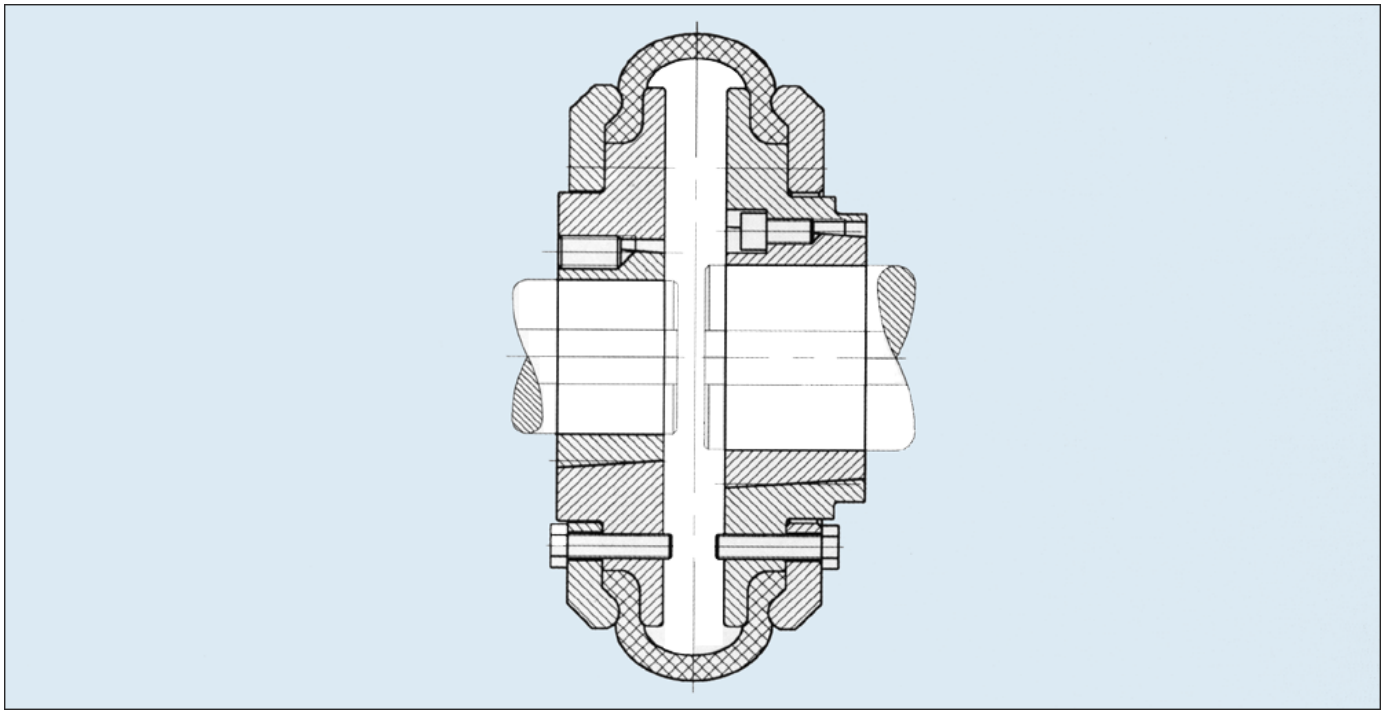
TYREX

VIRTUS
Power Transmission

General description



Tyrex couplings are highly torsionally flexible tyre couplings with progressive torsional deflection characteristic. The salient feature of the Tyrex shaft couplings is that the coupling hubs are supplied with commercially available taper bushes for nominal torques of up to 11500 Nm. This allows easy and time saving mounting of the coupling hubs on the shafts. Special tools are not required.

The torque transmission element of the Tyrex coupling is a rubber tyre reinforced with fabric plies. This tyre transmits the torque without torsional backlash, it is wear-resistant and maintenance-free. The rubber tyre is slit, thus permitting easy radial installation with no need for axial movement of the coupled machines.

Tyrex shaft couplings reduce torque surges substantially. In applications where torsional vibrations occur the stresses in the drive trains are minimized thanks to their high torsional flexibility.

The use of a rubber tyre as the transmission element compensates to a large extent for axial, radial and angular shaft displacements.

Features of the highly flexible Tyrex couplings

- High torsional flexibility with progressive torsional deflection characteristic
- High compensating capability for axial, radial and angular misalignments
- Easy and time saving mounting of the coupling hubs thanks to the use of taper bushes
- Radial change of the rubber element without axial movement of the coupled machines
- Backlash-free torque transmission even in case of alternating directions of rotation
- High torsional vibration and shock load damping capability
- Noice level insulation
- Wear-resistant and maintenance-free

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Tyrex coupling layout

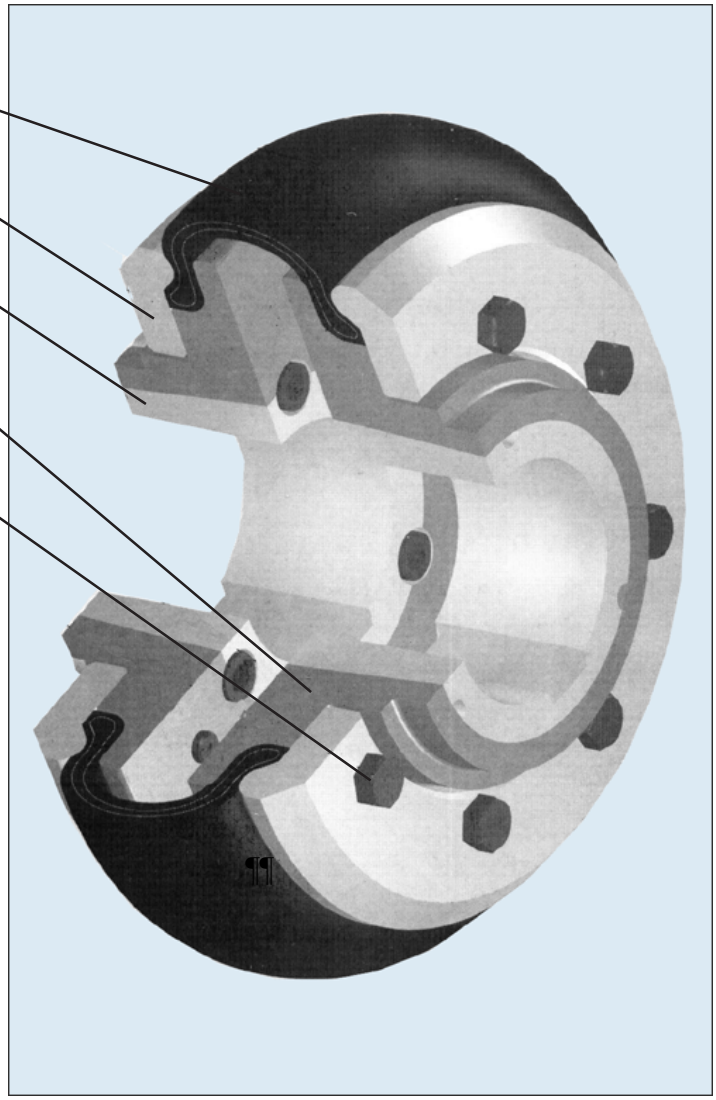
Rubber tyre, highly flexible elastic element
Item 2

Clamp ring
Item 3

Taper bush
Item 4

Coupling hub type F, H or B
Item 1

Fastening bolts
Item 5



Component - materials

Tyrex Couplings (have no fail safe device)

Item	Specification	Materail
1	Coupling hub	GGG 40
2	Rubber tyre	a) Standard version
		Natural rubber tyre
		b) Chloroprene tyre
		flame-resistant and
		antistatic
3	Clamp ring	Steel / GGG 40
4	Taper bush	GG 25
5	Fastening bolt	Grade 8.8

Technical details of Tyrex couplings

Coupling size	Norminal torque T_{KN} (Nm)	Maximum torque T_{Kmax} (Nm)	Continuous vibratory torque $T_{KW\ [10\ Hz]}$ (Nm)	Dynamic torsional stiffness C_T (Nm/rad)	Relative dumpling ψ (-)	Maximum speed n_{max} (rpm)	Permissible shaft displacement*1 axial ΔK_a (mm)	radial ΔK_r (mm)	angular ΔK_W (mm)
Tyrex 40	24	64	11	285	0.9	4500	1.3	1.1	5.7
Tyrex 50	66	160	26	745	0.9	4500	1.7	1.3	7.0
Tyrex 60	125	320	53	1500	0.9	4000	2.0	1.6	8.7
Tyrex 70	250	490	81	2350	0.9	3600	2.3	1.9	10.0
Tyrex 80	380	760	125	3600	0.9	3100	2.6	2.1	12.0
Tyrex 90	500	1100	185	5200	0.9	3000	3.0	2.4	13.0
Tyrex 100	680	1500	250	7200	0.9	2600	3.3	2.6	15.0
Tyrex 110	880	2150	355	10000	0.9	2300	3.7	2.9	16.0
Tyrex 120	1350	3550	590	17000	0.9	2050	4.0	3.2	18.0
Tyrex 140	2350	5650	940	28000	0.9	1800	4.6	3.7	22.0
Tyrex 160	3800	9350	1560	44500	0.9	1600	5.3	4.2	24.0
Tyrex 180	6300	16500	2750	78500	0.9	1500	6.0	4.8	28.0
Tyrex 200	9300	23500	3900	110000	0.9	1300	6.6	5.3	30.0
Tyrex 220	11500	33000	5550	160000	0.9	1100	7.3	5.8	33.0
Tyrex 250	14500	42500	7100	200000	0.9	1000	8.2	6.6	37.0

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Selection of the proper coupling size

The coupling size should be adequately dimensioned to ensure that the permissible coupling load is not exceeded in any operating condition encountered. For drives which are not subjected to periodically recurring vibratory torque loads, the coupling
Design may be selected based on the driving torque with reference to the corresponding service factors.

For specific applications which are subject to periodically recurring high vibratory torque such as combustion engines, piston pumps and compressors, please consult us. Upon request and receipt of your pertinent technical details, we would be pleased to provide a torsional vibration analysis for your specific application.

Calculate the driving torque: T_{AN}

Given a driving power P_{AN} and a coupling speed $n_{AN,}$ the driving torque is calculated as follows:

$$T_{AN} = \frac{9550 \times P_{AN}}{n_{AN}}$$

T_{AN} in Nm, P_{AN} in kW, n_{AN} in rpm

$$T_{KN} \geq T_{AN} \times S_A$$

Select the coupling size:

The following prerequisites must be given for the proper coupling selection: Nrminal torque capacity T_{KN} in Nm, T_{AN} in Nm, service factor S_A as per table bellow.

Service factor: SA	Type of operation of the driven machine		
Prime mover	Load		
	uniform	medium shock	heavy shock
Electric motors, turbines, hydraulic motors	1.00	1.75	2.50
Combustion engines 4-6 cylinders	1.25	2.00	2.75
Combustion engines 1-3 cylinders	1.50	2.25	3.00

Service factor S_A allows for up to 25 starts per hour. For up to 120 starts per hour, the service factor S_A shall be increased by 0.75.

Uniform loads: Agitators (light liquids), centrifugal pumps, blowers and fans (T ≤ 100 Nm), belt conveyors, screw pumps filling machines, light-weight centrifuges.

Medium shock loads: Agitators (viscous liquids), construction machinery, blowers and fans (T ≤ 100 Nm), mixers, conveyors, planing machines, plastic industry machinery, textile machines, heavy centrifuges.

Heavy shock loads: Blowers and fans (T ≥ 100 Nm), traveling gears, planning machines, plate mills, paper machines, belt conveyors, generators, frequency transformers, presses.

Verify the maximum torque capacity: T_{Kmax}

The max. coupling torque capacity T_{Kmax} must be greater than any max. torque T_{max} encountered in operation:

$$T_{Kmax} \geq T_{Max}$$

Permissible **ambient temperature** range:
For applications at higher ambient temperatures, please consult us.

$$-50^\circ C \leq Temp \leq +70^\circ C$$

Calculation example:

Required: A Tyrex shaft coupling for driving a planning machine positioned between the electric motor and the gearbox. Electric motor P_M = 75 kW, speed n_M = 1485 rpm, power requirement of the planning machine P_{AN} = 60 kW, up to 60 starts/hr, ambient temperature 25 °C.

Solution: The Tyrex coupling shall be designed for P_{AN} = 60 kW and with a service factor of S_A = 2.5 (1.75 as per table plus 0.75 for a starting frequency of more than 25).
There for: $T_{AN} = 9550 \times P_{AN}/n_{AN} = 9550 \times 60$ kW/1485 rpm=385 Nm and $T_{KN} \geq T_{AN} \times SA = 385$ Nm X 2.5 = 965 Nm.

The Tyrex shaft coupling Tyrex 120 FF at T_{KN} = 1350 Nm should be selected for the present application.

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Assignment to IEC standard motors

Tyrex shaft couplings for IEC standard motors acc. to DIN 42 637/1

Motor size	Motor power at ~ 3000 rpm		Coupling	Motor power at ~ 1500 rpm		Coupling	Motor power at ~ 1000 rpm		Coupling	Motor power at ~ 750 rpm		Coupling	Cyl. Shaft extension D X L (mm)	
	power P (kW)	torque T (Nm)	**Tyrex**	power P (kW)	torque T (Nm)	**Tyrex**	power P (kW)	torque T (Nm)	**Tyrex**	power P (kW)	torque T (Nm)	**Tyrex**	3000 rpm	= 1500 rpm
56	0.9	0.29	Tyrex 40	0.06	0.38	Tyrex 40							9 X 25	
	0.12	0.38	Tyrex 40	0.09	0.57	Tyrex 40								
63	0.18	0.57	Tyrex 40	0.12	0.76	Tyrex 40							11 X 23	
	0.25	0.8	Tyrex 40	0.18	1.1	Tyrex 40								
71	0.37	1.2	Tyrex 40	0.25	1.6	Tyrex 40							14 X 30	
	0.55	1.8	Tyrex 40	0.37	2.4	Tyrex 40								
80	0.75	2.4	Tyrex 40	0.55	3.5	Tyrex 40	0.37	3.5	Tyrex 40				19 X 40	
	1.1	3.5	Tyrex 40	0.75	4.8	Tyrex 40	0.55	5.3	Tyrex 40					
90 S	1.5	4.8	Tyrex 50	1.1	7.0	Tyrex 50	0.75	7.2	Tyrex 50				24 X 50	
90 L	2.2	7.0	Tyrex 50	1.5	9.6	Tyrex 50	1.1	11	Tyrex 50					
100 L	3.0	9.6	Tyrex 50	2.2	14	Tyrex 50	1.5	14	Tyrex 50	0.75	10	Tyrex 50	28 X 60	
				3.0	19	Tyrex 50				1.1	14	Tyrex 50		
112 M	4.0	13	Tyrex 50	4.0	25	Tyrex 50	2.2	21	Tyrex 50	1.5	19	Tyrex 50		
132 S	5.5	18	Tyrex 60	5.5	35	Tyrex 60	3.0	29	Tyrex 60	2.2	28	Tyrex 60	38 X 80	
	7.5	24	Tyrex 60											
132 M	-	-	-	7.5	48	Tyrex 60	4.0	38	Tyrex 60	3.0	38	Tyrex 60		
	-	-	-				5.5	53	Tyrex 60					
160 M	11	35	Tyrex 70	11	70	Tyrex 70	7.5	72	Tyrex 70	4.0	51	Tyrex 70	42 X 110	
	15	48	Tyrex 70							5.5	70	Tyrex 70		
160 L	18.5	59	Tyrex 70	15	96	Tyrex 70	11	105	Tyrex 70	7.5	96	Tyrex 70		
180 M	22	70	Tyrex 70	18.5	118	Tyrex 70	-	-	-	-	-	-	48 X 110	
180 L	-	-	-	22	140	Tyrex 70	15	143	Tyrex 80	11	140	Tyrex 70		
200 L	30	96	Tyrex 80	30	191	Tyrex 80	18.5	177	Tyrex 80	15	191	Tyrex 80	55 X 110	
	37	118	Tyrex 80				22	210	Tyrex 80					
225 S	-	-	-	37	236	Tyrex 90	-	-	-	18.5	236	Tyrex 90	55 X 110	60 X 140
225 M	45	143	Tyrex 80	45	287	Tyrex 100	30	287	Tyrex 100	22	280	Tyrex 90		
250 M	55	175	Tyrex 80	55	350	Tyrex 100	37	353	Tyrex 100	30	382	Tyrex 100	60 X 140	65 X 140
280 S				75	478	Tyrex 110	45	430	Tyrex 110	37	471	Tyrex 120	65 X 140	75 X 140
280 M				90	573	Tyrex 120	55	525	Tyrex 120	45	573	Tyrex 120		
315 S				110	700	Tyrex 120	75	716	Tyrex 120	55	700	Tyrex 120	65 X 140	80 X 170
315 M				132	840	Tyrex 140	90	860	Tyrex 140	75	955	Tyrex 140		
315 L				160	1019	Tyrex 140	110	1051	Tyrex 140	90	1146	Tyrex 140		
				200	1273	Tyrex 140	132	1261	Tyrex 140	110	1401	Tyrex 160		
355 L				250	1592	Tyrex 160	160	1528	Tyrex 160	132	1681	Tyrex 160	75 X 140	95 X 170
				315	2006	Tyrex 160	200	1910	Tyrex 160	160	2037	Tyrex 160		
							250	2388	Tyrex 180	200	2547	Tyrex 180		
400 L				355	2260	Tyrex 180	315	3008	Tyrex 180	250	3183	Tyrex 180	80 X 170	100 X 200
				400	2547	Tyrex 180								

This assignment takes usual loads, service factor SA = 1.75, into account. For other loads, a design according to "Selection of the proper coupling size" on page 3 is required. For plants with predominant periodic excitation, the design shall either comply with DIN 740 part 2, or a torsional vibration analysis shall be conducted. The analysis could be provided by us on your request.

Power ratings

Speed	Size	40	50	60	70	80	90	100	110	120	140	160	180	200	220	250
rpm		Power rating (kW)														
100		0.25	0.69	1.31	2.62	3.98	5.5	7.1	9.2	14.1	24.6	39.8	66	97	120	152
200		0.50	1.38	2.62	5.24	7.96	10.5	14.2	18.4	28.3	49.2	79.6	132	195	241	304
300		0.75	2.07	3.93	7.85	11.94	15.7	21.4	27.6	42.2	73.8	119	198	292	361	455
400		1.01	2.76	5.24	10.47	15.92	20.9	28.5	36.9	56.5	98.4	159	264	390	482	607
500		1.26	3.46	6.54	13.09	19.9	26.2	35.6	46.1	70.7	123	199	330	487	602	759
600		1.51	4.15	7.85	15.71	23.87	31.4	42.7	55.3	84.8	148	239	396	584	723	911
740		1.86	5.11	9.69	19.37	29.4	38.7	52.7	68.2	105	182	294	488	721	891	1124
800		2.01	5.5	10.5	20.9	31.8	41.9	57	73.7	113	1197	318	528	779	963	1215
960		2.41	6.6	12.6	25.1	38.2	50.3	68.4	88.5	136	236	382	633	935	1156	1458
1200		3.02	8.3	15.7	31.4	47.7	62.8	85.4	111	170	295	477	792	1169		
1480		3.72	10.2	19.4	38.7	58.9	77.5	105	136	209	364	589	976			
1600		4.0	11.1	20.9	41.9	63.7	83.8	114	147	226	394	637				
1800		4.5	12.4	23.6	47.1	71.6	94.2	128	166	254	443					
2000		5.0	13.8	26.2	52.4	79.6	105	142	184	283						
2200		5.5	15.2	28.8	57.6	87.5	115	157	203							
2400		6.0	16.6	31.4	62.8	95.5	126	171								
2600		6.5	18.0	34	68.1	103	136	185								
2800		7.0	19.4	36.6	73.3	111	147									
2960		7.4	20.5	38.7	77.5	118	155									
3100		7.8	21.4	40.6	81.2	123										
3600		9.0	24.9	47.1	94.2											

The given power ratings apply to the service factor S_A = 1.0, see page 3.
For other service conditions and/or other power ratings, the design should be selected according to page 3.

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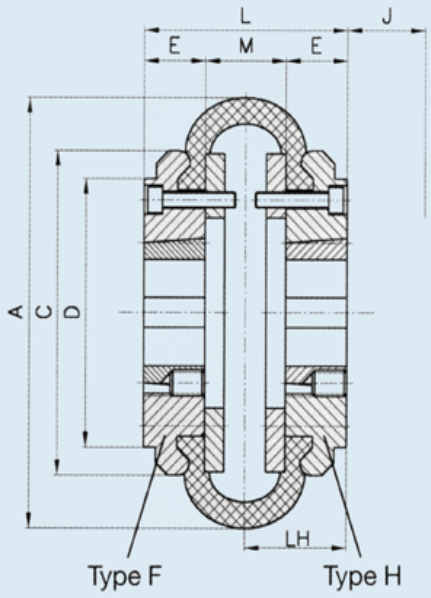
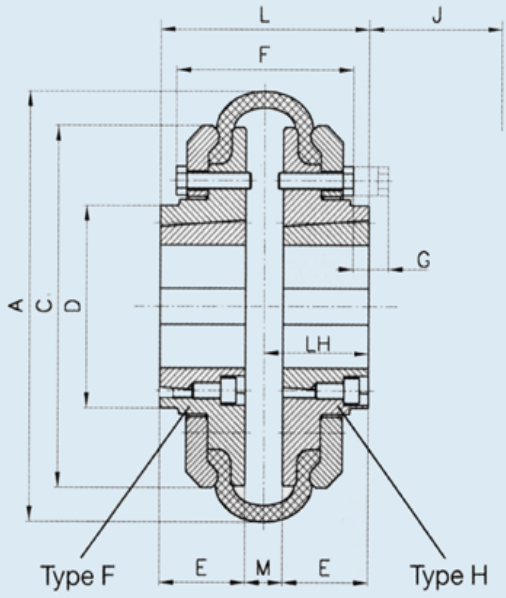
Tyrex shaft couplings

with taper bushes



Sizes Tyrex 40 to 60



Sizes Tyrex 70 to 220

G: Spacer required for removing and changing the rubber tyre

J: Spacer required for fixing and removing the bushes and clamp rings

LH: Mounting dimension of the Tyrex coupling half

Coupling size	Hub type	Taper bush	Bore max. mm	A mm	C mm	D mm	L mm	LH mm	M mm	E mm	F mm	G mm	J mm	Mass *1 kg	Moment of inertia *1 kgm *2
Tyrex 40	F H	1008	22	104	82	-	66	33	22	22	-	-	29	1.6	0.001
Tyrex 50	F H	1210	32	133	100	79	76	38	25	25	-	-	38	2.4	0.002
Tyrex 60	F H	1610	40	165	125	70	84	42	33	25	-	-	38	4.0	0.01
Tyrex 70	F H	2012 1610	50 40	187	144	80	88 84	44 42	23	32 25	100	13	42 38	6.2 6.0	0.018
Tyrex 80	F H	2517 2012	60 50	211	167	95 97	116 90	58 45	25	45 32	108	16	48 42	9.8 9.2	0.036 0.034
Tyrex 90	F H	2517	60	235	188	108	119	60	27	45	120	16	48	14.0	0.062
Tyrex 100	F H	3020 2517	75 60	254	216	120 113	131 119	66 60	27	51 45	124	16	55 48	19.8 18.8	0.11 0.108
Tyrex 110	F H	3020	75	279	233	134	127	64	25	51	124	16	55	23.4	0.156
Tyrex 120	F H	3525 3020	90 75	314	264	140	159 131	80 66	29	65 51	134	16	67 55	33.0 31.8	0.274 0.26
Tyrex 140	F H	3525	90	359	311	178	163	82	32	65	146	17	67	44.6	0.51
Tyrex 160	F H	4030	100	402	345	197	184	92	30	77	156	19	80	65.0	0.76
Tyrex 180	F H	4535	110	470	398	205	224	112	46	89	188	19	89	84.4	1.694
Tyrex 200	F H	4535	110	508	429	205	226	113	48	89	206	19	89	107.2	2.562
Tyrex 220	F H	5040	125	562	474	223	259	130	55	102	236	20	92	144.0	4.208

*1) Mass and moment of inertia for complete coupling, including tyre and taper bush

*2) Min. bore 85 mm

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Ordering information

The following parts are required for a complete Tyrex shaft coupling:

a) 2 coupling halves, each consisting of hub (type F, H), clamp ring, fastening bolts
b) 1 rubber tyre
c) 2 taper bushes, size depending on the hub type F or H (not for size Tyrex 250), with indication of the bore dimensions; e.g. bush 3020 with 65 mm bores, corresponding designation: 3020.65

Ordering example: 1 Tyrex shaft coupling size Tyrex 100

Consisting of 1 coupling half Tyrex 100 F (hub, clamp ring and set of fastening bolts)
1 coupling haft Tyrex 100 H (hub, clamp ring and set of fastening bolts)
1 rubber tyre Tyrex 100
1 taper bush 3020.65 (keyway acc. To DIN 6885/1)
1 taper bush 2517.48 (keyway acc. To Din 6885/1)

The following parts are required for a complete **Tyrex shaft coupling with spacer:**

a) 2 coupling halves, each consisting of hub, type F or H, clamp ring, fastening bolts
b) 1 rubber tyre
c) 2 taper bushes, size depending on the hub type F or H, with indication of the bore dimensions; e.g. for the pump shaft; bush 2517 with 48 mm bores, corresponding designation: 2517.48
d) Flange hub with specification of the motor shaft diameter, spacer (with indication of the required length L) and fastening bolts. The flange hub is also available with a taper bush on request

Ordering example: 1 Tyrex shaft coupling with spacer size Tyrex 90 Z

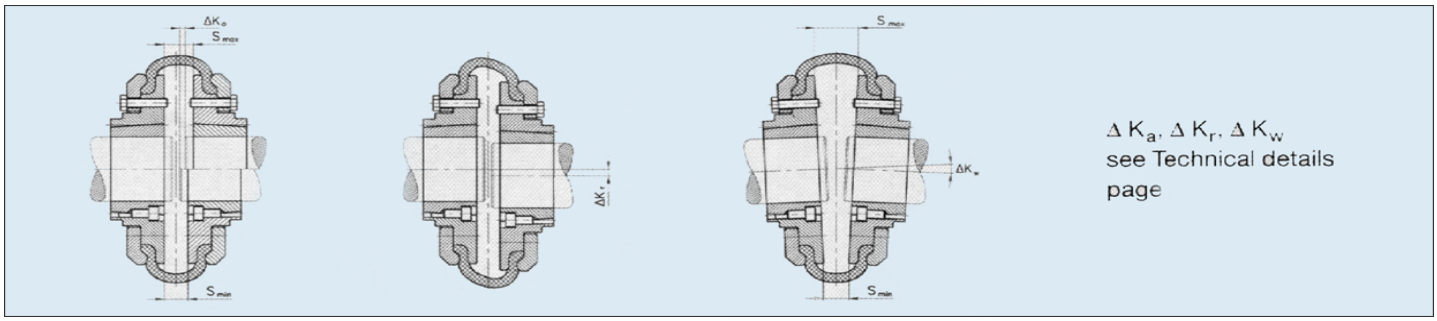
Consisting of: 2 coupling halves Tyrex 90 F (hub, clamp ring and set of fastening bolts)
1 rubber tyre Tyrex 90
1 taper bush 2517.48 (keyway acc.to DIN 6885/1)
1 taper bush 2517.48 (keyway acc.to DIN 6885/1) for pump shaft
1 spacer shaft with L = 134 mm
1 flange hub with 55 H7 bore, keyway acc. To DIN 6885/1 and fastening bolts

Available taper bushes

Taper bushes mount Tyrex couplings in a shrink-fit-like manner on the shafts. The taper bushes shown below are available from stock. Taper bushes are also available with inch bores.

No.	Metric bores and keyways acc. To DIN 6885/1																		
1008	9	10	11	12	14	16	18	19	20	22									
1210	11	12	14	16	18	19	20	22	24	25	28	30	32						
1610	14	16	18	19	20	22	24	25	28	30	32	35	38	40	42				
2012	14	16	18	19	20	22	24	25	28	30	32	35	38	40	42	45	48	50	
2517	16	18	19	20	22	24	25	28	30	32	35	38	40	42	45	48	50	55	60
3020	25	28	30	32	35	38	40	42	45	48	50	55	60	65	70	75			
3525	35	38	40	42	45	48	50	55	60	65	70	75	80	85	90				
4030	40	42	45	48	50	55	60	65	70	75	80	85	90	95	100				
4535	55	60	65	70	75	80	85	90	95	100	105	110							
5040	70	75	80	85	90	95	100	105	110	115	120	125							

Permissible shaft displacements of Tyrex couplings



ΔK_a, ΔK_r, ΔK_w
see Technical details page

The indicated values for ΔK_W [mm] = $S_{max} - S_{min}$ (see page 2) correspond to an angular displacement of $\Delta K_W = 4°$. This permissible angular shaft displacement is the max. angular misalignment of the coupling halves which may only be fully utilized when no axial and radial misalignments exist. An angular displacement of $\Delta K_W = 2°$ is permissible when axial and radial misalignment of $\frac{1}{2}\Delta K_a$ and $\frac{1}{2}\Delta K_r$ are present.

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Mounting instructions for Tyrex shaft couplings

1. The outer taper of the bush and the hub bore with inner taper shall be bright and free from grease prior to assembly. Any preservatives shall be removed completely.
2. Insert the bush into the coupling hub making sure that all connecting bores are lined up. This means that the threaded half holes shall be opposite the plain half holes (Fig. 2).
3. Lightly oil or grease the mounting screws and screw them in loosely. Do not tighten the screws yet (Fig.2).
4. Push the coupling hub with inserted taper bush onto the cleaned shaft with key and position it properly so that the clearance M (see table 1 and Fig. 3) is maintained. Attach the (outer or inner) clamp ring loosely prior to assembly of the hub.
5. Tighten the screws uniformly with a torque wrench to half of the specified tightening torque M_{A2} (Table 2). The Tyrex shaft coupling size 250 is not available with taper bush.
6. Hold a piece of wood or brass against the bush and hit it lightly with a hammer and tighten the screws to the specified tightening torque M_{A2} (Table 2). Repeat, if necessary.

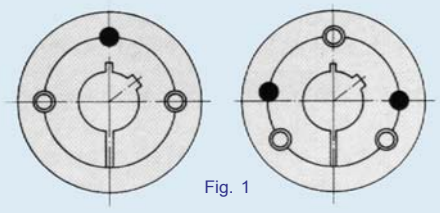

Fig. 1

No. 1008, 1210, 1610, 2012, 2517, 3020

No. 3525, 4030, 4535, 5040

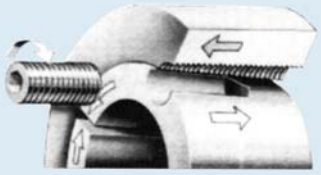

Fig. 2

Clearance M = Mounting dimension for the rubber tyre

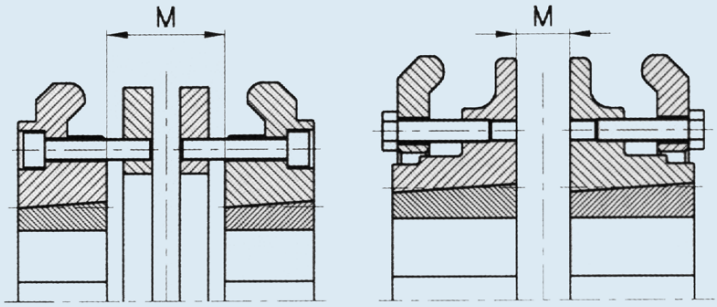

Fig. 3

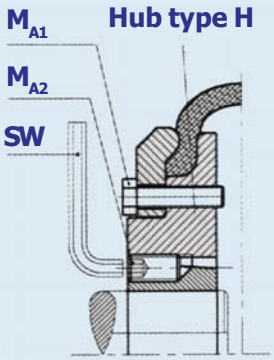

Fig. 4

Table 1: Clearance M and tightening torques for mounting the clamp rings

Tyrex coupling size	40	50	60	70	80	90	100	110	120	140	160	180	200	220	250
Clearance M (mm)	22	25	33	23	25	27	27	25	29	32	30	46	48	55	59
Screw size	M6	M6	M6	M8	M8	M10	M10	M10	M12	M12	M16	M16	M16	M20	M20
Tightening torque M_{A1} (Nm)	15	15	15	24	24	40	40	40	50	55	80	105	120	165	165

Table 2: Tightening torques for mounting the taper bushes

Tyrex coupling size	40	50	60 70	70 80	80 90 100	100 110 120	120 140	160	180 200	220
Taper bush No.	1008	1210	1610	2012	2517	3020	3525	4030	4535	5040
Screw size B.S.W.*	¼ x 13	3/8 x 16	3/8 x 16	7/16 x 22	½ x 25	5/8 x 32	½ x 38	5/8 x 45	¾ x 51	7/8 x 57
Tightening torque MA2 (Nm)	5.7	20	20	31	49	92	115	172	195	275
Wrench size SW (mm)	3	5	5	6	6	8	10	12	14	14

) No. 1008/1210/1610/2012/2517/3020/set screw;) No. 3525/4030/4535/5040 socket head cap screws

Removing the coupling hubs with taper bushes

1. Loosen and remove all screws. Depending on the taper bush size, screw 1 or 2 greased screws into the half threaded push-off holes of the taper bush (Fig. 5).
2. Tighten the screws uniformly until the bush detaches from the hub.
3. The hub can be pulled off the shaft together with the taper bush as soon as the taper bushcis detached.

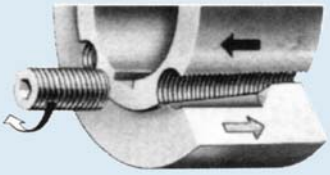

Fig. 5

TYREX

VIRTUS Power Transmission

Instructions for inserting the rubber tyre

1. Make sure that the coupling hubs are positioned at right angles on the shaft ends. Align the coupling hubs to each other in the axial, radial and angular directions. See also permissible shaft displacements on pages 2 and . The radial and angular displacements should be kept as small as possible, particularly in high speed applications.
2. Pull the rubber tyre that is slit for assembly, apart and place it over the coupling hub. Make sure that the tyre lies completely against the hub. If not, apply light hammer blows onto the outer contours of the tyre. After completion of the assembly, a gap as specified in Table 3 shall exist between the ends of the rubber tyre.
3. Fit the remaining clamp rings, if any, and tighten the screws hand-tight. Thereafter, tighten them uniformly in an alternating sequence (half a turn each) until the specified tightening torque M_{A1} (Table 1 and Fig. 4 on page) is reached.

Table 3

Tyrex coupling size	40 to 60	70 to 120	140 to 160	180 to 250
Rubber tyre gap (mm)	2	3	5	6