ROTEX® GS
Backlash-free jaw couplings

Technical description

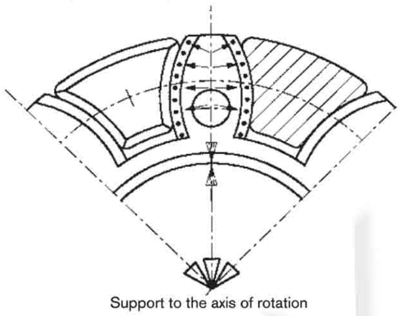
ROTEX® GS is a three-part, axial plug-in coupling backlash-free under prestress. It is convincing even with critical applications by its backlash-free power transmission, its stiffness which is each adapted to the application and its optimum damping of vibrations. This principle of installation offers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

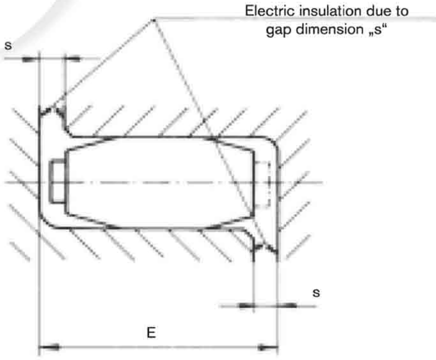
ROTEX® GS (straight tooth, backlash-free)

The straight spline 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.

The pegs arranged reciprocally on the spider prevent the spider from touching the hub over the entire surface. Observing the distance dimension E ensures the ability of the coupling to compensate for displacements.

By observing the gap dimension „s" the electrical insulation 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.





Notes

- Feather keyways available from a bore ≥Ø6
- Finish bore tolerance H7 (except for clamping hubs), from Ø55 G7 with clamping ring hubs
- Finish bore tolerance H6 for ROTEX® GS P
- Recommended insertion dimension of shafts into the coupling hubs: l_1/l_2; for clamping ring hubs l_3
- Spider available with bore on request

Use in explosive applications

ROTEX® GS couplings are suitable for power transmission in drives in hazardous areas. The couplings are certified and confirmed according to EC standard 94/9/EC (ATEX 95) as units of category 2G/2D and thus suitable for the use in hazardous areas of zone 1, 2, 21 and 22. Please read through our information included in the respective Type Examination Certificate and the operating and mounting instructions at 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 such 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.

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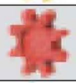
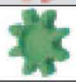
Spiders

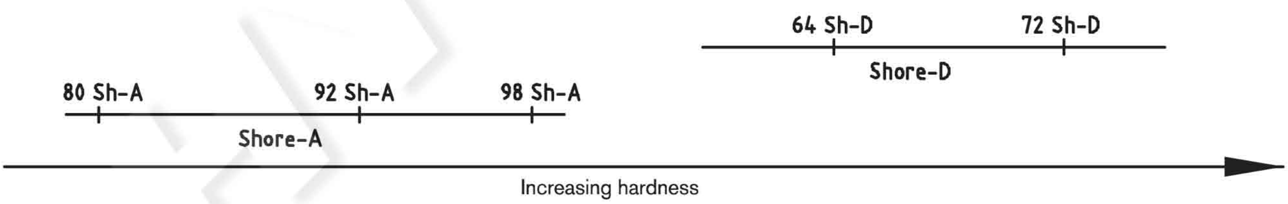
The elastic spiders of the GS line are available in five different kinds of Shore hardness, identified by colour, the material being soft to hard. Due to these five spiders with different kinds of Shore hardness it is easily possible to adjust the ROTEX® GS with regard to torsional stiffness and the vibration behaviour to the individual conditions of an application. The flexible prestress varies depending on the coupling size, the spiders/material and the production tolerances. Resulting herefrom is the axial plug-in force starting from low as a close sliding fit or with torsionally soft spider, respectively, to heavy with high prestress or torsionally rigid spider

Along with an increasing hardness of the spider the torques to be transmitted and the stiffness of the spider increase, too. Along with a reduced hardness of the spider the ability of compensating for displacements and damping the spider is increased.

Properties

Description of spider hardness [Shore]	Identification Colour	Material	Perm. temperature range [°C] Permanent temperature	Perm. temperature range [°C] Max. temperature short-term	Available for coupling size	Typical applications
80 Sh-A-GS		Polyurethane	- 50 to + 80	- 60 to + 120	size 5 to 24	– drives of electric measuring systems
92 Sh-A-GS		Polyurethane	- 40 to + 90	- 50 to + 120	size 5 to 55	– drives of electric measuring and control systems – main spindle drives
98-Sh A-GS		Polyurethane	- 30 to + 90	- 40 to + 120	size 5 to 90	– positioning drives – main spindle drives – high load
64 Sh-D-H-GS		Hytrel	- 50 to + 120	- 60 to + 150	size 7 to 38	– planetary gears / backlash-free gears – higher torsion spring stiffness / high ambient temperatures
64 Sh-D-GS		Polyurethane	- 20 to + 110	- 30 to + 120	size 42 to 90	– higher load – higher torsion spring stiffness
72 Sh-D-H-GS		Hytrel	- 50 to + 120	- 60 to + 150	size 24 to 38	– very high torsion spring stiffness / high ambient temperature – very high load
72 Sh-D-GS		Polyurethane	- 20 to + 110	- 30 to + 120	size 42 to 90	– very high torsion spring stiffness – very high load

Degree of hardness



Spider material	Polyurethane			Hytrel
Degree of hardness	**92 Shore-A**	**98 Shore-A**	**64 Shore-D**	**64 Shore-D**
Relative Damping ψ [-]	0,80	0,80	0,75	0,60
Resonance factor VR [-]	7,90	7,90	8,50	10,5

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Technical data

Size	Spider Shore GS	Shore range	Max. speed [rpm] for type						Torque [Nm]		Static torsion spring stiffness 1) [Nm/rad]	Dynamic torsion spring stiffness 1) [Nm/rad]	Radial spring stiffness Cr [N/mm]	Weight [kg]		Mass moment of inertia J [kgm2]	
			2.0 / 2.1 2.5 / 2.6	2.8 2.9	1.0 1.1	6.0 light [2]	6.0 P [2]	DKM	T_{KN}	$T_{K\,max}$				Each hub 5)	Spider	Each hub 5)	Spider
5	70	A	38000	38000	47700			57300	0,2	0,3	1,78	5	43	0,001	0,2 x 10^{-3}	0,015 x 10^{-6}	0,002 x 10^{-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	27000	34100			40900	0,7	1,4	8,6	26	114	0,003	0,5 x 10^{-3}	0,085 x 10^{-6}	0,01 x 10^{-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				
8	80	A		23800					0,7	1,4	8,8	27	117	0,003	3 x 10^{-3}	0,117 x 10^{-6}	0,01 x 10^{-6}
	98	A							2,0	4,0	23,5	71	433				
	64	D							2,4	4,8	35,3	106	648				
9	80	A	19000	19000	23800			28600	1,8	3,6	17,2	52	125	0,01	1,7 x 10^{-3}	0,48 x 10^{-6}	0,085 x 10^{-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	15200	19100			22900	3,0	6,0	84,3	252	274	0,02	2,3 x 10^{-3}	1,5 x 10^{-6}	0,139 x 10^{-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				
13	80	A		12700					3,6	7,2	111	330	359	0,01	1,3 x 10^{-3}	1,1 x 10^{-6}	0,155 x 10^{-6}
	98	A							11,0	22,0	316	941	1109				
	64	D							14,5	29,0	430	1287	1570				
14	80	A	12700	12700	15900	32000	47700	19100	4,0	8,0	60,2	180	153	0,02	4,7 x 10^{-3}	2,8 x 10^{-6}	0,509 x 10^{-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				
16	80	A		12000					5,0	10,0	157	471	400	0,02	2,3 x 10^{-3}	2,8 x 10^{-6}	0,434 x 10^{-6}
	98	A							15,0	30,0	450	1341	1710				
	64	D							19,0	38,0	612	1835	2238				
19	80	A	9550	9550	11900	24000	35800	14300	6,0	12,0	618	1065	582	0,09	7 x 10^{-3}	19,5 x 10^{-6}	1,35 x 10^{-6}
	92	A							12,0	24,0	1090	1815	1120				
	98	A							21,0	42,0	1512	2540	2010				
	64	D							26,0	52,0	2560	3810	2930				
24	92	A	6950	10400	8650	17000	26000	10400	35	70	2280	4010	1480	0,2	0,02	81,9 x 10^{-6}	6,7 x 10^{-6}
	98	A							60	120	3640	5980	2560				
	64	D							75	150	5030	10896	3696				
	72 [3]	D							97	194	9944	17095	5799				
28	92	A	5850	8800	7350	15000	22000	8800	95	190	4080	6745	1780	0,3	0,03	184,2 x 10^{-6}	14,85 x 10^{-6}
	98	A							160	320	6410	9920	3200				
	64	D							200	400	10260	20177	4348				
	72 [3]	D							260	520	21526	36547	7876				
38	92	A	4750	7150	5950	12000	17900	7150	190	380	6525	11050	2350	0,6	0,05	542,7 x 10^{-6}	39,4 x 10^{-6}
	98	A							325	650	11800	17160	4400				
	64	D							405	810	26300	40335	6474				
	72 [3]	D							525	1050	44584	71180	11425				
42	92	A	4000		5000	10000 8050 [4]	15000	6000	265	530	10870	15680	2430	2,4	0,08	2802 x 10^{-6}	85 x 10^{-6}
	98	A							450	900	21594	37692	5570				
	64	D							560	1120	36860	69825	7270				
	72 [3]	D							728	1456	58600	93800	9766				
48	92	A	3600		4550	9100 7200 [4]	13600	5450	310	620	12968	18400	2580	3,3	0,09	4709 x 10^{-6}	135 x 10^{-6}
	98	A							525	1050	25759	45620	5930				
	64	D							655	1310	57630	99750	8274				
	72 [3]	D							852	1704	80000	136948	11359				
55	92	A	3150		3950	6350 [4]	11900	4750	410	820	15482	21375	2980	5,1	0,12	9460 x 10^{-6}	229 x 10^{-6}
	98	A							685	1370	42117	61550	6686				
	64	D							825	1650	105730	130200	9248				
	72 [3]	D							1072	2144	150000	209530	12762				
65	98	A	2800		3500	5650 [4]	11000		940	1880	48520	71660	6418	6,7	0,2	15143 x 10^{-6}	437 x 10^{-6}
	64	D							1175	2350	118510	189189	8870				
	72 [3]	D							1527	3054	160000	310000	11826				
75	98	A	2350		2950	4750 [4]	8950		1920	3840	79150	150450	8650	10,5	0,3	32750 x 10^{-6}	1179 x 10^{-6}
	64	D							2400	4800	182320	316377	11923				
	72 [3]	D							3120	6240	360540	586429	16454				
90	98	A	1900		2380	3800 [4]	7150		3600	7200	204500	302900	10700	18,2	0,6	87099 x 10^{-6}	3362 x 10^{-6}
	64	D							4500	9000	429450	908700	14700				
	72 [3]	D							5850	11700	847440	1308852	20290				

1) Static and dynamic torsion spring stiffness with 0,5 x T_{KN}
2) Higher speeds on request
3) With the use of the 72Sh-D spider we recommend to use hubs made of steel
4) Clamping ring hubs 6.0 made of steel
5) Hubs with an average bore type 1.0

The coupling has to be dimensioned in a way that the permissible coupling load is not exceeded with any operating condition. (see coupling selection on page 18 et seqq.).
The torques TKN/TKmax specified refer to the spider. The shaft-hub-connection has to be investigated by the customer.

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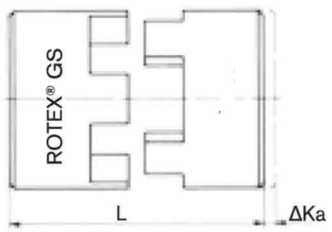
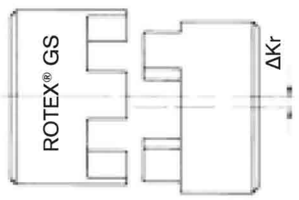
Notes for displacements

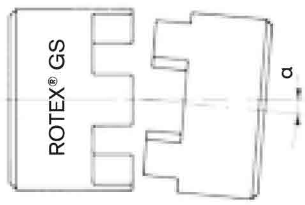
Axial displacement



Radial displacement



Angular displacement



Due to its design the ROTEX® GS is able to absorb axial, angular and radial displacement, 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.

As an example, axial displacement 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 displacement and to keep the reaction forces low.

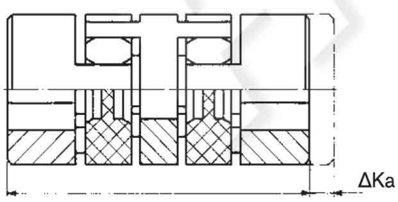
In case of pure angular displacement the imagined bisecting lines of the shafts intersect in the middle of the coupling. Up to a certain permissible extent this displacement can be absorbed by the coupling without any danger of extensive restoring forces.

Radial displacement 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 displacement the largest restoring forces are produced here, consequently causing the highest stresses for the adjacent components.

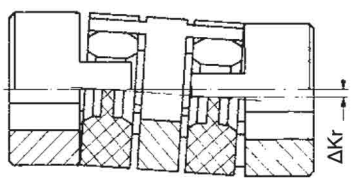
In case of larger displacements (especially radial displacements) the ROTEX® GS DKM double-cardanic design should be applied in order to avoid excessive restoring forces.

The above-mentioned permissible displacement figures of the flexible ROTEX® GS couplings are standard values, considering the coupling load up to the rated torque TKN of the coupling and with an ambient temperature of + 30 °C. 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.

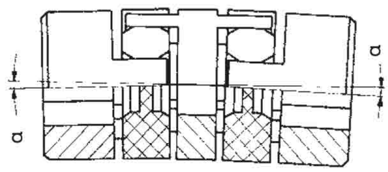
Axial displacement



Radial displacement



Angular displacement



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

Displacements

Displacements							
Size	Spider GS	Displacements standard			Displacements DKM		
		[mm] axial ΔKa[1]	[mm] radial ΔKr	[degree] angular α	[mm] axial ΔKa[1]	[mm] radial ΔKr	[degree] angular α
5	70 Sh-A		0,14	1,2°		0,17	1,2°
	80 Sh-A	+0,4	0,12	1,1°	+0,4	0,15	1,1°
	92 Sh-A	-0,2	0,06	1,0°	-0,4	0,14	1,0°
	98 Sh-A		0,04	0,9°		0,13	0,9°
7	80 Sh-A		0,15	1,1°		0,23	1,1°
	92 Sh-A	+0,6	0,10	1,0°	+0,6	0,21	1,0°
	98 Sh-A	-0,3	0,06	0,9°	-0,6	0,19	0,9°
	64 Sh-D		0,04	0,8°		0,17	0,8°
8	80 Sh-A		0,15	1,1°			
	98 Sh-A	±1	0,08	0,9°	—	—	—
	64 Sh-D		0,06	0,8°			
9	80 Sh-A		0,19	1,1°		0,29	1,1°
	92 Sh-A	+0,8	0,13	1,0°	+0,8	0,26	1,0°
	98 Sh-A	-0,4	0,08	0,9°	-0,8	0,24	0,9°
	64 Sh-D		0,05	0,8°		0,21	0,8°
12	80 Sh-A		0,20	1,1°		0,35	1,1°
	92 Sh-A	+0,9	0,14	1,0°	+0,9	0,32	1,0°
	98 Sh-A	-0,4	0,08	0,9°	-0,9	0,29	0,9°
	64 Sh-D		0,05	0,8°		0,25	0,8°
13	80 Sh-A		0,20	1,1°			
	98 Sh-A	±1	0,08	0,9°	—	—	—
	64 Sh-D		0,05	0,8°			
14	80 Sh-A		0,21	1,1°		0,40	1,1°
	92 Sh-A	+1,0	0,15	1,0°	+1,0	0,37	1,0°
	98 Sh-A	-0,5	0,09	0,9°	-1,0	0,33	0,9°
	64 Sh-D		0,06	0,8°		0,29	0,8°
16	80 Sh-A		0,21	1,1°			
	98 Sh-A	±1	0,10	0,9°	—	—	—
	64 Sh-D		0,08	0,8°			
19	80 Sh-A		0,15	1,1°		0,49	1,1°
	92 Sh-A	+1,2	0,10	1,0°	+1,2	0,45	1,0°
	98 Sh-A	-0,5	0,06	0,9°	-1,0	0,41	0,9°
	64 Sh-D		0,04	0,8°		0,36	0,8°
24	92 Sh-A		0,14	1,0°		0,59	1,0°
	98 Sh-A	+1,4	0,10	0,9°	+1,4	0,53	0,9°
	64 Sh-D	-0,5	0,07	0,8°	-1,0	0,47	0,8°
	72 Sh-D		0,04	0,7°		0,42	0,7°
28	92 Sh-A		0,15	1,0°		0,66	1,0°
	98 Sh-A	+1,5	0,11	0,9°	+1,5	0,60	0,9°
	64 Sh-D	-0,7	0,08	0,8°	-1,4	0,53	0,8°
	72 Sh-D		0,05	0,7°		0,46	0,7°
38	92 Sh-A		0,17	1,0°		0,77	1,0°
	98 Sh-A	+1,8	0,12	0,9°	+1,8	0,69	0,9°
	64 Sh-D	-0,7	0,09	0,8°	-1,4	0,61	0,8°
	72 Sh-D		0,06	0,7°		0,54	0,7°
42	92 Sh-A		0,19	1,0°		0,84	1,0°
	98 Sh-A	+2,0	0,14	0,9°	+2,0	0,75	0,9°
	64 Sh-D	-1,0	0,10	0,8°	-2,0	0,67	0,8°
	72 Sh-D		0,07	0,7°		0,59	0,7°
48	92 Sh-A		0,23	1,0°		0,91	1,0°
	98 Sh-A	+2,1	0,16	0,9°	+2,1	0,82	0,9°
	64 Sh-D	-1,0	0,11	0,8°	-2,0	0,73	0,8°
	72 Sh-D		0,08	0,7°		0,64	0,7°
55	92 Sh-A		0,24	1,0°		1,01	1,0°
	98 Sh-A	+2,2	0,17	0,9°	+2,2	0,91	0,9°
	64 Sh-D	-1,0	0,12	0,8°	-2,0	0,81	0,8°
	72 Sh-D		0,09	0,7°		0,71	0,7°
65	98 Sh-A	+2,6	0,18	0,9°			
	64 Sh-D	-1,0	0,13	0,8°	—	—	—
	72 Sh-D		0,10	0,7°			
75	98 Sh-A	+3,0	0,21	0,9°			
	64 Sh-D	-1,5	0,15	0,8°	—	—	—
	72 Sh-D		0,11	0,7°			
90	98 Sh-A	+3,4	0,23	0,9°			
	64 Sh-D	-1,5	0,17	0,8°	—	—	—
	72 Sh-D		0,13	0,7°			

[1] The Ka figures mentioned above have to be added to the length of the respective coupling type.