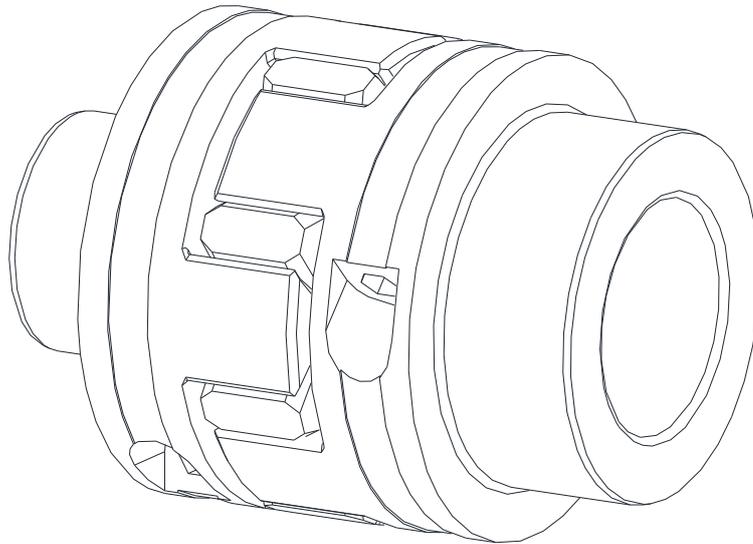




ROTEX® GS P ETP®

Torsionally flexible jaw couplings type ETP® and their combinations



ROTEX® GS P is a plug-in shaft coupling for measuring technology and automatic control engineering. It is able to compensate for shaft misalignment, for example caused by manufacturing inaccuracies, thermal expansion, etc.

Type **ETP®** allows for a quick and easy assembly and disassembly of the coupling.

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1 Technical data

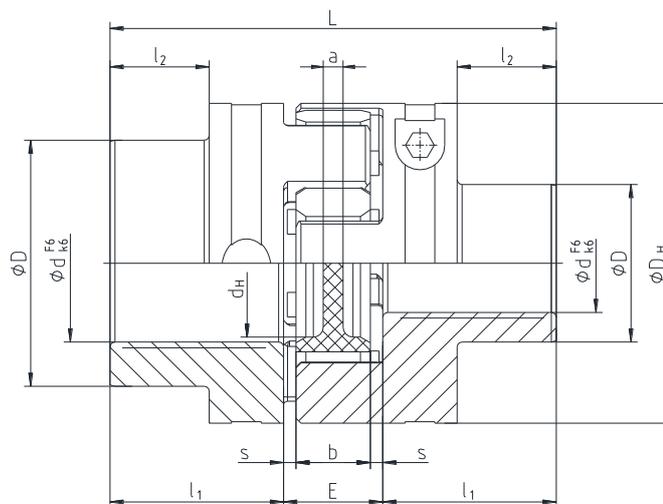


Illustration 1: ROTEX® GS P ETP® hub

Table 1: Dimensions

Size	Dimensions [mm]									
	Max. finish bore d	D _H ¹⁾	d _H	L	l ₁	l ₂	E	b	s	a
24	24	55	27	78	30	16	18	14	2.0	3
28	32	65	30	90	35	20	20	15	2.5	4
38	40	80	38	114	45	29	24	18	3.0	4
42	48	95	46	126	50	34	26	20	3.5	4

¹⁾ Ø D_H + 2 mm with high speeds for expansion of spider

Table 2: Torques

Size	Spider ²⁾ (component 2) rated torque T _{KN} [Nm]			
	92 ShA-GS	98 ShA-GS	64 ShD-GS	72 ShD-GS
24	35	60	75	97
28	95	160	200	260
38	190	325	405	525
42	265	450	560	728

²⁾ For coupling selection see catalogue Drive Technology "ROTEX® GS".
 Consider transmittable torques of the integrated hydraulic clamping system (see table 3)

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1 Technical data

Table 3: Torques and surface pressure

Size	24	28	38	42
Clamping screw M ¹⁾	M6	M6	M6	M6
Tightening torque T _A [Nm]	5	5	5	5
Bore Ød / ØD	<u>Transmittable friction torque T_R of hub [Nm]²⁾</u>			
	<u>Surface pressure [N/mm²]³⁾</u>			
Ø15 / Ø24	42	50		
	71	71		
Ø16 / Ø26	50	60		
	72	72		
Ø19 / Ø30	70	80		
	71	71		
Ø20 / Ø32	80	95		
	72	72		
Ø24 / Ø39	125	150	220	
	75	75	75	
Ø25 / Ø40		160	230	270
		75	75	75
Ø28 / Ø44		210	310	360
		77	77	77
Ø30 / Ø47		230	350	410
		78	78	78
Ø32 / Ø50		250	380	440
		76	76	76
Ø35 / Ø55			450	540
			77	77
Ø38 / Ø59			570	660
			78	78
Ø40 / Ø62			610	730
			79	79
Ø42 / Ø65				820
				79
Ø45 / Ø70				940
				80
Ø48 / Ø74				1100
				81

¹⁾  **A calculation is necessary if hollow shafts are used!**

²⁾ The transmittable torques of the integrated hydraulic clamping system consider the max. fitting tolerance with shaft clearance h6/bore F6. The torque is reduced with bigger fitting tolerances.

³⁾ The surface pressures of the integrated hydraulic clamping system specified consider the min. fitting tolerance with tolerance fit h6/F6.

2 Advice

The **ROTEX® GS ETP®** coupling was developed for backlash-free power transmission and easy plug-in assembly. This backlash-free power transmission is realized in the area of prestress (see illustration 2).

The large concave surface contact results in a lower surface pressure on the involute tooth. Consequently the tooth can be overloaded many times over with no wear/deformation.

The safe operation in the range of prestress is ensured, because the coupling operates according to the principle of positive-locking rubber spring prestress with high damping features. The star-shape coupling spider is inserted in the cams of the hubs which are machined specifically accurately with a small amount of prestress, resulting in the necessary backlash-free power transmission.

The flexible teeth compensating for misalignment are radially supported in the internal diameter by means of a web. An external deformation is limited by the concave shape of the cams, ensuring a smooth operation even with bigger masses (e. g. machine tables, articulated arms, etc.).

The flexible spiders for the GS series are available in four different kinds of Shore hardness, injected in different colours, either as a torsionally soft or hard material.

pegs on the lateral tooth in alternate arrangement

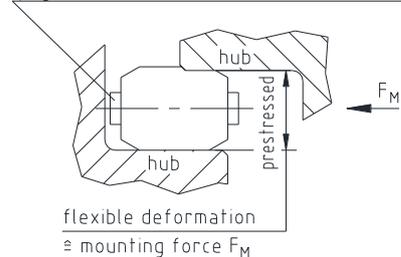


Illustration 2: Prestress of spider

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2 Advice

2.1 General advice

Please read through these operating/assembly instructions carefully before you start up the coupling. Please pay special attention to the safety instructions!

In order to ensure the operating principle of **ROTEX® GS P ETP®** and avoid early wear of the coupling, a respective operating factor „S_B“ has to be considered with the selection, each depending on the application (see catalogue Drive Technology). Temperatures and shocks are provided with the corresponding factors, too (see catalogue Drive Technology).

The operating/assembly instructions are part of your product. Please store them carefully and close to the coupling. The copyright for these operating/assembly instructions remains with KTR.

2.2 Safety and advice symbols



Warning of personal injury

This symbol indicates notes which may contribute to preventing bodily injuries or serious bodily injuries that may result in death.



Warning of product damages

This symbol indicates notes which may contribute to preventing material or machine damage.



General advice

This symbol indicates notes which may contribute to preventing adverse results or conditions.

2.3 General hazard warnings



With assembly, operation and maintenance of the coupling it has to be made sure that the entire drive train is secured against accidental switch-on. You may be seriously hurt by rotating parts. Please make absolutely sure to read through and observe the following safety indications.

- All operations on and with the coupling have to be performed taking into account "safety first".
- Please make sure to switch off the power pack before you perform your work on the coupling.
- Secure the power pack against accidental switch-on, e. g. by providing warning signs at the place of switch-on or removing the fuse for current supply.
- Do not reach into the operating area of the coupling as long as it is in operation.
- Please secure the coupling against accidental contact. Please provide for the necessary protection devices and covers.

2.4 Intended use

You may only assemble, operate and maintain the coupling if you

- have carefully read through the operating/assembly instructions and understood them
- had technical training
- are authorized by your company

The coupling may only be used in accordance with the technical data (see chapter 1). Unauthorized modifications on the coupling design are not admissible. We will not assume liability for any damage that may arise. In the interest of further development we reserve the right for technical modifications.

The **ROTEX® GS P ETP®** described in here corresponds to the technical status at the time of printing of these operating/assembly instructions.

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**2 Advice****2.5 Coupling selection**

For a long-lasting and failure-free operation of the coupling it must be selected according to the selection instructions (following DIN 740, part 2 with specific factors) for the particular application (see catalogue drive technology "ROTEX® GS").

If the operating conditions (performance, speed, modifications on engine and machine) change, the coupling selection must be reviewed.

Please make sure that the technical data regarding torque refer to the spider only. The transmittable torque of the shaft-hub-connection must be reviewed by the customer and is subject to his responsibility.

For drives subject to torsional vibrations (drives with cyclic stress due to torsional vibrations) it is necessary to perform a torsional vibration calculation to ensure a reliable selection. Typical drives subject to torsional vibrations are e. g. drives with diesel engines, piston pumps, piston compressors etc. If requested, KTR will perform the coupling selection and the torsional vibration calculation.

3 Storage, transport and packaging**3.1 Storage**

The coupling hubs are supplied in preserved condition and can be stored at a dry and roofed place for 6 - 9 months.

The features of the coupling spiders (elastomers) remain unchanged for up to 5 years with favourable storage conditions.



The storage rooms must not include any ozone-generating devices like e. g. fluorescent light sources, mercury-vapour lamps or electrical high-voltage appliances.

Humid storage rooms are not suitable.

Please make sure that condensation is not generated. The best relative air humidity is less than 65 %.

3.2 Transport and packaging

In order to avoid any injuries and any kind of damage please always make use of proper transport and lifting equipment.

The couplings are packed differently each depending on size, number and kind of transport. Unless otherwise contractually agreed, packaging will follow the in-house packaging specifications of KTR.

4 Assembly

The coupling is supplied in the following component assemblies and single parts. Before assembly the coupling has to be inspected for completeness.

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4 Assembly

4.1 Components of the coupling

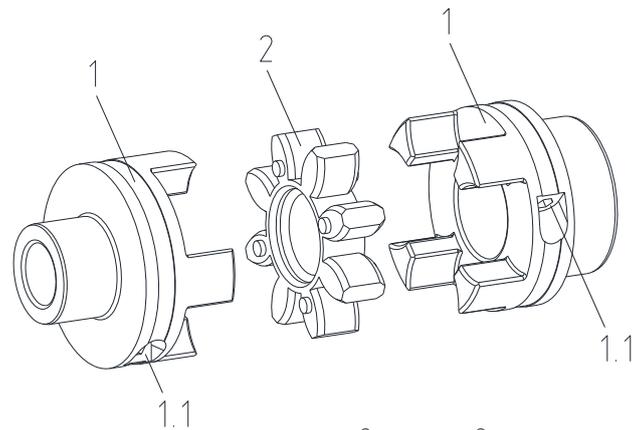
Features of standard spiders

Spider hardness (Shore)	Increasing hardness					
		92 ShA-GS (yellow)	98 ShA-GS (red)	64 ShD-H-GS (green)	64 ShD-GS (green)	72 ShD-H-GS (grey)
Size	24 - 42	24 - 42	24 - 38	42	24 - 38	42
Material	Polyurethane	Polyurethane	Hytrel	Polyurethane	Hytrel	Polyurethane
Marking (colour)						

Components of ROTEX® GS P ETP®

Component	Quantity	Description
1	2	ETP hub
1.1	1 ¹⁾	Setscrew
2	1	Spider

1) each ETP® hub



4.2 Advice for assembly

Subject to its design ROTEX® GS P ETP® allows to axially plug in the coupling having assembled the hubs onto the shaft journal. Consequently there is no need for subsequent screwing and the respective mounting holes in the housing.

The pegs on the spider arranged reciprocally prevent contact between the spider and the hubs over the full surface. Observing the distance dimension E (see table 1), the ability to compensate for displacements of the coupling is ensured in this way. All teeth are chamfered on the face which allows a blind assembly. When the coupling hubs are combined with the ROTEX® GS spider an axial assembly force is generated resulting from the flexible prestress of the star-shape elastomer. This assembly force varies depending on the coupling size, the spider hardness and the machining tolerances.

The axial assembly force is offset after assembly of the hubs and consequently does not mean any risk of axial load being applied to adjacent bearings.

The mounting force can be reduced by lightly greasing or lubricating the elastomer or the hubs. For this purpose please only use oils and greases on a mineral oil basis without any additives. Lubricants on a silicone basis (e. g. Optimol Optisit WX) or vaseline have proven their worth, too.

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4 Assembly
4.3 Assembly of the coupling

The power transmission of the **ROTEX® GS P ETP®** hub is frictionally engaged. The necessary surface pressure is transmitted via the integrated hydraulic clamping system onto the shaft. The torques specified in table 3 consider a fit pair F6/k6. With a bigger fit clearance the torques specified in table 3 are reduced.

The stiffness and dimensions of the shafts (here specifically hollow shafts) have to be dimensioned in a way that sufficient safety against plastic deformation is ensured. This may roughly be reviewed as per the following criterion.

With clamping connections with hollow shafts the required internal diameter of the hollow shaft d_{iW} is calculated based on the following formula:

$$d_{iW} \leq d \cdot \sqrt{\frac{R_{p0,2} - 2 \cdot p_W}{R_{p0,2}}} \quad [\text{mm}]$$

Shear stress on the internal shaft diameter for hollow shaft:

$$\sigma_{tiW} \approx - \frac{2 \cdot p_W}{1 - C_W^2} \quad [\text{N/mm}^2]$$

Shear stress for solid shaft:

$$\sigma_{tW} = - p_W \quad [\text{N/mm}^2]$$

$R_{p0,2}$ = yield strength of shaft material $[\text{N/mm}^2]$
 p_W = surface pressure of hub/shaft $[\text{N/mm}^2]$

d_{iW} = internal diameter of hollow shaft $[\text{mm}]$
 d = shaft diameter $[\text{mm}]$
 C_W = d_{iW} / d

The strength required is not provided if the hollow shaft bore is bigger than the max. internal bore calculated or if the shear stress exceeds the yield strength of the material.

For a detailed calculation please contact KTR's engineering department.

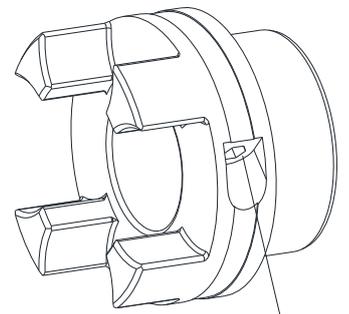


We recommend to inspect bores and shafts for dimensional accuracy before assembly.



With the assembly please make sure that the distance dimension E (see table 1) is observed to allow for axial clearance of the spider when in operation. Disregarding this advice may cause damage to the coupling.

- Clean and degrease the hub bore and the shaft.
- Lightly unscrew the setscrew (component 1.1).
- Shift the hub onto the shaft. Make sure that at least dimension l1 (table 1) is observed.
- Tighten the setscrew at the tightening torques specified in table 3.



Setscrew

Illustration 4: Assembly of hub



The frictionally engaged transmittable torques of the ETP® hub depend on the bore diameter (table 3).

- Insert the spider into the cam section of the hub on the driving or driven side.
- Shift the power packs in axial direction until the distance dimension E is achieved.



4 Assembly

4.3 Assembly of the coupling



If the shaft diameters are smaller than dimension d_H (see table 1) of the sider, one or two shaft ends may protude into the spider.



If the setscrew is not tightened at the correct tightening torque, there is the risk of
a) a fracture of the hub and plastic deformation with a too high tightening torque T_A
b) early slipping, untightening of the screws with a too small tightening torque T_A

Disassembly:

- Shift the power packs apart and remove the spider from the cam section of the hub.
- Unscrew the setscrews (component 1.1) of the hubs by about 1 - 2 revolutions and pull off the hubs from the shaft ends.
- Before the assembly is repeated the bores of the hubs and shafts have to be cleaned.

4.4 Displacements - alignment of the couplings

The displacement figures specified in table 4 provide for sufficient safety to compensate for external influences like, for example, thermal expansion or foundation settling.



In order to ensure a long service life of the coupling, the shaft ends have to be accurately aligned. Please absolutely observe the displacement figures specified (see table 4). If the figures are exceeded, the coupling will be damaged.
The more accurate the alignment of the coupling, the longer is its service life.

Please note:

- The displacement figures specified in table 4 are maximum figures which must not arise in parallel. If radial and angular displacements arise at the same time, the permissible displacement values may only be used proportionally (see illustration 6).
- Please inspect with a dial gauge, ruler or feeler gauge whether the permissible displacement figures specified in table 4 can be observed.

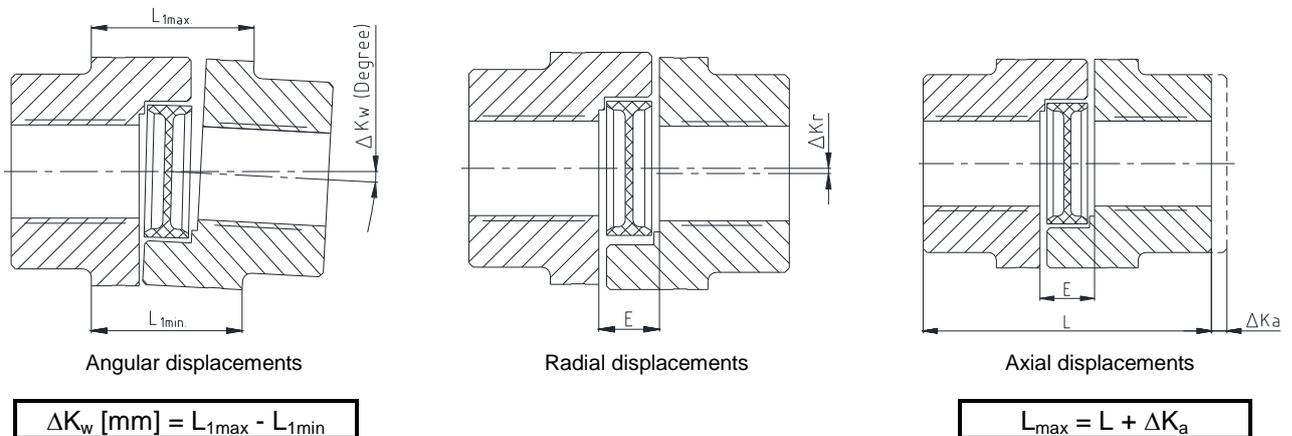


Illustration 5: Displacements

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4 Assembly

4.4 Displacements - alignment of the couplings

Examples of the displacement combinations specified in illustration 6:

Example 1:

$\Delta K_r = 30\%$

$\Delta K_w = 70\%$

Example 2:

$\Delta K_r = 60\%$

$\Delta K_w = 40\%$

$$\Delta K_{\text{total}} = \Delta K_r + \Delta K_w \leq 100\%$$

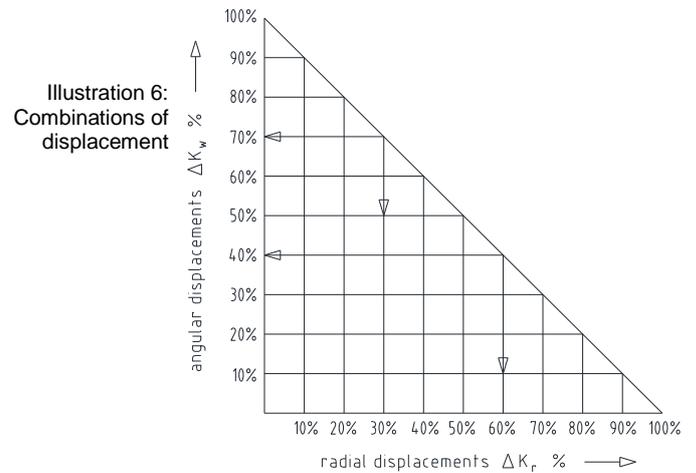


Table 4: Displacement figures

Size	Max. axial displacement ΔK_a [mm]	Max. radial displacement ΔK_r [mm]				Max. angular displacement ΔK_w [degree/mm]							
		92 ShA-GS	98 ShA-GS	64 ShD-GS	72 ShD-GS	92 ShA-GS	98 ShA-GS	64 ShD-GS	72 ShD-GS	92 ShA-GS	98 ShA-GS	64 ShD-GS	72 ShD-GS
24	+1.4 / -0.5	0.14	0.10	0.07	0.04	1.0	1.0	0.9	0.85	0.8	0.75	0.7	0.65
28	+1.5 / -0.7	0.15	0.11	0.08	0.05	1.0	1.1	0.9	1.0	0.8	0.9	0.7	0.8
38	+1.8 / -0.7	0.17	0.12	0.09	0.06	1.0	1.4	0.9	1.25	0.8	1.1	0.7	1.0
42	+2.0 / -1.0	0.19	0.14	0.10	0.07	1.0	1.65	0.9	1.5	0.8	1.3	0.7	1.1

The permissible displacement figures of the flexible **ROTEX® GS P ETP®** couplings specified are general standard values taking into account the load of the coupling up to the rated torque T_{KN} of the coupling and an ambient temperature of + 30 °C.

5 Start-up

Before start-up of the coupling inspect tightening of the setscrews in the hubs, the alignment and the distance dimension E and adjust, if necessary.

Finally the coupling protection against accidental contact must be fitted.

The cover must be electrically conductive and included in the equipotential bonding. Bellhousings (magnesium share below 7.5 %) made of aluminium and damping rings (NBR) can be used as connecting element between pump and electric motor. The cover may only be taken off with standstill of the unit.

During operation of the coupling, please pay attention to

- different operating noise
- vibrations occurring.

If the couplings are used in locations subject to dust explosion and in mining the user must make sure that there is no accumulation of dust in a dangerous volume between the cover and the coupling. The coupling must not operate in an accumulation of dust.

For covers with unlocked openings on the top face no light metals must be used if the couplings are used as equipment of equipment group II (*if possible, from stainless steel*).

If the couplings are used in mining (equipment group I M2), the cover must not be made of light metal. In addition, it must be resistant to higher mechanical loads than if it is used as equipment of equipment group II.



5 Start-up

The minimum distance „Sr“ between the protective device and the rotating parts must at least correspond to the figures specified below.

If the protective device is used as cover, regular openings can be arranged from the point of view explosion protection that must not exceed the following dimensions:

Openings	Cover [mm]		
	Top side	Lateral components	Distance „Sr“
Circular - max. diameter	4	8	≥ 10
Rectangular - max. lateral length	4	8	≥ 10
Straight or curved slot - max. lateral length/height	not permissible	8	≥ 20



If you note any irregularities with the coupling during operation, the drive unit must be switched off immediately. The cause of the breakdown must be specified by means of the table „Breakdowns“ and, if possible, be eliminated according to the proposals. The potential breakdowns specified can be hints only. To find out the cause all operating factors and machine components must be considered.

6 Breakdowns, causes and elimination

The below-mentioned failures can lead to a use of the **ROTEX® GS P ETP®** coupling other than intended. In addition to the specifications given in these operating and assembly instructions please make sure to avoid such failures.

The errors listed can only be clues to search for the failures. When searching for the failure the adjacent components must generally be considered.

General failures with use other than intended:

- Important data for the coupling selection were not forwarded.
- The calculation of the shaft-hub-connection was not considered.
- Coupling components with damage occurred during transport are assembled.
- The fit of the components to be assembled is not coordinated with one another.
- Tightening torques have been fallen below/exceeded.
- Components are mixed up by mistake/assembled incorrectly.
- A wrong or no spider is inserted in the coupling.
- No original **KTR** components (purchased parts) are used.
- Old/already worn out spiders or spiders stored for too long are used.
- Maintenance intervals are not observed.

6 Breakdowns, causes and elimination

Breakdowns	Causes	Elimination
Different operating noise and/or vibrations occurring	Misalignment	1) Set the unit out of operation 2) Eliminate the reason for misalignment (e. g. loose foundation bolts, breaking of the engine mount, heat expansion of unit components, modification of the installation dimension E of the coupling) 3) For inspection of wear see item inspection
	Wear of spider, short-term torque transmission due to metal contact	1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the spider 3) Inspect coupling components and replace coupling components that are damaged 4) Insert spider, assemble coupling components 5) Inspect alignment, adjust if necessary
	Screws for axial fastening of hubs working loose	1) Set the unit out of operation 2) Inspect alignment of coupling 3) Tighten the screws to fasten the hubs and secure against working loose 4) For inspection of wear see item inspection
Breaking of cams	Wear of spider, torque transmission due to metal contact	1) Set the unit out of operation 2) Replace complete coupling 3) Inspect alignment
	Breaking of the cams due to high impact energy/overload	1) Set the unit out of operation 2) Replace complete coupling 3) Inspect alignment 4) Find out the reason for overload
	Operating parameters do not meet with the performance of the coupling	1) Set the unit out of operation 2) Review the operating parameters and select a bigger coupling (consider mounting space) 3) Assemble new coupling size 4) Inspect alignment
	Operating error of the unit	1) Set the unit out of operation 2) Replace complete coupling 3) Inspect alignment 4) Instruct and train the service staff
Early wear of spider or reverse backlash	Misalignment	1) Set the unit out of operation 2) Eliminate the reason for misalignment (e. g. loose foundation bolts, breaking of the engine mount, heat expansion of unit components, modification of the installation dimension E of the coupling) 3) For inspection of wear see item standard values of wear
	e. g. contact with aggressive liquids/oils, ozone influence, too high/low ambient temperatures etc. causing physical modification of the spider	1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the spider 3) Inspect coupling components and replace coupling components that are damaged 4) Insert spider, assemble coupling components 5) Inspect alignment, adjust if necessary 6) Make sure that further physical modifications of the spider are excluded



6 Breakdowns, causes and elimination

Breakdowns	Causes	Elimination
Early wear of spider or reverse backlash	Ambient temperatures impermissibly high/low for the spider (observe selection factors in the catalogue Drive Technology, page 18 et seqq.)	<ol style="list-style-type: none"> 1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the spider 3) Inspect coupling components and replace coupling components that are damaged 4) Insert spider, assemble coupling components 5) Inspect alignment, adjust if necessary 6) Inspect and adjust ambient/contact temperature (possibly corrective by using different spider materials)
Early wear of spider (liquefaction of material inside the spider cam)	Vibrations of drive	<ol style="list-style-type: none"> 1) Set the unit out of operation 2) Disassemble the coupling and remove remainders of the spider 3) Inspect coupling components and replace coupling components that are damaged 4) Insert spider, assemble coupling components 5) Inspect alignment, adjust if necessary 6) Find out the reason for the vibrations (possibly corrective by spider with lower or higher Shore hardness)

7 Disposal

In respect of environmental protection we would ask you to dispose of the packaging or products on termination of their service life in accordance with the legal regulations and standards that apply, respectively.

- **Metal**
Any metal components have to be cleaned and disposed of by scrap metal.
- **Nylon materials**
Nylon materials have to be collected and disposed of by a waste disposal company.

8 Maintenance and service

ROTEX® GS P ETP® is a low-maintenance coupling. We recommend to perform a visual inspection on the coupling **at least once a year**. Please pay special attention to the condition of the coupling spiders.

- Since the flexible machine bearings of the driving and driven side settle during the course of load, please inspect the alignment of the coupling and re-align the coupling, if necessary.
- The coupling parts have to be inspected for damages.
- The setscrew has to be inspected visually.



Having started up the coupling, the tightening torque of the setscrew has to be inspected at regular maintenance intervals.

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8 Maintenance and service

8.1 Standard values of wear

In case of a backlash > X mm, the flexible spider must be replaced.

Reaching the limits for replacing depends on the operating conditions and the existing operating parameters.



In order to ensure a long service life of the coupling, the shaft ends have to be accurately aligned. Please absolutely observe the displacement figures specified (see table 4). If the figures are exceeded, the coupling will be damaged.

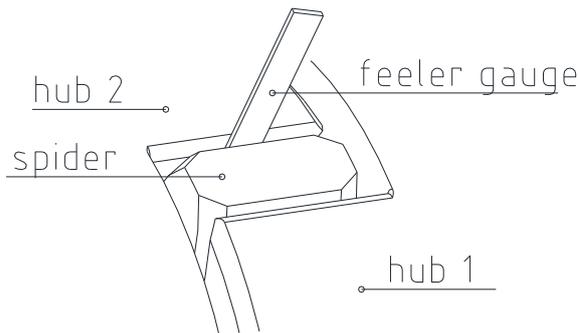


Illustration 7: Inspection of the limit of wear

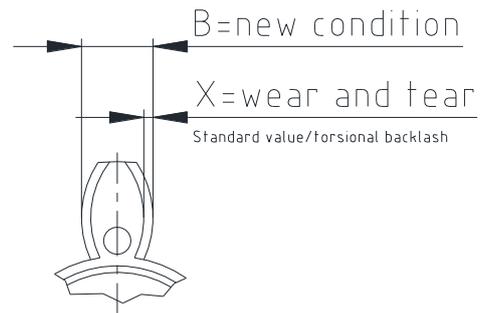


Illustration 8: Wear of spider



For backlash-free applications no wear is permitted, since otherwise the operating principle of the coupling (backlash-free condition) is no longer ensured. If a backlash-free operation is not required, the following figures apply:

Table 5:

Size	Limits of wear (friction)		Size	Limits of wear (friction)	
	$X_{max.}$ [mm]			$X_{max.}$ [mm]	
24	1.0		38	1.7	
28	1.4		42	2.0	

9 Spares inventory, customer service addresses

A basic requirement to ensure the readiness for use of the coupling is a stock of the most important spare parts on site.

Contact addresses of the KTR partners for spare parts and orders can be obtained from the KTR homepage at www.ktr.com.



KTR does not assume any liability or warranty for the use of spare parts and accessories which are not provided by KTR and for the damages which may incur as a result.

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