Backlash-free shaft couplings:

ROTEX® GS
backlash-free flexible shaft couplings

TOOLFLEX®
backlash-free torsionally stiff bellow-type couplings

RADEX®-NC
backlash-free torsionally stiff servo lamina coupling

ROTEX® GS

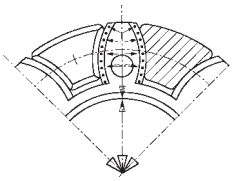
Backlash-free shaft coupling

Technical description

ROTEX® GS is a 3-part, axial plug-in coupling backlash-free under pre-stress. It is convincing even with critical applications by its backlash-free power transmission, its stiffness which is each adapted to the application and its optimum damping of vibrations. This principle of installation offers
significant assembly possibilities which optimize the assembly times in production.

ROTEX® GS (straight tooth, backlash-free)
The straight toothing of the spider mounted under prestress results in a smaller surface pressure and consequently higher stiffness of the coupling system. The flexible teeth compensate for misalignment but are supported radially in the inside diameter by a central web. This avoids too high internal or external deformation by high acceleration or high speeds. This is vital for a smooth operation and long service life of the coupling.

Limitation by concave cams in case of too high speeds/centrifugal forces and prestress of elastomer parts

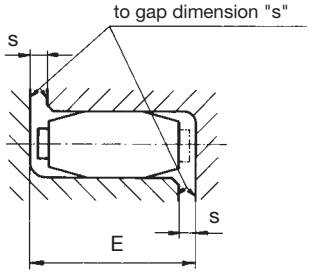


Support to the axis of rotation

The hub claws and the nylon teeth are chamfered to allow for a "blind assembly". The pegs arranged reciprocally on the spider prevent the spider from touching the hub over the entire surface. Provided that the distance dimension E is observed, the ability of the coupling to compensate for displacements is ensured. The plug-in force varies depending on the Shore hardness and prestress of the spider (see comments in the mounting instructions KTR-N 45510).

By observing the gap dimension "s" the electrical isolation is ensured, as well as a high service life of the coupling. This fact is gaining more and more importance, due to the increasing precision of shaft encoders and the existing demand for electro-magnetic compatibility.

Electric isolation due to gap dimension "s"



The elastic spiders of the GS line are available in three different kinds of Shore hardness, identified by colour, the material being soft to hard. Due to these four spiders with different kinds of Shore hardness it is easily possible to adjust the **ROTEX® GS** regarding the torsional stiffness and the vibration behaviour to the individual conditions of an application.

Description of spider hardness [Shore]	Identification Colour	Material	Permissible temperature range [° C] Permanent temperature	Max. temperature short-term	Available for coupling size	Typical applications
80 Sh A-GS	blue	Polyurethane	– 50 to + 80	– 60 to + 120	size 5 to 24	– drives of electric measuring systems
92 Sh A-GS	yellow	Polyurethane	– 40 to + 90	– 50 to + 120	size 5 to 55	– drives of electric measuring and control systems – main spindle drives - backlash-free in the range of prestress
95/98 Sh A-GS	red	Polyurethane	– 30 to + 90	– 40 to + 120	size 5 to 75	– drives, positioning drives, main spindle drives – high load
64 Sh D-H-GS	green	Hytrel	– 50 to + 120	– 60 to + 150	size 7 to 38	– control drives / tool spindles planetary gears / feed drives – high load, torsionally stiff – high ambient temperat. / resistant to hydrolysis
64 Sh D-GS	green	Polyurethane	– 20 to + 110	– 30 to + 120	size 42 to 75	

ROTEX® GS

Backlash-free shaft coupling

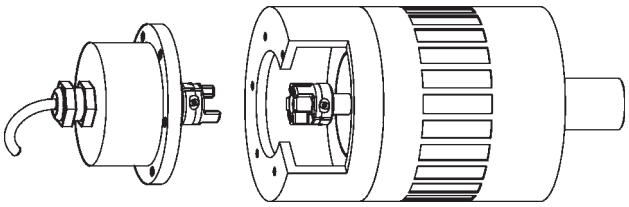
Application recommendation

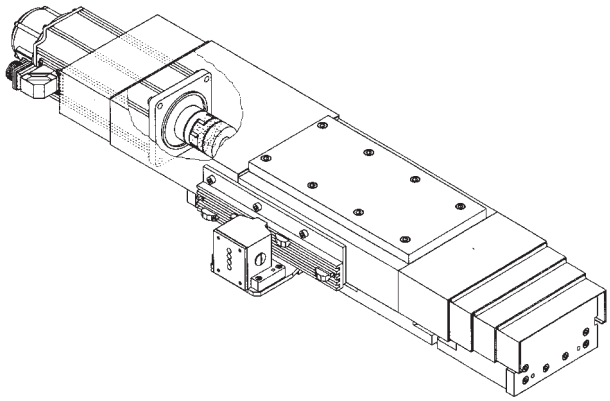
Measurement and control systems

For measurement and control systems a high torsional stiffness of the coupling is required in order to obtain positioning repeatability.

The torques that arise are relatively small so that backlash-free, torsionally stiff power transmission is achieved by the elastomer pre-stress.

In order to minimize the restoring forces we would recommend the spider 80 Sh A GS for such applications.





Servo and positioning drives

ROTEX® GS as an alternative to torsionally rigid couplings

Torsionally rigid shaft-to-shaft connections do not only transmit the torque backlash-free and non-rigid, but also torque peaks and vibrations. For driving systems with critical vibrations, the benefit of high stiffness for torque transmission soon becomes a serious disadvantage. For applications on which torsionally rigid shaft-to-shaft connections may cause a problematic torque transmission, the optimum alternative is ROTEX® GS.

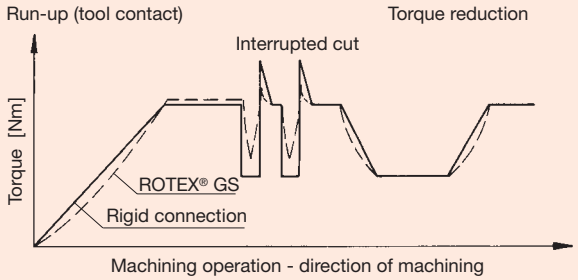
Backlash-free, damping vibrations, yet sufficiently torsionally rigid so that even highly dynamic servo drives must not suffer from lower precision with the right sizing of the coupling.

Main spindle drives

With the high torques in the field of machine tools, e. g. direct spindle drives, initial small twisting (under prestress) and damping dependent on the elastomer hardness is achieved. Peak tensions and shock loads are reduced or the resonance range is shifted to non-critical speed ranges, respectively.

For peripheral speeds up to 40 m/s (referred to the outside diameter of the coupling) we would recommend to use our ROTEX® GS clamping ring hub. For peripheral speeds exceeding 50 m/s, ROTEX® GS...P should be used. We have on hand experiences from industrial applications for peripheral speeds up to 80 m/s.

Comparison of rigid connection – ROTEX® GS



Explosion protection use

ROTEX® GS couplings are suitable for power transmission in drives in hazardous areas. The couplings are certified according to EC Standard 94/9/EC (ATEX 95) as units of category 2G and thus suitable for the use in hazardous areas of zone 1 and 2. Please read our information in the respective Type Examination Certificate and the operating and mounting instructions under www.ktr.com.

Selection: In case of use in hazardous areas the clamping ring hubs (clamping hubs without feather keyway only for use in category 3) must be selected so that there is a minimum safety factor of s = 2 between the peak torque (including all operating parameters) and the nominal torque and frictional torque of engagement of the coupling.

ROTEX® GS

Backlash-free shaft coupling

Technical data

ROTEX® GS Size	Spider Shore GS	Shore range	Max. speed [min^{-1}] for hub design 2.0 / 2.1 2.5 / 2.6	1.0 1.1	6.0 [2]	6.0 P [2]	Torque [Nm] T_{KN}	$T_{K\,max}$	Static torsion spring stiffness [1] [Nm/rad]	Dynamic torsion spring stiffness [1] [Nm/rad]	Radial stiffness C_r [N/mm]	Weight [kg] each hub	spider	Mass moment of inertia J [kgm^2] each hub	spider
5	70	A	38000	47700			0,2	0,3	1,78	5	43	1 x 10^{-3}	0,2 x 10^{-3}	0,016 x 10^{-6}	0,002 x10^{-6}
	80	A					0,3	0,6	3,15	10	82				
	92	A					0,5	1,0	5,16	16	154				
	98	A					0,9	1,7	8,3	25	296				
7	80	A	27000	34100			0,7	1,4	8,6	26	114	3 x 10^{-3}	0,7 x 10^{-3}	0,085 x 10^{-6}	0,014 x10^{-6}
	92	A					1,2	2,4	14,3	43	219				
	98	A					2,0	4,0	22,9	69	421				
	64	D					2,4	4,8	34,3	103	630				
9	80	A	19000	23800			1,8	3,6	17,2	52	125	9 x 10^{-3}	1,8 x 10^{-3}	0,49 x 10^{-6}	0,079 x10^{-6}
	92	A					3,0	6,0	31,5	95	262				
	98	A					5,0	10,0	51,6	155	518				
	64	D					6,0	12,0	74,6	224	739				
12	80	A	15200	19100			3,0	6,0	84,3	252	274	14 x 10^{-3}	2,3 x 10^{-3}	1,3 x 10^{-6}	0,139 x10^{-6}
	92	A					5,0	10,0	160,4	482	470				
	98	A					9,0	18,0	240,7	718	846				
	64	D					12,0	24,0	327,9	982	1198				
14	80	A	12700	15900	25400	47700	4,0	8,0	60,2	180	153	20 x 10^{-3}	4,6 x 10^{-3}	2,8 x 10^{-6}	0,457 x10^{-6}
	92	A					7,5	15,0	114,6	344	336				
	98	A					12,5	25,0	171,9	513	654				
	64	D					16,0	32,0	234,2	702	856				
19	80	A	9550	11900	19000	35800	4,9	9,8	618	1065	582	66 x 10^{-3}	7 x 10^{-3}	20,4 x 10^{-6}	1,49 x10^{-6}
	92	A					10,0	20,0	1090	1815	1120				
	98	A					17,0	34,0	1512	2540	2010				
	64	D					21,0	42,0	2560	3810	2930				
24	92	A	6950	8650	13800	26000	35	70	2280	4010	1480	132 x 10^{-3}	18 x 10^{-3}	50,8 x 10^{-6}	7,5 x10^{-6}
	98	A					60	120	3640	5980	2560				
	64	D					75	150	5030	10895	3696				
28	92	A	5850	7350	11700	22000	95	190	4080	6745	1780	253 x 10^{-3}	29 x 10^{-3}	200,3 x 10^{-6}	16,5 x10^{-6}
	98	A					160	320	6410	9920	3200				
	64	D					200	400	10260	20177	4348				
38	92	A	4750	5950	9550	17900	190	380	6525	11050	2350	455 x 10^{-3}	49 x 10^{-3}	400,6 x 10^{-6}	44,6 x10^{-6}
	98	A					325	650	11800	17160	4400				
	64	D					405	810	26300	42515	6474				
42	92	A	4000	5000	8050	15000	265	530	10870	15680	2430	1850 x 10^{-3}	79 x 10^{-3}	2246 x 10^{-6}	100 x10^{-6}
	98	A					450	900	21594	37692	5570				
	64	D					560	1120	36860	62600	7270				
48	92	A	3600	4550	7200	13600	310	620	12968	18400	2580	2520 x 10^{-3}	98 x 10^{-3}	3786 x 10^{-6}	200 x10^{-6}
	98	A					525	1050	25759	45620	5930				
	64	D					655	1310	57630	99750	8274				
55	92	A	3150	3950	6350	11900	410	820	15482	21375	2980	3800 x 10^{-3}	115 x 10^{-3}	7496 x 10^{-6}	300 x10^{-6}
	98	A					685	1370	42117	61550	6686				
	64	D					825	1650	105730	130200	9248				
65	95	A	2800	3500	5650	11000	940	1880	48520	71660	6418	4500 x 10^{-3}	210 x 10^{-3}	12000 x 10^{-6}	500 x10^{-6}
	64	D					1175	2350	118510	189189	8870				
75	95	A	2350	2950	4750	8950	1920	3840	79150	150450	8650	7180 x 10^{-3}	340 x 10^{-3}	26000 x 10^{-6}	2000 x10^{-6}
	64	D					2400	4800	182320	316377	11923				

1) Static and dynamic torsional stiffness with 0,5 x T_{KN}

2) Higher speeds on request

The size of the coupling has to be such that the permissible coupling load is not exceeded in any operating condition (see coupling selection on page 105).

1. Definitions and factors for coupling selection

Prestress: The flexible prestress varies depending on the coupling size, the spiders/spider material and the production tolerances. As a result there is the axial plug-in force varying from low as sliding seat or with a torsionally soft spider to heavy with a high amount of prestress or torsionally rigid spider.

T_{KN} Rated torque of coupling [Nm]
Torque which can be transmitted continuously over the entire permissible speed range, taking into account the operating factors (S_t, S_d).

T_{Kmax} Maximum torque of coupling [Nm]
Torque which can be transmitted during the full service life of the coupling as dynamic load $\geq 10^5$ or as alternating load $5 \cdot 10^4$, taking into account the operating factors (S_t, S_d, S_A).

T_R Friction torque [Nm]
Torque which can be transmitted by the frictionally engaged shaft-hub-connection.

T_{AN} Constantly occurring max. driving torque

T_{AS} Maximum driving torque [Nm]
Peak torque in case of shock by the driving A. C. motor, for example during acceleration or breakdown torque of the A. C. motor.

T_S Peak torque [Nm]
Peak torque on the coupling, calculated from max. driving torque T_{AS}, rotational inertia coefficient m_A or m_L and opertaing factor S_A.

S_t Temperature factor
Factor considering the lower loading capacity or larger deformation of an elastomer part under load particularly in case of increased temperatures. In case of temperatures exceeding 80 °C we would recommend to use the RADEX®-NC (see page 129).

S_d Torsional stiffness factor
Factor considering the different demands on the torsional stiffness and fatigue strength of the coupling dependent on the application. In case of using the spider 64 Sh D-GS and reversing drive S_d has to selected in case of couplings made of aluminium. For positioning drives with increased demand on torsional stiffness (e. g. gearbox with low transmission) we would recommend the use of the TOOLFLEX® or RADEX®-NC (see page 119 and 129).

S_A Operating factor
Factor considering the occurring shocks or starts each minute, depending on the use

$m_{A(L)}$ Rotational inertia coefficient of driving side (load side)
Factor taking into account the distribution of masses in case of drive and load side shocks and vibration excitation.

ROTEX® GS

Backlash-free shaft coupling

Coupling selection

2. Factors

Temperature factor S_t

	– 30 °C + 30 °C	+ 40 °C	+ 60 °C	+ 80 °C
S_t	1	1,2	1,4	1,8

See note on page 104.

Torsional stiffness factor S_d

Main spindle drive of machine tool	Positioning drive (x - y axis)	Shaft encoders Angle encoders
2 – 5*	3 – 8*	10 →

See note on page 104.
*When using the 64 Sh D-GS spider at least factor 4

Operating factor S_A

main spindle drive	positioning drive*	S_A
light shock loads	≤ 60	1,0
average shock loads	≥ 60 ≤ 300	1,4
heavy shock loads	≤ 300	1,8

*Starts/minute

3. Calculation formula

Rated driving torque

$$T_N\ [Nm] = 9550 \cdot \frac{P_{AN/LN}\ [kW]}{n\ [1/min]}$$

Peak torque

Shock on driving side
$T_S = T_{AS} \cdot m_A \cdot S_A$

Shock on load side
$T_S = T_{LS} \cdot m_L \cdot S_L$

$m_A = \frac{J_L}{J_A + J_L}$ $m_L = \frac{J_A}{J_A + J_L}$

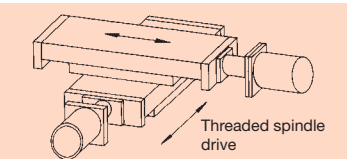
J_A = Moment of inertia of driving side
J_L = Moment of inertia of load side

The size of the coupling must be selected so that the following conditions are met.

$T_{KN} \geq T_N \cdot S_t \cdot S_d$ and $T_{KN} \geq T_S \cdot S_t \cdot S_d$

For the factors please see the tables at the top.

4. Example of calculation (positioning drive)



Details of driving side
Servo motor
Rated torque T_{AN} = 43 Nm
Max. drive torque T_{AS} = 144 Nm
Moment of inertia J_{Mot} = $108 \cdot 10^{-4}$ kgm²
Driving shaft d = 32 k6 without feather key

Details of driven side
Ball spindle J_{SP} = $38 \cdot 10^{-4}$ kgm²
Screw pitch s = 10 mm
Driven shaft d = 30 k6 without keyway
Mass of slide and work piece m_{Schl} = 1030 kg

Ambient temperature 40 °C, 60 starts/minute required, high torsional stiffness.

Coupling selection: ROTEX® GS clamping ring hub - axial plug-in jaw coupling backlash-free under prestress with frictionally engaged shaft-hub-connection.

Moment of inertia of slide and work piece reduced to driving axis.

$$J_{Schl} = m_{Schl} \left(\frac{S}{2 \cdot \pi}\right)^2\ [kgm^2] \qquad J_{Schl} = 1030\ kg \left(\frac{0{,}01\ m}{2 \cdot \pi}\right)^2 = 26 \cdot 10^{-4}\ kgm^2$$

Selection of temperature, stiffness and operating factor:

S_t (40° C) = 1,2 S_d = 4 S_A = 1,0

Coupling selection:

Selection according to rated torque (pre-selection)

$T_{KN} \geq T_{AN} \cdot S_t \cdot S_d$ $T_{KN} \geq 43\ Nm \cdot 1{,}2 \cdot 4$ $T_{KN} \geq 206{,}4\ Nm$

Coupling selection: ROTEX® GS 38 - 98 Sh A-GS - clamping ring hub design T_{KN} 325 Nm

Review of max. driving torque

$T_{KN} \geq T_S \cdot S_t \cdot S_d$ with $T_S = T_{AS} \cdot m_A \cdot S_A$ and $m_A = \frac{J_L}{J_A + J_L}$

$J_L = (J_{Sp} + J_{Schl} + 1/2\ J_K)$ $J_L = (38 + 26 + 9{,}6) \cdot 10^{-4}\ kgm^2 = 73{,}8 \cdot 10^{-4}\ kgm^2$

$J_A = J_{Mot} + 1/2\ J_K = (108 + 9{,}6) \cdot 10^{-4}\ kgm^2 = 117{,}6 \cdot 10^{-4}\ kgm^2$

$$m_A = \frac{J_L}{J_A + J_L} = \frac{73{,}8 \cdot 10^{-4}}{(117{,}6 + 73{,}8) \cdot 10^{-4}} \quad m_A = 0{,}385$$

$T_S = T_{AS} \cdot m_A \cdot S_A = 144\ Nm \cdot 0{,}385 \cdot 1{,}0 = 55{,}44\ Nm$ ROTEX® GS 38 98 Sh A-GS T_{KN} = 325 Nm

$T_{KN} = T_S \cdot S_t \cdot S_d = 55{,}44\ Nm \cdot 1{,}2 \cdot 4$ $T_{KN} \geq 266{,}11\ Nm$

Check of torque transmission of clamping ring hub for shaft diameter ø 30.

$T_R > T_{AS}$ Figures for T_R see table on catalogue page 110.

Transmittable torque Ø 30 H7 / k6 = 436 Nm > 144 Nm

Selection of ROTEX® GS 38 98 Sh A-GS, clamping ring hub design is permissible.

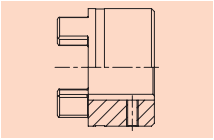
ROTEX® GS

Backlash-free shaft coupling

Hub designs

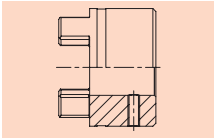
Due to the numerous applications of ROTEX® GS for many different mounting situations, this coupling system is available with various hub designs. These designs mainly differ in that they offer either positive or frictionally engaged (backlash-free) connections, but mounting situations like, for example, hollow shaft tacho, shaft encoder installation or similar applications are covered, too.

Design 1.0 with keyway and fixing screw



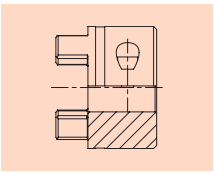
Positive power transmission; permissible torque depends on the permissible surface pressure. Not suitable for backlash-free power transmission for heavily reversing operation.

Design 1.1 without keyway, with setscrew



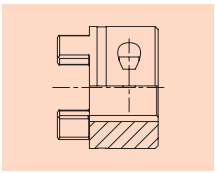
Non-positive torque transmission, suitable for backlash-free transmission of very small torques.
(No ATEX release)

Design 2.0 clamping hub, single slotted, without keyway



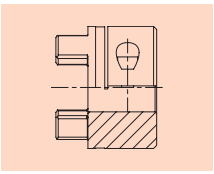
Frictionally engaged, backlash-free shaft-hub-connection. Transmittable torques depend on the bore diameter. Design 2.0 up to size 14 as standard.
(Only for ATEX category 3)

Design 2.1 clamping hub, single slotted, with keyway



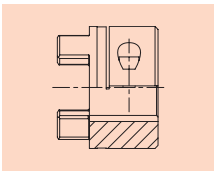
Positive power transmission with additional frictional tightness. The frictional tightness avoids or reduces reversal backlash. Surface pressure of the keyway connection is reduced. Design 2.1 up to size 14 as standard.

Design 2.5 clamping hub, double slotted, without keyway



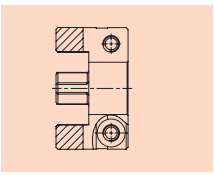
Frictionally engaged, backlash-free shaft-hub-connection. Transmittable torques depend on the bore diameter. Design 2.5 from size 19 as standard.
(Only for ATEX category 3)

Design 2.6 clamping hub, double slotted, with keyway



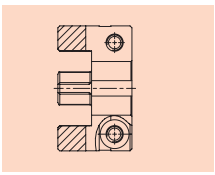
Positive power transmission with additional frictional tightness.
The frictional tightness prevents or reduces reversal backlash.
Surface pressure of the keyway connection is reduced.
Design 2.6 from size 19 as standard.

Type 2.8 short clamping hub with axial slots without feather key



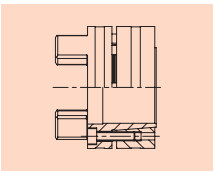
Frictionally engaged, backlash-free shaft-hub-connection, good properties of
concentric running due to symmetrical arrangement and cams without slots. Design 2.8 up to size 24 as standard.
(Only for ATEX category 3)

Type 2.9 short clamping hub with axial slots with feather key



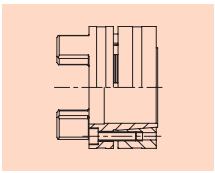
Positive-locking power transmission in addition frictionally engaged. Smooth power transmission due to cams without slots. The surface pressure of the feather key combination is reduced. Type 2.9 from size 24 as standard.

Design 6.0 clamping ring hub



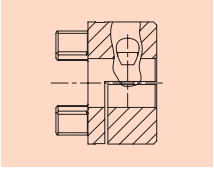
Integrated frictionally engaged shaft-hub-connection for transmission of higher torques. Screw fitting on elastomer side. For details about torques and dimensions see page 110. Suitable for high speeds.

Design 6.0 P precision clamping ring hub



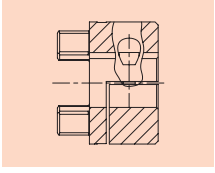
Design equal to 6.0, but highly accurate machining with slight modifications of design, see page 111.

Design 7.5 split claming hub without feather keyway for double-cardanic connections



Frictionally engaged, backlash-free shaft-hub connection for the radial assembly of the coupling. Transmittable torques dependent on bore diameter. Torque indicated on page 116.

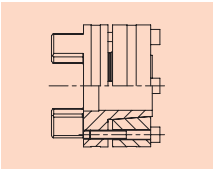
Design 7.6 split clamping hub with feather keyway for double-cardanic connections



Positive shaft-hub connection with additional frictional engagement for the radial assembly of the coupling. The frictional engagement avoids or reduces the reverse backlash. The surface pressure of the feather key connection is reduced.

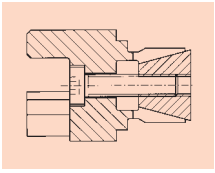
Special designs on request of customers

Design 6.5 clamping ring hub

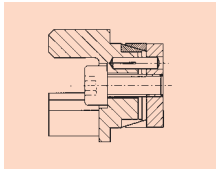


Design equal to 6.0, but clamping screws on the outside. For example for radial
disassembly of the intermediate tube (special design).

Special hub designs for hollow shaft drives



Expansion hub



ROTEX® GS hub with CLAMPEX® KTR 150

ROTEX® GS

Backlash-free shaft coupling

Basic programme

For advanced drive technology KTR

Size	Hub design	Finish bore [mm] according to ISO fit H7 / feather keyway with thread according to DIN 6885 sheet 1 - JS9																													
		un-/pilot bored	Ø2	Ø3	Ø4	Ø5	Ø6	Ø6,35	Ø7	Ø8	Ø9	Ø9,5	Ø10	Ø11	Ø12	Ø14	Ø15	Ø16	Ø18	Ø19	Ø20	Ø22	Ø24	Ø25	Ø28	Ø30	Ø32	Ø35	Ø38	Ø40	Ø42
7	1.1	●			●	●	●		●																						
	2.0	●		●	●	●	●	●	●																						
9	1.0	●					●		●	●	●		●																		
	1.1	●			●	●	●		●	●			●																		
	2.0	●		●	●	●	●	●	●	●	●	●	●	●																	
	2.1	●					●			●	●		●																		
12	1.0	●													●																
	1.1	●																													
	2.0	●			●	●	●	●		●	●		●	●	●																
	2.1	●											●		●																
14	1.0	●					●			●	●		●	●	●	●	●	●													
	1.1	●					●			●			●	●	●	●															
	2.0	●			●	●	●	●	●	●	●	●	●	●	●	●	●	●													
	2.1	●								●	●		●	●	●	●	●	●													
	6.0									●			●	●	●	●															
	6.0 P															●															
19	1.0	●											●	●	●	●	●	●	●	●	●	●									
	2.5	●				■				●		●	●	●	●	●	●	●	●	●	●	●	●								
	2.6	●								●			●	●	●	●	●	●	●	●	●		●								
	6.0												●		●	●	●	●	●	●	●										
	P 37.5																	●													
	6.0 P																			●											
24	1.0	●													●	●	●	●	●	●	●	●	●	●							
	2.5	●								■					●	●	●	●	●	●	●	●	●	●							
	2.6	●													●	●		●	●	●	●	●	●	●							
	6.0															●	●	●	●	●	●	●	●	●							
	P 50																					●									
	6.0 P																							●							
28	1.0	●																		●	●	●	●	●	●	●	●	●			
	2.5	●											■						●	●	●	●	●	●	●	●	●	●	●		
	2.6	●																●			●	●	●	●	●	●	●	●	●		
	6.0																		●	●	●	●	●	●	●	●	●	●	●		
	6.0 P																										●	●	●		
38	1.0	●																			●			●	●	●	●	●	●	●	●
	2.5	●													■									●			●	●	●	●	
	6.0																				●	●	●	●	●	●	●	●	●	●	
	6.0 P																										●		●	●	

Taper bores for Fanuc motors: GS 19 1:10 Ø 11; GS 24 1:10 Ø 16

Size	Hub design	Finish bores [mm]											
		28	30	32	35	38	40	42	45	48	50	55	60
42	6.0	●	●	●	●	●	●	●	●	●	●		
48	6.0			●	●	●	●	●	●	●		●	
55	6.0						●	●	●	●	●	●	●
65	6.0											●	
75	6.0												

■ = Pilot bored clamping hubs ● = Standard bore

Unbored hubs up to size 65 available from stock.

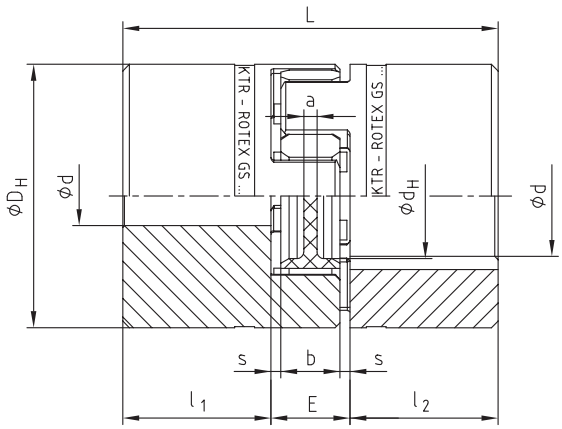
Further dimensions on request

ROTEX® GS

Backlash-free shaft coupling

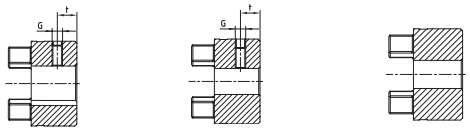
Miniature couplings

- Backlash-free shaft connections for measurement drive swith small torques
- Single cardanic coupling in three parts
- Axial plug-in ability - easy blind assembly, without any time-consuming screw connections
- Small dimensions - low flywheel mass
- Maintenance-free, easy to check visually
- Different elastomer hardness of spiders
- Available from stock for all usual shaft dimensions
- Finish bore acc. to ISO fit H7 (apart from clamping hub), keyway, from Ø 6 mm acc. to DIN 6885 sheet 1 - JS9
- Ⓔx Approved according to EC Standard 94/9/EC (only for hub design 1.0 and 2.1)
- Basic programme see page 107



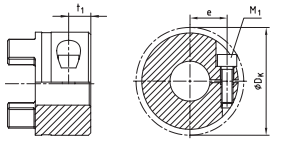
Hub designs (see page 106):

Design 1.0 | Design 1.1 | Design 1.2



with keyway and setscrew | without keyway with setscrew | without keyway without setscrew

Setscrew to DIN EN ISO 4029



Clamping hub with capscrew DIN EN ISO 4762 (ROTEX® 5 DIN 84)

Design 2.0 Clamping hub without keyway, (only category 3), torques depending on bore diameter

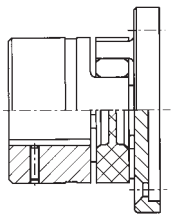
Design 2.1 Clamping hub with keyway

Size	Finish bore				Dimensions [mm]								Setscrew		Clamping screw				
	d_{min}	Hub design 1.0 d_{max}	1.1, 1.2 d_{max}	2.0, 2.1 d_{max}	D_H	d_H	L	l_1; l_2	E	b	s	a	G	t	M_1	t_1	e	Ø D_K	T_A [Nm]
Hub material – Aluminium (Al - H)																			
5	2	-	5	5	10	-	15	5	5	4	0,5	4,0	M2	2,5	M1,2	2,5	3,5	11,4	-
7	3	7	7	7	14	-	22	7	8	6	1,0	6,0	M3	3,5	M2	3,5	5,0	16,5	0,37
9	4	10	11	11	20	7,2	30	10	10	8	1,0	1,5	M4	5,0	M2,5	5,0	7,5	23,4	0,76
12	4	12	12	12	25	8,5	34	11	12	10	1,0	3,5	M4	5,0	M3	5,0	9,0	27,5	1,34
14	5	15	16	16	30	10,5	35	11	13	10	1,5	2,0	M4	5,0	M3	5,0	11,5	32,2	1,34

Size	Bores and the corresponding transmittable torques of the clamping hub design 2.0 [Nm]													
	Ø 2	Ø 3	Ø 4	Ø5	Ø 6	Ø 7	Ø 8	Ø 9	Ø 10	Ø 11	Ø 12	Ø 14	Ø 15	Ø 16
5	*	*	*	*										
7		0,8	0,9	0,95	1,00	1,10								
9			2,1	2,2	2,3	2,4	2,5	2,6	2,7	2,8				
12			3,6	3,8	4,0	4,1	4,3	4,5	4,7	4,8	5,0			
14				4,7	4,8	5,0	5,1	5,3	5,5	5,6	5,8	6,1	6,3	6,5

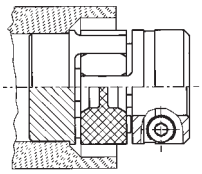
* Use of DIN 84 screw, tightening torque T_A not defined (slotted screw)

Other designs

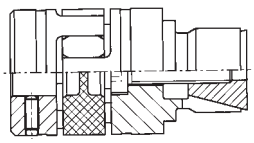


ROTEX® GS-CF

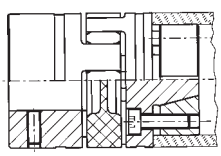
ROTEX® GS for hollow shaft connections



ROTEX® GS with interference fit hub



ROTEX® GS with expansion hub



ROTEX® GS with external clamping ring hub

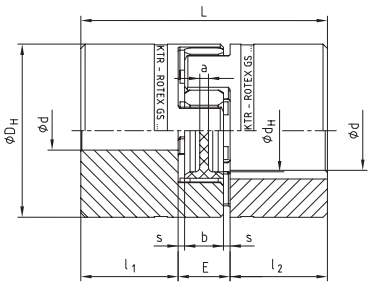
Order form:

ROTEX® GS 14	80 Sh A- GS	1.0 – Ø 12		2.0 – Ø 10	
Coupling size	Spider hardness	Hub design	Finish bore	Hub design	Finish bore

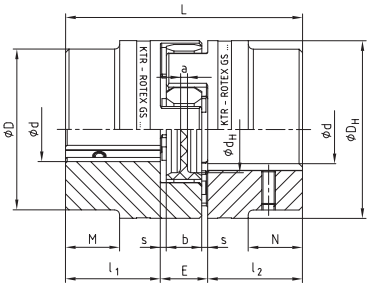
ROTEX® GS

Backlash-free shaft coupling

- Backlash-free shaft connection under prestress for spindle drives, elevating platforms, machine tool drives, etc.
- Single cardanic coupling in three parts
- Axial plug-in ability - easy blind assembly, without any time-consuming screw connections
- Small dimensions - low flywheel mass
- Maintenance-free, easy to check visually
- Different elastomer hardness of spiders
- Available from stock for all usual shaft dimensions
- Finish bore acc. to ISO fit H7 (apart from clamping hub), ⟨Ex⟩way, from Ø 6 mm acc. to DIN 6885 sheet 1 - JS9
- Approved according to EC Standard 94/9/EC (only for hub design 1.0 and 2.1/2.6)
- Basic programme see page 107

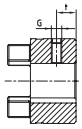


ROTEX® GS 5 - 38

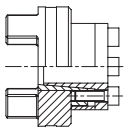


ROTEX® GS 42 - 75

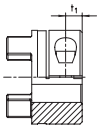
Hub designs: (see page 106)



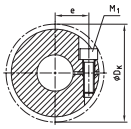
Design
1.0 with keyway and thread
1.1 without keyway, with thread



Design 4.2
with
CLAMPEX®
KTR 250



Design from size 19
as standard
2.5 double slot, without key-
way (only for category 3)
2.6 double slot
with keyway



Design 2.5
Torque depending
on bore diameter

Size	Un-bored	Finish bores [1]		Dimensions [mm]										Setscrew		Clamping screws				
		$d_{min.}$	$d_{max.}$	D	D_H	d_H	L	l_1, l_2	M, N	E	b	s	a	G	t	M_1	t_1	e	D_K	T_A [Nm]
Hub material – Aluminium (Al-H)																				
19	●	6	24	–	40	18	66	25	–	16	12	2,0	3,0	M5	10	M6	11,0	14,5	46	10,5
24	●	8	28	–	55	27	78	30	–	18	14	2,0	3,0	M5	10	M6	10,5	20,0	57,5	10,5
28	●	10	38	–	65	30	90	35	–	20	15	2,5	4,0	M8	15	M8	11,5	25,0	73	25
38	●	12	45	–	80	38	114	45	–	24	18	3,0	4,0	M8	15	M8	15,5	30,0	83,5	25
Hub material – (Steel St-H)																				
42	●	14	55	85	95	46	126	50	28	26	20	3,0	4,0	M8	20	M10	18	32,0	93,5	69
48	●	15	62	95	105	51	140	56	32	28	21	3,5	4,0	M8	20	M12	21	36,0	105	120
55	●	20	74	110	120	60	160	65	37	30	22	4,0	4,5	M10	20	M12	26	42,5	119,5	120
65	●	22	80	115	135	68	185	75	47	35	26	4,5	4,5	M10	20	M12	33	45,0	124	120
75	●	30	95	135	160	80	210	85	53	40	30	5,0	5,0	M10	25	M16	36	51,0	147,5	295

Size	Bores and the corresponding transmittable torques of the clamping hub design 2.5 [Nm]																											
	Ø8	Ø10	Ø11	Ø14	Ø15	Ø16	Ø18	Ø19	Ø20	Ø22	Ø24	Ø25	Ø28	Ø30	Ø32	Ø35	Ø38	Ø40	Ø42	Ø45	Ø48	Ø50	Ø55	Ø60	Ø65	Ø70	Ø75	Ø80
19	25	27	27	29	30	31	32	32	34	30 [2]	32 [2]																	
24		34	35	36	38	38	39	40	41	42	43	45	46															
28				80	81	81	84	85	87	89	91	92	97	99	102	105	109											
38					92	94	97	98	99	102	104	105	109	112	113	118	122	123	126	130								
42									232	238	244	246	255	260	266	274	283	288	294	301	309							
48												393	405	413	421	434	445	454	462	473	486	494	514					
55															473	486	498	507	514	526	539	547	567	587	608			
65																507	518	526	535	547	559	567	587	608	627	648		
75																			1102	1124	1148	1163	1201	1239	1278	1316	1354	1393

1) depending on hub design 2) clamping hub single slotted 2 x clamping screw M4

Order form:

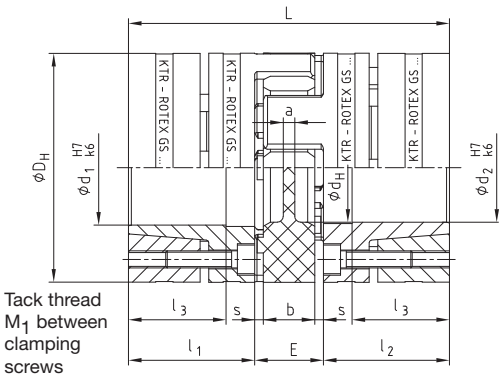
ROTEX® GS 24	98 Sh A-GS	2.5 – Ø 24		1.0 – Ø 20	
Coupling size	Spider hardness	Hub design	Finish bore	Hub design	Finish bore

ROTEX® GS

Backlash-free shaft coupling

Clamping ring hubs

- Backlash-free shaft coupling with integrated clamping system
- Applicable to, for example, forward feed main spindle drives of machine tools, press rollers, etc.
- High smoothness of running, application up to a peripheral speed of 40 m/s
- For high friction torques (consider the selection in case of explosion protection use)
- Easy to assemble due to internal clamping screws
- Finish bore up to Ø 50 mm according to ISO fit H7, from Ø 55 mm according to ISO fit G7
- Ⓔx Approved according to EC Standard 94/9/EC (Explosion Certificate ATEX 95)



Tack thread M_1 between clamping screws

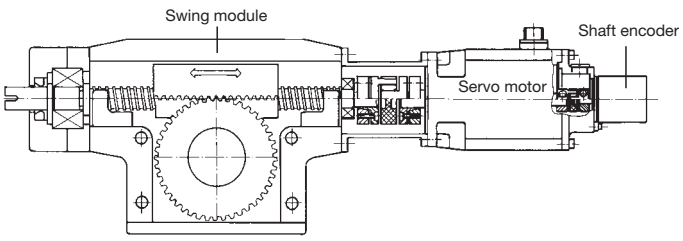
Size	Bores d_1/d_2 and the corresponding transmittable friction torques T_R of clamping ring hub in [Nm] 1)																								
	Ø6	Ø10	Ø11	Ø14	Ø15	Ø16	Ø19	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32	Ø35	Ø38	Ø40	Ø42	Ø45	Ø48	Ø50	Ø55	Ø60	Ø65	Ø70	Ø80
14	8,6	13,8	14,7	22,7																					
19		41	45	62	68	67	83	90																	
24			48	67	74	72	90	97	112	120	143														
28					142	154	189	188	237	250	280	307	310	353	389										
38								269	337	356	398	436	442	501	533	572	615	644							
42										399	445	506	470	566	581	647	630	728	836	858					
48												650	685	809	841	926	916	1042	1181	1125	1311				
55														918	954	1052	1040	1185	1220	1318	1359	1646	1662	1960	
65																1568	1569	1768	1833	1968	2049	2438	2495	2898	
75																		2246	2338	2500	2620	3082	3179	3657	4235

The transmittable torques of the clamping connection consider the max. clearance with shaft fit k6 / bore H7, from Ø55 G7/m6. With bigger clearance the torque is reduced.

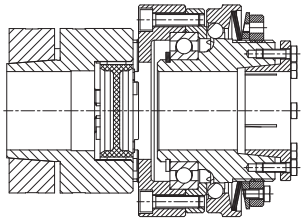
As shaft material – steel or spheroïdal iron with a yield point of approx. 250 N/mm² or more can be used.
If hollow shafts are used, the strength must be checked (see KTR mounting instructions, KTR Standard 45510 at our homepage www.ktr.com).

Size	Torques [Nm] 1)				Dimensions [mm]									Clamping screws				Weight per hub with max. bore [kg]	Mass moment of inertia per hub with max. bore [kgm²]
	92 Sh A-GS		98 Sh A-GS																
	T_{KN}	T_{Kmax}	T_{KN}	T_{Kmax}	D_H 3)	d_H	L	$l_1; l_2$	l_3	E	b	s	a	M	Number z	T_A [Nm]	M_1		
4) Hub material – Aluminium (Al-H) optionally steel Clamping ring material – Steel (St-H)																			
14	7,5	15	12,5	25	30	10,5	50	18,5	13,5	13	10	1,5	2,0	M3	4	1,34	M3	0,049	0,07 x 10^{-4}
19	10,0	20	17	34	40	18	66	25	18	16	12	2,0	3,0	M4	6	3	M4	0,120	0,31 x 10^{-4}
24	35,0	70	60	120	55	27	78	30	22	18	14	2,0	3,0	M5	4	6	M5	0,280	1,35 x 10^{-4}
28	95,0	190	160	320	65	30	90	35	27	20	15	2,5	4,0	M5	8	6	M5	0,450	3,13 x 10^{-4}
38	190,0	380	325	650	80	38	114	45	35	24	18	3,0	4,0	M6	8	10	M6	0,950	9,60 x 10^{-4}
Hub and clamping ring material – Steel (St-H)																			
42	265	530	450	900	95	46	126	50	35	26	20	3,0	4,0	M8	4	35	M8	2,30	31,7 x 10^{-4}
48	310	620	525	1050	105	51	140	56	41	28	21	3,5	4,0	M10	4	69	M10	3,08	52,0 x 10^{-4}
55	375	750	685	1370	120	60	160	65	45	30	22	4,0	4,5	M10	4	69	M10	4,67	103,0 x 10^{-4}
65	-	-	940 2)	1880 2)	135	68	185	75	55	35	26	4,5	4,5	M12	4	120	M12	6,70	191,0 x 10^{-4}
75	-	-	1920 2)	3840 2)	160	80	210	85	63	40	30	5,0	5,0	M12	5	120	M12	9,90	396,8 x 10^{-4}

1) Please note coupling selection on pages 104, 105, 117 · 2) Figures for 95 Sh A - GS · 3) $ØD_H$ + 2 mm with high speeds for expansion of spider
4) In case of using the spider 64 Sh D-GS resp. short dimensioning we recommend the application of clamping ring hubs made of steel.



ROTEX® GS for connection of swing module – servo motor – shaft encoder



ROTEX® GS with clamping ring hub and torque limiter KTR-SI

Order form:

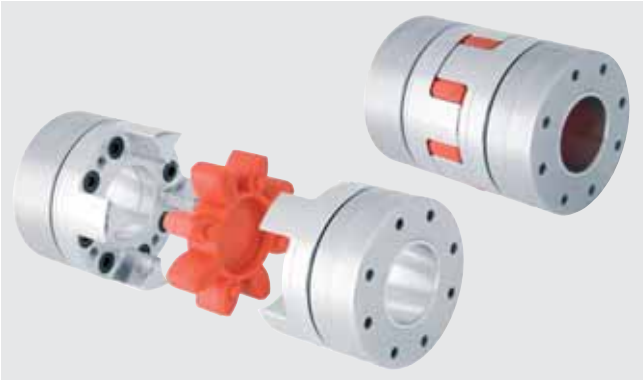
ROTEX® GS 24	98 Sh A-GS	6.0 – Ø 24		6.0 – Ø 20	
Coupling size	Spider hardness	Hub design	Finish bore	Hub design	Finish bore

ROTEX® GS

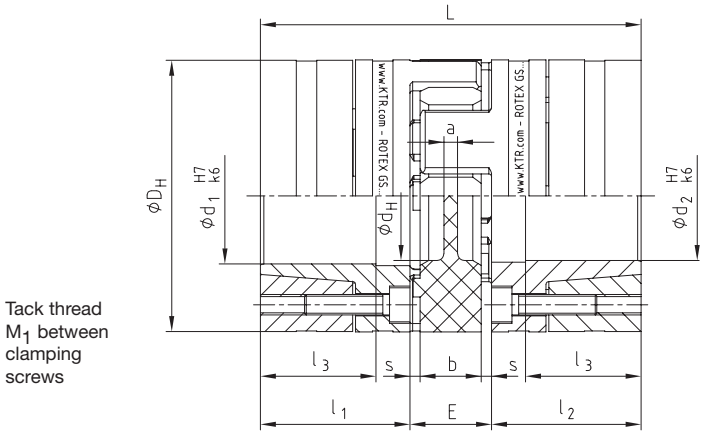
Backlash-free shaft coupling

Clamping ring hubs light

For advanced drive technology KTR NEW



- Backlash-free shaft coupling with integrated clamping system
- Low weight and low mass moment of inertia due to a design fully made from aluminium
- Easy assembly due to internal clamping screws and block assembly
- High friction torques
- High smoothness of running, application up to a peripheral speed of 40 m/s



Tack thread M_1 between clamping screws

Size	Torque [Nm] 1)				Dimensions [mm]									Clamping screws				Weight per hub with max. bore [kg]	Mass moment of inertia per hub with max. bore [kgm²]
	92 Sh A		98 Sh A																
	T_{KN}	T_{Kmax}	T_{KN}	T_{Kmax}	D_H 2)	d_H	L	l_1; l_2	l_3	E	b	s	a	M	Number z	T_A [Nm]	M_1		
24	35	70	60	120	55	27	78	30	22	18	14	2,0	3,0	M5	4	7	M5	0,162	0,78 x 10^{-4}
28	95	190	160	320	65	30	90	35	27	20	15	2,5	4,0	M5	8	7	M5	0,240	1,70 x 10^{-4}
38	190	380	325	650	80	38	114	45	35	24	18	3,0	4,0	M6	8	12	M6	0,490	5,17 x 10^{-4}
42	265	530	450	900	95	46	126	50	35	26	20	3,0	4,0	M8	4	30	M8	0,772	11,17 x 10^{-4}
48	310	620	525	1050	105	51	140	56	41	28	21	3,5	4,0	M10	4	59	M10	1,066	18,81 x 10^{-4}

1) Please note coupling selection on pages 104, 105, 117. 2) $ØD_H$ + 2 mm with high speeds for extension of spider.
In case of using the spider 64 Sh D-GS resp. short dimensioning we recommend the application of clamping ring hubs made of steel.

Size	Bore d_1/d_2 and the corresponding transmittable friction torques T_R of clamping ring hub in [Nm] 1)																	
	Ø14	Ø15	Ø16	Ø19	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32	Ø35	Ø38	Ø40	Ø42	Ø45	Ø48	Ø50	Ø55
24	47	57	67	98	110	127	139	175										
28				121	133	201	219	248	285	253	307	329						
38					203	304	331	394	452	453	543	550	609	669	634			
42								444	508	535	638	692	763	754	858	964	976	
48									572	638	762	842	929	943	1074	1208	1136	1336

The transmittable torques of the clamping connection consider the max. clearance with shaft fit k6 / bore H7. With bigger clearance the torque is reduced.

As shaft material – steel or spheroïdal iron with a yield point of approx. 250 N/mm² or more can be used.
If hollow shafts are used, the strength must be checked (see KTR mounting instructions, KTR Standard 45510 at our homepage www.ktr.com).

Order form:

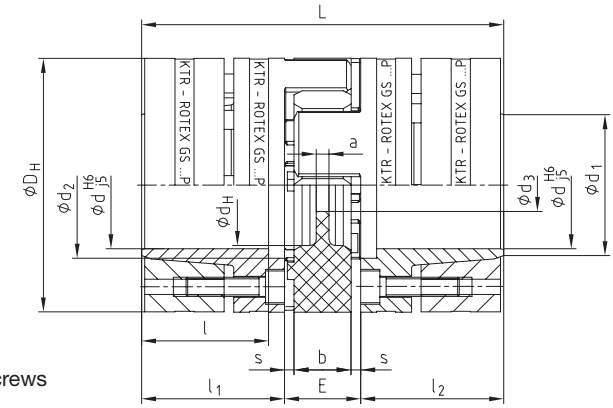
ROTEX® GS 24	98 Sh A-GS	6.0 light – Ø 24		6.0 light – Ø 20	
Coupling size	Spider hardness	Hub design	Finish bore	Hub design	Finish bore

ROTEX® GS

Backlash-free shaft coupling

Type P according to DIN 69002

- Backlash-free, highly accurate shaft coupling with integrated clamping system
- Developed specifically for stub spindles on multiple spindle heads according to DIN 69002
- Application on main spindle drives with high speeds, peripheral speeds of 50 m/s and more (please consult with KTR Engineering Department)
- For high friction torques (consider the selection in case of explosion protection use)
- Easy to assemble to due internal clamping screws
- Ⓔx Approved according to EC Standard 94/9/EC Certificate ATEX 95)



Tack thread M1
between clamping screws

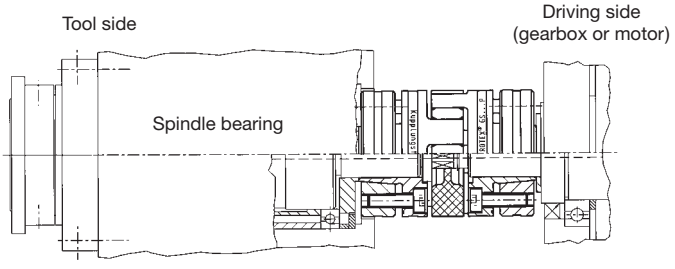
As shaft material – steel or spheroidal iron with a yield point of approx. 250 N/mm² or more can be used. If hollow shafts are used, the strength must be checked (see KTR mounting instructions, KTR Standard 45510 at our homepage www.ktr.com).

Size	Torque [Nm] 2)				Dimensions [mm] Hub and clamping ring material – steel (St-H)													Transmittable torque of clamping ring hub Ø d [Nm] 1)	Tightening torque of clamping screws T_A [Nm]	Weight per hub with bore Ø d norm [kg]	Mass moment of inertia J with bore Ø d norm [kgm²]
	98 Sh A-GS		64 Sh D-GS																		
	T_{KN}	T_{Kmax}	T_{KN}	T_{Kmax}	d 1)	D_H 3)	d_H	L	l_1; l_2	l	E	b	s	a	d_1	d_2	d_3				
14 P	12,5	25	16	32	14*	32	10,5	50	18,5	15,5	13	10	1,5	2	17	17	8,5	25	1,89	0,08	0,011·10⁻³
19 P 37,5	14	28	17	34	16*	37,5	18	66	25	21	16	12	2	3	20	19	9,5	60	3,05	0,16	0,037·10⁻³
19 P	17	34	21	42	19*	40	18	66	25	21	16	12	2	3	23	22	9,5	71	3,05	0,19	0,046·10⁻³
24 P 50	43	86	54	108	24*	50	27	78	30	25	18	14	2	3	28	29	12,5	108	4,9	0,331	0,136·10⁻³
24 P	60	120	75	150	25*	55	27	78	30	25	18	14	2	3	30	30	12,5	170	8,5	0,44	0,201·10⁻³
28 P	160	320	200	400	35*	65	30	90	35	30	20	15	2,5	4	40	40	14,5	506	8,5	0,64	0,438·10⁻³
38 P	325	650	405	810	40	80	38	114	45	40	24	18	3	4	46	46	16,5	821	14	1,32	1,325·10⁻³
42 P	450	900	560	1120	42	95	46	126	50	45	26	20	3	4	52	55	18,5	709	35	2,23	3,003·10⁻³
48 P	525	1050	655	1310	45	105	51	140	56	50	28	21	3,5	4	52	60	20,5	1340	69	3,09	5,043·10⁻³
55 P	685	1370	825	1650	50	120	60	160	65	58	30	22	4	4,5	55	72	22,5	1510	69	4,74	10,02·10⁻³

1) * Standard spindle shaft diameter · 2) Please note coupling selection on pages 104, 105, 117 · 3) Ø D_H + 2 mm with higher speed for expansion of spider

Selection for stub spindles

Spindle drive Size	ROTEX® GS P Size	Dimensions				
		d	D_H	l_1 / l_2	L	E
25 x 20	14 P	14	32	18.5	50	13
32k x 25	19 P37.5	16	37.5	25	66	16
32g x 30	19 P	19	40	25	66	16
40 x 35	24 P50	24	50	30	78	18
50 x 45	24 P	25	55	30	78	18
63 x 55	28 P	35	65	35	90	20



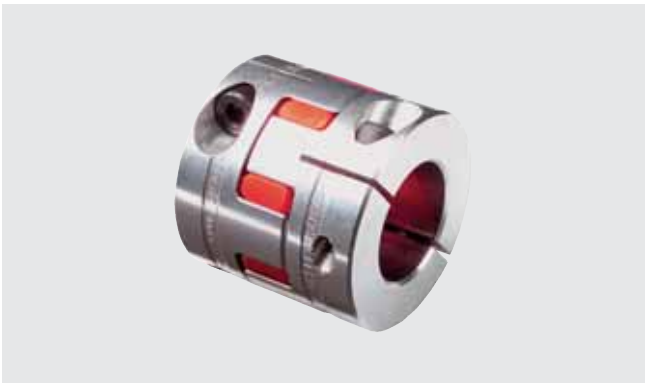
ROTEX® GS type P with central coolant supply for stub spindles and multiple spindle heads

Order form:

ROTEX® GS 24	P	98 Sh A-GS	6.0 – Ø 25		6.0 – Ø 25	
Coupling size	Type	Spider hardness	Hub design	Finish bore	Hub design	Finish bore

ROTEX® GS

Compact design

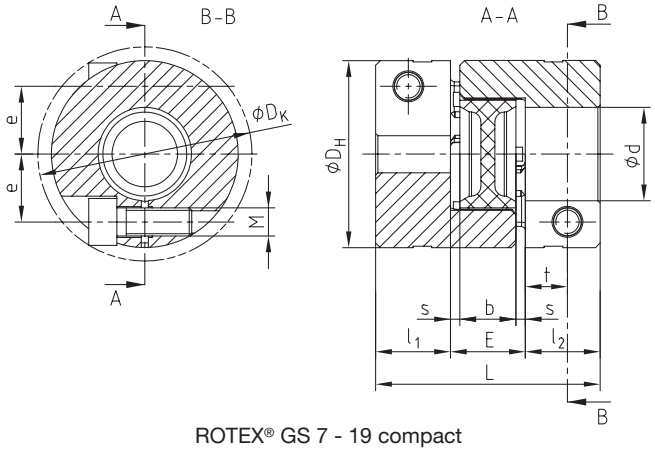


- Up to 1/3 shorter
- High performance

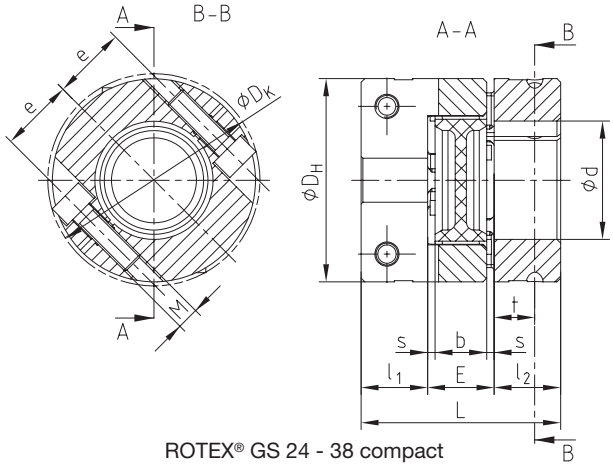
Design with axial slot, patent pending

- Good concentric running properties
- Uniform power transmission due to cams without slots
- Improved balancing quality

- Finish bore from Ø 6 mm also available with feather key acc. To DIN 6885 sheet 1 – JS9



ROTEX® GS 7 - 19 compact
single slotted [1] design 2.0



ROTEX® GS 24 - 38 compact
axially slotted design 2.8

Size	Torque [Nm]			Dimensions [mm]											T_A [Nm]
	92Sh A	98Sh A	64Sh D	$d_{max.}$	D_H	D_K	L	l_1, l_2	E	b	s	t	e	M	
7	1,2	2,0	2,4	7	14	16,6	18	5	8	6	1	2,5	5,0	M2	0,37
9	3,0	5,0	6	9	20	21,3	24	7	10	8	1	3,5	6,7	M2,5	0,76
12	5,0	9,0	12	12	25	26,2	26	7	12	10	1	3,5	8,3	M3	1,34
14	7,5	12,5	16	16 [2]	30	30,5	32	9,5	13	10	1,5	4,5	9,6	M4	2,9
19	10	17	21	24 [2]	40	45,0	50	17	16	12	2	9	14,0	M6	10
24	35	60	75	32	55	57,5	54	18	18	14	2	11	20,0	M6	10
28	95	160	200	35	65	69,0	62	21	20	15	2,5	12	23,8	M8	25
38	190	325	405	45	80	86,0	76	26	24	18	3	16	30,5	M10	49

Size	Bores and the corresponding transmittable torques of clamping hub design 2.0/2.8																									
	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8	Ø9	Ø10	Ø11	Ø12	Ø14	Ø15	Ø16	Ø18	Ø19	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32	Ø35	Ø38	Ø40	Ø42	Ø45
7	0,8	0,9	1,0	1,0	1,1																					
9		1,9	2,0	2,1	2,2	2,3	2,4																			
12		3,4	3,6	3,7	3,9	4,1	4,2	4,4	4,6	4,7																
14			7,1	7,4	7,7	8,0	8,2	8,5	8,8	9,1	5,8[2]	5,9[2]	6,1[2]													
19						24,3	25,0	25,7	26,3	27,0	28,4	29,0	29,7	31,1	31,7	32,4	25,0[2]									
24								21	23	25	30	32	34	38	40	42	51	53	59	63	68					
28											54	58	62	70	74	78	93	97	109	116	124	136				
38												92	99	111	117	123	148	154	173	185	197	216	234	247	259	278

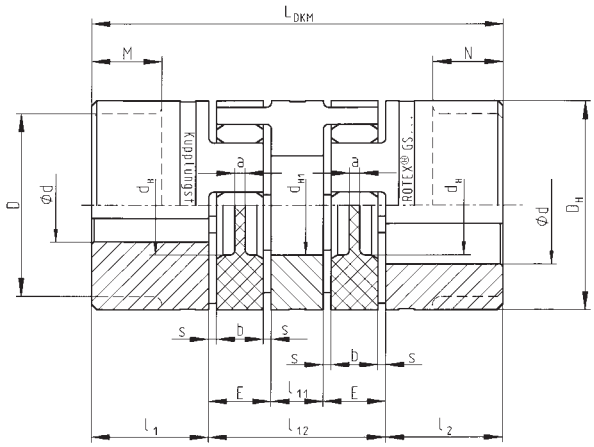
1) ROTEX® GS compact size 7 to 19 axially slotted on request
2) Size 14 with screw M3, size 19 with screw M5

Order form:

ROTEX® GS 38	Compact	98 Sh A-GS	Design 2.8	Ø 28	Design 2.8	Ø 45
Coupling size	Design	Spider	Hub design	Finish bore	Hub design	Finish bore

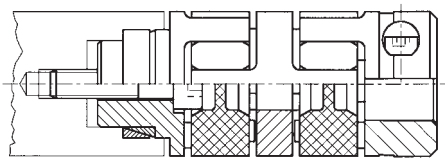
Design DKM double cardanic

- Backlash-free, double cardanic shaft connection
- Double cardanic design allowing for absorption of larger radial displacements
- Axial plug-in ability - easy blind assembly
- Maintenance-free
- Simple to check visually
- Finish bore according to ISO fit H7 (apart from clamping hub), keyway, from Ø 6 mm according to DIN 6885 sheet 1 - JS9
- Ⓔx Approved according to EC Standard 94/9/EC (Explosion Certificate ATEX 95)
- Hub designs see page 106

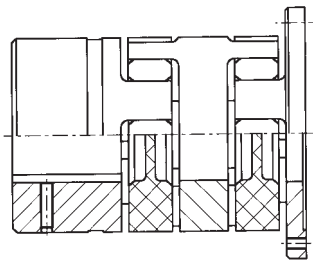


Size	Un-bored	Finish bore d_{min}	Finish bore d_{max}	D	D_H	d_H	d_{H1}	l_1; l_2	M; N	l_{11}	l_{12}	L_{DKM}	E	b	s	a
Hub material – Aluminium (Al-H) Spacer material – Aluminium (Al-H)																
5 DKM	●	2	5	–	10	–	–	5	–	3	13	23	5	4	0,5	4,0
7 DKM	●	3	7	–	14	–	–	7	–	4	20	34	8	6	1,0	6,0
9 DKM	●	4	9	–	20	7,2	–	10	–	5	25	45	10	8	1,0	1,5
12 DKM	●	4	12	–	25	8,5	–	11	–	6	30	52	12	10	1,0	3,5
14 DKM	●	4	15	–	30	10,5	–	11	–	8	34	56	13	10	1,5	2,0
19 DKM	●	6	24	–	40	18,0	18	25	–	10	42	92	16	12	2,0	3,0
24 DKM	●	8	28	–	55	27,0	27	30	–	16	52	112	18	14	2,0	3,0
28 DKM	●	10	38	–	65	30,0	30	35	–	18	58	128	20	15	2,5	4,0
38 DKM	●	12	45	–	80	38,0	38	45	–	20	68	158	24	18	3,0	4,0
Hub material – Steel (St-H) Spacer material – Aluminium (Al-H)																
42 DKM	●	14	55	85	95	46	46	50	28	22	74	174	26	20	3,0	4,0
48 DKM	●	15	62	95	105	51	51	56	32	24	80	192	28	21	3,5	4,0
55 DKM	●	20	74	110	120	60	60	65	37	28	88	218	30	22	4,0	4,5

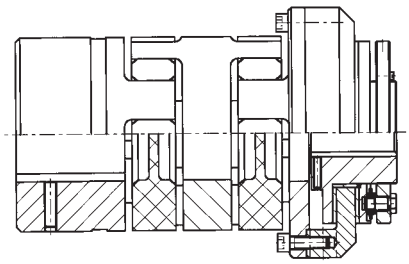
Other designs:



ROTEX® GS - DKM as hollow shaft design



ROTEX® GS - CF - DKM



ROTEX® GS - DKM in combination with torque limiter KTR-RU

Order form:

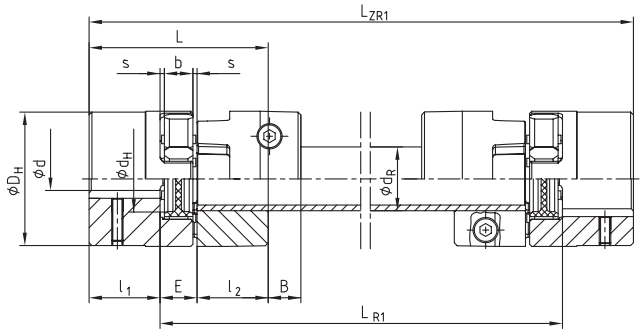
ROTEX® GS 38	DKM	92 Sh A-GS	1.0 – Ø 38		2.5 – Ø 32	
Coupling size	Design	Spider hardness	Hub design	Finish bore	Hub design	Finish bore

ROTEX® GS

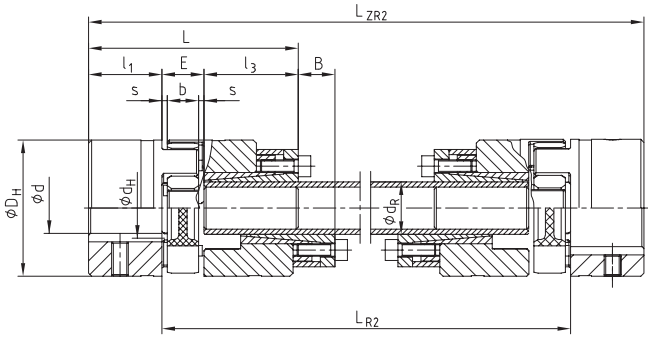
Intermediate shaft couplings

Design ZR1/ZR2

- Backlash-free intermediate shaft coupling
- Application, for example, on lifting spindle elements, parallel linear systems, overhead gantry robots, handling machines
- For connection of larger shaft distances and a maximum speed of 1500 1/min
- Spacer part to be disassembled radially
- Design ZR1 for torques up to the maximum friction torque of clamping hub, design ZR2 for higher torques
- Finish bore according to ISO fit H7 (apart from clamping hub), keyway, from Ø 6 mm according to DIN 6885 sheet 1 - JS9
- Hub designs see on page 106



Design ZR1



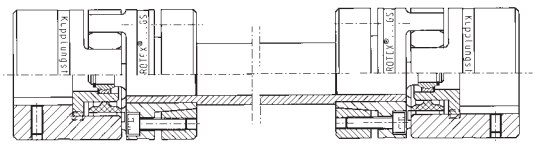
Design ZR2

Size	Finish bore			Dimensions [mm] ZR1										Cap screw DIN EN ISO 4762 – 8.8	Tightening torque	Friction torque
	Un-bored	d min	d max	D_H	l_1; l_2	L	E	b	s	B	L_{R1}	L_{R1} min.	L_{ZR1}	d_R	M x l	T_A [Nm]	T_R [Nm]
14 ZR1	●	4	15	30	11	35	13	10	1,5	11,5	please mention for inquiries and orders	71	L_{R1}+22	14x2,5	M3x12	1,34	6,1
19 ZR1	●	6	24	40	25	66	16	12	2,0	14,0		110	L_{R1}+50	20x3,0	M6x16	10,5	34
24 ZR1	●	8	28	55	30	78	18	14	2,0	16,0		128	L_{R1}+60	25x2,5	M6x20	10,5	45
28 ZR1	●	10	38	65	35	90	20	15	2,5	17,5		145	L_{R1}+70	35x4,0	M8x25	25	105
38 ZR1	●	12	45	80	45	114	24	18	3,0	21,0		180	L_{R1}+90	40x4,0	M8x30	25	123

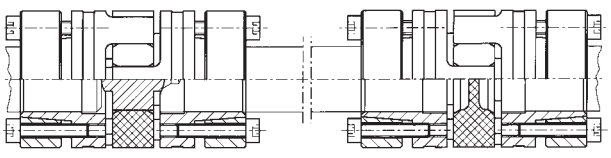
Size	Finish bore			Dimensions [mm] ZR2												CLAMPEX® KTR 250		
	Un-bored	d min.	d max.	D_H	l_1; l_2	l_3	L	E	b	s	B	L_{R2}	L_{R2} min.	L_{ZR2}	Precision tube d_R	Precision tube C_2 [Nm²/rad]	Clamping set size	Clamping screws DIN EN ISO 4762–12.9 µtot. = 0,14 M x l	Tightening torque T_A [Nm]
14 ZR2	●	4	15	30	11	26	50	13	10	1,5	11,5	please mention for inquiries and orders	109	L_{R2} + 22	10x2,0	68,36	10x16	M4x10	5,2
19 ZR2	●	6	24	40	25	26	67	16	12	2,0	14,0		120	L_{R2} + 50	12x2,0	130	12x18	M4x10	5,2
24 ZR2	●	8	28	55	30	38	86	18	14	2,0	16,0		156	L_{R2} + 60	20x3,0	954,9	20x28	M6x18	17,0
28 ZR2	●	10	38	65	35	45	100	20	15	2,5	17,5		177	L_{R2} + 70	25x2,5	1811	25x34	M6x18	17,0
38 ZR2	●	12	45	80	45	45	114	24	18	3,0	21,0		192	L_{R2} + 90	32x3,5	5167	32x43	M6x18	17,0
42 ZR2	●	14	55	95	50	52	128	26	20	3,0	23,0		214	L_{R2} + 100	40x4,0	11870	40x53	M6x18	17,0
48 ZR2	●	15	62	105	56	70	154	28	21	3,5	24,5		261	L_{R2} + 112	45x4,0	17486	45x59	M8x22	41,0
55 ZR2	●	20	74	120	65	80	175	30	22	4,0	26,0		288	L_{R2} +130	55x4,0	33543	55x71	M8x22	41,0
65 ZR2	●	22	80	135	75	80	185	35	26	4,5	30,5		387	L_{R2} + 150	60x4,0	44362	60x77	M8x22	41,0

1) For inquiries and orders please mention the shaft distance dimension L_{R1}/L_{R2} along with the maximum speed to review the critical whirling speed.

Other designs:



ROTEX® ZRG with bearing for higher speeds



ROTEX® GS ZR for vertical assembly

Order form:

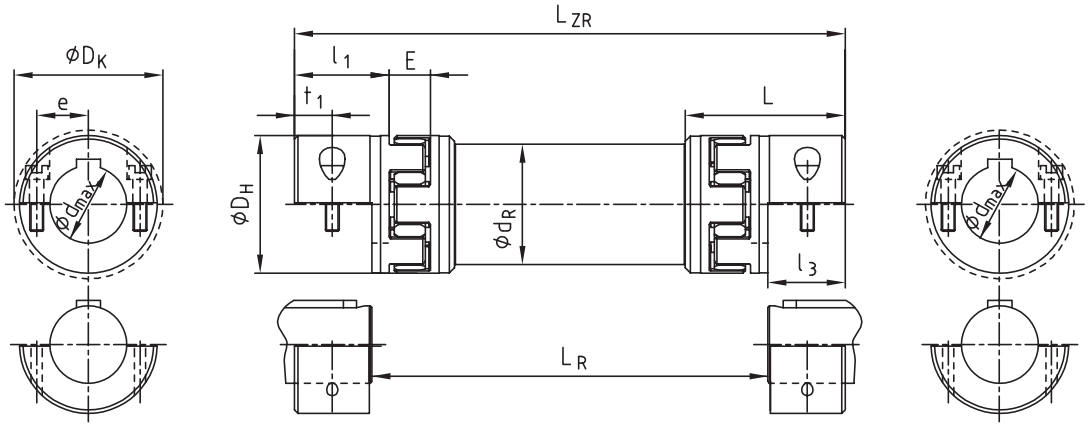
ROTEX® GS 24	ZR1	1200	98 Sh A-GS	1.0 – Ø 24		2.5 – Ø24	
Coupling size	Design	Shaft distance dimension [L_{R1}/L_{R2}]	Spider hardness	Hub design	Finish bore	Hub design	Finish bore

ROTEX® GS

Intermediate Shaft Couplings with Aluminium Tube

Design ZR3

- Use with lifting machines, in handling units, robotic palletisers etc.
- Easy, radial coupling assembly because of split coupling hub
- Exchange of spiders without displacing the drive and driven side
- Lengths are possible up to 4 m without intermediate bearing dependent on speed and size
- Positive and frictionally engaged torque transmission
- Low mass moment of inertia due to use of aluminium
- Can be combined with other hub forms (clamping or clamping ring hubs)
- Finish bore according to ISO fit H7, keyway according to DIN 6885 sheet 1 - JS9



ROTEX® GS Size	Dimensions [mm]																
	Finish bore		General													Capscrew DIN EN ISO 4762	
	$d_{min.}$	$d_{max.}$	D_H	l_1	L	l_3	E	L_R min.	L_R max.	L_{ZR} min.	L_{ZR} max.	d_R	D_K	t_1	e	8.8	T_A [Nm]
19	8	20	40	25	49,0	17,5	16	98	2965	133	3000	40	46	8,0	14,5	M 6	10
24	10	28	55	30	59,0	22,0	18	113	3456	157	3500	50	57,5	10,5	20	M 6	10
28	14	38	65	35	67,0	25,0	20	131	3950	181	4000	60	73	11,5	25	M 8	25
38	18	45	80	45	83,5	33,0	24	163	3934	229	4000	70	83,5	15,5	30	M 8	25
42	22	50	95	50	93,0	36,5	26	180	3927	253	4000	80	93,5	18,0	32	M10	49
48	22	55	105	56	103,0	39,5	28	202	3921	281	4000	100	105	18,5	36	M12	86

ROTEX® GS Size 98 Sh A-GS	Coupling torques [Nm]		Mass moment of intertia [10^3 kgm²]			stat. torsion spring stiffness	ROTEX® GS Size 98 Sh A-GS	Coupling torques [Nm]		Mass moment of intertia [10^3 kgm²]			stat. torsion spring stiffness
	T_{KN}	$T_{K\,max.}$	GTS-hub [1] J_1	ZR-hub J_2	Pipe/ meter J_3	ZW [2] C_2 [Nm²/rad]		T_{KN}	$T_{K\,max.}$	GTS-hub [1] J_1	ZR-hub J_2	Pipe/ meter J_3	ZW [2] C_2 [Nm²/rad]
19	17	34	0,02002	0,01304	0,329	3243,6	**38**	325	650	0,50385	0,2572	2,972	29290,4
24	60	120	0,07625	0,04481	0,673	6631,8	**42**	450	900	1,12166	0,5523	4,560	44929,7
28	160	320	0,17629	0,1095	1,199	11814,1	**48**	525	1050	1,87044	1,1834	9,251	91158,2

ROTEX® GS Size	Bores and the corresponding transmittable friction torques of split hub without keyway [mm]																								
	Ø 8	Ø 10	Ø 11	Ø 14	Ø 15	Ø 16	Ø 18	Ø 19	Ø 20	Ø 22	Ø 24	Ø 25	Ø 28	Ø 30	Ø 32	Ø 35	Ø 38	Ø 40	Ø 42	Ø 45	Ø 46	Ø 48	Ø 50	Ø 55
19	17	21	23	30	32	34	38	40	42															
24		21	23	30	32	34	38	40	42	47	51	53	59											
28				54	58	62	70	74	78	86	93	97	109	117	124	136	148							
38							70	74	78	86	93	97	109	117	124	136	148	156	163	175				
42										136	149	155	174	186	198	217	235	248	260	279	285	297	310	
48										199	217	226	253	271	290	317	344	362	380	407	416	434	452	498

1) At $d_{max.}$ 2) Torsional spring stiffness with an intermediate pipe of a length of 1 m, L_{Pipe} being = L_{ZR} - 2 . L

For enquiries and orders please mention the shaft distance dimension L_R along with the maximum speed to review the critical speed.

Order form:

ROTEX® GS 24	ZR3	1200 mm	98 Sh A-GS	7.5 – Ø 24 mm		7.5 – Ø 24 mm	
Coupling size	Type	Shaft distance dimension [L_R]	Spider hardness	Hub design without keyway	Finish bore	Hub design without keyway	Finish bore

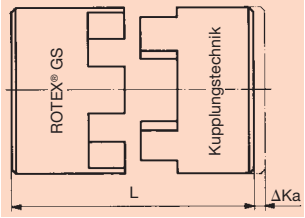
ROTEX® GS

Backlash-free shaft coupling

Displacements

Due to its design the ROTEX® GS is able to absorb axial, angular and radial misalignment, without causing any wear or premature failure of the coupling. As the spider is only stressed under pressure it is ensured that the coupling will remain backlash-free even after a longer operation period.

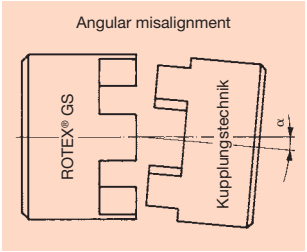
Axial misalignment



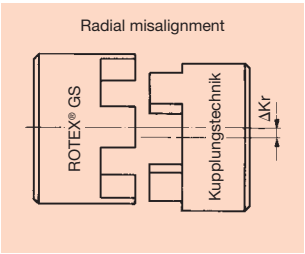
As an example, axial misalignment may be produced by different tolerances of the connecting elements during the assembly or by alteration of the shaft length if fluctuation of temperature occurs.
As the shaft bearings usually cannot be axially stressed to a big extent, it is the task of the coupling to compensate for this axial misalignment and to keep the reaction forces low.

In case of pure angular misalignment the imagined bisecting lines of the shafts intersect in the middle of the coupling. Up to a certain permissible extent this displacement can be absorbed by the coupling without any danger of extensive restoring forces.

Angular misalignment



Radial misalignment



Radial misalignment results from parallel displacement of the shafts towards each other, caused by different tolerances at the centerings or by mounting of the power packs on different levels.

Due to the kind of misalignment the largest restoring forces are produced here, consequently causing the highest stresses for the adjacent components.

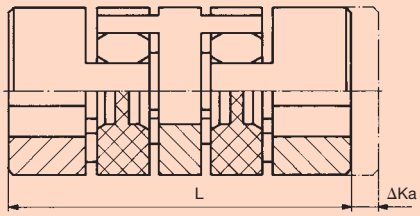
In case of larger displacements (especially radial displacements) the ROTEX® GS DKM double cardanic design should be applied in order to avoid excessive restoring forces.

ROTEX® GS Size	GS spider	Displacement standard design [mm] Axial ΔKa[2)]	[mm] Radial ΔKr	[degrees] Angular α	Displacements DKM [mm] Axial ΔKa[2)]	[mm] Radial ΔKr	[degrees] Angular α
	70		0,14	1,2°		0,17	1,2°
	80	+ 0,4	0,12	1,1°	+ 0,4	0,15	1,1°
5	92	– 0,2	0,06	1,0°	– 0,4	0,14	1,0°
	98		0,04	0,9°		0,13	0,9°
	80		0,15	1,1°		0,23	1,1°
	92	+ 0,6	0,10	1,0°	+ 0,6	0,21	1,0°
7	98	– 0,3	0,06	0,9°	– 0,6	0,19	0,9°
	64		0,04	0,8°		0,17	0,8°
	80		0,19	1,1°		0,29	1,1°
	92	+ 0,8	0,13	1,0°	+ 0,8	0,26	1,0°
9	98	– 0,4	0,08	0,9°	– 0,8	0,24	0,9°
	64		0,05	0,8°		0,21	0,8°
	80		0,20	1,0°		0,35	1,1°
	92	+ 0,9	0,14	1,0°	+ 0,9	0,32	1,0°
12	98	– 0,4	0,08	0,9°	– 0,9	0,29	0,9°
	64		0,05	0,8°		0,25	0,8°
	80		0,21	1,1°		0,40	1,1°
	92	+ 1,0	0,15	1,0°	+ 1,0	0,37	1,0°
14	98	– 0,5	0,09	0,9°	– 1,0	0,33	0,9°
	64		0,06	0,8°		0,29	0,8°
	80		0,15	1,1°		0,49	1,1°
	92	+ 1,2	0,10	1,0°	+ 1,2	0,45	1,0°
19	98	– 0,5	0,06	0,9°	– 1,0	0,41	0,9°
	64		0,04	0,8°		0,36	0,8°
	92	+ 1,4	0,14	1,0°	+ 1,4	0,59	1,0°
24	98	– 0,5	0,10	0,9°	– 1,0	0,53	0,9°
	64		0,07	0,8°		0,47	0,8°
	92	+ 1,5	0,15	1,0°	+ 1,5	0,66	1,0°
28	98	– 0,7	0,11	0,9°	– 1,4	0,60	0,9°
	64		0,08	0,8°		0,53	0,8°
	92	+ 1,8	0,17	1,0°	+ 1,8	0,77	1,0°
38	98	– 0,7	0,12	0,9°	– 1,4	0,69	0,9°
	64		0,09	0,8°		0,61	0,8°
	92	+ 2,0	0,19	1,0°	+ 2,0	0,84	1,0°
42	98	– 1,0	0,14	0,9°	– 2,0	0,75	0,9°
	64		0,10	0,8°		0,67	0,8°
	92	+ 2,1	0,23	1,0°	+ 2,1	0,91	1,0°
48	98	– 1,0	0,16	0,9°	– 2,0	0,82	0,9°
	64		0,11	0,8°		0,73	0,8°
	92	+ 2,2	0,24	1,0°	+ 2,2	1,01	1,0°
55	98	– 1,0	0,17	0,9°	– 2,0	0,91	0,9°
	64		0,12	0,8°		0,81	0,8°
65	95	+ 2,6	0,18	0,9°	–	–	–
	64	– 1,0	0,13	0,8°			
75	95	+ 3,0	0,21	0,9°	–	–	–
	64	– 1,5	0,15	0,8°			

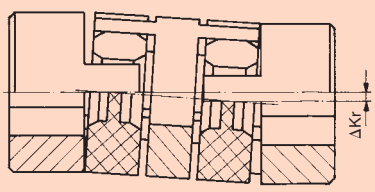
2) The Ka figures mentioned above have to be added to the length of the corresponding coupling type.

Shaft misalignment ROTEX® GS … DKM

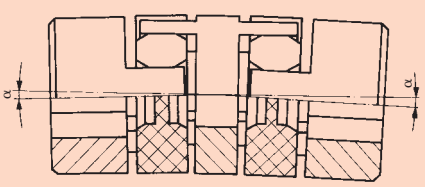
Axial misalignment



Radial misalignment



Angular misalignment



This design reduces the restoring forces arising with radial misalignment to a minimum, due to the double-jointed operation, additionally the coupling is able to compensate for higher axial and angular misalignment.

The above-mentioned permissible displacement figures of the flexible ROTEX® GS couplings are standard values, taking into account the coupling load up to the rated torque T_{KN} of the coupling and an operating speed n = 1500 min^{-1} along with an ambient temperature of + 30 °C.

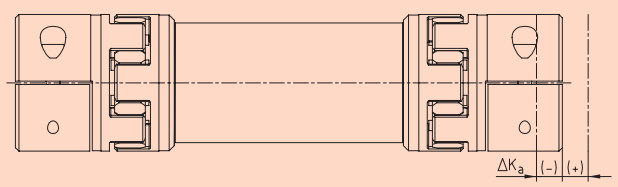
The displacement figures may, in each case, merely be used individually - if they occur simultaneously they may only be used proportionately. The ROTEX® GS-couplings are in a position to compensate for radial and angular displacements. Careful and accurate alignment of the shafts increases the service life of the coupling.

ROTEX® GS

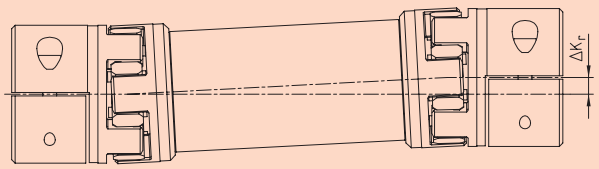
Design ZR1-ZR3

Displacements and technical data

Axial displacements

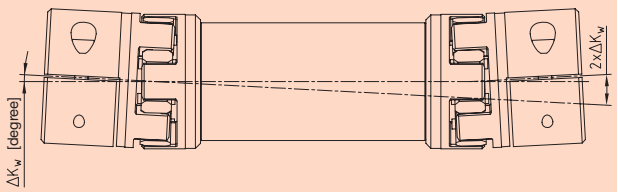


Radial displacements



$$\Delta K_r = (L_{ZR} - 2 \cdot l_1 - E) \cdot \tan \alpha$$

Angular displacements



ROTEX® GS Size 98Sh A-GS	Displacements		
	[mm] Axial ΔK_a	[mm] Radial ΔK_r 1)	[degrees] Angular α
14	+1,0 / -1,0	15,16	0,9°
19	+1,2 / -1,0	14,67	0,9°
24	+1,4 / -1,0	14,48	0,9°
28	+1,5 / -1,4	14,30	0,9°
38	+1,8 / -1,4	13,92	0,9°
42	+2,0 / -2,0	13,73	0,9°
48	+2,1 / -2,0	13,51	0,9°
55	+2,2 / -2,0	13,19	0,9°
65	+2,6 / -2,0	12,80	0,9°

1) Radial displacements based on coupling length L_{ZR} = 1000 mm

2) $L = L_{ZR} - 2 \cdot l_2$

Calculation of total torsion spring stiffness:

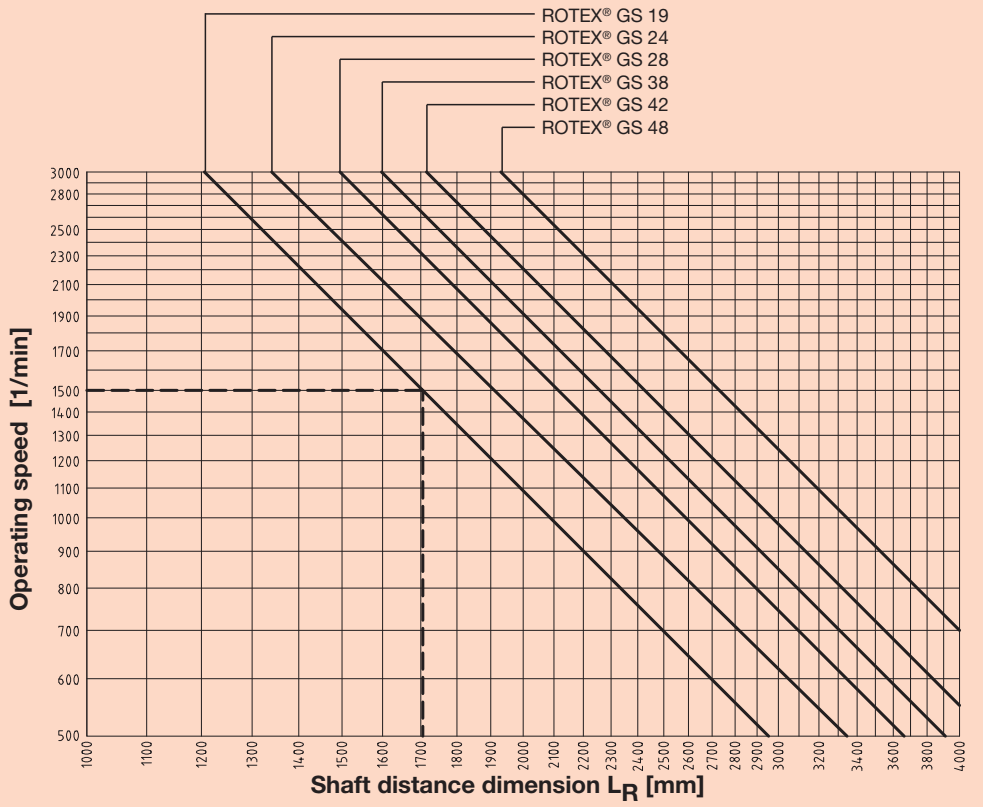
$$C_{total} = \frac{1}{2 \cdot \frac{1}{C_1} + \frac{L_{pipe}}{C_2}} \quad [Nm/rad]$$

$$\text{with } L_{pipe} = \frac{L_{ZR} - 2 \cdot L}{1000} \quad [m]$$

C_1 = torsion spring stiffness for spider page 104

C_2 = from table page 115/116

Chart of critical speeds for design ZR3



Example:

ROTEX® GS 19
Operating speed: 1500 1/min
Max. permissible shaft distance dimension: 1700 mm
Operating speed = n_{krit}/1,4

For advanced drive technology KTR

TOOLFLEX®

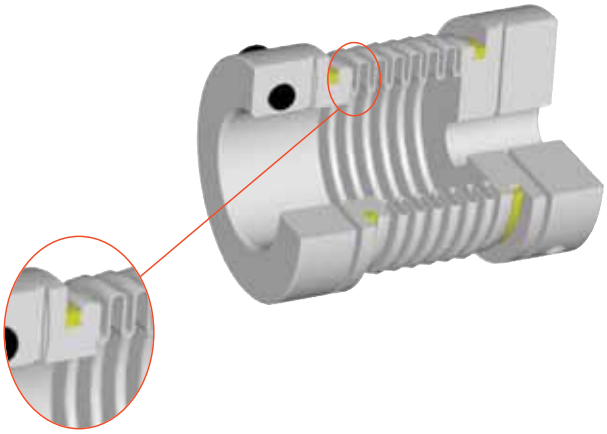
Backlash-free torsionally rigid metal bellow-type couplings

TOOLFLEX® Metal bellow-type couplings

Backlash-free, torsionally stiff and maintenance-free coupling

The **TOOLFLEX**® is a coupling system that has proven successfully many times (metal bellow-type coupling). Its most important features are the good compensation for displacements (axial, radial and angular), the high torsional stiffness as well as the easy and fast assembly of the clamping hub.

Examples of applications:
Machine tools, positioning systems (e. g. ball roll spindles with high pitch), indexing tables, planet gears with low transmissions for precise positioning



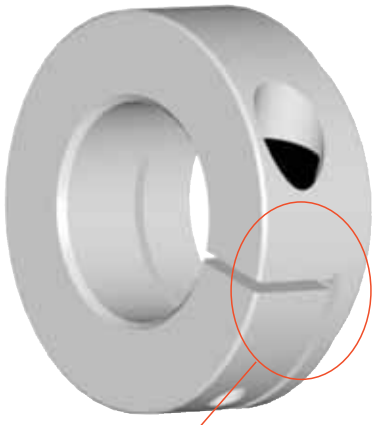
Proven joint procedure, ensuring:

- non-positive, backlash-free connection of the aluminium hubs with the multilayer bellows made from stainless steel
- safe torque transmission of „every“ bellow layer into the hub
- fatigue strength in high temperature ranges up to max. 280 °C and in case of influences of media or critical operating conditions

Proven shaft-hub connection

Clamping hubs with two slots, ensuring:

- easy assembly of the clamping hubs through radial clamping screw
- no deformation of the bellow when tightening the clamping screw by two slots in the hub
- bore tolerance „F7“ for easier assembly onto the shaft



clamping hub with two slots

TOOLFLEX® Metal bellow-type couplings

Backlash-free, torsionally stiff and maintenance-free coupling

Coupling selection

Normally the **TOOLFLEX®** is selected according to the nominal torque (T_{KN}) shown in the list of technical data, like all other coupling systems. In all cases the torque (T_{KN}) must exceed the maximum torque to be transmitted. This should mainly be considered in connection with servo motors because their accelerating torques both positive and negative can exceed the nominal torque of the coupling by a significant amount.

Judgement calculation

$$T_{AS}\ [Nm] = 9550 \cdot \frac{P_{max}}{n}$$

$$T_{KN}\ [Nm] \geq T_{AS/LS} \cdot k$$

P_{max} = max. engine performance [kW]
n = engine speed [min^{-1}]
T_{AS} = peak torque of the engine [Nm]
T_{LS} = peak torque of load side [Nm]
k = operating factor

k = 1.5 with uniform movement, k = 2 with ununiform movement, k = 2.5 - 4 with shocking movement

For drives in machine tools (servo motors) k values of 1.5 - 2 must be used.

When selecting servo motors the calculations are made with the torque values of the engine suppliers and not with P_{max}. When dimensioning the coupling please use the respective data of the manufacturer considering the servo controller to be used.

Accelerating torque (drive side / load side)

$$T_{KN} > T_S$$

$$T_S = T_{AS} \cdot m_A \cdot k \qquad T_S = T_{LS} \cdot m_L \cdot k$$

$$m_A = \frac{J_L}{J_A + J_L} \qquad m_L = \frac{J_A}{J_A + J_L}$$

T_S = accelerating torque (drive or driven side)
m_A = drive-side shock
m_L = driven-side shock
J_A = moment of inertia of the drive side
J_L = moment of inertia of the driven side

Torsional stiffness

Transmission error of the metal bellow due to torsional strain

$$\varphi = \frac{180 \cdot T_{AS}}{\pi \cdot C_T}$$

φ = torsional angle [degrees]
C_T = torsional stiffness of the coupling [m/rad]

Natural frequency

The natural frequency of the coupling must be above or below the frequency of the unit. Valid for the mechanical spare model of the 2-mass-system:

$$f_e = \frac{1}{2 \cdot \pi} \sqrt{C_T \cdot \frac{J_L + J_A}{J_L \cdot J_A}}\ [Hz]$$

f_e = frequency of the 2-mass-system [s^{-1}]
f_r = exciting frequency of the drive [s^{-1}]

Valid in practice: $f_e \geq 2 \cdot f_r$

Note:

In case of values exceeding T_{KN} only limited alternating load figures are possible. In this torque range there can be remaining deformations of the bellow and fatigue fractures can occur.

Basic programme

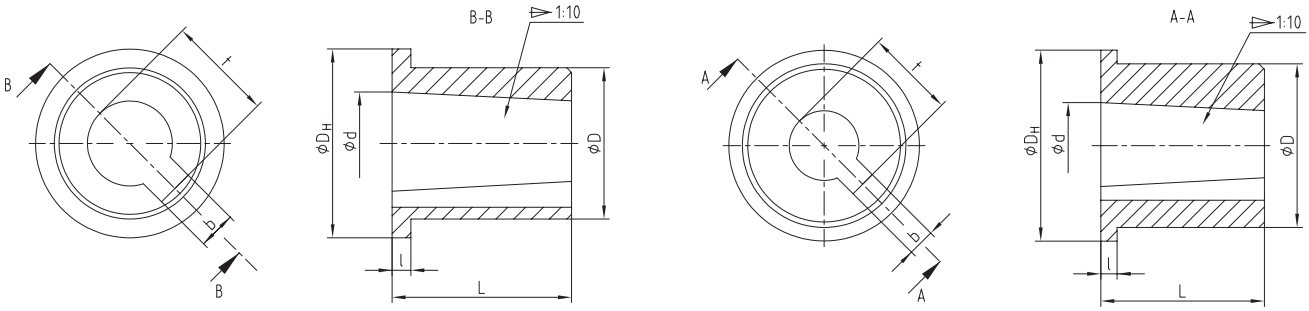
Basic programme TOOLFLEX® miniature

Size	Hub design	Finish bore [mm] according to ISO fit F7														
		Ø2	Ø3	Ø4	Ø5	Ø6	Ø6,35	Ø7	Ø8	Ø9	Ø9,5	Ø10	Ø11	Ø12	Ø14	Ø16
5	1.1	●	●	●	●											
7	1.1		●	●	●	●		●	●							
	2.5		●	●	●	●	●	●								
9	1.1			●	●	●		●	●	●		●				
	2.5		●	●	●	●	●	●	●	●						
12	1.1				●	●		●	●			●				
	2.5				●	●	●		●	●		●	●	●		

Basic programme TOOLFLEX® M and S

Size	Pilot bore	Finish bore [mm] according to ISO fit F7																														
		Ø5	Ø6	Ø6,35	Ø7	Ø8	Ø9	Ø10	Ø11	Ø12	Ø14	Ø15	Ø16	Ø18	Ø19	Ø20	Ø22	Ø24	Ø25	Ø28	Ø30	Ø32	Ø35	Ø38	Ø40	Ø42	Ø45	Ø48	Ø50	Ø55
16	●	●	●	●	●	●	●	●	●	●	●		●																			
20	●							●	●	●	●	●	●	●	●	●																	
30	●										●	●	●	●	●	●	●	●	●	●													
38	●														●	●	●	●	●	●	●	●	●	●									
45	●																		●	●	●	●	●	●	●	●	●						
55	●																					●	●	●	●	●	●	●	●	●			

Type M and S sleeve dimensions for FANUC engines



Size 1 Size 2

Sleeve size	Dimensions [mm]								Notice
	L	l	D_H	D	$d^{+0,05}$	b^{JS9}	$t^{+0,1}$	Taper	
1	16	2	20	16	10,9	4	12,2	1:10	For TOOLFLEX® size 16-20
2	30	3	35	30	15,8	5	17,9	1:10	For TOOLFLEX® size 30-45

Basic programme TOOLFLEX® KN

Size	Pilot bore	Finish bore [mm] according to ISO fit F7																
		Ø14	Ø15	Ø16	Ø18	Ø19	Ø20	Ø22	Ø24	Ø25	Ø28	Ø30	Ø32	Ø35	Ø38	Ø40	Ø42	Ø45	Ø48
30	●	●	●	●	●	●	●	●											
38	●	●	●	●	●	●	●	●	●	●	●								
45	●				●	●	●	●	●	●	●	●	●	●	●				
55	●										●	●	●	●	●	●	●	●	●

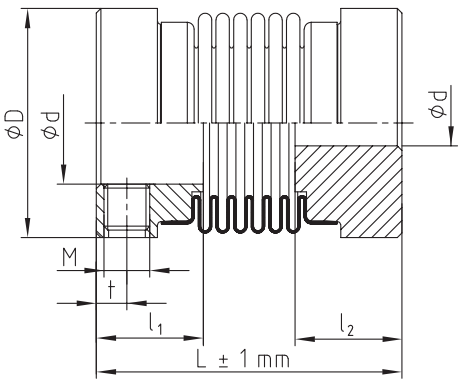
● Standard bore
Further dimensions on request

TOOLFLEX® Metal bellow-type couplings

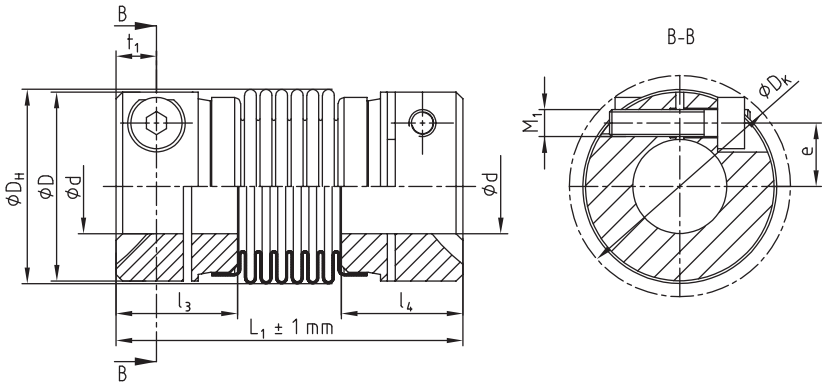
Backlash-free, torsionally stiff and maintenance-free coupling

Miniature couplings

- Backlash-free, torsionally stiff
- Maintenance-free
- Low mass moment of inertia
- Easy assembly due to tolerance F7
- Temperature range - 30 °C to + 100 °C
- Finish bore from Ø 6 mm also available with feather key acc. To DIN 6885 sheet 1 – JS9



TOOLFLEX® Type 1.1



TOOLFLEX® Type 2.5

TOOLFLEX®		Technical data of type with fixing screw (type 1.1)													
		Torque	Dimensions [mm]								Perm. displacements			Torsional stiffness	Weight [4]
			Finish bore		General			Fixing screw							
Size	Design[1/2]	T_{KN} [Nm]	$d_{min.}$	$d_{max.}$	D_H	L	l_1; l_2	M	t	number[3] z	Axial [mm]	Radial [mm]	Angular [degrees]	[Nm/rad]	[kg]
5	S	0,1	2	5	10	15 [1]	6	M2	1,8	1	0,30	0,10	0,7	97	0,0027
	M					17 [2]					0,40	0,15	1,0	75	0,003
7	S	1,0	3	8	15	18 [1]	7	M3	2,0	1	0,30	0,10	0,7	390	0,005
	M					20 [2]					0,40	0,15	1,0	300	0,006
9	S	1,5	4	10	20	21 [1]	8	M3	2,5	2	0,35	0,15	1,0	750	0,010
	M					24 [2]					0,50	0,20	1,5	580	0,011
12	S	2,0	5	14	25	27,5 [1]	11	M4	2,8	2	0,40	0,15	1,0	1270	0,017
	M					31 [2]					0,60	0,20	1,5	980	0,019

Circumferential speed v_{max}= 25 m/s

TOOLFLEX®		Technical data of type with clamping screw (type. 2.5)														
		Torque	Dimensions [mm]										Perm. displacements			Torsional stiffness	Weight [4]
			Finish bore		General			Clamping screw									
Size	Design[1/2]	T_{KN} [Nm]	$d_{min.}$	$d_{max.}$	D_H	L_1	l_3; l_4	M_1	t_1	e	D_K	T_A [Nm]	Axial [mm]	Radial [mm]	Angular [degrees]	[Nm/rad]	[kg]
7	S	1,0	3	7	15	24 [1]	9	M2	3,2	5,0	16,5	0,37	0,3	0,1	0,7	390	0,007
	M					26 [2]							0,4	0,15	1,0	300	0,008
9	S	1,5	3	9	20	30 [1]	11	M2,5	3,5	7,1	21,5	0,76	0,35	0,15	1,0	750	0,014
	M					33 [2]							0,5	0,2	1,5	580	0,015
12	S	2,0	4	12	25	34,5 [1]	13	M3	4,0	8,5	26,5	1,34	0,4	0,15	1,0	1270	0,025
	M					38 [2]							0,6	0,2	1,5	980	0,027

1) Design S = 4 shafts 2) Design M = 6 shafts 3) Quantity each hub, from size 9: 2x120° offset
4) Figures refer to the complete coupling with max. bores
Circumferential speed v_{max}= 20 m/s

Note:
The coupling must be selected in a way that the nominal torque exceeds the maximum torque to be transmitted (accelerating or peak torque). In case of values exceeding T_{KN} (collision, trouble) only limited alternating load figures are possible. In this torque range there can be permanent deformation of the bellow and fatigue fractures can occur.

Order form:

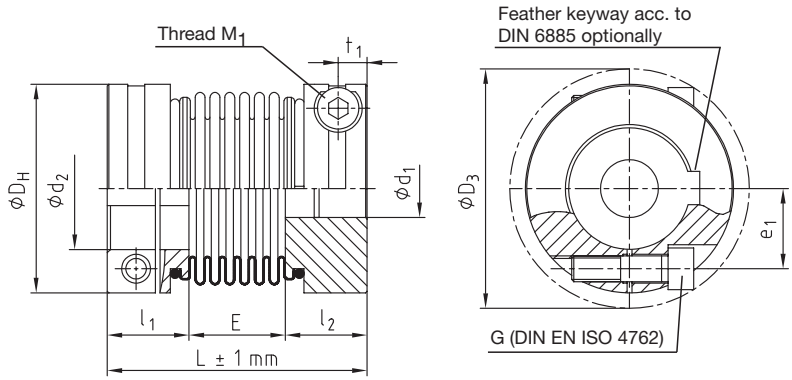
TOOLFLEX® 7 M	2.5	d - Ø4	2.5	d - Ø6
Coupling size	Hub design	Finish bore component 1	Hub design	Finish bore component 2

TOOLFLEX® Metal bellow-type couplings

Backlash-free, torsionally stiff and maintenance-free coupling

Type M

- Backlash-free, torsionally stiff
- Non-positive bellow-hub connection
- Frictionally engaged clamping hubs
- Maintenance-free
- Suitable for high temperatures due to flanged insert connection (max. 280 °C)
- Well-resistant to corrosion due to bellow made from stainless steel and aluminium clamping hubs
- Finish bore from Ø 6 mm also available with feather key acc. To DIN 6885 sheet 1 – JS9



TOOLFLEX® Size	Dimensions [mm]										
	Finish bore		General				Clamping screws				
	$d_{min.}$	$d_{max.}$	L	l_1; l_2	E	D_H	M_1	D_3	t_1	e_1	T_A [Nm]
16	5	16	49	17,0	15	32	M4	35,0	5	12,0	2,9
20	8	20	62	21,5	19	40	M5	43,5	6	14,5	6
30	10	30	72	23,0	26	55	M6	58,0	7	19	10
38	14	38	81	25,5	30	65	M8	72,6	9	25	25
45	14	45	103	32,0	39	83	M10	89,0	11	30	49
55 [3]	20	55	125	40,0	45	100	M12	106,0	14	37	120

TOOLFLEX® Size	Torque T_{KN} [Nm]	Speed n [1] [min^{-1}]	Technical data							
			Moment of inertia [2] [$x10^{-6}kgm^2$]	Torsional stiffness [Nm/rad]	Axial spring stiffness [N/mm]	Radial spring stiffness [N/mm]	Perm. displacements			Mass [2] [$x10^{-3}kg$]
							Axial [mm]	Radial [mm]	Angular [degrees]	
16	5	14900	7	3050	29	92	±0,5	0,20	1,5	61
20	15	11950	31	6600	42	126	±0,6	0,20	1,5	144
30	35	8700	117	14800	65	155	±0,8	0,25	2,0	306
38	65	7350	254	24900	72	212	±0,8	0,25	2,0	448
45	150	5750	1011	64000	88	492	±1,0	0,30	2,0	1125
55 [3]	340	4800	5157	96100	107	598	±1,0	0,30	2,0	3300

TOOLFLEX® Size	Bore range and respective torques of frictional engagement of the clamping hub [Nm]																								
	Ø5	Ø6	Ø7	Ø8	Ø9	Ø10	Ø11	Ø12	Ø14	Ø15	Ø16	Ø18	Ø19	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32	Ø35	Ø38	Ø40	Ø42	Ø45	Ø50	Ø55
16	8,5	8,8	9,1	9,4	9,7	9,9	10,2	10,5	11,1	11,4	11,7															
20				17,6	18,1	18,6	19,0	19,5	20,5	21,0	21,4	22,4	22,9	23,3												
30							33	34	35	36	36,4	38	38,5	39	42	42,5	44,5	46								
38												84	85	87	92	93	97	99	101	105	109					
45														157	165	167	173	177	181	187	193	197	200	206		
55 [3]															397	401	413	421	429	441	453	462	470	482	502	522

1) With v= 25 m/s 2) Figures refer to the complete coupling with max. bores 3) Hubs from steel welded with bellow

Note:
The coupling must be selected in a way that the nominal torque exceeds the maximum torque to be transmitted (accelerating or peak torque). In case of values exceeding T_{KN} (collision, trouble) only limited alternating load figures are possible. In this torque range there can be permanent deformation of the bellow and fatigue fractures can occur.

Order form:

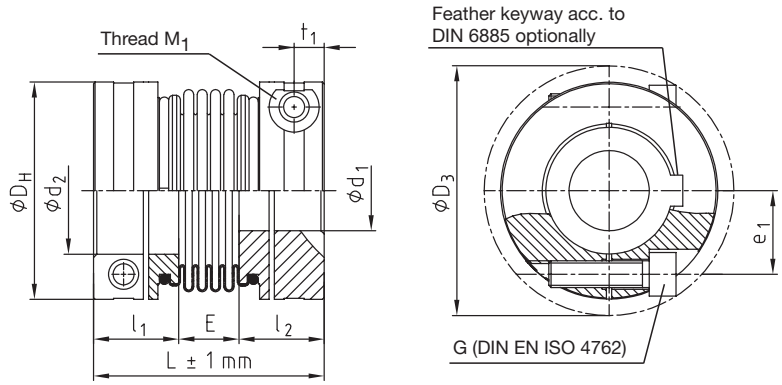
TOOLFLEX® 30 M	d_1 - Ø25	d_2 - Ø30
Coupling size	Finish bore Component 1	Finish bore Component 2

TOOLFLEX® Metal bellow-type couplings

Backlash-free, torsionally stiff and maintenance-free coupling

Type S

- Short design
- Higher stiffness of torsion spring
- Lower mass moment of inertia
- Finish bore from Ø 6 mm also available with feather key acc. To DIN 6885 sheet 1 – JS9



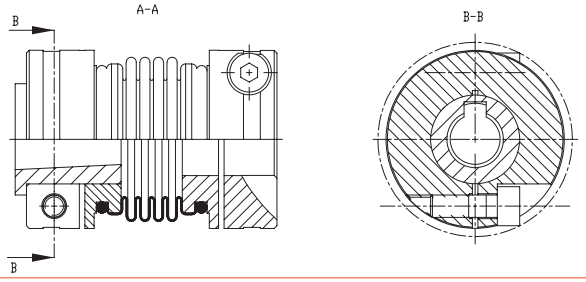
TOOLFLEX® Size	Dimensions [mm]										
	Finish bore		General				Clamping screws				
	$d_{min.}$	$d_{max.}$	L	l_1; l_2	E	D_H	M_1	D_3	t_1	e_1	T_A [Nm]
16	5	16	45	17,0	11	32	M4	35,0	5	12,0	2,9
20	8	20	55	21,5	12	40	M5	43,5	6	14,5	6
30	10	30	63	23,0	17	55	M6	58,0	7	19	10
38	14	38	69	25,5	18	65	M8	72,6	9	25	25
45	14	45	86,5	32,0	22,5	83	M10	89,0	11	30	49
55 [3]	20	55	111	40,0	31	100	M12	106,0	14	37	120

TOOLFLEX® Size	Torque	Speed	Technical data							
							Perm. displacements			Mass [2]
	T_{KN} [Nm]	n [1] [min^{-1}]	Moment of inertia [2] [$x10^{-6}kgm^2$]	Torsional stiffness [Nm/rad]	Axial spring stiffness [N/mm]	Radial spring stiffness [N/mm]	Axial [mm]	Radial [mm]	Angular [degrees]	[$x10^{-3}kg$]
16	5	14900	10	4500	43	138	±0,3	0,15	1,0	61
20	15	11950	30	9600	63	189	±0,4	0,15	1,0	121
30	35	8700	114	17800	97	233	±0,5	0,20	1,5	243
38	65	7350	243	37400	108	318	±0,6	0,20	1,5	351
45	150	5750	933	95800	132	738	±0,9	0,25	1,5	824
55 [3]	340	4800	5036	144100	160	894	±1,0	0,25	1,5	3213

1) With v= 25 m/s 2) Figures refer to the complete coupling with max. bores 3) Hubs from steel welded with bellow

Info:
Torques of frictional engagement of the clamping hub shown under Type M (page 124)

Other designs: Type for FANUC-Motors



Order form:

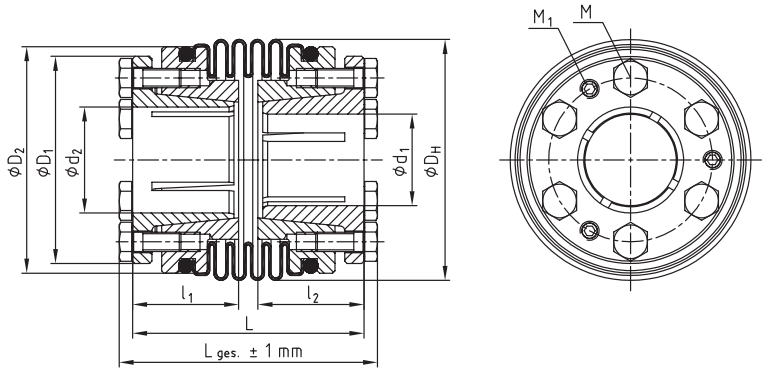
TOOLFLEX® 30 S	d_1 - Ø25	d_2 - Ø30
Coupling size	Finish bore Component 1	Finish bore Component 2

TOOLFLEX® Metal bellow-type couplings

Backlash-free, torsionally stiff and maintenance-free coupling

Type KN

- Backlash-free, torsionally stiff
- Non-positive bellow-hub connection
- High friction torques
- Maintenance-free
- Good properties of concentric running with high speeds
- Maximum speed up to 40 m/s circumferential speed



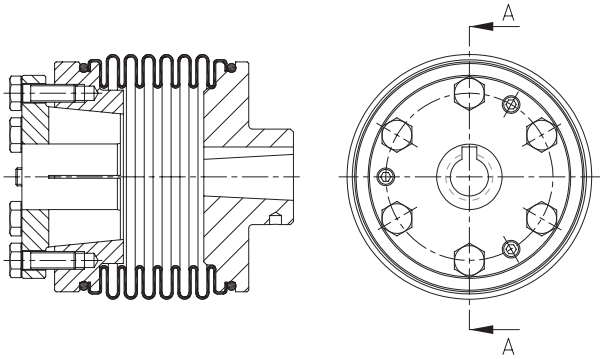
TOOLFLEX® S-KN

TOOLFLEX® Size	Torque T_{KN} [Nm]	Dimensions [mm]															
		Finish bore		L		$L_{ges.}$		l_1; l_2	D_H	D_1	D_2	Clamping screw			Pull-off threads		
		$d_{min.}$	$d_{max.}$	4 shafts 1)	6 shafts 2)	4 shafts 1)	6 shafts 2)					M	T_A [Nm]	Number z	M_1	Number z	T_{A1} 4) [Nm]
30	35	12	22	48	57	54	63	22	50	43	47	M4	2,9	12	M4	6	1,2
38	65	12	28	56	68	63	75	26	60,5	52	56	M5	6	12	M5	6	1,4
45	150	15	40	74,5	91	82,5	99	34	82	68	77	M6	14	12	M6	6	3
55 3)	340	15	56	95,5	109	106	120	40	97	95	95	M8	35	12	M8	6	6

TOOLFLEX® Size	Bore range d and the corresponding transmittable torques T_R of frictional engagement of the clamping hub [Nm]																			
	Ø12	Ø14	Ø15	Ø16	Ø19	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32	Ø35	Ø38	Ø40	Ø42	Ø45	Ø48	Ø50	Ø55	Ø56
30	37	50	58	66	71	79														
38	52	71	81	92	130	103	149	161	202											
45		113	130	147	208	230	332	230	288	331	376	451	531	589						
55 3)			174	198	279	309	445	483	606	696	792	585	690	764	843	967	1101	1194	1445	1498

1) Design S = 4 shafts 2) Design M = 6 shafts 3) Hubs from steel welded with bellow
4) After assembly of the clamping screws (M) tighten the pull-off thread (M_1) to the torque T_{A1} indicated.

Other designs: TOOLFLEX® KN for FANUC engines



Order form:

TOOLFLEX® 38 S-KN	d_1 - Ø15	d_2 - Ø22
Coupling size	Finish bore component 1	Finish bore component 2

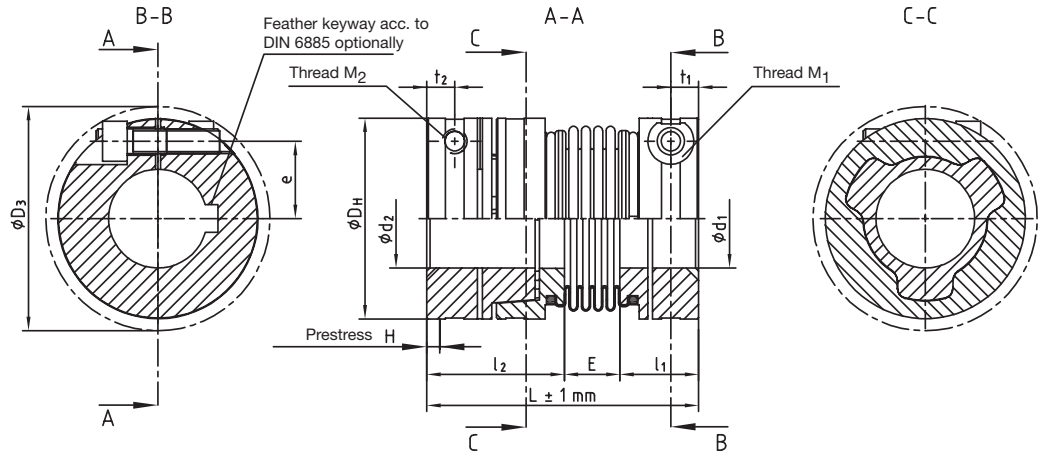
TOOLFLEX® PI (Plug-In)

Backlash-free, torsionally stiff and maintenance-free coupling

Plug-in metal bellow-type coupling

- Axial plug-in
- Backlash-free, torsionally stiff
- Maintenance-free
- Suitable for high temperatures due to flanged insert connection
- Well-resistant to corrosion due to bellow made from stainless steel and aluminium clamping hubs
- Optionally type M (6 shafts)
  - higher perm. displacements

  or Type S (4 shafts, short design)
  - higher stiffness of torsion spring
  - lower mass moment of inertia



TOOLFLEX®		Dimensions [mm]													
		General									Clamping screws				
Size	Design	$d_1;d_2$ min.	d_1 max.	d_2 max.	L [1]	l_1	l_2	E	D_H	H	$M_1;M_2$	D_3	e	$t_1;t_2$	T_A [Nm]
20	S	8	20	20	67,0	21,5	33,5	12,0	40	0,5 - 1	M5	43,5	14,5	6	6
	M				74,0			19,0							
30	S	10	30	28	73,5	23,0	33,5	17,0	55	0,5 - 1	M6	58,0	19,0	7	10
	M				82,5			26,0							
38	S	14	38	32	87,5	25,5	44,0	18,0	65	0,5 - 1,5	M8	72,6	25,0	9	25
	M				99,5			30,0							
45	S	14	45	42	96,0	32,0	41,5	22,5	83	0,5 - 1,5	M10	89,0	30,0	11	49
	M				112,5			39,0							

TOOLFLEX®		Torque	Speed	Technical Data						Mass [2]
				Moment of inertia [2]	Torsional stiffness	Axial spring stiffness	Radial spring stiffness	Perm. displacements		
Size	Design	T_{KN} [Nm]	n [3] [min^{-1}]	[$x10^{-6}kgm^2$]	[Nm/rad]	[N/mm]	[N/mm]	Radial [mm]	Angular [degrees]	[$x10^{-3}kg$]
20	S	15	11950	37	9600	63	189	0,15	1,0	149
	M			38	6600	42	126	0,20	1,5	155
30	S	35	8700	140	17800	97	233	0,20	1,5	294
	M			145	14800	65	155	0,25	2,0	313
38	S	65	7350	329	37400	108	318	0,20	1,5	496
	M			346	24900	72	212	0,25	2,0	520
45	S	150	5750	1031	95800	132	738	0,25	1,5	930
	M			1127	64000	88	492	0,30	2,0	1000

TOOLFLEX®	Transmittable friction torque of clamping hubs $Ød_1/Ød_2$																			
Size	Ø8	Ø9	Ø10	Ø11	Ø12	Ø14	Ø15	Ø16	Ø18	Ø19	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32	Ø35	Ø38	Ø40	Ø42
20	17,6	18,1	18,6	19,0	19,5	20,5	21,0	21,4	22,4	22,9	23,3									
30				33,0	34,0	35,0	36,0	36,4	38,0	38,5	39,0	42,0	42,5	44,5	46					
38									84,0	85,0	87,0	92,0	93,0	97,0	99,0	101,0				
45											157,0	165,0	167,0	173,0	177,0	181,0	187,0	193,0	197,0	200,0

1) When being plugged in
2) Figures refer to the complete coupling with max. bores
3) With v= 25 m/s

Order form:

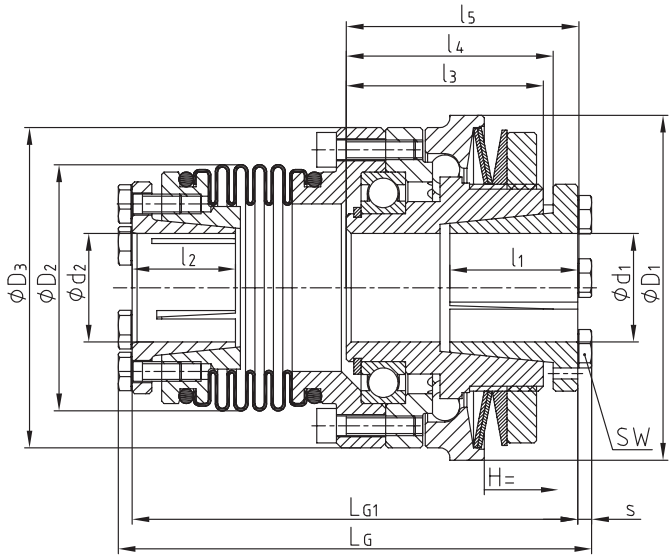
TOOLFLEX® 30 PI-S	d_1 - Ø22	d_2 - Ø18
Coupling size	Finish bore Component 1	Finish bore Component 2

TOOLFLEX® Metal bellow-type couplings

Backlash-free, torsionally stiff and maintenance-free coupling

With KTR-SI Compact safety system

- Backlash-free safety coupling with degressive spring characteristic
- Accurate disconnection with a high repeating accuracy
- Accurate, backlash-free torque transmission even in case of wear
- Comfortable setting subject to torque scale on the coupling
- Mounting flange with ball bearing
- Hardened ratchet surfaces for a long service life
- Backlash-free shaft-hub-connection subject to taper bush
- Available either as design M (6 shafts) or design S (4 shafts, short design)



TOOLFLEX® S-KN with KTR-SI Compact

TOOLFLEX® S-KN [1] Size	KTR-SI Compact Size	max. speed [min^{-1}]	TOOLFLEX® S-KN Torque [Nm]	KTR-SI Compact Torque [Nm]		Dimensions [mm]				
				T1	T2	d_1 max.	d_2 max.	D_1	L_G [2]	L_{G1} [2]
30	01	4000	35	3-14	6-28	25	22	70	96	90,5
38	0	3000	65	9-35	18-70	30	28	85	109	102,0
45	1	2500	150	19-65	38-130	40	40	100	145	137,5
55	2	2000	340	35-110	80-220	50	56	115	170	159,5

TOOLFLEX® S-KN [1] Size	KTR-SI Compact Size	Dimensions [mm]									
		D_2	D_3	l_1	l_2	l_3	l_4	l_5	s	SW_1	H
30	01	50,0	65	26	22	40	42,0	47	2,8	7	1,2
38	0	60,5	80	31	26	46	49,0	56	4,0	7	1,5
45	1	82,0	95	40	34	57	60,0	67	4,0	8	1,8
55	2	97,0	110	29	40	63	68,5	73	3,5	10	2,0

1) Optionally available with clamping hub
2) Depending on the design (M with 6 shafts or S with 4 shafts) of TOOLFLEX®

Order form:

KTR-SI Compact	1	45	DK	T2	d_1 ∅ 40	d_2 ∅ 40	100 Nm
Coupling type	KTR-SI Compact Size	TOOLFLEX S-KN Size	Design	Arrangement of disk springs	Bore KTR-SI Compact [mm]	Bore TOOLFLEX S-KN [mm]	Ratchet torque set [Nm]

RADEX®-NC

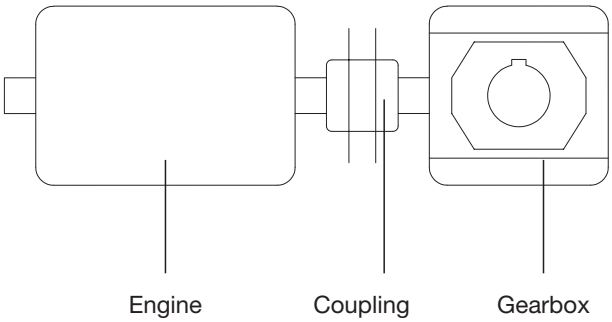
Backlash-free torsionally rigid servo lamina couplings

RADEX®-NC Servo lamina coupling

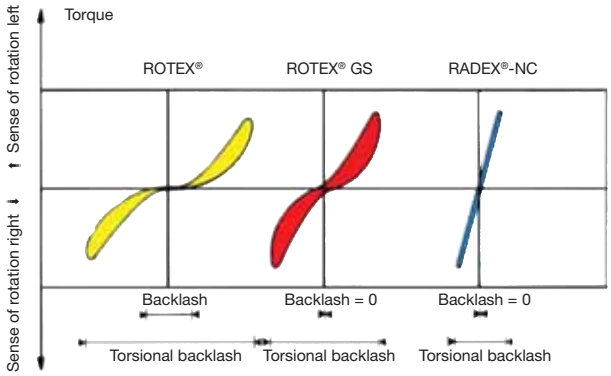
Backlash-free, torsionally rigid and maintenance-free couplings

The RADEX®-NC is a line particularly developed for the servo technology. In this coupling a package of torsionally rigid steel laminae that are soft in bending ensures a reliable compensation for axial, angular and radial shaft displacements. As all-metal coupling - the laminae are made from stainless steel - the RADEX®-NC can even be used with high temperatures (up to 200 °C) and under aggressive ambient conditions. The RADEX®-NC is manufactured in 6 sizes from size 5 to 35 for max. torques of up to 200 Nm. The hubs are frictionally engaged clamping hubs made from aluminium (size 42 made from steel) and are thus backlash-free even in a reversing drive.

A typical application of the RADEX®-NC are backlash-free worm gear pairs with low transmissions. The rigidity of the coupling must be converted by reason of the transmission of the gearbox from the drive side to the driven side. Here the transmission itself has a decisive influence because it is squarely included in the calculation. This converted rigidity is added in line to the gearbox stiffness in order to get the total rigidity. In case of transmissions that are lower than i = 8 we recommend to use the RADEX®-NC due to the loss of rigidity of the total system if flexible couplings are used.



The opposite diagram shows the influence of backlash and torsion angle on the drive train.
By reason of the high torsional rigidity of the RADEX®-NC the torsion angle under torque is very low.
Contrary to the flexible ROTEX® and ROTEX® GS a damping of torsional vibrations etc. is not possible.



Explosion protection use

RADEX®-NC couplings are suitable for power transmission in drives in hazardous areas. The couplings with feather key are approved according to EC Standard 94/9/EC (ATEX 95) as units of category 2G/2D and are thus suitable for use in hazardous areas in zones G1, G2, D21 and D22. Please see our Certificate and our operating and mounting instructions on our web site www.ktr.com.

Selection: In case of use in hazardous areas the clamping hubs without feather key, only for use in category 3 (with feather key for category 2), must be selected in a way that there is a minimum safety factor of s = 2 between the peak torque (inclu ding all operating parameters) and the nominal torque andfrictional torque of engagement of the coupling.

RADEX®-NC Servo lamina coupling

Coupling selection

1. **Drives without periodic torsional vibrations**
For example centrifugal pumps, fans, screw compressors, etc. The coupling selection requires that the rated torque T_{KN} and the maximum torque T_{Kmax} are reviewed.

1.1 **Loading by rated torque**
Taking into account the operating factor S_B the permissible rated torque must be at least as big as the rated torque T_{KN} of the machine.

$$T_{KN} \geq T_N \bullet S_B$$

(For operating factor S_B see table below)

1.2 **Loading by torque shocks**
The permissible maximum torque T_{Kmax} of the coupling must be at least as big as the sum of the peak torque T_S and the rated torque T_N of the machine. This is valid in case that the rated torque of the machine is superimposed by a shock (e. g. starting of the engine). For drives with A. C. motors and large masses on the load side we would recommend calculations by our simulation programme (please consult with our Engineering Department).

$$T_{Kmax} \geq (T_N + T_S)$$

2. **Drives with periodic torsional vibrations**
For drives subject to dangerous torsional vibrations (e. g. diesel engines, piston compressors, piston pumps, generators, etc.) it is necessary to perform a torsional vibration calculation (please consult with our Engineering Department).

2.1 **Loading by rated torque**
Taking into account the operating factor S_B the permissible rated speed must be at least as large as the rated torque T_N of the machine.

$$T_{KN} \geq T_N \bullet S_B$$

2.2 **Passing through resonance**
The peak torque T_{SR} arising while passing through resonance must not exceed the permissible maximum torque of the coupling T_{Kmax}.

$$T_{Kmax} \geq T_{SR}$$

2.3 **Loading by vibratory torque**
The permissible vibratory torque of the coupling T_{KW} must not be exceeded by the maximum periodic vibratory torque of the machine T_W.

$$T_{KW} \geq T_W$$

Explanation of the above-mentioned coupling torques

Description	Code	Explanation
Rated torque of coupling	T_{KN}	Torque which can be transmitted continuously over the entire speed range of the coupling

Description	Code	Explanation
Maximum torque of coupling	T_{Kmax}	Torque which can be transmitted during the entire life of the coupling $\geq 10^5$ times as spike load or 5×10^4 times as alternating load.

Guidelines for operating factor S_B

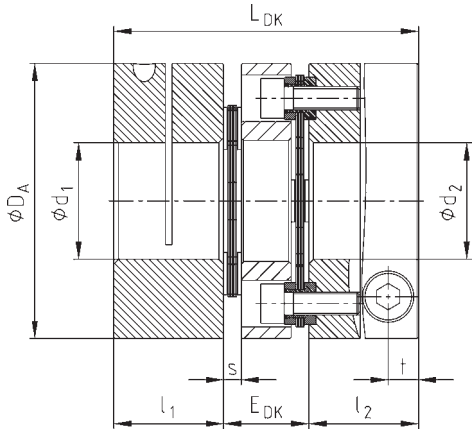
Application	S_B
Construction machinery	2
Agitators	1 - 2
Centrifuges	1,5
Conveyors	2
Elevators	2
Fans/Blowers	1,5
Generators	1
Calanders	2
Crushers	2,5
Textile machinery	2
Rolling mills	2,5

Application	S_B
Woodworking machinery	1,5
Mixers and extruders	2
Stamps, presses	2,5
Machine tools	2
Grinders	2,5
Packaging machines	1
Roller drives	2,5
Piston pumps	2,5
Centrifugal pumps	1,5
Piston compressors	2,5
Turbo compressors	2

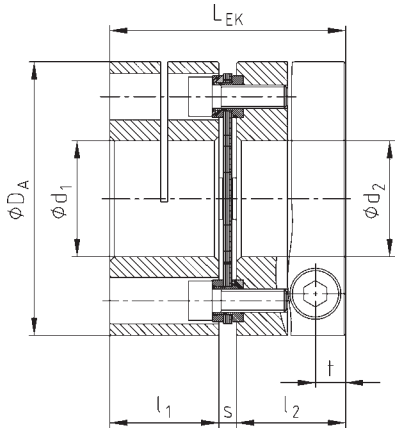
RADEX®-NC Servo lamina coupling

Standard types

- Backlash-free torque transmission
- Higher torsional rigidity
- Backlash-free shaft-hub-connection
- Low mass moment of inertia
- High speeds
- Operating temperature up to 200 °C
- Compact type
- Finish bore from Ø 6 mm also available with feather key acc. To DIN 6885 sheet 1 – JS9
- Ⓔx Approved according to EC Standard 94/9/EC (Explosion Certificate ATEX 95) (without feather key only for category 3)



Type DK



Type EK

Size	Technical data					Displacement type DK			Displacement type EK		
	T_{KN} [Nm]	$T_{K\ max.}$ [Nm]	Max. speed [min^{-1}]	Torsional rigidity [Nm/rad] Type EK	Type DK	Radial [mm]	Axial [mm]	Angular for each lamina [°]	Radial [mm]	Axial [mm]	Angular for each lamina [°]
5	2,5	5	25000	2400	1200	0,10	0,4	1	–	0,2	1
10	7,5	15	20000	5600	2800	0,14	0,8	1	–	0,4	1
15	20	40	16000	12000	6000	0,16	1,0	1	–	0,5	1
20	30	60	12000	30000	15000	0,25	1,2	1	–	0,6	1
25	60	120	10000	60000	30000	0,30	1,6	1	–	0,8	1
35	100	200	9000	72000	36000	0,40	2,0	1	–	1,0	1
42	180	360	7000	120000	60000	0,50	2,8	1	–	1,4	1

Size	Dimensions [mm]								Clamping screw		Mass moments of inertia	
	Max. d_1/d_2	D_A	l_1/l_2	L_{DK}	E_{DK}	L_{EK}	s	t	M	T_A [Nm]	DK [kgm^2]	EK [kgm^2]
5	10	26	12	34	10	26,5	2,5	3,5	M2,5	0,8	0,000004	0,000003
10	15	35	16	44	12	35	3	5,0	M4	3	0,000016	0,000012
15	20	47	21	55	13	45	3	6,8	M6	10	0,000065	0,000053
20	25	59	24	67	19	52	4	6,5	M6	10	0,000199	0,000154
25	35	70	32	88	24	69	5	9,0	M8	25	0,000508	0,000393
35	40	84	35	98	28	77	7	10,5	M10	49	0,001153	0,000911
42	55	104	40	116	36	91	11	10,5	M10	69	0,007458	0,006153

Size	Transmittable torque of the RADEX®-NC clamping hub [Nm] for standard bores																					
	Pilot bored	∅ 3	∅ 5	∅ 8	∅ 10	∅ 12	∅ 14	∅ 15	∅ 16	∅ 19	∅ 20	∅ 24	∅ 25	∅ 28	∅ 30	∅ 32	∅ 35	∅ 38	∅ 40	∅ 45	∅ 50	∅ 55
5	2,5	2,2	2,3	2,4	2,5																	
10	4,5		8	9	10	10	11	11														
15	5,5				28	30	31	32	32	34	35											
20	7,5					36	37	38	39	40	41	44	45									
25	9,5							82	83	87	88	93	94	98	100	103	106					
35	11,5									155	157	165	167	173	177	181	187	193	197			
42	15,0											285	287	296	301	307	315	323	329	343	357	370

Order form:

RADEX®-NC 20	DK	Ø 20	Ø 25
Coupling size	Type	Bore d_1	Bore d_2