,943	0,0046	86	0,40
125	4,025	5.600	75 125	330	268	465	153	150	165	45	173	198	12	15	135	114	1xØ2,5	7	1,401	0,0068	108	0,47
140	5,670	5.000	85 140	375	305	505	170	165	175	50	198	224	10	15	145	126,5	2xØ2	9	2,635	0,0088	159	0,53
160	8,085	4.750	120 160	425	347	594	194	190	214	55	228	260	13	17	180	147	2xØ2	9	5,064	0,014	238	0,70
180	11,305	4.500	140 180	470	392	654	219	220	214	55	258	290	18	17	180	169	2xØ2,5	14	8,414	0,023	324	0,79
200	16,100	4.250	160 200	535	437	740	246	245	250	65	288	330	19	20	210	188,5	2xØ2,5	14	15,569	0,036	477	1,2
220	22,400	4.000	180 220	580	495	796	265	270	256	40	330	365	28	23	210	198,5	2xØ2,5	14				
240	28,700	3.750	200 240	645	535	862	287	290	282	45	355	415	29	26	230	214	2xØ3	20				
260	35,875	3.550	220 260	680	580	906	308	310	286	45	385	425	30	28	230	230,5	2xØ3	20				
280	44,975	3.350	240 280	745	630	994	341	340	314	50	415	460	31	32	250	256	2xØ4	36				
300	56,700	3.150	260 300	775	660	1038	362	360	318	55	445	490	32	34	250	272,5	2xØ4	36				
320	71,750	3.000	280 320	825	710	1082	383	380	322	60	480	530	33	36	250	289	3xØ4	54				

Subject to change due to technical improvement.

Curved Tooth Couplings High-Speed Series TRL



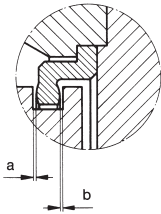
Dimension table No. 243 120/1



Coupling Type TRL Size	Torsional Spring Rate	
	$C_{T1}^{1)}$ MNm/rad	C_{T2} MNm · mm/rad
30	0,44	186
40	1,03	274
50	2,07	537
60	3,36	898
70	4,93	1335
80	7,48	1895
90	9,89	2638
100	11,84	3557
110	14,94	4690
125	19,30	6909
140	27,83	8928
160	39,57	14088
180	59,05	23218
200	78,11	36882

The coupling series TRL is equipped with two Z-shaped retaining rings for end float limitation.

For coupling selection and size determination, please see page 5.



The axial clearances a and b can be altered if required by the service conditions. The speed n_{max} depends on the weight and length of the spacer.

1) Values of the complete coupling with

$$E = E_{min} \text{ and bore } d_1; d_{2 \max}$$

C_{T2} = torsional spring rate per 1 mm spacer length

C_{T3} = torsional spring rate of the complete coupling, if $E > E_{min}$

The dismounting dimension F is required to allow vertical installation and removal of the machines and for installing the retaining rings.

$$C_{T3} = \frac{1}{\frac{1}{C_{T1}} + \frac{E - E_{min}}{C_{T2}}}$$

Sizes 30 to 200 are available from stock, without spacer.
Larger types on request.

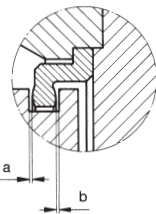
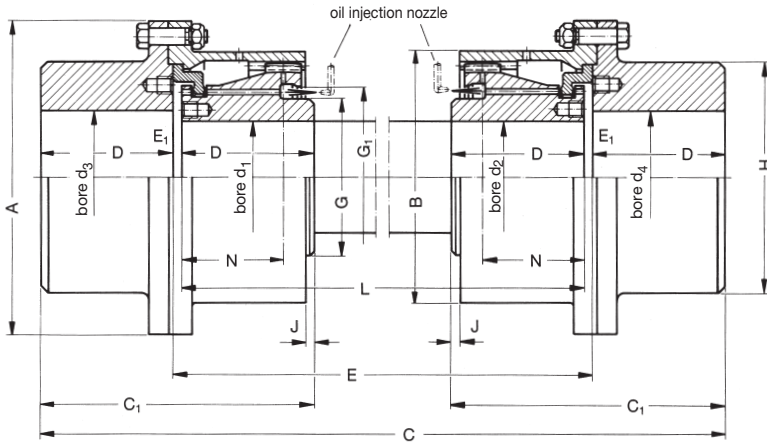
Coupling Type TRL Size	Normal Speed cont. operation		Dimensions														Axial clearances a and b	Oil injection nozzles per half Quantity and size	Total oil requirement per min at 1.5 bar pressure	Mass moment of inertia J ¹⁾	per 10 mm tube length, if $L > L_{min}$	Weight ¹⁾	Extra weight per 10 mm spacer length
	$\frac{P_{KN}}{n}$	n_{max}	bore $d_1; d_2$ min max	A	B	C_1	C_{min}	D	E_{min}	F	G	G_1	J	K	L_{min}	N							
30	0,072	14.000	12 30	115 85	50	182	50	82	20	44	54	3,5	3,5	75	35	0,5	1xØ2	4,5	0,0057	0,00018	4,1	0,12	
40	0,128	12.500	22 40	145 105	60,5	209	60	89	25	58	71	6,5	7	75	43,5	0,5	1xØ2	4,5	0,0147	0,00027	7,1	0,13	
50	0,252	11.200	22 50	165 125	70,5	229	70	89	25	73	86	6,5	7	75	52	0,5	1xØ2	4,5	0,0292	0,00053	10,7	0,18	
60	0,438	10.000	28 60	195 145	82	267	80	107	30	88	103	6,5	8,5	90	61	0,5	1xØ2	4,5	0,063	0,00089	16,8	0,22	
70	0,718	9.000	28 70	215 168	92	288	90	108	30	98	116	7	9	90	69	0,5	1xØ2	4,5	0,111	0,0013	24	0,25	
80	0,998	8.000	32 80	230 185	102	308	100	108	35	118	136	7	9	90	77,5	0,5	1xØ2	4,5	0,169	0,0019	30,5	0,28	
90	1,435	7.100	32 90	265 210	114,5	349	110	129	40	128	146	7,5	12	105	85	0,5	1xØ2	4,5	0,332	0,0026	45	0,31	
100	2,013	6.300	55 100	270 224	123,5	369	120	129	45	138	158	8,5	12	105	92	1,0	1xØ2,5	7	0,427	0,0035	53	0,36	
110	2,520	6.000	65 110	305 245	133	419	130	159	50	153	177	9	12	135	99,5	1,0	1xØ2,5	7	0,71	0,0046	72	0,40	
125	4,025	5.600	75 125	330 268	153	465	150	165	45	173	198	12	15	135	114	1,0	1xØ2,5	7	1,09	0,0068	92	0,47	
140	5,670	5.000	85 140	375 305	170	505	165	185	50	198	224	10	15	155	126,5	1,0	2xØ2	9	2,04	0,0088	136	0,53	
160	8,085	4.750	120 160	425 347	194	594	190	214	55	228	260	13	17	180	147	1,0	2xØ2	9	3,88	0,014	200	0,70	
180	11,305	4.500	140 180	470 392	219	654	220	214	55	258	290	18	17	180	169	1,0	2xØ2,5	14	6,79	0,023	284	0,79	
200	16,100	4.250	160 200	535 437	246	740	245	250	65	288	330	19	20	210	188,5	1,0	2xØ2,5	14	11,94	0,036	400	1,2	
220	22,400	4.000	180 220	580 495	265	796	270	256	40	330	365	28	23	210	198,5	1,5	2xØ2,5	14	21,34		579		
240	28,700	3.750	200 240	645 535	287	862	290	282	45	355	415	29	26	230	214	1,5	2xØ3	20	32,8		748		
260	35,875	3.550	220 260	680 580	308	906	310	286	45	385	425	30	28	230	230,5	1,5	2xØ3	20	46,1		915		
280	44,975	3.350	240 280	745 630	341	994	340	314	50	415	460	31	32	250	256	1,5	2xØ4	36	69,2	Values upon request!	1170		
300	56,700	3.150	260 300	775 660	362	1038	360	318	55	445	490	32	34	250	272,5	1,5	2xØ4	36	90,2	Values upon request!	1380		
320	71,750	3.000	280 320	825 710	383	1082	380	322	60	480	530	33	36	250	289	1,5	3xØ4	54	126,5	Values upon request!	1685		

Subject to change due to technical improvement.

Curved Tooth Couplings High-Speed Series TRG

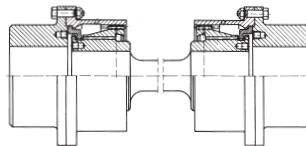


Dimension table No. 243 121/1



Sizes 30 to 200 are available from stock, without intermediate shaft. Larger sizes on request.

The coupling series TRG is equipped with two Z-shaped retaining rings for end float limitation. The axial clearances a and b can be altered if required by the service conditions. The speed n_{max} depends on the weight and length of the intermediate shaft. The bending-critical speed has to be checked by using the equation given on page 29. The couplings of the TRG series can also be supplied with a torsion shaft being adapted to the vibration characteristics of the plant.



Coupling Type TRG Size	Torsional Spring Rate	
	$C_{T1}^{1)}$ MNm/rad	C_{T2} MNm · mm/rad
30	0,10	To be calculated using the equation on page 29
40	0,26	
50	0,54	
60	0,96	
70	1,53	
80	2,31	
90	3,37	
100	4,43	
110	6,05	
125	8,26	
140	12,24	
160	18,21	
180	25,19	
200	34,01	

For coupling selection and size determination, please see page 5.

- 1) Values of the coupling with bore d_3 ; d_4 max. The intermediate shaft is considered with a diameter d_1 ; d_2 max in the area of the hub lengths D only. The values for the exposed part of the shaft have to be calculated.
- C_{T2} = torsional spring rate of the intermediate shaft
 C_{T3} = torsional spring rate of the complete coupling

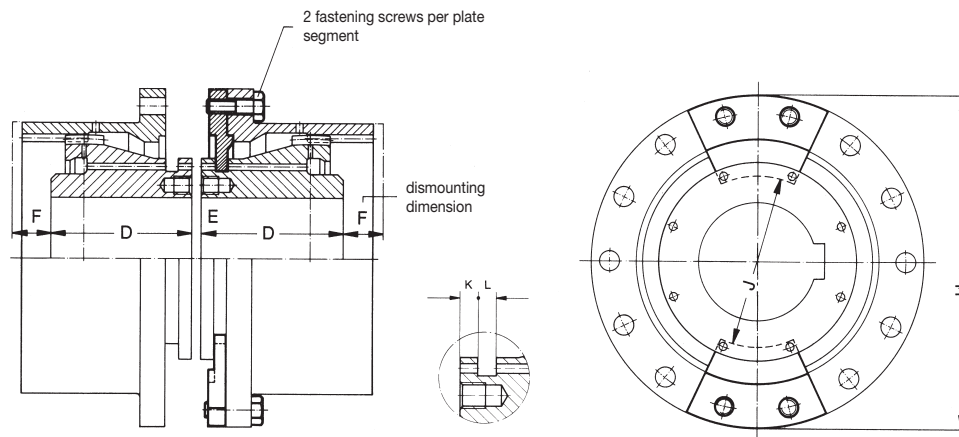
$$C_{T3} = \frac{1}{\frac{1}{C_{T1}} + \frac{1}{C_{T2}}}$$

Coupling Type TRG Size	Normal Speed cont. operation		Dimensions														Axial clearances a and b	Oil injection nozzles per half Quantity and size	Total oil requirement per min at 1.5 bar pressure	Mass moment of inertia J ¹⁾	Weight ¹⁾
	P_{KN}	n_{max}	bore d_1 ; d_2				bore d_3 ; d_4														
	$\frac{P_{KN}}{n}$	rpm	min	max	min	max	A	B	C_1	D	E_1	G	G_1	H	J	N					
30	0,072	14.000	12	30	12	55	115	85	103,5	50	3,5	44	54	80	3,5	35	0,5	1xØ2	4,5	0,011	7,9
40	0,128	12.500	22	40	22	65	145	105	125	60	5	58	71	95	6,5	43,5	0,5	1xØ2	4,5	0,027	13,4
50	0,252	11.200	22	50	25	80	165	125	145	70	5	73	86	112	6,5	52	0,5	1xØ2	4,5	0,053	20,4
60	0,438	10.000	28	60	28	90	195	145	166	80	6	88	103	130	6,5	61	0,5	1xØ2	4,5	0,115	37,8
70	0,718	9.000	28	70	30	100	215	168	186	90	6	98	116	150	7	69	0,5	1xØ2	4,5	0,206	47
80	0,998	8.000	32	80	32	115	230	185	206	100	6	118	136	170	7	77,5	0,5	1xØ2	4,5	0,32	62
90	1,435	7.100	32	90	32	130	265	210	228	110	8	128	146	190	7,5	85	0,5	1xØ2	4,5	0,61	89
100	2,013	6.300	55	100	55	140	270	224	248	120	8	138	158	205	8,5	92	1,0	1xØ2,5	7	0,79	107
110	2,520	6.000	65	110	65	155	305	245	268	130	8	153	177	225	9	99,5	1,0	1xØ2,5	7	1,32	144
125	4,025	5.600	75	125	75	170	330	268	310	150	10	173	198	250	12	114	1,0	1xØ2,5	7	2,11	196
140	5,670	5.000	85	140	85	195	375	305	340	165	10	198	224	285	10	126,5	1,0	2xØ2	9	3,89	280
160	8,085	4.750	120	160	110	225	425	347	392	190	12	228	260	325	13	147	1,0	2xØ2	9	7,43	413
180	11,305	4.500	140	180	134	250	470	392	452	220	12	258	290	360	18	169	1,0	2xØ2,5	14	12,8	583
200	16,100	4.250	160	200	150	280	535	437	504	245	14	288	330	410	19	188,5	1,0	2xØ2,5	14	23,4	836
220	22,400	4.000	180	220	180	310	580	495	556	270	16	330	365	450	28	198,5	1,5	2xØ2,5	14	38,5	1136
240	28,700	3.750	200	240	200	330	645	535	598	290	18	355	415	480	29	214	1,5	2xØ3	20	57,8	1452
260	35,875	3.550	220	260	220	360	680	580	640	310	20	385	425	520	30	230,5	1,5	2xØ3	20	81,1	1777
280	44,975	3.350	240	280	240	380	745	630	702	340	22	415	460	550	31	256	1,5	2xØ4	36	120,1	2263
300	56,700	3.150	260	300	260	400	775	660	744	360	24	445	490	580	32	272,5	1,5	2xØ4	36	155,5	2668
320	71,750	3.000	280	320	280	425	825	710	786	380	26	480	530	620	33	289	1,5	3xØ4	54	215,4	3236

Subject to change due to technical improvement.

Distance Plates for Curved Tooth Couplings High-Speed Series TSB

Dimension table No. 243 122



Distance plates are used for the radial and axial guidance of the coupling housing, when the coupling is open. This allows speeding up the driving machine without the driven machine being coupled.

This is, for example, necessary during turbine trip tests or when checking the direction of rotation of electric motors. Distance plates are only intended for short-time use and are not suitable for continuous operation.

The space - dimension F - is required to install and remove the distance plates.

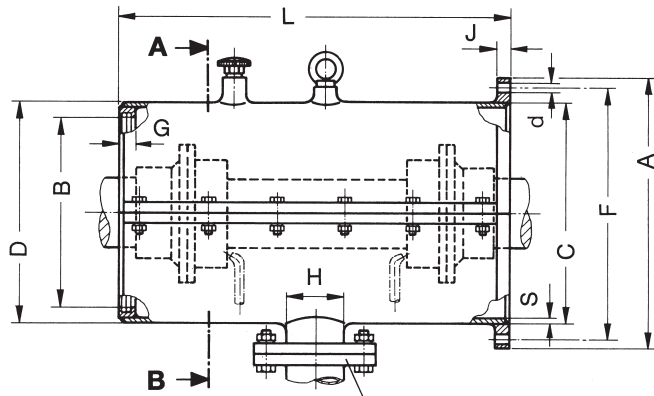
Coupling Type TSB Size	Dimensions								Size of fastening screws
	D mm	E mm	F mm	H mm	J mm	K mm	L mm		
30	50	5	20	115	48	4,5	5	M 6 x 20	
40	60	5	20	145	62	4,5	5	M 8 x 20	
50	70	5	20	165	75	4,5	6	M 8 x 25	
60	80	6	25	195	85	7,0	6	M 10 x 25	
70	90	6	25	215	105	8,0	8	M 10 x 30	
80	100	6	25	230	118	8,5	8	M 10 x 30	
90	110	8	30	265	128	8,5	10	M 12 x 35	
100	120	8	30	270	145	10,5	10	M 12 x 35	
110	130	8	30	305	156	11,0	12	M 16 x 40	
125	150	10	35	330	180	11,0	12	M 16 x 45	
140	165	10	35	375	210	12,0	13	M 18 x 45	
160	190	12	40	425	240	14,0	14	M 22 x 55	
180	220	12	40	470	270	14,5	14	M 22 x 55	
200	245	14	45	535	310	15,0	15	M 27 x 60	
220	270	16	20	580	345	20,0	21	M 27 x 60	
240	290	18	30	645	375	20,5	22	M 33 x 60	
260	310	20	30	680	405	21,5	23	M 33 x 60	
280	340	22	30	745	440	22,5	24	M 36 x 70	
300	360	24	30	775	470	25,0	27	M 36 x 75	
320	380	26	40	825	505	26,5	28	M 36 x 75	

Subject to change due to technical improvement.

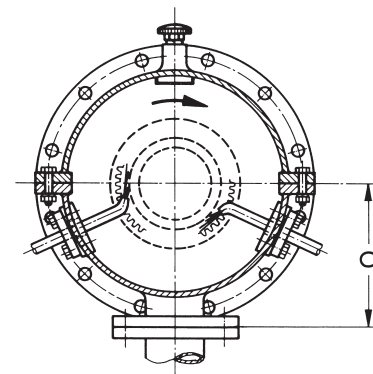
Guards for High-Speed Curved Tooth Couplings



Dimension table No. 243 123



Flange acc. to EN 1092-1



Section A-B

The overall length L of the guard depends on the length of the coupling and is adapted according to the customer's specifications.

Intermediate flanges are used to accommodate different connecting dimensions. It is therefore possible to retrofit them to existing installations.

The longitudinal division of the guard ensures easy handling and good accessibility to all main components.

Types					Dimensions										Number of screws in the flange	Eye bolt DIN 580	Breather Type F-2033	Number of nozzles per half
ZTNH ZTF	ZTA ZTAF ZTAH ZTN	TF TFH	THB TSB TSR	TSBL TRL TRG	A min	B max	C	D	d	F	G	H	J	O				
Size	Size	Size	Size	Size	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm			
-	35	30	30	30	240	155	185	185	11	220	17	48,3	10	130	5			
-	40	40	-	-	260	168	200	200	11	235	17	48,3	10	140	5			
35	45	-	40	40	280	180	220	220	11	260	20	60,3	15	150	5			
40	55	50	50	50	300	200	240	240	11	275	20	60,3	15	160	5			
45	63	-	-	-	320	220	260	260	11	295	20	60,3	15	170	5			
55	-	-	60	60	320	220	260	260	11	295	20	60,3	15	170	5			
63	73	60	-	-	350	245	285	285	14	325	20	76,1	18	180	6			
73	85	-	70	70	350	245	285	285	14	325	20	76,1	18	180	6			
85	100	70	-	-	375	260	305	305	14	350	25	76,1	18	195	6			
-	-	80	80	80	375	260	305	305	14	350	25	76,1	18	195	6			
100	-	90	90	90	410	295	340	340	14	385	25	88,9	18	220	6			
115	115	100	100	100	435	310	365	365	14	410	28	88,9	18	230	6			
130	130	110	110	110	460	340	390	390	14	430	28	88,9	20	245	6			
150	150	125	125	125	490	370	420	420	14	460	28	88,9	20	260	6			
175	175	140	140	140	530	410	460	460	14	505	28	88,9	20	280	6			
205	205	160	160	160	620	490	540	540	14	590	28	114,3	22	335	6			
-	-	180	180	180	620	490	540	540	14	590	28	114,3	22	335	6			
-	-	200	200	200	720	590	640	640	18	690	28	114,3	22	385	6			

Subject to change due to technical improvement.

Special Designs



Machines and installations that are subject to changing application conditions normally require complex, adaptable drive systems. This necessitates special solutions both for the gear units and for the couplings. An example of this is a test stand installation from the field of aviation and aeronautics. The test stand is used to investigate performance and optimize new types of large engines.

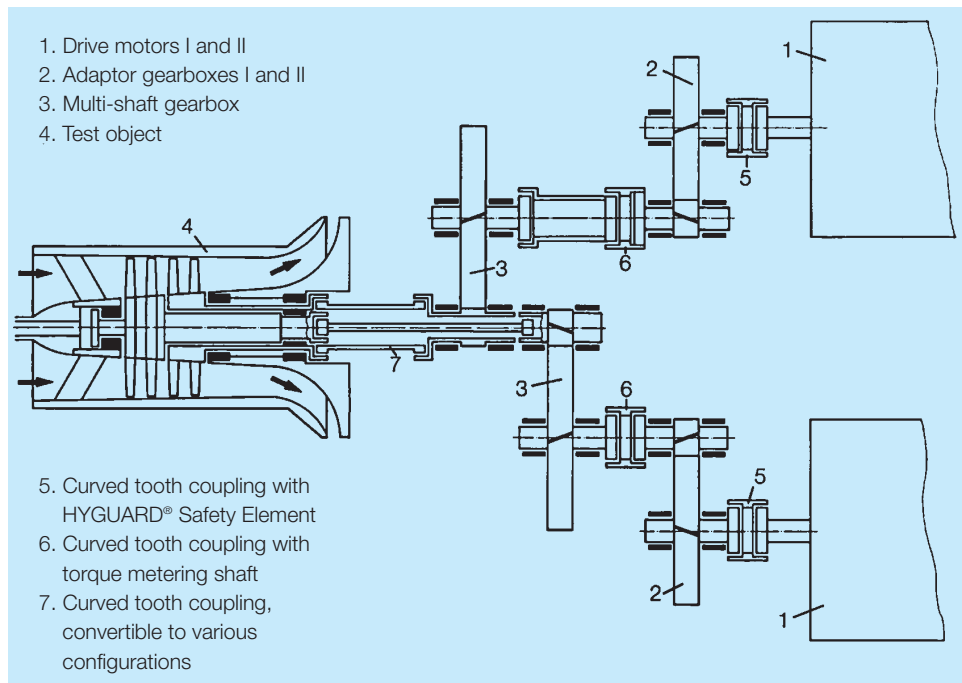
RENK developed the drive concept and built the drive motors as well as all related components. The primary requirement was rapid and uncomplicated adaptation of the drive system to the different test conditions. This applied both to the power requirement and the speed range. The use of curved tooth couplings to connect the individual system parts proved to be the most favourable technical and economic solution.

The overall installation consists of two electric variable speed motors with a power rating of 5000 kW each, three gearboxes and five coupling systems.

In addition to the torque transmission function, the couplings assume three important tasks:

1. Protection of the installation by the built-in HYGUARD® Safety Elements.
2. Monitoring and transfer of the values of torque, speed and direction of rotation by means of integrated torque metering shafts.
3. Quick adaptation of the drive system to varying test conditions.

The last point is guaranteed by the coupling connected to the test object, whereby the coupling consists of various components.

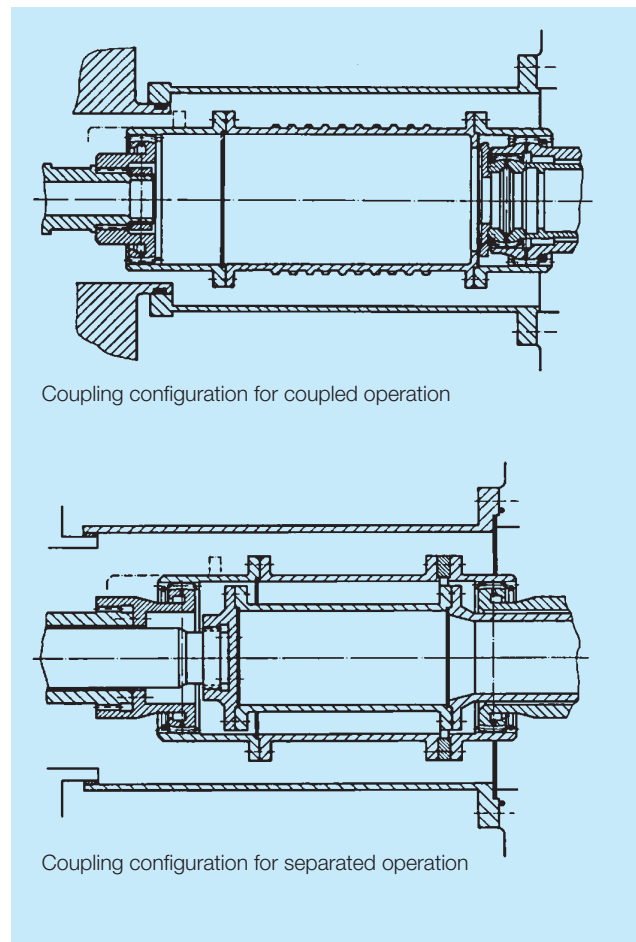


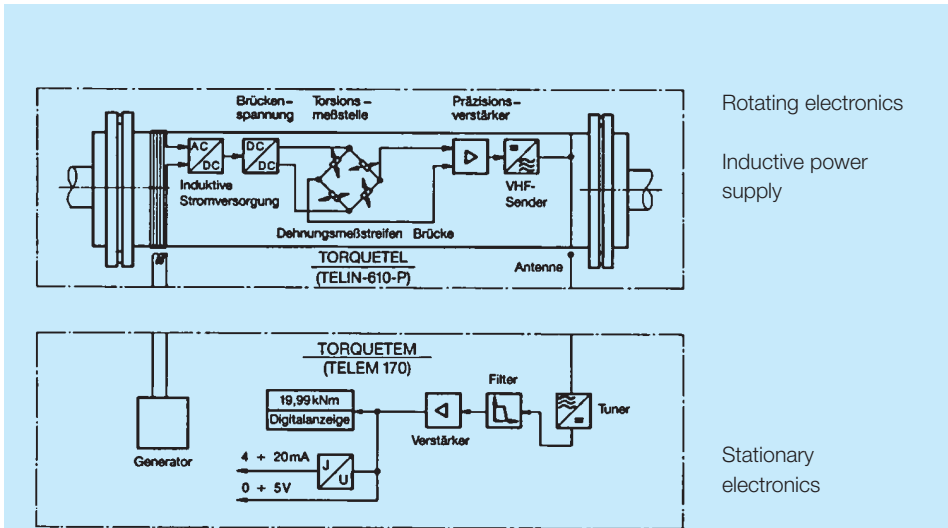
All parts are designed as plug-in connections and can be replaced without problem. The highest-precision coupling is designed for speeds up to 20,000 rpm.

The balancing quality and running performance are always preserved, even for different combinations of individual parts.

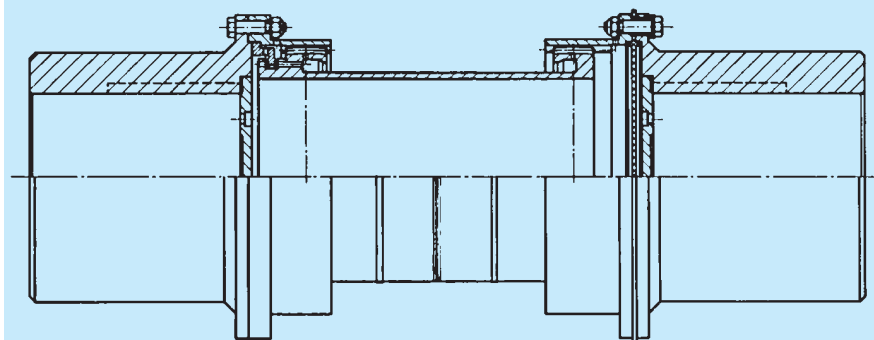
For single-shaft test objects with a high power requirement, the two drive motors are coupled via the connection coupling. A power output of 10,000 kW is therefore available to the test object at a speed of 20,000 rpm.

Multi-shaft test objects with concentric shafts require the so-called separated operation. Here, each motor is operated independently in each direction. The speed that can be achieved in synchronous operation amounts to 20,000 rpm. Relative speeds of up to 40,000 rpm are possible for rotors rotating in opposite directions.

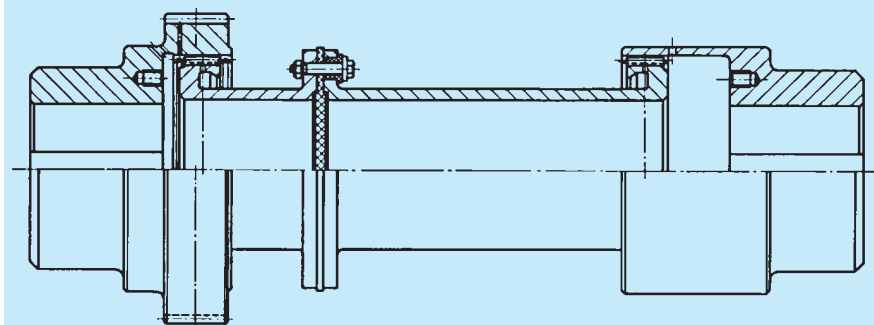




Schematic diagram of the torque measurement equipment



Curved tooth coupling with integrated electronics for torque measurement



Electrically insulated curved tooth coupling with additional external teeth on one hub

Curved tooth couplings as torque metering shafts are another speciality of the coupling range. Various model series and designs are available, which are used according to the specific requirements. The application is the decisive criterion for the construction form, whereas the individual design, on the other hand, is mostly determined by the measuring unit used. These are predominantly independent devices which are built into the coupling as a complete unit. The connection dimensions are correspondingly matched to each other.

A further possibility is the option shown in the drawing on the left. Instead of the built-in measuring unit, the coupling sleeve itself serves as a basis for determining the torque values. It is not necessary to change the external dimensions.

The measuring electronics and related signal conditioning are firmly connected to the coupling sleeve. The acquired data are transmitted in a non-contact manner to the stationary part of the measuring equipment. The coupling shown is designed for a nominal torque of 72,682 Nm and an operating speed of 3000 rpm.

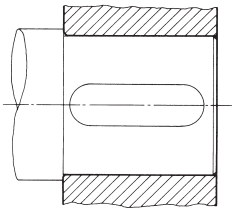
In addition to the standard models, electrically insulated curved tooth couplings are available in any special design. They are primarily of importance where leakage current transfer may have a detrimental effect in electrical installations.

The special solutions shown on these pages are only a few examples of the many different possibilities for using curved tooth couplings. Nevertheless, they clearly show that these couplings can also be used to solve unusual tasks.

Shaft-Hub Connections

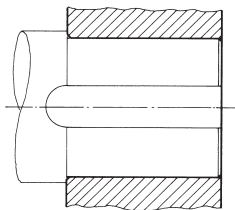


Fig. 1



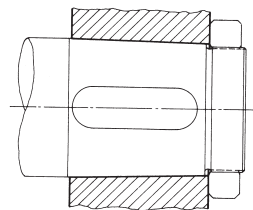
cyl. seat with 2 keys and interference fit

Fig. 2



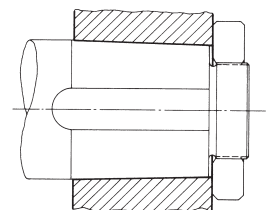
cyl. seat with 2 keys and interference fit

Fig. 3



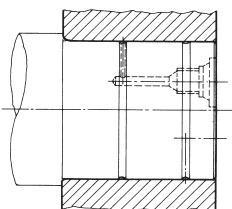
conical seat with 2 keys and interference fit

Fig. 4



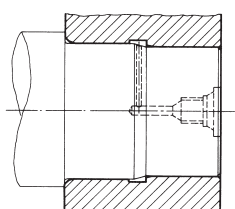
conical seat with 2 keys and interference fit

Fig. 5



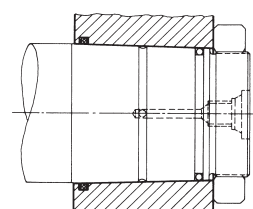
hydraulically fitted, cylindrical

Fig. 6



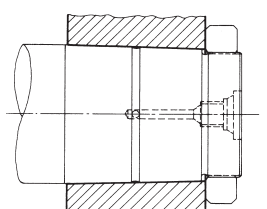
hydraulically fitted, cylindrical, with stepped seat

Fig. 7



hydraulically fitted, conical, with seal rings

Fig. 8



hydraulically fitted, conical

Fig.	1	2	3	4	5	6	7	8
Constructional use of the space	○	○	○	○	○	○	○	○
Production	○	○	○	○	○	○	○	○
Insensitiveness to damage	○	○	○	○	○	○	○	○
Running quality	○	○	○	○	○	○	○	○
Axial positioning	○	○	○	○	○	○	○	○
Transfer of force	○	○	○	○	○	○	○	○
Installation, warm	○	○	○	○	○	○	○	○
Installation, cold	○	○	○	○	○	○	○	○
Disassembly	○	○	○	○	○	○	○	○

○ favourable ○ neutral ○ less favourable

1. Bending Critical Speed

Rough calculation of the bending critical speed of intermediate shafts, spacers and hub sleeves

$$n_k = 300 \cdot \sqrt{\frac{78.3 \cdot E \cdot I_{\text{axial}}}{G_1 \cdot l_0^4}}$$

n_k = bending critical speed, rpm

n = operating speed, rpm

E = module of elasticity = $20.6 \cdot 10^4$ N/mm²

G_1 = weight per 1 mm length in kg (see item 5)

l_0 = tooth centre distance, mm

I_{axial} (see item 4)

Permissible for sub-critical operation

$$n \leq 0.75 \cdot n_k$$

For over-critical operation

$$n \geq 1.35 \cdot n_k$$

2. Torsional Spring Rate C_{T2}

$$C_{T2} = \frac{I_{\text{pol}} \cdot G}{l \cdot 10^9}$$

C_{T2} = torsional spring rate of the intermediate shaft, MNm/rad

G = shear modulus = $7.95 \cdot 10^4$ N/mm²

l = length of the intermediate shaft in mm

l = $L - 2 \cdot D$

I_{pol} (see item 4)

3. Mass Moments of Inertia J

Applicable for the shaft:

$$J = \frac{G_2 \cdot d^2}{8 \cdot 10^6}$$

Applicable for the spacer (tube):

$$J = \frac{G_2 \cdot (d_a^2 + d_i^2)}{8 \cdot 10^6}$$

J = mass moment of inertia, kgm²

G_2 = weight, kg (see item 5)

d = shaft diameter, mm

d_a = outer diameter of the spacer, mm

d_i = inner diameter of the spacer, mm

4. Geometrical Moment of Inertia I

Applicable for the shaft:

$$I_{\text{axial}} = \frac{d^4}{20.37}$$

Applicable for the spacer (tube):

$$I_{\text{axial}} = \frac{d_a^4 - d_i^4}{20.37}$$

I_{axial} = axial geometrical moment of inertia, mm⁴

d = shaft diameter, mm

d_a = outer diameter of the spacer, mm

d_i = inner diameter of the spacer, mm

I_{pol} = polar geometrical moment of inertia, mm⁴

$$I_{\text{pol}} = 2 \cdot I_{\text{axial}}$$

5. Weight G_2

Applicable for the shaft:

$$G_2 = \frac{d^2 \cdot 6.165 \cdot l}{10^6}$$

Applicable for the spacer (tube):

$$G_2 = \frac{(d_a^2 - d_i^2) \cdot 6.165 \cdot l}{10^6}$$

G_2 = weight, kg

d = shaft diameter, mm

d_a = outer diameter of the spacer, mm

d_i = inner diameter of the spacer, mm

l = length, mm

G_1 = weight per 1 mm length, kg/mm

$$G_1 = \frac{G_2}{l}$$

Torsional Vibrations, Coefficients of Friction, API Design

Torsional Vibration Calculations

If there are special operating conditions it is possible to provide a rapid technical solution by targeted torsional vibration calculations. We have extensive computer programs at our disposal for this purpose. These permit the simulation of different operating conditions for the overall installation and provide information about the dynamic loads to be expected. Operating conditions

such as start, various short-circuits, system transfer etc. can be computed. These calculations are an important prerequisite for dimensioning couplings with an integrated torsion shaft.

Both conditions are satisfied by the following series:

- ZTNH, ZTKH
- ZTF, ZTFK
- ZTAF, ZTAKF
- ZTAH, ZTAKH
- TF, TFH

Couplings according to ISO 10441

In compliance with the API 671 standard, August 2007 edition, the distance between two shafts to be connected shall be at least 18 inches.

This corresponds to a metric value of 457.2 mm. It is also

specified that coupling removal must be possible without changing the shaft positions.

Deviations from the API 671 Standard are furnished upon request.

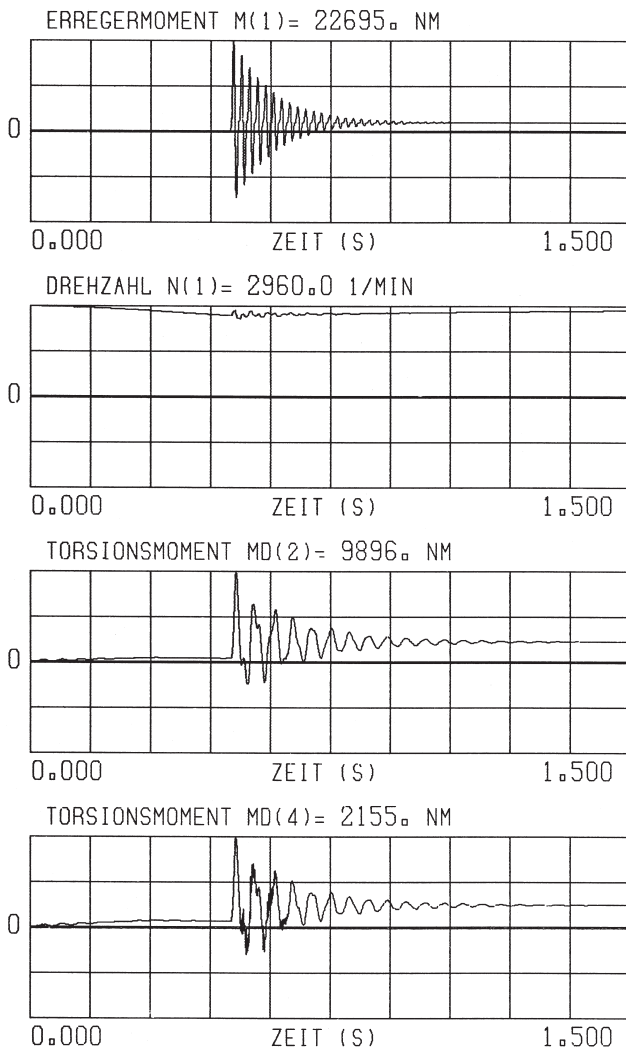
Coefficient of Friction, μ , and Determination of the Axial Force

The magnitude of the coefficient of friction for gear couplings is subject to a large number of different influences and factors. These include, for example, coupling characteristics such as gear teeth quality, flank form, flank hardness and surface roughness, hardening and material combination, as well as the different operating conditions such as load, misalignment, speed, sliding velocity, lubricant and lubrication type. Since the individual factors are mostly evaluated differently, it is hardly possible to find any uniform specifications of the actual value of the coefficient of friction in specialist literature.

The API Standard 613, Feb. 2003 edition, specifies that a coefficient of friction of $\mu = 0.25$ be taken into account when dimensioning thrust bearings for gear units.

This value is without doubt achieved only under extremely poor conditions and where several unfavourable factors coincide. Under normal conditions, coefficients of friction of between 0.02 and 0.06 are certainly realistic.

For the ZT series with hardened and ground gear teeth, it is advisable to use a coefficient of friction of $\mu = 0.08$ when calculating the axial force. The value $\mu = 0.1$ applies approximately to the other coupling series described in this catalogue.



Approximate calculation of the axial force F_a

$$F_a \approx \frac{P_N \cdot 9550 \cdot 1000}{n \cdot \text{coupling size}} \cdot \mu \text{ [N]}$$



1 CNC gantry drilling machine

2 Grinding of the hardened internal teeth of a coupling housing

3 Finish-machined hub sleeves with bores for injection lubrication

4 Grinding of the hardened curved gear teeth of a coupling hub

5 Machining of a spacer on a universal turning lathe

6 Test stand set-up of the drive system with high-speed gear units and couplings for the test facility described on page 26



2



3



4

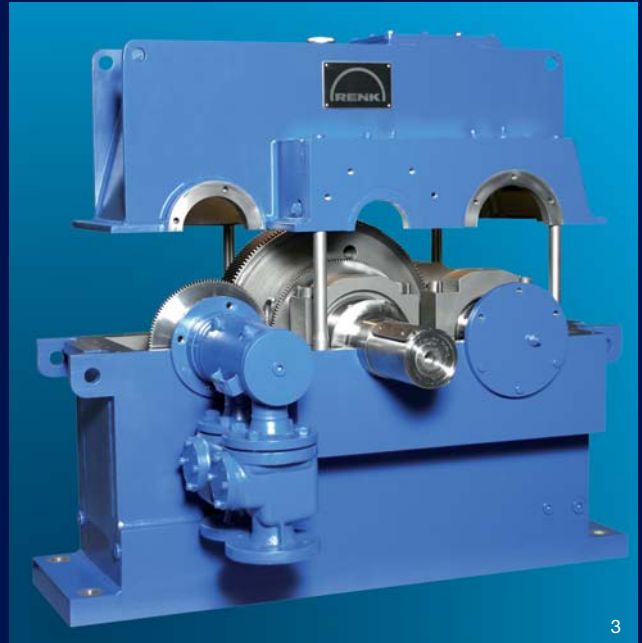


5



6

Further products of our coupling range



1 Curved Tooth Coupling Type SB
2 Curved Tooth Coupling Type SBk

3 High-Speed Gear Unit Type THGD-280
4 Raflex® Steel Disk Coupling Type MTP
acc. to API 610



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